

Revisions of British and Irish Lichens



British
Lichen
Society

Volume 38

January 2024



Ostropales genera I

Cover image: *Secoliga (Gyalecta) jenensis*, on a limestone cliff, Lismore, Argyll. Image copyright Mike Sutcliffe, [British Lichens](http://www.britishtlichensociety.org) website.

Revisions of British and Irish Lichens is a free-to-access serial publication under the auspices of the British Lichen Society, that charts changes in our understanding of the lichens and lichenicolous fungi of Great Britain and Ireland. Each volume will be devoted to a particular family (or group of families), and will include descriptions, keys, habitat and distribution data for all the species included. The maps are based on information from the BLS Lichen Database, that also includes data from the historical Mapping Scheme and the *Lichen Ireland* database. The choice of subject for each volume will depend on the extent of changes in classification for the families concerned, and the number of newly recognized species since previous treatments.

To date, accounts of lichens from our region have been published in book form. However, the time taken to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published. Issuing updates as a serial electronic publication means that important changes in understanding of our lichens can be made available with a shorter delay. The accounts may also be compiled at intervals into complete printed accounts, as new editions of the *Lichens of Great Britain and Ireland*.

Editorial Board

Dr P.F. Cannon (Royal Botanic Gardens, Kew, Surrey TW9 3AB, UK).

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

Dr B.J. Coppins (Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, UK)

Dr A.M. Fryday (Department of Plant Biology, Michigan State University, 612 Wilson Rd., East Lansing, MI 48824, USA)

Mr N.A. Sanderson (3 Green Close, Woodlands, Southampton, Hampshire SO40 7HU, UK)

Dr J.A. Simkin (School of Natural and Environmental Science, Newcastle University, Newcastle upon Tyne NE1 7RU, UK)

Dr R. Yahr (Royal Botanic Garden, Inverleith Row, Edinburgh EH3 5LR, UK)

Downloads can be obtained from the British Lichen Society website at <https://www.britishtlichensociety.org.uk/content/lgbi3>

Made available under Creative Commons Licence  CC BY-SA

ISSN 2634-7768

© British Lichen Society, 9 January 2024

Revisions of British and Irish Lichens vol. 38

Ostropales genera I

including *Absconditella*, *Belonia*, *Clathroporinopsis*, *Corticifraga*, *Cryptodiscus*, *Cryptolechia*, *Francisrosea*, *Gomphillus*, *Gyalecta*, *Gyalidea*, *Gyalideopsis*, *Jamesiella*, *Karstenia*, *Nanostictis*, *Neopetractis*, *Pachyphiale*, *Petractis*, *Phialopsis*, *Phlyctis*, *Ramonia*, *Sagiolechia*, *Secoliga*, *Sphaeropezia*, *Spirographa*, *Stictis*, *Thelopsis*, *Thrombium* and *Xerotrema*

by

Paul Cannon

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

Brian Coppins

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK

André Aptroot

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

Neil Sanderson

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

Janet Simkin

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

This publication can be cited as:

Cannon, P., Coppins, B., Aptroot, A., Sanderson, A. & Simkin, J. (2024). Ostropales genera I, including *Absconditella*, *Belonia*, *Clathroporinopsis*, *Corticifraga*, *Cryptodiscus*, *Cryptolechia*, *Francisrosea*, *Gomphillus*, *Gyalecta*, *Gyalidea*, *Gyalideopsis*, *Jamesiella*, *Karstenia*, *Nanostictis*, *Neopetractis*, *Pachyphiale*, *Petractis*, *Phialopsis*, *Phlyctis*, *Ramonia*, *Sagiolechia*, *Secoliga*, *Sphaeropezia*, *Spirographa*, *Stictis*, *Thelopsis*, *Thrombium* and *Xerotrema*. *Revisions of British and Irish Lichens* **38**: 1–60.

This volume contains the remaining genera of Ostropales that have not so far been included in volumes of *Revisions of British and Irish Lichens* – i.e. the Coenogoniaceae (vol. 3, 2021), the Porinaceae (vol. 4, 2021), the Protothelenellaceae (vol. 7, 2021), the Thelenellaceae (vol. 8, 2021) and the Graphidaceae (vol. 36, 2023). The family and generic structure within the Ostropales is still somewhat fluid.

The genera included are as follows:

Gomphillaceae

Corticifraga, Gomphillus, Gyalidea, Gyalideopsis, Jamesiella

Gyalectaceae

Belonia, Clathroporinopsis, Cryptolechia, Gyalecta, Pachyphiale, Phialopsis, Secoliga, Thelopsis

Odontotremataceae

Xerotrema

Phlyctidaceae

Phlyctis

Sagiolechiaceae

Sagiolechia

Spirographaceae

Spirographa

Stictidaceae

Absconditella, Cryptodiscus, Karstenia, Nanostictis, Sphaeropezia, Stictis

Thrombiaceae

Thrombium

Unassigned to a family

Francisrosea, Neopetractis, Petractis, Ramonia

GOMPHILLACEAE Walt. Watson (1929)

Thallus crustose, very varied in form, sometimes setose. **Photobiont** chlorococcoid. **Ascomata** apothecia, usually sessile, discoid, usually without a well-defined margin. **Exciple** composed of radiating hyphae in a gelatinous matrix or of isodiametric cells. **Hamathecium** of branched and anastomosing filiform paraphysoids, hymenial gel I-. **Asci** cylindrical, sometimes elongate, with only a slight apical thickening, fissitunicate, 1- to 8-spored, not blueing in iodine. **Ascospores** ellipsoidal to filiform, with transverse septa, sometimes muriform. **Anamorphs** occasionally pycnidial but mostly spine-like to brush-like or peltate; forming hyphophores. **Conidia** in clusters formed by branched, septate filaments, usually dispersed as a whole, mostly constricted at the septa (moniliform), colourless. **Ecology**: mostly foliicolous but also on bark, bryophytes, soil etc., occasionally lichenicolous.

Core members of the Gomphillaceae are easily recognized by their apothecial anatomy and their peculiar stalked conidiomata, referred to as hyphophores. Molecular data for British and Irish species are sparse, and almost all representatives are tropical in distribution. *Gyalidea* does not possess hyphophores and Baloch *et al.* (2010a) resurrected the family Solorinellaceae to include that genus, but it was included in the family by Lücking *et al.* 2017 and Xavier-Leite *et al.* (2022). Flakus *et al.* (2019) placed the Gomphillaceae in paraphyly within a broader clade containing the Graphidaceae s.l. , but further sequencing is required to confirm that relationship.

The generic delimitation is artificial and it is likely that further phylogenetic study will result in a rather different arrangement. Five genera are represented in Britain and Ireland, including the exclusively lichenicolous *Corticifraga*.

Literature:

Lücking (2008), Lücking *et al.* (2005, 2006, 2007), Vezda (1973a), Xavier-Leite *et al.* (2022, 2023).

- | | | |
|------|--|---------------------|
| 1 | Thallus absent (lichenicolous)..... | <i>Corticifraga</i> |
| | Thallus present, lichenized..... | 2 |
| 2(1) | Apothecia stalked; ascospores > 100 µm long, filiform, with very many septa | <i>Gomphillus</i> |
| | Apothecia sessile; ascospores < 60 µm long, fusiform to cylindrical, transversely septate or muriform .3 | |
| 3(2) | Conidiomata pycnidia | <i>Gyalidea</i> |
| | Conidiomata hyphophores (rarely absent)..... | 4 |
| 4(3) | Hyphophores isidium-like, with algal cells within the stipes | <i>Jamesiella</i> |
| | Hyphophores hooked, with short lateral projections; algae not present | <i>Gyalideopsis</i> |

CORTICIFRAGA D. Hawksw. & R. Sant. (1990)

Thallus absent (lichenicolous). **Ascomata** scattered or in small groups, immersed, at first almost globose to lens-shaped, breaking through the host cortex and finally apothecial in appearance; concave to flat, pale brown to black. **Exciple** well-developed in young apothecia, becoming excluded with age, not or scarcely extending above the surface of the disc, colourless to dark olivaceous brown, composed of irregularly subglobose pseudoparenchymatous cells, periphysoids absent. **Hamathecium** of unbranched or sparsely branched filiform paraphyses, the apices capitate and brown or non-capitate and unpigmented. **Asci** elongate-clavate, short-stalked, fissitunicate; apices strongly thickened, I-, discharge by a short extension of the inner apical tissues, 8-spored. **Ascospores**

biseriately arranged, broadly fusiform to ellipsoidal or soleiform, often tapered below, (0-) 1- to 3-septate, colourless, smooth-walled, without a distinct perispore. **Anamorph** unknown.

A genus of ten species, all of which are parasites of Peltigeraceae (s.l.) except for *C. ramalinae* (Roux *et al.* 2022). A key to the species is included in that publication. There are two collections of an unidentified species of *Corticifraga* from Wales (Cardiganshire and Caernarvonshire) on *Sticta limbata* with ascospores $10\text{--}11.5 \times ca\ 5\ \mu\text{m}$ in size; these must represent a further, possibly undescribed species.

Literature:

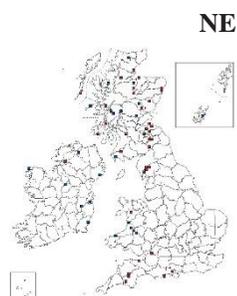
Hawksworth & Santesson (1990), Roux *et al.* (2022).

- 1 Ascospores mostly 1-septate, (12-) 13-17 (-19) \times (4-) 4.5-6 μm , apothecia usually pale brown, not causing necrosis of the host tissues *fuckelii*
 Ascospores mostly 3-septate, (19-) 20-22.5 (-24) \times (4-) 4.5-7 (-8) μm ; apothecia becoming dark brown to black, developing on necrotic spots on the host thallus..... *peltigerae*

Corticifraga fuckelii (Rehm) D. Hawksw. & R. Sant. (1990)

Apothecia scattered or in small groups on the host surface, 0.2-0.3 (-0.5) mm diam., not in necrotic spots, pale brown at first but becoming dark brown to black at a late stage, erumpent through the host cortex (jagged remains of which surround the apothecia) but remaining \pm immersed, irregular in shape but usually \pm circular when fully developed; exciple poorly developed, composed of subglobose to elongate cells. Paraphyses remaining colourless, not strongly swollen at the apices. Ascospores (12-) 13-17 (-19) \times (4-) 4.5-6 μm , ellipsoidal to soleiform, the apex rounded and the base \pm attenuated, (0-) 1- (to 2-) septate, constricted at the median septum, colourless, smooth-walled, without a perispore. **BLS 2037.**

On various species of *Peltigera*, most frequently recorded on *P. hymenina*. Throughout Scotland, also Cumbria, Wales (Brecon, Cardigan, Merioneth) and S.W. England. Scattered in Ireland.



Corticifraga peltigerae (Fuckel) D. Hawksw. & R. Sant. (1990)

Apothecia in small groups on bleached necrotic patches on the host surface, sometimes concentrically arranged, (1.5-) 0.2-0.3 (-0.4) mm diam., soon becoming dark brown to black at a late stage, erumpent through the host cortex but remaining \pm immersed, irregular in shape but usually \pm circular when fully developed; exciple well-developed, dark olivaceous brown, composed of subglobose to elongate cells. Paraphyses 1.5-2.5 μm diam., with dark capitate apices 3.5-5 μm diam.. Ascospores (19-) 20-22.5 (-24) \times (4-) 4.5-7 (-8) μm , fusiform, sometimes slightly curved, the apex obtuse and the base \pm attenuated, (1-) 3-septate, slightly constricted at the median septum, colourless, smooth-walled, without a perispore. **BLS 2038.**

Recorded from a broad range of *Peltigera* spp., but perhaps less common than *C. fuckelii*. Scattered throughout Scotland and England, two records from eastern Ireland.

Zhurbenko (2009) considered that the ascospores of *C. peltigerae* were rather shorter than those measured by Hawksworth & Santesson (1990); possibly more than one species is involved.



GOMPHILLUS Nyl. (1853)

Thallus crustose, very thin, semi-transparent and sub-gelatinous when wet, effuse or delimited. **Photobiont** chlorococcoid. **Ascomata** apothecia, irregularly globose or frequently top-shaped, brown-black above becoming pale to colourless below. **Thalline margin** absent. **True exciple** well-

developed, extended below into a stalk-like extension, pale brown at the upper edge, pale within, of thin, anastomosing hyphae in a gelatinous matrix, not carbonized. **Epithecium** red-brown, non-granular. **Hamathecium** of numerous anastomosing paraphyses, <1 µm diam., the apices not swollen. **Asci** 8-spored, narrowly cylindrical (up to, or more than, 50 times longer than broad), with an apical tholus, K/I–, fissitunicate. **Ascospores** very long, thread-like, multi-septate, colourless. **Conidiomata** pycnidia, black above, pale below. **Conidia** minute, ellipsoidal. **Hyphophores** present in some extralimital species. **Chemistry**: no lichen products detected by TLC. **Ecology**: on mosses, liverworts, and sometimes, lichens; oceanic.

Separated from all other species of the Gomphillaceae by the vertically elongated apothecium containing very long asci and filiform-acicular spores. Hyphophores are not present in the sole British and Irish species.

Gomphillus might be confused with *Acrospermum*, species of which may be lichenicolous or bryophilous, including *A. adeanum* which is reported from GBI on mosses. However, the two genera do not appear to be closely related in phylogenetic terms (Darmostuk & Flakus 2023).

Literature:

Dobson *et al.* (2009), Ferraro & Lücking (2005), Lücking *et al.* (2005, 2007).

Gomphillus calycioides (Del.) Nyl. (1853)

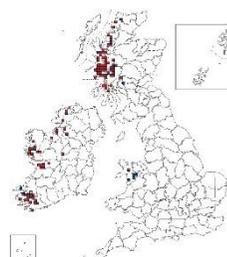
Thallus thin, membrane-like, colourless, pale grey to green, sometimes almost disappearing; hyphae penetrating moss and hepatic leaf cells; photobiont cells (6.5–) 9–11 µm, globose. Apothecia few to numerous, stalked, 0.2–0.6 mm diam., scattered, sessile but appearing shortly stalked, simple or sometimes 2–6 per stalk, lower part of stalk ± furrowed; epithecium red-brown, sometimes pale, K± brown; hymenium 290–360 µm tall. Asci 280–350 × 7–10 µm. Ascospores 160–200 (–210) × 1.5–2 (–3) µm, apices rounded, 25–65 (–100)-septate. Conidia 2–4 × 0.5–0.7 µm. **BLS 0528**.

Overgrowing mosses and hepatics (probably parasitic) on mossy trees and rocks, more rarely on the ground, mainly in sheltered, well-wooded sites or on isolated trees in sheltered valleys, often by streams and lakesides; local, probably overlooked. N. Wales, S.W., W. & N. Scotland, W. Ireland.

Distinguished by the distinctive ± top-shaped, black-brown apothecia, thin, skin-like thallus and hair-like, multiseptate spores with almost isodiametric cells; other species that also grow on mosses and which are superficially similar include: *Thelenella muscorum* which has pale, totally immersed perithecia, and *Gyalideopsis muscicola* which has black, hooked hyphophores and much shorter spores that are 15- to 20-septate.

Host to *Neocoleroa cf. lichenicola* (Hansf.) M.E. Barr (1997); known from Westernness, Mull and Skye.

