

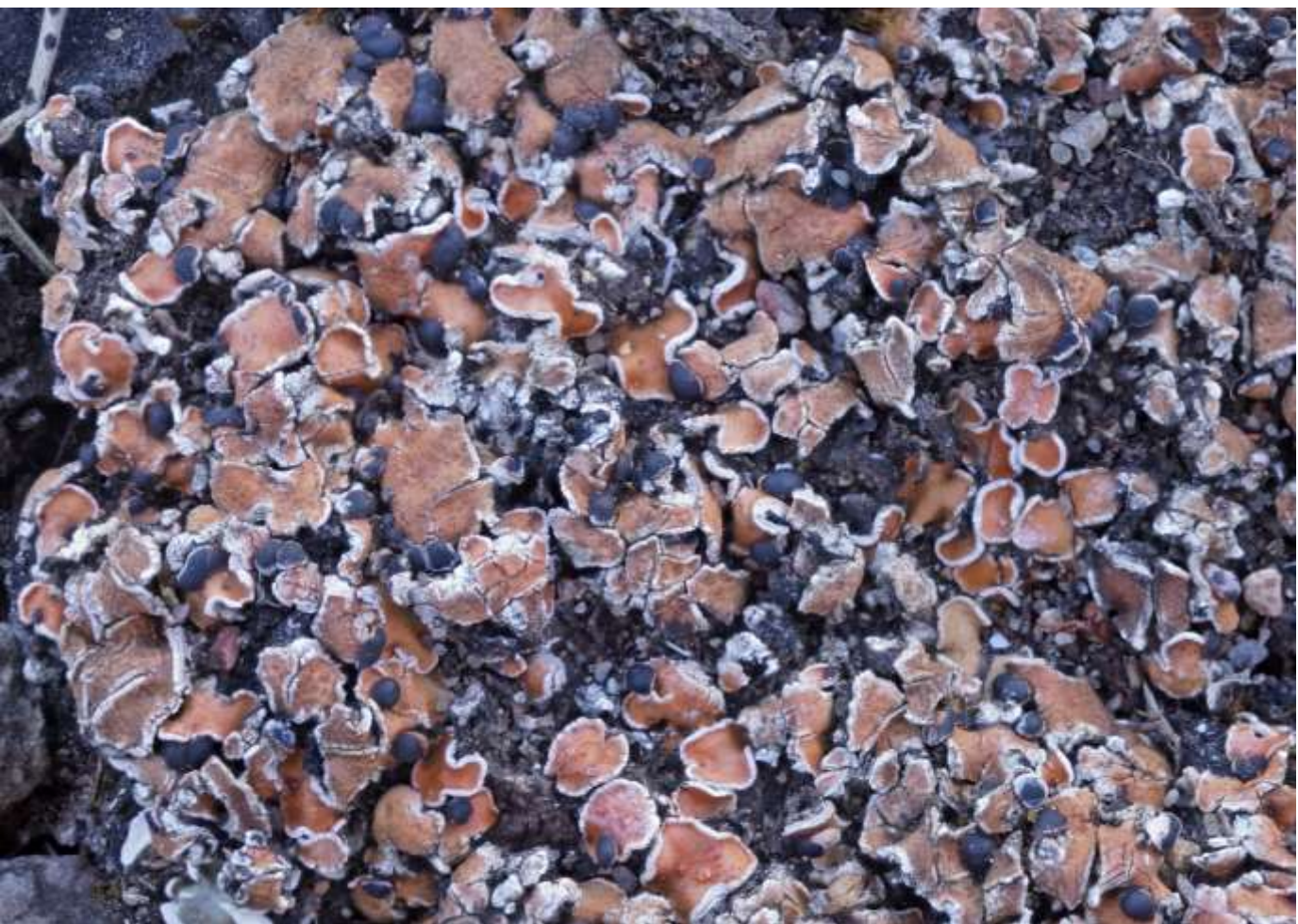
Revisions of British and Irish Lichens



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Lecanorales: Psoraceae

Cover image: *Psora decipiens*, thallus on soil over limestone pavement, Parboäng alvar, Öland, Sweden.

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.

Key to map date classes

	2000–
	1960 - 1999
	1650 - 1959

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. Conservation assessments use the [codes](#) listed in the BLS website. The four-digit number at the end of each description refers to BLS numbers which are part of the recording scheme; they link to species rather than names, and are unchanged (with rare exceptions)

when names alter following improvements in taxonomy.

