Revisions of British and Irish Lichens

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Miscellaneous Pertusariales

Cover image: *Icmadophila ericetorum*, on peaty soil, Glen Quoich, VC92 S Aberdeenshire, 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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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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Revisions of British and Irish Lichens **vol. 51**

Miscellaneous Pertusariales

including *Agyrium* (Agyriaceae), *Coccotrema* (Coccotremataceae), *Dibaeis*, *Icmadophila*, *Siphula* and *Thamnolia* (Icmadophilaceae), and *Microcalicium* (Microcaliciaceae)

by

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AGYRIACEAE Corda (1838)

The family contains only the single genus *Agyrium*, so the description below constitutes that of the family. Molecular work by Lumbsch *et* al. (2007) and Schmitt *et al.* (2010, 2012) demonstrated that the genus belonged in the *Pertusariales*, and Hodkinson & Lendemer (2011) preferred that ordinal name over Agyriales which was published before. Kraichak *et al.* (2018) found a sister relationship between the Agyriaceae and Miltideaceae (the latter not represented in our region) and placed the families in synonymy, but that arrangement was not favoured by Baral (2023).

Literature:
Baral (2023), Hodkinson & Lendemer (2011), Kraichak *et al.* (2018), Lumbsch *et al.* (2007), Schmitt *et al.* (2010, 2012).

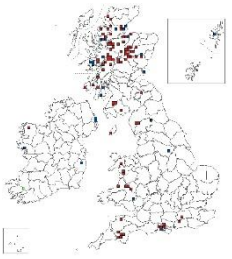
AGYRIUM Fr. (1822)

Thallus non-lichenized, usually immersed within the substratum but often showing as a pale whitish or yellowish stain. **Photobiont** absent. **Ascomata** apothecia. **Thalline margin** absent. **Exciple** poorly developed, annulate, composed of richly branched and anastomosing hyphae. **Epithecium** pinkish to red-brown, non-granular; pigmentation K+ dissolving. **Hymenium** I+ pale blue. **Hypothecium** colourless to pale straw. **Hamathecium** of paraphyses, richly branched, anastomosing, entangled especially towards the slender and slightly swollen apices. **Asci** 8-spored, cylindric-clavate, the outer wall K/I+ pale blue, apical dome K/I–, or weakly K/I+ blue, *Trapelia*-type. **Ascospores** colourless, aseptate, ellipsoidal, without a perispore. **Conidiomata** unknown. **Chemistry**: lichen products not detected by TLC. **Ecology**: on lignum and bark.

Ptychographa (Xylographaceae) differs in the black apothecia with a wide, very dark exciple and the hymenium which is divided into several parallel sections. *Xylographa* differs in having pale to dark brown apothecia (without an orange tinge) and a better developed, usually raised, margin (exciple).

Literature:
Baral (2023), Dobson *et al.* (2009).

Agyrium rufum (Pers.) Fr. (1822) **LC**



Apothecia 0.2–1 mm diam., discrete, rounded or broadly elliptical in outline along the grain of the substratum, sessile, ± gelatinous when wet; disc flat to convex, emarginate or with an indistinct, concolorous margin, slightly roughened or warted, pale orange to orange-brown; hymenium 85–90 µm tall. Asci 70–80 × 10–12 µm, clavate, the apex broadly rounded, rather thick-walled. Ascospores 10–15 × 6–8 µm, ellipsoidal, aseptate, biseriately arranged, colourless, often with a large central oil drop. **BLS 1611**.

On lignum, rarely on bark, most frequent on *Pinus* and *Calluna*; probably overlooked. Most common in N. Scotland, also occurs in Ireland, Wales and England (Dartmoor, New Forest).

Evidently not lichenized but clusters of chlorococcoid algae surrounded by hyphae of the fungus are occasionally present. The recently recognized *A. roseum* (Baral 2023) has pinkish-purple apothecia and narrower ascospores; it could well be found in our region.