NT IR



GYALIDEA Lettau ex Vězda (1966)

Thallus crustose, inconspicuous to superficial, smooth or sparingly cracked, sometimes gelatinous when moist, effuse. **Prothallus** absent. **Photobiont** trebouxoid. **Ascomata** apothecia, urceolate to flat, pale cream, olive-brown, black-brown, rarely pink, translucent when wet. **True exciple** well-developed, elevated, generally darker than the disc. **Hymenium** colourless, I+ yellow or red-brown. **Hamathecium** of abundant septate mostly unbranched paraphyses, rarely thickened at the apices, bound with the asci in a gelatinous matrix. **Asci** (4-)8-spored, subspherical, cylindrical or clavate, thin-walled except for a slightly thickened apical tholus, K/I– and a ± small ocular chamber. **Ascospores** (1-)3-septate to muriform, the septa ± constricted, ellipsoidal to fusiform, colourless, often with a thin perispore. **Conidiomata** pycnidia, black, immersed in the thallus. **Conidia** bacilliform. **Chemistry**: lichen products not detected by TLC. **Ecology**: on soil, mosses and rocks,

often in specialized habitats, e.g. on mica-schist, pebbles in or near streams, mine-spoil-heaps; extralimital species may be corticolous.

Gyalecta differs in having *Trentepohlia* as photobiont, lacking a thin perispore around the ascospores which are also without constricted septa, and has a different apical structure of the ascus. *Sagiolechia* has a K/I+ blue ascus wall, and *Trentepohlia* photobiont. However, there seems to be a difference of opinion regarding the algal partners of *Gyalidea* species; most authors consider them to be trebouxoid but Thüs & Schultz (2009) state that *Trentepohlia* is involved.

Many species are known only from small numbers of collections, and their delimitation is poorly understood.

Literature:

Aptroot & Lücking (2002), Gilbert *et al.* (2009b), Van den Boom (2015), Vězda (1966a), Vězda & Poelt (1991).

- | | | |
|------|---|-------------------------------|
| 1 | Ascospores 1- to 3-septate | 2 |
| | Ascospores at least mostly muriform | 3 |
| 2(1) | Ascospores 1(-3)-septate; disc dark when dry, lilac-grey-opalescent when moist; apothecia 0.2–0.4 mm diam. | <i>diaphana</i> |
| | Ascospores 3-septate; disc pale orange to brown when dry, translucent when moist; apothecia 0.4–1 mm diam. | <i>hyalinescens</i> |
| 3(1) | Ascospores mostly <22 µm long | 4 |
| | Ascospores mostly >22 µm long | 7 |
| 4(3) | Apothecia brown-black, with a thick crenate margin; ascospores 14–21.5 × 11–14.5 µm | <i>Gyalideopsis crenulata</i> |
| | Apothecia variously coloured, but with a smooth margin; ascospores <10 µm broad | 5 |
| 5(4) | Ascospores (15–) 17–20 (–22) × 7–10 µm; on soil or mosses | <i>subscutellaris</i> |
| | Ascospores ≤7 µm broad; on rock..... | 6 |
| 6(5) | Ascospores 16–18 × 6–7 µm; on siliceous rock by streams, Scotland | <i>rivularis</i> |
| | Ascospores 13–15.5 × 6–7 µm; on old brickwork, S. England | <i>psammoica</i> |
| 7(3) | Epithecium colourless; true exciple pale pink- or yellowish brown to cream | <i>roseola</i> |
| | Epithecium pale green-brown; true exciple dark brown | 8 |
| 8(7) | Hymenium dark brown-green above, green-brown colour extending down from the epithecium into the upper hymenium; apothecia regular or ± contorted; on ± dry calcareous rocks | <i>lecideopsis</i> |
| | Hymenium pale brown above; apothecia regular; on ± damp siliceous rocks | <i>fritzei</i> |

***Gyalidea diaphana* (Körb. ex Nyl.) Vězda (1978)**

Thallus thin, blackish, rimose-cracked, effuse, ± gelatinous when wet. Photobiont *Trentepohlia*. Apothecia 0.2–0.4 mm diam., superficial; disc flat, flesh-coloured to dark brown or black when dry, violet-grey-opalescent when wet; true exciple thin, smooth, almost colourless or dark brown to black, unchanged when wet; hymenium 70–80 µm thick, colourless. Ascospores 8–12 (–15) × 5–6 µm, 1 (–3)-septate, ellipsoidal to fusiform, with a gelatinous perispore. Conidia 7–12 × 1–1.3 µm. **BLS 1655.**

On rocks in peaty streams, including melt water from snow patches; rare. Scotland (Highlands).

According to Vězda (1978), ascospores with two or three septa are very variable in shape and occur in asci with fewer than eight ascospores; such phenomena can also occur in other species of *Gyalidea*. *G. fritzei* occurs in similar habitats and is externally similar, but has larger muriform ascospores.



Gyalidea fritzei (Stein) Vězda (1966)

Thallus thin, superficial or immersed, smooth, rarely cracked, whitish or sometimes rusty red, often disappearing, effuse. Apothecia 0.2–0.6 mm diam., 0.1–0.2 mm high, emergent, sessile and scattered or in clusters of two or three; disc persistently deeply concave, perithecioid when young, pale orange to dark brown; true exciple well-developed, markedly fuscous brown, sometimes fissured; epithecium pale green-brown; hymenium (80–) 120–160 μm tall, pale brown above; hypothecium very pale brown. Asci (76–) 100–120 \times (25–) 30–45 μm , (6–)8-spored. Ascospores (18–) 24–35 (–43) \times (10–) 12–16 (–21) μm , ellipsoidal or subglobose, occasionally attenuated at one end, muriform. **BLS 0543.**

On somewhat basic rocks and pebbles, e.g. basalt and mica-schist in upland areas, often in seepage tracks and spasmodically wet situations; rare but widespread. C. Wales, Pennines, C. & N. Scotland, Ireland (Antrim).

Resembles *G. lecideopsis*, which occurs on dry limestones and has the upper part of the hymenium darker. A specimen with apothecia with a regular, deeply fissured margin, and smaller, muriform spores, 16–18 \times 7–9 μm , collected on galena in mid-Wales, may be a new species closely related to *G. fritzei*.

NT

**Gyalidea hyalinescens** (Nyl.) Vězda (1966)

Thallus thin, membranous, smooth or cracked, effuse, grey to brown-grey; photobiont *Leptosira*-like. Apothecia to 1 mm diam., dispersed or 2- to 5-confluent, immersed or superficial; disc flat to concave, orange to brown, translucent when wet, with a persistent \pm raised pale grey to brownish margin; hymenium 70–85 (–120) μm tall, colourless. Asci 70–80 \times 10–14 μm . Ascospores 12–16 (–24) \times 5–7 μm , 3-septate, cylindrical-ellipsoidal. **BLS 0544.**

On soft, moist rocks in sheltered sites; rare. N. and W. Scotland, W. Ireland. A record from Gloucestershire refers to *G. psammoica*.

Superficially resembles some morphs of *Ionaspis lacustris* but differs in the well-developed exciple and the septate ascospores. *G. hyalinescens* var. *pauciseptata* has submuriform ascospores.

NT

**Gyalidea psammoica** (Nyl.) Lettau ex Vězda (1966)

Gyalidea hyalinescens var. *pauciseptata* van den Boom (1995)

Thallus greenish grey, in small patches, smooth and effuse, very thin. Apothecia 0.15–0.25 (–0.3) mm diam., scattered to clustered, greyish brown, sessile, concave, constricted at the base; exciple olive-greyish brown, well-developed; hymenium 50–60 μm tall; epithecium colourless to pale olive-brown. Asci 45–55 \times 10–15 μm , 8-spored. Ascospores 13–15.5 \times 6–7 μm [10–15 \times 4–6 μm *vide* van den Boom & Vězda 1995], narrowly ellipsoidal, submuriform, with 3–4 transverse septa and (0–)1–2 longitudinal septa. Conidia unknown. **BLS 2670.**

On old brickwork, England (Essex, Gloucestershire).

Treated in Gilbert *et al.* (2009b) as a variety of *G. hyalinescens* but the synonymy with *G. psammoica* was established by Aptroot & Lücking (2002). The similarities with *G. rivularis* need further consideration.

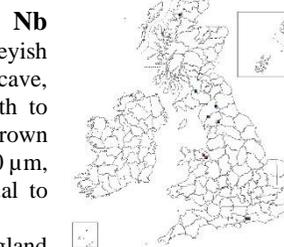
NE

Gyalidea lecideopsis (A. Massal.) Lettau ex Vězda (1966)

Thallus immersed or thin to inconspicuous, cracked-scurfy, effuse, a pale or greyish stain. Apothecia 0.3–0.6 mm, \pm immersed, scattered to confluent; disc deeply concave, whitish to grey-brown, the margin somewhat darker, well-developed, smooth to crenate; epithecium dark green-brown, hymenium 90–130 μm tall, dark green-brown to black-brown in the upper part, the remainder colourless. Asci 60–120 \times 15–30 μm , 4- to 8-spored. Ascospores (17–) 22–30 (–36) \times 10–12 (–15) μm , ellipsoidal to cylindrical-ellipsoidal, muriform. **BLS 0545.**

On basic substrata such as heavy-metal-rich shingle or chalk nodules; rare. England (Cumbria, N. Pennines, Sussex), Scotland (Lanark, Sutherland), N. Wales.

Very similar to *G. fritzei*, which apparently has a paler upper hymenium and occurs in damper habitats; the delimitation of these taxa is uncertain.



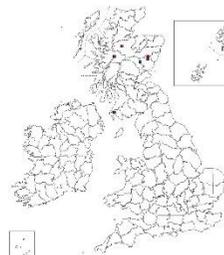
Gyalidea rivularis (Eitner) R.O. Novak & Tobol. (1975)

VU

Similar to *G. fritzei* (and treated as a variety of that species by Vězda 1966a) but with smaller apothecia (0.07–0.2 mm) and ascospores (16–18 × 6–7 μm). **BLS 2421**.

On siliceous riverine rocks in the middle geolittoral zone. Scotland (Galloway, Angus, Inverness).

The species should be compared with *G. psammoica* (see above). Neither taxon is well-known and the limits of variation are unclear.

**Gyalidea roseola** (Arnold) Lettau ex Vězda (1966)

CR B

Thallus thin, epilithic, smooth or uneven-scurfy, effuse or with isolated areoles, white to pinkish (sometimes appearing brownish due to overlying cyanobacteria). Apothecia (0.2–) 0.3–0.7 mm diam. and 100–200 μm tall, superficial; disc concave to ± flat in older apothecia; true exciple well-developed, elevated, smooth, concolorous with the disc or somewhat browner, cream to pinkish or yellowish brown, appearing translucent when wet; epithecium colourless, hymenium 90–120 μm tall, colourless. Asci 70–100 × 15–25 μm, clavate, thin-walled except for a slightly thickened apical dome, K/I –, with a ± small ocular chamber, (4–)8-spored. Ascospores (20–) 29–34 (–36) × (8–) 12–14 μm, ellipsoidal, muriform with 3–5 transverse septa and 1–3 discontinuous longitudinal septa, with a thin perispore. **BLS 0546**.

On ± calcareous rocks in old lead mine spoil. Scotland (Dumfries, Lanark, Argyll, W. Inverness), England (Yorkshire).

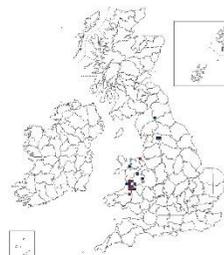
Differs from other species in the genus in the flesh-coloured apothecia. Apart from the pigmentation, *G. roseola* is similar to *G. fritzei* and could be an albino morph of that species.

**Gyalidea subscutellaris** (Vězda) Vězda (1966)

NT

Thallus continuous, thin, green-brown, ± gelatinous when wet, effuse, becoming grey-brown or blackish or inconspicuous when dry, encrusting soil and mosses and merging imperceptibly into adjacent algal colonies. Apothecia numerous, (0.2–) 0.3–0.5 mm diam., emergent to superficial, scattered or confluent; true exciple well-developed, brown; disc at first urceolate, especially when dry, later becoming concave to flat, dull yellow to fawn when young and moist, darkening to brown with age or when dry; hymenium 90–120 μm high, colourless. Ascospores (15–) 17–20 (–22) μm × 7–10 μm, ellipsoidal, muriform. **BLS 1703**.

Overgrowing mosses on ± basic, heavy metal-rich soil, often by rivers; rare. Mid & N. Wales, N. Pennines.

**GYALIDEOPSIS** Vězda (1972)

Thallus crustose, often filmy, smooth or rarely verrucose, effuse, often with hyphophores; **hyphophores** erect, scale-like. **Photobiont** trebouxoid. **Ascomata** apothecia, orbicular, red-brown to almost black, becoming plump and translucent when wet, with a raised margin. **Thalline margin** absent. **True exciple** and **hymenium** of a distinctive loosely anastomosing network of thin hyphae in a gelatinous matrix. **Asci** 2- to 8-spored, cylindric-clavate to ovoid, thickened at the apices, the contents K/I+ wine-red. **Ascospores** transversely septate to densely muriform, colourless, with a thin to thick perispore. **Conidiomata**: pycnidia unknown, but hyphophores may have parallel roles. **Chemistry**: no lichen substances detected by TLC. **Ecology**: rocks, trees and associated bryophytes

in humid woodland situations, also on montane schist and epidiorite soils.

A large, primarily tropical genus, characterized by the apothecial anatomy and in many species by the production of hyphophores that do not contain algae, in contrast to those of *Jamesiella* which have algal cells included within hyphophore stalks.

Literature:

Coppins *et al.* (2009), Lücking (2008), Lücking *et al.* (2005, 2006), Sérusiaux (1998), Vězda (1979), Xavier-Leite *et al.* (2018).

- | | | |
|------|--|-------------------|
| 1 | Hyphophores present, ascomata present or absent | 2 |
| | Hyphophores absent | 3 |
| 2(1) | Hyphophores hooked, forming an apical flange with several short lateral projections on either side | <i>muscicola</i> |
| | Hyphophores cylindrical, recurved at the tip, without lateral projections | <i>cyanophila</i> |
| 3(1) | Ascospores ellipsoidal, submuriform; on rocks in old mine sites | <i>crenulata</i> |
| | Ascospores elongate, transversely septate; overgrowing mosses in oceanic woodlands | <i>muscicola</i> |

Gyalideopsis crenulata Coppins & Aptroot (2008)

Thallus very thin, continuous, inconspicuous, forming a pale grey to brownish film on rock. Apothecia emergent, 0.2–0.3 mm diam., disc and margin brown-black, the exciple thick, crenate; hamathecium of anastomosing paraphyses *ca* 1 µm diam.; epithecium red-brown; hypothecium colourless. Asci clavate, 8-spored, 55–75 × 15–25 µm. Ascospores 14–21.5 × 11–14.5 µm, ellipsoidal, submuriform with 3 transverse septa and 1–2 longitudinal septa. Pycnidia and hyphophores not seen. Lichen products not detected. **BLS 2505**.

On rock (slate or pebbles) in mines, in copper-rich places but not necessarily heavy metal-tolerant; rare. Wales (Cardigan and Caernarvon), endemic.

In the field, superficially resembles the quite unrelated *Acarospora privigna* (Acarosporaceae), which has aseptate ascospores and polyspored asci. The lack of hyphophores makes the generic placement uncertain, and the dark crenate apothecia are atypical of *Gyalideopsis*. No sequences are available.

