Revisions of British and Irish Lichens

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Lecideales

Cover image: *Porpidia striata*, on schistose stone, Meall nan Subh, Mid Perthshire, Scotland.

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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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

including *Amygdalaria*, *Bellemerea*, *Bryobilimbia*, *Cecidonia*, *Clauzadea*, *Farnoldia*, *Immersaria*, *Koerberiella*, *Lecidea*, *Lecidoma*, *Porpidia*, *Porpidinia* and *Romjularia* (Lecideaeae) and *Lopadium* (Lopadiaceae)

by

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LECIDEACEAE Chevall. (1826)

Thallus crustose or rarely subsquamulose, sometimes areolate, sometimes immersed, rarely absent (in lichenicolous species), soredia or isidia sometimes present. Ascomata apothecia, immersed to sessile, thalline margin usually absent, true exciple weakly to very strongly developed and usually black, the disc domed to concave, usually dark; hymenium usually blueing in iodine; hypothecium pale or dark. Interascal tissue of sparsely to richly branched and anastomosed paraphyses, often swollen at the apices, often pigmented or with an epithecial layer. Asci cylindrical to clavate, thick-walled, with an I+ apical cap, often with a more strongly staining tube-like structure and an outer I+ gelatinized layer. Ascospores cylindrical to ellipsoidal, hyaline, aseptate, thin-walled, sometimes with a gelatinous sheath. Conidiomata immersed, dark-walled, sometimes with a broad ostiole. Conidiogenous cells cylindrical to flask-shaped, apparently proliferating both percurrently and sympodially. Conidia cylindrical to bacilliform or filiform, hyaline, aseptate.

The above description applies only *to* Lecideaceae s. str., which includes the genera *Amygdalaria, Bellemerea, Cecidonia, Immersaria, Koerberiella, Lecidea* and *Porpidia*. It may also include *Farnoldia,* which is basal to the family and may lie outside it,

The Porpidiaceae was separated from the Lecideaceae by Hafellner (1984) based on the presence of a dark blue-staining tubular structure in the ascus apex, but subsequent molecular investigations (e.g. Buschbom & Mueller 2004, Miądlikowska *et al*. 2014) failed to find a clear distinction between the two families in phylogenetic terms, and they are now all included in an expanded Lecideaceae (Lücking *et al*. 2017a). However, more recent molecular work (Ruprecht *et al*. 2020, Fryday *et al.* 2024) has indicated that *Lecidea,* with the exception of the *L. auriculata* and (the non-British) *L. tessellata* groups, occupies a distinct clade separate from *Porpidia* s str. However, the same analyses also show that *Porpidia* is paraphyletic unless *Lecidea* is included and so both groups should be retained in Lecideaceae.

One of the larger and less well understood families of lichens. *Lecidea* in particular needs major revision, as many species were placed therein in the early days of lichenology and have not yet been assigned phylogenetically meaningful positions (Schmull *et al*. 2011). The same is true at the generic level with several genera (viz., *Bryobilimbia, Clauzadea, Lecidoma, Porpidinia, Romjularia*) having been shown to lie outside of the *Lecideales* (Schmull *et al.* 2011; Fryday *et al.* 2014; Kistenich *et al.* 2018, Kantvilas *et al.* 2021). Similarly, the *Lopadiaceae* is retained in the *Lecideales* even though its true position almost certainly lies elsewhere. The treatment here follows Lücking *et al.* (2017a), except that *Mycobilimbia* has been removed to the Ramalinaceae based on work by Kistenich *et al*. (2018).

The table of diagnostic characters and key below are in large part derived from Fryday & Hertel (2014) and Fryday *et al*. (2014) and refers only to British species.

Literature:

Buschbom & Mueller (2004), Fryday & Hertel (2014), Fryday & Van den Boom (2019), Fryday *et al*. (2014), Hafellner (1984), Hertel (1995), Kistenich *et al*. (2018), Lücking *et al.* (2017), Miądlikowska *et al*. (2014), Schmull *et al*. (2011).

Amygdalaria	Apothecia sunken into the thallus; hypothecium dark brown to black; asci *Porpidia*-type; ascospores large, with a gelatinous sheath, not amyloid; cephalodia usually present; on siliceous rock
Bellemerea	Apothecia sunken into the thallus; medulla I+ blue; true exciple reduced or absent; hypothecium colourless; asci *Porpidia*-type; ascospores small, with an I+ blue epispore and broad gelatinous sheath; on siliceous rock
Bryobilimbia	Apothecia sessile; hypothecium brown; asci *Porpidia*-type; ascospores small, sometimes septate, sometimes with a gelatinous sheath; on siliceous rock or overgrowing bryophytes

Cecidonia	Apothecia sessile, locules within the hymenium; true exciple well-developed; hypothecium brown; asci *Lecidea*-type; ascospores small, without a gelatinous sheath; on siliceous rock, lichenicolous
Clauzadea	Apothecia sessile to immersed; asci *Porpidia*-type; ascospores ± small, with a thin gelatinous sheath when young, not amyloid; thallus ± endolithic on calcareous rock
Farnoldia	Apothecia sessile; true exciple black, well-developed; asci *Porpidia*-type; ascospores ± large, with a gelatinous sheath, not amyloid; thallus ± endolithic on calcareous rock
Immersaria	Thallus with an epinecral layer; apothecia immersed; true exciple reduced or absent; asci *Porpidia*-type; ascospores ± small, with a gelatinous sheath, not amyloid; on siliceous rock
Koerberiella	Thallus isidiate; apothecia sessile, with a thalline margin; asci *Porpidia*-type; ascospores large, with a gelatinous sheath, not amyloid; conidia bacilliform
Lecidea	Thallus sometimes with an epinecral layer, sometimes squamulose; apothecia sessile, true exciple well-developed; asci *Lecidea*-type; ascospores ± small, without a gelatinous sheath; conidia bacilliform
Lecidoma	Thallus squamulose; true exciple well-developed; hypothecium colourless; asci *Porpidia*-type; ascospores small; conidia not known; terricolous
Porpidia	Thallus sometimes sorediate, isidiate in one species; apothecia usually sessile; true exciple well-developed, sometimes very thick; hypothecium brown or black; asci *Porpidia*-type; ascospores often large, with a gelatinous sheath, not amyloid
Porpidinia	Thallus squamulose, ± with an epinecral layer; true exciple and hypothecium dark brown, asci *Lecidea*-type; ascospores small, without a gelatinous sheath; on calcareous rock
Romjularia	Thallus squamulose; apothecia sessile; true exciple well-developed; hypothecium brown; asci *Porpidia*-type; ascospores small, without a gelatinous sheath; conidia ellipsoidal; terricolous or on calcareous rock

1 Apothecia with a persistent thalline margin; thallus isidiate ..... ***Koerberiella***
Apothecia without a clear thalline margin, the true exciple variably developed 2

2(1) Terricolous, or on calcareous rock, the thallus then often endolithic 3
On siliceous rock, or overgrowing bryophytes 10

3(2) Terricolous 4
On calcareous rock 5

4(3) On acid alpine soils; thallus areolate-squamulose with wide marginal lobes; hypothecium hyaline; paraphyses unbranched, thick (3–4 mm) and distinctly capitate (5–7 mm) ..... ***Lecidoma***
On calcareous soils; thallus squamulose; hypothecium pale brown; paraphyses narrower ..... ***Romjularia***

5(3) Thallus squamulose 6
Thallus crustose or inconspicuous and endolithic 7

6(5) Asci *Lecidea*-type; thallus usually densely white-pruinose; ascospores sometimes 1-septate .. ***Porpidinia***
Asci *Porpidia*-type; thallus not pruinose; ascospores always aseptate ..... ***Romjularia***

7(6) Apothecia appearing carbonized, the true exciple composed of strongly conglutinated dark brown hyphae, clearly separate from the paler hypothecium ..... ***Farnoldia***
Apothecia not appearing carbonized, red-brown to brown-black 8

8(7) Apothecia minute, initially ± perithecial; asci *Lecidea*-type; on chalk pebbles ..... ***Watsoniomyces obsoletus*** [Lichinales]
Apothecia not initially perithecial, often large; asci *Porpidia*-type 9

9(8) Hypothecium concolorous with exciple; brown and/or olivaceous pigments present internally; conidia developed apically; usually upland, ascospores usually >15 µm long..... ***Porpidia***
Hypothecium paler than exciple; only brown, K– pigments present internally; conidia developed laterally and apically, ascospores usually <15 µm long, if longer then apothecia immersed .... ***Clauzadea***

10(2) Apothecia sunken into the thallus 11
Apothecia emergent to sessile 14

11(10) Thalline medulla I+ blue, apothecia with a brown disc, ascospores with an I+ blue epispore and broad gelatinous sheath..... ***Bellemerea***
Medulla and ascospores not blueing in iodine, apothecia usually with a black disc 12

12(11) Asci *Porpidia*-type; true exciple reduced or absent 13
Asci *Lecidea*-type; true exciple well-developed..... ***Lecidea***

13(12) Thallus white to grey, lacking an epinecral layer; cephalodia usually present, immersed to tuberculate..... ***Amygdalaria***
Thallus brown, with an epinecral layer (atrobrunnea-type); cephalodia absent ..... ***Immersaria***

14(10) Asci *Porpidia*-type..... 15
Asci *Lecidea*-type 16

15(14) Ascospores with a broad gelatinous sheath; hypothecium and exciple usually dark brown, if orange-brown then ascospores >20 mm long; on rock ..... ***Porpidia***
Ascospores <18 µm long, with a narrow, sometimes warted gelatinous sheath; hypothecium and exciple dark reddish to orange brown; usually overgrowing bryophytes..... ***Bryobilimbia***

16(14) True exciple prominent, carbonaceous, the disc sometimes with a central umbo; lichenicolous fungus, forming white galls on Lecideaceae species..... ***Cecidonia***
True exciple not carbonaceous, the disc flat; not lichenicolous ..... ***Lecidea***

AMYGDALARIA Norman (1853)

Thallus crustose, superficial, areolate, often coarsely so, sometimes with a pinkish tinge, with immersed to tuberculate cephalodia between the areoles; without a distinct epinecral layer. **Medulla** I–. **Photobiont** *Trebouxia*-like, with *Stigonema* in the cephalodia. **Ascomata** apothecia, deeply immersed in the areoles, occasionally umbonate; discs black or brown-black, flat to concave. **True exciple** often poorly developed, of conglutinated radially orientated hyphae. **Thalline margin** absent. **Hymenium** tall, I+ blue. **Hypothecium** colourless to pale brown, or dark brown to black and carbonaceous, then well-developed and cupulate, K+ reddish. **Hamathecium** a net of thin branched and anastomosing paraphysoid-like hyphae, septate especially above where they are almost moniliform, not or slightly swollen at the apex. **Asci** elongate-clavate, *Porpidia*-type, with a thin outer amyloid layer and a thickened tholus penetrated by a pore, the sides of which stain I/KI+ deep blue, 8-spored. **Ascospores** large, ellipsoidal (to ovoid), aseptate, colourless, smooth, with a compact gelatinous perispore. **Conidiomata** pycnidia, immersed. **Conidia** bacilliform. **Chemistry**: gyrophoric acid often present, sometimes with lecanoric acid (other orcinol depsides or β-depsidones in non-British representatives). **Ecology**: on damp slightly calcareous siliceous rocks and especially basalts, in upland and mountainous areas.

This genus is essentially an 'aspicilioid' counterpart of *Porpidia*, with the apothecia sunk into the thallus areoles. However, some non-British taxa placed here have elevated apothecia and well-developed true exciples. They are also distinguished by the generally taller hymenium, large ascospores, less well-developed exciple, the tendency of the thalli to be pinkish or brownish, and the presence of cephalodia and gyrophoric acid in some species.

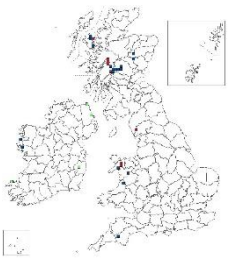
Bellemerea has ascospores with an I+ blue perispore, brown apothecia, a colourless (or absent) exciple, and colourless hypothecium. *Clauzadea* differs in the often endolithic thallus, the strictly calcicolous habitat, and the uniform brown pigmentation of the apothecia. *Clauzadeana* differs on the basis of ascus structure and the presence of algal cells in the exciple and under the hymenial tissues. The apothecia of *Koerberiella* develop from isidium-like protuberances. The thallus of *Immersaria* is brown and nitid with a distinct epinecral layer and an I+ blue medulla.

Published sequence data are sparse for the genus. Work by Buschbom & Mueller (2004) suggested that the genus clustered within a paraphyletic *Porpidia* sensu lato. Fryday (2005) considered that the *P. cinereoatra* group might be transferred to *Amygdalaria* based on this information, and further phylogenetic research by Xie *et al.* (2022) and Fryday *et al.* (2024) confirmed the relationship. However, more data are needed before changes in generic circumscription are justified.

Literature:
Brodo & Hertel (1987), Buschbom & Mueller (2004), Fryday (2005), Gilbert & Hawksworth (2009a), Xie *et al*. (2022).

1 Cortex C–; thallus cracked-areolate, areoles ± flat; cephalodia, when present, usually immersed, brown ..... ***consentiens***
Cortex C+ pink; thallus of distinct, sometimes dispersed and strongly convex areoles; cephalodia usually present, immersed to conspicuously tuberculate, red-brown to grey ..... ***pelobotryon***

Amygdalaria consentiens (Nyl.) Hertel, Brodo & May. Inoue (1984) **LC NS**

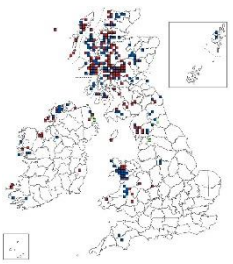


Thallus grey to rust-coloured, more rarely yellowish or pinkish, cracked-areolate, the areoles ± flat, the thallus margin usually well-delimited; cephalodia, when present, usually immersed, rarely convex, brown. Apothecia (0.3–) 0.5–0.8 (–1.5) mm diam., usually one per areole; disc flat, often with a central umbo; hymenium (100–) 150–180 (–200) µm tall. Ascospores 21–34 × 9.5–16 µm. Thallus C–, K–, Pd– (no substances detected by TLC). **BLS 0563**.

On damp schists, other siliceous rocks, and occasionally on limestone in mountainous areas; local. S.W. and N.W. England (Dartmoor, Lake District), N. & W. Wales, Scotland (Highlands), W. Ireland.

The thallus sometimes hosts the tiny black apothecia of *Sclerococcum amygdalariae* (Triebel) Ertz & Diederich (2018) or *S. attendendum* (Nyl.) Ertz & Diederich (2018), and the perithecia of *Endococcus perpusillus* Nyl. (1857).

Amygdalaria pelobotryon (Wahlenb.) Norman (1853) **LC**



Thallus white, pale yellowish grey or fawn to yellowish brown, sometimes tinged pink, thick, cracked-areolate, the areoles continuous to somewhat dispersed, strongly convex; cephalodia, when present, immersed to tuberculate, dark red-brown to grey. Apothecia (0.3–) 0.5–1 (–1.5) µm diam., innate, usually one per areole; disc concave to flat, rarely umbonate; hymenium (135–) 140–180 (–210) µm tall. Ascospores 18–34 × 9.5–15.5 µm. Thallus C+ pink, K–, Pd– (gyrophoric, ± lecanoric acids). **BLS 0044.**

On ± damp, somewhat base-rich siliceous rocks, especially basalts, in upland and mountainous areas; local. S.W. England (Dartmoor), N. England, S. to Derbyshire, C. & N. Wales, Scotland, W. and N. Ireland.

"*Lecidea*" *phaeops*, which occasionally occurs in similar habitats, can be distinguished by the C– thallus

(atranorin and psoromic acid), the unbranched paraphyses, different ascus apical apparatus, and smaller ascospores.

Host to *Arthonia almquistii* (q.v.), *Endococcus rugulosus* Nyl. (1855), *Sclerococcum attendendum* and *S. purpurascens* (Triebel) Ertz & Diederich (2018).

BELLEMEREA Hafellner & Cl. Roux (1984)

Thallus crustose, cracked- to warted-areolate, whitish, greyish, ochraceous to rust-coloured; areoles dispersed to contiguous; prothallus black. **Photobiont** chlorococcoid, many cells ellipsoidal, the algal layer at times continuous beneath the hypothecium. **Medulla** I+ strongly blue to violet. **Ascomata** apothecia, ± immersed, at times occupying virtually the entire surface of the areole; disc concave to flat. **Thalline margin** thin, not raised, scarcely distinguishable from the thallus (but well-developed in some non-British species (e.g. *B. cinereorufescens*). **True exciple** very thin, or absent. **Hamathecium** of paraphyses, branched and anastomosed; apices slightly swollen, often with a thin dark brown cap. **Epithecium** brown. **Hypothecium** colourless. **Asci** 8-spored, clavate, similar to *Porpidia*-type but with a less distinct tube structure. **Ascospores** aseptate, occasionally spuriously 1-septate, ± ellipsoidal, colourless, with a distinct I+ blue inner wall, and a distinct gelatinous sheath. **Conidiomata** pycnidia, immersed. **Conidiogenous cells** in short chains. **Conidia** apical or lateral, short-bacilliform, aseptate, colourless. **Chemistry**: norstictic acid present in some species. **Ecology**: on montane or Arctic rocks.

Separated from *Aspicilia* by the *Porpidia*-type ascus. Distinguished from *Amygdalaria*, and *Porpidia* species with immersed apothecia, by the ascospores with an I+ blue perispore, colourless (or absent) exciple, and colourless hypothecium. For differences from *Eiglera*, *Immersaria* and *Koerberiella* see those genera. There is only one confirmed British species.

Literature:
Clauzade & Roux (1984), Purvis & Gilbert (2009), Xie *et al*. (2022).

Bellemerea alpina (Sommerf.) Clauzade & Cl. Roux (1984) **CR B**

Thallus creamy white to pale blue-grey, areolate with contiguous or dispersed areoles; prothallus black. Apothecia 0.2–1.0 mm diam., dull brown when dry, bright red-brown when wet; epithecium brown, N–; algal layer discontinuous beneath the hypothecium. Ascospores broadly ellipsoidal, 8–23 × 7–13 µm. Thallus C–, K+ yellow→red (crystals), Pd+ yellow-orange (norstictic acid). **BLS 0101**.

On quartz rocks and pebbles near late snow patches in the Cairngorms (Banff, E. Inverness, S. Aberdeenshire). There is also a 19th century record from schists on Ben Lawers.

B. cinereorufescens (Ach.) Clauz. & Roux (1984) differs in having a thick grey to brown thallus and apothecia with a well-developed thalline margin (the algal layer continuing beneath the hypothecium) and ascospores 7–16 × 4–9 µm. It was recorded last century from N. Scotland (Lochan nan Cat, Ben Lawers and walls at Glen Fender, Blair Atholl) but these records are dubious and the collections may have originated from outside of our region.

BRYOBILIMBIA Fryday, Printzen & S. Ekman (2014)

Thallus effuse, thin, continuous or irregularly rimose, pale grey or grey-green; medulla I–; **Prothallus** not differentiated. **Photobiont** trebouxioid. **Soralia** and **isidia** absent. **Apothecia** sessile, reddish brown to black. **Thalline margin** absent. **True exciple** persistent, sometimes prominent, the outer edge and hypothecium dark reddish brown. **Epithecium** colourless or pale brown, K–. **Hymenium** and **hypothecium** usually with blue-violet (K+ green) granules. **Hamathecium** of paraphyses, the apices slightly broadened, unbranched or sparingly branched and anastomosed, without apical cap or hood. **Asci** *Porpidia*-type. **Ascospores** ellipsoidal, aseptate or with 1(-3) narrow septa, smooth or finely warted.

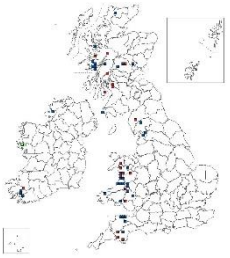
A segregate from *Lecidea* distinguished from that genus and *Mycobilimbia* [Lecanorales: Ramalinaceae] by having a *Porpidia*-type ascus. There are nine species, of which three occur in our region.

Literature:
Fryday & Hertel (2014), Fryday *et al*. (2014).

1 On damp, periodically inundated siliceous rocks; ascospores (5–) 6–7 (–9) µm wide ..... ***ahlesii***
Over bryophytes on rocks, trees or soil 2

2(1) Ascospores 4.5–6 (–7) µm wide with a warted perispore, often 1-septate, true exciple usually persistent; over bryophytes on calcareous rocks and trees ..... ***hypnorum***
Ascospores 3–4.5 (–6) µm wide, smooth, aseptate, true exciple usually excluded; over bryophytes on acid bark, exceptionally on siliceous rock ..... ***sanguineoatra***

Bryobilimbia ahlesii (Körb.) Fryday, Printzen & S. Ekman (2014) **Nb**
Lecidea ahlesii (Körb.) Nyl. (1872)

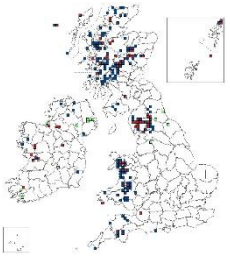


Thallus effuse, ± shiny, thin, continuous or irregularly rimose, pale grey or grey-green; medulla I–; prothallus not differentiated. Apothecia (0.2–) 0.3–0.6 (–1.2) mm diam., sessile, reddish brown to brown-black to black; disc concave to slightly convex; true exciple usually prominent and persistent, the outer edge and hypothecium dark reddish brown; inner exciple pale reddish brown or almost colourless; epithecium colourless or yellowish- to pale reddish brown, K–; hymenium 65–80 (–90) µm tall; hymenium and hypothecium usually with blue-violet (K+ green) granules; paraphyses *ca* 1.5 µm diam., apices slightly widened to 2.5–3 µm, unbranched or sparingly branched and anastomosed, without apical cap or hood. Asci similar to *Porpidia*-type. Ascospores 12–17 × (5–) 6–7 (–9) µm. Thallus C–, K–, KC–, Pd–, UV+ white (lichen products not detected by TLC). **BLS 0790**.

On periodically inundated, shaded siliceous (or very rarely slightly calcareous) rocks; localized. N.W. England (Lancashire), S.W. England, Wales, Cumbria, N. Scotland (Highlands), S.W. Ireland.

Close to *B. sanguineoatra* but distinguished by its broader ascospores and habitat on rocks rather than bryophytes. Rare morphs of *B. sanguineoatra* that grow directly on rocks can be separated from *B. ahlesii* by their narrower ascospores. Also similar is *L.* aff. *strasseri* (q.v.), which has a granular thallus and paraphyses with wide (5 µm) apices.

Bryobilimbia hypnorum (Lib.) Fryday, Printzen & S. Ekman (2014) **Nb**
Lecidea hypnorum Lib. (1853)



Thallus effuse, thin, membranous, pale grey, sometimes with a brownish tinge; I–. Apothecia 0.6–1.2 mm diam. (sometimes forming larger tuberculate clusters), dark brown to black, sessile; disc flat to convex; true exciple thin and often flexuose, usually persisting; exciple and hypothecium dark reddish brown, K–; epithecium pale brown or almost colourless; hymenium 60–70 µm tall, hymenium and hypothecium usually with scattered blue-violet (K+ green) granules; paraphyses 1.5–1.7 µm diam., mostly

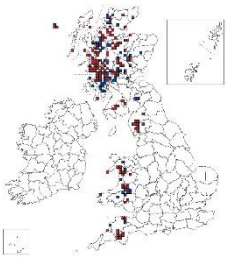
unbranched, the apices gradually widening to *ca* 2.5 µm diam., colourless. Ascospores 10–16 (–19) × 4.5–6 (–7) µm, ellipsoidal, often thinly 1(-3)-septate, mostly with a finely warted epispore. Thallus C–, K–, KC–, Pd–, UV+ white (lichen products not detected by TLC). **BLS 0730**.