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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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

including the genera *Brianaria*, *Protoblastenia*, *Protomicarea* and *Psora*.

by

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PSORACEAE Zahlbr. (1898)

Thallus crustose, immersed to superficial, cracked-areolate, scurfy, granular or squamulose. **Photobiont** chlorococcoid. **Ascomata** apothecia, usually becoming strongly convex, sometimes tuberculate, lecideine. **Thalline margin** absent, **true exciple** often poorly developed. **Hamathecium** of paraphyses, usually sparingly branched, strongly conglutinated, apical cell not or slightly swollen. **Asci** 8-spored, clavate, with a well-developed, K/I+ blue tholus containing a deeper K/I+ blue tube, ocular chamber absent; *Porpidia*-type. **Ascospores** colourless, usually aseptate, ± ellipsoidal, smooth. **Conidiomata** pycnidia, frequent, immersed in the thallus. **Conidia** bacilliform to cylindrical, aseptate, colourless.

Four genera are represented in Great Britain and Ireland. The family was accepted as an independent unit by Hafellner (1984), and demonstrated to be monophyletic by Ekman & Blaaid (2011), Schmuell *et al.* (2011) and Ekman & Svensson (2014). The position of *Protomicarea* is still unclear, with Schmuell *et al.* (2011) placing it in an unsupported basal clade sister to the Pilocarpaceae, but it was accepted as part of the Psoraceae by Lücking *et al.* (2016).

Literature

Ekman & Blaaid (2011), Ekman & Svensson (2014), Hafellner (1984), Lücking *et al.* (2016), Miądlikowska *et al.* (2014), Schmuell *et al.* (2011).

- | | | |
|------|--|-----------------------|
| 1 | Thallus crustose, sometimes scurfy-granular | 2 |
| | Thallus squamulose | <i>Psora</i> |
| 2(1) | On acid rock, or soil over mosses or humus; anthraquinones not present | 3 |
| | On calcareous rock; anthraquinones present in the epithecium (K+ orange) | <i>Protoblastenia</i> |
| 3(2) | Paraphyses dimorphic, with some branched; mostly on acid rock in sheltered conditions | <i>Brianaria</i> |
| | Paraphyses not dimorphic, rarely branched; mostly on acid soil over mosses or humus, montane | <i>Protomicarea</i> |

BRIANARIA S. Ekman & M. Svensson (2014)

Thallus areolate, scurfy or granular-verruculose, grey or greyish green. **Photobiont** of two types, one chlorococcoid with cells 5–12 (–15) µm diam. and the other irregularly ellipsoidal and up to 15 × 10 µm in size. **Ascomata** apothecia, lecideine, immarginate, convex-hemispherical, often becoming tuberculate, pale bluish grey to black. **Exciple** absent. **Hypothecium** composed of interwoven hyphae, colourless to dark brown. **Hymenium** 30–75 µm. **Paraphyses** dimorphic, either evenly distributed, sparingly branched, often anastomosing below, or fewer in number, often in fascicles, unbranched or occasionally forked above, distinctly septate. **Asci** 8-spored, cylindric-clavate, the tholus with a broad dark tube structure that expands towards the top, without a pale axial body. **Ascospores** aseptate (sometimes 1-septate in *B. tuberculata*), colourless. **Pycnidia** immersed in the thallus, black. **Conidiogenous cells** cylindrical. **Conidia** bacilliform to cylindrical or obovoid. **Chemistry**: No lichen substances detected by TLC. **Ecology**: on acidic rock in sheltered conditions (e.g. in underhangs), sometimes extending onto roots and soil.

Brianaria contains the *Micarea sylvicola* group as treated in Coppins (2009a), recognized as phylogenetically distinct and allied to the Psoraceae by Ekman *et al.* (2008) and Ekman & Svensson (2014).

Literature:

Coppins (2009a), Coppins *et al.* (2021), Czarnota (2007), Ekman *et al.* (2008), Ekman & Svensson (2014).

- | | | |
|------|--|--------------------|
| 1 | Hypothecium colourless or pale greenish..... | <i>bauschiana</i> |
| | Hypothecium dark greenish or brown..... | 2 |
| 2(1) | Hypothecium fuscous or reddish brown; ascospores aseptate..... | <i>lutulata</i> |
| | Hypothecium dark green, sometimes with the lower part dark purple-brown; ascospores
0- or 1-septate | 3 |
| 3(2) | Ascospores (6-) 7-10 × (2.5-) 3.5-4 μm, ellipsoidal or ovoid-ellipsoidal; apothecia 0.2-0.5 mm
diam., to 1.2 mm if tuberculate | <i>sylvicola</i> |
| | Ascospores 5.5-8 (-9) × 1.5-2.5 μm, cylindric-ovoid or cylindric-ellipsoidal; apothecia
0.1-0.3 mm diam., to 0.55 mm if tuberculate | <i>tuberculata</i> |

Brianaria bauschiana (Körb.) S. Ekman & M. Svensson (2014)

LC

Micarea bauschiana (Körb.) V. Wirth & Vězda (1976)