Nb



Gyalideopsis cyanophila Sérus. (1998)

Thallus overgrowing bryophytes, thin, inconspicuous, pale grey, ± glossy; prothallus not differentiated. Photobiont chlorococcoid. Apothecia unknown. Hyphophores 1–1.8 mm tall, long, slender, mostly dark brown, without lateral processes, the apex recurved and slightly broadened with a white tear-drop-shaped conidial mass. Conidia (“diahypae”) colourless, filiform, multiseptate, (60–) 100–140 × *ca* 1.5 µm, the cells 5–9 µm long, produced from branched conidiophores.

On moribund mosses in maritime turf, St Kilda.

Originally described from mats of cyanobacteria overgrowing montane mosses in the Caribbean (Sérusiaux 1998) but subsequently reported from the Azores. The very tall hyphophores are distinctive.

NE

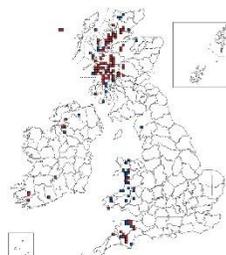


Gyalideopsis muscicola P. James & Vězda (1972)

Nb IR

Thallus very thin, continuous, inconspicuous, forming a pale grey to glaucous grey film over mosses, the hyphae penetrating moss cells. Apothecia frequent, 0.3–0.6 mm diam., brown-black or becoming red-brown, single or in groups of 2–4. Asci 8-spored. Ascospores 48–55 × 2–3 µm, cylindrical, 15- to 20-septate. Conidiomata: pycnidia unknown. Hyphophores minute, black, (dark brown when wet), hooked at the apex forming a terminal flange and with several short, lateral projections on either side, the whole holding a clear, spherical droplet. Conidia not described. **BLS 0548**.

Over mosses on tree trunks, rock faces and boulders in damp situations preferring



the 'drip tassels' of pendent mosses, particularly *Isoetecium myosuroides*: scattered throughout western oceanic woodlands. W. Britain and Ireland.

Fertile specimens of *Jamesiella anastomosans* can be distinguished by their muriform ascospores and different hyphophores (see illustration below). Also, superficially resembles *Gomphillus calycioides*, which occurs in similar habitats, but has club-shaped apothecia and filiform ascospores.

JAMESIELLA Lücking, Sérus. & Vězda (2005)

This genus was segregated from *Gyalideopsis* (q.v.) from which it differs by the presence of isidiiform hyphophores where the conidia and algal cells are enclosed in their stipes.

There are five species known currently, of which two occur in Britain and Ireland. The isidiiform hyphophores ('thlasidia'), are interpreted as transformed stipitate hyphophores in which the diahyphae (moniliform or filiform conidia) are produced internally instead of externally, and the whole hyphophore is dispersed as an entity and functions as a diaspore.

Literature:

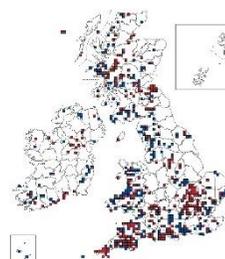
James (1975), Lücking *et al.* (2005, 2006, 2009), Vězda (1972).

- 1 Hyphophores pale grey to green, spine-like; ascospores (6-)8 per ascus, <35 µm long*anastomosans*
 Hyphophores brown, top-shaped; ascospores (1-)2(-3) per ascus, >35 µm long.....*scotica*

Jamesiella anastomosans (P. James & Vězda) Lücking, Sérus. & Vězda (2005)

LC

Thallus filmy, continuous, thin, skin-like, smooth or verrucose, glaucous to pale grey, in small, occasionally coalescing patches; prothallus often delimiting, pale grey or white. Apothecia frequent, 0.2–0.4 mm diam., scattered or occasionally crowded and contiguous, orange-red to black-brown, round or angular, the margin smooth or irregularly uneven, pale, translucent, when wet with a dark brown margin. Asci (6-) 8-spored. Ascospores 20–30 × 6–13 µm, ellipsoidal or subclavate, muriform or submuriform, less than 30-celled. Hyphophores thin, pale grey to green, ca 0.1 mm long, usually abundant and crowded, mostly absent when ascomata are developed, often flattened, swollen and translucent at the pointed apices (hand lens), sometimes proliferating by budding. **BLS 0547.**



On smooth, shaded bark, often on horizontal boughs, especially of *Salix* or *Fagus*, in moist, sheltered woods, copses and carrs, damp lignum, rarer on timber, mosses among boulder scree and under rock overhangs; pollution tolerant; locally frequent, increasing. Throughout Britain and Ireland.

Jamesiella scotica (P. James) Lücking, Sérus. & Vězda (2005)

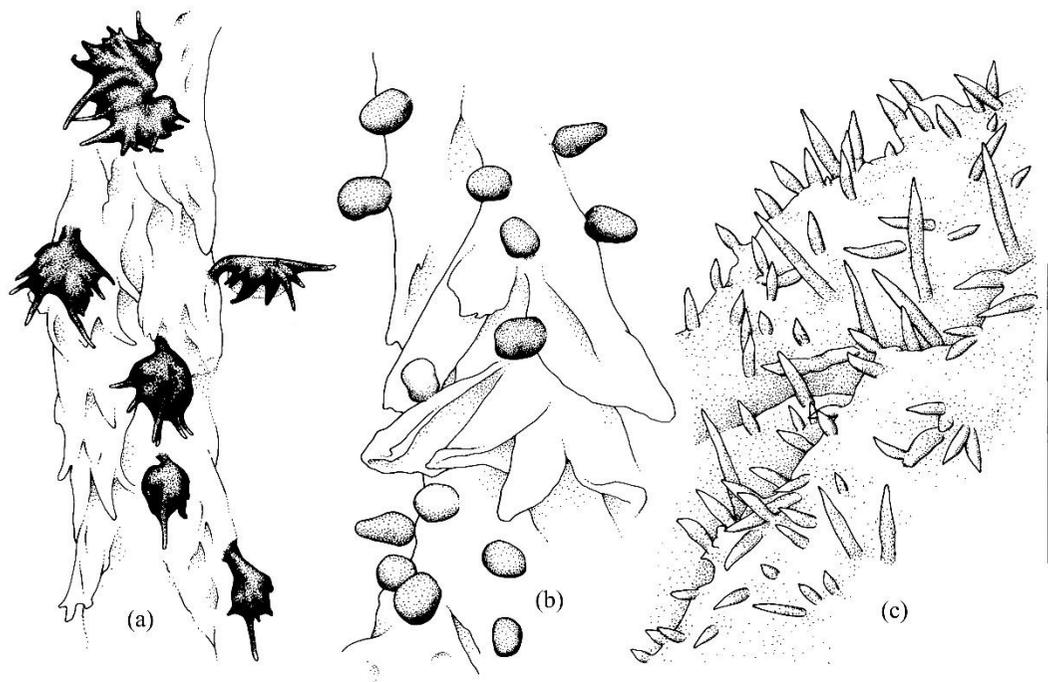
NT IR

Thallus varnish-like, ± shining and translucent when wet, grey-white, mostly effuse and ill-defined, to ca 1.5 cm diam. Apothecia rare, scattered in groups of 2 or 3, sessile, but often hidden. Asci (1-)2(-3)-spored, thick-walled, ovoid-ellipsoidal. Ascospores 40–63 × 22–30 µm, muriform. Hyphophores 0.1–0.3 mm tall, 0.1–0.2 mm wide, creamy brown to red-brown, numerous, evenly scattered, rounded and squat, peg- or top-like. **BLS 0549.**



On decomposing liverworts and mosses on base-rich mountain rock and soil; rare. England (Lake District), Wales (Snowdonia), throughout the Scottish Highlands, W. Ireland.

The pale brown, peg-like hyphophores are diagnostic.



Gyalideopsis and *Jamesiella* hyphophores. (a) *G. muscicola* (on moss); (b) *J. scotica* (on dead hepatic); (c) *J. anastomosans* (on bark). Scale bar = 10 μ m.

GYALECTACEAE Stizenb. (1862)

Thallus crustose, smooth or granular, sometimes cracked and scurfy, effuse or inconspicuous. Isidia absent, soredia very rare. **Photobiont** *Trentepohlia*, rarely *Trebouxia*. **Ascomata** apothecia, the disc flat to strongly concave or urceolate, or perithecia, the pore often opening somewhat at maturity; then immersed in the thallus, in projecting thalline warts, or emergent; frequently waxy-looking, pallid, flesh-coloured, orange or brown, translucent and semi-opaque when wet. **Thalline margin** mostly absent, rarely reduced to a thin layer. **True exciple** well-developed, persistent, white to grey or concolorous with the disc, of angular, rounded or elongate cells, sometimes two-layered, sometimes containing crystals, with or without periphysoids. **Hamathecium** of paraphyses; unbranched, septate, sometimes swollen or hooked at the tips, usually not forming a distinct epithecium. **Asci** thin-walled, lacking an apical apparatus or tholus, contents and wall K/I+ blue, rarely K/I-, sometimes multisporous. **Ascospores** ellipsoidal to fusiform or acicular, usually multiseptate or muriform, colourless. **Conidiomata** pycnidia, only known in a few species; inconspicuous, immersed. **Conidiogenous cells** elongate-ampulliform, arising in groups on short-branched conidiophores. **Conidia** bacilliform, ellipsoidal, curved to thread-like, aseptate, colourless.

As with other groups within the Ostropales, phylogenetic research has shown that there is not a clear evolutionary divide between apothecial and perithecial forms. Studies by Baloch *et al.* (2013a), Lücking *et al.* (2019) and Ertz *et al.* (2021) has established that the Gyalectaceae contains numerous

clades that mostly correlate with the traditionally recognized genera when European species are studied, but their definition appears problematic in some cases when tropical species are considered. The arrangement here must therefore be regarded as provisional.

Lücking *et al.* (2019) and Ertz *et al.* (2021) proposed a broadly defined *Gyalecta* including *Belonia*, *Cryptolechia* and *Pachyphiale*, but we prefer a more narrow interpretation of the genus that allows retention of these well-known taxa. This approach dictates the separation of *Gyalecta ulmi* as a basal clade of *Gyalecta* s.l., for which the generic name *Phialopsis* Körber (1855) is available, the lectotypification of *Secoliga* Norman (1852) as a home for *G. jenensis*, and recognition of *Clathroporinopsis* M. Choisy (1929) for *Belonia* (*Gyalecta*) *nidarosiensis*. This also allows continued recognition of the perithecial *Thelopsis*, which nests within the broad *Gyalecta* clade; as observed by Ertz *et al.* (2021) it is not possible to preserve use of this name and avoid paraphyly without fragmenting *Gyalecta* into several segregate genera.

Ramonia was included in the Gyalectaceae by Lücking *et al.* (2017) but has since been excluded (Ertz *et al.* 2021), and only one of the species included in Sanderson & Purvis (2009) belongs to that genus; most are now included in *Karstenia* (Stictidaceae).

Literature:

Baloch *et al.* (2010a, 2013a), Ertz *et al.* (2021), Kauff & Büdel (2005), Lücking *et al.* (2017, 2019).

1	Ascomata usually prominent, apothecial or perithecial in structure	2
	Ascomata absent or rare	25
2(1)	Asci multispored	3
	Asci (4-) 8-spored	10
3(2)	Ascomata perithecial in structure with a narrow ostiole; asci with very many spores	4
	Ascomata apothecial in structure, though sometimes urceolate with a quite narrow opening; asci (8-) 16- to 48-spored	7
4(3)	Ascospores 1-septate; ascomata enclosed in a thalline wart; exciple unpigmented	<i>Thelopsis isiaca</i>
	Ascospores 3-septate; ascomata sometimes immersed in thallus or clothed below with thallus fragments, but not enclosed by a well-defined thalline wart; exciple orange-brown in outer part	5
5(4)	Ascomata pale brown to red-brown, sometimes blackish at the apex, surface smooth; thallus grey-green to pale brownish when fresh; on bark of native trees, lowland	6
	Ascomata black, surface wrinkled or striate; thallus orange-red to red-brown when fresh; on mosses on rocks, upland	<i>Ramonia melathelia</i>
6(5)	Ascomata with at most a collar of thallus at the base but not deeply immersed; thallus not sorediate; ascospores (10-) 12-16 (-18) × 4-8 µm.....	<i>Thelopsis rubella</i>
	Ascomata immersed in the thallus with only the upper part of the perithecia visible; thallus with punctiform soralia, sometimes in patches; ascospores 7.5-13 × 3-5 µm	<i>Thelopsis corticola</i>
7(3)	Apothecial disc pink to yellow, soon flattened, margin fissured or crenulate; paraphyses with swollen apices	<i>Cryptolechia carneolutes</i>
	Apothecia red-brown to orange, urceolate with sunken disc; smooth margin; paraphyses usually with the apices not swollen	8
8(7)	Ascospores acicular, S-shaped, helically arranged within the ascus	<i>Pachyphiale ophiospora</i>
	Ascospores fusiform, not helically arranged within the ascus.....	9
9(8)	Ascospores 38-85 × 3-5 µm, 9- to 15-septate, straight to somewhat curved	<i>Pachyphiale carneola</i>
	Ascospores 15-35 × 3.5-5 µm, 3- to 7-septate, not curved	<i>Pachyphiale fagicola</i>

- 10(2) Ascomata perithecial, the pore often opening somewhat at maturity 11
 Ascomata apothecial, open from an early stage, the disc flat to strongly concave or urceolate 14
- 11(10) Ascospores muriform; thallus wide-spreading, powdery-granular *Clathroporinopsis nidarosiensis*
 Ascospores acicular, with multiple transverse septa; thallus inconspicuous, varnish-like to
 coarsely granular-warted 12
- 12(11) On soil, bryophytes or algal mats; apothecia without thalline covering in the upper part;
 photobiont *Trebouxia* *Belonia incarnata*
 On rock; photobiont *Trentepohlia* 13
- 13(12) Thallus superficial; inconspicuous to thickly granular; ascomata in thalline warts 0.25-0.6 mm
 diam.; ascospores 50-100 (-125) μm long *Belonia russula*
 Thallus semi-immersed, thin; ascomata in thalline warts 0.2-0.25 mm diam.; ascospores
 50-75 (-100) μm long *Belonia calcicola*
- 14(11) Ascospores transversely septate only 15
 Ascospores muriform, at least with a single longitudinal septum 20
- 15(14) Ascospores 5- to 13-septate 16
 Ascospores (2-)3(-4)-septate 18
- 16(15) Ascospores 5- to 7-septate; on rock or compacted soil 17
 Ascospores (5-) 7- to 13-septate; on trees *Gyalecta derivata*
- 17(16) Apothecia 0.2–0.3 mm diam.; thallus pale grey or green-grey *Gyalecta biformis*
 Apothecia 0.3–0.7 mm diam.; thallus yellowish to brownish white *Gyalecta hypoleuca*
- 18(15) True exciple not pruinose, even, not crenulate 19
 True exciple white-pruinose, \pm crenulate; disc pinkish brown; ascospores 12–23 \times 5–8 μm
 *Phialopsis ulmi*
- 19(18) Apothecia (0.2–) 0.3–0.5 (–0.6) mm diam.; ascospores 9–14 (–16) \times 4–7 μm , at least a few
 oblique-septate *Gyalecta geoica*
 Apothecia (0.4–) 0.6–0.8 (–2.0) mm; ascospores (10–) 12–16 (–21) \times 5–6 (–7) μm , the septa
 consistently transverse *Gyalecta foveolaris*
- 20(14) Ascospores 5- to 13-septate, with an occasional longitudinal septum 21
 Ascospores muriform: septa oblique, rarely transverse 22
- 21(20) Ascospores (5-) 7- to 13-septate; on trees *Gyalecta derivata*
 Ascospores 5- to 7-septate; on rock or compact soil *Gyalecta biformis*
- 22(20) On trees 23
 On rocks and mortar 24
- 23(22) Ascospores 9–14 (–17) \times 6–9 (–11) μm , 6 or fewer cells visible in optical view; all septa
 oblique *Gyalecta flotowii*
 Ascospores 14–28 (–31) \times 5–9 μm , 6 or more cells visible in optical view; transverse and
 oblique septa visible *Gyalecta truncigena*
- 24(22) Ascospores (11–) 13–23 (–25) \times 6–10 μm ; on calcareous rock or overgrowing mosses;
 not strongly maritime *Secoliga jenensis*
 Ascospores (27–) 30–38 (–40) \times (10–) 12–16 μm ; on shaded siliceous rock, strongly
 maritime *Secoliga macrospora*

