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Baeomycetales: Trapeliaceae

Cover image: *Placopsis lambii*, on siliceous riverine rock, Clatteringshaws Loch, Kirkudbrightshire, 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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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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Baeomycetales: Trapeliaceae

including the genera *Coppinsia*, *Placopsis*, *Placynthiella*, *Rimularia*, *Trapelia* and *Trapeliopsis*

by

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TRAPELIACEAE Choisy ex Hertel (1970)

Thallus crustose, sometimes placodioid, often granular; a few species lichenicolous but retaining independent thalli. **Photobiont** chlorococcoid, sometimes with cyanobacteria in cephalodia. **Apothecia** sessile or \pm sunken, pale brown to black, sometimes greenish, round, usually discoid or convex, often constricted at the base. **Thalline margin** mostly absent, forming a collar around the apothecia in a few species. **True exciple** usually well-developed but becoming excluded, composed of intertwined hyphae or isodiametric cells, variously pigmented. **Hamathecium** of branched and anastomosed paraphyses, occasionally with dark tips or immersed within pigmented epithelial gel. **Asci** *Trapelia*-type, the tholus I+ diffuse blue, sometimes with a darker-staining cap, or *Rimularia*-type with I+ blue flanks also, 8-spored. **Ascospores** aseptate, ellipsoidal, colourless but occasionally browning with age, without a gelatinous perispore. **Ecology**: mostly on siliceous rocks, or on soil, bryophytes or rotten wood.

Comprises a group of ten genera that form a monophyletic grouping (at least those that have been sequenced) within the *Baeomycetales* (Resl *et al.* 2015, Lücking *et al.* 2016). It occupies a clade sister to that containing the *Xylographaceae*.

Ascus morphology can be difficult to reconcile with phylogeny in this group, as noted by Hertel & Rambold (1990) and Lumbsch *et al.* (2007). Two non-lichenized genera with broadly similar asci are now excluded from the *Trapeliaceae*. *Agyrium* (*Agyriaceae*) is now treated as part of the *Pertusariales* (Lumbsch & Lücking 2016), and the non-lichenized resin-associated *Sarea* was removed and placed in a separate class by Beimforde *et al.* (2020).

The key below only includes genera present in Britain and Ireland, and will not be a reliable identification aid for material outside of northern Europe.

Literature

Beimforde *et al.* (2020), Hertel & Rambold (1990), Lücking *et al.* (2016), Lumbsch (1997), Lumbsch & Lücking (2016), Lumbsch *et al.* (2007), Resl *et al.* (2015).

- | | | |
|------|---|----------------------|
| 1 | Thallus placodioid, large and robust, with broad lobes; cephalodia often present | <i>Placopsis</i> |
| | Thallus crustose, squamulose or minutely placodioid, often granular; cephalodia absent | 2 |
| 2(1) | Thallus some shade of brown; exciple composed of brown-walled isodiametric cells; paraphyses with a brown apical cap..... | <i>Placynthiella</i> |
| | Thallus some shade of grey or green; exciple composed (at least mostly) of pale intertwined hyphae; paraphyses colourless throughout..... | 3 |
| 3(2) | Thallus inconspicuous, sometimes filmy; apothecia \pm globose, minute, the exciple reduced and becoming excluded | <i>Coppinsia</i> |
| | Thallus well-developed; apothecia discoid to convex, the exciple usually well-differentiated | 4 |
| 4(3) | Ascus tholus with well-developed I+ blue flanks and an apical I+ blue cap; ascospores becoming brown..... | <i>Rimularia</i> |
| | Ascus tholus I- or I+ diffuse blue; ascospores remaining colourless | 5 |
| 5(4) | Thallus C+ red; mostly on siliceous rock..... | <i>Trapelia</i> |
| | Thallus C- or C+ red; mostly on peaty soil and rotten wood..... | <i>Trapeliopsis</i> |

COPPINSIA Lumbsch & Heibel (1998)

As this is a monotypic genus the description below of *C. minutissima* constitutes the generic description.

The presence of an epinecral layer, unbranched to only slightly branched paraphyses, *Trapelia*-type ascus and aseptate spores suggest affinities to *Trapelia*. *Coppinsia*, however, has biatorine apothecia with a different exciple structure. No sequences of the type (and only) species are currently available.

Literature

Lumbsch & Heibel (1998, 2009), Resl *et al.* (2015).

Coppinsia minutissima Lumbsch & Heibel (1998)

Thallus thinly crustose, continuous, greenish-grey to not visible or only as a slight discolouration of the substratum; with a thin upper epinecral layer over an algal layer but no cortex or medulla present; prothallus absent; photobiont chlorococcoid. Apothecia sessile, pale orange to orange-brown to pallid pink, 0.2–0.6 mm diam., thalline margin concolorous with the disc, not pruinose, slightly shiny, biatorine; true exciple 10–25 µm thick when young, cupulate or much reduced, of intertwined hyphae, colourless; hymenium 120–160 µm tall, colourless, I–, slightly greenish-blue in I; paraphyses 1.5–2 (–2.5) µm diam., septate, unbranched to slightly branched, not to slightly thickened apically (up to ca 3 µm diam.). Asci cylindrical, 110–140 × 15–22 µm, 8-spored, *Trapelia*-type, K/I– but showing a slight bluish reaction of the outermost wall and a tube-like amyloid structure in the tholus. Ascospores ovoid, 12–18 × 7–9.5 µm, aseptate, colourless. Conidiomata not known. No lichen substances found by TLC. **BLS 1977.**

An inconspicuous species on soil, bryophytes, moribund lichens and detritus in metal-enriched habitats, such as old lead mines, spoil tips, and railway banks; probably overlooked. S.W. England (also West Sussex, East Suffolk), Highland Scotland, W. Wales.

Associated lichens include *Vezdaea acicularis* and *V. cobria*.



PLACOPSIS (Nyl.) Linds. (1867)

Thallus crustose, placodioid, with deeply incised radiating marginal lobes. **Cephalodia** usually present, as conspicuous pink-brown lobed structures towards the centre of each rounded thallus. **Upper cortex** composed of angular cells, often overlaid by a colourless necrotic layer. **Photobiont** chlorococcoid; cephalodia containing *Stigonema* or *Scytonema*. **Ascomata** apothecia, sessile. **Thalline margin** present, persistent. **True exciple** thin, often visible in old apothecia, ± colourless, of elongate thin-walled cells. **Epithecium** yellowish brown. **Hymenium** colourless, I+ blue. **Hypothecium** colourless. **Hamathecium** of paraphyses, branched, the upper part ± moniliform, with minute, yellowish external granules. **Asci** 8-spored, mostly uniseriate, cylindrical to narrowly clavate, amyloid, with a K/I+ pale blue tholus and a narrow, internal darker blue cap, *Trapelia*-like but without an amyloid ring structure. **Ascospores** colourless, ellipsoidal, aseptate, often somewhat pale pink with densely granular contents, without a perispore. **Conidiomata** pycnidia, immersed, causing slight swellings of the thallus, opening by a minute, dark ostiole, to 0.1 mm diam. **Conidia** colourless, thread-like, aseptate. **Chemistry**: orcinol depsides, principally gyrophoric acid; one species contains 5-*O*-methylhiassic acid. **Ecology**: primarily on well-lit moist acid rocks and soils.

A genus of around 60 species, most of which have austral distributions. The presence of cephalodia separates *Placopsis* in morphological terms from *Trapelia*; however, it clusters within that genus

according to Resl *et al.* (2015) and further analysis will be needed. In the few cases where cephalodia are not always present, ascoma anatomy can be used to separate the genera. Well-developed thalli of *Trapelia placodioides* may resemble British *Placopsis* spp. but lack cephalodia and any trace of the \pm broad, incised, \pm radiating marginal lobes.

Variation in the two British species of *Placopsis* is considerable and to some extent the morphology overlaps, so TLC is recommended for populations in areas where both species occur. Their distribution in Ireland is uncertain.

Numerous lichenicolous species parasitise thalli of *Placopsis*, including three gall-forming species of *Polycoccum* (Brackel & Berger 2010).

Literature: Harrold *et al.* (2010), Lumbsch (1997), Moberg & Carlin (1996), Resl *et al.* (2015).