On bryophytes and plant debris over limestones and calcareous schists or their derived soils; very rarely on old tree trunks (*Fraxinus*); from sea level to over 1000m; locally frequent. N. & W. Britain and Ireland. Specimens with a thick thallus on acid debris on the Cairngorm Plateau warrant further investigation.

An unidentified species of *Stigmidium*, with spores 13–15 × 4–4.5 µm, has been collected from Angus.

Bryobilimbia sanguineoatra (Wulfen) Fryday, Printzen & S. Ekman (2014) **Nb**

Lecidea sanguineoatra (Wulfen) Ach. (1803)



Like *B. hypnorum* but apothecia usually a paler brown (rarely dark brown), with a more readily excluded true exciple, and narrower ascospores, (8–) 9–14 (–15) × 3–4.5 (–6) µm, which are smooth and never septate. **BLS 1772**.

On bryophytes over siliceous rocks or acid bark (esp. *Quercus*, *Betula*, *Sorbus*) in woodlands or sheltered valleys, very rarely directly on rock; below 600 m, local. N. & W. Britain and Ireland, also recorded from a humid gill in S. Hampshire (New Forest).

Rare morphs on rocks can be separated from *B. ahlesii* by their narrower ascospores. *Lecidea berengeriana* has a thicker tartareous white thallus and stouter apices to the paraphyses; it was thought to belong to this group but appears to be most closely related to *Clauzadea* and *Romjularia*. The species as interpreted by Aptroot *et al*. (2009) was thought to differ from the type, but Fryday *et al*. (2014) neotypified Wulfen's name so as to conform to modern usage.

Reported as host to *Lichenochora inconspicua* Hafellner (1989), *Sclerococcum microsporum* (Etayo) Ertz & Diederich (2018) and an unidentified species of *Stigmidium*.

CECIDONIA Triebel & Rambold (1988)

Thallus crustose, composed of white gall-like swellings to 6 mm diam., lichenicolous on saxicolous crustose lichens. **Photobiont** protococcoid green algae (?*Trebouxia*). **Ascomata** apothecia, black, sessile, to 0.6 mm diam., the disc often umbonate; margin persistent, often radially cracked. **Thalline margin** absent. **True exciple** of irregular chains of swollen cells, outer layer ± carbonaceous, internally paler brown. **Epithecium** dilute olivaceous-brown. **Hymenium** I+ blue. **Hypothecium** mid- to dark brown. **Hamathecium** of branched and anastomosing paraphyses, the apical cells usually pigmented. **Asci** elongate-clavate, *Lecidea*-type, outer coat K/I+ blue, apex thickened, apical dome K/I+ pale blue, usually with a distinct I+ blue meniscus-like shallow subapical ring. **Ascospores** ellipsoidal, colourless, aseptate, without a gelatinous sheath. **Conidiomata** pycnidia, immersed, black. **Conidia** bacilliform, aseptate, colourless. **Chemistry**: stictic acid, norstictic acid (probably from the host lichen), or lichen substances absent. **Ecology**: lichenicolous on *Lecidea* or *Porpidia* spp. on siliceous rocks.

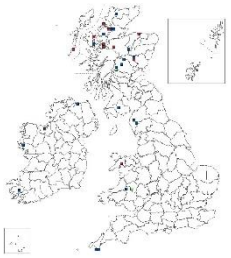
Cecidonia was introduced to accommodate two lichenicolous species. Interactions with their host lichens need further examination, but it is probable that their 'thallus' is a modification of that of the host. The genus appears to be closely related to *Lecidea* s. str., from which it differs primarily in having an exciple with a carbonaceous cortex and branched, anastomosing paraphyses, but further molecular studies are needed.

Literature:

Buschbom & Mueller (2004), Fryday (2009), Triebel & Rambold (1988).

1 Apothecia 0.3–0.45 (–0.6) mm diam; hymenium 70–110 µm; ascospores (10–) 11–15 (–16) × (6–) 6.5–8 (–10) µm; on *Lecidea* spp. ..... ***umbonella***
Apothecia 0.2–0.3 (–0.5) mm diam.; hymenium 50–80 µm; ascospores (9–) 10–12 (–13) × 5–6.5 (–7.5) µm; on *Porpidia* spp. ..... ***xenophana***

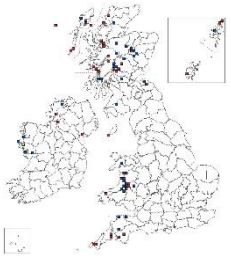
Cecidonia umbonella (Nyl.) Triebel & Rambold (1988) **Nb**



Lichenicolous, forming gall-like swellings on the host thallus. Thallus whitish; medulla I+ violet (? from host). Apothecia 0.3–0.45 (–0.6) mm diam., erumpent, black; disc with a central umbo; true exciple prominent, brown-black; epithecium brown or greenish brown; hymenium 70–110 µm tall; hypothecium brown to dark brown; paraphyses branched and anastomosed, the apices scarcely swollen. Asci 50–80 × 12–18 µm. Ascospores (10–) 11–15 (–16) × (6–) 6.5–8 (–10) µm. Conidia 5–9 × *ca* 1 µm, bacilliform. Thallus K+ yellow or yellow→red, Pd+ orange or yellow (stictic or norstictic acid, possibly from host). **BLS 0789**.

Usually lichenicolous on *Lecidea lapicida* s. lat., including *L. lactea* and *L. swartzioidea*; infrequent. S.W. & N.W. England (W. Cornwall, Cumbria), N. Wales (Merioneth), N. and S.W. Scotland (mostly in the Highlands), W. and N. Ireland.

Cecidonia xenophana (Körb.) Triebel & Rambold (1988) **LC**



Similar to *C. umbonella*, but with smaller apothecia, 0.2–0.3 (–0.5) mm diam. that usually lack a central umbo, a lower hymenium (50–80 µm), smaller ascospores, (9–) 10–12 (–13) × 5–6.5 (–7.5) µm, and a 'thallus' with an I– medulla and negative spot-test reactions. **BLS 1838**.

Lichenicolous on thalli of *Porpidia* spp.; occasional where its principal host (*P. cinereoatra*) occurs. N. & W. Britain and Ireland.

CLAUZADEA Hafellner & Bellem. (1984)

Thallus crustose, generally immersed; when superficial grey or brown, granular or ± areolate; prothallus, when present, ± black. **Photobiont** *Trebouxia*. **Ascomata** apothecia, red-brown to black, sessile or immersed in rock and sometimes leaving pits, glabrous or ± pruinose. **Thalline margin** absent. **True exciple** generally persistent and brown-black. **Epithecium** red-brown to brown. **Hymenium** I+ pale blue in part. **Hypothecium** ± colourless to red-brown or orange-brown. **Hamathecium** of branched and occasionally anastomosing paraphyses, septate, scarcely or markedly swollen and pigmented at the apices. **Asci** 8-spored, elongate-clavate, *Porpidia*-type. **Ascospores** ellipsoidal or pyriform, aseptate, ± colourless, smooth, with a gelatinous perispore when young. **Conidiomata**, when present, pycnidial, ± immersed. **Conidiogenous cells** in chains. **Conidia** borne laterally, bacilliform, aseptate. **Chemistry**: no lichen products detected by TLC. **Ecology**: on calcareous rocks.

This genus is close morphologically to both *Amygdalaria* and *Porpidia*, but differs in the often endolithic thallus, the strictly calcicolous habitat, the uniformly brown pigmentation of the apothecia and, particularly, the conidial state. Molecular data are too sparse to establish relationships in detail, though there are indications that species form a group with *Bryobilimbia*, *"Lecidea" berengeriana*, *Lecidoma* and *Romjularia*. The species with immersed apothecia superficially resemble *Verrucaria* species of the *V. hochstetteri* group in the field, especially when dry, but are easily distinguished when wet as those of *Clauzadea* turn brown, and by the different types of ascomata.

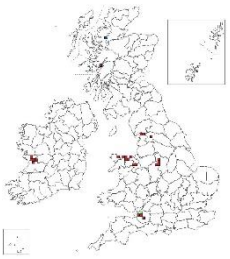
Literature:
Fryday *et al*. (2014), Gilbert & Hawksworth (2009b), Meyer (2002).

1 Apothecia ± immersed; disc ± flat, in deep or shallow pits; thallus generally immersed 2
Apothecia sessile; disc becoming convex, not in pits; thallus generally superficial .....***monticola***

2(1) Disc ± pruinose; apothecia mainly less than 0.5 mm diam., in deep pits, rather regularly arranged; ascospores (not including perispore) 10–15 (–19) × (6–) 7–8 (–9) µm .....***immersa***
Disc not pruinose; apothecia mainly exceeding 0.5 mm diam., in shallow pits 3

3(2) Apothecia scattered, ascospores (not including perispore) (15–) 16–20 (–28) × (6–) 8–10 (–12) µm, ellipsoidal, weakly ovoid or pyriform; hypothecium broad, plug-like.....***metzleri***
Apothecia often crowded into groups, ascospores (not including perispore) (12–) 13–18 (–21) × (5–) 6–9 (–10) µm, always ellipsoidal; hypothecium narrow, stalk-like.....***chondrodes***

Clauzadea chondrodes (A. Massal.) Clauzade & Cl. Roux (2001) **Nb**

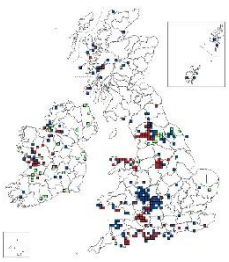


Thallus epilithic, white, without cracks but cartilaginous, prothallus absent. Apothecia in shallow pits, 0.2–1.1 mm diam., elliptical to rounded, often in a 'regeneration' stage where they are deformed and crowded into groups; very strongly constricted at the base; disc flat, dull brown to black when dry, red-brown when moist, not pruinose; hymenium 65–130 µm tall; hypothecium narrowly stem-like, deeply immersed, colourless to pale reddish-brown. Asci 60–120 × 10–25 µm. Ascospores (not including perispore) (12–) 13–18 (–21) × (5–) 6–9 (–10), ellipsoidal, perispore *ca* 1.5 µm thick. **BLS 2369**.

On hard limestones, both sunny or somewhat shaded and moist; distribution poorly known but probably widespread in areas with naturally outcropping hard limestones; local. England (Somerset, Mendips), N. Wales, Peak District, Cumbria, Scotland (Argyll, Lismore), Ireland (Co. Clare, The Burren).

Readily recognized in its 'regeneration' stage by the crowded apothecia occurring in groups, otherwise the narrow stem-like hypothecium is diagnostic.

Clauzadea immersa (Hoffm.) Hafellner & Bellem. (1984) **LC**

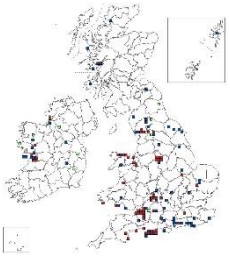


Thallus white to grey, immersed; prothallus absent or black. Apothecia in pits, ± regularly arranged; disc (0.2–) 0.3–0.5 (–0.8) mm diam., ± level with the rock surface or slightly depressed, dark red brown to black, red-brown and ± translucent when wet, often white-grey pruinose; true exciple black to white-grey, pruinose, persistent; epithecium orange-brown to brown; hymenium 45–60 µm tall; hypothecium ± colourless to orange-brown. Asci 55–60 × 12–20 µm. Ascospores 10–15 (–19) × (6–) 7–8 (–9) µm, when mature with warted ornamentation (oil immersion); the perispore to 1 µm thick and ± granular in old spores. Pycnidia often frequent; conidia 3–4 × 0.7–1 µm. **BLS 0734**.

On hard calcareous rocks and walls, especially limestones, in both sunny and somewhat sheltered situations; locally frequent. Throughout Britain and Ireland, but very rare in eastern S. England, and absent from E. Scotland.

C. metzleri has almost superficial, non-pruinose, irregularly arranged apothecia.

Clauzadea metzleri (Körb.) Clauzade & Cl. Roux ex D. Hawksw. (1992) **Nb**



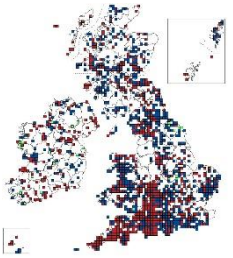
Thallus white to pale grey, ± immersed; prothallus absent. Apothecia in shallow pits, scattered or occasionally in contiguous lines along crevices, one half to three-quarters immersed; disc (0.3–) 0.5–0.8 mm diam., flat to slightly convex, red-brown to black, red-brown with black margins when wet, not pruinose; true exciple black, not pruinose, persistent, slightly raised; epithecium reddish brown; hymenium 75–100 µm tall; hypothecium broad and plug-like, ± colourless to reddish brown. Asci 50–60 ×

12–16 µm. Ascospores (15–) 16–20 (–28) × (6–) 8–10 (–12) µm, the perispore <2 µm thick and not or scarcely granular; ellipsoidal, weakly ovoid or pyriform. **BLS 0749**.

On calcareous rocks, walls, and pebbles, mainly in chalk and limestone areas, often in somewhat sheltered and moist situations; local. Throughout England & Wales, rare in Scotland & Ireland.

Distinguished from *C. immersa* by the generally larger dimensions, lack of pruina, and less deeply immersed, irregularly distributed apothecia.

Clauzadea monticola (Ach.) Hafellner & Bellem. (1984) **LC**



Thallus brownish grey to ochre or grey, granular to almost rimose and superficial, grey and scurfy or ± immersed; prothallus absent. Apothecia sessile, not immersed, constricted at the base, not forming pits; disc (0.2–) 0.3–0.8 (–1.5) mm diam., flat to convex, reddish brown to dark brown or black, red-brown when wet, not pruinose; true exciple black, slightly raised, generally persistent but sometimes finally excluded, not pruinose; epithecium orange-brown to reddish brown; hymenium 50–70 µm tall; hypothecium deep red-brown. Asci 45–60 × 12–19 µm. Ascospores (6–) 8–12 (–14) × 4–6 (–9) µm, the perispore to 0.5 µm thick, not becoming granular. **BLS 0751**.

On sunny or sheltered calcareous rocks, walls, cement, mortar and asbestos cement; very rarely on worked timber; widespread but rarely abundant. Throughout Britain and Ireland.

The commonest British species of the genus, superficially not unlike certain Acarosporaceae species (e.g. *Sarcogyne hypophaea*) when fresh but easily separated by the 8- rather than multi-spored asci. *C. monticola* is frequently confused with *Lecidella stigmatea*, which often occurs in similar habitats; in the latter the hypothecium is colourless, the spores longer and there is no trace of the red-brown pigmentation within the apothecia, so characteristic of *Clauzadea*. The similar *Catillaria modesta* and *C. picila* (neither of which properly belong in that genus) have a *Bacidia*-type ascus structure. *Farnoldia jurana* is separated from *Clauzadea monticola* by its larger apothecia (0.5–1.5 mm diam.) and ascospores (13–28 × 7–14 µm).

Host to *Muellerella lichenicola* (Sommerf.) D. Hawksw. (1979) and its apothecia have been reported infected by *Intralichen* cf. *christiansenii*.

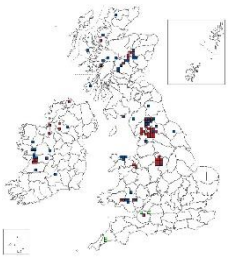
FARNOLDIA Hertel (1983)

Thallus crustose, immersed or superficial, continuous or cracked; prothallus absent; medulla, when developed, I+ violet (but sometimes very pale). **Photobiont** trebouxioid. **Ascomata** apothecia, sessile, ± constricted below; disc black, flat to convex. **True exciple** well-developed, raised, of strongly compacted dark brown hyphae, black. **Epithecium** greenish to brownish. **Hymenium** colourless or greenish, I+ blue. **Hypothecium** dark greenish to dark brown, even blackish, but paler in some non-British species. **Hamathecium** of branched and anastomosed septate paraphyses, apices not markedly swollen. **Asci** 8-spored, elongate-clavate, with a thickened K/I+ blue tholus containing a more densely amyloid tube, *Porpidia*-type. **Ascospores** ellipsoidal, aseptate, smooth, with a thick, gelatinous perispore. **Conidiomata** pycnidia, black, scattered on the surface of the substratum or immersed in the thallus. **Conidiogenous cells** ± cylindrical. **Conidia** bacilliform. **Chemistry**: lichen products not detected by TLC. **Ecology**: on calcareous rocks, mainly upland.

Farnoldia is distinguished from *Porpidia* by the black exciple, which is usually separable (thin sections!) from the blackish brown hypothecium. The genus appears as basal to the *Lecideaceae* in molecular phylogenies and possibly lies outside of the family. There is only one British species.

Literature:
Gilbert & Hawksworth (2009c).

Farnoldia jurana (Schaer.) Hertel (1983) **Nb**



Thallus whitish grey, usually immersed and scarcely visible, when present generally I+ violet. Apothecia rather large, (0.2–) 0.5–1.5 (–2.5) mm diam., scattered or sometimes aggregated in small groups, carbonaceous, shining, numerous, generally flat, pruinose or not; hymenium 70–130 µm tall; hypothecium to 120 µm or more tall, mostly very dark brown, often intensely greenish in the upper part, K± purplish in section (as is the true exciple). Ascospores (11–) 13–28 (–33.5) × (5.5–) 7–14 (–20) mm; thick-walled. Pycnidia 60–100 µm diam., often present; wall green above, colourless below; conidia 3.5–9 × 0.5–1 µm. **BLS 0863**.

On hard limestones, often in somewhat damp situations such as by streams or at the edge of scree slopes, a member of the *Gyalectetum jenensis* association; local. Throughout upland Britain & W. Ireland.

Only likely to be confused in its habitat with *Clauzadea monticola*, which is separated in the field by its smaller apothecia with red-brown to dark brown discs in the wet state, and under the microscope by its red-brown hypothecium and smaller ascospores. The apothecia of *F. jurana* are exceptionally hard, coal-black, internally notably conglutinated and are extremely difficult to section or prepare for detailed examination.

Reported to host both *Muellerella lichenicola* and *M. pygmaea* (Körb.) D. Hawksw. (1979).

IMMERSARIA Rambold & Pietschm. (1989)

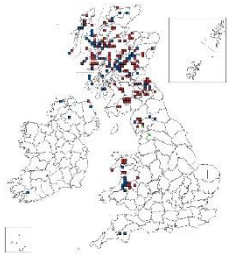
Thallus crustose, areoles irregular, with a flat to concave surface, sometimes with a pruinose margin, cortex containing brown pigments and an epinecral layer. **Prothallus** black when present. **Ascomata** apothecia, black to grey, immersed, ± thinly marginate. **True exciple** sometimes almost absent. **Disc** flat to concave, sometimes pruinose, not umbonate. **Hymenium** colourless, I+ blue. **Hypothecium** colourless to brown, I+ blue. **Asci** *Porpidia*-type. **Ascospores** colourless and with a gelatinous perispore, I–. **Conidiomata** pycnidia, sometimes present, immersed in the thallus, often linear or stellate. **Conidia** cylindrical. **Chemistry**: orcinol depsides. **Ecology**: on rocks or rarely overgrowing lichens.

Similar to *Porpidia* which has a better developed exciple and lacks brown pigments in the cortex. *Bellemerea* has flat to convex areoles which are not brown and lack an epinecral layer, the medulla is I+ strongly violet, and has ascospores with an amyloid perispore. *Amygdalaria* may sometimes have aspicilioid apothecia but never has brown, flat areoles. There is only one British species.

Some non-British species have a thalline margin and these have been segregated into the genus *Lecaimmeria* C.M. Xie, Lu L. Zhang & Li S. Wang (2022).

Literature:
Calatayud & Rambold (1998), Fletcher *et al*. (2009), Xie *et al*. (2022).

Immersaria athroocarpa (Ach.) Rambold & Pietschm. (1989) **Nb**



Thallus small to very large, irregularly spreading, distinctly cracked-areolate, yellow-brown, olive- or grey-brown to dark brown, with dark brown pigments in the cortex, which is warm brown and glossy, smooth; areoles angular, flat to weakly concave, separated by deep cracks, with white, wavy margins; medulla I+ blue-violet; prothallus black, occasionally visible at the margins. Apothecia (0.2–) 0.5–1.2 (–1.8) mm diam., rounded or deformed through mutual pressure, flat to concave, numerous, scattered or crowded in groups; immersed at first then flat, often aspicilioid, at edges of areoles, separated by deep cracks; disc black, roughened, not pruinose, the margins thin, raised, persistent, black; hymenium green in part, not clearing in K, 70–110 (–120) µm tall. Ascospores (12–) 15–24 (–

26) × (6–) 8–12 (–14) µm, with a narrow gelatinous sheath. Conidia 5–12 (–14) × 1–1.5 (–2) µm. Medulla C–, K–, KC–, Pd– (confluentic, 2′-*O*-methylperlatolic and 2′-*O*-methylmicrophyllinic acids). **BLS 0699**.

On somewhat metal-rich basaltic or schistose rocks and boulders, including tops of old walls, sometimes upon other lichens (*Aspicilia* s.l. spp.), mainly upland and montane; rare in SW England, but local to common in Wales, Cumbria, Scotland and N. Ireland.

The shiny, warm brown areoles with pale margins and immersed apothecia are distinctive, although the species has been much overlooked. In the field it resembles small morphs of *Lecidea fuscoatra* and *L. grisella* (both with cortex C+ red and an I– medulla).

Occasionally host to *Muellerella pygmaea*.

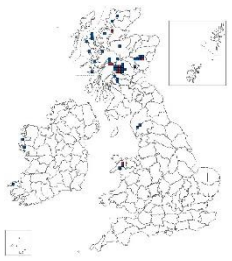
KOERBERIELLA Stein (1879)

Thallus crustose, areolate to granular, the medulla not amyloid, sometimes isidiate; prothallus indistinct or blackish. **Photobiont** trebouxioid, the algal cells rather dispersed. **Ascomata** apothecia, sessile, with a distinct thalline margin; discs brown but colour sometimes hidden under a pruina. **True exciple** composed of isodiametric cells and containing dispersed algal cells. **Epithecium** brownish. **Hypothecium** colourless. **Hamathecium** of paraphyses, at least with some anastomoses and branches, the apices swollen and covered with brown pigment. **Asci** *Porpidia*-type, clavate. **Ascospores** aseptate, ellipsoidal, colourless, at least when young surrounded by a gelatinous sheath, not bluing in iodine. **Ecology**: on calcareous rocks. **Distribution**: two species, widely distributed.

Distinguished from other British genera of the Lecideaceae, apart from *Bellemerea*, by the presence of a thalline margin; it is separated from that genus primarily by the I–, not I+ blue, ascospore walls. Preliminary molecular data shows *Koerberiella* nested within *Bellemerea*. Only one of the two species occurs in Britain.

Literature:
Gilbert & Hawksworth (2009d), Rambold *et al*. (1990).

Koerberiella wimmeriana (Körb.) Stein (1879) **Nb**



Thallus crustose, superficial, rounded or contorted, smooth, sometimes cracked-areolate, areoles contiguous or dispersed, 0.3–0.7 mm diam., pale grey to grey-pink; isidia usually present, mostly one per areole, to 0.75 (–1.25) × (0.3–) 0.5–0.6 mm; cortex *ca* 20 µm thick; prothallus indistinct, or blackish and mainly between the areoles; photobiont trebouxioid. Apothecia 0.5–0.8 (–1.5) mm diam., rare, flat to slightly convex, red-brown to dark brown, not pruinose, sessile, developing from isidia-like protuberances; thalline margin persistent, ± pseudoparenchymatous, outer zone brownish; true exciple not clearly differentiated; epithecium brownish, not granular; hymenium 110–140 µm tall, colourless or occasionally brownish below; paraphyses branched and anastomosed, 1.5–2 µm diam., apices 2.5–5 µm thick. Asci elongate-clavate, (80–) 105–115 × 20–25 µm, 8-spored, *Porpidia*-type. Ascospores 17–30 × 9–15 µm, ellipsoidal, colourless, aseptate, with a strongly thickened perispore when young, wall I–. Pycnidia immersed in the tips of the isidia, pycnidial walls brown at the apex and colourless below; conidia bacilliform, colourless, aseptate, 3.5–5 × 1–1.5 µm. Thallus C–, K–, KC–, Pd– (gyrophoric and 5-*0*-acetyl-4-methyl hiasic acid trace only, unidentified substance). **BLS 0117**.