- 25(1) Thallus effuse, pinkish-orange, powdery-granular; apothecia uncommon with muriform ascospores; on calcareous rock *Clathroporinopsis nidarosiensis*
Thallus thin or immersed and inconspicuous, grey-green to dull brown; with punctiform soralia; on bark of broadleaved trees *Thelopsis corticola*

BELONIA Körb. ex Nyl. (1857)

Thallus crustose, superficial, or immersed in the substratum; some species finely granular-warted but without true soredia. **Cortex** absent. **Photobiont** *Trentepohlia*, rarely *Trebouxia*. **Ascomata** perithecioid, opening by an apical pore, or the pore opening somewhat at maturity; immersed in the thallus, in projecting thalline warts, or emergent. **Exciple** hyphal or of rounded to slightly elongate cells, sometimes two-layered; exciple without dark pigments, or partly brown-pigmented. **Involucrellum** absent. **Hymenium** sometimes containing small yellow-orange oil droplets; hymenial gel either I–, K/I–, or I+ dull blue to dull red (but blue at low concentrations of I), K/I+ blue. **Hamathecium** of paraphyses; these thin, to 3 µm diam., unbranched, septate, lax, not forming a distinct epithecium, but filling the cavity formed by the ascomatal walls. **Asci** (4-)8- spored, I– or K/I+ blue, narrowly cylindrical, thin-walled, without apical thickening or apparatus. **Ascospores** colourless, needle-shaped, transversely septate. **Conidiomata** unknown. **Chemistry**: lichen products not detected by TLC. **Ecology**: on bark, calcareous rock and soil.

The ascomata are perithecioid, but their ontogeny is similar to apothecioid ascomata in related genera (e.g. *Gyalecta*); in some species the apical pore is said to open when wet. Paraphyses arise either mainly from the base of the centrum or from both the base and sides, but there is no distinct zone of periphysoids.

In this account, *Belonia nidarosiensis* is excluded from the genus and placed in *Clathroporinopsis*, following phylogenetic analysis by Ertz *et al.* (2021); that species has muriform rather than acicular, transversely septate ascospores. *B. calcicola* and *B. incarnata* have not been sequenced, and their retention in *Belonia* is provisional. *B. incarnata* differs from all other species in its trebouxiioid photobiont, I– hymenial gel, and habitat on soil.

Literature:

Ertz *et al.* (2021), Jørgensen *et al.* (1983), Navarro-Rosinés & Llimona (1997), Orange (2013), Purvis & Orange (2009).

- 1 On soil, bryophytes or algal mats; apothecia without a thalline covering in the upper part; photobiont *Trebouxia* *incarnata*
On rock; photobiont *Trentepohlia* 2
- 2(1) Thallus superficial, inconspicuous to thickly granular; ascomata in thalline warts 0.25–0.60 mm diam.; ascospores 50–100 (–125) µm long *russula*
Thallus semi-immersed, thin; ascomata in thalline warts 0.20–0.25 mm diam.; ascospores 50–75 (–100) µm long *calcicola*

Belonia calcicola Walt. Watson (1935)

Nb IR

Gyalecta calcicola (Walt. Watson) Baloch & Lücking (2013)

Thallus semi-immersed, effuse, pink-white; photobiont *Trentepohlia*. Ascomata ± perithecial, discrete or in clusters of 1 to 3, one-quarter to half-immersed in the thallus, in fertile warts 0.2–0.25 mm diam., the apex free of thallus; involucrellum absent; exciple colourless to pale yellow-brown or pink. Asci (2-) 4-8-spored.

Ascospores 50–75 (–100) × 3–7 μm, acicular, 10- to 20-septate. **BLS 0177.**

On limestone; rare. S.W. England (N. Somerset: Goblin Combe), Peak District (Staffordshire) and Scotland (Ben Alder, Ben Hope). Endemic.

Close to *B. russula* and possibly conspecific, differing in the partly immersed thallus, smaller size of ascomata and ascospores, and possibly the smaller number of ascospores in the ascus. The record from N.W. England (Cumberland: Buttermere) must either be erroneous or (conceivably) introduced; there is no suitable habitat in the area.



Belonia incarnata Th. Fr. & Graewe ex Th. Fr. (1865)

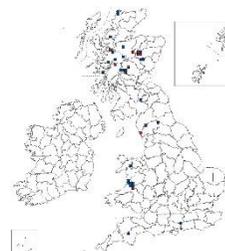
Gyalecta incarnata (Th. Fr. & Graewe ex Th. Fr.) Baloch & Lücking (2013)

Thallus indistinct, effuse, thin, varnish-like, greyish white or greenish grey, ± gelatinous when wet, comprising goniocyst-like clusters of trebouxoid algae in a matrix of narrow, filamentous hyphae; photobiont trebouxoid. Ascomata one- to three-quarters immersed, irregularly scattered, single or clustered, pinkish or yellowish grey, 0.25–0.45 mm diam., not covered by a thalline layer; opening remaining pore-like; exciple pale pink to reddish brown, thin; hymenial gel I–, K/I–. Asci 8-spored, I–, K/I–. Ascospores 120–160 × 3–4 μm, acicular, multiseptate. **BLS 0178.**

On mosses on more or less base-rich soils, and on algal films over peat on mine spoil heaps; rare, probably overlooked. S.W. England (Dartmoor), N.E. England (Teesdale), Wales, Scotland (Highlands).

The species has not been sequenced, and its association with trebouxoid rather than trentepohlioid algae is unusual for the family. Collections identified as *Abconditella synchgonioides* (Stictidaceae, Ostropales; see Suija & Van den Boom 2023) have been confused with *B. incarnata* (Aptroot *et al.* 2014b). *A. synchgonioides* has perithecial ascomata with fusiform 3-septate ascospores. It has not yet been reported from Britain and Ireland.

Nb



Belonia russula Körb. ex Nyl. (1857)

Gyalecta russula (Körb. ex Nyl.) Baloch, Lumbsch & Wedin (2013)

Thallus mostly superficial, effuse, inconspicuous to thickly granular, dull pinkish orange to dark reddish grey to reddish brown; photobiont *Trentepohlia*. Ascomata mostly discrete, rarely contiguous, immersed in prominent thalline warts (0.25–) 0.4–0.6 mm diam., dull reddish brown, the apex pale grey or pink-grey, translucent when wet; exciple ± completely covered by thalline tissue; hymenial gel I+ dull red (blue at low concentrations of I), K/I+ blue. Asci 8-spored, wall K/I+ blue. Ascospores (50–) 75–100 (–125) × 3–6 μm, acicular, 10- to 20-septate, sometimes faintly constricted at the septa. **BLS 0180.**

On calcareous metamorphic rock and limestone in moist, shaded overhangs, usually above 600 m; local. Scotland (Highlands), Cumbria, N. Wales.

The thalline tissue surrounding the exciple has a denser structure than the rest of the thallus, forming a pale, involucrellum-like structure. See under *B. calcicola* for differences from that species.

Nb



CLATHROPORINOPSIS M. Choisy (1929)

The genus is monotypic, so the description of *C. nidarosiensis* below constitutes that of the genus. Choisy (1929) introduced *Clathroporinopsis* in an informal but Code-compliant publication, and without combining any species into the genus. Lücking *et al.* (2017) reviewed the species of *Clathroporina* Müll. Arg. (1882) to which Choisy referred when introducing the genus, and lectotypified *Clathroporinopsis* with *Clathroporina calcarea* Walt. Watson (1925), which is a synonym of *Microglæna nidarosiensis* Kindt (1884), i.e. the species treated by Purvis & Orange

(2009) as *Belonia nidarosiensis*. The necessary combination into *Clathroporinopsis* has not been made to date, so that situation is regularized in this publication.

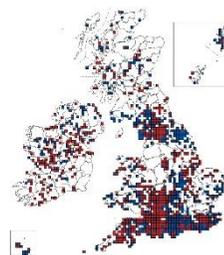
Clathroporinopsis nidarosiensis (Kindt.) P.F. Cannon (2024)

LC

Belonia nidarosiensis (Kindt) P.M. Jørg. & Vězda (1983)

Gyalecta nidarosiensis (Kindt) Baloch & Lücking (2013)

Thallus ± superficial, effuse, rather thin, often wide-spreading, pink-orange, fading to whitish cream in dried collections; uneven, irregularly cracked, finely powdery-granular, the granules 20–30 µm diam.; photobiont *Trentepohlia*. Ascomata uncommon, scattered, 0.24–0.42 mm diam., pale pink, globose, with an apical pore which is closed in healthy ascomata when dry, but which is said to open somewhat when wet; hymenial gel I+ dull red (blue at low concentrations of I), K/I+ blue. Asci (4–) 6–8-spored. Ascospores (36–) 50–60 (–82) × (8–) 10–12 (–14) µm, muriform, with (7–) 12–15 (–19) transverse septa; elongate, ± constricted at the middle septum, with attenuated apices. **BLS 0179**.



On dry, rain-sheltered vertical surfaces and overhangs on calcareous rocks, especially hard limestone but also on calcareous mudstone, and common on sheltered stone walls; widely distributed and locally frequent. Throughout Britain and Ireland, in the Midlands & S.E. England mainly confined to churchyards, throughout Ireland.

Sequence analysis of *C. nidarosiensis* by Ertz *et al.* (2021) shows the species to be part of a somewhat disparate cluster of *Gyalecta* s.l. species, which appear to be monophyletic but show significant sequence variation with several further potential subclades. The muriform ascospores with attenuated apices contrast with the acicular spores of *Belonia* spp., and while *Secoliga* (*Gyalecta*) species also belong to the same broad clade, their ascomatal structure is rather different.

Often forming extensive sterile granular orange-pink sheets on vertical rock faces and north-facing church walls; some morphs resemble sorediate morphs of *Gyroglypha gyrocarpa*, the thallus of which is C+ red (gyrophoric and schizopeltic acids). Care should be taken to avoid confusion with poorly developed sterile thalli of other *Trentepohlia*-containing species including *Porina linearis* and *Secoliga jenensis*.

CRYPTOLECHIA A. Massal. (1853)

Thallus crustose, superficial. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, at first immersed, with a pale pseudothalline exciple visible as they emerge; disc pink to yellow, without attached cortical remnants. **Thalline margin** absent. **True exciple** pale and indistinct. **Hymenium** I+ pale blue (mainly ascus walls). **Hamathecium** of mostly unbranched, septate paraphyses with ± swollen apices. **Asci** narrowly clavate, with a single functional wall layer, (8–)12- to 48-spored, wall K/I+ blue, apex not thickened, without internal apical apparatus. **Ascospores** 3- to 7-transversely septate, colourless. **Conidiomata** pycnidia, immersed; wall colourless. **Conidiogenous cells** short-cylindrical to elongate, bottle-shaped, sometimes arising in groups on branched conidiophores. **Conidia** bacilliform or ellipsoidal. **Chemistry**: no lichen products reported by TLC. **Ecology**: mainly epiphytic on bark.

Only one species has been sequenced, and that occupies a clade sister to *Gyalecta* s.str. according to Lücking *et al.* (2019) and Ertz *et al.* (2023). The genus has not been revised in recent years, and it is not clear whether all the species currently accepted are congeneric.

Distinguished from *Gyalecta* s. str. by its multispored asci, whereas *Pachyphiale* has more darkly coloured (orange- to red-brown) apothecia and curved to thread-like conidia. Only one species occurs in Britain and Ireland.

Literature:

Ertz *et al.* (2021), Gilbert & Hawksworth (2009), Lücking *et al.* (2019).

Cryptolechia carneolutea (Turner) A. Massal. (1853)

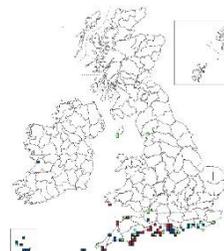
Gyalecta carneolutea (Turner) H. Olivier (1884)

Thallus white or glaucous-white, smooth, continuous to somewhat rimose. Apothecia 0.4–1 mm diam., often abundant, discrete or rarely 2- to 3-contiguous; disc pinkish orange or pale yellow, often darkening to \pm black with age, immersed at first, emerging with an irregularly striate to crenulate margin, becoming flat to convex with age, and \pm immarginate; hypothecium pale; paraphyses 1.5–2 μ m diam., the apices sometimes swollen to *ca* 4 μ m diam. Asci (8-) 12- to 16-spored. Ascospores 10–20 \times 3.5–5 μ m, 3- (to 4-) septate, cylindrical, the ends \pm abruptly rounded. Pycnidia *ca* 200 μ m diam., in swollen warts but inconspicuous, sometimes found without apothecia; conidiogenous cells 4–6 \times 2–3 μ m; conidia 7.5–9 \times 3.8–4.5 μ m. **BLS 0473.**

A rare and decreasing species in wound tracks on the shaded trunks of old trees with nutrient-rich bark, formerly centred on *Ulmus*, now chiefly on *Acer*, *Fagus*, *Fraxinus* and *Hedera*. Woodland, parkland, wayside trees, usually near the coast. S. & S.W. England, from Sussex to Cornwall, Isles of Scilly, Channel Islands, formerly north to Morecambe Bay and Isle of Man, W. Ireland (Clare).

This species is distinguished in the field by its extensive smooth white thallus and pinkish to yellow apothecia, some of which, when young, are reminiscent of *Petractis clausa* in having radiately fissured margins.

EN A2, C1+2, D IR

**GYALECTA** Ach. (1808)

Thallus crustose, smooth, continuous, sometimes cracked and scurfy, effuse, or inconspicuous. **Soralia** and **isidia** absent. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, the disc mostly strongly concave or urceolate, initially porpoid but with the pore often opening widely at maturity; immersed in the thallus, in projecting thalline warts, or emergent; frequently waxy-looking, pallid, flesh-coloured, orange or brown, translucent and semi-opaque when wet. **Thalline margin** mostly absent, rarely reduced to a thin layer. **True exciple** well-developed, persistent, white to grey or concolorous with the disc, of rounded to elongate cells, sometimes two-layered, sometimes containing crystals, without periphyses. **Hymenium** sometimes containing small yellow-orange oil droplets; hymenial gel either I–, K/I–, or I+ dull blue to dull red (but blue at low concentrations of I), K/I+ blue. **Hamathecium** of paraphyses, unbranched, septate, sometimes hooked at the tips, lax, usually not forming a distinct epithecium. **Asci** thin-walled, lacking an apical apparatus or tholus, contents and wall K/I+ blue, rarely K/I–. **Ascospores** (4-) 8 per ascus, ellipsoidal to fusiform, multiseptate to muriform, without a perispore, not indented at the septa, colourless. **Conidiomata** pycnidia, only known in a few species; inconspicuous, immersed, small, reddish brown; wall pale red-brown above, colourless below. **Conidiogenous cells** elongate-ampulliform, arising in groups on short-branched conidiophores. **Conidia** bacilliform, ellipsoidal, curved to thread-like, aseptate, colourless. **Chemistry**: no lichen products detected by TLC. **Ecology**: on soil, mosses, bark and rock in nutrient- or base-rich substrata.