COCCOTREMATACEAE Henssen ex J.C. David & D. Hawksw. (1991)

Thallus crustose or lobate, sometimes becoming ± foliose; usually with cephalodia. **Ascomata** sessile or immersed in thalline warts, originating as cavities within the primordium, opening by a pore, often perithecium-like. **Hamathecium** of apical and basal paraphyses, the basal paraphyses sometimes evanescent. **Hymenium** I–. **Asci** short, cylindrical, the wall not multilayered, the apex thickened and staining blue in iodine, apparently dehiscing by an apical split. **Ascospores** large, aseptate, colourless, thin-walled. **Anamorphs** pycnidial, with bacilliform conidia.

Three genera are included in this family by Lücking *et al*. (2017), the type genus *Coccotrema*, *Gyalectaria* which has sunken apothecia with ± exposed discs and the sterile foliose to fruticose *Parasiphula*. Neither *Gyalectaria* or *Parasiphula* are known from Britain & Ireland. Indications are that the Coccotremataceae forms a sister group to the Icmadophilaceae, within the Pertusariales (Kraichak *et al*. (2018).

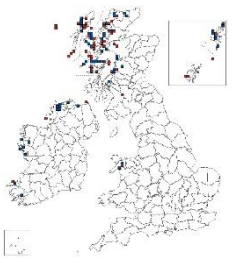
COCCOTREMA Müll. Arg. (1888)

Thallus crustose, granular-verrucose, rarely nodular or minutely fruticose, when crustose with a pale, ± conspicuous prothallus. **Soredia** or **isidia** sometimes present. **Cephalodia** usually present, laminal, containing *Nostoc* or *Stigonema*. **Photobiont** green, ?*Myrmecia*. **Ascomata** apothecia, but immersed and appearing perithecial, ± globose, within thalline warts with a central ostiole. **Exciple** pale, semi-translucent in section. **Hamathecium** of paraphyses, thin, usually branched and anastomosed; periphysoids also present. **Asci** 4- to 8-spored; walls thin, sometimes evanescent. **Ascospores** aseptate, colourless, with a uniformly thickened, non-layered wall. **Conidiomata** pycnidia, in small, pale thalline warts; wall pale. **Conidia** short, bacilliform. **Chemistry**: stictic acid complex. **Ecology**: usually on bark or rock, less often on soil or overgrowing mosses.

This genus, only fairly recently recorded for Europe, was formerly allied to *Pertusaria* by some authors. However, the perithecium-like ascomata, the presence of periphysoids and cephalodia, and the thin-walled spores do not indicate a close relationship with that genus. Only a single species is known from our area.

Literature:
Brodo (1973), Gilbert & James (2009), Kraichak *et al*. (2018), Lücking *et al*. (2017), Schmitt *et al*. (2010).

Coccotrema citrinescens P. James & Coppins (1992) **Nb**



Thallus wide-spreading, thin to rather thick, smooth to unevenly verrucose, occasionally ± granular, continuous or ± irregularly and unevenly cracked-areolate, pale green-grey, at times with a ± well-developed pale grey filmy prothallus; soralia 0.5–1 mm diam., numerous, at first punctiform, bursting from low nodular elevations on areoles, remaining discrete or becoming ± efflorescent and then ± contiguous, pale greenish yellow or ± concolorous with the thallus; soredia coarsely to finely granular; cephalodia scattered, at times very sparse, inconspicuous, scale-like and partly immersed in areoles or more conspicuous, irregularly peltate, ± partly convex, pale grey to pinkish yellow-brown, ± pellucid, containing *Stigonema* or *Nostoc*. Apothecia 0.6–0.8 (–1) mm diam., perithecium-like, rather rare, often restricted to a limited area on the thallus, ± spherical with a flattened apex and ± entirely enveloped in a thin thalline cuff; exciple 40–50

µm thick at the base, 100–140 µm towards the apex, pale, of elongate periclinal hyphal cells *ca* 2 µm diam. Ascospores (25–) 30–50 (–60) × (19–) 21–28 (–33) µm, with a uniform 2–3 µm thick wall. Warts containing pycnidia *ca* 0.3 mm diam.; pycnidia *ca* 100 µm diam.; conidia 3.8–5 × 0.8–1 µm. Soralia C–, K+ bright golden yellow, I–, Pd+ red-orange, UV– (stictic acid). **BLS 1699**.