- 1 Upper surface matt, or shiny only at the lobe tips; soralia mostly 0.5–0.9 mm in radial length, often eroded and excavate, rarely black; gyrophoric acid only *gelida*
Upper surface often shiny throughout; soralia mostly 0.3–0.6 mm in radial length, usually blackish, sometimes capitate and greenish; 5-*O*-methylhiascic and gyrophoric acids *lambii*

***Placopsis gelida* (L.) Linds. (1866)**

Thallus dull grey, pinkish or pale brown, closely appressed to the substratum, forming rosettes 1–5 cm diam., cracked to rimose-areolate in the central part, with deeply incised \pm radiating marginal lobes 0.5–1.5 mm broad, matt except for the lobe ends; surface with flesh-coloured to dark red-brown, clearly lobed cephalodia 0.5–4 mm diam.; soralia radially elongate, mostly 0.5–0.9 mm in length, slightly to strongly eroded, greenish or greyish, more numerous towards the centre of the thallus. Apothecia 0.8–1.6 mm diam., occasional, sessile; thalline margin thick, entire; disc flat, rough, dark pink-, yellow- or red-brown, sometimes whitish pruinose. Ascospores 13–18 \times 6–8.5 μ m. Pycnidia rare, immersed, globose, with brown walls; conidia filiform, 15–25 \times ca 0.5 μ m. Thallus C+ red (gyrophoric acid, \pm trace lecanoric acid).

BLS 1133.

Distribution centred on basalt in the W. Scottish Highlands and islands with a few confirmed records from mid Perthshire. Reports from elsewhere in Britain are likely to be misidentifications for *P. lambii*. The status of Irish records needs further analysis.

Distinguished from most populations of *P. lambii* by the matt upper surface, the relatively short eroded pale-coloured soralia, and with gyrophoric acid as the only major substance.

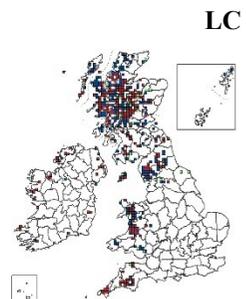
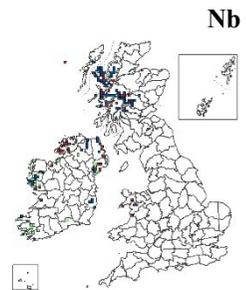
***Placopsis lambii* Hertel & V. Wirth (1987)**

Differs from *P. gelida* in having soralia that are mostly longer in radial length (see key), thalli with an upper cortex that may be shiny throughout (some populations have matt thalli as for *P. gelida*), and most importantly in chemistry. Soralia are described as flat and blackish or subglobose to capitate and greenish. Thallus C+ red (gyrophoric acid, 5-*O*-methylhiascic acid is present as a major substance). **BLS 1723.**

On siliceous rocks or rarely on soil, in open moist situations such as along water courses, by lake margins or on boulders and scree in high rainfall areas. Sometimes on slate roofs, and often associated with metal-rich sites. Frequent in the uplands, W. & N. Britain and Ireland.

Other differential features described by Gilbert & Purvis (2009) appear to be unreliable, according to Harrold *et al.* (2010). Well-developed thalli of *Trapelia placodioides* can resemble some forms of *P. lambii* but always lack any trace of radiating marginal lobes and cephalodia; furthermore, *T. placodioides* contains only gyrophoric acid as its main chemical component.

Host to a range of lichenicolous species, including *Arthonia gelidae* R. Sant., *Polycoccum squamarioides* (Mudd) Arnold, *Roselliniopsis gelidaria* (Mudd) Matzer, *R. ventosa* (Rostr.) Alstrup and less often *Endococcus perpusillus* Nyl., *Pyrenidium actinellum* Nyl. and *Roselliniopsis tartaricola* (Leight.) Matzer.



PLACYNTHIELLA Elenkin (1909)

Thallus crustose, effuse, subgelatinous or of minute granular or isidiate-granular goniocysts, weakly areolate, dark green-brown, at times tinged red or chestnut-brown. Goniocysts and areoles with an outer layer of brown-walled pseudoparenchymatous hyphae, colourless within, connected with brownish hyphae. **Photobiont** *Pseudochlorella* or *Radiococcus*. **Ascomata** apothecia, appressed to sessile, red-brown to black; at maturity internally brown throughout. **Thalline** margin absent. **True exciple** brown, pseudoparenchymatous, incurved to reflexed. **Epithecium** dark brown with a gel matrix, K/I+ green-blue. **Hymenium** brown. **Hypothecium** dark brown. **Hamathecium** of paraphyses, often branched, the apices ± capitate, dark brown. **Asci** 8-spored, cylindric-clavate, *Trapelia*-type. **Ascospores** frequently uniseriate, aseptate (to 1-septate), ellipsoidal, often containing a single large oil drop and several smaller droplets, without a perispore. **Conidiomata** pycnidia, brown-black, ± globose. **Conidiophores** branched. **Conidia** cylindrical to bacilliform. **Chemistry**: orcinol depsides or no lichen products detected by TLC. **Ecology**: on acidic substrata, particularly peaty soils, bark and wood, less often on siliceous rock.

Differs from *Trapelia* and *Trapeliopsis* in having a true exciple of brown-walled pseudoparenchymatous cells and paraphyses with irregularly capitate apices, each crowned with a dark brown apical cap. Due to the dark colour of the thallus, chemical reactions should be observed in microscope sections or spot tests on filter paper.

Placynthiella occupies a clade sister to that containing *Trapelia* and *Trapeliopsis*, according to Resl *et al.* (2015). *Aphanopsis* is superficially similar but has a different apothecial structure and larger ascospores; it is placed in its own family, of uncertain relationships (Lücking *et al.* 2016).

Literature

Coppins & James (1984), Hitch & Purvis (2009), Lumbsch (1997), Resl *et al.* (2015), Voytsekhovich *et al.* (2011).

- | | | |
|------|---|-------------------|
| 1 | Thallus coarsely granular-verrucose, becoming yellowish when wet; goniocysts 0.1–0.3 mm diam. | <i>oligotropa</i> |
| | Thallus minutely granular, coralloid or subgelatinous, dark brown, green when wet; goniocysts <0.1 mm diam. | 2 |
| 2(1) | Thallus coralloid, C+ red; apothecia rare, with true exciple persistent, paler than the disc | 3 |
| | Thallus sub-gelatinous, C–; apothecia usually abundant, with true exciple soon excluded, concolourous with the disc | 4 |
| 3(2) | Coralloid goniocysts isidiate, dark-brown to green-black, shining | <i>icmalea</i> |
| | Coralloid goniocysts breaking down into sorediate areas, mid-brown to greenish when abraded, matt | <i>dasaea</i> |
| 4(2) | Hypothecium fuscous, reddish-brown in K; apothecia often coalescing, pinkish-brown to dark red-brown (rarely blackish), margin soon disappearing, disc becoming strongly convex | <i>uliginosa</i> |
| | Hypothecium purple-violet in K; apothecia blackish (even when wet), with prominent incurved margins and concave disc, later becoming plane or slightly convex | <i>hyporhoda</i> |

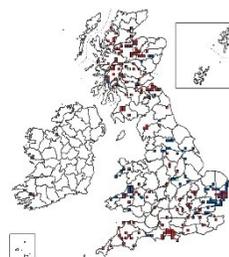
Placynthiella dasaea (Stirt.) Tønsberg (1992)

LC

Thallus of minutely coralloid goniocysts forming an indistinct areolate crust, pale to dark brown or greenish brown, to 5–10 cm diam., becoming sorediate; prothallus rarely distinct, brown; soralia brown due to colour in the outermost soredia or greenish due to abrasion, continuous, leprose, in clusters *ca* 45 (–65) µm diam.; the outermost soredia ± corticate, 20–30 µm diam., brown with globose algal cells to 12 µm diam. Apothecia to 0.3 mm diam., disc dark brown with a thin paler margin. Ascospores 9–11 × 4–5 µm. Pycnidia not seen in British and Irish material, elsewhere very rare. Thallus (microscope section) C+ red, K–, KC+ red, Pd– (gyrophoric and ± trace lecanoric acids). **BLS 1735**.

On dead rotting bark and lignum of *Pinus* and *Ulex*, occasionally spreading to soil rich in organic matter, also well-weathered, worked timber and sandstone (especially tops of old gravestones). It withstands moderate levels of air pollution. Outside Britain and Ireland it is frequently recorded on smooth or rough bark of healthy tree trunks of broadleaved trees. From sea level to 600 m in sunny or sheltered and shady habitats. Scattered and fairly common throughout England, Scotland and Wales, very rarely recorded from Ireland.

Distinguished from *Placynthiella icmalea* by the globose soredia and the absence of 5-*O*-methylhiascic acid. *P. dasaea* superficially resembles *Japewia subaurifera* but in that species the soredia are golden yellow internally and lack gyrophoric acid.