In this account, *Gyalecta* is reduced to a small group of species with urecolate smooth-rimmed apothecia, (4-)8-spored asci and fusiform to ellipsoidal, transversely septate to muriform ascospores. The generic description above focuses on British and Irish species, and extralimital taxa may have somewhat different characteristics; a world revision would be desirable with many more species sequenced.

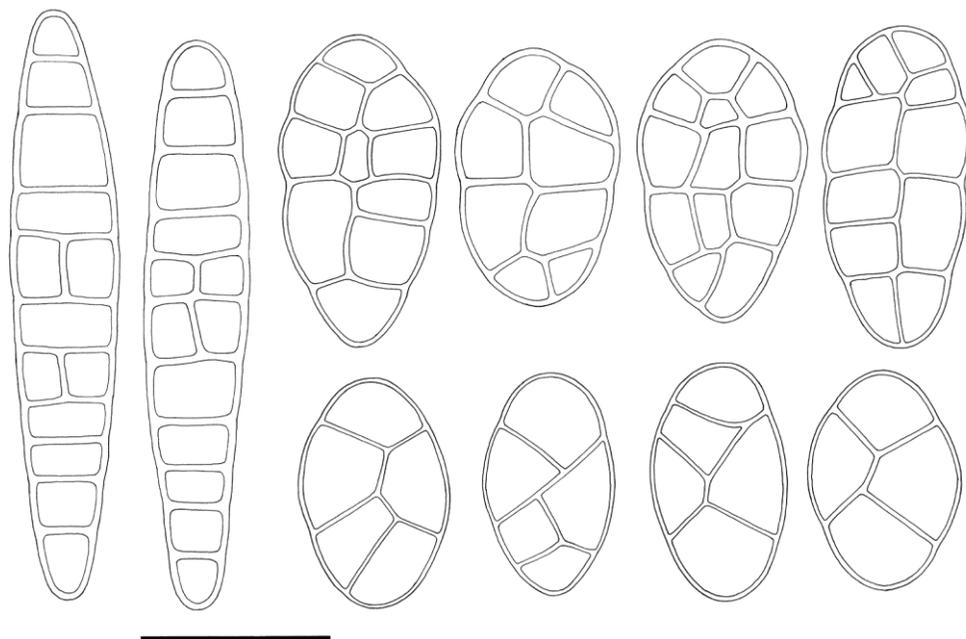
Of related genera in the second edition of *Lichens of Great Britain & Ireland*, *Belonia* differs from *Gyalecta* primarily by the perithecioid rather than apothecioid ascomata, albeit often with a broadly gaping ostiole. *Cryptolechia* and *Pachyphiale* both have multispored asci, but are otherwise similar to *Gyalecta*. Those two genera are separated by apothecial pigmentation and conidial characters. *Gyalecta jenensis* is here transferred to the genus *Secoliga*; this has apothecia \pm immersed in rock, the margins with irregular radiate-striate thickenings.

Other apparently similar genera are now shown to be more distantly related. *Gyalidea* (Gomphillaceae) differs in having ascospores with constricted septa, a different apical structure of the ascus and does not have *Trentepohlia* as photobiont. *Petractis* (of uncertain position) differs in the radially fissured, thalline covering layer of the apothecia, and lack of orange (carotenoid) globules in the paraphyses or excipular hyphae. Other superficially similar genera with urceolate apothecia are *Absconditella*, *Coenogonium*, *Cryptodiscus* and *Xerotrema*.

Literature:

Baloch *et al.* (2013a), Ertz *et al.* (2021), Gilbert & Hawksworth (2009), Gilbert *et al.* (2009a), Lücking *et al.* (2019), Purvis & Orange (2009a), Woods *et al.* (2009).

1	Ascospores transversely septate only	2
	Ascospores muriform, at least with a single longitudinal septum	7
2(1)	Ascospores 5- to 13-septate	3
	Ascospores (2-)3(-4)-septate	5
3(2)	Ascospores 5- to 7-septate; on rock or compacted soil	4
	Ascospores (5-) 7- to 13-septate; on trees	<i>derivata</i>
4(3)	Apothecia 0.2–0.3 mm diam.; thallus pale grey or green-grey	<i>biformis</i>
	Apothecia 0.3–0.7 mm diam.; thallus yellowish to brownish white	<i>hypoleuca</i>
5(2)	True exciple not pruinose, even, not crenulate	6
	True exciple white-pruinose, \pm crenulate; disc pinkish brown; ascospores 12–23 \times 5–8 μ m	<i>Phialopsis ulmi</i>
6(5)	Apothecia (0.2–) 0.3–0.5 (–0.6) mm diam.; ascospores 9–14 (–16) \times 4–7 μ m, at least a few oblique-septate	<i>geoica</i>
	Apothecia (0.4–) 0.6–0.8 (–2.0) mm; ascospores (10–) 12–16 (–21) \times 5–6 (–7) μ m, the septa consistently transverse	<i>foveolaris</i>
7(1)	Ascospores 5- to 13-septate, with an occasional longitudinal septum	8
	Ascospores muriform: septa oblique, rarely transverse	9
8(7)	Ascospores (5-) 7- to 13-septate; on trees	<i>derivata</i>
	Ascospores 5- to 7-septate; on rock or compact soil	<i>biformis</i>
9(7)	Ascospores 9–14 (–17) \times 6–9 (–11) μ m, 6 or fewer cells visible in optical view; all septa oblique	<i>flotowii</i>
	Ascospores 14–28 (–31) \times 5–9 μ m, 6 or more cells visible in optical view; transverse and oblique septa visible	<i>truncigena</i>



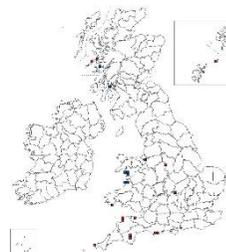
Gyalecta ascospores. (left) *G. derivata*; (centre) *G. truncigena*; (right) *G. flotowii*. Scale bar = 10 μm .

***Gyalecta biformis* (Körb.) H. Olivier (1911)**

Like *G. derivata* but differs in a greyish to orange-grey thallus, slightly larger apothecia (to 400 μm diam.) and in having spores with 5–7 transverse and occasional single longitudinal or oblique septa, measuring 17.5–20 \times 5–6.5 μm with a narrow perispore. **BLS 0534.**

Saxicolous or terricolous on crumbling alkaline shale or other basic substrata, especially on soft cliffs near the coast; rare. W. England, Wales, W. and N. Scotland. *Gyalecta derivata* occurs on bark of broadleaved trees, in contrast to the saxicolous or terricolous habit of *G. biformis*. *G. hypoleuca* has larger apothecia and ascospores, and occurs on calcareous substrata. According to Orange (2009), *G. biformis* can be confused macroscopically with *Neopetractis nodispora*; that has 3-septate spores and distinctive multiseptate conidia.

Nb



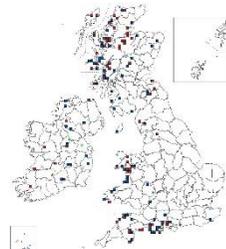
***Gyalecta derivata* (Nyl.) H. Olivier (1911)**

Thallus thin or somewhat scurfy, smooth or immersed and then inconspicuous, pale grey or green-grey. Apothecia 0.2–0.3 mm diam., scattered or confluent, \pm immersed at first, becoming emergent; disc 0.2–0.4 mm diam., urceolate, with a well-developed raised smooth and pale or concolorous true exciple, buff to orange. Ascospores 21–31 (–33) \times (3–) 4–6 μm , (5–) 7- to 13-septate, cylindric-fusiform, with an occasional single longitudinal septum. **BLS 0535.**

On bark of wayside broad-leaved trees, particularly nutrient-rich or wounded trunks of *Fraxinus* and *Acer*; local. W. Britain, rare in E. Scotland, scattered in Ireland.

Pachyphiale fagicola is similar, but has 16- or more spored asci. The apothecia of the doubtfully lichenized *Karstenia rhopaloides* (syn. *Ramonia interjecta*, Stictidaceae) are larger (0.4–0.7 mm diam.), the ascospores larger (24–43 \times 4–6 μm) and the spores generally rounded at one end.

Nb



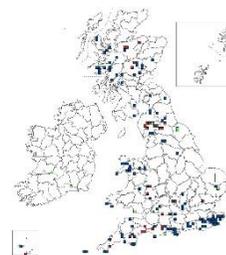
Gyalecta flotowii Körb. (1855)

Thallus thin, superficial to immersed, inconspicuous, smooth, continuous to somewhat cracked, grey to grey-green. Apothecia 0.2–0.4 mm diam., usually numerous, scattered or confluent, small, sessile to immersed; disc to 0.2 mm diam., concave, with a paler or concolorous prominent smooth to occasionally crenate true exciple, cream to orange. Ascospores 9–14 (–17) × 6–9 (–11) μm, ± spherical to shortly ellipsoidal, muriform, most of the cross walls obliquely arranged, with 6 or fewer cells in optical view. **BLS 0536.**

On base-rich bark and nutrient tracks, formerly on *Ulmus*, now particularly on *Acer* and *Fraxinus*; rare and declining. Throughout Britain except for central England, apparently absent from Ireland.

Differs from the more frequent *G. truncigena* in the smaller, usually nearly spherical, fewer-celled ascospores.

NT

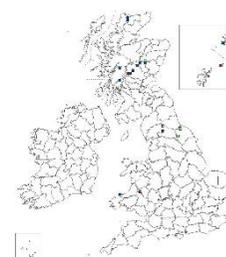
**Gyalecta foveolaris** (Ach.) Schaer. (1836)

Thallus thin to thick, ± even, becoming coarsely verrucose-granular, grey-white to orange-brown, the granules sometimes tumid and intricately convoluted; surface matt to shining, often pruinose, not cracked or areolate. Apothecia (0.4–) 0.6–0.8 (–2) mm diam., frequent, sessile, scattered to crowded-confluent; disc shallowly to deeply concave-urceolate, flesh-pink to orange; true exciple well-developed, smooth to crenate, sometimes ± tumid, white to flesh-pink. Ascospores (10–) 12–16 (–21) × 5–6 (–7) μm, (2–)3(–4) transversely septate, ellipsoidal. **BLS 0537.**

Overgrowing mosses and soil associated with basic rocks, in uplands, rarely coastal; rare. N. England (? extinct), Scotland (Highlands, esp. Breadalbanes, also Sutherland and the Northern Isles) and Wales (Cardiganshire).

Differs from *G. geoica* in the paler thallus, larger apothecia and ascospores with consistently transverse, not oblique, septa.

NT

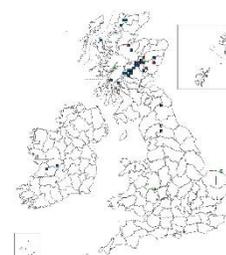
**Gyalecta geoica** (Wahlenb. ex Ach.) Ach. (1808)

Thallus uneven, occasionally somewhat gelatinous, thin, matt, pale green-grey, without convolutions, effuse. Apothecia (0.2–) 0.3–0.5 (–0.6) mm diam., numerous, immersed to sessile, scattered or confluent; true exciple well-developed smooth, raised, even, rarely slightly crenate, grey to flesh-pink; disc 0.2–0.3 mm diam. shallowly to deeply concave, yellow-pink when young, often becoming orange to brown. Ascospores 9–14 (–16) × 4–7 μm, 3-septate, some oblique, ellipsoidal. **BLS 0538.**

On basic soil, crumbling rocks, humus and associated mosses, also very rarely on base-rich bark; rare and local. Scotland (Highlands, esp. Breadalbanes), extending to scattered localities in N. England and W. Ireland.

More widespread than *G. foveolaris*, which has a better-developed, nodulose-verrucose thallus, larger apothecia, and ascospores with consistently transverse, not oblique septa.

Nb

**Gyalecta hypoleuca** (Ach.) Zahlbr (1924)

Thallus epilithic, brownish white or yellowish white; photobiont *Trentepohlia*. Apothecia 0.3–0.7 mm diam., with or without a whitish thalline margin and with or without radiating fissures; disc pale orange to red-orange when moist, sometimes drying reddish-brown; thalline margin 30–80 μm thick; true exciple very thin or inconspicuous, pale. Ascospores 20–38 × 4.5–7 μm, mostly 5- to 9-septate, rarely submuriform, fusiform to clavate, without a perispore. Pycnidia not seen. **BLS 2453.**

On vertical or sloping limestone boulders; rare, Isle of Portland, Dorset.

The species was transferred to *Petractis* by Vězda (1965), but molecular data confirm its placement within *Gyalecta* s.l. (Ertz *et al.* (2021). However, it appears not to belong to *Gyalecta* s.str. but to a poorly defined clade that includes *Clathroporinopsis*. It is retained here pending a full revision of that group.

VU D2

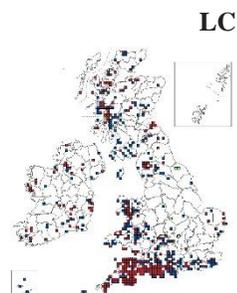


Gyalecta truncigena (Ach.) Hepp (1853)

Thallus inconspicuous, thin to scurfy, glaucous, greenish or grey. Apothecia 0.2–0.5 mm diam., immersed, rarely superficial, scattered to confluent, pale orange, flesh-coloured or pale brown; true exciple thick, smooth, even, rarely uneven-wavy, cream to brownish or yellowish pink; disc to 0.25 mm diam., deeply concave, pale to deep orange or brownish. Ascospores 14–28 (–31) × 5–9 μm, cylindrical-fusiform, sparingly muriform, with 6 or more cells in optical view; septa oblique, rarely regularly transverse. **BLS 0541.**

On nutrient-rich bark of trees, especially *Fraxinus* and *Acer*, often in well-lit situations; very rarely on old mortar of walls, limestone boulders and gravestones; common overall. Throughout Britain and Ireland.

For separation from *G. flotowii* see that species.

**PACHYPHIALE** Lönnr. (1858)

Thallus crustose, superficial, whitish-grey or green-grey, thin, effuse. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, at first immersed, then emerging, becoming concave, with a conspicuous persistent true exciple and sometimes a thin thallus-like external margin; disc red-brown to orange, rather gelatinous in texture. **True exciple** of narrow, thin, compacted hyphae, the outer edge red-brown, pale within, often containing crystals. **Epithecium** well-developed, fleshy, red-brown. **Hymenium** I+ pale blue (mainly ascus walls). **Hamathecium** of paraphyses, unbranched, thread-like, septate, ± hooked at the tips. **Asci** (8-)16- to 48-spored, ellipsoidal; wall K/ I+ blue, not or only slightly thickened at the apex and without internal apical apparatus. **Ascospores** colourless, acicular to spindle-shaped or fusiform, multiseptate, lying parallel to one another or helically arranged in the ascus. **Conidiomata** pycnidia, inconspicuous, immersed, reddish brown; wall pale red-brown above, colourless below. **Conidiogenous cells** elongate-ampulliform, arising in groups on short-branched conidiophores. **Conidia** filiform, often curved, aseptate, colourless. **Chemistry**: no lichen products detected by TLC. **Ecology**: on bark of deciduous trees in ancient woodland or parkland.