On wet, regularly water-flushed calcareous schists and tuffs, montane; local. N. England (Lake District), N. Wales (Snowdonia), N. Scotland (Highlands), W. Ireland.

Specimens vary from almost completely non-isidiate to densely so. Host to the lichenicolous fungus *Sagediopsis aquatica* (Stein) Triebel (1989).

LECIDEA Ach. (1803)

Thallus crustose, rarely subsquamulose, superficial or immersed, continuous to rimose or areolate, white, brown or often grey; prothallus present or absent; soredia present in a few species. **Photobiont** protococcoid green algae, probably mostly *Trebouxia* (incl. *Pseudotrebouxia*). **Ascomata** apothecia, immersed to sessile, usually persistently marginate. **Thalline margin** absent. **True exciple** of radiating thick-walled hyphae, sometimes branched and anastomosing, apical cells usually swollen, outer layer brown to dark brown, internally ± colourless. **Epithecium** pigmented, olivaceous or brown to blackish or green-black. **Hymenium** usually I+ blue. **Hypothecium** colourless to dark brown. **Hamathecium** of simple or sparsely branched paraphyses, anastomoses absent or sparse, the apical cells usually pigmented and moderately swollen. **Asci** 8-spored, elongate-clavate, usually *Lecidea*-type, outer coat K/I+ blue, apex thickened, apical dome K/I+ pale blue, usually with a distinct K/I+ blue meniscus-like shallow subapical ring but sometimes prolonged into a tube. **Ascospores** ellipsoidal to cylindrical, aseptate, sometimes with a central plasma bridge, smooth, without a perispore, colourless. **Conidiomata** when present pycnidial, immersed, black. **Conidia** bacilliform, rarely subfiliform, aseptate, colourless. **Chemistry**: *para*-depsides of the orcinol type, depsidones of the β-orcinol type, dibenzofurans (traces of atranorin may be found here and there). **Ecology**: throughout saxicolous, especially common on hard siliceous substrata; exceptionally on hard wood or conglutinated sandy soil.

The type species for the genus *Lecidea* is *L. fuscoatra*. This generic name has been applied historically to a wide variety of unrelated crustose lichens which have in common aseptate colourless ascospores formed in apothecioid ascomata lacking a thalline margin. As a result of more critical studies within the last decades, more homogeneous groups have been recognized and referred to a wide variety of families and genera. However, the species treated here include disparate elements: those that fit the above description of the genus are only the saxicolous taxa treated below from couplet 12 in the key onwards. Many other species are treated here that do not fit the generic description given above and presumably are not closely related to the genus *Lecidea*, but have not yet been assigned to other genera. These include all corticolous, muscicolous and terricolous taxa treated below as well as the taxa keyed out in the first 11 couplets of the key to saxicolous taxa. In addition, even in the narrow sense, *Lecidea* appears to be paraphyletic with preliminary molecular data showing the *L. auriculata* group nested within *Porpidia* (Fryday *et al*. 2024).

The structure of the ascomata, especially the nature of the hamathecial tissues, exciple and asci (as observed when stained in K/I), have played major roles in these regroupings. In determining lecideoid lichens, particular attention has to be paid to microscopical features, especially colours and their reactions in K & N.

The lichenicolous genus *Cecidonia* differs, primarily, in having an exciple with a carbonaceous cortex, and branched, anastomosing paraphyses.

The species of *Bryobilimbia* were formerly placed in *Lecidea*; however they have a *Porpidia*-type ascus and have been shown to be a monophyletic group quite distinct from the *Lecidea*/*Porpidia* clade. *Micarea doliiformis* was housed within *Lecidea* by Aptroot *et al*. (2009), but excluded from that genus by Sérusiaux *et al*. (2010). Printzen *et al*. (2008) introduced a new genus *Myochroidea* for the *Lecidea leprosula* group (including *L. porphyrospoda*); it is placed as a genus of uncertain affinity within the Lecanorales. *Lecidea luteoatra* is a species of *Lecanora*, treated there as *L. viridiatra* (Stenh.) Nyl. by Fryday & Coppins (2012).

Lecidea alpestris Sommerf. (1825) and *L. commaculans* Nyl. (1868), treated in *Lecidea* by Aptroot *et al*. (2009) are now transferred to *Protomicarea* (Lecanorales: Psoraceae). The type of *L. lichenicola* was recently found to belong to *Trapelia* and the species described under this name in Aptroot *et al.* (2009) can now be found as *Watsoniomyces obsoletus* (Díaz-Escandón *et al*. 2021). *Lecidea exigua* Chaub. (1821) was placed in synonymy with *Traponora varians* (Ach.) J. Kalb & Kalb (Lecanoraceae) by Kalb & Kalb (2017).

The following names, all based on material growing on rocks from Scotland, are excluded as of uncertain application, since none of the type material has been traced: *L. callista* Stirt. (1874), *L. calpodes* Stirt. (1876) and *L. stirtoniana* Zahlbr. (1925) [syn. *L. relicta* Stirt. (1876)]. *L. sincerula* Nyl. (1876), described from the Antarctic, is a most dubious British record and so is not treated here. British material previously identified as *L. meiocarpa* Nyl. (1876) was found to be *Lecania cyrtellina* and that name is also therefore omitted here.

Literature:
Aptroot & van Herk (2007), Aptroot *et al*. (2009), Díaz-Escandón *et al*. (2021), Fryday & Coppins (2012), Fryday & Van den Boom (2019), Haugan & Timdal (2018), Hertel (1969, 2008), McCune *et al*. (2028), Øvstedal *et al*. (2019), Printzen *et al*. (2008), Ruprecht *et al*. (2010, 2020), Schmull *et al*. (2011), Sérusiaux *et al*. (2010), Stenroos *et al*. (2009).

The key below is arranged in two sections, only *Lecidea grisella* is common to both. In the couplets, species not included in *Lecidea* sensu stricto are indicated with [s.l.] following the epithet. The descriptions are arranged in two groups, with those in *Lecidea* sensu stricto separated from those placed in that genus for convenience.

1 On rock or pebbles 2
On bark, wood, moss, plant debris or soil 47

On rock or pebbles.

2(1) Thallus immersed in chalk pebbles; apothecia pinkish to reddish brown ..... ***Watsoniomyces obsoletus*** (Lichinaceae)
Thallus on siliceous rock or superficial on limestone; apothecia grey to black 3

3(2) Thallus sorediate, with blackish soralia ..... ***Miriquidica pycnocarpa*** f. ***sorediata*** (Lecanoraceae)
Thallus without soredia 4

4(3) Hymenium and hypothecium with blue-violet (K+ green) granules 5
Hymenium and hypothecium without coloured granules 6

5(4) Thallus thin, finely granular-areolate, with granules *ca* 0.06–0.11 mm diam., paraphyses tips *ca* 5 µm wide. ..... aff. ***strasseri*** [s.l.]
Thallus smooth, paraphyses tips 2–3 µm wide (rare, saxicolous morphs of *B. sanguineoatra* may key out here) ..... ***Bryobilimbia ahlesii***

6(4) Apothecia strongly convex, or forming complex botryose groups, margin often evanescent 7
Apothecia concave to flat or slightly convex, not botryose 10

7(6) Apothecia in botryose clusters, flat to slightly convex ..... ***Miriquidica pycnocarpa*** (Lecanoraceae)
Apothecia convex, not botryose 8

8(7) Thallus glossy brown, wart-like, forming convex heaps, almost squamulose; apothecia not pruinose; hypothecium K– ..... ***fuliginosa*** [s.l.]
Thallus whitish to grey, granular; hypothecium K+ purple 9

9(8) Apothecia usually ± pruinose; hypothecium brown; ascospores 14–21 µm long ..... ***Protomicarea alpestris*** (Psoraceae)
Apothecia not pruinose; hypothecium red; ascospores 7–12 µm long ..... ***Protomicarea commaculans***

10(6) Thallus pale yellowish green (usnic acid) ..... ***Lecanora viridiatra*** (Lecanoraceae)
Thallus not yellowish 11

11(10) Thallus Pd+ yellow (psoromic acid); apothecia innate; paraphysis tips reddish brown; ascus of *Biatora*-type (see also *Herteliana gagei*, Squamarinaceae) ..... ***phaeops*** [s.l.]
Thallus Pd± orange/red or Pd–; paraphyses tips not reddish; ascus of *Lecidea*- or *Porpidia*-type 12

12(11) Exciple and/or thallus C+ red 13
Exciple and thallus C– 19

13(12) Medulla and exciple I–; major substance gyrophoric acid 14
Medulla and/or exciple I+ violet; major substance 2′-*O*-methylanziaic acid 18

14(13) On mortar or calcareous sandstone; thallus white, mealy; apothecia surrounded by white pseudothalline margin ..... ***subspeirea***
On siliceous to neutral rock; thallus not mealy, usually not white; apothecia without thalline margin .. 15

15(14) Thallus absent or represented by isolated areoles in crevices; apothecia without pruina; ascospores 9–15 µm long ..... ***confluentula***
Thallus well-developed; apothecia often pruinose 16

16(15) Ascospores 7–12 × 3.5–5 µm; thallus *ca* 0.1 mm thick ..... ***siderolithica***
Ascospores 11–16.5 × 4.5–6.5 µm; thallus often thicker 17

17(16) Thallus at the margins starting as confluent areoles, surface grey-brown to red-brown ..... ***fuscoatra***
Thallus continuous at the margins, rimose to areolate towards the centre, surface grey ..... ***grisella***

18(13) Ascospores less than 2 times as long as wide, 5–7.5 µm long ..... ***brachyspora***
Ascospores over 2 times as long as wide, 7–10.5 µm long ..... ***diducens***

19(12) Medulla I+ blue or violet 20
Medulla I– 36

20(19) Thallus with an epinecral layer, therefore shiny 21
Thallus without an epinecral layer, dull 24

21 (20) Thallus K–, Pd– 22
Thallus K+ yellow or K+ yellow→red 23

22(21) Thallus well-developed, strongly areolate with a black prothallus; hypothecium dark brown; ascospores 12–14 µm long ..... ***herteliana***
Thallus poorly developed, of scattered areoles; hypothecium pale; ascospores 8.5–11 µm long ..... ***haerjedalica***

23(21) Thallus K+ yellow→red, (norstictic acid), Pd± yellow; ascospores 6.5–11.5 µm long ..... ***syncarpa***
Thallus K+ yellow (stictic acid), Pd+ orange; ascospores 9–15.5 µm long..... ***paupercula***

24(20) Thallus K+ yellow→red (norstictic acid) 25
Thallus K+ yellow or K– 26

25(24) Hypothecium colourless to pale brown ..... ***lactea***
Hypothecium dark brown to black ..... ***swartzioidea***

26(24) Hypothecium colourless to pale ochraceous 27
Hypothecium brown to dark brown 28

27(26) Hymenium suffused with brownish to reddish colour, K+ reddish to violet; epithecium granular; thallus K– (no substances) ..... ***haerjedalica***
Hymenium hyaline, K–; epithecium not granular; thallus K+ yellow (stictic acid) ..... ***lapicida***

28(26) Medulla UV+ white (perlatolic acid); always on copper-rich rock ..... ***inops***
Medulla UV– 29

29(28) Exciple thick, in old apothecia often flexuose or crenate; hyphae inside the exciple 2–3 µm diam., leaving large interspaces 30
Exciple thin; hyphae inside the exciple 3–4.5 µm diam., densely packed 31

30(29) Ascospores over 2.5 times as long as wide, 6.5–11 µm long; thallus usually endolithic ..... ***auriculata***
Ascospores less than 2 times as long as wide, 5–7.5 µm long; thallus usually epilithic ..... ***brachyspora***

31(29) Ascospores up to 4.5 µm wide 32
Ascospores generally over 4.5 µm wide 34

32(31) Most apothecia <0.5 mm diam., the largest ones up to 1 mm; epithecium olive green to brown ..... ***promixta***
Most apothecia >0.5 mm diam., the largest ones up to 4 mm; epithecium green to bluish green 33

33(32) Thallus absent or patchy; major substance confluentic acid ..... ***promiscens***
Thallus thick, white; major substance 2′-*O*-methylperlatolic acid ..... ***promiscua***

34(31) Subhymenium bluish, markedly different from the hyaline hymenium; thallus orange-brown, bullate..... ***silacea***
Subhymenium and hymenium colourless; thallus at least partly grey to whitish 35

35(34) Thallus K–; exciple blackish at outer edge; major substance confluentic acid; 2′-*O*-methylperlatolic acid and traces of stictic acid usually present ..... ***confluens***
Thallus K+ yellow; exciple dark green at outer edge; major substance stictic acid ..... ***lapicida***

36(19) Hypothecium colourless to pale ochraceous 37
Hypothecium brown to dark brown 39

37(36) Thallus well-developed, usually whitish grey with rust-coloured patches; apothecia usually pruinose, discs turn brown on wetting; ascospores generally over 4.5 µm diam..... ***lithophila***
Thallus absent to patchy or well developed but then pale grey, without rust-coloured patches; apothecia not pruinose, discs remain black on wetting 38

38(37) Thallus absent to patchy or well-developed and pale grey; ascospores up to 4.5 µm diam..... ***plana***
Thallus absent to patchy; ascospores over 4.5 µm diam. ..... ***haerjedalica***

39(36) Thallus thin, absent to patchy 40
Thallus well-developed 45

40(39) Hymenium usually reddish purple, K+ violet; inside of the exciple grey, filled with crystals ..... ***sarcogynoides***
Hymenium hyaline to greenish, K–; inside of the exciple without crystals 41

41(39) Asci *Porpidia*-type 42
Asci *Lecidea*-type 44

42(41) Paraphyses not capitate, but with the upper half pigmented fuscous brown ..... ***phaeophysata*** [s.l.]
Paraphyses swollen at the apex to 5 µm, with dark brown caps 43

43(42) Thallus thin, finely granular-areolate, with granules *ca* 0.06–0.11 mm diam., paraphyses tips c. 5 µm wide. ..... aff. ***strasseri*** [s.l.]
Thallus smooth, paraphyses tips 2–3 µm wide (rare, saxicolous morphs of ***B. sanguineoatra*** may key out here) ..... ***Bryobilimbia ahlesii***

44(41) Exciple thin; hyphae inside the exciple 3–4.5 µm diam., densely packed; ascospores 11–16 µm long ..... ***promixta***
Exciple thick, in old apothecia often flexuose or crenate; hyphae inside the exciple 2–3 µm diam., with large interspaces; ascospores 6.5–11 µm long ..... ***auriculata***

45(39) Thallus K–; exciple thick, in old apothecia often flexuose or crenate; hyphae inside the exciple 2–3 µm diam., leaving large interhyphal spaces; ascospores <4 µm diam. ..... ***auriculata***
Thallus K+ faintly yellow; exciple thin; hyphae inside the exciple 3–5 µm diam., densely packed; ascospores >4 µm diam. 46

46(45) Thallus of scattered, bullate areoles; ascospores (9–) 11–12 (–15) µm long ..... ***endomelaena***
Thallus areolate but areoles not bullate; ascospores 9.5–10.5 µm long ..... ***obluridata***

On bark, wood, moss, plant debris or soil.

47(1) On moss, plant debris or soil; only brown pigments present internally; hymenium usually with blue-violet, K+ green crystals 48
[compare also with *Micarea incrassata* (Lecanorales, Pilocarpaceae) and *Protomicarea limosa* (Lecanorales, Psoraceae)]
On bark or wood; hymenium without coloured crystals 50

48(47) Thallus tartareous, white, obscuring the form of the underlying plant remains, surface of contiguous granular warts 0.1–0.3 (–0.5) mm diam; apothecia >0.5 mm diam. ..... ***berengeriana*** [s.l.]
Thallus grey or tinged brown or dull green, thin, membranous; apices of paraphyses colourless, up to 3 µm diam. 49

49(48) Apothecia dark brown to black, usually persistently marginate; ascospores 4.5–6 (–7) µm wide, often indistinctly 1(-3)-septate and finely warted ..... ***Bryobilimbia hypnorum***
Apothecia pale to dark brown, usually soon immarginate; ascospores 3–4.5 µm wide, aseptate and smooth ..... ***Bryobilimbia sanguineoatra***

50(47) Thallus with distinct soralia, often becoming confluent to form a continuous leprose crust 51
Soralia absent 54

51(47) Thallus well-developed, grey to grey-brown, coarsely granular sorediate, dark apothecia in dense botryose clusters, constricted below; medulla UV+ white (perlatolic acid)
..... ***Hertelidea botryosa*** (Stereocaulaceae)
Not as above 52

52(51) Thallus ± brownish sorediate; UV+ white (lobaric acid)
..... ***Myochroidea porphyrospoda*** (Lecanorales, uncertain position)
Thallus grey, yellowish grey, or bluish grey sorediate; UV± 53

53(52) Prothallus distinct, bluish; soredia not bursting from the areoles, bluish grey; medulla UV+ white (divaricatic acid) ..... ***nylanderi*** [s.l.]
Prothallus ± distinct, blue or blue-grey; soralia bursting apically from minute areoles, pale green or tinged brown ..... ***Frutidella furfuracea*** (Lecanorales, uncertain position)
Prothallus indistinct or absent; soredia irregular, yellowish grey; medulla UV– (pseudoplacodiolic acid) ..... ***leprarioides*** [s.l.]

54(50) Thallus either C+ red or KC+ orange 55
Thallus reactions negative 56

55(54) Thallus thin, continuous; apothecia 0.15–0.25 mm diam.; thallus C–, KC+ orange; on smooth bark ..... ***Traponora varians*** (Lecanoraceae)
Thallus, thick, areolate; apothecia 0.5–2 mm diam.; thallus C+ red, KC–; on lignum ..... ***grisella***

56(54) Ascospores globose, 4–5.5 µm diam.; coniferous bark and wood; thallus inconspicuous; apothecia small, 0.2–0.4 mm diam. ..... ***globulispora*** [s.l.]
Ascospores ellipsoidal to narrowly ellipsoidal 57

57(56) Thallus with numerous, conspicuous, dark, barrel-shaped, sessile to shortly stalked pycnidia; on acid-barked trees and lignum ..... ***Micarea doliiformis*** (Pilocarpaceae)
Pycnidia absent or immersed 58

58(57) Hypothecium dark brown to black 59
Hypothecium colourless to pale yellow 60

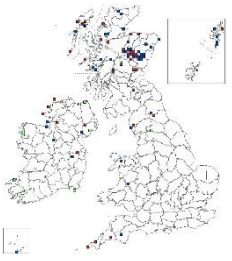
59(58) Hyphae of outer exciple dark brown, 2.5–3 µm wide, with swollen end cells to 5 µm diam., no outer hyaline gelatinous zone around the outer exciple ..... ***paraclitica*** [s.l.]
Hyphae of outer exciple mostly pale, 1.5–2 µm wide, with swollen end cells to 3.7 µm diam., the outer exciple surrounded by a hyaline gelatinous zone 4–5 µm thick ..... ***mucosa*** [s.l.]

60(58) Apothecia minute, <0.1 mm diam.; asci 12- to 16-spored ..... ***huxariensis*** [s.l.]
Apothecia larger (>0.2 mm diam.); asci 8-spored 61

61(60) Epithecium colourless, brown, blue-green or dark olive, N+ reddish, K+ green intensifying, with minute pale granules that dissolve in K and give the apothecia a pruinose appearance when wet (cf. also *Lecanora aitema*) ..... ***turgidula*** [s.l.]
Epithecium red-brown, N– 62

62(61) Apothecia mainly >0.5 mm diam.; exciple thin and soon excluded; ascospores fusiform-ellipsoidal, (8–) 9–14 (–18) µm long; on smooth bark of deciduous trees ..... ***erythrophaea*** [s.l.]
Apothecia mainly <0.5 mm diam.; exciple at first well-developed; ascospores cylindric-ellipsoidal, (8–) 9–12 µm long; on acid-barked trees and wood ..... ***hypopta*** [s.l.]

Lecidea auriculata Th. Fr. (1861) **Nb**



Thallus often ± immersed, when visible grey, areolate; areoles ± flat to somewhat convex, often dispersed with rock crystals visible between; medulla I+ violet (best seen in microscopic sections); prothallus black, fimbriate, sometimes predominating. Apothecia (0.4–) 0.6–1.8 (–4) mm diam., sessile, black, disc concave to flat, strongly constricted below, single or closely aggregated; margin persistent, raised, thick, in old apothecia often flexuose or crenate, exciple massively developed, blue-black at the outer edge, internally ± colourless to pale reddish-mauve, intensifying in K, C–; hyphae inside the exciple 2–3 µm diam., leaving large interhyphal spaces; epithecium green, blue-black to green-black; hymenium 30–50 µm tall, ± greenish; hypothecium massively developed, pale to dark brown, to 200 µm or more tall in old apothecia;

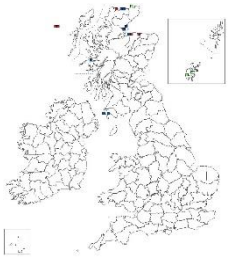
paraphyses 1.3–1.8 µm diam., mainly unbranched, occasionally anastomosed, apical cells clavate to 3.5 µm diam., with a dark green-brown cap to 5 µm diam. Asci 27–40 × 8–12 µm, the apex strongly thickened, the outer coat I+ blue. Ascospores (5–) 6.5–11 (–12) × (1.5–) 2–3 (–4) µm, narrowly ellipsoidal, abruptly truncate at the ends. Conidiomata immersed, ± linear with a gaping ostiole; conidia 10–15 × *ca* 0.8 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV– (confluentic acid syndrome). **BLS 0701**.

On coarse-grained siliceous rocks and pebbles, especially granites, often in fine cracks; local. S.W. and N. England, N. Wales, N. Scotland (Highlands), S. Scotland (Lanarkshire, on a gravestone), Ireland.

This species, in which the mauvish flush of the exciple medulla in water is especially characteristic, is most likely to be confused with *L. diducens* which has a C+ red exciple, or *L. inops*, which is UV+ white. *L. promiscens* is also similar but differs in a less pronounced exciple and in somewhat wider spores. See also *L. brachyspora* and *L. sarcogynoides*.

Lecidea brachyspora (Th. Fr.) Nyl. (1887) **Nb**

Lecidea auriculata var. *brachyspora* (Th. Fr.) Lettau (1954)

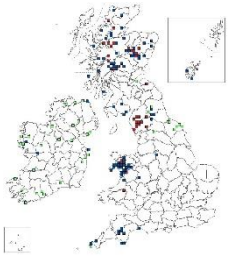


Similar to *L. auriculata* but the thallus is always conspicuously areolate, the areoles flat to somewhat convex, often ± immersed, whitish grey; prothallus often inconspicuous. Ascospores 5–7.5 (–8) × 3.5–4.5 (–5) µm, broadly ellipsoidal to subglobose. **BLS 0704**.

On coarse-grained siliceous rocks, especially pebbles, coastal; local in W. & N. Scotland.

The length:breadth ratio of the ascospores in *L. auriculata* is 2.5–4.0, whereas in this species it is only 1.0–1.8.

Lecidea confluens (Weber) Ach. (1803) **Nb**

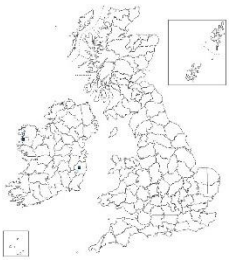


Morphologically similar to *L. lapicida*, but usually with a lead grey thallus and larger, flat, adnate apothecia and negative reaction of the thallus with K. As with *L. lapicida* s.l., the exciple is blackish at the outer edge, ± colourless within and the epithecium green to olive-green, brownish green or black. Thallus C–, K–, KC–, Pd–, UV– (confluentic acid, 2′-*O*-methylperlatolic acid, and often stictic acid). **BLS 0711**.