Placynthiella hyporhoda (Th. Fr.) Coppins & P. James (1984)

Thallus subgelatinous, of small non-isidiate goniocysts (to 0.1 mm diam.), dark green to dark brown. Apothecia blackish (even when moist), with a prominent \pm incurved true exciple and concave disc when young, the disc later becoming flat to slightly convex; hypothecium purple-violet in K. Ascospores $9.5\text{--}12 \times 4\text{--}6 \mu\text{m}$. Pycnidia not seen. Thallus (microscope section) C-, K-, KC-, Pd- (lichen products not detected by TLC). **BLS 1788.**

On consolidated spoil and metal-rich turf of disused mines, and eroding banks of metal-polluted river shingle. Usually in association with *Vezdaea* spp. and *Baeomyces placophyllus*; rare. Wales (Cardiganshire) & England (Devon).

Similar to *Placynthiella uliginosa* which also has a subgelatinous thallus; the K+ purple-violet hypothecium in *P. hyporhoda* is diagnostic.



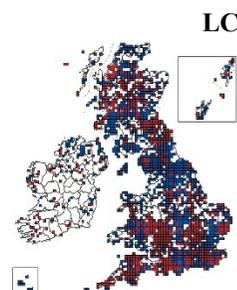
Placynthiella icmalea (Ach.) Coppins & P. James (1984)

Thallus of isidiate to minutely coralloid goniocysts, black-brown to red-brown, \pm shining, $25\text{--}150$ ($\text{--}200$) μm tall and $25\text{--}50 \mu\text{m}$ diam., closely packed or sometimes scattered, effuse. Apothecia mostly $0.2\text{--}0.6$ mm diam., often absent, usually scattered when present, rarely crowded and confluent, usually with a distinct and often paler true exciple. Ascospores $8\text{--}12 \times 4\text{--}5 \mu\text{m}$. Pycnidia not seen. Thallus (microscope section) C+ red, K-, KC+ red, Pd- (gyrophoric, lecanoric and 5-*O*-methylhiascic acids). **BLS 0732.**

In a wide range of acidic habitats, occurring on dead bark and wood of fallen trees, stumps, rotting fence- posts, plant debris, tree roots, \pm horizontal branches, shaded siliceous rocks and humus-rich soils. With *Trapeliopsis granulosa*, a primary colonizer of heathland following burning; often abundant, sometimes dominant. Throughout Britain and Ireland.

Easily noticed when forming a wide-spreading brown isidiate crust, but often occurs as less conspicuous small scattered sterile clusters of coralloid goniocysts amongst other lichens, including *Placynthiella uliginosa*. *P. dasaea* is somewhat similar but has soredia and does not have 5-*O*-methylhiascic acid. Can be confused with *Lambiella furvella* (Xylographaceae).

Trichonectria hirta (A. Bloxam) Petch has been recorded on this host.



Placynthiella oligotropa (J.R. Laundon) Coppins & P. James (1984)

Thallus coarsely granular-verrucose; goniocysts brown, $0.1\text{--}0.3$ mm diam., \pm contiguous or dispersed, becoming yellowish when wet; soredia absent. Apothecia $0.2\text{--}0.5$ mm diam., brownish black, at first flat with an \pm elevated true exciple, occasionally becoming convex and immarginate, surface rugose-roughened, matt; exciple deep red-brown, extending into a concolorous hypothecium; epithecium $10\text{--}15 \mu\text{m}$, red-brown, granular; hymenium $55\text{--}60 \mu\text{m}$ tall, colourless or pale reddish brown. Ascospores $10\text{--}14 \times 4.5\text{--}6 \mu\text{m}$. Pycnidia \pm globose, $80\text{--}100 \mu\text{m}$ diam.; conidia cylindrical, $3.8\text{--}4.8 \times 0.8\text{--}1.2 \mu\text{m}$. Thallus (microscope section) C-, K-, KC-, Pd- (lichen products not detected by TLC). **BLS 0756.**

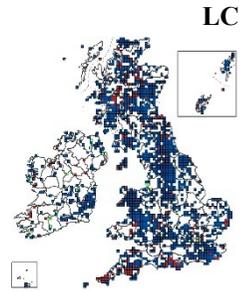
On peaty soil and well-rotted lignum in open heathlands and woodland clearings, often around old stumps, but never on bark; local. Scattered throughout Britain and Ireland, perhaps more frequent in E. & S.E. England. Probably under-recorded.



Distinguished from other species in the genus by the larger goniocysts which become noticeably more prominent and yellowish when wet, and can be near impossible to spot when dry.

Placynthiella uliginosa (Schrad.) Coppins & P. James (1984)

Thallus of low, rounded goniocysts 25–100 µm diam., black-brown, never markedly vertically elongated or branched, often minutely wrinkled when dry (×50 lens), dark green to dark brown, ± gelatinous when wet. Apothecia 0.12–0.3 (–0.4) mm diam., always abundant, often coalescing, pinkish to dark reddish brown (rarely blackish); true exciple present when young, usually soon disappearing as the apothecium becomes convex; hypothecium fuscous, reddish brown in K. Ascospores 9–14 (–16.5) × (4–) 5–6 (–7) µm. Pycnidia ± globose, 80–100 µm diam.; conidia 3.8–4.8 × 0.8–1.2 µm. Thallus (microscope section) C–, K–, KC–, Pd– (lichen products not detected by TLC). **BLS 0788.**



On peaty heathland soils, dead bark and wood of fallen trees and stumps, occasionally on bare sandy soil in conifer plantations and stable acid dunes; frequent. Throughout Britain and Ireland.

Characterized by the C– subgelatinous non-coralloid granular thallus and the numerous concolorous, soon convex apothecia. It is less common than *Placynthiella icmalea*. *P. uliginosa* could be confused with *Micarea turfosa* macroscopically and is similar to *Gregorella humida* which has a blue-green photobiont and larger ascospores.

Epigloea urosperma Döbbele has been found on this host in N. Devon.

RIMULARIA Nyl. (1868)

Thallus crustose, superficial, thin, continuous, subareolate to distinctly areolate, reddish or yellowish brown to dark olivaceous brown or white, epinecral layer present. **Photobiont** chlorococcoid. **Ascomata** apothecia, immersed to sessile, flat to convex, black; disc umbonate or gyrose. **Thalline margin** absent. **True exciple** persistent, often contorted to gyrose, black. **Epithecium** pale to dark brown or olivaceous. **Hymenium** I+ blue; hyaline below, brown above, the paraphyses thin, richly branched and anastomosed, septate; apices pigmented but not swollen. **Hypothecium** dark-brown to black, continuous with the true exciple, K–. **Asci** 8-spored, cylindrical-clavate, *Rimularia*-type. **Ascospores** ellipsoidal to globose, aseptate, smooth- and thin-walled, initially colourless but becoming brown before dehiscence; perispore absent. **Conidiomata** pycnidia, immersed. **Conidia** bacilliform, aseptate, colourless. **Chemistry:** norstictic, stictic and gyrophoric acids and accessories, unidentified UV+ pink compound. **Ecology:** on upland siliceous rocks, soil, mosses, wood and bark and on other lichens.

Distinguished by the richly branched and anastomosed paraphyses, the thick-walled asci with a distinctive iodine reaction at the apex (K/I+ blue tholus tube and flank) and the large, finally brown, ascospores, as well as the umbonate to gyrose apothecia which lack a thalline margin. In *Porpidia* the tholus flank is K/I–. Brown-spored *Fuscidea* species (e.g. *F. kochiana*) have an ascus structure without a K/I+ blue apical tube in the tholus.

The genus *Lambiella* was introduced by Hertel (1984) and quickly placed into synonymy with *Rimularia*, but re-established by Spribille *et al.* (2014) and Resl *et al.* (2015) with molecular support. Important morphological features include the apothecia surrounded by a rim-like exciple. The asci of *Lambiella* species are more similar to the *Trapelia*-type, though the difference are subtle and intermediates occur (see Hertel & Rambold 1990, Lumbsch 1997), and thalli that contain depsidones (Resl *et al.* 2015). *Lambiella* species are therefore included in the key to *Rimularia* below.

Literature

Coppins & Kantvilas (2001), Fryday (1999), Hertel & Rambold (1990), Lumbsch (1997), Lumbsch *et al.* (2007), Resl *et al.* (2015), Spribille *et al.* (2014).