The two species sequenced by Lücking *et al.* (2019) and Ertz *et al.* (2021) belong to a distinct clade within *Gyalecta* s.l., prompting retention of the genus as defined by Woods *et al.* (2009). A third representative of the genus has been added to the British and Irish list since then.

Cryptolechia also has multisporous asci but has paler apothecia, the ascospores are broader and cylindrical with rounded ends, and the conidia are bacilliform or ellipsoidal.

Literature:

Baloch *et al.* (2010a, 2013a), Ertz *et al.* (2021), Lücking *et al.* (2019), Woods *et al.* (2009).

- | | | |
|------|--|-------------------|
| 1 | Ascospores acicular, S-shaped, helically arranged within the ascus | <i>ophiospora</i> |
| | Ascospores fusiform, not helically arranged within the ascus..... | 2 |
| 2(1) | Ascospores 38-85 x 3-5 μm, 9- to 15-septate, straight to somewhat curved | <i>carneola</i> |
| | Ascospores 15-35 x 3.5-5 μm, 3- to 7-septate, not curved..... | <i>fagicola</i> |

Pachyphiale carneola (Ach.) Arnold (1871)

LC

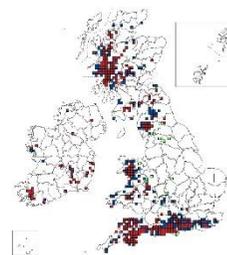
Gyalecta carneola (Ach.) Hellb. (1896)

Thallus crustose, superficial, whitish-grey or green-grey, thin, effuse. Apothecia numerous, scattered, rarely contiguous, gelatinous and ± translucent when wet, concave, red- or orange-brown; true exciple dark brown; at first sunk in the thallus, then erumpent with a spurious, crenulate, pale thalline margin, sometimes persistent.

Asci (8-) 16- to 48-spored, 75–100 µm long. Ascospores 38–80 (–85) × 3–5 (–6) µm, acicular, straight or somewhat curved or flexuose, with sharp-pointed ends, 9- to 15-septate. Pycnidia rare. **BLS 0972.**

On bark of mature to old broad-leaved trees, mostly in older woodlands or parklands, but colonising into younger stands as they mature, mainly on sheltered, moderately well-lit base-rich flushed bark in open patches between mosses, also on smooth bark on *Corylus* in the west; an ancient woodland indicator; locally frequent. From Kent & Cornwall northwards to Ross & Nairn, absent or very rare in N.E. & C. England, E. Anglia, rare in Ireland.

Can be mistaken for *Gyalecta truncigena* with less concave than typical apothecia, but this has shorter and broader muriform spores and does not have a white thallus. *Thelopsis rubella*, which grows in similar habitats, has perithecia of similar width and colour, the apical pores of which are normally easily seen when wet (×10) and can resemble the widening apothecial discs of *Gyalecta carneola*.



Pachyphiale fagicola (Arnold) Zwackh (1862)

Gyalecta fagicola (Arnold) Kremp. (1861)

Like *G. carneola*, but differs in the more immersed thallus, the often more crowded, rather duller, darker brown apothecia, often with a less widely exposed disc, and shorter, 15–35 × 3.5–5 µm, 3- to 7-septate, fusiform ascospores, the ends rounded or shortly acute. Pycnidia occasional. **BLS 0973.**

Chiefly on *Ulmus glabra* in old woodlands and on basic-barked, wayside trees; rare and very local. W., C., & E. Scotland.

Gyalecta derivata is similar, but has 8-spored asci and ascospores with (usually) more than seven septa.



NT

Pachyphiale ophiospora Lettau (1937)

Gyalecta ophiospora (Lettau) Baloch & Lücking (2013)

Similar to *P. carneola*, but with S-shaped ascospores that are helically arranged inside the ascus, 35–60 × 2–2.5 µm in size, 7- (to 9-) septate. Little detailed information is accessible on its morphology.

Recently discovered and so far known from *Pinus* in a ravine pinewood in western Scotland (W. Inverness) and *Betula* in upland pastured woodlands in Speyside (E. Inverness) and mid-Wales (Radnorshire). To be looked for on more acid bark habitats than *P. carneola*.

NE

PHIALOPSIS Körb. (1855)

Thallus crustose, thin, smooth or scurfy to finely verrucose-granular, white to greyish green or occasionally olive-grey, smooth or granular-powdery, rarely cracked. **Photobiont** *Trentepohlia*. **Apothecia** emergent to sessile, sometimes constricted at the base. **Thalline margin** absent. **True exciple** pale grey to brownish yellow, densely white-pruinose in the GBI species, smooth or often crenate. **Disc** concave to flat, covered at first, pink to pink-brown becoming chestnut brown with age, or orange-yellow to yellow-brown, sometimes thinly white-pruinose especially when young. **Hymenium** colourless, the hymenial gel I+ blue. **Hamathecium** of paraphyses, unbranched or sparingly branched, slightly swollen at the apices. **Asci** 8-spored, cylindrical to elongate-subclavate, thin-walled, without a tholus, the wall and contents I+ blue. **Ascospores** 3-septate, occasionally with one ± oblique, ellipsoidal to fusiform, colourless, without a gelatinous perispore. **Conidiomata** not known. **Chemistry**: no lichen products detected by TLC. **Ecology**: on bark of deciduous trees in ancient woodland or parkland, or on calcareous rock.

A genus of two species, occupying a basal clade and sister to that occupied by the broader *Gyalectaceae* cluster (Ertz *et al.* 2021). One is described below, the other is the circumboreal-montane

Phialopsis friesii (Flotow ex Körb.) M. Choisy (syn. *Gyalecta friesii* Flotow ex Körb.) which has paler apothecial discs without a well-developed crenulate margin. *P. ulmi* is included in the key to *Gyalecta* above.

Phialopsis ulmi (Sw.) Arnold (1884)

EN C2 IR

Gyalecta ulmi (Sw.) Zahlbr. (1905)

Thallus thin, smooth or scurfy to finely verrucose-granular, thick white to white-grey or occasionally grey-green, smooth, rarely cracked and following irregularities of the substratum. Apothecia 0.6–1.6 mm diam., numerous, scattered or frequently contiguous, emerging to sessile, scattered to confluent; true exciple pale, densely white-pruinose, smooth or often crenate; disc covered at first, 0.2–1.0 mm diam., concave, pink to pink-brown, thinly white-pruinose especially when young, sometimes persisting, becoming chestnut brown with age. Ascospores (12–) 15–20 (–23) × 5–7 (–8) μm, 3-septate, occasionally with one ± oblique, broadly ellipsoidal. **BLS 0542.**



On shaded or north- to east-facing calcareous rock outcrops, sometimes overgrowing mosses or soil-filled crevices; very rare on trees as a result of the loss of elm trees due to Dutch elm disease.

Extant but rare in C. & E. Scottish Highlands, E. Lothian, N.E. England & Herefordshire, previously also in Devon, Sussex & Shropshire.

Distinguished by its distinctive apothecia, with a pink to chestnut-coloured disc, and a prominent white-pruinose ± crenate true exciple.

SECOLIGA Norman (1852)

Thallus crustose, effuse, inconspicuous or thin and nodular to rather thick and uneven, pinkish to orange-grey. **Photobiont** *Trentepohlia*. **Apothecia** usually sessile, not constricted at the base. **Thalline margin** absent. **True exciple** orange to brownish, even to coarsely radiate-striate or crenate, sometimes with whitish nodose crystalline deposits on the surface. **Disc** at first pore-like, then concave, often shiny, pale to deep orange. **Hymenium** colourless, the hymenial gel I+ blue. **Hamathecium** of paraphyses, unbranched or sparingly branched, slightly swollen at the apices. **Asci** 8-spored, cylindrical to elongate-subclavate, thin-walled, without a tholus, the wall and contents I+ blue. **Ascospores** muriform, colourless, without a gelatinous perispore. **Conidiomata** not known. **Chemistry**: no lichen products detected by TLC. **Ecology**: on calcareous or maritime siliceous rock.

Secoliga Norman (1852) contained a rather disparate range of lichen species when originally published, and the confusion was compounded by Stizenberger (1863) who included a large number of quite unrelated taxa. It was subsequently adopted for species now assigned to the Porinaceae and Ramalinaceae among others in addition to the *Gyalectaceae*, but the generic name has never been lectotypified until now. See the Nomenclature section at the end of this paper for more information. The choice of *S. cupularis* (Hedw.) Norman, a well-established synonym of *S. (Gyalecta) jenensis*, allows its use for members of a clade of the *Gyalectaceae* identified by Ertz *et al.* (2021) that we consider is not congeneric with the type of *Gyalecta*. Data on more species are needed to fully elucidate the relationships of this clade, but it appears to be sister to one that includes *Clathroporinopsis*.

Secoliga jenensis (Batsch) P.F. Cannon (2024)

LC

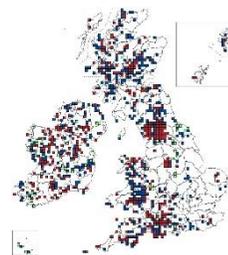
Gyalecta jenensis (Batsch) Zahlbr. (1924)

Thallus thin to rather thick and then uneven, sometimes cracked or effuse, inconspicuous, grey pinkish or orange-pink, fading in dried preserved specimens. Apothecia 0.3–1 mm diam., usually numerous, sessile, scattered or

occasionally confluent, with well-developed, smooth, even to coarsely radiate-striate crenate pinkish true exciple; disc at first pore-like, then concave, often shiny, pale to deep orange. Ascospores (11–) 13–23 (–25) × 6–10 μm, 3-septate, muriform when mature, ellipsoidal. **BLS 0539**.

On damp, often sheltered and shaded calcareous rocks, also on shaded walls including N. walls of churches, sometimes spreading to adjacent soil and mosses; widespread and common. Throughout Britain and Ireland.

The immature apothecia are ± spherical prior to development of the disc, and then resemble pale pink perithecia. The thallus is sometimes associated with bright orange tufts of the photobiont (*Trentepohlia*). Poorly developed sterile thalli should be carefully compared with those of *Clathroporinopsis nidarosiensis* and *Porina linearis*.



Secoliga macrospora (Vězda) P.F. Cannon (2024)

Gyalecta jenensis var. *macrospora* Vězda (1969)

Thallus inconspicuous, effuse, nodular, greenish when wet, often reduced to small patches in between rock crystals. Apothecia 0.6–1 mm diam. and 0.25–0.35 μm tall, sessile, strongly cupulate when fully hydrated, the disc yellow-brown to yellow-orange; true exciple brownish to pale apricot, with very conspicuous white crystalline nodose deposits on the outer surface. Ascospores muriform, colourless, (27–) 30–38 (–40) × (10–) 12–16 μm, broadly fusiform to ellipsoidal, with 6–7 transverse and 2–3 longitudinal septa. **BLS 0540**.

On shaded siliceous rocks, mainly granite influenced by basic run off; rare. S.W. England (Cornwall, Channel Isles, Isles of Scilly). Also known from France (Brittany).

Similar to *Gyalecta jenensis* but with larger ascospores, a less well-developed thallus and a different habitat. The Mediterranean species *Gyalecta schisticola* Werner (1934) is similar and occurs in maritime habitats on siliceous rocks, but has somewhat smaller ascospores that measure 18–30 × 9–12 μm (Nimis 2023). Molecular data supports its position in *Secoliga* (Ertz *et al.* 2021), but no material has been seen so the necessary transfer is not made here.

Nb



THELOPSIS Nyl. (1855)

Thallus crustose, immersed to superficial, rarely byssoid, grey, greenish, or orange-red. **Prothallus** present and whitish, or absent. **Photobiont** trentepohlioid. **Soralia** present in one species, then punctiform, sometimes becoming contiguous, soredia concolorous with the thallus. **Ascomata** perithecia, immersed, sessile, or enclosed in thalline warts; colourless to reddish brown or black. **Involucrellum** absent. **Exciple** of compressed cells or of distinctly filamentous hyphae, colourless to brownish black, sometimes layered. **Hymenial** gel I–, K/I–. **Hamathecium** of thread-like unbranched paraphyses (a few anastomoses sometimes present) and of periphyses. **Asci** multispored, cylindrical to narrowly clavate, the apices often attenuated, I+ blue at low concentration, or dull greyish or dull red, K/I+ blue; walls uniformly thin, without an apical apparatus. **Ascospores** 0- to 3(-5)-septate, colourless, often with a perispore. **Conidiomata** pycnidia, pale, in one species divided into several locules. **Conidia** aseptate, colourless, ellipsoidal to ovoid (or also thread-like?). **Chemistry**: lichen products not detected by TLC. **Ecology**: on bark and rock.

The genus is recognized by the tough, semi-gelatinous perithecia, persistent, unbranched paraphyses and asci with very numerous, septate ascospores, and trentepohlioid photobiont. In at least some species, the I+ reactions of the hymenium are situated in the ascus walls, the hymenial gel itself is I–. The periphyses occupy a broad zone around the ostiole, becoming gradually very short below; they are very distinct in size and point of origin from the paraphyses. It forms a monophyletic group, but nested within *Gyalecta* s.l.

Literature:

Aptroot *et al.* (2014a), Ertz *et al.* (2021), Orange (2013), Rose *et al.* (2009), Vězda (1968).

- 1 Ascomata rare; thallus grey-green to brownish with ochre punctiform soralia *corticola*
 Ascomata present, perithecial; thallus not sorediate..... 2
- 2(1) Ascospores 1-septate; ascomata enclosed in a thalline wart; exciple unpigmented *isiaca*
 Ascospores 3-septate; ascomata sometimes immersed in thallus or clothed below with thallus
 fragments, but not enclosed by a well-defined wart; exciple orange-brown in the outer part 3
- 3(2) Ascomata pale brown to red-brown, sometimes blackish at the apex, surface smooth;
 thallus grey-green to pale brownish when fresh; on bark of native trees, lowland 4
 Ascomata black, surface wrinkled or striate; thallus orange-red to red-brown when fresh;
 on mosses on rocks, upland..... *Ramonia melathelia*
- 4(3) Ascomata with at most a collar of thallus at base but not deeply immersed in the thallus;
 thallus not sorediate; ascospores (10–) 12–16 (–18) × 4–8 μm *Thelopsis rubella*
 Ascomata immersed in the thallus with only the upper part of the perithecia visible; thallus
 with punctiform soralia, sometimes in patches; ascospores 7.5–13 × 3–5 μm *Thelopsis corticola*

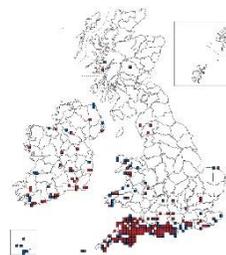
Thelopsis corticola (Coppins & P. James) Ertz (2020)

Opegrapha corticola Coppins & P. James (1979)

Thallus wide-spreading, effuse, continuous, thin to thick, grey-green in shade, suffused dull brown in more exposed situations; prothallus pale, usually inconspicuous; soralia initially punctiform, 0.2–0.7 mm diam., scattered, sometimes becoming ± patchily contiguous in irregular and erose groups 2–3 mm diam., typically even-coloured unless damaged, greenish fawn, pale grey-brown or ochraceous, fading to whitish grey in dried collections. Soredia fine but compacted and granulated, difficult to separate but individual soralia measure between 10–17 μm diam. The soralia are partly suppressed in fertile material, but are usually present. Apothecia infrequent, but mis-recorded previously as those of *T. rubella*, similar to those of *T. rubella* but usually in verrucae covered laterally by the thallus, with only the upper part of the perithecia visible, rarely the upper third emerging from the thallus. Ascospores (2–) 3-septate, 7.5–13 × 3–5 μm. Soralia C–, K–, KC–, Pd–, UV± pale fawn (rarely with UV+ red spots). **BLS 0945.**

Typical of flushed base-rich bark on veteran *Quercus*, formerly frequent on old, rough bark of *Ulmus*, but it also occurs on a wide range of wayside and woodland deciduous trees, sometimes in deep shade, as on old trees in coppice woodland and on aged boles of *Taxus* in churchyards; locally common. Scattered throughout England and common in the S.W., also Ireland and Wales. Some records may be errors for *Francisrosea bicolor*.