On ± sheltered and humid, often ± vertical rock faces, especially on basalt; widespread but local, especially near the coast, rarely inland. W. and N. Scotland from Firth of Clyde to Unst (Shetland), Wales (Snowdonia), W. and N.W. Ireland.

The vivid and rapid K+ golden yellow reaction of the soralia is diagnostic. The soralia may resemble those of *Lecanora jamesii*, which may also rarely occur on rocks, but in that species the thalli are less extensive and the soralia are K–. More often confused with *Ochrolechia androgyna*, which differs in having C+ red soralia.

On this host are two collections of an undescribed *Sagediopsis* with 3–5-septate ascospores, 19–22 × 4–4.5 µm (Shiants and St. Kilda in Outer Hebrides).

ICMADOPHILACEAE Triebel (1993)

Thallus either crustose or squamulose, or ± fruticose, sometimes sterile and then sometimes vagrant. **Ascomata** apothecia (sometimes absent), sessile or shortly stipitate, pale pink to whitish, sometimes clustered, formed on specialized often non-lichenized thalline branches, flat or convex. **Hamathecium** of unbranched or sparingly branched paraphyses, often swollen at the apices. **Asci** persistent, cylindrical, with an I+ apical cap. **Ascospores** colourless, aseptate or transversely septate. **Anamorph** pycnidial.

The Icmadophilaceae contains eight genera in the systematic arrangement by Lücking *et al*. (2017), with three further genera accepted by Ludwig *et al.* (2020). Four occur in Great Britain & Ireland. The family appears to occupy a position sister to the Coccotremataceae within the Pertusariales (Kraichak *et al*. 2018).

References

Kantvilas (2018), Lücking *et al*. (2017), Ludwig *et al*. (2020), Platt & Spatafora (1999, 2000), Rambold *et al*. (1993), Schmitt *et al*. (2006), Stenroos *et al*. (2002).

1 Thalli ± fruticose, not producing ascomata or separate vegetative propagules 2
Thalli crustose, with pink sessile to stalked apothecia and sometimes soralia or schizidia 3

2(1) Thallus solid, composed of tufts of ± vertical cylindrical blunt-tipped structures; not generally vagrant ..... ***Siphula***
Thallus hollow, ± horizontal, elongate, ± acuminate, not obviously attached to the soil ..... ***Thamnolia***

3(1) Apothecia ± sessile; thallus uneven and ± granular, lacking schizidia, at least usually UV+ glaucous ..... ***Icmadophila***
Apothecia on distinct stalks, sometimes in clusters; thallus ± smooth and shiny, usually with rounded schizidia, UV+ orange ..... ***Dibaeis***

DIBAEIS Clem. (1909)

Thallus crustose, whitish, continuous, granular to verrucose with ± hollow granules or subspherical warts. **Soralia** present in some instances or with calcium oxalate encrustations resembling soralia. **Photobiont** *Coccomyxa*. **Ascomata** apothecia, round or sublobulate, rose-pink, on short or long

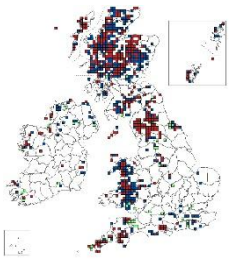
podetia, corticate at the base. **Thalline margin** absent. **Exciple** inconspicuous, excluded. **Hymenium** K/I+ blue with colourless crystals within the hymenium and epithecial layer. **Hamathecium** of paraphyses, slender, sparingly branched. **Hypothecium** colourless. **Asci** 8-spored, thin-walled, cylindrical, walls and tip K/I+ blue with a distinct ocular chamber in the tholus, *Icmadophila*-type. **Ascospores** colourless, aseptate (plasma bridges may be present). **Conidiomata** pycnidia, immersed in the thallus warts. **Conidiogenous cells** catenate, barrel-shaped. **Conidia** bacilliform. **Chemistry**: β-orcinol depsides. **Ecology**: characteristic of temporary and recently disturbed sites on acid gravels and roadsides, earth banks, mine-spoil heaps and heathland.