On siliceous rocks. Scottish Highlands and N. England, extending to S.W. England and Wales.

Occasionally host to *Muellerella pygmaea*.

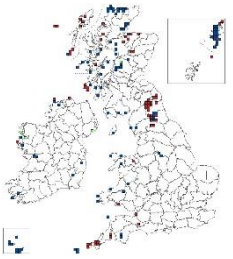
Lecidea confluentula Müll. Arg. (1872) **NE**



Thallus ± absent, loosely associated with algae, or only present in crevices, no cortex developed, medulla I–; prothallus dominant, black, spreading irregularly around rock crystals. Apothecia 0.15–0.25 (–0.35) mm diam., black, shiny, sessile; disc concave to flat and ± pore-like; true exciple persistent, to 50 µm thick, the outer layer dark brown, cellular, C+ weakly reddish, K–; hymenium (45–) 50–60 µm tall; epithecium olivaceous brown interspersed with granules; hypothecium brown; paraphyses branched, particularly towards the apices, the apices brown, swollen to 4 µm diam. Asci 35–45 × (8–) 10–15 µm. Ascospores (9–) 11–15 × 5–6 (–6.5) µm, ellipsoidal. Thallus C± red, K–, KC–, Pd–, UV– (gyrophoric acid). **BLS 0747**.

On granite; rare. S.E. and W. Ireland (Wicklow (Lugnaquilla mtns), Mayo). A record from Derbyshire needs confirmation.

Lecidea diducens Nyl. (1865) **Nb**



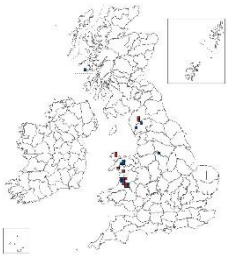
Like *L. auriculata*, but differing in the exciple, which is C+ carmine red in section. With 2′-*O*-methylanziaic acid in the exciple and confluentic acid in the thallus. **BLS 0715**.

On siliceous rocks and pebbles, particularly near the coast; occasional, especially in N. Britain. S.W. & N. England (Lake District, N. Pennines), Wales, Scotland, W. Ireland, Channel Is.

This species may be a chemotype of *L. auriculata* and is sometimes treated as *L. auriculata* var. *diducens* (Nyl.) Th. Fr. (1874). Many specimens under this name in older collections refer to *L. auriculata*. See also *L. inops*.

Can be host to *Muellerella pygmaea*.

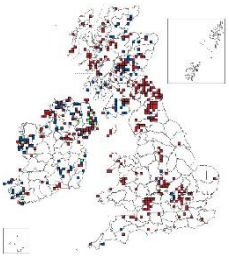
Lecidea endomelaena Leight. (1876) **Nb**



Thallus of scattered strongly convex to bullate areoles, 0.2–0.5 mm diam., greenish white, medulla I–; prothallus poorly developed, black. Apothecia 0.2–0.4 mm diam., sessile, ± flat to slightly convex, black; true exciple persistent, black, brown in section but greenish at the outer edge; epithecium olivaceous brown, becoming bluish green in K; hymenium 60–70 µm tall; hypothecium dark brown; paraphyses 1.5–2 µm diam., mainly unbranched; apices clavate with dark greenish walls, to 3 µm diam. Asci not seen mature. Ascospores (9–) 11–12 (–15) × 4–5 µm, narrowly ellipsoidal. Thallus C–, K+ weakly yellow, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 0717**.

On old schist walls and in basalt crevices; rare. N. and mid Wales, Derbyshire, Cumbria, W. Scotland (Mull).

Lecidea fuscoatra (L.) Ach. (1803) **LC**

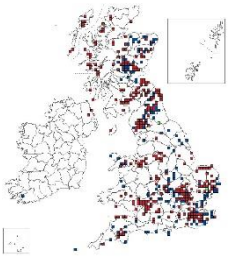


Thallus areolate, whitish grey to pale yellowish brown or grey-brown, shiny, with a layer of colourless cells above the pigmented cortex (epinecral layer), the areoles to 3 mm diam., flat to ± convex, medulla I–; prothallus black. Apothecia 0.5–2 (–3) mm diam., ± immersed, sunken into or between the areoles, flat to slightly convex, black to densely grey-pruinose; true exciple persistent, slightly raised, of irregular chains of subglobose cells, the outer brown and to 5 µm diam., ± colourless within, C+ pink; epithecium olive-green to olive-brown, olivaceous in K; hymenium 40–60 µm tall; hypothecium dark brown to black, well-developed and stipe-like; paraphyses unbranched, or sparsely branched near the apices, 1.5–2 µm diam., not swollen or gradually widening to 3 (–5) µm diam. at the apices, the apices sometimes with olive-brown pigment. Asci 45–55 × 8–15 µm. Ascospores (7–) 11–16.5 (–17) × (3.5–) 4.5–6.5 (–10) µm, ellipsoidal to narrowly ellipsoidal. Conidia 7–10 (–12) × 0.5–0.8 µm, bacilliform. Thallus C+ red, K–, KC–, Pd–, UV– (gyrophoric and ± lecanoric acids). **BLS 0724**.

On rather smooth, often slightly nutrient-rich siliceous rocks; common. Throughout Britain, but distribution uncertain owing to historical confusion with *L. grisella*.

Host to *Muellerella pygmaea* and more rarely *Polycoccum kerneri* J. Steiner (1893). See also *L. paupercula, L. siderolithica, L. syncarpa* and *Immersaria athroocarpa*.

Lecidea grisella Flörke (1829) **LC**



Like *L. fuscoatra*, but the thallus is ± continuous, cracked, rimose, only later seemingly areolate, whitish grey to pale yellow-brown or grey-brown, generally thicker and never convex. **BLS 2474**.

This taxon occurs on a wider variety of substrata (rather smooth, slightly nutrient-rich siliceous rocks, walls and brick) and is the only one growing on roof tiles and also rarely on timber. It occurs throughout Britain; the paucity of records from Ireland may be due to taxonomic confusion.

Differs from *L. fuscoatra* mainly in the thallus structure; *L. grisella* starts as a continuous crust and becomes rimose, whereas *L. fuscoatra* is areolate from the beginning. This character is highly correlated with the thallus colour. It has often not been recognized as a separate species, but as *L. fuscoatra* var. *grisella* (Flörke) Nyl. (1856), but the two taxa co-occur on siliceous rock without any apparent intermediates. *L. grisella* is the more widespread of the two and is the most common *Lecidea* in our region.

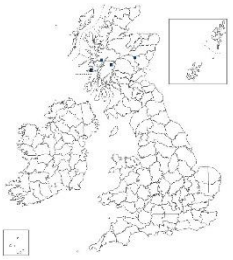
Can be host to *Muellerella pygmaea*.

Lecidea haerjedalica H. Magn. (1948) **Nb**

Thallus of scattered areoles, pale grey, sometimes with a brownish tinge; medulla I± violet. Apothecia 0.4–0.8 (–1.3) mm diam., black; disc surface rough; exciple with a 25–45 µm thick margin; inside of exciple, hymenium and subhymenium brown to red-brown, K+ reddish to violet; epithecium granular; hypothecium hyaline to pale ochraceous. Ascospores 8.5–11 × 5–6 µm. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 1965**.

On slate in quarry; rare. Scotland (Mid-Perthshire).

Lecidea herteliana Fryday & Coppins (2012) **NE**

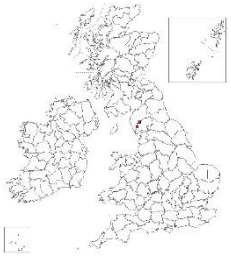


Thallus effuse, rarely more than 1–2 cm across; areolate, areoles flat to slightly convex, irregular, 0.2–0.4 mm diam., grey to pale brown, often with a paler margin, contiguous or somewhat dispersed on a black hypothallus; cortex 10–20 µm thick with a pale brown pigmented upper layer 7–10 µm thick (rarely red-brown or ± colourless); epinecral layer thick, 45–95 µm, 20–25 µm at the edge of areoles; medulla and upper cortex I+ violet. Photobiont chlorococcoid, cells 9–15 µm diam. Apothecia black, 0.4–0.6 mm diam., sessile, slightly convex with a thin (50 µm), barely raised margin. True exciple dark blue-black with swollen (to 5 µm) cortical cells. Hymenium 90–105 µm tall; epithecium *ca* 10 µm tall, sharply delimited, blue-black (HCl+ blue, N+ red; cinereorufa-green); paraphyses sparingly branched and anastomosing, 1.5–2 µm diam., swelling at the apex to *ca* 5 µm with a dark blue-black cap. Hypothecium dark brown. Asci cylindrical to slightly clavate, 45–50 × 12–15 µm, *Lecidea*–type; ascospores aseptate, colourless, 12–14 × 5–6 mm. Conidiomata not known. Chemistry: all spot tests negative; no substances detected with TLC. **BLS 2571**.

On siliceous stones and boulders, esp. schists and basalt. Highland Scotland; reported from Mull, Rannoch, Strontian, E. Perthshire and Angus.

Similar to *L. paupercula* but that species has a more wide-spreading, red-brown to dark grey-brown thallus that reacts K+ yellow, Pd+ orange.

Lecidea inops Th. Fr. (1874) **EN B**

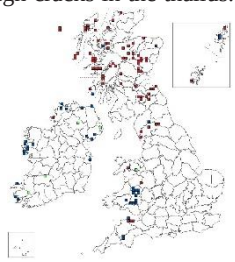


Thallus areolate, uneven, continuous or occurring as dispersed convex granules, whitish grey to dark grey, medulla I+ violet; prothallus indistinct. Apothecia 1–3 mm diam., sessile, black, occasionally pruinose, usually strongly convex and often irregular in shape; true exciple soon excluded, rarely persistent and flexuous, olive-brown at the outer edge, colourless within; epithecium olivaceous brown, K+ olive-green, N+ red; hymenium 45–55 µm tall; hypothecium dark brown to ± black; paraphyses unbranched, the apices slightly swollen to 2.5–3 µm diam., brownish. Asci 25–45 × 6–9 µm. Ascospores 8–11 (–13) × 2.5–4 µm, cylindric-ellipsoidal. Pycnidia *ca* 0.5 mm diam., usually abundant, immersed to slightly raised, with ± elevated margins, conidia 9–15 × 0.8 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV+ white (perlatolic acid in the thallus; an unidentified substance, probably anziaic acid or a derivative, in the exciple). **BLS 1658**.

On copper-rich rocks; rare. N.W. England (Lake Distict, Coniston and Glenridding). Records from the North Pennines need confirmation.

This species resembles *L. diducens*, with which it has sometimes been confused, but differs in the less-developed and soon excluded exciple, darker hypothecium, the UV+ white medulla and the marginate pycnidia and different chemistry. The bright blue colour of copper oxalate is often visible through cracks in the thallus. See also *L. auriculata.*

Lecidea lactea Flörke ex Schaer. (1828) **LC**

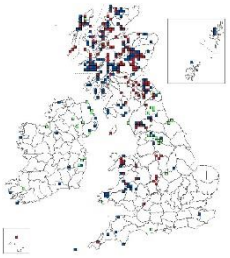


Like *L. lapicida*, but differs in the predominance of norstictic acid (thallus K+ yellow→red, crystals), and when growing with *L. lapicida* by its usually thicker, whiter thallus with more neatly arranged, angular areoles. *Lecidea lapicida* contains stictic acid with only traces of norstictic acid and reacts K+ yellow. **BLS 0737**.

In similar habitats as *L. lapicida*, but also coastal, localized. W. & N. Britain, Ireland.

Sometimes parasitized by *Cecidonia umbonella* (q.v.) and once reported hosting *Rhizocarpon intermediellum*. See also *L. swartzioidea*.

Lecidea lapicida (Ach.) Ach. (1803) **LC**



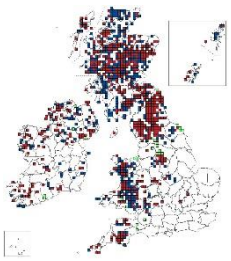
Thallus irregularly rimose, whitish to grey, often unevenly rust-coloured; medulla I+ violet; prothallus often conspicuous, black. Apothecia (0.2–) 0.5–1.2 (–1.8) mm diam., immersed to ± sessile, black, arising between the areoles and often compacted together with angular margins; true exciple persistent, raised, dark green at the outer edge, ± colourless within, K+ yellowish; epithecium greenish black, K+ bright blue-green, N+ red; hymenium 50–70 (–90) µm tall; hypothecium pale to dark brown, K– ; paraphyses 1.5–2 µm diam., unbranched or sparsely branched and anastomosed, the apices expanding to 3 µm diam. or with a green-brown hood and 3–4 (–5) µm diam. Asci (40–) 50–60 (–65) × (12–) 15–20 µm. Ascospores (8–) 10–15 (–16) × (4.5–) 5–8 µm, broadly ellipsoidal. Conidia 8–12 (–20) × 1 µm, elongate bacilliform. Thallus C–, K+ yellow (flooding out in squash mounts when concentrations are high enough), KC–, Pd+ orange, UV– (stictic acid syndrome). **BLS 2358**.

On siliceous, sometimes iron-rich rocks in upland areas; frequent. Mainly in W. & N. Britain, S.W., E. & N.E. Ireland.

Accepted here in a strict sense; which is morphologically and chemically different from *L. lactea*. A chemotype with norstictic acid is recognized as *L. lapicida* var. *pantherina* but has not been reliably reported from our region. *L. confluens* with confluentic (and sometimes stictic) acid has a darker grey thallus. See also *L. plana*.

Cecidonia umbonella (q.v.) is usually lichenicolous on *Lecidea lapicida* and related species. Also reported are *Rhizocarpon intermediellum* and more commonly *Muellerella pygmaea*.

Lecidea lithophila (Ach.) Ach. (1814) **LC**



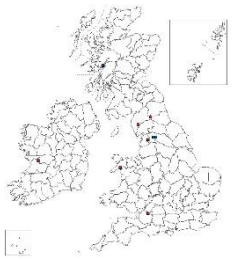
Thallus ± continuous to irregularly rimose, surface smooth to slightly warted, pale grey to blue-grey, often rust-coloured in parts, medulla I–; prothallus generally indistinct. Apothecia (0.2–) 0.5–1.5 (–2.5) mm diam., dark brown to black, disc brown when moistened, ± sessile, partly immersed only in the early stages, sometimes angular by compaction; disc ± flat to slightly convex, not constricted below; true exciple persistent, raised, the outer edge dark brown ± with a greenish tinge, internally pale brown to ± colourless, K–; epithecium brown, K–; hymenium (45–) 50–80 µm tall, sometimes brownish in parts; hypothecium colourless, composed of ± vertically orientated hyphae; paraphyses sparsely branched and anastomosed, the apices brownish, to 4.5 µm diam., often with granules adhering. Asci (45–) 50–60 × 12–15 µm, elongate-clavate. Ascospores (9–) 11–15 × (4–) 5–6 (–7) µm, cylindric-ellipsoidal. Conidia 12–18 × 0.5–1.5 µm, cylindrical. Thallus C–, K–, KC–, Pd–, UV– (4-*O*-demethylplanaic and often planaic acids). **BLS 0743**.

On exposed siliceous rocks, stones and pebbles, especially on sites protected from rapid drying, often those rich in iron; common. Throughout N. & W. Britain, and Ireland.

The separation of the species from the closely related *L. plana*, with which it has often been confused, is discussed there.

Can be host to *Muellerella pygmaea*.

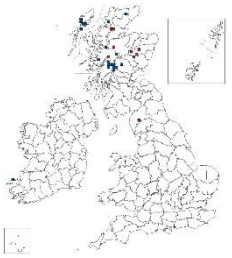
Lecidea obluridata Nyl. (1873) **Nb**



Thallus grey-brown, areolate, areoles ± flat to convex, ± shiny, medulla I–; prothallus black. Apothecia 0.5–1.1 mm diam., black, arising between the areoles and finally appearing ± sessile, convex, sometimes angular by compression; true exciple tending to become excluded, poorly developed, ± continuous with the hypothecium in section, K–; epithecium green-black, intensifying in K, N+ deep red; hymenium 60–75 µm tall; hypothecium dark brown, deep reddish brown in K; paraphyses mainly unbranched, rarely branched towards the apices and occasionally anastomosed, the apices slightly swollen to *ca* 3 µm diam., greenish black, interspersed with crystalline granules. Asci 40–55 × 12–17 µm. Ascospores (7–) 9.5–10.5 (–11) × 4–5.5 (–6) µm, broadly ellipsoidal. Conidia 6–8 × *ca* 1 µm. Medulla C–, K+ faintly yellow, KC–, Pd– , UV– (confluentic acid). **BLS 2312**.

On calcareous rocks; rare. N. England (Cumbria, Pennines), N. Wales, N. Somerset, W. Ireland. Several of the records need re-examination, as does the distinction between this species and *L.endomelaena* (see above).

Lecidea paupercula Th. Fr. (1874) **Nb**

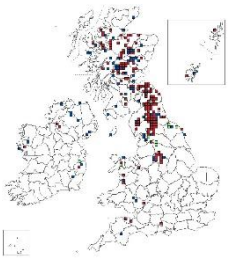


Like *L. fuscoatra*, but thallus a darker, ± reddish brown, and medulla I+ violet, C–, K± yellow, KC–, Pd± orange, UV– (± stictic acid); ascospores 9–15.5 × 5–8 µm. **BLS 1697**.

On tops of large siliceous boulders above 500 m alt. Scottish Highlands, Outer Hebrides, Cumbria, with an old record from W. Ireland.

Similar to *L. atrobrunnea* s.l. [not recorded from our region], which differs in smaller ascospores (5–) 6.5–10 (–14) × (2.5–) 3–5 (–6) µm. See also *L. syncarpa*. *Miriquidica garovaglii* (Lecanoraceae) is of similar appearance and chemistry, but has flat to convex areoles, apothecia becoming a bit brownish on wetting, a colourless hypothecium and contains miriquidic acid.

Lecidea plana (J. Lahm) Nyl. (1872) **LC**

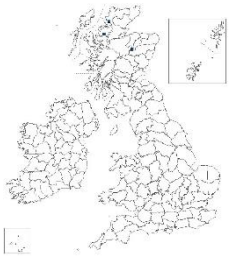


Thallus pale grey, granular to cracked and irregularly rimose, often dispersed and often inconspicuous, medulla I–; prothallus indistinct. Apothecia 0.2–0.5 (–1.5) mm diam., black, remaining so when moistened, sessile, disc flat to slightly convex; true exciple persistent, raised, green-black at the outer edge, internally yellowish grey or colourless; epithecium dark green-black to black, intensified in K, N+ red; hymenium 35–50 (–55) µm tall; hypothecium ± colourless to pale yellowish brown, of ± vertically orientated hyphae; paraphyses sparsely branched and anastomosed, apices with a dark green cap to *ca* 4 µm diam. Asci 30–40 × 8–14 µm, *Lecidea*-type. Ascospores (7–) 8–11 (–13) × (2.5–) 3.5–5 (–6) µm, ellipsoidal. Conidia 10–13 × 0.5–0.6 µm. Thallus C–, K–, KC–, Pd–, UV– (planaic and 4-*O*-demethylplanaic acids). **BLS 0764**.

On siliceous rocks, pebbles and stonework; frequent, especially in N. Britain; Throughout N. England and Scotland, also C. & N. Wales and S.W. England, a few records in N., W. and E. Ireland.

Differs from *L. lapicida* in the yellow-grey exciple and I– medulla, and from *L. lithophila* in the pale grey (not white with rusty patches) thallus, the small ascospores and greenish epithecium, and the disc remaining black when moist.

Lecidea promiscens Nyl. (1872) **Nb**



Thallus thin or lacking, indistinctly areolate, white; prothallus not developed or indistinct; areoles flat, irregular and indistinct; medulla I+ intensely violet. Apothecia sessile, with a markedly or strongly constricted base, to 2.5 (–4) mm diam.; disc black, flat to moderately convex, not or slightly pruinose; margin black, persistent, dull to shiny; exciple blackish green to black in a thin, peripheral rim 60–150 µm thick; epithecium dark green to green-brown, 12–18 µm thick; hymenium colourless or faintly green, (40–) 45–55 (–60) µm tall; paraphyses mostly unbranched, occasionally branched especially towards the apices; subhymenium colourless, 14–45 µm thick; hypothecium dark brown below, colourless above; asci clavate, 40–50 × 13–17µm; ascospores colourless, aseptate, cylindrical to cylindric-ellipsoidal, (7–) 7.5–12 (–14.5) × (2.5–) 3–4.5 (–5) µm. Pycnidia semi-immersed, 90–150 µm diam.; conidia bacilliform to filiform, ± straight, 9.5–14 (–15.5) × 1–1.3 µm. C–, K–, KC–, Pd–, UV– (confluentic acid syndrome, 2′-*O*-methylperlatolic acid minor). **BLS 1967**.

On acidic rock, including sandstone, in open habitats; local. Scottish Highlands (E. & W. Ross, E. Inverness).

Similar morphologically to *L. auriculata* from which it differs in its somewhat larger ascospores and less well-developed exciple. See also *L. promiscua*. Specimens with the excipular structure of *Lecidea auriculata* and the spore size of *L. promiscens* should be checked chemically. If stictic acid is found instead of the confluentic acid syndrome it could be *L. andersonii* R. Filson (1974), a species not yet reported from Britain and Ireland, but to be expected, e.g. in the Scottish Highlands.

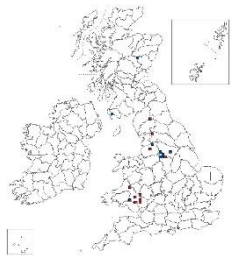
Lecidea promiscua Nyl. (1874) **Nb**

Like *L. promiscens*, from which it only differs only in the thick, white thallus; major substance 2′-*O*- methylperlatolic acid. **BLS 1968**.

On acidic rock, including granite; uncommon. Only recorded from one site in the Scottish Highlands (Coire an Lochan, Easterness). Map right.

Lecidea promixta Nyl. (1898) **Nb**

Thallus dark grey, of ± scattered scurfy granules, or scarcely apparent; medulla I+ violet; prothallus black. Apothecia 0.2–0.4 (–0.5) mm diam., sessile, strongly constricted below, black, disc flat to convex; true exciple persistent, raised and somewhat swollen, of ± radially arranged swollen hyphae, the outer layer dark brown to black, internally reddish brown; epithecium dark brown, N+ red; hymenium 40–55 µm tall, I–; hypothecium dark brown; paraphyses mainly branched only towards the apex, the apices brown, capitate and to 5.5 µm diam. Asci 45–55 × 12–15 µm. Ascospores (7–) 11–16 (–16.5) × (3–) 4–5 (–6) µm, narrowly ellipsoidal, ± attenuated at the ends, often with two oil drops. Thallus C–, K–, KC–, Pd–, UV– (no substances detected with TLC). **BLS 0760**.

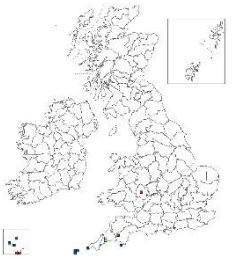


On coarse-grained sandstone; local. N. England (Derbyshire, Peak District; S. Lancashire), S. Wales. a few scattered records in Cumbria and Scotland.

Material on stones in acid dunes in S.W. Scotland (Wigtown, Torrs Warren) is perhaps this species but has scattered white areoles.

Lecidea sarcogynoides Körb. (1855) **VU D2**

Epilithic thallus usually ± absent, when present of dispersed greyish white areoles, medulla I–; prothallus well-developed, fimbriate, often dominant, black. Apothecia (0.3–) 0.5–1.5 (–2.2) mm diam., black, sometimes pruinose, sessile, strongly constricted at the base, often in groups; disc slightly concave to flat; true exciple persistent, raised, ± shiny, often flexuose, purple-black at the outer edge, grey within, filled with crystals; epithecium dark olivaceous brown to brownish black; hymenium 40–50 µm tall, usually pale reddish to violet, K+ reddish purple in parts; hypothecium brown-black; paraphyses unbranched or sparsely branched; apices to 4 µm diam., olivaceous, capitate. Asci 35–45 × 11–12 µm, the outer coat I+ blue, the apex strongly thickened with an I+ blue tholus. Ascospores (7–) 10–12 (–14) × (2–) 2.5–3.5 (–4) µm, narrowly ellipsoidal; apices rounded to somewhat attenuated. Thallus C–, K–, KC–, Pd–, UV– (no lichen substances or traces of terpenoids). **BLS 0769**.