Key to species of *Rimularia* and *Lambiella* (Xylographaceae)

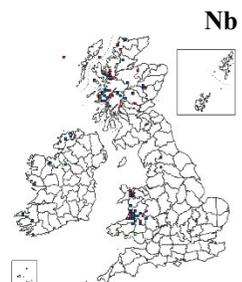
- 1 Discrete punctiform soredia present; on bark *Lambiella fuscosora*
Soredia absent; on rocks, bryophytes or other lichens 2
- 2(1) Thallus C+ red (gyrophoric acid) 3
Thallus C- (gyrophoric acid absent) 5
- 3(2) Thallus dark brown-black, granular or scurfy, effuse with a leprose appearance;
usually lichenicolous *Lambiella furvella*
Thallus pink-brown, smooth; saxicolous 4
- 4(3) Thallus with numerous papillae; usually sterile *intercedens*
Thallus without papillae; usually fertile; apothecia innate, contorted or umbonate *badioatra*
- 5(2) Thallus K+ yellow→red (norstictic acid) 6
Thallus K+ yellow or K- (norstictic acid absent) 7
- 6(5) Overgrowing bryophytes on montane rocks; thallus white, cracked areolate; apothecia round
(except where distorted by compression) with a thick persistent true exciple *Lambiella sphacelata*
On upland and montane, siliceous rocks and boulders; thallus dark grey; apothecia
usually contorted, slit-like *Lambiella mullensis*
- 7(5) Lichenicolous, on *Glaucomaria* (*Lecanora*) *rupicola*; mainly maritime *Lambiella insularis*
Directly on rocks, upland 8
- 8(7) Apothecia 0.5–0.8 mm diam., sessile, true exciple thick and cracked; ascospores
18–30 × 10–18 µm; thallus K- (stictic acid absent) *limborina*
Apothecia 0.2–0.8 mm diam., true exciple thin; ascospores <15 µm long; thallus K+ yellow
(stictic acid) 9
- 9(8) Apothecia innate; ascospores 9–11 × 4.7–7 µm; thallus pale grey, composed of flat
contiguous areoles *Lambiella gyrizans*
Apothecia sessile; ascospores 13–14 × ca 8 µm; thallus brown-grey, composed of granular
areoles on a thin black prothallus *Lambiella globulosa*

Rimularia badioatra (Kremp.) Hertel & Rambold (1990)

Thallus thin, usually small, forming discrete patches, yellowish to pinkish brown or dark brown, cracked- areolate; areoles 0.2–0.5 mm diam.; prothallus dark brown to black. Apothecia immersed, mostly solitary; disc at first punctiform, then widening to 0.2–0.3 mm diam., black, concave to umbonate, not pruinose; hymenium 70–100 µm tall; paraphyses 1–1.5 µm diam., apices to 3 µm diam. Asci 50–70 (–90) × 17–20 µm. Ascospores 10–17 × 7–10 µm. Pycnidia not seen. Thallus C+ red (gyrophoric acid). **BLS 0733.**

On sunny exposed siliceous or ± basic rocks and boulders in humid areas; uncommon. N. England, Wales, W. Scotland, Cairngorms, W. Ireland.

Looks like a tiny pinkish brown *Rhizocarpon* with umbonate apothecia. *R. intercedens* has a more wide-spreading papillate thallus and is usually sterile (see Fryday 1999).



Rimularia intercedens (H. Magn.) Coppins (1993)

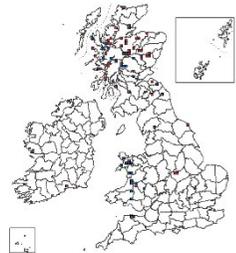
Thallus thin, often widespreading, grey- to pinkish brown, cracked-areolate; prothallus black, often visible between the areoles; areoles mostly 0.2–0.5 mm diam., most with a single, central isidium-like protuberance 50–150 µm in diam. that sometimes becomes detached or abraded to form a yellowish sororium-like structure. Apothecia very rare, similar to *R. badioatra*, but 0.2–0.4 (–0.5) mm diam. and ascospores 19–21 × 10–12 µm. Thallus C+ red (gyrophoric acid). **BLS 1633**.

On sun-exposed, mostly fine-grained siliceous rocks, boulders, pebbles and walls, sea-level to 700 m alt.; local. N. and C. England, throughout Wales and Scotland, S. Ireland.

Easily overlooked, especially when forming small thalli in species-rich mosaics, but readily identified with a hand-lens by the nipple-like papillate areoles. Known fertile at only two sites in N.W. Scotland.

There is a single report of *Phaeospora parasitica* (Lönnr.) Arnold on this host.

Nb

**Rimularia limborina** Nyl. (1868)

Thallus thin, contiguous or verrucose-areolate, sometimes nearly absent, ash to dark grey or chestnut to dark brown to black, matt; prothallus dark, sometimes visible between the areoles; medulla I–; photobiont cells 5–12 µm diam., or some to 14 × 10 µm. Apothecia (0.3–) 0.5–0.8 mm, dispersed or densely distributed, mostly sessile; hymenium 90–150 µm tall. Ascospores (14–) 18–30 (–40) × (5–) 10–18 (–21) µm, ellipsoidal to almost subglobose. Pycnidia 80–100 µm diam., immersed to half-emergent, black; wall dark brown, K–; conidia 3.5–5 × 0.5–1 µm. Thallus C ± pink (± gyrophoric acid). **BLS 0741**.

On siliceous, especially basaltic rocks, in uplands sometimes spreading to ivy from below shaded overhangs. S.W. England (Dartmoor), N.E. England, N. Wales, Scotland, N. and S.W. Ireland.

Characterised by its distinctive gyrose-umbonate apothecia with a thick, cracked exciple.

Nb

**TRAPELIA** Choisy (1929)

Prothallus present or apparently absent. **Thallus** crustose, either arising with a thin entire margin, later cracking, or as discrete areoles which later become crowded or merged into a crust. **Cortex** poorly differentiated, of rounded cells; a thin epinecral layer of cell remains is often present, giving rise to a faint pruina. **Photobiont** chlorococcoid. **Ascomata** apothecia, rounded in outline, immersed in the thallus to sessile, margin thin, inconspicuous, brown in part, without photobiont cells; margin often bearing pale flecks or wefts of thalline material derived from the emergence of the apothecia, or surrounded by a collar of disrupted thallus, these conditions forming a so-called pseudothalline margin; disc light pinkish brown to brown-black, often rough. **Epithecium** brown, K– or K + orange-brown going into solution. **Hypothecium** hyaline to pale brown. **Hamathecium** of paraphyses, branched and anastomosing above, in most species with an ± unthickened apex, rarely with the apex brown and thickened. **Asci** 8-spored, wall K/I+ dilute blue, apical dome without any structures staining in I. **Ascospores** aseptate, hyaline, ellipsoidal, 9–25 µm long. **Conidiomata** pycnidia, immersed in the thallus, unknown in many species. **Conidia** aseptate, colourless, filiform, straight or curved. **Chemistry**: either gyrophoric acid, lecanoric acid and/or 5-O-methylhiassic acid are found in all species.

The genus as circumscribed here is non-monophyletic: *Placopsis* is nested within *Trapelia*, and represents a clade characterised by the acquisition of cephalodia (Resl *et al.* 2015, Schneider *et al.* 2016).

A broad species concept has been in use until recently. Morphological distinctions between the species of *Trapelia* mostly rely on differences in the growth form of the thallus, and are easily obscured by environmental modification. The key below should be used with caution, and photographs and confirmed specimens should be consulted where possible. The relative abundance of gyrophoric acid and 5-*O*-methylhiassic acid can be a useful taxonomic character, but requires TLC in Solvent System C. See also under *Trapeliopsis*, species of which can be difficult to distinguish from those of *Trapelia*.

Literature

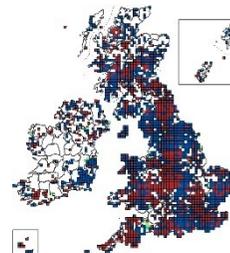
Orange (2018), Purvis *et al.* (2009), Resl *et al.* (2015), Schneider *et al.* (2016).