The brown to reddish brown ascomata, K/I– hymenium and asci, and chemistry (stictic acid) of *Baeomyces* clearly separates it from *Dibaeis*. The two genera are only distantly related. *Icmadophila* is closely related to *Dibaeis* but has sessile apothecia.

Around 15 species are currently accepted, of which only one has been recorded from our region.

References:
Gierl & Kalb (1993), Hitch (2009), Ihlen (1998), Kantvilas (2018).

Dibaeis baeomyces (L. f.) Rambold & Hertel (1993) **LC**



Thallus in small patches or becoming more wide-spreading; basal crust smooth, ± shiny, margin ± determinate, without marginal lobes or squamules, whitish, pale grey or sometimes green-grey; schizidia scattered, coarse, rounded or flattened, pink-white, shiny, varying in texture and size, 0.1–0.3 mm diam. on fertile thalli, to 1 mm diam. on sterile thalli, sometimes farinose-sorediate; photobiont cells 5–8 µm diam., mostly globose. Apothecia to 3 mm diam., stalked, the stipe 2–5 mm tall, white or pink, not corticate for the most part, ± hollow; disc bright rose-pink, domed; epithecium with fine crystals dissolving in K; hymenium 120–140 µm thick, I+ blue. Asci *ca* 125 × 6 µm, with a thin K/I+ blue apical cap. Ascospores 10–26 × 2–3 µm, fusiform. Pycnidia *ca* 0.2 mm diam.; wall colourless or brown above; conidia 3.8–5 × 0.8–1 µm. Thallus C–, K+ yellow→orange, KC+ orange, Pd+ orange, UV+ orange (mainly apothecia and schizidia) [baeomycesic, squamatic, ± barbatic acids and atranorin]. **BLS 0175**.

On mineral or peaty soil on acid heaths and moors, usually sterile, often on flat compacted ground. Throughout Britain & Ireland; widespread in N. England, Wales, Scotland; rare and very local elsewhere.

Sometimes confused with *Icmadophila ericetorum*, which has larger, flatter, nearly sessile apothecia, a thallus that contains perlatolic and thamnolic acids, and ellipsoidal photobiont cells, with the different UV fluorescence of the thalli readily separating these species in the field when sterile. Some past records of *Icmadophila* from E. England may refer to *Dibaeis baeomyces*.

Host-specific parasites on the thallus of *D. baeomyces* include *Arthrorhaphis muddii* (q.v.), *Micarea inquinans* (q.v.) and *Rhymbocarpus ericetorum* (Körb.) Etayo, Diederich & Ertz (2010).

ICMADOPHILA Trevis. (1852)

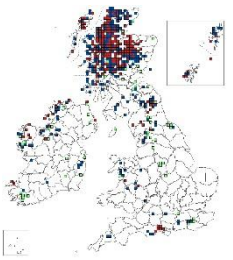
Thallus crustose, superficial, delimited, not corticate; prothallus white or absent. **Photobiont** *Coccomyxa*. **Ascomata** apothecia, mostly rounded, pale, sessile or slightly elevated, sometimes appearing very shortly stalked. **Thalline margin** soon excluded. **Exciple** well-developed, persistent or partially excluded, extended below, of intricately interwoven hyphae. **Hymenium** K/I+ blue. **Hamathecium** of unbranched or sparingly branched, slender paraphyses, the apical cells often swollen. **Asci** (6-) 8-spored, cylindrical, K/I– except for a thin dark blue apical cap; *Icmadophila*-type. **Ascospores** ellipsoidal-fusiform, aseptate to 3-septate, colourless, without a perispore. **Conidiomata** pycnidia, immersed; wall colourless. **Conidiogenous cells** short-cylindrical. **Conidia** arising laterally and terminally, bacilliform, aseptate, colourless. **Chemistry**: orcinol and β-orcinol

depsides, together with β- orcinol depsidone. **Ecology**: in cool, humid climates, occurring mainly on acidic organic substrata such as rotting wood, peat and moss.