Thallus continuous, cracked or scurfy granular, greenish grey, ± tinged brownish or ferruginous; photobiont cells 5-12 μm diam. Apothecia 0.2-0.3 mm diam., if tuberculate to 0.7 mm diam., convex to ± globose, pale bluish grey to black, sometimes brown (when infected by *Intralichen* sp.) or pale (in shade); true exciple absent; hymenium 35-60 μm tall, colourless or greenish, K-, N± red; hypothecium colourless or pale greenish in the upper part; paraphyses rather scanty, of two types: mostly 0.5-1.5 μm diam., sparingly branched; some 1.5-2 μm diam., unbranched, often in fascicles. Asci 35-50 × 9-12 μm, in K/I with a dark axial tube. Ascospores 6.5-10.5 × 2.5-4 μm, aseptate, ellipsoidal to ovoid. Pycnidia 40-80 μm diam., immersed; conidia 4-6 × 0.5-1 μm, bacilliform. Lichen products not detected by TLC. **BLS 0873**.



In dry but humid situations, especially under overhangs, on rock, stones, roots and consolidated soil; tolerant of iron and copper-rich rocks; common. N. & W. Britain, N. and W. Ireland.

The commonest member of *Brianaria*; care is needed to separate it from similar species with a pale hypothecium, especially *Micarea farinosa*, *M. lithinella*, *M. lynceola* and *Psilolechia clavulifera*. The hypothecium can be dilutely pigmented, but never densely so as in *B. lutulata*, *B. sylvicola* and *B. tuberculata*.

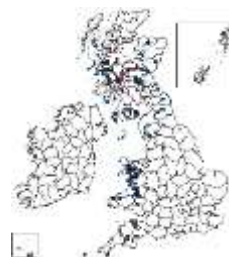
A single record exists of the parasite *Phaeospora parasitica* (Lönnr.) Zopf (1874) on this host; its identity needs confirmation.

Brianaria lutulata (Nyl.) S. Ekman & M. Svensson (2014)

LC

Micarea lutulata (Nyl.) Coppins (1980)

Thallus smooth or cracked, or scurfy granular, lacking discrete areoles or granules, pale grey, greenish or buff, sometimes ferruginous; photobiont cells 5-12 (-15) μm diam. Apothecia 0.2-0.4 mm diam., when tuberculate to 0.8 mm diam., convex to ± globose, grey-brown to black; true exciple absent; hymenium 30-40 μm tall, colourless, pale brown olivaceous or blue-green, the pigment often vertically streaked; hypothecium dark fuscous or reddish brown, K- or K± red intensifying (not purplish or greenish), N-; paraphyses rather sparse, dimorphic: mostly 0.5-1 (-1.5) μm diam., often branched; some 1.5-2 μm diam., unbranched and often in fascicles. Asci 30-40 × 7-10 μm. Ascospores 6-9 × 2-3 (-4) μm, aseptate, ellipsoidal or ovoid. Pycnidia 80-200 μm diam., immersed, black; conidia (3.5-) 4-5 (-5.5) × 1-1.5 μm, bacilliform. Lichen products not detected by TLC. **BLS 0882**.



On rocks and roots under dry but humid overhangs in woods and small valleys; abundant. N. & W. Britain, scattered in Ireland.

Brianaria sylvicola is distinctive in hypothecium pigmentation; *Micarea pseudomarginata* differs in having a distinct true exciple, larger ascospores and a small-celled photobiont. Has been confused with “*Catillaria*” *modesta* [see under Lecanorales: Ramalinaceae], which has broader paraphyses with swollen apices, larger ascospores and grows on limestone.

Brianaria sylvicola (Flot. ex Körb.) S. Ekman & M. Svensson (2014)

Micarea sylvicola (Flot. ex Körb.) Vězda & V. Wirth (1976)

Like *B. bauschiana*, but thallus darker, often bluish grey, often \pm areolate; apothecia 0.2–0.5 mm diam., or to 1.2 mm when tuberculate, black; hymenium 40–60 (–70) μm tall; hypothecium blackish green (K– or K \pm green intensifying) but at least the lower part dark purple brown (K \pm purple intensifying). Asci 35–45 \times 8–12 μm , in K/I with dark axial tube. Ascospores (6–) 7–10 \times (2.5–) 3.5–4 μm , 0 or (–1)-septate. Pycnidia 40–200 μm diam., immersed; wall dark green, K–; conidia 3.5–6 (–7) \times 1–2 μm , bacilliform to cylindric-ovoid. **BLS 0893.**

Usually in similar habitats to *Brianaria bauschiana*, but also rarely on old wooden fence posts; local. N. & W. Britain, S.E. Ireland.

Specimens with immature ascospores need care to separate them from *B. tuberculata*; can also be confused with *Micarea pseudomarginata*.