On exposed granite rocks and stones, generally warmth-loving. S.W. England, Channel Isles, Isles of Scilly.

Similar to *L. auriculata*, but distinguished by the colour of the exciple and hymenium, *Sarcogyne*-like apothecia, and less abruptly truncated ascospores. Sometimes confused with *Adelolecia pilati*.

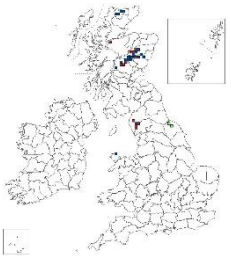
Lecidea siderolithica Müll. Arg. (1872) **Nb**

Like *L. fuscoatra*, but with a small, thin (*ca* 0.1 mm thick) thallus and ascospores only 7–12 × 3.5–5 µm in size. Until recently often not recognized as a separate species. **BLS 0753**.

On acidic rock, including granite. Distribution in Britain not well-known, apart from one confirmed record from Mull.

Lecidea silacea (Ach.) Ach. (1803) **Nb**

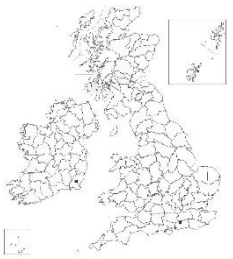
Thallus ochre to rust-red, areolate; areoles to 1.5 mm diam., convex, the cortex deep rust in section (iron oxides), medulla I+ violet; prothallus indistinct. Apothecia 0.5–1.5 mm diam., black, arising between the areoles, at first appearing ± immersed but finally ± sessile, flat to strongly convex; true exciple becoming excluded, green-black at the outer edge, internally pale; epithecium green to blue-green or black-green, K+ aeruginose, N+ red; hymenium 40–60 µm tall, colourless to greenish in parts; hypothecium dark brown, massively developed and almost stipe-like in section; subhymenium bluish; paraphyses sparsely branched and anastomosed, the 2–4 final



cells swollen; apices to 5 µm diam., greenish. Asci 40–55 × 8–12 µm. Ascospores (8–) 10–15 (–17.5) × 4.5–6 (–7) µm, ellipsoidal to broadly ellipsoidal. Conidia 8–12 × *ca* 1 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV– (usually no lichen substances, sometimes porphyrilic acid). **BLS 0772**.

On upland metal-rich siliceous rocks, often with *Acarospora sinopica, Rhizocarpon oederi* and *Tremolecia atrata*; localized. N.W. England (Lake District), N. Scotland (Highlands), N. Wales (Anglesey), old records from the N. York Moors.

L. subspeirea Coppins, P. James & Hertel (1995) **Nb IR**

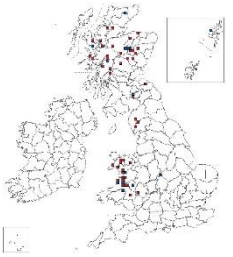


Thallus white, thick, continuous, tartareous, full of calcium oxalate crystals, medulla I–; prothallus whitish. Apothecia 0.5–1.2 (–2.0) mm diam., black but densely whitish blue-grey pruinose, surrounded by a white pseudothalline margin; epithecium green to olive brown; hymenium 60–100 µm tall; subhymenium 15–35 µm. Ascospores 13–13.5 × 6–6.5 µm, ellipsoidal. Thallus C+ red, K–, Pd– (gyrophoric acid). **BLS 0608**.

On mortar and calcareous sandstone of a church; so far only known only from the type locality in West Sussex.

A calciphilous species resembling *Porpidia speirea* in aspect.

Lecidea swartzioidea Nyl. (1859) **Nb**

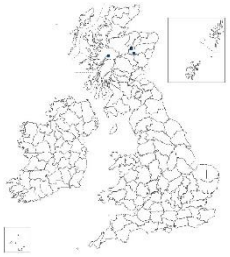


Very similar to *L. lactea*, but with a dark brown to nearly black hypothecium. **BLS 0603**.

On exposed siliceous rock, including granite; locally common. C. & N. Wales, Scottish Highlands.

Occasionally host to *Cecidonia umbonella* (q.v.) and *Muellerella pygmaea*.

Lecidea syncarpa Zahlbr. (1918) **Nb**



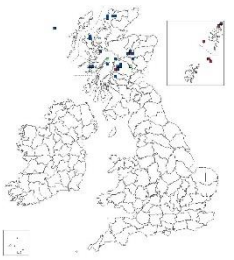
Like *L. paupercula*, from which it only differs in the usually paler brown, thicker, K+ yellow→red (norstictic acid) thallus, the less strongly appressed apothecia, lower hymenium, and larger ascospores 6.5–11.5 × 3.5–6 µm in size. **BLS 1969**.

On exposed siliceous rock, including granite; rare. Scottish Highlands (Easterness, Westerness).

Sometimes treated as a subspecies of the non-British *L. atrobrunnea*, as subsp. *saxosa* Hertel & Leuckert.

Species not belonging in *Lecidea* s. str. but with no defined alternative placement

Lecidea berengeriana (A. Massal.) Nyl. (1866) **Nb**



Thallus mostly *ca* 0.2 mm thick, tartareous, white, obscuring the form of the underlying bryophytes or plant remains, surface of contiguous granular warts 0.1–0.3 (–0.5) mm diam; medulla I–. Apothecia 0.5–1 (–1.5) mm diam., flat and ± thinly marginate when young but soon convex and immarginate, medium to dark brown or blackish; exciple and hypothecium dark reddish brown, but outer edge of exciple colourless, giving the appearance of a thalline margin; epithecium yellowish brown; hymenium 60–65 µm tall; hymenium and hypothecium with scattered blue-violet (K+ green) granules; paraphyses 1.5–2 (–2.5) µm wide, becoming clavate to capitate and brown-walled at the apices and to 6 µm diam., mostly unbranched. Asci *Porpidia*-type. Ascospores (9.5–) 11–16 (–19) × 4–5 (–6) µm, fusiform-ellipsoidal, epispore absent. Thallus C–, K–, KC–, Pd–, UV– (no lichen substances detected by TLC). **BLS 0702**.

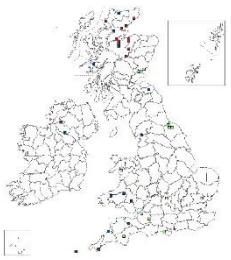
On bryophytes over ± calcareous rocks (esp. mica-schist) or on exposed turf of mountain ridges or summits; localized. N. Scotland (Highlands, Inner Hebrides, Shetland).

Morphologically close in many respects to *Bryobilimbia hypnorum* and *B. sanguineoatra* but distinguished by its white, tartareous thallus and the much broader, brown-walled apices to the paraphyses. Sometimes confused with *Micarea assimilata*. The presence of this species in the Lake District requires confirmation, and a collection from Wales has been redetermined as *Bryobilimbia sanguineoatra*. Collections under this name from England (Herefordshire) and Scotland (Perthshire) have been redetermined as *Lecidea* aff. *strasseri* (q.v.), which is is mainly distinguished by its thinner, more finely granular-areolate, grey-green thallus.

Schmull *et al*. (2011) demonstrated that this species should not be included in *Lecidea* based on phylogenetic data, and noted morphological parallels with *Mycobilimbia*. Fryday *et al*. (2014) also showed that *L. berengeriana* does not belong to *Lecidea*, and neither apparently to *Bryobilimbia*; instead they postulated a relationship with *Romjularia*. The species is retained here pending further study.

Host to the lichenicolous fungi *Lichenochora inconspicua* and *Zwackhiomyces berengerianus* (Arnold) Grube & Triebel (1990).

Lecidea erythrophaea Flörke (1826) **VU B**

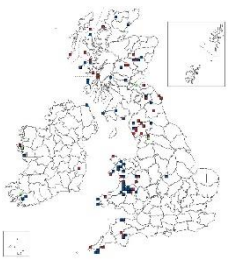


Thallus immersed or ± superficial, thin, whitish, medulla I–; prothallus absent. Apothecia 0.3–0.8 (–1) mm diam., flat to convex, dark reddish brown to brown-black; true exciple thin to excluded, colourless within, the hyphal apices swollen at the outer edge, the edge and epithecium red-brown, K–, N–; hymenium 35–45 (–70) µm tall, I+ blue; hypothecium colourless to weakly yellowish; paraphyses unbranched or rarely branched; apices to 5 µm diam., capitate, usually with a brown hood. Asci 30–40 × 9–12 µm, *Bacidia*-type. Ascospores (8–) 9–14 (–18) × 3–4.5 (–5) µm, fusiform-ellipsoidal. Thallus C–, K–, KC–, Pd–, UV– (no substances detected by TLC). **BLS 0720**.

On smooth bark of deciduous trees, especially young *Fraxinus*, also on *Corylus* and *Populus tremula*, in sheltered woodlands; rare, appears to be very pollution sensitive. Scattered through S. England and Wales, Scotland, Ireland (Fermanagh), but only seen in W. Cornwall and the Scottish Highlands in recent decades.

Most easily confused with "*Lecidea*" *hypopta* (q.v.), which is best separated by the more raised exciple in young apothecia. Easily overlooked in the field for the acicular-spored *Bacidia arceutina* with which it often grows. *Japewiella tavaresiana* and *Lecidea erythrophaea* have previously been misidentified as *L. tenebricosa* (Ach.) Nyl. (1861) by British authors. *L. erythrophaea* differs in its narrower, thin-walled ascospores. *J. tavaresiana* has a green-brown to brown, ± rimose thallus with discrete to ± confluent, spotted brown-yellow soralia, yellow internally.

Lecidea fuliginosa Taylor (1836) **Nb**



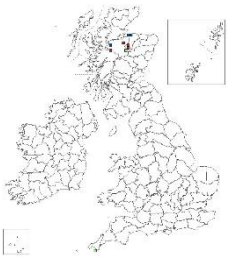
Thallus of convex to subglobose ± squamulose wart-like areoles (0.5–) 1–2 (–3) mm diam., rather loosely attached to the rock, constricted below, red-brown to dark brown, often shiny, surface uneven, medulla I–; prothallus absent. Apothecia 0.3–0.5 (–1) mm diam., sessile, ± flat to somewhat convex, black; true exciple black, becoming excluded, of dark brown radiating hyphae expanded to 6–8 µm diam. at the surface; epithecium dark brown, K–; hymenium 30–40 µm tall; hypothecium dark brown, massively developed and sometimes ± stipitate; paraphyses sparsely branched and anastomosed, apical cells with dark brown caps, to 6 µm diam. Asci 30–35 × 10–12 µm, *Catillaria*-type. Ascospores (6.5–) 7–10 (–12) × 4–5 (–6) µm, ellipsoidal, ± attenuated at the ends. Conidia reported to be 12–17 × *ca* 0.5 µm, thread-like and curved. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 0721**.

On exposed siliceous rocks; rare. S.W. England, Wales, N.W. England, Scotland, W. Ireland (Kerry to Galway, but not reported recently).

This species has a distinctive *Acarospora*-like habit. Its generic disposition needs further study; no sequence data are available. Young sterile areoles can resemble juvenile *Miriquidica atriseda* which occurs in similar habitats.

Lecidea globulispora Nyl. (1859) **VU D2**

Lecidea antiloga Stirt. (1877)

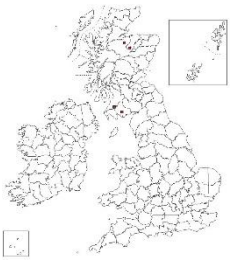


Thallus immersed, hardly visible, not or scarcely discolouring the wood; prothallus absent. Apothecia small, (0.1–) 0.2–0.4 (–0.5) mm diam.; disc ± flat to somewhat concave, black, sometimes ellipsoidal with the wood grain; true exciple persistent, black, shiny, ± colourless and granular within, the surface cells expanded, brown capitate (K+ greenish), 4–6 µm diam.; epithecium granular, brown, K+ greenish olivaceous; hymenium 30–60 µm tall; hypothecium colourless; paraphyses generally branched only near the apices, with dark brown caps to 3.5 µm diam. Asci 30–40 × 8–10 µm, broadly clavate, tholus well-developed, *Bacidia*-type. Ascospores (3.5–) 4–5.5 (–6) µm, sometimes ± uniseriate, globose. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 0695**.

On hard exposed conifer palings and on dead *Pinus* cones and loose or detached bark; rare. N. Scotland (Easterness and Moray). Present on *Juniperus* in Scandinavia.

The spherical ascospores are diagnostic. The species does not belong in *Lecidea*, and was considered to belong to the *Lecanora fuscescens* group by Øvstedal *et al*. (2019). As that group itself is not congeneric with *Lecanora* s. str. and requires a new generic placement, *L. globulispora* is retained here pending further research.

Lecidea huxariensis (Beckh. ex J. Lahm) Zahlbr. (1925) **NE**

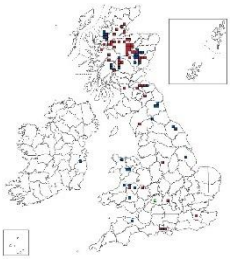


Thallus thin and pale greyish or inconspicuous and endoxylic. Apothecia minute, to 0.1 mm diam., sessile, dark brown to black, flat or rarely convex; hypothecium colourless; paraphyses with dark apical caps forming an olivaceous epithecium. Asci *Lecanora*-type, 12- to 16-spored. Ascospores ellipsoidal, aseptate, 5–7 × 2–4 µm. Pycnidia not known. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 2650**.

On lignum of decorticated conifer snags in felled plantations, E. Inverness and Kirkudbright. Probably much overlooked.

The minute apothecia and multispored asci are diagnostic. No sequences are available, but the species clearly does not belong in *Lecidea*.

Lecidea hypopta Ach. (1803) **Nb**



Thallus ± immersed, or superficial and then white, continuous; prothallus absent. Apothecia (0.2–) 0.3–0.5 (–0.7) mm diam., deep reddish- to dark brown or almost black, strongly convex to almost tuberculate; true exciple pale fawn, soon becoming excluded, giving the apothecia a piebald appearance, exciple colourless within, the outer edge pale brown; epithecium reddish brown, K± olivaceous brown; hymenium 25–40 µm tall; hypothecium colourless; paraphyses unbranched or sparsely branched; apical cells brown and swollen to 3–4 µm diam. Asci 30–40 × 10–12 µm, walls ± evenly thickened throughout; outer layer and the shallow apical dome K/I uniformly blue, *Catillaria*-type. Ascospores (8–) 9–12 × (2.5–) 3–4 (–5) µm, cylindric-ellipsoidal to slightly curved, often pale greyish brown and/or spuriously 1-septate. Conidia 14–18 × 4–5 µm, curved. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 0731**.

On dry wood of standing or fallen trunks or more rarely bark, of *Betula, Quercus* and especially conifers; localized. S. England (Somerset, Hampshire, Oxford & Kent), N. England (Derbyshire, N.E. Yorkshire, Northumberland), C. & N. Wales, Scotland.

This species has been included in *Lecanora* (see Holien *et al.* 2016), but a thalline margin is absent and the asci are not characteristic of that genus; its affinities require further study. It was found to cluster with *Puttea* in a poorly understood clade within the Lecanorales by Stenroos *et al*. (2009) but it does not appear to belong to that genus. British collections may not be conspecific with "*Lecidea*" *hypopta* and appear to be referable to *Lecanora phaeostigma* (Körb.) Almb., but it seems unlikely that this generic placement will endure. See also *Lecidea erythrophaea*.

Lecidea leprarioides Tønsberg (1992) **NT**

Thallus thin or endosubstratal, episubstratal granules (if present) to 0.1 µm diam.; surface whitish to green-grey or beige, dull, usually sorediate; soralia irregular, effuse, bursting through the uppermost layers of the substratum,

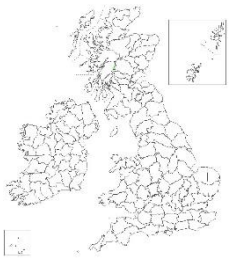
forming a discontinuous leprose crust, soredia fine, 10–30 µm diam.; photobiont green, globose, to 10 µm diam. Apothecia rounded to flexuose or tuberculate, sessile with a constricted base, 0.2–0.85 (–1.2) mm diam.; disc dark grey to black, often whitish or bluish pruinose, weakly to strongly convex; margin lacking; exciple colourless to brown below, turquoise or greenish brown near the hymenium, N+ violet, laterally 25–50 µm thick, basally 30–60 µm thick, composed of branched and anastomosing radiating hyphae with 0.7–1 µm diam. unthickened apical lumina; epithecium greenish ochre to deep turquoise, composed of amorphous green pigment and ochre granules, 5–10 µm thick or streaking into the hymenium, N+ violet; hymenium colourless to pale green, 25–40 µm tall; paraphyses moderately branched and anastomosing, not thickened at the apex; subhymenium pale yellow to brown, poorly distinguishable from the hypothecium, *ca* 50 µm thick; hypothecium pale yellow to sordid reddish brown, 50–125 µm thick. Asci clavate, *Bacidia*-type with an I+ blue tholus and indistinct lighter blue tapering axial body, 8-spored. Ascospores colourless, aseptate, narrowly ellipsoidal, sometimes slightly curved, (6.5–) 8.2–9.8 (–11.5) × (2.5–) 2.7–3.4 (–4) µm. Pycnidia not seen. Thallus C–, K–, KC–, Pd–, UV– (pseudoplacodiolic acid). **BLS 0768**.

On old *Pinus* trunks; rare. Scotland (Inverness-shire).

The thallus morphologically resembles some thickly developed morphs of *Ochrolechia microstictoides* or pale variants of *Lecanora expallens*. Related to *L. turgidula*, which has placodiolic acid and lacks soralia; see Schmull *et al*. (2011) for further details. A new genus within the Lecanoraceae would probably be justified.

Lecidea mucosa Stirt. (1879) **DD IR**

Thallus thin, scarcely visible with a reddish-tawny gelatinous appearance which may be a result of algal contamination. Apothecia small, dark brown, convex to almost spherical, immarginate; hypothecium dark brown, paraphyses 1–1.8 µm diam., only a few of which have dark, apical subclavate caps to 3.7 µm diam., coherent in K; colourless narrow hyphae *ca* 1.2–2 µm diam. in the outer exciple, which is surrounded by a colourless gelatinous zone 4–5 µm thick; epithecium brown in thick section. Ascospores 7–10 × 4–5 µm, ellipsoidal. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 1966**.

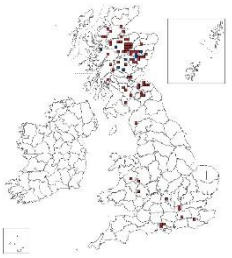


On rotting wood; rare, Scottish Highlands (Argyll, near Tyndrum); known only from a single 19th century collection.

Careful microscopical examination is required to separate this species from *L. paraclitica*.

Lecidea nylanderi (Anzi) Th. Fr. (1874) **Nb**

Thallus to 20 cm across, effuse, grey-white, often tinged brownish in part, soralia varying from small and discrete to confluent and forming a bluish-grey crust; granules 20–60 (–70) µm diam.; external hyphae sometimes brown; prothallus often distinct and bluish; photobiont cells 5–12 (–14) µm diam. Apothecia (not seen in British material) 0.2–0.5 (–0.9) mm diam., pale to dark red-brown, flat to slightly convex; true exciple thin, pale brown, the outer part sometimes darker; epithecium brown, K–; hymenium 35–40 µm tall, colourless; hypothecium colourless; paraphyses unbranched, the apices abruptly swollen with dark brown caps to 4 µm diam. Asci *Bacidia*-type. Ascospores 6–7 µm diam., globose. Thallus C–, K–, KC–, Pd–, UV+ white (divaricatic acid). **BLS 1711**.

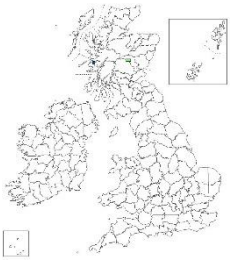


On bark and lignum of old trunks of *Pinus*, *Betula* and *Juniperus*, especially in old oak-birch or pine-birch woodlands, rarely on *Quercus* lignum; local. Scottish Highlands, S.E. Scotland, Welsh Marches and S.E. England.

Difficult to separate from sterile *Hertelidea botryosa* except by TLC (both species are UV+ white), although the latter usually has a darker grey-brown thallus. *Mycoblastus caesius* also contains divaricatic acid, but has blue-grey hyphae in some soredia and a usually conspicuous grey-blue-black prothallus. The last feature helps to separate strongly sorediate morphs from *Lepraria incana*.

L. nylanderi was shown to belong in the Lecanoraceae by Schmull *et al*. (2011), confirming observations by Edwards *et al*. (2009) that it belonged to an unnamed genus centred on *Lecanora fuscescens*. That position was agreed by Øvstedal *et al*. (2019), but again without formally introducing a new genus.

Lecidea paraclitica Nyl. (1872) **DD**



Thallus immersed, ± inconspicuous, effuse. Apothecia 0.15–0.3 (–0.4) mm diam., black, flat to convex; true exciple soon excluded, of compacted ± radiating densely pigmented hyphae 2.5–3 µm diam., with terminal cells to 5 µm diam.; no gelatinous zone around the exciple; true exciple, epithecium and hypothecium dark brown to blackish, K–, N–; hymenium 20–30 µm tall, colourless; paraphyses 1.7–3 µm diam., mostly unbranched, apices capitate, with dark brown caps 3–6 µm diam. Asci 20–25 × 8–12 µm, the outer coat and apical dome K/I+ blue, the latter with a narrow apical cushion surrounded by a dark blue border. Ascospores (5–) 6–10 × 2.5–3.5 µm, narrowly ellipsoidal. Pycnidia unknown. Thallus C–, K–, KC–, Pd–, UV–. **BLS 0758**.

On dry, weathered conifer wood; rare. Inner Hebrides (Mull) and two 19th century collections from E. Perthshire.

Close to *L. mucosa*. The name is provisional, as the type of *L. paraclitica* differs from the British material by the N+ violet epithecium and the non-capitate paraphyses. It has been confused with *Micarea erratica*, but differs in the shallower hymenium, brown, N– epithecium, capitate paraphyses and the absence of pycnidia.

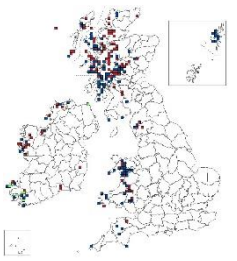
Lecidea phaeophysata Fryday & van den Boom (2019) **NE**

Thallus effuse, to 5 cm diam., thin and diffuse or endolithic, pale greenish when fresh, creamish to brown in dried collections; medulla I−. Photobiont chlorococcoid; cells 9–12 µm diam. Apothecia sessile, 0.6–1.1 mm diam., black with a flat matt disc and slightly raised shiny margin, constricted below (especially in mature apothecia); margin 70–100 µm broad, prominent when young, occasionally becoming excluded in old apothecia, with fuscous brown internal pigments. True exciple well-developed, 60–70 µm thick, cupular, continuous below the hypothecium, composed of parallel radiating hyphae with brown extracellular granules. Hymenium 55–65 µm tall, paraphyses 2–2·5 µm diam. at the base and apex, narrowing somewhat to 1·5–2 µm diam. in mid-hymenium, unbranched, septate, not capitate or strongly conglutinated, the upper 10–25 µm pigmented fuscous brown, pigment sometimes extending all the way down to the hypothecium. Hypothecium brown, *ca* 100 µm thick. Asci cylindrical, 35–50 × 10–12 µm, *Porpidia*-type, amyloid tube not reaching all the way to the apex in immature asci. Ascospores colourless, ellipsoidal, 11–18 × 4–5·5 µm, perispore absent. Conidiomata uncommon, flat, brown, 0·6–0·8 mm diam., sometimes with a gaping ostiole; conidia filiform, curved, 14–16 × 0·5–0·6 µm. Chemistry: K−, C−, KC−, Pd−, UV+ yellow (?carotenoids).