Icmadophila is most closely related to *Dibaeis*, which has a smooth thallus with scattered schizidia and stipitate apothecia. Only one species occurs in our region.

References:
Hitch *et al*. (2009), Ihlen (1998), Ludwig (2015), Ludwig *et al*. (2020).

Icmadophila ericetorum (L.) Zahlbr. (1895) **LC**



Thallus rather soft, of compacted irregular soredium-like granules 100–300 µm diam., forming a continuous, very uneven pale green, blue-green or whitish-grey crust; photobiont cells 6–10 × 3.5–5 µm, ellipsoidal. Apothecia 2 (–3) mm diam., usually abundant, a striking pink or pale orange-pink, the margin (exciple) thin or excluded, paler or concolorous with the disc, even, smooth or irregularly crenulate or nodulose; disc smooth or corrugate-wrinkled, sometimes faintly pruinose; epithecium red-brown, densely packed with minute crystals, K+ orange, dissolving; hymenium 120–140 µm tall; hypothecium colourless, the central part of interwoven hyphae with scattered, interspersed clusters of coarse crystals, K–, not dissolving; paraphyses *ca* 1 µm diam., the apices swollen to *ca* 5 µm. Ascospores aseptate to 3-septate, 13–27 × 4–6 µm. Conidia 3.5–4 × 0.5–1 µm. Thallus C–, K+ orange, KC+ orange, Pd+ orange, UV+ glaucous (apothecia UV–) (thamnolic, perlatolic acids; thamnolic acid only in the apothecia). **BLS 0584**.

On damp ground, peat and rotted wood, especially exposed moorland, usually in uplands, rarely on flat compacted ground; very rare and decreasing in lowlands. Widespread in Scotland, Ireland and N. England, very local elsewhere.

Can be confused with *Dibaeis baeomyces* which has distinctly stalked apothecia. All lowland records need careful checking against that species, with the different UV fluorescence of the thalli readily separating these species in the field when sterile.

Stigmidium icmadophilae R. Sant. (1984) has been found on this host (Moray, Abernethy Forest).

SIPHULA Fr. (1831)

Thallus minutely shrubby, erect, sparingly branched, whitish, solid. **Cortex** pseudoparenchymatous. **Photobiont** chlorococcoid. **Medulla** compact; hyphae ± longitudinally aligned. **Apothecia** and **conidiomata** very rare and seldom well-developed, not known in GBI. **Chemistry**: *p*- and *m*-depsides, dibenzofurans and/or chromones (e.g. siphulin). **Ecology**: on peaty soils and acid-leached bark in temperate moorlands and wet alpine sites.

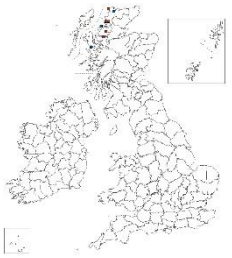
One species, *Siphula ceratites*, occurs in Britain & Ireland.

References:
Grube & Kantvilas (2006), Kantvilas (1996), Lambley & Purvis (2009a), Ludwig (2015), Motiejūnaitė *et al.* (2019), Platt & Spatafora (2000).

Siphula ceratites (Wahlenb.) Fr. (1831) **NT**

Thallus 1.5–2 (–3) cm tall, forming compact tufts, scattered or continuous in extensive patches; branches to 2 mm diam., chalk-white, pale greyish or ivory, ± erect, not or sparingly branched, cylindrical or somewhat flattened, sometimes longitudinally furrowed, particularly towards the ± rooting base, smooth, rugose or scabrid-pruinose, solid; apices rounded, not markedly tapered; without soredia, isidia or apothecia. Cortex C+ violet→yellow-brown (soon fading), K+ yellow to yellow-brown, KC+ yellow-orange to yellow-brown, Pd–; medulla UV+ violet-glaucous or yellow (siphulin). **BLS 1323**.