Thelopsis corticola often grows with *T. rubella* and was thought perhaps to be a sterile, sorediate morph related to that species; molecular studies by Ertz *et al.* (2021) have shown this assessment to be correct. *Thelopsis rubella* has very similar perithecia but these are less than one quarter immersed in the thallus and the ascospores are larger ((10–) 12–16 (–18) × 4–8 μm). *Gyrographa gyrocarpa*, which occasionally occurs on bark, resembles *T. corticola* but differs in having gyrophoric (C+ orange-red) and schizopeltic acids. Sterile *Zwackhia sorediifera* has smaller, discrete soralia which are C+ pink-red. *Francisrosea bicolor* is rather similar to sterile *T. corticola*, but the thallus is inconspicuous, immersed in the bark, only visible by the soralia and the soredia are coarser ((25–)30–50(–70) μm diam.) and more loosely packed, are orange-ochre at the surface with a contrasting pale greenish inside always visible; and is more ephemeral and confined to wound tracks.

Nb IR**Thelopsis isiaca** Stizenb. (1895)**Nb**

Thallus immersed, or superficial and cracked or areolate, grey to pale brown; cortex of hyphae with gelatinized walls. Ascomata 0.35–0.5 mm diam., enclosed in hemispherical thalline warts 0.45–0.75 mm diam., slightly paler than the main thallus, the ostiole inconspicuous, the upper part of the ascomatal wall lined with copious periphyses/periphysoids 15–20 μm in length. Exciple unpigmented, of several layers of compressed cells. Asci

200–240 (–270) × 16–20 μm, >100-spored. Ascospores 1-septate, cylindrical-ellipsoidal, quite thick-walled, colourless, 16–18.5 × 5–6.5 μm. Conidia ellipsoidal to ovoid, 3–5 × 1–1.5 μm, or thread-like, 18–20 × ca 1 μm. **BLS 0957.**

On mortar and shale on walls, rare; S. England (Cornwall, Devon, Dorset), Wales (Anglesey).

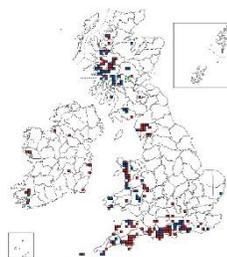
The existence of long, thread-like conidia needs confirmation. Known elsewhere primarily from bark (Aptroot *et al.* 2014a).

Thelopsis rubella Nyl. (1855)

Thallus superficial, thin to thick, grey to grey-green or pale brownish, often wide-spreading and diffuse. Perithecia scattered, discrete, at first ± immersed, less than one quarter immersed when mature, 0.4–0.6 mm diam., sometimes with the lower part covered with a ring or with patches of thallus fragments, but without a well-defined thalline layer; pale pink-brown, red-brown to dark brown; exciple distinctly hyphal, of intertwined hyphae with thick gelatinized walls, innermost layer of exciple of ± thin-walled hyphae; exciple colourless within, outer part orange-brown, K± slightly darkening; hymenial gel I–, K/I–; periphyses unbranched or sparingly branched, up to 65 μm long. Asci (100–) 150–200 × (16–) 18–25 μm, 100- to 150-spored, wall I+ dull grey to dull red, K/I+ blue. Ascospores (10–) 12–16 (–18) × 4–8 μm, ellipsoidal to cylindrical-ellipsoidal, the ends rounded, (1-)3-septate, without a distinct perispore. **BLS 1408.**

On trunks of mature, broad-leaved trees, particularly *Quercus*, *Fagus* and *Fraxinus*, with bark of pH >5.0; mostly in the Lobarion or the Agonimion octosporae in ancient woodlands or parklands, where it is an important indicator species; often in furrows or intermittent rain tracks in association with the liverwort *Metzgeria furcata*; local. Throughout the Britain and Ireland, from S. England (E. Sussex to Cornwall) to Scotland (West Ross, Skye and Nairn), absent from most of C. & E. England and E. Scotland.

The perithecia are unusual among British lichenized fungi in being relatively short-lived and are soon replaced when shed; they are usually most abundant in winter and early spring. Fertile *Thelopsis corticola* has very similar perithecia but these are deeply immersed in the thallus and the ascospores are smaller ((7.5–13×3–5 μm). *Porina leptalea* is superficially similar but is usually on smooth bark, the perithecia are smaller and usually more orange and the asci are 8-spored. The young apothecia of *Gyalecta carneola* are similar in colour, size and diameter to the perithecia of *Thelopsis rubella* but differ in the gradual widening of the initial pore-like disc; the apical pore of the perithecia of *T. rubella* is usually easily seen when wet (×20). *Swinscowia thelopsidoides* has similar but smaller perithecia and 3-septate ascospores but they are produced in 8-spored asci. *T. flaveola* Arnold (1873), with yellowish perithecia and aseptate ascospores, occurs on trees in continental Europe.



ODONTOTREMATACEAE D. Hawksw. & Sherwood (1982)

Stromata sometimes present. **Ascomata** apothecial, immersed or erumpent, with a well-developed hyphal exciple, often black and carbonized, often deeply urceolate. **Hamathecium** of simple paraphyses, sometimes branched at the base, the exciple usually lined with periphysoids. **Asci** elongate, with a thickened apex, with or without a well-developed J– pore. **Ascospores** ellipsoidal to filiform, variously septate. Anamorphs not definitely known.

A primarily saprotrophic family, of which *Xerotrema* is the only genus treated here. *Odontotrema pertusariae* Etayo, Diederich & Coppins (2002) was transferred to *Sphaeropezia* (Stictidaceae) by Baloch *et al.* (2013b). Sherwood-Pike (1987) included the lichenicolous genera *Pleospilis* Clem. (1909) and *Skyttea* Sherwood, D. Hawksw. & Coppins (1981) in the Odontotremataceae, but the

former is now considered to be a synonym of *Spirographa* (Spirographaceae) and the latter is placed within the Helotiales. The bryophilous *Potriphila navicularis* occurs on dead leaves of Polytrichaceae in the Cairngorms (Döbbeler & Hertel 2013) and is listed as a member of the Odontotremataceae, but its position is uncertain and it is not treated further in the current work.

XEROTREMA Sherwood & Coppins (1980)

Thallus inconspicuous or immersed. **Photobiont** absent, loosely associated with *Trentepohlia*, not or facultatively lichenized. **Ascomata** apothecia, erumpent, dark brown to black, at first \pm closed but becoming urceolate, opening entire to dentate. **Thalline margin** absent. **True exciple** of irregularly septate hyphae in a gelatinous matrix, black. **Epithecium** brownish. **Hymenium** colourless, K/I–. **Hypothecium** poorly developed, colourless. **Hamathecium** of thread-like, septate paraphyses, branched at the apices; periphysoids lining the inner surface of the true exciple, unbranched. **Asci** at first cylindrical, becoming elongate-clavate, the wall \pm even in thickness, with a single functional wall layer, not thickened at the apex, K/I–, 1-spored. **Ascospores** muriform, very large, colourless, K/I \pm violet, smooth, lacking a distinct perispore. **Conidiomata** unknown. **Chemistry**: lichen products not detected by TLC. **Ecology**: on wood.

Distinguished by the massive muriform ascospores in one-spored asci, K/I– hymenium, the absence of any apical thickening in the ascus and brown epithecium. The structure of the true exciple separates *Xerotrema* from *Ramonia* species, which have clearly lichenized thalli. *Xerotrema* merits comparison with *Mellitiosporium propolidoides*, which also has one-spored asci with muriform spores, but these are much smaller than those of *Xerotrema* (Senn-Irlet 2014).

Literature:

Brodo (2020), Sanderson & Hawksworth (2009), Senn-Irlet (2014), Sherwood & Coppins (1980).

- 1 Ascospores K/I–; exciple brown or with a faint green tinge in water, lower parts K/I+ blue *megalosporum*
 Ascospores K/I+ violet; exciple green in water, K/I– *quercicola*

Xerotrema megalosporum Sherwood & Coppins (1980)

NT IR

Apothecia 0.3–0.6 mm diam., the margins dentate, with coarse radial striations; disc urceolate, dark brown; exciple brown or occasionally with a faint green tinge in water mounts, lower parts K/I+ blue. Asci 140–180 \times 35–40 μ m, 1-spored. Ascospores 90–140 (–170) \times 22–40 μ m, composed of numerous cells individually 3–4 μ m diam., K/I–. **BLS 1960.**

On dry wood of trunks and branches of *Pinus* in old growth native pinewoods; rare. C. & E. Highlands of Scotland.



Xerotrema quercicola Coppins & Aptroot (2008)

NT IR

Thallus inconspicuous, dubiously lichenized. Apothecia 0.3–0.6 mm diam., the margins dentate, with coarse radial striations; disc urceolate, dark brown; true exciple distinctly green-tinged in water mounts, lower parts K/I–. Asci 140–180 \times 35–40 μ m, 1-spored. Ascospores 52–98 \times 16–28 μ m., composed of numerous cells individually 3–4 μ m diam., K/I+ violet. **BLS 2518.**

On lignum of standing or fallen and propped, decorticated *Quercus* trunks in western Britain in woodlands and rarely parkland, from the New Forest (Hampshire) to N. Scotland (Skye & E. Ross). In Ireland, also mainly on *Quercus* lignum in S.W. Ireland (Kerry) and the Wicklow Mountains, but also recorded on *Taxus* in Killarney (Kerry) and *Larix* at Powerscourt (Wicklow). Potentially could occur on native *Pinus* in western Scotland. Endemic.



PHLYCTIDACEAE Poelt & Vězda ex J.C. David & D. Hawksw. (1991)

The family currently contains the single genus *Phlyctis*, so the description of the genus below constitutes that of the species. *Psathyrophlyctis* Brusse (1987) has been included by some recent authors, but was excluded from the family by Muscavitch *et al.* (2017a).

PHLYCTIS (Wallr.) Flot. (1850)

Thallus crustose, smooth, thin to superficial, rough and \pm cracked-areolate, pale green-white to grey-green when fresh, becoming creamy or pale brownish in dried material; prothallus white. **Photobiont** chlorococcoid (*Symbiochloris*). **Soralia** present or absent, discrete to confluent, the soredia farinose to granular. **Ascomata** apothecia, immersed, scarcely emergent, the entire surface sometimes obscured by a coarse, white pruina. **Thalline margin** thin, irregularly crenate or indistinct. **True exciple** thin, poorly developed. **Epithecium** granular, colourless to pale brown. **Hymenium** colourless. **Hypothecium** poorly developed, colourless to pale brown. **Hamathecium** of paraphyses slender, sparingly branched near their apices, with indistinct, widely spaced septa and slightly enlarged tips. **Asci** broadly clavate, thin-walled, not strongly thickened at the apex, outer wall K/I+ blue, tholus I+ weakly blue; 1-, 2-, 4- or 8-spored. **Ascospores** ellipsoidal, elongate, or subspherical, \pm apiculate, densely muriform, with a thin, I+ blue wall and very thin perispore, colourless or pale yellow-brown when over-mature. **Conidiomata** pycnidia, \pm immersed, sometimes multichambered, black. **Conidia** aseptate, colourless, narrowly ellipsoidal or bacilliform. **Chemistry**: various depsidones, but only norstictic acid in British species. **Ecology**: predominantly corticolous but also over mosses and on rock (rarely so in British and Irish species).

The genus includes around 20 species worldwide. Lichenicolous species on *Phlyctis* are described by Muscavitch *et al.* (2017b).

Literature:

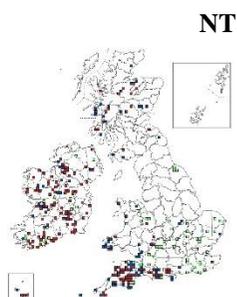
Benfield *et al.* (2009), Muscavitch *et al.* (2017a, b).

- | | | |
|---|---|----------------|
| 1 | Thallus not sorediate; apothecia always present | <i>agelaea</i> |
| | Thallus sorediate, apothecia rare | <i>argena</i> |

Phlyctis agelaea (Ach.) Flot. (1850)

Thallus grey-white to pale grey, powdery, thin, continuous to rough, \pm rimose-cracked, forming small patches; prothallus white, delimiting. Apothecia 0.2–0.5 (–1.0) mm, irregular or rounded, scattered or \pm contiguous, deeply embedded, disc concave to flat, black-grey veiled with coarse powdery granules and white pruina; thalline margin white-granular; true exciple thin, grey, I+ bluish, usually obscured by the thalline margin; hypothecium brown. Asci 2(–4)-spored. Ascospores (35–) 50–80 (–85) \times 12–25 (–30) μ m, markedly muriform, apiculate or lemon-shaped, colourless but becoming pale yellow-brown when over-mature. Conidia aseptate, ellipsoidal, occasionally curved, 6–7.5 (–8) \times 3–4 μ m. Thallus C–, KC+ red, K+ yellow-red (crystals), Pd+ orange, UV– (norstictic acid). **BLS 1109**.

On bark of deciduous trees in moist habitats, chiefly on the smooth trunks and branches of young trees, especially *Corylus*, *Fraxinus*, *Acer pseudoplatanus*, *Populus* and *Salix*, in sheltered valley bottoms, copses and bogs, very rarely on smooth, porous, acid to neutral rocks in sheltered sites; rare. S.W. England (formerly much more widespread, but relict populations are found in the New Forest (Hampshire) on *Fagus* and Kent on



Carpinus), Wales, throughout Scotland and Ireland.

The powdery granular covering of the apothecia may resemble soralia, the absence of which separates this species from *P. argena*. The K⁺ blood-red reaction of the thallus separates it from *Lepra multipuncta*.

Reichlingia zwackhii has been reported as lichenicolous on this host in Cornwall.

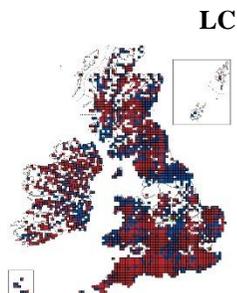
Phlyctis argena (Spreng.) Flot. (1850)

Thallus smooth, thin or thick and then rough and cracked, pale green-white or grey-green when fresh, becoming creamy to pale brownish in dried specimens, forming small to large patches surrounded by a white prothallus; soralia usually paler than the thallus, irregular, ulcerose, coalescing, soredia fine to coarsely granular. Apothecia rare, 0.2–0.5 mm diam., grey to grey-black, irregular, ± rounded, embedded in the thallus, concave to flat, ± pruinose; thalline margin elevated, granular; true exciple thin, flexuose, usually covered by the granules of the thalline margin. Asci 1-spored. Ascospores (75–) 90–130 (–140) × (25–) 30–50 μm, strongly muriform, without apiculate apices. Conidia narrowly ellipsoidal, ± curved, 5–6.5 × ca 3 μm. Thallus C[–], K⁺ blood-red (crystals), KC⁺ red, Pd⁺ orange-red, UV[–] (norstictic acid).