LC



Brianaria tuberculata (Sommerf.) S. Ekman & M. Svensson (2014)

Micarea tuberculata (Sommerf.) R.A. Anderson (1974)

Like *B. sylvicola* with its dark green hypothecium, but with ascospores 5.5–8 (–9) \times 1.5–2.5 μm , 0- or 1-septate, cylindric-ovoid or cylindric-ellipsoidal; hymenium 30–35 μm tall. The thallus is pale buff to greenish, never blue-grey, and the apothecia are usually only 0.16–0.3 mm diam., or to 0.55 mm if tuberculate. Conidia 3–4.5 \times 1–1.5 μm . **BLS 0896.**

On siliceous rocks, stones and roots under dry overhangs; rare. N. & W. Britain, a few records from Ireland.

Psilolechia clavulifera differs in the smaller, aseptate ascospores, paler hymenium, *Stichococcus* photobiont and a hyphomycetous anamorph. See also *Micarea olivacea*.

Nb



PROTOBLASTENIA (Zahlbr.) J. Steiner (1911)

Thallus crustose, immersed to superficial and cracked, whitish to grey-green or pale brown. **Photobiont** chlorococcoid. **Ascomata** apothecia, flat to strongly convex, orange or orange-red to brown. **Thalline margin** absent. **True exciple** poorly developed, of colourless branched hyphae. **Epithecium** with orange granular material (anthraquinone), K+ crimson (weakly so in *P. lilacina*). **Hymenium** colourless to orange, I+ blue. **Hypothecium** colourless to brown, occasionally \pm violet. **Hamathecium** of broad paraphyses, conglutinate, sparingly branched and anastomosed, the apices not or scarcely swollen. **Asci** 8-spored, cylindric-clavate, *Porpidia*-type. **Ascospores** aseptate, colourless, ellipsoidal or globose, without a thickened perispore. **Chemistry**: lichen products not detected in the thallus; apothecia with anthraquinones, principally parietin. **Ecology**: on calcareous rocks.

The genus appears well circumscribed. Superficially confusable with *Caloplaca* s.l., but the ascospores are not polarilocular and the asci are different in structure. “*Catillaria*” *minuta* [Caliciales: Catillariaceae] is unusual in having orange apothecia, whose K– reaction distinguishes them from those of *Caloplaca* and *Protoblastenia* species.

The lichenicolous *Merismatium discrepans* (J. Lahm) Triebel 1989 [syn. *Halospora discrepans* (J. Lahm ex Arnold) Hafellner 2011] is sometimes found on the thallus of *P. calva* and other species of

Protoblastenia. Its perithecia are half-immersed, brown and 190–230 µm diam., and it has dark brown submuriform spores.

Literature

Kainz & Rambold (2004), Lambley & Orange (2009).

- | | | |
|------|---|-----------------------|
| 1 | Thallus endolithic to weakly epilithic | 2 |
| | Thallus distinctly epilithic, often cracked | 5 |
| 2(1) | Ascospores subglobose to globose | <i>cyclospora</i> |
| | Ascospores ellipsoidal..... | 3 |
| 3(2) | Apothecia K± slightly reddish only; hypothecium sometimes with violet pigment | <i>lilacina</i> |
| | Apothecia K+ red or red-purple, often going into solution; hypothecium never violet | 4 |
| 4(3) | Apothecia immersed to semi-immersed in rock, small, 0.3–0.55 (–0.85) mm diam., concave, flat or weakly convex | <i>incrustans</i> |
| | Apothecia sessile, large, 0.6–1.25 (–1.4) mm diam., convex to strongly convex | <i>calva</i> |
| 5(1) | Apothecia K± slightly reddish only; hypothecium sometimes with violet pigment | <i>lilacina</i> |
| | Apothecia K+ red or red-purple, often going into solution; hypothecium never violet | 6 |
| 6(5) | Hypothecium brown; apothecia orange, brown, olivaceous brown, or blackish brown, convex to strongly convex | <i>siebenhaariana</i> |
| | Hypothecium colourless or yellow; apothecia slightly to moderately convex | <i>rupestris</i> |

Protoblastenia calva (Dicks.) Zahlbr. (1930)

Thallus immersed, inconspicuous, white to dirty grey. Apothecia 0.6–1.25 (–1.4) mm diam., not in pits at maturity, sessile, soon strongly convex, orange to dull orange or reddish-orange; hypothecium colourless or yellowish. Ascospores 8–15 × 5–8 µm, ellipsoidal. **BLS 1186**.

On hard limestones. Throughout Britain and Ireland, though rare in the east.

Characterized by the immersed thallus and large, convex apothecia. *Protoblastenia rupestris*, which it can accompany, has a darker, superficial thallus and less intensely pigmented, smaller, often flattened apothecia. Many records of *P. calva* refer to *P. lilacina*, which differs in the faint or absent K reaction of the apothecium.