On shallow peat or gravelly soil, often in shallow, temporary rain hollows in bedrock, or by pools in blanket bog; submontane, apparently rare but perhaps overlooked; locally frequent at four sites in N.W. Scotland where it was first found in 1955 but not found elsewhere despite recent searches.



A distinctive species unlikely to be confused with any other British lichen, though poorly developed material could be confused with *Cladonia uncialis*, which has a more yellow-green thallus composed of hollow podetia that are dichotomously branched with pointed apices and open axils. *Thamnolia vermicularis* differs in having pointed apices, hollow, extended branches, a prostrate habit and a different chemistry. Small, immature specimens have been mistaken for *Lepra dactylina* and/or *Ochrolechia frigida*.

THAMNOLIA Ach. ex Schaer. (1850)

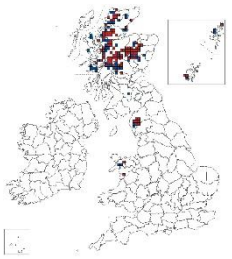
Thallus prostrate or decumbent, ± cylindrical and worm-like, the apices usually attenuated, often becoming vagrant due to breakdown of the basal parts, not or sparingly branched, the branches similar in form to the main axis. **Cortex** composed of longitudinally orientated hyphae. **Medulla** thin, of longitudinally orientated hyphae, the interior hollow. **Photobiont** trebouxioid. **Ascomata** unknown, although incipient structures may rarely be seen in non-GBI material. **Conidiomata** formed as small pustules on the thallus surface, ± hemispherical, ostiolate. **Conidiophores** elongate, forming chains of intercalary conidiogenous cells. **Conidia** bacilliform, colourless, aseptate, thin-walled. **Chemistry**: with β-orcinol depsidones (baeomycesic, squamatic or thamnolic acids). **Ecology**: in exposed montane heaths, on stony soil.

An unmistakeable genus with species that reproduce clonally via fragmentation of the thallus. It occupies an isolated phylogenetic position within the Icmadophilaceae.

Literature:
Culberson (1963), Ihlen (1995), Jørgensen (2019), Lambley & Purvis (2009b), Lord *et al*. (2013), Ludwig (2015), Onuț-Brännström *et al.* (2017, 2018), Platt & Spatafora (2000), Zhurbenko (2012).

Thamnolia vermicularis (Sw.) Schaer. (1850) **LC**

Thamnolia vermicularis var. *subuliformis* (Ehrh.) Schaer. (1850)



Thallus to 5 cm in length, 1–2 mm diam., decumbent or straggling, rarely ± erect, rarely with a few short lateral branches, occasionally ± densely tufted, the apices usually attenuated; smooth, chalk-white, cylindrical, hollow and thin-walled. Soredia and isidia absent. Conidiomata formed as small pustules on the thallus surface, 200–350 µm diam. and 150–200 µm tall, ± hemispherical, the surface irregular, ostiolate, with pinkish exudates formed by a mucilaginous mass of conidia. Conidiophores elongate, forming chains of intercalary conidiogenous cells with peg-like processes near the upper cell septum. Conidia 3–5 × 1–2 µm, bacilliform, tapering slightly at one end, colourless, aseptate, thin-walled. Thallus C–, K+ pale yellow, KC–, Pd+ yellow, UV+ yellow (baeomycesic and squamatic acids). **BLS 1382**.

On exposed montane heaths, often amongst *Racomitrium lanuginosum* and *Salix herbacea* above 850 m, rarely at sea-level on heaths developed on old shingle ridges and dunes in N. Scotland; locally frequent. N.W. England (Lake District), N. Wales (there likely to be extinct), Scotland (Highlands).