Although predominately a species of maritime siliceous mica-schist rocks, the single collection from our region (Co. Galway, Ireland) is from 350 m altitude, several kilometres from the sea.

The species is of uncertain relationships (Fryday & van den Boom 2019), and has not been sequenced. It is most similar externally to *Porpidia crustulata*, but has somewhat larger apothecia with a constricted base, and unbranched paraphyses with a pigmented upper section. The ascus type precludes a placement in *Lecidea* sensu stricto. It bears some resemblance to species of *Bryobilimbia* but the pigmented paraphyses are anomalous for that genus.

Lecidea phaeops Nyl. (1858) **LC**



Thallus white, pale greenish white, glaucous or whitish grey, irregularly and sparingly cracked to ± rimose, smooth, medulla I–; prothallus white, often well-developed, sometimes replaced by dark contact zones with other thalli. Apothecia 0.2–0.5 (–0.6) mm diam., black, immersed, aspicilioid, irregular in shape, sometimes coalescing; disc flat to concave; true exciple scarcely apparent in surface view, the outer edge red-brown where exposed, internally pale; epithecium red-brown, somewhat olivaceous in K; hymenium (95–) 100–150 (–160) µm tall; hypothecium dark red-brown; paraphyses ± unbranched, occasionally branched towards the tips, apices reddish brown, scarcely swollen to *ca* 3 µm diam. Asci 60–80 × 12–15 µm, *Biatora*-type. Ascospores 12–18 (–23) × 5–6 (–7) µm, narrowly ellipsoidal, somewhat inequilateral with one side flattened; apices often attenuated. Thallus C–, K+ yellow, KC+ yellow, Pd+ yellow, UV– (atranorin and psoromic acids). **BLS 0761**.

In damp, shaded crevices of siliceous rock outcrops, often near the ground, occasionally by streams; local. W. Britain from Devon to Shetland, S.W. & W. Ireland.

The continuous, ± glaucous thallus is very reminiscent of *Herteliana gagei* (uncertain position within Lecanorales), but the apothecia in that species are emergent to ± sessile and the thallus chemistry is different

(Pd–, confluentic acid). *Amygdalaria pelobotryon*, which occasionally occurs in similar habitats, can be distinguished by the C+ red thallus, the anastomosed paraphyses, the different ascus-apical apparatus, and larger ascospores.

The asci and chemistry are atypical for *Lecidea* sensu stricto, but its true affinities are unknown.

Lecidea aff. **strasseri** Zahlbr. (1898) **NE**

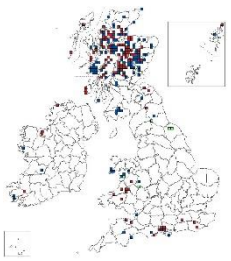
Similar to *L. berengeriana* but the thallus is thinner and finely granular-areolate, with granules 0.06–0.11 mm diam., grey-green when fresh but fading to whitish in dried material. Apothecia (0.15–) 0.25–0.4 (–0.50) mm diam., urceolate or concave when young, later becoming flat or slightly convex, with a ± persistent margin, dark brown to blackish. Ascospores ellipsoidal, 9–14 × 3–4.5 µm. **BLS 2877**.

On shaded basic rocks (sandstone or schist) in ravine or valley woodland, rare. Herefordshire (Downton Gorge) and Mid Perthshire (Glen Lochay).

Only recently resurrected from the synonymy of *L. berengeriana* (Vězda & Liška 1999), though judging from preliminary molecular data British collections could represent a distinct species.

Most Scandinavian and Central European occurrences of *L. strasseri* are corticolous or overgrowing mosses and plant debris in old-growth woodlands (Svensson *et al*. 2020). Although related to *L. berengeriana* in having noticeably swollen paraphysis apices, it is more likely to be confused with *Bryobilimbia ahlesii* and *B. sanguineoatra* (q.v.), neither of which have a granular or areolate thallus and the former having broader (mostly 6–7 µm) ascospores. The relationship of *L. strasseri* with "*Mycobilimbia*" *parvilobulosa* Sarrión *et al*. (2003), described from forests in southern Spain, requires investigation.

Lecidea turgidula Fr. (1824) **LC**



Thallus effuse, immersed or thinly granular, whitish to grey, often inconspicuous. Apothecia 0.2–0.6 (–0.8) mm diam., black, with bluish bloom when wet, sometimes thinly white-pruinose, sessile or (on wood) partly immersed, flat to convex; true exciple excluded, usually of coherent (in K) radiating hyphae, colourless to darkish greenish or brownish, I± pale violet; epithecium brownish to blue-green, K± green intensifying, N+ reddish, also with minute pale granules that dissolve in K; hymenium 30–40 (–50) µm tall, streaked violaceous (K+ green) or brownish to greenish (K+ intensifying); hypothecium colourless; paraphyses 1.3–2 µm diam., sparingly branched and anastomosed, the apices scarcely swollen but sometimes with a dark brownish hood to 5 µm diam. Asci 25–30 × 10–13 µm, *Bacidia*-type. Ascospores 6–10 (–14) × 2.5–4.5 (–6) µm, 0(-1)-septate, narrowly ellipsoidal to cylindrical, sometimes slightly curved. Pycnidia *ca* 100 µm diam., black, ± immersed in the substratum, the wall green-brown, K+ green intensifying; conidiogenous cells in chains, subcylindrical; conidia arising laterally and terminally, 3–3.5 × 1.5–1.8 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV– (placodiolic acid). **BLS 0787**.

On acid bark and wood of (mostly) conifers; common. N. Scotland (Highlands), extending locally to S. and S.W. England, Wales and Ireland.

Sometimes mistaken for a *Micarea* (e.g. *M. olivacea*), but distinguished from that genus by the exciple of coherent hyphae, and minute granules in the epithecium that give the apothecia a pruinose appearance (bluish bloom when wet).

Schmull *et al*. (2011) showed that this species and *L. leprarioides* occupy a well-defined clade within the Lecanoraceae; a new genus would probably be justified but this has not yet been introduced.

LECIDOMA Gotth. Schneid. & Hertel (1981)

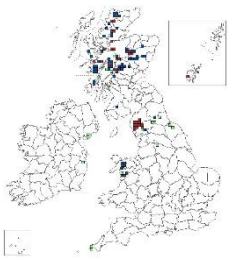
As this is a monotypic genus the description below (*L. demissum)* incorporates the generic description. Similar to *Psora* and some *Lecidea* species but the central areoles form small to spreading lumpy mounds with adnate apothecia, and asci with a well-developed tholus with K/I+ ring-shaped pore.

The genus was confirmed as phylogenetically close to *Bryobilimbia*, *Clauzadea*, *Romjularia* and

"*Lecidea*" *berengeriana* by Fryday *et al*. (2014), a group that was previously shown by Schmull *et al.* (2011) to occupy a position outside the *Lecideales*. Morphologically, it is close to *Bryobilimbia* but differs in its thick, areolate thallus and colourless, rather than brown, hypothecium.

Literature:
Fryday *et al*. (2014), Gilbert & Purvis (2009a), Hertel (1981), Schneider (1979).

Lecidoma demissum (Rutstr.) Gotth. Schneid. & Hertel (1981) **Nb**



Thallus thick, coarsely areolate to subsquamulose, cushion-shaped, to 7 (–12) cm diam., dark brown, rarely grey to grey-brown (shade morphs), ± shiny; areoles 1–2 (–4) mm across, flat to convex, polygonal or somewhat subsquamulose, tightly packed, ± turgid, often contiguous and coalescing; lower surface deep brown-black, attached directly to the substrate by black hyphae; photobiont chlorococcoid, dividing into 2–4 daughter cells. Apothecia 0.5–2 (–3) mm diam., discrete or becoming confluent into irregular shapes, immersed or adnate; true exciple thin when young, becoming excluded when mature; disc round, dull brown-black, red-brown when moist; hymenium 60–70 µm tall, colourless, I+ blue; paraphyses 2–3 µm diam., thin-walled, strongly conglutinate, only slightly branched at the tips and anastomosed, apical cells swollen to 4 µm diam., with a thin, dark brown cap. Asci thin-walled, clavate, with a well-developed K/I+ pale blue apical dome and a K/I+ dark blue tubular structure, *Porpidia*-like, 50–55 × 10–12 µm. Ascospores 12–16 × 5.5–7 µm. Conidiomata not seen. Lichen products not detected by TLC. **BLS 0806**.

On peaty soils, decaying vegetation and acid gravels, rarely on bare rock, on exposed mountain sides and summits. Within Scotland frequent N. of the Highland Boundary Fault, extending locally to N.W. England (Lake District), N. Wales, Ireland (Wicklow).

When well-developed, the thalli resemble small cow-pats in colour and surface appearance.

PORPIDIA Körb. (1855)

Thallus crustose, thick and tartareous to inconspicuous, continuous to areolate-cracked, grey, white or orange; prothallus present (especially between adjacent thalli) or absent, black or sometimes orange, thin; medulla I+ or I–; soredia present or absent, either forming irregularly and diffusely in cracks in thallus, or more commonly forming discrete regular round soralia; isidia present in one species. **Photobiont** green, chlorococcoid; including both *Trebouxia* and *Asterochloris*. **Ascomata** apothecia, scattered or clustered, sometimes in concentric rings, emerging from small dots on the thallus, innate or sessile, often rather large, 0.5–1.5 (–3) mm diam.; disc dark brown to black, pruinose or not, with a distinct true margin (sometimes excluded with age). **Thalline margin** absent. **True exciple** with a dark blue-black (rarely brown) rim and, usually, a paler brown or colourless inner part; comprised of conglutinated, radiating hyphae. **Epithecium** usually olivaceous, but occasionally brown, orange-brown, or aeruginose. **Hymenium** 80–150 µm tall, I+ blue. **Hypothecium** upper part (subhymenium) colourless, otherwise dark brown to brown-black, K± reddish in parts, hyphae irregularly arranged. **Hamathecium** of paraphyses, septate, branched-anastomosing, netted, slightly swollen at the apices, rarely with dark apical caps. **Asci** 8-spored, clavate to subcylindrical, *Porpidia*-type. **Ascospores** aseptate, typically 15–22 µm long, ± ellipsoidal, occasionally with one or both ends acuminate; perispore well-developed, 2–7 µm thick. **Conidiomata** often present, usually with a gnarled surface and a white pseudothalline rim. **Conidiogenous cells** elongate, bottle-shaped, in a

single layer. **Conidia** bacilliform. **Chemistry**: β-orcinol depsidones or long side-chain orcinol depsides; stictic, norstictic, confluentic, 2′-*O*-methylsuperphyllinic and 2′-*O*-methylperlatolic acids, or methyl 2′-*O*-methylmicrophyllinate, present or absent. **Ecology**: mainly on siliceous, rarely calcareous, rocks, pebbles and stonework, atypically on bark, lignum and compacted soil.

Closely related to *Lecidea* s. str., but differs in the distinctive ascus type and larger, halonate ascospores. Preliminary molecular evidence suggests that *Porpidia*, as currently understood, is paraphyletic with the *P. speirea, P. albocaerulescens* and *P. flavicunda* groups (*Porpidia* s. str.) separate from the *P. macrocarpa* and *P. cinereoatra* groups and *Amygdalaria*. If this is confirmed, in order to avoid returning the porpidioid genera to *Lecidea*, it will be necessary to recognize the *P. macrocarpa* and *P. cinereoatra* groups as distinct genera.

Other crustose, saxicolous genera with a similar ascus type are *Clauzadea* and *Farnoldia*, all species of which grow on highly calcareous substrata, *Amygdalaria*¸ which has innate apothecia and a thallus with cephalodia, *Bellemerea*, which has I+ blue ascospores, *Immersaria* which has innate apothecia with a poorly developed exciple and brown pigments in the cortex, *Koerberiella*, which has apothecia with a thalline margin, *Bryobilimbia ahlesii* which has blue-violet (K+ green) granules in the hymenium and non-halonate ascospores, and crustose *Stereocaulon* species, which have septate to submuriform ascospores and a thallus containing atranorin. *Rimularia* has a different ascus structure and richly branched and anastomosing, often moniliform, paraphyses.

Identification to species is often difficult, requiring thin sectioning of ascomata and TLC. The delimitation of many species has been clarified by recent studies, but many collections remain difficult to place. The world distributions are incompletely known; many, even rather recent, reports need re-examination.

A useful field test for confluentic acid is the K/UV(wet)+ mauve spot test, along with the microchemical test for confluentic acid (minute droplets form from a section in water to which KOH is drawn through under the coverslip; Orange *et al*. 2010) which is a helpful diagnostic method; species containing confluentic acid include *P. cinereoatra*, *P. lowiana*, *P. melinodes* (usually), *P. pachythallina*, *P. speirea* and *P. tuberculosa*, while those that lack the compound include *P. contraponenda*, *P. irrigua*, *P. macrocarpa* and *P. platycarpoides.*

Literature:

Buschbom & Mueller (2004), Fryday (2005), Fryday *et al*. (2009), Gowan (1989), Gowan & Ahti (1993), Jabłońska (2008, 2009, 2010), Orange (2014), Orange *et al*. (2010), Ruprecht *et al.* (2020), Schmull *et al*. (2011).

The following key must be considered provisional because the taxonomy of the genus is still very fluid. In particular, species that have a more variable chemistry than previously reported may not key out correctly. The result obtained from using the key should always be checked with the descriptions.

1 Thallus with papillose isidia; containing stictic acid (K+ yellow, Pd+ orange); known only from serpentine rocks ..... ***nadvornikiana***
Thallus not isidiate; chemistry and substratum various 2

2(1) Thallus with soredia, apothecia present or absent 3
Thallus without soredia, apothecia present 10

3(2) Medulla I+ violet ..... ***tuberculosa***
Medulla I– 4

4(3) Thallus orange 5
Thallus grey, sometimes partly orange or reddish due to oxidation 6

5(4) Thallus thin, cracked-rimose, pale creamy orange; stictic acid present (K+ yellow, Pd+ orange); on damp rocks, usually beside streams ..... ***ochrolemma***
Thallus areolate, orange or pale orange-grey or olivaceous; usually containing confluentic acid (K+ numerous 'oil droplets' in section), although other chemotypes (2′-*O*-methyperlatolic acid, norstictic acid) have been reported ..... ***melinodes***

6(4) Thallus containing stictic acid (K+ yellow, Pd+ orange), or rarely with no lichen substances present 7
Stictic acid absent (K–, Pd–); confluentic acid, methyl 2′-*O*-methylmicrophyllinate, or 2′-*O*-methylsuperphyllinic acid present 8

7(6) On basic or water-flushed rocks in upland areas; thallus continuous-cracked, creamy white; soralia arising from cracks; apothecia with constricted base and brown disc..... ***superba*** f. ***sorediata***
On siliceous rocks in lowland areas; soralia usually tuberculate; apothecia sessile with black disc ..... ***soredizodes***

8(6) Confluentic acid present; thallus whitish to grey; soredia creamy; on exposed montane rocks ..... ***pachythallina***
Confluentic acid absent 9

9(8) Methyl 2′-*O*-methylmicrophyllinate present; thallus usually thin, soredia ± round; exciple of apothecia in section ± uniformly dark ..... aff. ***contraponenda***
2′-*O*-methylsuperphyllinic acid present; thallus often thick and tartareous, if thin then soredia linear; exciple of apothecia in section with a dark pigmented cortex and ± colourless medulla .... ***rugosa***

10(2) Exciple of apothecia in section with a dark pigmented cortex and ± colourless medulla composed of thin filamentous hyphae 2–3 µm diam. 11
Exciple of apothecia with pigmented medulla, usually composed of thicker pseudoparenchymatous hyphae 3–8 µm diam., if hyphae thinner then medulla not ± colourless 12

11(10) Epithecium vivid aeruginose; usually on ± semi-inundated, siliceous rocks ..... ***hydrophila***
Epithecium olivaceous ..... ***rugosa***

12(10) Medulla I+ violet, thallus with confluentic acid present; thallus white, apothecia innate, on ± basic rock ..... ***speirea***
Medulla I–, thallus with confluentic acid or not 13

13(12) Thallus orange 14
Thallus grey, sometimes partly oxidated 15

14(13) Excipular hyphae 5–8.5 µm diam.; usually with K+ crimson pigment; thallus lacking lichen substances ..... ***flavocruenta***
Excipular hyphae 3–4 µm diam.; without K+ crimson pigment; thallus usually containing confluentic acid, although a chemotype with norstictic acid has also been reported ..... ***flavicunda***

15(13) Epithecium and exciple with only orange-brown pigment; exciple intensifying in N and 15% HCl, exciple medulla dark orange-brown (N and 15% HCl paler orange) with a dark brown cortex that lacks reddish coloration with N; apothecia ± strongly constricted below, disc usually brown with a thick raised darker margin; ascospores usually >20 µm long; thallus white, usually bullate but occasionally smoother; usually on basic rocks..... ***superba*** f. ***superba***
Epithecium and/or exciple cortex with olivaceous or brown pigments (N+ reddish) 16

16(15) On ± basic rocks 17
On siliceous rocks 18

17(16) Apothecia constricted at the base, with white pruina on the outer rim of the exciple; internally, exciple and/or hypothecium with numerous granular inclusions not dissolving in K or N; epithecium with olivaceous pigment; paraphyses without well-developed pigmented tips ..... ***zeoroides***
Apothecia ± adnate to sessile, not constricted at the base; exciple without white pruina; epithecium with only brown pigments; paraphyses with well-developed, swollen pigmented caps ..... ***islandica***

18(16) Exciple dark, with paler medulla apparent only in thin section; thallus epilithic, containing confluentic acid or methyl 2′-*O*-methylmicrophyllinate 19
Exciple not uniformly dark in section; thallus often endolithic, containing stictic acid, norstictic acid, or no substances (K+ red or yellow or K–) 22

19(18) Thallus containing confluentic acid 20
Thallus containing methyl 2′-*O*-methylmicrophyllinate, confluentic acid absent 21

20(19) Apothecia usually innate, becoming convex, with a thin (*ca* 50 µm), barely raised margin; thallus thicker, cracked-areolate, usually continuous ..... ***cinereoatra***
Apothecia sessile, with a thick (*ca* 0.1 mm) raised, persistent margin; thallus thinner, often composed of ± dispersed areoles ..... ***lowiana***

21(20) Thallus thin, the apothecia sessile from an early stage; methyl 2′-O-methylmicrophyllinate the only major compound..... ***irrigua***
Thallus thicker, the apothecia often remaining partly innate; an unidentified depside as well as methyl 2′-O-methylmicrophyllinate ..... ***contraponenda***

22(18) True exciple thin and barely raised, <80 µm thick; mature apothecia <1.5 mm diam.; thallus thin, usually containing stictic acid (K+ yellow, Pd+ orange); ascospores 12–16 (–18) µm long, hymenium 70–90 µm high ..... ***crustulata***
True exciple thick and raised, >0.1 mm thick; mature apothecia usually >1.5 mm diam.; exciple pale to mid-brown internally; thallus endolithic to moderately thick, containing norstictic acid (K+ red, Pd+ yellow), stictic acid (K+ yellow, Pd+ orange), or no substances; ascospores 16–18 (–21) µm long..... 23

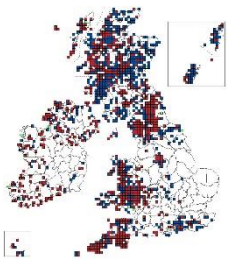
23(22) Thallus and exciple K+ red (norstictic acid) or rarely K+ yellow, Pd+ orange (stictic acid); thallus epilithic, white; apothecia densely pruinose; medulla of exciple very pale; usually coastal, also in the uplands ..... ***platycarpoides***
Thallus and exciple K+ yellow and Pd+ orange or K–, Pd– (stictic acid or no substances present); thallus often endolithic; apothecia not or only slightly pruinose; medulla of exciple pale brown 24

24(23) True exciple persistent, radially striate; internally, exciple with a cracked, carbonaceous cortex; thallus lacking lichen substances ..... ***striata***
True exciple ± smooth (at most flexuose); internally without a carbonaceous cortex 25

25(24) Apothecia <1.5 mm diam (usually <1.1 mm), true exciple *ca* 0.1 mm thick; exciple composed of swollen elongate cells 5–8 (–10) µm diam. ..... ***thomsonii***
Apothecia to 3 mm diam., margin to 0.2 mm thick; exciple composed of cells 4–6 (–8) µm diam. 26

25(24) Exciple releasing a K+ crimson solution ..... ***macrocarpa*** f. ***nigrocruenta***
Exciple not releasing a K+ crimson solution ..... ***macrocarpa*** f. ***macrocarpa***

Porpidia cinereoatra (Ach.) Hertel & Knoph (1984) **LC**



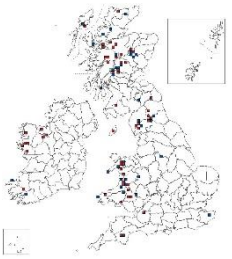
Thallus thick, unequal, cracked- to verrucose-areolate; areoles 0.5–1.5 (–2) mm diam., flat to convex or occasionally hemispherical, obtuse-angular in outline to irregularly rounded, dirty cream-white or ash grey; medulla I–; black prothallus sometimes visible between areoles. Apothecia 0.5–1.5 mm diam., numerous, irregularly scattered, solitary or confluent in groups of 2–6 forming irregular masses, shallowly innate, rounded to obtusely angular, ± flat; margin entire, matt or glossy black, sometimes eventually excluded; disc black, matt, finely grey- or white-pruinose at first, later glabrous and occasionally umbonate with plugs of sterile tissue; epithecium 6–12 µm thick, olivaceous to olive-grey; exciple heavily pigmented, hyphae 3–5 µm diam.; hymenium 90–105 µm tall. Paraphyses richly branched and anastomosing, conglutinate. Ascospores 13–18 × 6–9 µm. Medulla C–, K–, Pd–, K/UV(wet)+ mauve, (confluentic acid, traces of 2′-*O*-methylperlatolic and 2′-*O*- methylmicrophyllinic acids). **BLS 0562**.

On exposed, siliceous rocks; locally common. Upland Britain and Ireland, locally extending into the lowlands.

Most British material of '*P. albocaerulescens*' belongs here. Closely related to *P. contraponenda* and *P. irrigua*, from which it is separated by its thalline chemistry and also from the latter by its innate apothecia. Specimens with a thallus containing confluentic acid, sessile apothecia and an arctic-alpine distribution are included under *P. lowiana*. Similar specimens with non-pruinose, sessile apothecia and a temperate–boreal distribution have been called *P. herteliana* Gowan, but the type specimen of that species has innate apothecia and is referable to *P. cinereoatra*. The relationship of such specimens to *P. contraponenda* is in need of further study. *P. musiva* was previously separated from *P. cinereoatra* by having larger spores and a thicker thallus. However, thallus thickness is very variable in *Porpidia* and the types of these two taxa have spores of identical size, but specimens with a thallus composed of dispersed bullate areoles may be referable to that species.

Commonly host to *Cecidonia xenophana* (q.v.). Other lichenicolous species on this host are *Endococcus brachysporus* (Zopf) M. Brand & Diederich (1999), *E. propinquus* (Körb.) D. Hawksw. (1979), *Muellerella pygmaea* and the plurivorous *Marchandiomyces corallinus* (Roberge) Diederich & D. Hawksw. (1990).