Lichenicolous fungi on this host include *Endococcus perpusillus* Nyl. (1857), *Merismatium discrepans* (J. Lahm) Triebel (1989) and *Muellerella lichenicola* (Sommerf.) D. Hawksw. (1979).



LC

Protoblastenia cyclospora (Hepp ex Körb.) Poelt (1975)

Thallus immersed to superficial, sometimes finely cracked, inconspicuous, pale grey to yellowish. Apothecia 0.4–0.85 mm diam., not in pits, becoming moderately convex, dark orange to bright orange-red; hypothecium colourless to pale orange-brown. Ascospores 5–8.5 × 5–7.5 µm, subglobose to globose. **BLS 1187**.

On limestones; local. S.W. & N.W. England (N. Somerset, E. Gloucester, Derbyshire, N.W. Yorkshire, Westmorland), N & W Wales, N Scotland. Apparently absent from Ireland.

Distinguished by the ± globose spores. In the field the rather dark (often reddish rather than orange) apothecia attract attention; in addition, *Protoblastenia calva* and *P. lilacina* have more strongly convex apothecia, and *P. rupestris* differs in the well-developed epilithic thallus.



Nb

Protoblastenia incrustans (DC.) J. Steiner (1911)

LC

Thallus immersed, inconspicuous, whitish to grey or yellowish. Apothecia immersed to semi-immersed in pits in the substratum, small, 0.3–0.55 (–0.85) mm diam., concave, flat or weakly convex, yellow-orange; hypothecium colourless to yellowish. Ascospores 9–13 × 4.5–6 µm, ellipsoidal. **BLS 1188.**

On hard limestones. Throughout Britain and Ireland (rare in E. England).

Distinguished from *Protoblastenia calva* and *P. rupestris* by the small, often pale orange apothecia, immersed in pits in the rock.

There is a single record of *Endococcus perpusillus* with this species as host.

**Protoblastenia lilacina** Poelt & Vězda (1970)

Nb

Thallus endolithic or in part thinly epilithic, entire or with a few fine cracks, whitish, grey or cream. Apothecia sessile, moderately to usually strongly convex at maturity, 0.5–0.85 mm diam., orange, sometimes orange-pruinose to some degree; K– or at most K+ darkening, sections becoming dark yellow with a slight reddish tinge; hypothecium often violet. Ascospores ellipsoidal, 12–16 × 6.5–8 µm. **BLS 2413.**

On limestone, common and widespread but distribution poorly known. S.W. & N.W. England, Wales, W. Scotland.

Formerly confused with *Protoblastenia calva*, but distinguished by the K– or almost negative reaction of the apothecium. This may be conveniently observed by placing a thick section of an apothecium in a drop of K over a white background, under the dissecting microscope.

A single report of *Merismatium discrepans* has been made as a parasite of *P. lilacina*.

**Protoblastenia rupestris** (Scop.) J. Steiner (1911)

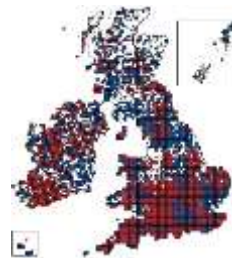
LC

Thallus superficial, cracked-polygonal, pale grey to dirty grey-brown or grey-green. Apothecia 0.3–0.9 mm diam., not in pits, slightly convex to moderately convex, ± dirty or dull orange; hypothecium colourless to yellowish, true exciple thin or excluded. Ascospores 8–17 × 5–8 µm, ellipsoidal. **BLS 1189.**

On a wide range of calcareous substrata, including limestone, chalk pebbles, concrete, mortar and asbestos-cement; common. Throughout Britain and Ireland.

Distinguished by the well-developed epilithic thallus and only moderately convex apothecia. An important indicator species of calcareous substrata. The *Athallia* (*Caloplaca*) *holocarpa* aggregate of species is superficially similar but has a grey thallus, flat and densely crowded apothecia, a thick, persistent true exciple and polarilocular ascospores.

Several lichenicolous fungi have been reported as associates of this species. Alongside the common *Merismatium discrepans* and *Muellerella lichenicola*, they include *Endococcus protoblasteniae* Diederich (1999) and *Zwackhiomyces dispersus* (J. Lahm ex Körb.) Triebel & Grube (1990).

**Protoblastenia siebenhaariana** (Körb.) J. Steiner (1911)

Nb

Thallus superficial, smooth to uneven, cracked-polygonal, whitish to pale dirty brown. Apothecia 0.45–1.5 mm diam., at first dull orange or orange-brown, often becoming dull brown to olive-brown and strongly convex; hypothecium orange to brown. Ascospores 9.5–13 × 4.5–6 µm, ellipsoidal. **BLS 1190.**

On sheltered damp, often vertical faces of calcareous schist, basic metamorphic and basalt rocks. Wales (Snowdonia), Scotland (Highlands).