- | | | |
|------|---|---------------------|
| 1 | On bark or wood, soralia present, ascospores 9–15.5 µm long | <i>corticola</i> |
| | On rock (rarely reported from soil), ascospores 14–24.5 µm | 2 |
| 2(1) | Pycnidia present | <i>sitiens</i> |
| | Thallus without pycnidia..... | 3 |
| 3(2) | Soralia present | 4 |
| | Soralia absent | 5 |
| 4(3) | Thallus extensive, coherent, ± flat, pale pinkish grey | <i>placodioides</i> |
| | Thallus of isolated or aggregated convex areoles, grey to grey-brown | <i>obtegens</i> |
| 5(3) | Thallus thinning to the margin, the margin at most with slightly convex and indistinct areoles, soon coalescing to form an entire or cracked crust, which may be discontinuous in less favourable habitats | 6 |
| | Thallus margin with ± distinct convex areoles which increase in size to form a cracked crust, or thallus of scattered or aggregated plane or convex areoles with an abrupt margin, not gradually thinning | 7 |
| 6(5) | Apothecia sometimes separated from the adjacent thallus by a crack with white-pruinose sides (may be rare or absent in stressed specimens from drier habitats); young apothecia rarely appearing as a white mealy-pruinose convex mound before the appearance of the disc | <i>elacista</i> |
| | Apothecia not separated from the adjacent thallus by a white-pruinose crack, young apothecia often appearing as a white-pruinose convex mound | <i>coarctata</i> |
| | <i>[The differences between these two species are very subtle, and not all specimens can be distinguished by morphology].</i> | |
| 7(5) | Areoles tending to form a coherent thallus; prothallus often visible; apothecia generally <300 µm diam., often regenerating, the healthy disc surrounded by a light brown ring of older tissue; containing 5- <i>O</i> -methylhiassic acid as the major substance | <i>collaris</i> |
| | Areoles often scattered, forming a more extensive thallus only by becoming crowded; apothecia may become larger, only occasionally regenerating; prothallus absent or inconspicuous..... | 8 |
| 8(7) | Areoles strongly convex from early on, sometimes becoming convoluted but not crenate | <i>obtegens</i> |
| | Areoles mostly more or less flat or gently convex, the larger ones tending to be crenate | 9 |
| 9(8) | Areoles relatively large; unimpeded areoles becoming lobed and cracked but recognisable as individuals until up to 700 (–1200) µm diam., thereafter difficult to distinguish from aggregations of separate areoles; areoles sometimes slightly glossy, at least in shade; apothecia often absent or slow to appear; containing 5- <i>O</i> -methylhiassic acid as the major substance | <i>involuta</i> |
| | Areoles relatively small; unimpeded areoles often recognisable as individuals until 200-400 (–700) µm diam.; apothecia appearing early, sometimes on areoles as small as 200 µm diam.; containing gyrophoric acid as the major substance, or both gyrophoric acid and 5- <i>O</i> -methylhiassic acid | <i>glebulosa</i> |

Trapelia coarctata (Sm.) M. Choisy (1932)

LC

Prothallus white, very thin, non-fimbriate, or undifferentiated. Thallus often forming \pm extensive patches, pale greenish grey, matt, weakly to fairly strongly cracked, rarely uncracked, surface usually slightly to moderately uneven, though may be flat in shade, to 160 μm thick; thallus margin with small gently convex poorly delimited areole-like units, these sometimes appearing separate on the prothallus, but mostly coalescing from the start. Apothecia first appearing as white slightly rough or pruinose convex mounds; expanding margin with the outer surface white, faintly roughened, or coarsely pruinose with a 'mealy' appearance (granules *ca* 20 μm diam.); mature apothecia to 600 μm diam., the margin often becoming excluded; disc dark brown to black, slightly rough. Ascospores 14–21 \times 7.5–10.5 μm . Conidiomata not detected. Chemistry: gyrophoric acid (major), 5-*O*-methylhiascic acid (trace); thallus C+ red. **BLS 1431**.



On recently disturbed stones and brick fragments on waste ground or open woodland; few confirmed British records, but the distribution is poorly known due to confusion with the recently resurrected *Trapelia elacista*. The map contains many unconfirmed historical records.

The thallus is usually extensive and cracked, not composed of aggregations of initially discrete areoles. *Trapelia elacista* is very similar and many specimens need sequencing for confirmation. *T. elacista* differs in the following inconstant features: the emerging apothecia may be visible as a white-pruinose disc or mound, but are typically less conspicuous at this stage than in *T. coarctata*; a proportion of the apothecia may be separated from the thallus by a fissure with white-pruinose sides, especially when young; this may be inconspicuous, or may form a conspicuous crater-like depression; the thallus in *T. elacista* is often smoother than in *T. coarctata*.

Lichenicolous fungi on this host are *Lichenochora coarctatae* Hafellner & F. Berger and *Roselliniella microthelia* (Wallr.) Nik. Hoffm. & Hafellner.

Trapelia collaris Orange (2018)

NE

Prothallus present, very thin, appearing as a whitish or brown stain, or undifferentiated. Thallus pale grey to greenish grey (or young areoles brownish grey), often forming a coherent, cracked-areolate crust growing at the margin by extension and cracking of the marginal areoles, but sometimes with areoles in smaller, more scattered groups and forming a larger thallus by growing in diameter and becoming mutually compressed; marginal areoles sometimes slightly elongated or crenate, giving an effigurate effect to the thallus; mature areoles very variable in size, mostly 160–500 (–1000) μm diam., convex or with several convex areas due to coalescence of smaller areoles; the thallus rarely much thickened locally. Apothecia relatively small, to 300 μm diam., occasionally more; when emerging the margin has some whitish thalline tissue, but never conspicuous white flecks; apothecium sometimes surrounded by a low collar of thallus; apothecia often appear to degenerate and frequently a new one is initiated in the centre of the old one, so that the apothecium has a collar of pale brown material of somewhat cartilaginous appearance. Ascospores 16–22 \times 9–12.5 μm . Conidiomata not detected. Chemistry: 5-*O*-methylhiascic acid (major), gyrophoric acid (trace); thallus C+ red. **BLS 2709**.

On siliceous stones in disturbed habitats including tracks, spoil heaps, and montane stone patches, usually where moist from contact with soil; possibly favouring rocks with heavy metals, at least iron; probably frequent, but apparently less so than *Trapelia elacista*, *T. glebulosa* and *T. involuta*. Confirmed reports scattered throughout Wales, Cumbria and N. Ireland (Mountains of Mourne); not known outside of Britain and Ireland.

This species often forms rather extensive, strongly cracked thalli of convex areoles. Sometimes the thallus is apparently a coherent whole, and has a characteristic appearance, but in specimens experiencing drier or otherwise suboptimal conditions, strongly convex and isolated areoles appear to arise on an immersed prothallus, and form a discontinuous thallus. Even in 'coherent' thalli the areoles typically have an abruptly thickening margin, unlike the thin edge or very gently convex 'areoles' of *Trapelia elacista*. The apothecia often remain small, and frequently regenerate from the centre, although this can occur also in other species. *T. glebulosa* has thalli which are typically small and very early fruiting, and a prothallus is not obvious; *T. elacista* can have larger apothecia; non-sorediate morphs of *Trapelia obtegens* differ in the more strongly convex areoles which can become crowded, but which do not form a coherent thallus; in addition, the apothecia can become larger.

Trapelia corticola Coppins & P. James (1984)

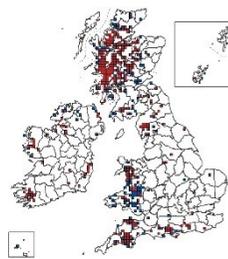
LC

Prothallus occasionally visible as a very thin, pale film. Thallus with young areoles arising on the prothallus, with thin margins, early becoming uneven, coalescing into a thin verrucose-uneven crust with very poorly-delimited subunits *ca* 30–80 μm diam.; thallus light brown in good light, brownish green in shade, occasionally

lightly cracked. Soralia always present, mostly discrete, usually convex, to 500 μm diam., rarely confluent, pale green with a brownish tinge, soredia very fine, *ca* 20 μm diam. Apothecia rare (but easily overlooked in the field), sessile, 220–380 μm diam., margin pale brown, smooth, thin, disc pale brown to dull mid brown, \pm flat, without a pseudothalline margin. Exciple thin, *ca* 20–30 μm thick, brown; hymenium 80–100 μm high. Paraphyses with the apical cells brown, irregularly swollen, to 3.5 μm diam. Ascospores 9–15.5 \times 5–9 μm . Chemistry: gyrophoric acid (the possible presence of 5-*O*-methylhiassic acid has probably not been checked); thallus C+ red. **BLS 1581**.

On acidic bark and wood of trees including *Quercus petraea*, *Alnus glutinosa*, *Betula*, *Larix decidua* and *Picea sitchensis*, usually in humid woodland. Locally frequent in North and West Britain.

Differs from the other European species by the substratum of bark or wood, the smaller ascospores, and the swollen paraphysis apices. It could be mistaken for a species of *Trapeliopsis*, and is included additionally in the key to that genus.