Thamnolia vermicularis has two chemotypes, which were assigned to different species by Onuț-Brännström *et al*. (2017, 2018). However, their typification is complex (Jørgensen 2019) and there is no convincing argument to keep them separate. Our chemotype is widespread; the other which has thamnolic acid alone (C–, K+ bright yellow, KC–, Pd+ orange to red, UV–) appears to be restricted to central Europe but could possibly occur in

Britain, as could *T. tundrae* Onut-Brännstr. & Tibell (1918) in the extreme north. The chalk-white, worm-like, usually unbranched, hollow and prostrate thalli are unlikely to be confused with any other species. Perhaps the most similar in our region is *Siphula ceratites*, which has a shorter, erect, compact and solid thallus.

Host to the gall-forming *Thamnogalla crombiei* (Mudd) D. Hawksw. (1980), and a substantial number of other lichenicolous species; see Zhurbenko (2012); of these *Geltingia associata* (Th. Fr.) Alstrup & D. Hawksw. (1990) and *Sphaerellothecium thamnoliae* Zhurb. (2012) have been reported in Scotland..

MICROCALICIACEAE Tibell (1978)

The family contains a single genus, *Microcalicium*, so its description below constitutes that of the family. *Microcalicium* contains minute mazaediate species that are very different from other genera of the Pertusariales in morphological terms, but its phylogenetic position was established by Prieto *et al*. (2012). It appears to form a sister group with *Varicellaria* (included in the Ochrolechiaceae by Cannon *et al.* 2021).

MICROCALICIUM Vain. (1927)

Thallus immersed in lichens, amongst free-living algae or saprotrophic. **Photobiont** absent. **Ascomata** apothecia, black, sessile or stalked, mazaediate. **Exciple** well-developed, dark, composed of angular cells or thick-walled hyphae. **Hamathecium** of sparse, thick-walled paraphyses. **Asci** broadly ellipsoidal, formed in chains from ascogenous hyphae lacking croziers, with a single functional wall layer, deliquescing at maturity. **Ascospores** 1- to 7-septate, broadly ellipsoidal to cylindrical, blue-green, distinctively ornamented with helical ridges (developing after breakdown of asci), which disappear in K; forming a dry green-black ascospore mass (mazaedium). **Conidiomata** pycnidia, frequent in some species, ± globose and sessile, black. **Conidiogenous cells** ± cylindrical, arising singly, proliferating percurrently with distinct broad collarettes. **Conidia** terminal, formed singly, ellipsoidal to subglobose, colourless, aseptate, extruded in a slimy drop. **Chemistry**: lichen substances not detected by TLC; ascospores, true exciple and stalk contain unidentified pigments which are generally green in acidic and red-brown in alkaline solutions. **Ecology**: parasitic on lichens or algae, or saprotrophic, on bark, wood and rocks in humid and shaded sites.

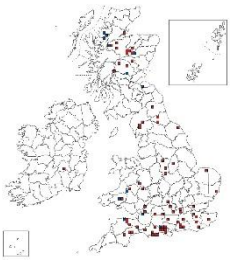
Calicium (Caliciaceae) is similar but lichenized, with a black ascospore mass (mazaedium). *Chaenotheca* (Coniocybaceae) has aseptate ascospores forming a brown ascospore mass. The ascomata of some *Chaenothecopsis* species (Mycocaliciaceae) are similar in size and occur in similar habitat niches, but the asci do not disintegrate early to form a dry ascospore mass and the ascospores never have a helical ornamentation.

Literature:
Giavarini (2009), Prieto *et al.* (2012), Tibell (1978, 1999a).