Differs from *Protoblastenia rupestris* in the darker hypothecium and the olive brown, more convex apothecia.



PROTOMICAREA Hafellner (2001)

Thallus crustose, areolate, sometimes granular. **Photobiont** chlorococcoid. **Ascomata apothecia**, lecideine, black, convex, immarginate, sometimes confluent. **True exciple** not prominent, sometimes reflexed. **Epithecium** dark green, the pigmentation sometimes extending to the hymenium. **Hypothecium** reddish brown, K⁺ orange to red. **Hamathecium** of paraphyses, ± unbranched, occasionally anastomosed, adglutinated, scarcely swollen at the apices. **Asci** *Psora*-type, clavate, with a well-developed K/I⁺ blue tholus containing a deeper K/I⁺ blue tube, ocular chamber absent. **Ascospores** colourless, usually aseptate. **Conidiomata** pycnidia where known, with bacilliform conidia. **Chemistry**: pannarin and unidentified triterpenoids detected in one species. **Ecology**: on acid soil or siliceous rocks, montane.

The genus differs from *Psora* in the crustose morphology of the thallus, greenish epithecium and hymenium, absence of anthraquinone pigments in the hymenium and absence of calcium oxalate crystals in the hypothecium; from *Brianaria* which has branched paraphyses; from *Lecidea* s. str. by the immarginate apothecia and *Psora*-type ascus. *Lecidea alpestris* was transferred to *Protomicarea* by McCune *et al.* (2018), based on both anatomical and sequence similarity. *L. commaculans* is not part of *Lecidea* s. str., and Aptroot *et al.* (2009) suggested that it might belong in *Protomicarea*.

Literature

Aptroot *et al.* (2009), Coppins (2009b), Hafellner & Türk (2001), McCune *et al.* (2018).

- 1 Ascospores 14–21 × 2.5–4 µm; thallus well-developed, areolate, whitish grey to pale grey-brown *alpestris*
Ascospores (7–) 9–14 (–15) × (2–) 3–4.5 (–5) µm; thallus inconspicuous or granular 2
- 2(1) Ascospores narrowly ellipsoidal to somewhat dumb-bell-like, sometimes tending to be 1-septate; hypothecium K⁺ crimson purple; thallus Pd[–] *commaculans*
Ascospores narrowly ellipsoidal to subfusiform, one or both apices often attenuated; hypothecium K⁺ orange; thallus Pd⁺ orange-red, often patchily *limosa*

Protomicarea alpestris (Sommerf.) McCune (2018)

Nb

Lecidea alpestris Sommerf. (1825)

Thallus well-developed, areolate, whitish grey to pale grey-brown; areoles convex, 0.4–0.9 mm diam. Apothecia 0.5–1.0 mm diam., convex, black, pruinose; epithecium dark green; hymenium 60–85 µm tall, pale blue-green at least in the upper part, hypothecium, especially in the lower part, yellow-brown or brownish orange-red, K[–] or K⁺ orange intensifying; paraphyses not swollen at the tips. Ascospores 14–21 × 2.5–4 µm, 0 (–1)-septate, narrowly cylindrical-ellipsoidal. Thallus C[–], K[–], KC[–], Pd⁺ orange-red (pannarin), UV[–]. **BLS 2391**.

On siliceous boulders; upland, rare. Scotland (Angus and Dumfries).

Distinguished from *P. limosa* most easily by ascospore size and hypothecium pigmentation. The species was transferred to *Protomicarea* by McCune *et al.* (2018); there are some discrepancies between descriptions of British and North American specimens, and it may be that more than one species is involved. At any rate, neither taxon rests appropriately within *Lecidea* in its phylogenetic sense.



Protomicarea commaculans (Nyl.) Aptroot (2022)

Nb

Lecidea commaculans Nyl. (1868)

Thallus ± inconspicuous, sometimes present as scattered whitish grey areoles, medulla I[–]; prothallus if present black. Apothecia (0.2–) 0.4–0.6 (–1.3) mm diam., superficial, strongly convex, often in groups and then angular in shape, not or slightly constricted below, black; true exciple indistinct, soon excluded, greenish black at the outer edge, ± colourless within; epithecium dark greenish-black; hymenium (30–) 40–60 µm tall, slightly brownish; hypothecium deep red to, more rarely, brown, K⁺ crimson purple; paraphyses branched and sometimes

anastomosed, with a thick gelatinous sheath, the apices with green-black hood, to 4 μm diam. Asci 35–45 \times 7–12 μm , similar to *Bacidia*-type. Ascospores (7–) 9–12 \times (2–) 3–3.5 μm , sometimes tending to be 1-septate, narrowly ellipsoidal to somewhat dumb-bell-like. Conidia 6–8 \times 0.5–1 μm , bacilliform. Thallus C–, K–, KC–, Pd–, UV– (lichen products not detected by TLC). **BLS 0710.**

On siliceous rocks in upland and montane areas; rare. Scottish Highlands (S. Aberdeen, Mull, Skye, Sutherland), England (Yorkshire), N. Wales.