Trapelia elacista (Ach.) Orange (2018)

NE

Prothallus sometimes visible at unimpeded margins, very thin, pale; sometimes undifferentiated. Thallus margin thin, growing outwards, sometimes uneven with low convex areas, but (at least usually) without new areoles arising on the prothallus; rapidly becoming cracked, mature thallus surface flat to slightly uneven, cracks usually numerous, sometimes delimiting discrete secondary areoles; thallus pale grey or pale pinkish grey, at most faintly brownish when young; thallus discontinuous in drier habitats. Apothecia often first visible as a pale pruinose disc, sometimes becoming convex but often beginning to split at the apex before becoming convex; developing margins often white, slightly roughened or pruinose, sometimes irregularly crenulate or with white flecks, often excluded when mature; sometimes a proportion of apothecia are surrounded by a \pm circular fissure with a white-pruinose surface, especially when young, the crack sometimes wide and crater-like; adjacent apothecia sometimes separated by white-pruinose fissures; apothecia variable in size, but to 560 μm (thus relatively large); young apothecia sometimes arising on the degenerating remains of a previous one. Ascospores 14–24.5 \times 8–12.5 μm . Conidiomata not detected. Chemistry: gyrophoric acid (major), 5-*O*-methylhiassic acid (trace). **BLS 2710**.

On recently exposed siliceous stones and rock surfaces, including regularly inundated stream margins, beside tracks, on spoil heaps and on low, ruined walls; typically on surfaces moist from inundation or contact with soil. Probably widespread and frequent in Britain and Ireland.

This species is very similar to *Trapelia coarctata* (see under that species) and has been included within it until recently. The thallus may form conspicuous pale patches in moist places, but thalli in drier habitats may be discontinuous and more difficult to identify. The species comprises two clades which appear to be morphologically indistinguishable.

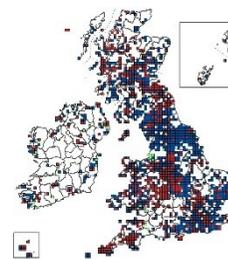
Trapelia glebulosa (Sm.) J.R. Laundon (2005)

LC

Prothallus inconspicuous. Thallus of areoles, these arising singly, \pm flat or slightly convex, 200–400 (–700) μm diam., the largest areoles sometimes only *ca* 200 μm diam. in small specimens; greenish grey to brownish grey, matt, entire or crenulate, when old sometimes cracking into secondary areoles, and sometimes aggregated to form a small \pm effigurate thallus to 2 mm diam. Apothecia always present, appearing very early, sometimes on areoles no larger than 200 μm diam., the margin with stretched pale thalline material, or with a few irregular teeth of thalline material; mature apothecia to 460 (–600) μm diam., sessile and without thalline material visible from above, or retaining a rim of thalline material (sometimes the only visible remains of the whole areole); disc light pinkish brown (in shade) to brown or black. Ascospores 17–24.5 \times 8.5–10.5 μm . Conidiomata not detected. Chemistry: gyrophoric acid (major), 5-*O*-methylhiassic acid (minor or trace); thallus C+ red. **BLS 2713**. [NB: **BLS 1432** is used for *T. glebulosa* s. lat., records of which will include many of *T. involuta*. The attached map is for *T. glebulosa* s. lat.]

On siliceous rock and brick; a colonist of small stones and other recently exposed surfaces, often restricted to stones lying on soil and thus experiencing prolonged moisture. Probably widespread in Great Britain and Ireland, but records (and dots on the map) need re-examination.

The thallus is typically small, there is no prothallus, and apothecia are produced very early. This has been confused with *Trapelia involuta* which has larger areoles which are slower to fruit, and are often found sterile.



The two species are usually easily distinguished, but they do overlap in size; TLC would allow separation of difficult specimens.

Trapelia involuta (Taylor) Hertel (1973)

LC

Prothallus undifferentiated. Thallus of areoles which arise singly; when unimpeded these growing radially, or later mainly in one direction, becoming lobed and later usually developing cracks; singly-growing areoles retaining their individuality until 700 (–1600) μm diam., thereafter difficult to distinguish from possible aggregations of areoles; areoles \pm flat, not much thickening with age, pale grey (especially in shade) to brownish grey, slightly glossy to matt, the margin sometimes slightly raised from the substratum; crowded areoles often remaining small and forming aggregations of mutually-impeded, gently-convex areoles 200–600 μm diam.; some thalli eventually forming a thick crust of overlapping areoles to 600 μm thick, the primary areoles indistinguishable, and the crust cracked into secondary areoles. Apothecia often sparse or absent; at first apparent as a convex pruinose-scurfy mound, soon sessile, expanding margin with a white scurfy-pruinose covering; when mature to 900 μm diam., the margin brown or grey-brown or white-pruinose; disc light pinkish brown to black, \pm rough. Ascospores 19–24.5 \times 9–12.5 μm . Conidiomata not detected. Chemistry. 5-*O*-methylhiascic acid (major), gyrophoric acid (trace); thallus C+ red. **BLS 2711**.



On recently exposed siliceous rock or on brick, on small stones in disturbed places, boulders, bedrock and walls, tolerant of some shade. Widespread in Britain and Ireland (substantially more so than the map indicates), but the distribution remains uncertain due to confusion with *T. glebulosa*. Most records will be included in the map for *T. glebulosa* s. lat. – see above.

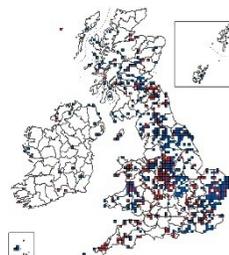
Distinguished by the large \pm flat crenate subsquamulose areoles, which are sometimes slightly glossy, especially in shade; a prothallus is absent. The species has not been distinguished from *Trapelia glebulosa* by recent authors, but that species differs in the smaller thallus and areoles, which rapidly become fertile, and in the different chemistry. The two species are closely related, but there are consistent differences in morphology and chemistry.

An unidentified *Polycoccum* sp. has been collected on this host from N.E. Scotland; it has spores 17–22 \times 6.5–7 μm in size.

Trapelia obtegens (Th. Fr.) Hertel (1970)

LC

Prothallus undifferentiated. Thallus of areoles with abrupt margins, often scattered, strongly convex, sometimes more flattened later, with a \pm round outline or becoming slightly lobed, green-grey to normally pale brownish grey to dull grey-brown, to 720 μm diam. but often much smaller; soralia either absent or sparse, or abundant; when soralia are abundant, the areoles are dissolved into soralia early on, and corticate areoles are inconspicuous. Apothecia frequent, even in sorediate morphs, to 700 μm diam.; young thalline margins often with pale stretched thalline remains; disc pinkish brown to brown-black, rough. Ascospores 17–23 \times 8.5–12.5 μm . Conidiomata not detected. Chemistry: gyrophoric acid (major), 5-*O*-methylhiascic acid (trace); thallus C+ red. **BLS 1434**.



On siliceous rock in a wide variety of habitats, the non-sorediate morph is frequent in upland situations on bedrock and boulders where there is recently exposed rock. Both sorediate and non-sorediate morphs are on stones in scree and on disturbed ground; frequent.

In recent years this species has been regarded as exclusively sorediate, but there is also a non-sorediate morph which has probably been confused with other species. This morph can usually be distinguished from other species by the scattered or loosely aggregated, often strongly convex, often brownish areoles. Variation in the species needs more study.

Trapelia placodioides Coppins & P. James (1984)

LC

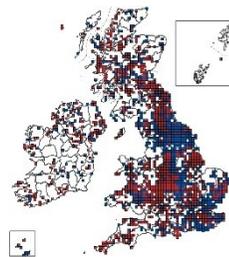
Prothallus sometimes visible, whitish. Thallus thin or somewhat abruptly thickened at the margin, the margin entire or divided by cracks, no primary areoles visible, the thallus forming a cracked crust, well-developed, 50–400 μm thick, pale pinkish grey, the surface flat, matt, slightly pruinose. Soralia nearly always present, on the upper surface of secondary areoles, usually originating at the areole margins, flat, pale green to pale greenish brown, irregular in shape, remaining limited in size and not obscuring the thallus. Apothecia very rare, to 500

μm diam., surrounded by a thick ring of finely cracked thalline material. Ascospores $14\text{--}24 \times 8\text{--}12 \mu\text{m}$. Conidiomata not seen. Chemistry: gyrophoric acid; thallus C+ red. **BLS 1595.**

On moist stones, stonework and on flushed or poorly drained bedrock, frequent, throughout Britain and Ireland.

Easily recognised by the pale cracked widely-spreading thallus with finely farinose soralia. Very rare fertile morphs differ from *Trapelia coarctata* and *T. elacista* in the often abrupt thallus margin, and at least some very small soralia are present.