Porpidia contraponenda (Arnold) Knoph & Hertel (1984) **Nb**



Thallus continuous to ± regularly areolate-cracked, cracks narrow to gaping, chalk white or cream-white; areoles polygonal, convex, the surface occasionally shallowly papillate to verrucose, thick, tartareous, soredia sometimes present, blue-grey; medulla I–; prothallus inconspicuous. Apothecia to 1.6 mm diam., single or confluent in groups of 2–5, rounded to irregular through mutual pressure, the margins swollen, innate to slightly raised, shiny, disc shallowly concave at first then flat to subconvex, matt, shiny or granular, often white-pruinose; exciple heavily pigmented, hyphae 3–5 µm diam.; epithecium olivaceous to olive-grey; hymenium 75–100 (–120) µm tall. Paraphyses richly branched and anastomosing, conglutinate, widening to 3.7 µm above, tip with a colourless to brown wall, but most pigment is extracellular. Ascospores (14–) 15.5–18.5 (–20.5) x (8–) 8.5–10.5 (–13) µm. Medulla C–, K–, Pd– (methyl 2′-*O*-methylmicrophyllinate and 2′-*O*-methylmicrophyllinic acids, and an unknown major compound). **BLS 1790**.

On siliceous rocks in upland regions; locally common. N. Wales, Scotland (Highlands), Ireland.

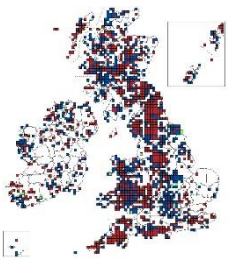
Often difficult to distinguish from *P. cinereoatra*, from which it is separated only by chemistry; TLC is recommended for confirmation. *P. irrigua* has a different chemistry and tends to have a thinner thallus with apothecia sessile from a very early stage; again TLC is recommended to separate the two species. An unnamed sorediate morph assigned to *P. contraponenda* is known from Scotland, Wales and the Netherlands. Reports prior to 2014 may refer to *P. irrigua.*

Cecidonia xenophana (q.v.), a lichenicolous species on the thalli of *Porpidia* spp. that appears to take over the host thallus, occurs frequently on *P. contraponenda* and *P. irrigua*.

Porpidia crustulata (Ach.) Hertel & Knoph (1984) **LC**

Thallus effuse, thin, ± inconspicuous, continuous to areolate or scurfy, white or cream to pale ash-grey, rarely tinged orange, sometimes inconspicuous; medulla I–; prothallus occasionally developed, black or dark brown; soredia absent. Apothecia to 0.3–0.8 (–1.5) mm diam., abundant, small, shiny, black, clustered in small groups or concentric, slightly constricted at the base; disc black, occasionally weakly pruinose, flat to convex; true exciple thin (<0.05 mm wide), black, ± glossy; exciple with a dark cortex and a pale brown medulla, excipular

hyphae 4–8 µm diam.; epithecium olivaceous to pale brown; hymenium 60–80 (–110) µm tall. Ascospores 10–17 × 5–9 µm. Medulla C–, K± yellow, Pd± orange (lichen products not detected, or containing stictic acid, with traces of cryptostictic, constictic and norstictic acids). **BLS 0564**.



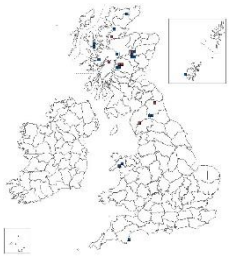
On a wide range of siliceous rocks, stonework and pebbles, occasionally on worked wood and old sacking; common. Often a pioneer species of recently exposed surfaces. Frequent in lowland and urban areas of Britain and Ireland, becoming less common in upland areas.

Separated from *P. macrocarpa*, with which it has been much confused, by the smaller apothecia and less massive true exciple that is < 50 µm wide compared with up to 0.2 mm in *P. macrocarpa*.

Lichenicolous fungi recorded are: *Endococcus brachysporus*, *E. propinquus*, *Muellerella pygmaea* and *Zwackhiomyces martinatianus* (Arnold) Triebel & Grube (1990).

Porpidia flavicunda (Ach.) Gowan (1989) **Nb**

Thallus yellow-orange with a prominent marginal black prothallus separating adjacent colonies. Apothecia 0.2–2 (–4) mm diam., solitary or in clusters of 2 to 6 (–10), immersed at first, then sessile, shallowly concave to flat, later convex, round to irregular through mutual pressure; true exciple persistent, distinctly raised, entire, sinuous, disc black, matt, shiny, roughened, sooty, ± thinly white-pruinose, old apothecia with raised, gyrose plugs of sterile tissue; excipular hyphae 2–4 µm diam.; epithecium brownish with an olivaceous rim; hymenium 85–100 (–150) µm tall, colourless or very pale brown; subhymenium colourless to yellow-brown, hypothecium dark brown or dark red-brown. Ascospores (14–) 15–19 × 8.5–10 µm. Thallus containing confluentic acid; other chemotypes are known from N. America (stictic and/or norstictic acids). **BLS 1791**.

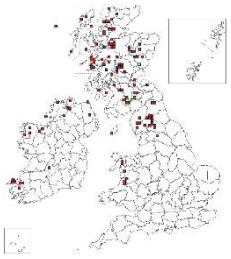


On siliceous rocks. Scottish Highlands, N. Pennines, Lake District, Snowdonia, Ireland (Kerry); probably widespread but rare.

Differs from rusty orange morphs of *P. macrocarpa* in the thicker, well-delimited thallus, narrower excipular hyphae and chemistry. Most British records of *P. flavicunda* and *P. flavocaerulescens* are referable to *P. flavocruenta*, which differs in having an exciple with broader hyphae and exuding a crimson solution with K, and a thallus lacking lichen substances.

Porpidia flavocruenta Fryday & Buschbom (2005) **Nb**

Thallus epilithic, thin to moderately thick (0.1–0.2 mm), yellow-orange, occasionally pale yellow-grey, cracked-areolate, the surface uneven with low warts from which the apothecia arise, black prothallus visible at the edges where adjoining other lichens. Apothecia black, large, (0.8–) 1.2–1.5 (–2.0) mm diam., sessile with a constricted base, the margin becoming flexuose when mature; disc usually flat, sometimes becoming convex in mature apothecia, occasionally umbonate, often grey- or orange-pruinose; margin raised and persistent, *ca* 0.1 mm thick; exciple cupular, composed of radiating, cellular hyphae, inner cells orange-brown (K± crimson, N-; ± unknown pigment), 6.0–8.5 µm diam., outer rim 17–25 µm thick, blue-black (N+ red), composed of globose cells *ca* 12.5 µm diam.; hymenium colourless, I+ blue, 135–150 µm tall; epithecium pale olivaceous (K–, N+ red); subhymenium colourless, *ca* 50 µm thick; hypothecium *ca* 100 µm thick, dark brown (K–, N–); paraphyses numerous, branched and anastomosing, very narrow (1–1.5 µm diam.) with scarcely swollen apices. Asci cylindrical, 70–80 × 15–17 µm. Ascospores ellipsoidal, 15–19 × 8–10 µm. Conidiomata frequent; 0.1–0.15 µm diam., black, innate to sessile, with an orange pseudothalline margin, surface gnarled when old; conidia bacilliform, (10–) 12–14 × *ca* 0.8 µm. Chemistry: C–, K–, KC–, Pd–. No substances detected by TLC. **BLS 2398**.



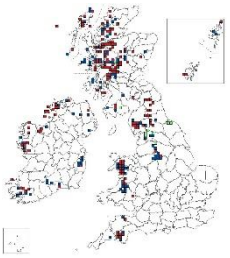
On siliceous rocks, often in shaded overhangs or other damp habitats; occasional. Throughout upland areas of Britain and Ireland.

The thallus colour is more yellow-orange than the rusty-red produced by iron accumulation. Though difficult to separate on gross morphology alone, *P. flavocruenta* differs from *P. flavicunda* in having a thallus lacking

lichen substances by TLC and possessing an exciple composed of thick hyphae, 6–8 µm diam. (2–4 µm in *P. flavicunda*) that usually contains an unidentified K+ crimson pigment.

Lichenicolous fungi: there is a single record of *Endococcus propinquus.*

Porpidia hydrophila (Fr.) Hertel & A.J. Schwab (1984) **LC**



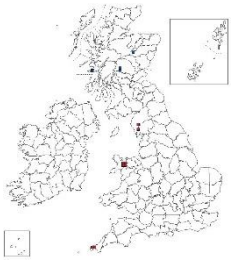
Thallus continuous to irregularly finely areolate-cracked, rarely gaping between areoles, surface smooth, ± shiny, occasionally minutely wrinkled, creamy white to pale olivaceous white, pale greyish orange or brownish; medulla I–; prothallus inconspicuous and pale, or dark between other lichens in mosaics. Apothecia (0.2–) 0.5–1.2 (–2.5) mm diam., round to irregular, scattered, immersed at first, soon becoming sessile; true exciple thick, prominent, crenulate, black, matt or shiny; disc flat to convex at maturity, shallowly concave to flat when young, black, matt or granular-roughened, occasionally white-pruinose, occasionally centrally papillate or with small irregular plugs of sterile tissue; exciple with a dark rim and ± colourless interior, excipular hyphae 3–5 µm diam.; epithecium 12–25 µm thick, aeruginose, N+ red; hymenium (80–) 100–120 (–140) µm tall, blue-green in the upper part. Ascospores (13.5–) 18–23 × (5.5–) 7–8 (–9.5) µm. Conidiomata generally extremely abundant; conidia (8–) 9–12 µm long. Medulla C–, K–, Pd– (lichen products not detected by TLC). **BLS 0567**.

On inundated siliceous rocks by upland streams and lakes, occasionally in water runnels on boulders; locally abundant. N. & W. Britain and Ireland.

Distinguished from other members of the genus, apart from *P.* aff. *melinodes*, by the striking blue-green epithecium.

Sometimes host to *Cecidonia xenophana* (q.v.).

Porpidia irrigua Orange (2014) **NE**



Thallus white or pale grey, occasionally light blue-grey, areoles arising on a blue-black to black prothallus when visible, soon coalescing and cracking; thallus ± smooth or gently convex between cracks, 100–400 µm thick. Apothecia becoming sessile as soon as the young disc begins to expand, to 2 mm diam., the margin smooth, rarely faintly striate, 60–220 mm thick, eventually excluded in old apothecia; disc flat to gently or strongly convex when mature; pruina sometimes present on the inner edge of young apothecial margins; true exciple densely pigmented at the surface, brown to dull green-brown or dark dull greenish blue, within paler, brown throughout, hyphae 3.5–8 (–12) µm diam.; hypothecium brown to red-brown; hymenium 100–140 µm high; epithecium dull green-brown or brown, K–; paraphyses 1.5–2 µm diam., tips 2.9–3.3 µm diam., walls colourless or dilute brown, surrounded by pigment (epithecial pigment mostly extracellular). Asci clavate. Ascospores ellipsoidal, aseptate, colourless, with a perispore, (15–) 16.5–20.5 (–21.5) x (7.5–) 8–10.5 (–12.5) µm. Conidiomata frequent; to 560 µm diam. in surface view, multilocular, with several ostioles, the apex uneven, black. Conidia aseptate, colourless, straight, 8–11 × *ca* 0.8 µm. Thallus K–, PD–, C– (methyl 2′-*O*-methylmicrophyllinate (major), 2′-*O*-methylmicrophyllinic acid (trace) and traces of 2 unidentified substances); microscopic preparations in K not exuding minute droplets. **BLS 2637**.

On damp siliceous rock, frequently where seasonally flushed, on bedrock and boulders, occasionally on fine scree. N. and S. Wales, S.W. and N.W. England, W. and central Scotland.

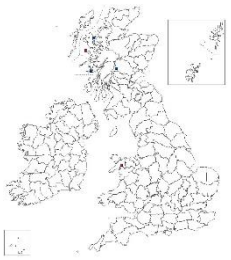
Until recently included within *P. contraponenda*, which has an unknown depside as a major compound in addition to methyl 2′-*O*-methylmicrophyllinate, and a usually thicker thallus with apothecia that are initially semi-immersed rather than becoming sessile at an early stage. TLC (or DNA) is recommended for reliable identification.

P. irrigua has been found with raised rugose galls caused by *Cecidonia xenophana* (q.v.)

Porpidia islandica Fryday, Knoph & Hertel (2005) **Nb**

Thallus epilithic, thin (*ca* 0.1 mm thick), cracked-rimose to slightly areolate; areoles 0.2–0.3 mm across, flat, pale grey with black prothallus sometimes visible at edges of areoles and at thallus margin; cortical cells blue-grey, *ca* 3 µm diam.; medulla I–. Apothecia black, not pruinose, (0.7–) 0.8–1.0 (–1.2) mm diam., sessile, somewhat constricted below and with a slightly concave disc; true exciple smooth, persistent, slightly raised, *ca* 0.1 mm thick; exciple heavily and uniformly pigmented, composed of radiating hyphae 2–3 µm diam. near the

hypothecium, becoming broader (to 5–7 µm) near the outer edge; hymenium colourless, I+ blue, 110–140 µm tall; epithecium pale brown, *ca* 30 µm tall; subhymenium hyaline, 25–30 µm tall; hypothecium dark brown, 180–200 µm tall (including exciple); paraphyses numerous, very narrow with distinctly swollen, brown-pigmented caps (to 3.5 µm), sparingly branched and anastomosing except in the upper 20 µm. Asci cylindrical, 75–80 × 17–20 µm. Ascospores ellipsoidal, 16.5–18.5 × 8–9.5 µm. Conidiomata frequent; 50–200 µm diam., black, innate with a white pseudothalline margin when young, becoming sessile with a gnarled surface when old. Conidia bacilliform, 5–6 × *ca* 0.8 µm. Chemistry*:* C–, K–, KC–, Pd–. No substances detected by TLC. **BLS 2405**.



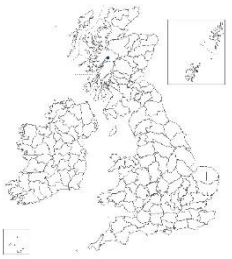
On somewhat basic rocks (basalt, schist); currently known from only four localities in the Scottish Highlands and a single site in Snowdonia.

Differs from most other species in the genus in having paraphyses with distinctly swollen pigmented caps and occurring on slightly basic rocks.

Lichenicolous fungi: there is a single record of *Endococcus propinquus.*

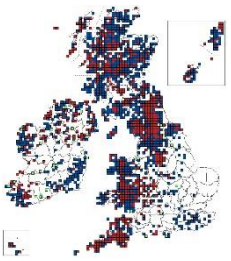
Porpidia lowiana Gowan (1989) **CR D**

Close to *P. cinereoatra* but with a much thinner thallus, sessile, flat, pruinose apothecia that also have a persistent, raised, thick (*ca.* 100 µm) true exciple. In *P. cinereoatra* the apothecia are typically innate and slightly convex with a scarcely raised, thin (*ca* 50 µm) true exciple that often becomes excluded in mature apothecia. Thallus with confluentic acid. **BLS 2403**.



A single record from schistose rocks near a snow-bed, Ben Nevis Range, Scottish Highlands.

Porpidia macrocarpa (DC.) Hertel & A.J. Schwab (1984) **LC**



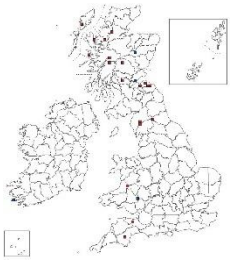
Thallus variable, but usually immersed to thin and continuous to rimose, rarely thicker and becoming areolate, surface roughened-subarachnoid, pale grey to greenish grey, frequently patchily or continuously 'oxidized' orange to rust red; medulla I–; prothallus indistinct at margins of immersed thalli, but wavy, black and ± distinct at margins of superficial thalli. Apothecia to 3 mm diam., ± distinctly sessile, abundant, scattered or crowded, constricted at the base; true exciple thick and tumid (0.15–0.2 mm thick), persistent, black, shiny, raised, entire to flexuose; hyphae 3–9 mm diam.; disc subconcave to flat or convex, black or brown-black, matt or shiny, occasionally grey-pruinose, often ± gyrose or with larger apothecia appearing to divide by formation of secondary margins within the disc; epithecium pale brown to olive-brown; hymenium (70–) 80–100 (–120) µm tall; hypothecium and inner exciple sometimes with K+ reddish tinge (f. *nigrocruenta* – see below). Ascospores (13–) 16–20 (–26) × (5–) 6–11.5 µm. Medulla K± yellowish, Pd± orange (± stictic and cryptostictic acids). **BLS 0568**.

On siliceous rocks and large boulders, less often on pebbles and loose stones in moorland and upland areas, rarely on wood and bark; common. Frequent in upland areas of Britain and Ireland (many old lowland records from the S.E. are probably errors).

Gowan (1989) and Fryday (2005) have separated some distinctive entities as separate species (e.g. *P. flavocruenta, P. striata, P. thomsonii*) but *P. macrocarpa* remains an extremely variable species and it is probable that more species will be separated from it in the future. *P. macrocarpa* s. str. is a distinctive species with an inconspicuous thallus and large apothecia with a thick, tumid margin. *P. crustulata* is readily separated by the narrower, non-tumid proper margin (<50 µm thick), especially in small apothecia, and the maximum diameter of the apothecia (1.5 mm diam.).

Host to the lichenicolous fungus *Sclerococcum australe* (Triebel & Hertel) Ertz & Diederich (2018), and also to *Cecidonia xenophana* (q.v.), *Endococcus propinquus*, *E. rugulosus* and *Muellerella pygmaea*.

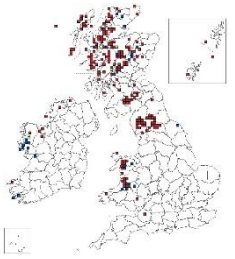
Porpidia macrocarpa f. **nigrocruenta** (Anzi) Fryday (2005) [**BLS 2399**; map right] differs from f. *macrocarpa* only in having an exciple containing a pigment that yields a K+ crimson solution. Occasional in the Scottish Highlands, S.E. Scotland and W. Britain.



The taxonomic status of this entity is uncertain, and it is often recognized as a distinct species, *P. nigrocruenta* (Anzi) Diederich & Sérus. (1988).

Porpidia melinodes (Körb.) Gowan & Ahti (1993) **Nb**

Thallus moderately thick, distinctly areolate-cracked, orange or pale orange-grey or olivaceous; areoles angular, cracks deep, often tinged rusty orange, surface smooth, matt or slightly shiny; medulla I–; prothallus black, in a distinct ± byssoid marginal zone; soralia scattered, solitary or grouped 2–4 together at margins or in the centre of areoles, 0.2–0.6 (–1.0) mm diam., ± delimited by a whitish raised rim, whitish but often speckled dark grey; soredia coarsely granular; abundant on sterile specimens, fewer in fruiting material. Occasionally fertile; apothecia similar to those of *P. flavicunda*. Medulla C–, K± yellow, Pd± orange (confluentic, 2′- *O*-methylperlatolic and 2′-*O*-methylmicrophyllinic acids, sometimes with additional stictic, norstictic and cryptostictic acids). **BLS 0565**.



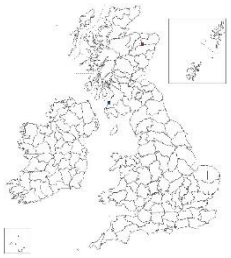
On metal-rich siliceous rocks in upland areas. Throughout W. and N. Britain and Ireland.

Similar fertile non-sorediate material is referred to *P. flavicunda*. Morphs of *P. tuberculosa* with a partly rust-coloured thallus differ in having an I+ violet medulla. A single collection from western Scotland (aff. *melinodes*), has an orange sorediate thallus lacking lichen substances and abundant apothecia with an aeruginose epithecium.

Lichenicolous fungi recorded are *Endococcus brachysporus*, *E. rugulosus*, *Muellerella pygmaea* and *Sclerococcum amygdalariae*.

Porpidia nadvornikiana (Vězda) Hertel (1984) **NT**

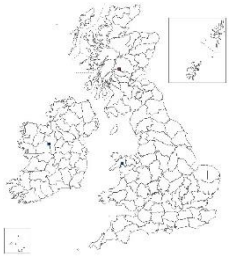
The only species of the genus that produces isidia. The thallus is covered with numerous short grey papillate isidia. All known collections are fertile; the exciple with a moderately dark pigmented medulla and a darker cortex, composed of rectangular cells 4–5 µm diam., becoming enlarged (to *ca* 10 µm) and ± globose towards the cortex, although the cortical cells are much smaller. K+ yellow, Pd+ orange (stictic acid). **BLS 2402**.



On upland serpentine outcrops; rare. Scotland (Ayrshire, N. Aberdeen).

Porpidia ochrolemma (Vain.) Brodo & R. Sant. (1995) **Nb**

Thallus smooth, rimose, creamy yellow-orange, reminiscent of *Ionaspis lacustris* but with numerous grey-white soralia. C–, K+ yellow, KC–, Pd+ orange (stictic acid). **BLS 0076**.



On semi-inundated rocks. Known in our region only from Snowdonia, Mid Perthshire and Galway.

Differs from *P. melinodes* in its smoother, more cream-yellow, rimose thallus and in containing only stictic acid (*P. melinodes* always contains confluentic acid).

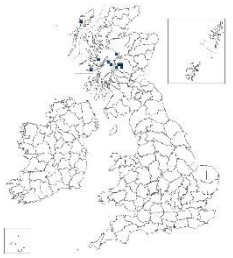
Porpidia pachythallina Fryday (2005) **Nb**

Thallus effuse, of ± dispersed white convex areoles 0.4–0.7 mm diam. on a black prothallus; medulla I–. Soralia tuberculate, arising from the areoles, blue-grey, 0.2–0.4 mm diam., becoming confluent. Apothecia black, not pruinose, 0.5–1.2 mm diam., often confluent in clusters of 2–5; true exciple thin and persistent, not or only slightly raised, smooth, flexuose in confluent apothecia; exciple of hyphae 2.5–4.0 µm diam., strongly pigmented, brown with swollen, dark blue-black (N+ red) cells at the surface; hymenium colourless, I+ blue, 110–120 µm tall; epithecium olivaceous: subhymenium pale brown to colourless, *ca* 25 µm tall; paraphyses slender, *ca* 1.5 µm diam., only slightly expanded at the apex (to *ca* 2.5 µm), numerous, septate, branched and anastomosing; hypothecium dark brown, 180–200 µm tall (including exciple). Asci cylindrical, 70–75 × 15–22 µm. Ascospores ellipsoidal, 17–21 × 6–7 µm. Conidiomata not seen. C–, K–, KC–, Pd–; confluentic acid chemosyndrome by

TLC. **BLS 2400**.

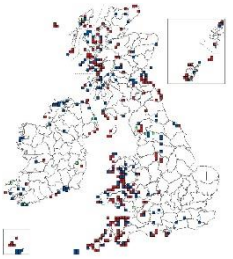
On low flat siliceous rocks at high altitudes; not uncommon. Scottish Highlands.

The dark exciple and thalline chemistry suggest that this species belongs in the *P. cinereoatra* group. It is most likely to be confused with *P. tuberculosa* which is also sorediate and contains confluentic acid. However, *P. pachythallina* has a thicker, whitish thallus with a non-amyloid (I–) medulla. The apothecia of *P. pachythallina* also differ from those of *P. tuberculosa* in being non-pruinose and having a well-developed exciple.



Porpidia platycarpoides (Bagl.) Hertel (1987) **LC**

Thallus usually granular-areolate, whitish or ashy grey; areoles ± convex, surface irregularly lumpy, minutely papillate or verrucose, cracks between areoles narrow to gaping; medulla I–; prothallus inconspicuous or thinly developed at the thallus edge. Apothecia large, 0.5–3 mm diam., scattered, sessile to slightly immersed; disc black, matt, often thinly white-pruinose, occasionally ± umbonate at maturity, flat to convex; true exciple prominent, raised, swollen, often shiny; exciple hyphae 4–8 µm diam.; epithecium olive-brown; hymenium 120–185 µm tall, colourless. Ascospores 15–23 (–26) × 7–10 (–12) µm. Medulla C–, K+ yellow to red (acicular crystals), Pd+ yellow (norstictic, connorstictic acids and 2 unidentified compounds). **BLS 0571**.