The deep red hypothecium, intensifying in K, is particularly diagnostic for this species. *L. alpestris* has a similar reaction, but larger spores. *Micarea subconfusa* (Pilocarpaceae) has a red-brown hypothecium, a better developed thallus, and shorter and never dumb-bell-like ascospores. Considered by Aptroot *et al.* (2009) as likely to belong to this genus, and formally transferred here.



Protomicarea limosa (Ach.) Hafellner (2001)

Thallus crustose, granular-verrucose, of convex granular areoles (0.1–) 0.2–0.6 (–1) mm diam., white-grey to grey; prothallus white or absent; photobiont chlorococcoid, 7–12 μm diam.; cephalodia absent. Ascomata apothecia, (0.3–) 0.5–0.8 (–1) mm diam. sessile, black, strongly convex, immarginate, appressed, sometimes confluent; true exciple not apparent, reflexed, \pm colourless, composed of branched, radiating hyphae 1–2 μm diam.; epithecium and hymenium deep bluish green, K–; hymenium 45–65 μm tall, hymenial gel I+ red; hypothecium reddish brown, K+ orange; paraphyses 1.3–2 μm diam., \pm unbranched, occasionally anastomosed, adglutinated, scarcely swollen at the apices. Asci 35–45 \times 9.5–11 μm , as in *Psora*, with a K/I+ blue tholus with intensely reacting tube. Ascospores (8–) 10–14 (–15) \times 3–4.5 (–5) μm , narrowly ellipsoidal to subfusiform, one or both apices often attenuated. Conidiomata pycnidia; conidia 6–7 \times 1.5 μm , bacilliform. Thallus C–, K–, KC–, Pd+ orange-red, often patchily (pannarin and unidentified triterpenoids). **BLS 0742.**

Nb



On acid soil, over mosses or humus, mostly above 900 m; rare. N. Scotland (Highlands).

This species recalls *Frutidella caesiastra*, which occurs in similar situations, but differs in the less granular and thinner thallus, non-pruinose apothecia, the darker hypothecium, smaller asci with darkly amyloid axial tube, the more pointed and narrower ascospores and in the thallus reactions. *Biatora cuprea* (Ramalinaceae) has a similar Pd+ red thallus (argopsin) but the apothecia are pale to dark red-brown, not black as in *P. limosa*. The thalli of *Micarea assimilata* and *M. incrassata* (Pilocarpaceae) are Pd–, produce cephalodia and both species have a more darkly coloured hypothecium. “*Catillaria*” *contristans* and *Micarea lignaria* have septate ascospores and mostly smaller apothecia and thallus areoles. “*Lecidea*” *berengeriana* has distinctly swollen paraphyses apices and *Bryobilimbia hypnorum* (Lecideaceae) has lecideine apothecia; both species also have a Pd– thallus, a dark brown hypothecium and violet (K+ green) pigment granules in the apothecial tissues.

PSORA Hoffm. (1796)

Thallus of relatively large thick squamules, yellow to red-brown, mostly 2–6 mm diam., prothallus absent. **Upper cortex** thick, well-developed. **Lower cortex** poorly developed to absent; often attached by a well-developed hyphal net of two types: (1) of \pm periclinally arranged long-celled closely conglutinated \pm brown-pigmented hyphae and lacking crystals of calcium oxalate; or (2) of \pm anticlinally arranged short-celled, only partly conglutinated colourless hyphae densely covered with crystals of calcium oxalate. **Photobiont** chlorococcoid; algal layer continuous. **Medulla** well-developed, I–. **Ascomata** apothecia, sessile, marginal or laminal, brown-black, usually flat or weakly convex when young, later becoming immarginate and strongly convex to semi-globose; pruina white, yellow or absent. **Thalline margin** absent. **True exciple** annular, colourless to pale brown, of radiating hyphae, usually indistinct, becoming excluded. **Epithecium** red-brown or brown, containing anthraquinones (mainly parietin), K+ red or purple-red, N–. **Hymenium** I–. **Hypothecium** pale brown to colourless, filled with crystals of calcium oxalate. **Hamathecium** of paraphyses, unbranched or

sparingly branched, strongly conglutinated, the apical cell slightly swollen. **Asci** 8-spored, clavate, with a well-developed K/I+ blue tholus containing a deeper K/I+ blue tube; ocular chamber absent, *Porpidia*-type. **Ascospores** colourless, aseptate, ellipsoidal, smooth, without a thick perispore. **Conidiomata** pycnidia, frequent, immersed in squamules; ostiole colourless. **Conidia** elongate-bacilliform, aseptate, colourless. **Chemistry**: depsides, depsidones, anthraquinones, aliphatic, pulvinic and usnic acids and triterpenes. **Ecology**: typically on calcareous soil and rock.