Host to *Polycoccum minutulum* Kocourk. & F. Berger and *Roselliniella microthelia* (Wallr.) Nik. Hoffm. & Hafellner. An unidentified, lichenicolous species of *Buellia* has been collected on this host from N.E. England (Durham); it lacks a discernible thallus and has spores $11\text{--}15 \times 6\text{--}7 \mu\text{m}$ in size.



Trapelia sitiens Orange (2018)

NE

Prothallus not seen. Thallus diffuse, continuous or discontinuous, thin at the margin; thin to locally well-developed, cracked, sometimes into discrete secondary areoles, very pale pinkish grey, matt, faintly pruinose in places. Apothecia when emerging with the margin covered by thallus material, becoming very irregularly toothed, disc appearing early; sessile when mature, to $600 \mu\text{m}$ diam., pseudothalline margin often forming a ring around the disc, concolorous with the thallus, often excluded later; disc \pm flat or slightly concave, brown to black, rough. Hypothecium colourless; hymenium *ca* $160 \mu\text{m}$ high. Ascospores $16.5\text{--}19.5 \times 8\text{--}14 \mu\text{m}$, 1.3–2.2 times as long as wide. Pycnidia immersed, appearing as grey dots or in short lines, $60\text{--}100 \times 60\text{--}80 \mu\text{m}$; conidia $12.5\text{--}20.5 \times \text{ca } 0.8 \mu\text{m}$, straight to strongly curved. Chemistry: 5-*O*-methylhiassic acid (major), gyrophoric acid (minor); thallus C+ red. **BLS 2728.**

Known from a single site on stone in scree, Cumbria.

Differs from the other species in the presence of pycnidia; similar to *T. coarctata* but with a thinner thallus and different chemistry. Known elsewhere only from the Falkland Isles; the description above is derived primarily from that material.

TRAPELIOPSIS Hertel & Gotth. Schneid. (1980)

Thallus granular, or squamulose to small-foliose. Upper cortex of entangled hyphae only present in representatives with distinctly squamulose thalli. **Photobiont** chlorococcoid (including *Chlorella* and *Pseudochlorella*); at least partly in clusters of 2–4 daughter cells resulting from binary fission, often not round but asymmetrical with one flattened side. **Ascomata** apothecia, yellow-brown to almost black, constricted at the base, appressed, disc-like from the start which expands without splitting. **Thalline margin** pronounced or absent. **True exciple** of colourless hyphae, the gel matrix occasionally weakly pigmented, never dark brown. **Hamathecium** of paraphyses, delicate, branched and anastomosed, usually colourless throughout and never with abruptly swollen apices, although in some species their upper parts and epithecium may appear slightly swollen due to an external coating of pigment. **Asci** 8-spored, clavate-cylindrical, thin-walled; apical dome not or weakly K/I+ blue, \pm *Trapelia*-type. **Ascospores** aseptate, colourless, smooth, ellipsoidal, without a thickened perispore. **Conidiomata** pycnidia, immersed. **Conidia** cylindrical to filiform. **Chemistry**: gyrophoric and traces of lecanoric acid often present. **Ecology**: on siliceous rocks, wood and soil.

Phylogenetically distinct from *Trapelia*, though sterile specimens often cannot be definitely referred to either genus. *Placynthiella* has a true exciple of brown-walled pseudoparenchymatous cells and paraphyses with irregularly capitate apices, each crowned with a dark brown apical cap.

Literature

Aptroot & Schumm (2012), Coppins & James (1984), Lumbsch *et al.* (2007), Palice & Printzen (2004), Purvis & Smith (2009), Resl *et al.* (2015).

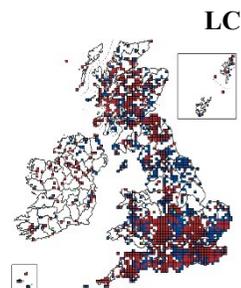
- 1 Thallus and/or soralia C+ red 2
Thallus and/or soralia C- 7
- 2(1) Thallus squamulose with marginal lobes and clusters of coarse, irregular isidium-like protuberances *walrothii*
Thallus not squamulose, but marginal areoles occasionally flattened and effigurate; usually sorediate and never with coarse isidium-like protuberances 3
- 3(2) Thallus of inconspicuous ± scattered dull green to green-brown areoles; soralia punctiform and neatly convex, greenish buff to buff, 0.15–0.25 (–0.4) mm diam., appearing pale on the darker thallus; on bark (occasionally decorticated trunks) or over mosses on bark..... *Trapelia corticola*
Thallus greenish grey to grey-green, white to pale grey or blue-grey, granular; soralia typically >0.20 mm and to at least 0.4 mm diam., less neatly convex and sometimes becoming confluent; mostly on soil or rotten lignum, occasionally on bark or shaded siliceous rocks 4
- 4(3) Thallus with irregular patches of orange-red, K+ purple pigment *pseudogranulosa*
Thallus without orange-red patches, all parts K- 5
- 5(4) Thallus of coherent minutely granular areoles (mostly <0.1 mm diam.) which are never effigurate; soralia effuse from the beginning or becoming confluent and giving the thallus a leprose appearance; apothecia immarginate from the beginning; on decaying trunks and stumps of large trees *viridescens*
Thallus of granular to verrucose areoles (mostly >0.1 mm diam.); soralia at first ± discrete, but occasionally becoming confluent; apothecia distinctly marginate, at least when young; substrata various 6
- 6(5) Thallus of granular areoles 80–250 µm diam., with scattered marginal areoles to 0.4 mm diam.; soralia 0.2–0.4 mm diam., farinose to finely granular, ± aeruginose; apothecia flat to slightly convex with hymenium 40–50 µm tall; ascospores 7–9.5 × 2.5–4 µm; on lignum, more rarely on bark or siliceous rocks..... *flexuosa*
Thallus of granular to verrucose areoles 120–500 µm diam., without scattered marginal areoles; soralia 0.3–0.6 mm diam., usually irregular and granular, whitish to cream-yellow (sometimes few or absent); apothecia occasionally tuberculose, hymenium 70–80 µm tall; ascospores 9–14 × 4–6 µm; on acid soils, moribund bryophytes and decayed lignum, more rarely on shaded rocks *granulosa*
- 7(1) Thallus squamulose, squamules with ascending, usually sorediate apices *glaucolepidea*
Thallus crustose, minutely verrucose or granular; sorediate or not *gelatinosa*

Trapeliopsis flexuosa (Fr.) Coppins & P. James (1984)

Thallus greenish grey to grey-green or white to dark blue-grey, of scattered to crowded, uneven granular areoles; areoles 80–250 µm diam., but scattered or marginal areoles often ± flattened and effigurate and up to 400 µm diam.; soralia 200–400 µm diam., at first discrete, sometimes becoming confluent; soredia farinose to finely granular, grey-green to dark blue-green. Apothecia 0.2–0.7 mm diam., dark green-grey to green-black, rarely pale or pinkish (in extreme shade), flat to slightly convex; hymenium 40–50 µm tall; asci 30–50 µm in length. Ascospores 7–9.5 × 2.5–4 µm. Thallus C+ red, K-, KC+ red, Pd-, UV+ whitish (gyrophoric acid). **BLS 0692.**

Mostly on wood, also on acid bark, siliceous rocks and shaded humus; often abundant though sterile. Throughout Britain and Ireland.

Resembles *Trapeliopsis granulosa* which has larger ascospores and also grows on soil and rotting wood. Diminutive morphs can resemble *Micarea coppinsii* which has smaller algal cells.



Trapeliopsis gelatinosa (Flörke) Coppins & P. James (1984)

LC

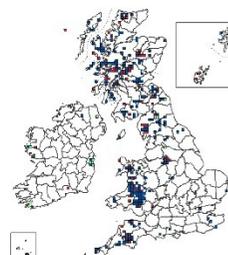
Trapeliopsis aeneofusca (Flörke ex Flot.) Coppins & P. James (1984)

Thallus thin and membranous, or minutely granular, dark green-brown to green-grey, without or often (especially when sterile or sparingly fertile) with pale green soralia, at first *ca* 0.2–0.7 mm diam., but often becoming very conspicuous, irregular and confluent. Apothecia 0.2–1 (–1.6) mm diam., appressed; exciple excluded or as a thin pale rim not exceeding the level of the disc, dark green-grey to grey-black or rarely pale to red-brown; epithecium pigment N+ green intensifying, K+ brown, rarely ± absent. Ascospores 8–14 × 4.5–6 µm. Thallus C–, K–, KC–, Pd–, UV–. The pale green colour of the soralia is in marked contrast with the darker thallus; occasionally no soralia are present on richly fertile thalli. **BLS 0726.**

On shaded peaty or clay soil, mainly in banks or cuttings with overhanging herbs or small shrubs; rather local, especially in upland districts, much overlooked on wood banks on acid soil in the lowlands. Throughout Britain and Ireland.