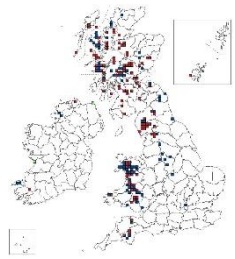
On siliceous rocks and compacted soil, rarely on worked timber; coastal, but sometimes inland, especially on basalt; occasional. In W. Britain coastal and inland, in E. Britain mostly coastal.

Close to *P. macrocarpa* but differs in the white epilithic thallus, K+ red (acicular crystals) reaction and, more frequently, pruinose apothecia. The less regularly areolate thallus, taller hymenium and larger ascospores separate this species from *Lecidea lactea* and *L. swartzioidea*.

Sometimes parasitized by *Muellerella pygmaea*.

Porpidia rugosa (Taylor) Coppins & Fryday (2005) **LC**

Thallus thick, tartareous, whitish to glaucous grey, matt, continuous to areolate-cracked, hummocky, verrucose; medulla I–. Soralia round or usually irregular, scattered or forming in lines along cracks in the thallus; soredia coarsely granular to minutely digitiform, whitish or greyish. Apothecia 0.3–1.2 (–2) mm diam., rare, scattered, solitary or in clusters of 2–8, immersed at first, soon becoming sessile and ± constricted at the base, round to irregular; true exciple thick, persistent, black, prominent, entire to ± crenulate; disc black, often grey-pruinose, matt, papillate to ± gyrose and with ± prominent plugs of sterile tissue; exciple with a dark rim and ± colourless medulla,, the hyphae 2–4 µm diam.; epithecium olive to brownish; hymenium 150–185 µm tall, colourless. Ascospores 15–23 (–25) × (5–) 7–10 (–12) µm. Medulla and soralia C–, K–, Pd– (2′- *O*-methylsuperphyllinic and glaucophaeic acids). Specimens containing confluentic acid and methyl 2′-*O*- methylmicrophyllinate are known from the Scottish Highlands. **BLS 0566**.



On damp siliceous rocks, rarely on compacted soil amongst rocks in damp situations; sheltered sea cliffs to montane sites, lake margins and stones on the ground at heavy metal sites. Throughout W. and N. Britain and Ireland.

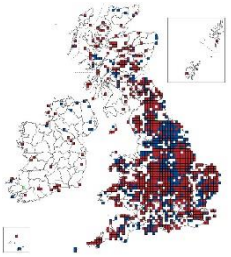
Distinguished from *P. tuberculosa* by the thicker, more verrucose thallus, I– medulla, more irregular soralia which never have a blue-grey tinge and chemistry (TLC).

Host to *Arthonia amylospora* (q.v.) as well as *Endococcus brachysporus*, *E. propinquus*, *Muellerella pygmaea* and *Sclerococcum attendendum*.

Porpidia soredizodes (Lamy ex Nyl.) J.R. Laundon (1989) **LC**

Thallus small to irregularly spreading, dirty creamish grey to grey, subcontinuous, rimose, subareolate to somewhat scurfy and indistinct; prothallus black, arachnoid, often visible between scattered areoles; medulla I–; soralia 0.1–0.5 mm diam., scattered, round to irregular, punctiform or erose-excavate; soredia white, greenish white to somewhat greyish, farinose to granular. Apothecia rare, scattered, solitary, immersed to sessile, round to irregular; true exciple thick, black, with hyphae 4–7 µm diam.; disc black or dark brown, not pruinose, flat,

matt or shiny; epithecium brown; hymenium 100–160 µm tall. Ascospores 15–19 (–22) × 6–9 µm. Soralia K+ yellow, Pd+ orange (stictic acid). **BLS 1690**.

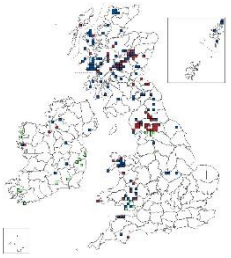


The sorediate counterpart of *P. crustulata*. Primarily a lowland species of siliceous rocks, stonework, pebbles and slate, rarely on worked timber; probably common. Throughout Britain and Ireland.

Differs from *P. tuberculosa* in the generally smaller, thinner and darker thallus that contains stictic acid (K+ yellow, Pd+ orange) and has an I– medulla.

Reported lichenicolous fungi are *Endococcus propinquus*, *Muellerella lichenicola*, *M. pygmaea* and a single find of *Arthonia almquistii* (q.v.).

Porpidia speirea (Ach.) Kremp. (1861) **LC**



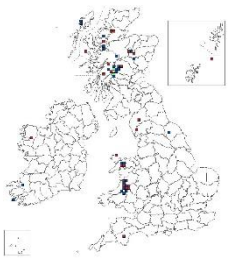
Thallus areolate-cracked, surface minutely granular-roughened, chalky-white, ± verrucose, white to creamish, to pale greenish grey; medulla I+ violet; prothallus indistinct or well-developed, black. Apothecia (0.2–) 0.3–1.2 (–2) mm diam., common, often clustered centrally, usually remaining ± immersed, black, often completely surrounded by a break in the thallus surface or by a ± distinct thalline collar; disc concave to convex, often pruinose when young, mature discs sometimes with small central plugs of sterile tissue; excipular hyphae 3–5 µm diam.; epithecium olivaceous; hymenium 75–100 µm tall. Ascospores 12–19 × 6–7 µm. Medulla C–, K–, Pd–, I+ violet, (confluentic with 2′-*O*-methylmicrophyllinic and 2′-*O*-methylperlatolic acids). **BLS 0774**.

On hard limestones and other calcareous rocks (especially schists); local. Upland Britain and Ireland. Also reported from acidic rocks in continental Europe.

Can be confused with *P. cinereoatra* which grows on more acidic rocks and in the field with *Rhizocarpon umbilicatum*. *P. superba*, which occurs on weakly calcareous schists, has an I– medulla and sessile apothecia with a brown disk. *P. trullisata* (type of the genus), known only from C. Europe, is similar, apparently differing only in having larger, non-pruinose apothecia. *Lecidea subspeirea* differs in having a thallus containing gyrophoric acid (C+ red) and a non-amyloid medulla (I–) and a different ascus stucture.

The only reported lichenicolous fungus is *Endococcus propinquus*.

Porpidia striata Fryday (2005) **Nb**

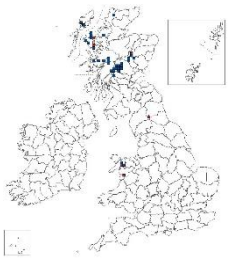


Thallus endolithic to scarcely apparent; if visible then composed of thin, flat, pale grey areoles, occasionally better developed with whitish areoles when in less exposed situations. Apothecia black, not pruinose, (0.3–) 0.5–1.0 (–1.2) mm diam., pore-like when young, expanding when mature; true margin persistent, thick (*ca* 0.1 mm) and raised, radially striate especially in young apothecia, becoming smoother when mature; exciple of radiating hyphae 4.0–5.0 (–8.0) µm diam., the outer 10–15 µm carbonaceous, cracked; inner cells pale brown to almost colourless in thin section; hymenium colourless, 80–100 µm tall; epithecium brown-olivaceous; subhymenium colourless, 20–25 µm tall; hypothecium dark brown, 180–200 µm tall (including exciple); paraphyses numerous, very narrow with swollen pigmented caps (2.5–3.0 µm diam.), branched and anastomosing, separating in K. Asci cylindrical, 60–70 × 20–25 µm. Ascospores ellipsoidal, 16–19 × 8–9 µm. Conidiomata frequent when the thallus is epilithic; 50–200 µm diam., black with a raised white pseudothalline margin when young, becoming sessile with a gnarled surface when old. Conidia bacilliform, 6–8 × *ca* 0.8 µm. No substances detected by TLC. **BLS 0586**.

On siliceous rocks and pebbles in exposed upland sites; frequent. England (very rare), Scotland, Wales, W. Ireland.

Distinguished from other species by the thick, raised, radially striate true exciple which enables field identification. This feature is particularly visible in young apothecia, which become smoother when mature. Apothecia of *P. contraponenda* and *P. thomsonii* occasionally have a weakly striate margin but the exciple cortex is never carbonaceous in these species.

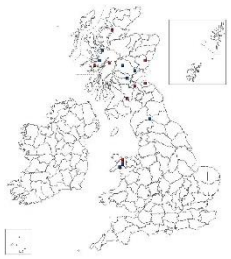
Porpidia superba (Körb.) Hertel & Knoph (1984) **Nb**



Thallus typically thick, verrucose to subverrucose-uneven, white, scabrid, with continuous or dispersed bullate areoles, occasionally (especially in damp habitats) thinner and cracked-areolate; medulla I–; prothallus black, between areoles or inconspicuous. Apothecia abundant, scattered among areoles, immersed at the margins of areoles at first, later sessile and ± constricted at the base, 0.5–2 mm diam., disc brown to dark brown, rarely thinly white-pruinose, flat to convex; true exciple thick, black; epithecium 20 µm thick, yellowish to orange-brown; exciple dark orange-brown; hymenium 110–140 µm tall; paraphyses with little apical swelling or pigmentation. Ascospores 17–25 (–33) × 8–12 (–14) µm. Medulla C–, K+ yellow, Pd+ orange (stictic acid usually present but often in small amounts or patchily distributed). **BLS 1705 [**upper map].

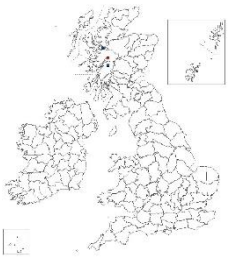
Montane schistose, ± calcareous rocks; local. England (Alston, N. Pennines), Wales (Snowdonia), Scotland (Highlands).

Distinguished by the white scabrid thallus, often dispersed, ± bullate areoles, brown apothecial discs contrasting with the black margin, orange-brown epithecium and chemistry.



Porpidia superba f. **sorediata** Fryday (2005) [**BLS 0930**; map right] has a thinner, continuous, cream-white thallus with irregular soredia concolorous or somewhat darker than the thallus arising from cracks in the thallus. Apothecia often present. On vertical flushed, acidic or weakly basic rock; less frequent than the typical form. N. Wales (Snowdonia), N. Pennines, Scotland.

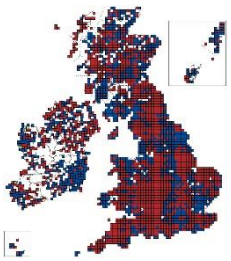
Porpidia thomsonii Gowan (1989) **NE**



Close to *P. macrocarpa* but the excipular hyphae of mature apothecia are, at 5–8.5 µm diam., broader than is usual in that species, and the medulla of the exciple is distinctly paler and has a brown coloration that contrasts sharply with the blue-black cortex. Medulla K+ yellow and Pd+ orange or K– and Pd– (± stictic acid). **BLS 2404**.

On siliceous rock, including small stones, in exposed high altitude situations; probably overlooked. Scotland, Western Highlands.

Porpidia tuberculosa (Sm.) Hertel & Knoph (1984) **LC**



Thallus irregularly areolate-cracked, surface smooth to roughened, occasionally minutely and irregularly papillate, white- to blue-grey or creamy grey, sometimes rusty orange or red in parts; medulla I+ violet; prothallus delimiting colonies black or brown, narrow, irregular or lacking; soralia 0.1–1 mm diam., round to irregular, scattered to crowded, 1–4 or more per areole, shallowly erose or abraded, often with slightly raised rim; soredia farinose to granular, white, pale grey or speckled blue-grey to ± blackened, I+ violet. Apothecia occasional, (0.2–) 0.5–1.5 mm diam., round to irregular through mutual pressure, scattered to 2–4 confluent, innate at first, later sessile and ± constricted at the base; true exciple ± prominent, persistent, slightly swollen, black, often shiny; hyphae 2.5–4 µm diam.; disc flat to subconvex, black, matt, sometimes whitish to grey-pruinose, occasionally with small plugs of sterile tissue; epithecium 15–25 µm thick, olivaceous; hymenium (70–) 90–120 (–135) µm, tall. Ascospores (10.5–) 12–19 (–22) × 7–9 µm. Medulla and soralia C–, K–, KC–, I+ violet, Pd–, K/UV(wet)+ mauve, (confluentic and traces of 2′-*O*-methylmicrophyllinic and 2′-*O*-methylperlatolic acids). **BLS 0572**.

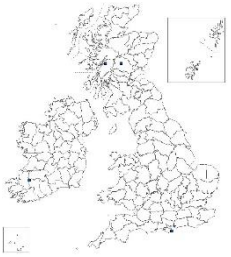
On siliceous rocks, walls, pebbles, rarely on worked timber; common. Throughout Britain and Ireland.

Very variable in appearance (e.g. in colour, thallus thickness) reflecting its ability to colonize a wide range of substrata under widely differing environmental conditions. A few collections have a very weak or negative reaction of the medulla to iodine, but are otherwise indistinguishable. Collections from the Scottish Highlands with a thick thallus and large pruinose apothecia possibly represent another, undescribed species. Other common *Porpidia* species with sorediate thalli are *P. rugosa* and *P. soredizodes*. *Lecanora pannonica* differs in having a thallus containing atranorin (K+ yellow) and a non-amyloid medulla (I–).

Host to the lichenicolous fungi *Endococcus brachysporus*, *E. propinquus*, *Muellerella pygmaea* and

Sclerococcum purpurascens. *Cecidonia xenophana* (q.v.) is occasionally on this host. An unidentified *Arthonia* with 3-septate, macrocephalic ascospores, 20–24 × 7–8 µm, has been collected on Sanday in the Inner Hebrides.

Porpidia zeoroides (Anzi) Knoph & Hertel (1984) **Nb**



Like *P. superba* but differs in having black apothecia with a white pruinose outer rim to the true exciple and an olivaceous pigment in the epithecium instead of orange-brown. The exciple and/or hypothecium have patches of fine granular inclusions that do not dissolve in K or N, which make the structure difficult to discern. C–, K+ yellow, KC–, Pd+ orange (stictic acid). **BLS 0276**.

Known from two collections on basic mica-schist in the central Scottish Highlands (Ben Lawers) and Argyll.

PORPIDINIA Timdal (2010)

This is a monotypic genus, so the description below constitutes the generic description.

Literature:
Hitch *et al.* (2009), Kistenich *et al*. (2018), Lücking *et al.* (2017b), Timdal (2010).

Porpidinia tumidula (Sm.) Timdal (2010) **Ex**

Toninia tumidula (Sm.) Zahlbr. (1927)

Squamules to 8 mm diam., scattered to contiguous, weakly to moderately convex, rounded to slightly lobate; upper surface pale greenish grey to medium brown, usually densely white-pruinose, dull, smooth or with a few shallow fissures, lacking pseudocyphellae; edges concolorous with the upper surface or white; underside white to medium brown; upper cortex 50–100 µm thick, sometimes including a thin epinecral layer, filled with crystals of calcium oxalate; lower cortex poorly developed or absent; photobiont layer continuous; medulla filled with crystals of calcium oxalate. Apothecia to 1.5 mm diam., arising at the edges of squamules, flat when young, later often becoming convex, not pruinose; true exciple distinct when young but becoming excluded, confluent with the hypothecium, dark brown throughout, K–, N–; epithecium brown, lacking crystals, K–, N–; hymenium 70–80 µm tall, colourless to pale brown, not amyloid, hypothecium dark brown. Paraphyses weakly conglutinated, sparingly branched, with a swollen apical cell with a pigmented cap. Asci clavate, with a well-developed amyloid apical dome containing an indistinct deeper amyloid apical cushion which is most pronounced in the upper part. Ascospores 10–16 × 3–5 µm, ellipsoidal, aseptate or 1-septate, without a perispore. Thallus K± yellow (atranorin). **BLS 1429**.

On calcareous rock, mainly in fissures of limestone; considered as extinct in Britain and Ireland. Reported from S.W. England (Devon and Somerset).

Placed provisionally in *Toninia* by Hitch *et al*. (2009), but given a separate genus by Timdal (2010), an action confirmed by molecular data from Kistenich *et al*. (2018). The placement in the Porpidiaceae by Timdal was amended to the Lecideaceae by Lücking *et al.* (2017b) but its correct systematic position appears to lie outside the Lecideales (Kistenich *et al* 2018).

The species could be confused with *Thalloidima sedifolia* (Lecanorales: Ramalinaceae), which has septate ascospores 14–25 × 2.5–5 µm in size and paraphyses which are not conglutinate.

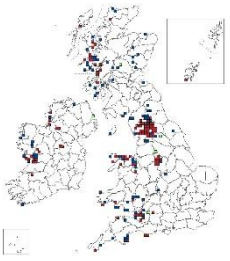
ROMJULARIA Timdal (2007)

As this is a monotypic genus the description below (*R. lurida*) constitutes the generic description.

The genus *Romjularia* was erected for the single species *R. lurida*, which had been switched back and forward between several genera, *viz. Lecidea, Mycobilimbia* and *Psora*. The species has (hopefully) finally come to taxonomic rest. Further molecular data are needed, but it appears to have a common ancestor with "*Lecidea*" *berengeriana* according to Fryday *et al*. (2014).

Literature:
Aptroot & Timdal (2009), Fryday *et al*. (2014), Timdal (2017).

Romjularia lurida (Ach.) Timdal (2007) **LC**



Squamules to 5 mm, rounded at the apices, sometimes minutely lobed, ± concave, usually strongly imbricate, pale brown to dark brown, dull greenish when wet, matt, not pruinose; margin concolorous with the upper surface; the lower surface usually dark. Apothecia to 1 (–1.5) mm diam., mostly single, marginal or on the surface, dark brown, at first flat, becoming weakly convex with an excluded exciple; epithecium brown, K–, N–, anthraquinones absent; hymenium I+ blue. Pycnidia immersed when young, soon sessile and marginal or on the undersurface near squamule margins; conidia 4–6 × *ca* 2 µm. Ascospores (8–) 9–11 (–15) × 6–8 µm, ellipsoidal. Lichen products not detected by TLC. **BLS 1202**.

On calcareous soils in crevices associated with limestone, sometimes directly on rock; rather local. Throughout most of Britain and Ireland, though absent from East Anglia and S.E. England.

Romjularia differs from *Psora* species [Lecanorales: Psoraceae] in the upper cortex containing no algal remains, an absence of calcium oxalate in the hypothecium, I+ blue hymenium, absence of anthraquinones in the hymenium, dark brown hypothecium, pycnidium type and the shape of the conidia. Specimens in shaded habitats are usually very pale in colour and in exposed sites become blackish brown. Resembles *Placidium lachneum* [Verrucariales: Verrucariaceae] which has perithecia, the tops of which are seen as small dark punctiform dots on the surface of the squamules. *Solenopsora holophaea* [Lecanorales: Catillariaceae] is similar but has 1-septate spores, usually flatter, darker, more loosely organised squamules and more elevated apothecia, which have a well-developed thalline margin; it occurs on non-calcareous substrates.

LOPADIACEAE Hafellner (1984)

The family is monotypic, so the description of *Lopadium* below constitutes that of the family. The muriform ascospores within 1-spored asci are unusual within the lichens. Ekman *et al*. (2008) found *L. disciforme* to form an isolated clade with a group of disparate species including *Bryobilimbia sanguineoatra* outside the main Lecanorales, whereas Miądlikowska *et al*. (2016) found *L. disciforme* to occupy an isolated position close to the Caliciales. Despite this, Lücking *et al*. (2017a) included it in the Lecideales citing Ekman *et al*. (2008). It seems clear that Lopadiaceae does not belong in Lecideales but its true systematic position is unclear.

LOPADIUM Körb. (1855)

Thallus crustose, granular to minutely squamulose, effuse. Cortex absent, but a cartilaginous layer is present. **Photobiont** chlorococcoid; cells large, globose or broadly ellipsoidal. **Ascomata** apothecia, sessile, the base distinctly constricted, round, with a protruding margin; disc concave to flat. **Thalline margin** absent. **True exciple** pseudoparenchymatous, dark red-brown. **Hamathecium** of paraphyses, unbranched or forked, straight, the terminal cells with swollen apices and dark brown pigmented caps. **Hymenium** I+ blue. **Hypothecium** brown-black, K–. **Asci** 1-spored, ellipsoidal to clavate-cylindrical, thick-walled, the outer layer K/I+ blue, without a distinct apical dome, with a thin K/I+ dark blue zone between the ascus wall and ascus contents in the ascus apex. **Ascospores** strongly muriform, cylindric-ellipsoidal, colourless or pale yellow-brown. **Conidiomata** not seen. **Chemistry**: no lichen products detected by TLC. **Ecology**: on rotting vegetation, bryophytes or bark.

Characterized by the asci which lack a distinct apical dome and the thick, ± unbranched paraphyses with dark brown conical caps. *Schadonia* [Pilocarpaceae] has thin, branched paraphyses and the asci have a distinct K/I+ blue tholus. *Brigantiaea* [Teloschistales: Brigantiaeaceae] has parietin in the apothecia, asci with a distinct K/I+ blue tholus, and paraphyses that are not enlarged at their apices.

Literature:
Ekman *et al.* (2008), Gilbert & Purvis (2009b), Lücking et al. (2017a), Miądlikowska et al. (2006).

1 On mossy, acid-barked trees ..... ***disciforme***
On mosses and plant remains on the ground; montane 2

2(1) Thallus surface finely coralloid with ± erect, branched isidia ..... ***coralloideum***
Thallus surface a granular-warted crust, not coralloid ..... ***pezizoideum***

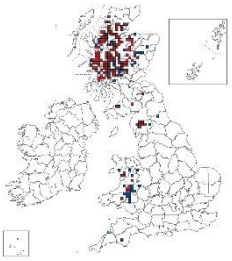
Lopadium coralloideum (Nyl.) Lynge (1940) **VU**

Thallus verrucose and coralloid-isidiate, isidia 0.4–1 × 0.07–2 mm, cylindrical, sometimes sparingly branched, brownish-olive to grey-olive, often darker brown at the apices. Apothecia (not seen in British material) top- shaped to cup-shaped, shortly stalked, the margin prominent, dark; disc black, concave and shining; paraphyses slender, branched, tips thickened and black-capped. Ascospores 70-115 × 20-47 µm. **BLS 1876**.

On moss, humus and plant remains in submontane and montane sites between 500-900 m; rare. Scotland (Breadalbane Mountains, Cairngorms).

Strongly isidiate morphs of *Massalongia carnosa* [Peltigerales: Massalongiaceae] are similar, but have the cyanobacterium *Nostoc* as photobiont.

Lopadium disciforme (Flot.) Kullh. (1870) **LC**



Thallus granular or minutely-squamulose; squamules mostly 0.1–0.4 mm diam., sometimes producing marginal isidium-like granules 0.05–0.1 mm diam., dark brown to green-brown (green when wet), matt, often with paler or white margins. Apothecia large, 0.4–1.0 mm diam., black. Ascospores 70–115 × 23–45 µm. **BLS 1695**.

On mossy acid-barked trees, especially *Quercus*, but also *Fraxinus*, *Alnus*, *Betula*, *Corylus*, *Salix* and *Sorbus*; occasional. N.W. England (Cumbria, Durham), central and E. Wales, N. Scotland (Highlands).

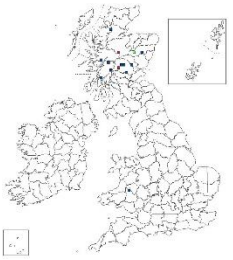
When sterile may resemble *Protoparmelia ochrococca* [Lecanorales: Parmeliaceae], which has uniform brown, shiny granules and occurs on *Pinus* and *Larix* trunks. Formerly regarded as a subspecies of *L. pezizoideum*.

Lopadium pezizoideum (Ach.) Körb. (1855) **NT**

Thallus granular-warted, dark brown-black. Apothecia 0.7–1 mm diam., the disc and margin black; edge of margin red- to black-brown, ± shiny. Ascospores 70–115 × 23–45 µm. **BLS 0859**.

On mosses and plant remains on the ground, montane (above 1000 m alt.). W. and N. Scotland, Central Highlands, one record in central Wales in need of confirmation.

Merismatium nigritellum (q.v.) has once been found on this species in the Ben Lawers range.



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