1 Apothecia stalked; mature ascospores 1-septate; pycnidia absent 2
Apothecia sessile; mature ascospores 1- to 3 (-5)-septate; pycnidia frequent ..... ***disseminatum***

2(1) On wood; ascospore mass green-black, with sclerotized hyphae; ascomata short-stalked ..... ***ahlneri***
On algae or lichens on rocks, or roots; ascospore mass dark brown or greenish black, without sclerotized hyphae; ascomata long-stalked ..... ***arenarium***

Microcalicium ahlneri Tibell (1978) **Nb**

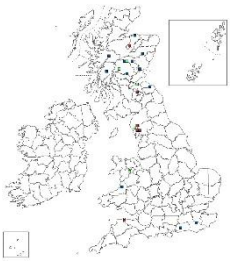


Thallus absent or immersed, the mycelium inconspicuous. Apothecia 0.4–0.7 mm tall, stalks occasionally branched, black; head narrowly conical, ascospore mass not taller than the width of the head, green-black, with sclerotized hyphae, pruina absent; stalk 0.06–0.1 mm diam., dull black with a coarsely granular surface; exciple in section reddish brown, poorly developed. Ascospores 5–7 × 2–2.5 µm, 1-septate. Pycnidia not known. **BLS 1441**.

On wood of ancient *Quercus* and *Pinus* trunks, parasitic or saprotrophic, in humid locations; rare. Scattered through England, mid Wales, Scotland (especially C. & E. Highlands), one record from Ireland.

Microcalicium arenarium differs in always being long-stalked, in having a well-developed exciple and lacking persistent, sclerotized hyphae in the ascospore mass.

Microcalicium arenarium (Hampe ex A. Massal.) Tibell (1978) **Nb**

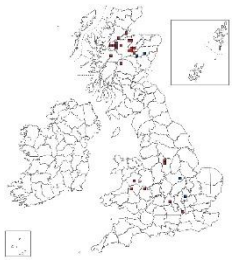


Thallus absent, or immersed and inconspicuous. Apothecia variable in size, 0.6–1.8 (–2.5) mm tall, black, head spherical, 0.2–0.3 mm diam.; ascospore mass not higher than the width of the head, dark brown or greenish black, without sclerotized hyphae, pruina absent; stalk 0.06–0.1 mm diam., dull black with a coarsely granular surface; exciple in section reddish brown, N+ greenish. Ascospores 6–7 × 2.0–2.5 µm, ellipsoidal, 1-septate, helically ridged. Pycnidia not known. **BLS 1951**.

On *Stichococcus* or other green algae, often growing with *Psilolechia lucida* and *P. clavulifera*. Parasitic or commensalistic, in shaded and humid localities, often under overhanging, siliceous rocks, or on exposed roots, mainly upland; rather rare. S. England, mid Wales, Cumbria and scattered throughout Scotland.

See also *M. ahlneri*. When parasitizing *Psilolechia lucida*, *M. arenarium* can be confused with *Chaenotheca furfuracea*, which differs in having smaller, pale brown, globose ascospores.

Microcalicium disseminatum (Ach.) Vain. (1927) **Nb**



Thallus absent or immersed and inconspicuous. Apothecia 0.1–0.3 mm diam., 0.1–0.2 mm tall, ± sessile; ascospore mass greenish black, protruding, with sclerotized hyphae; exciple aeruginose in section, K+ brown. Ascospores 11–13 × 3–4 µm, 1- to 3 (-5) septate, helically ridged. Pycnidia frequent, erumpent, 40–100 µm diam., the walls ± blue-green and of thick-walled cells; conidiogenous cells 4–5 × 1–1.5 µm; conidia subglobose, 2–3 × *ca* 2 µm. **BLS 1442**.

On trunks or stumps of veteran trees, associated with free-living green algae or growing on other calicioid lichens, parasitic or commensalistic. Sometimes apparently saprotrophic directly on wood of *Quercus*, or rarely *Betula*, or on bark and wood of *Pinus*, mainly in humid localities rich in calicioid lichens and fungi; rare. S. and C. England, mid Wales, Scotland (Highlands).

When lichenicolous, the pycnidia appear first, up to 15 per host areole and infected lichen thalli are decolourized or brownish, with the formation of extensive lesions. Distinguished by the protruding aeruginose dry spore mass. Resembles *M. ahlneri* which has long stalks (>0.4 mm) and a poorly developed exciple.

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