Protomicarea differs from *Psora* in its crustose thallus, greenish epithecium and hymenium, absence of anthraquinone pigments in the hymenium and absence of calcium oxalate crystals in the hypothecium. The genus *Romjularia* was erected for the species *R. lurida*, which had been switched back and forward between several genera, viz. *Lecidea*, *Mycobilimbia* and *Psora*. It is currently placed in Lecideales: Lecideaceae.

Literature:

Ekman & Blaaliid (2011), Ekman & Svensson (2014), Lambley *et al.* (2009), Leavitt *et al.* (2018), Ruprecht *et al.* (2014), Tindal (1984).

- | | | |
|------|---|--------------------------|
| 1 | Squamules bright pink-red-brown; apothecia marginal, black | <i>decipiens</i> |
| | Squamules variously coloured, never pink or red; apothecia laminal or marginal, brown-black | 2 |
| 2(1) | Squamules brownish to yellowish green, white-edged; lower surface pale brown to white; medulla C± red | <i>rubiformis</i> |
| | Squamules red-brown to dark brown; margin concolorous with the upper side or sometimes slightly pruinose; lower surface brown; medulla C- | 3 |
| 3(2) | Apothecia strongly convex to ± hemispherical; true exciple paler than disc; epithecium K+ red | <i>globifera</i> |
| | Apothecia flat to weakly convex; true exciple darker than disc; epithecium K- | <i>Romjularia lurida</i> |

Psora decipiens (Hedw.) Hoffm. (1794)

Squamules to 3–4 mm diam., round, scattered to contiguous, sometimes overlapping, appressed, bright pink-red-brown, not or partly white-pruinose; margin usually white, slightly upturned, entire or somewhat serrated; underside white; lower cortex poorly developed or absent; attached by a hyphal net. Apothecia to 2 mm diam., sessile, marginal, black, not or ± white-yellow pruinose. Ascospores 11–18 × 6–8 µm. Conidia 6–7 × ca 1 µm. Lichen products not detected by TLC. **BLS 1201**.

On calcareous soils developed over chalk, limestone, shell-sand or calcareous schist in open situations, both in montane and lowland habitats; local. Throughout Britain and Ireland, more frequently encountered in Highland Scotland.

Currently considered to be a cosmopolitan species, but Leavitt *et al.* (2018) detected multiple lineages and it is possible that the species will be split in future. No material from Great Britain and Ireland was included in the study.



Psora globifera (Ach.) A. Massal. (1852)

Squamules to 5 mm diam., elongated, appressed to ascending, becoming imbricate, shiny, red-brown to dark brown, upper surface smooth or occasionally corrugated, not or more rarely faintly white-pruinose; margin concolorous with the upper side or more rarely white-pruinose; underside pale brown to medium brown. Apothecia to 2 mm diam., sessile, on the surface of the squamules, strongly globose, dark brown to black, not or more rarely faintly yellow-pruinose, often more distinct when wet; true exciple indistinct when young, paler than the disc; epithecium K+ red. Ascospores 10–13 (–14) × (4–) 5–6 (–7) µm. Lichen products not detected by TLC. **BLS 1673**.

On calcareous schist soils, especially in wet rock crevices, montane; very rare. N.



Scotland (Ben Lawers).

Romjularia lurida differs in having flattened to weakly convex apothecial discs, with a more persistent exciple darker than the disc.

Psora rubiformis (Ach.) Hook. (1844)

Squamules to 4 mm diam., elongated, ascending and irregularly imbricate, thick, brownish to greenish yellow, upper surface smooth or cracked-areolate, sometimes white-pruinose towards the margin; margin yellow to white, pruinose; underside ± white; lower cortex type (2). Apothecia to 2 mm diam., sessile, brownish black to black, not or more rarely yellow-pruinose. Ascospores 9–14 × 5–7 µm. Conidia 5–7 × ca 1 µm. Medulla C+ faintly red or C–, K–, KC+ faintly red or KC– (usnic and ± gyrophoric acids). **BLS 1204**.

On calcareous boulders and wet rock ledges; very rare. N. Scotland (Ben Lawers).

Could be confused with the basal squamules of *Cladonia*, e.g. *C. symphyrcarpia*, which are K+ red with crystals (norstictic acid) and may occur in similar habitats. *P. rubiformis* has thicker, larger, coarser and more rounded squamules which are K–.



Nomenclature

Protomicarea commaculans (Nyl.) Aptroot, **comb. nov.**

Basionym: *Lecidea commaculans* Nyl., *Flora* (Regensburg) **51**: 476 (1868).

IF 557959

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