Trapeliopsis aeneofusca is a rare morph of *T. gelatinosa* that lacks green epithecial pigment, as suspected by Purvis & Smith (2009) and confirmed using molecular methods by Resl *et al.* (2015).

Often parasitized by the host-specific *Bachmanniomyces varius* (Coppins, Rambold & Triebel) Diederich & Pino-Bodas (*syn. Phaeopyxis varia*).

**Trapeliopsis glaucolepidea** (Nyl.) Gotth. Schneid. (1980)

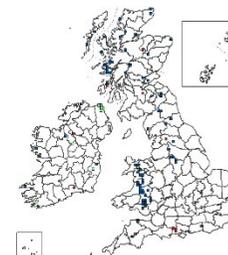
Nb

Trapeliopsis percrenata (Nyl.) Gotth. Schneid. (1980)

Thallus squamulose; squamules scattered or contiguous, (0.3–) 0.7–2.5 mm diam. with ascending, usually sorediate apices, grey-white to glaucous-grey, mostly with pale grey or greenish grey lip-shaped to ± capitate soralia. Apothecia 1.0–2.5 mm diam., sessile, at first flat and with the exciple ± distinct, later becoming convex and the exciple excluded; disc pale dull grey to dark grey, or dull reddish brown, margin often paler. Ascospores 8–11 × 4–5 µm. Thallus and soralia C–, K–, KC–, Pd–, UV± glaucous (unidentified UV+ substance). **BLS 1435.**

On bare peaty turf and edge of peat hags, or on shaded moist rotting wood of fallen trunks and tops of old fence posts; rarely on old ant hills on moorlands; local and probably much under-recorded in uplands, probably very rare in the lowlands. Scattered throughout Britain and Ireland.

Resembles a diminutive *Hypogymnia physodes* or small *Cladonia* squamules when on peaty soil. On rotten wood, it may be accompanied by *Placynthiella icmalea*. *Trapeliopsis percrenata* was distinguished by smaller squamules and soralia that may be ± capitate, but Palice & Printzen (2004) and Resl *et al.* (2015) found that the two taxa are conspecific.

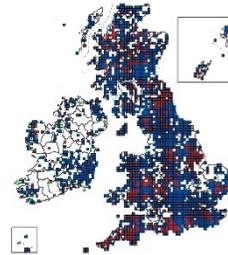
**Trapeliopsis granulosa** (Hoffm.) Lumbsch (1983)

LC

Thallus in small patches or coalescing to form more extensive patches, usually white to pale grey, sometimes in part pink, more rarely green-grey; of crowded granular to verrucose areoles, 0.12–0.5 mm diam., effigurate and less often flattened when scattered or at the edge of the thallus; soralia 0.3–0.6 mm diam., irregular and granular, whitish to cream-yellow, sometimes tinged grey-green, sometimes very few or absent. Apothecia frequent, 0.3–1 (–1.5) mm diam., at first flat but often becoming convex and the exciple ± excluded, occasionally tuberculose and to 1.7 mm diam., very variable in colour, pale pink to reddish brown or pale to dark green-grey, very often a piebald mixture of these hues; hymenium 70–80 µm tall; epithecium pale to greenish. Ascospores 9–14 × 4–6 µm, a few occasionally becoming 1-septate. Thallus C+ red, K–, KC+ red, Pd–, UV+ whitish (gyrophoric acid). **BLS 0727.**

Usually on acid soils, moribund bryophytes or plant debris and on dry well-lit wood, more rarely on shaded acid rocks; common. Throughout Britain and Ireland.

A primary colonizer of recently burnt heathland, often with *Placynthiella icmalea*. Thalli which lack soralia are often richly fertile; on sorediate thalli, apothecia are normally more sparse. Resembles *Trapeliopsis flexuosa* which has smaller ascospores. More data are required, but according to Resl *et al.* (2015) the species may be polyphyletic, and a sequence from *T. pseudogranulosa* (see below) clustered within the complex.

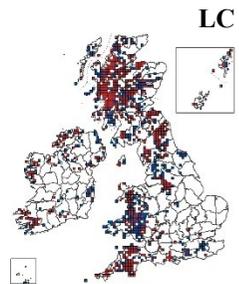


Trapeliopsis pseudogranulosa Coppins & P. James (1984)

Thallus effuse, often wide-spreading and forming large patches to 20 cm diam., grey- or green-white, in part patchily orange-pigmented, K⁺ purple, of granular areoles that soon coalesce forming a faintly cracked granular crust; areoles mostly 40–200 µm diam. Soralia mostly 0.2–1.6 mm diam., green-white, in part orange-pigmented, at first convex and discrete, later coalescing and forming coarse, irregular patches; soredia 18–25 µm diam., farinose. Apothecia very rare in our region, 0.4–1 (–1.6) mm diam., rare, ± appressed, flat with a shallow, wavy true exciple; disc green-grey to grey-black. Ascospores 10–12.5 × 3.5–6 µm. Thallus, soralia and apothecia C⁺ red, Pd[–], UV[–]; orange pigmented areas of thallus and soralia K⁺ purple, UV[±] deep orange-red (gyrophoric acid and an unidentified anthraquinone). **BLS 1582.**

On various humid sheltered acidic substrata, especially peat or over decaying bryophytes, rotting wood and plant debris, often in old woodlands; frequent. Throughout Britain and Ireland, commonest in the north and west.

Characterized by the minutely granular thallus, rather large farinose C⁺ red soralia and irregular, patchy orange coloration reacting K⁺ purple.

**Trapeliopsis viridescens** (Schrad.) Coppins & P. James (1984)

Thallus of coherent minutely granular white, pale grey or pale green areoles, mostly to 0.1 mm diam., which are never effigurate. Soralia pale green, irregular and soon confluent (or soralia effuse from the beginning), often giving the thallus a leprose appearance. Apothecia 0.2–0.6 mm diam., or tuberculate and to ca 1 mm diam., green-black or black, flat to convex; exciple inconspicuous. Ascospores 9–12 × 4–5 µm. Thallus C⁺ red, KC⁺ red, Pd[–], UV[±] whitish (gyrophoric + unknown substances). **BLS 0792.**

On decaying trunks and stumps of veteran trees; very rare. Very occasional in S. and W. Scotland, old records from Yorkshire and Devon.

Sometimes difficult to distinguish from *Trapeliopsis granulosa*; that species tends to have larger thallus granules and the apothecia have a distinct excipular margin, at least when young.

**Trapeliopsis wallrothii** (Flörke ex Spreng.) Hertel & Gotth. Schneid. (1980)

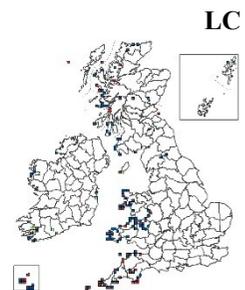
Thallus closely appressed, distinctly but unevenly scattered or crowded-squamulose, ± effigurate, with ± distinct short flat to convex marginal lobes, mostly 0.5–1.6 mm wide and 0.1–0.3 mm thick, whitish or pale grey; often with scattered clusters of coarse, irregular isidium-like protuberances which, following abrasion, leave small circular scars, 0.5–1 mm diam. Apothecia mostly 1–2 mm diam., often absent, with a pink-brown to dull green-grey, often faintly pruinose disc and flexuose, persistent, paler exciple. Ascospores 8–14 × 4–5 µm. Thallus C⁺ red, K[–], KC⁺ red, Pd[–], UV⁺ whitish (gyrophoric acid). **BLS 1437.**

On well-drained soil and turf, usually amongst low protruding rocks, earth banks and walls, exposed to the sun; local. W. coastal districts of Britain and Ireland, very rare inland.

Distinguished by the ± scattered, occasionally somewhat weakly radiate, pale areoles and the coarse clusters of irregular elongate isidia. Sometimes the thallus forms a compact uneven ± continuous warted crust which is abundantly fertile. Robust morphs of *Trapelia involuta* are sometimes similar but the lobes are narrower, usually more convex and the apothecia have a white thalline rim and longer spores, 15–26 × 7–12 µm.

Aptroot & Schumm (2012) described *Trapeliopsis gymniata* from compacted soils in Macaronesia; it could possibly occur in Britain and Ireland. It differs by softer, more clustered and partly decorticated isidia, which cannot be hand-sectioned without crumbling.

An unidentified species of *Polycoccum* has been collected on this host from Ardnamurchan Point (Westernness).



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