On deciduous trees, rarely on conifers, in well-lit wayside and woodland habitats, occasionally on N- and E-facing, ± basic siliceous rocks and walls, sometimes overgrowing mosses; common and pollution-tolerant. Widespread and locally common throughout Britain and Ireland.

Initially, the irregular soralia may have ± raised, unevenly granular or subcrenate margins; in this state they resemble the apothecia of *P. agelaea* and care is needed in identification of the two species. Older soralia are often very diffuse, irregular, and eroded and resemble browsed mollusc tracks across the surface of the thallus. The thallus can be very thin with few soralia or well-developed with the centre covered with soredia. When on rock, *P. argena* is often confused with *Pertusaria lactescens*. However, in the latter, the cortex of the thallus or initial soredial granules is in part grey, owing to a grey-green, K⁺ violet pigment (*Sedifolia* grey), which is also present in the epithecium and ascospore wall. In *Haematomma ochroleucum* var. *porphyrium*, which is also similar, the thallus is not K⁺ yellow turning red.

Phacographa zwackhii has been recorded on *P. argena* in E. Scotland and the New Forest. *Reichlingia zwackhii* often seems to begin as lichenicolous on this host, especially in the New Forest. Additional lichenicolous species include *Lichenostigma alpinum*, *Spirographa lichenicola* and *Taeniolella* sp. Records of *Monodictys cellulosa* might possibly be referable to the North American *M. phlyctidis*.



SAGIOLECHIACEAE Baloch, Lücking, Lumbsch & Wedin (2010)

The Sagirolechiaceae was considered to contain two genera, *Rhexophiale* and *Sagirolechia*, by Baloch *et al.* (2010a), but subsequent research suggests that they are synonymous (Ertz & Tønsberg 2021, Spribille *et al.* 2020). The description of *Sagirolechia* below therefore constitutes that of the family.

SAGIOLECHIA A. Massal. (1854)

Thallus crustose, effuse, thin or immersed in the substrate, or absent (lichenicolous). **Photobiont** where present *Trentepohlia*, one species with a chlorococcoid alga. **Ascomata** apothecia, initially immersed, becoming ± sessile. **Thalline margin** absent. **True exciple** prominent, smooth to distinctly crenate, black, carbonaceous, shining, in section dark brown in the outer part, colourless within. **Disc**

black, concave to convex, sometimes umbonate with conical outgrowths of excipular tissue, or gyrose. **Epithecium** dark brown, K–. **Hymenium** colourless or pale brown below, dark brown in the upper part, blueing in iodine. **Hypothecium** colourless or dark brown. **Hamathecium** of paraphyses, septate, sometimes sparingly branched above, frequently anastomosing, the apical 1 to 3 cells often swollen and bound by a dense matrix. **Asci** 8-spored (a few sometimes aborting), cylindric-clavate, wall K/I+ blue, apical dome K/I–. **Ascospores** transversely septate or muriform, ellipsoidal to fusiform with cuboid compartments, colourless or brown, often with a thin perispore. **Conidiomata** immersed pycnidia. **Conidiogenous cells** short, bottle-shaped, in a single layer. **Conidia** bacilliform, colourless. **Chemistry**: no lichen products detected by TLC. **Ecology**: on rock or overgrowing bryophytes, montane.

A genus of five or six species, that are rather disparate in morphological and ontogenetic terms (Ertz & Tønberg 2021). The carbonized apothecia are outwardly comparable with unrelated genera such as *Sarcogyne* and *Melaspilea*. Differs from *Gyalidea* in the mainly unbranched paraphyses, a K/I+ blue ascus wall and (in most species) a *Trentepohlia* photobiont.

Literature:

Baloch *et al.* (2010a), Ertz & Tønberg (2021), Gilbert (2009), Gilbert *et al.* (2009), Henssen (1995), Spribille *et al.* (2020).

- 1 Ascospores lacking a perispore; apothecia immersed to sessile, the exciple not continuous under the hymenium; on calcareous rock *protuberans*
 Ascospores with a thin perispore; apothecia sessile, the exciple continuous; overgrowing mosses *rhexoblephara*

Sagiolechia protuberans (Ach.) A. Massal. (1854)

NT

Thallus inconspicuous, immersed or partly superficial, sometimes a pale orange stain, effuse, not delimited, becoming greenish-grey in dried specimens. Apothecia (0.3–) 0.4–0.7 (–1) mm diam., frequently in lines or contiguous in groups of 2 or 3, partially immersed or emergent, appearing gyrose; true exciple thick, deeply divided or fluted into 3–8 segments, often star-like when well developed, <120 µm thick, in section black-brown, merging below with the lower part of the hypothecium; disc little-exposed, with a central convex sterile plug; epithecium red- to black-brown; hymenium 100–115 µm tall, paraphyses *ca* 1 µm diam., the apices *ca* 4 µm diam. Asci 100–140 × 10–20 (–25) µm, elongate-clavate or cylindrical. Ascospores (10–) 12–25 (–29) × 6–9 µm, (1-) 3-septate, one occasionally oblique, or septa quadrate. **BLS 1677**.



Submontane to montane, on hard limestone; rare. N. England (Cross Fell, Craven, Derbyshire, N.W. Yorkshire), Wales (Denbigh), Scotland (Highlands).

Acarospora and *Sarcogyne* species with carbonized exciples differ in the multispored asci; their apothecia are irregular in shape but rarely stellate. The black, star-shaped apothecia with a sterile central cone are diagnostic of *S. protuberans*.

Sagiolechia rhexoblephara (Nyl.) Zahlbr. (1913)

NT

Rhexophiale rhexoblephara (Nyl.) Hellb. (1875)
 Thallus a thin film, rarely thicker and then thinly warted-uneven, grey, pale grey or grey-violet, sometimes with a brown tinge; forming haustoria within host cells of bryophytes; photobiont *Trentepohlia*. Apothecia black, glossy, sessile with a constricted base, (0.5–) 0.7–2 mm diam., scattered or in clusters of 2–4, sessile; true exciple prominent, ± elevated, crenate, divided into 3–8 segments, in section black-brown, merging into the hypothecium; disc concave, becoming flat or irregularly convex, brown-black, glossy; epithecium red-brown or brown; hymenium 90–120 µm tall, with unbranched, conglutinated paraphyses *ca* 1 µm diam. with swollen tips to 4.5 µm diam, brown-black. Asci 70–110 × 10–12 µm, elongate-clavate, 8-spored, ascospores 16–24 × 5–7 µm, 3-septate, colourless, transversely septate, without a



perispore. Pycnidia *ca* 100 μm diam., half-immersed; conidia 3.5–4 \times *ca* 1 μm , bottle-shaped. No lichen substances detected by TLC. **BLS 1303**.

On bryophytes overgrowing mica-schist, other weakly basic rocks and soil, semi-parasitic, rarely directly on soil, in sheltered moist cool sites in subalpine and alpine situations; rare. N. Scotland (Highlands).

S. rhexoblephara bears a superficial resemblance to *Bryobilimbia hypnorum* (Lecideaceae) but the latter species has a \pm entire, even margin and different anatomical characters.

SPIROGRAPHACEAE Flakus, Etayo & Miadlikowska (2019)

The family contains a single genus, *Spirographa*, so the generic description below constitutes that of the family. According to Flakus *et al.* (2019) it forms a monophyletic unit within the Ostropales, in a sister clade to the Graphidaceae s.l. and the Gomphillaceae. All species are lichenicolous.

SPIROGRAPHA Zahlbr. (1903)

Thallus absent, lichenicolous. **Ascomata** apothecia or perithecia, immersed in host tissue or rarely sessile on the thallus. **Disc** concave, orange-brown to blackish when exposed, the hymenium not blueing in iodine. **Exciple** yellow-brown to black, composed of isodiametric to elongate cells, without hairs. **Epithecium** with granular pigment. **Hamathecium** of paraphyses, mostly unbranched and usually thickened at the apices. **Asci** clavate to cylindrical, not fissitunicate, not thickened in the apical region, not blueing in iodine, usually 16- or 32-spored. **Ascospores** \pm helically arranged, narrowly ellipsoidal to fusiform with rounded or acute apices, sometimes with large cilia at each end, straight to curved or sigmoid, 1-septate, colourless, smooth, without a perispore. **Conidiomata** immersed, globose to pyriform, colourless to yellowish or dark brown, the upper wall breaking down irregularly. **Conidiophores** septate, thin-walled, branched. **Conidiogenous cells** terminal to lateral, proliferating sympodially. **Conidia** colourless, aseptate, the base truncate, either Y-shaped with a main axis and two diverging arms, or triangular, tetra- or polyhedral.

The connection between teleomorph (*Spirographa*, historically also as *Pleospilis* and *Spilomela*) and anamorph (*Cornutispora*, *Asteroglobulus*) was established by Flakus *et al.* (2019) using molecular data. Species are now considered to be broadly host-specific, but most of the GBI occurrence data for the genus are identified only to the aggregate taxa *Spirographa ciliata*, *S. fusisporella* or *S. lichenicola*.

Spirographa vinosa Holien & Triebel (1996), a parasite of *Ochrolechia* spp., has been reported from Britain and Ireland, but the species was transferred to *Llimoniella* (Helotiales) by Diederich & Etayo (2000). It is included in the key below for comparative purposes. An apparently undescribed species with 1- to 3-septate ascospores 43–50 \times *ca* 3 μm has been reported from *Peltigera rufescens* from Wales (Glamorgan).

Literature:

Brackel (2011), Diederich *et al.* (2019), Flakus *et al.* (2019), Holien & Triebel (1996), Punithalingam (2003).

1	Teleomorph present.....	2
	Anamorph present.....	3

- 2(1) Asci 8-spored, ascospores 3–4 μm diam., up to 5-septate, usually with \pm obtuse apices; on *Ochrolechia*.....*Llimoniella vinosa*
Asci 16- or 32-spored; ascospores 1.5–2.5 μm diam, 0- or 1-septate, the ends acuminate *fusisporella* s.l.
- 3(1) Conidia tetrahedral or triangular in outline4
Conidia Y-shaped, one arm longer than the others.....7
- 4(3) Conidia triangular in outline and flattened in side view5
Conidia tetrahedral6
- 5(4) Conidia 11–17 μm diam., with deep incisions in the middle of each side of the triangle.....*triangularis*
Conidia 8–9 μm diam., the arms swollen and ciliate, not incised*tricupulata*
- 6(4) Conidia 7–10 μm diam.; on *Ramalina**giselae*
Conidia 4–5 μm diam.; on *Hypotrachyna**pyramidalis*
- 7(3) Main body of conidia (2–2.5 μm broad) and arms (2.5–3 μm broad) strongly swollen *ciliata* s.l.
Conidia with arms and body not or slightly swollen; main body 1.5 (–2.0) μm broad..... *lichenicola* s.l.

Spirographa ciliata (Kalb) Flakus, Etayo & Miádl. (2019)

NE

Ascomata not known. Conidiomata completely or partially immersed in host tissues, pycnidial, sometimes in clusters, yellowish brown, subglobose to globose, unilocular, 50–60 μm tall and 60–70 μm diam.; ostiolate, with dark brown cells surrounding the ostiole. Conidia colourless, the main axis 6.5–9 μm long (i.e. from the truncate base to the point at the apex where the conidium bifurcates) and 2–2.5 μm broad, with two divergent arms 2.5–3 μm broad at the base, the main axis and arms all with a narrowed tubular appendage 2.5–3 μm long and <0.5 μm diam. **BLS 2035**.

Apparently polyphagous; recorded from Britain and Ireland on thalli of *Evernia prunastri*, *Lecanora pulicaris*, *L. symmicta*, *Lepra amara*, *Lobaria pulmonaria*, *Pertusaria multipuncta*, *P. pertusa*, *Protoparmeliopsis muralis* and *Punctelia borrieri*, *Usnea subfloridana* and *Xanthoria polycarpa*; scattered and certainly much under-recorded.

Flakus *et al.* (2019) observed that the type of *S. ciliata* was collected from thalli of *Dibaeis cretacea* in Tasmania, and illustrations of an isotype in Punithalingam (2003) indicate that the conidial arms are more swollen than those from *Lobaria* and *Punctelia*. It is thus likely that none of the British and Irish material belongs to *S. ciliata* s. str., but sequencing will be needed to define segregate taxa.



Spirographa fusisporella (Nyl.) Zahlbr. (1903)

NE

Ascomata apothecial, 100–250 μm diam., immersed in host tissue but opening with a broad pore, sometimes with radial splits in the host tissue, often in large clusters. Disc concave, orange-brown to blackish when exposed, the hymenium not blueing in iodine. Exciple *ca* 40 μm thick, dark grey to brown-black, darker around the pore, the margin scurfy due to adherence of host tissues. Hymenium *ca* 75 μm thick. Paraphyses *ca* 1.5 μm diam., slightly swollen at the apices. Asci clavate to cylindrical, usually 16- or 32-spored. Ascospores helically arranged, (22–) 25–32 (–42) \times 1.5–2.0 μm , narrowly fusiform, curved or sigmoid, the apices acuminate, 1-septate. **BLS 2218**.

In Britain and Ireland, *S. fusisporella* s.l. has been recorded from thalli and apothecia of a broad range of lichens including *Cetraria sepincola*, *Lecanora symmicta*, *Lepra amara*, *L. aspergilla*, *L. corallina*, *L. multipuncta*, *Leptogium teretiusculum*, *Lobaria pulmonaria*, *Megalania pulvereana*, *Mycoblastus sanguinari*, *Ochrolechia androgyna*, *O. tartarea*, *Pertusaria pupillaris* and *Usnea subfloridana*.

S. fusisporella is an aggregate species according to Flakus *et al.* (2019), with the segregate taxa largely host-specific. However, several of these (including those listed below) have not been sequenced and their precise affinities are unknown. The description above is largely adapted from a Danish collection on *Pertusaria hymenea*, contributed by Sherwood-Pike (1987). Collections from *Ochrolechia* appear to have longer ascospores



(to ca 42 μm in length; see also Zhurbenko *et al.* 2018); these could correspond to *S. vermiformis* below but more data are needed.

S. fusisporella was described from a species of *Fissurina* (Graphidaceae) from Cuba (Flakus *et al.* 2019), although those authors referred additionally to a collection on *Graphis* from northern Spain. There are no records of *S. fusisporella* s.l. from Graphidaceae in Britain and Ireland, and if Flakus and co-authors are correct in their claims of host-specificity, none of our collections can be assigned to that species.

Spirographa ascaridiella (Nyl.) Flakus, Etayo & Miądl. (2019)

NE

Described from a sterile specimen from Ireland (Killarney) provisionally identified as *Porpidia* sp. by Hawksworth (1980; as *Spilomela ascaridiella* (Nyl.) D. Hawksw.). Ascospores were illustrated alongside those from the collection described by Sherwood-Pike (see above) and identified as *S. fusisporella*; they appear identical. There are no other collections from our region on *Porpidia* spp.

Spirographa vermiformis (Leight.) Flakus, Etayo & Miądl. (2019)

NE

The type of this species was collected from *Lepra albescens*, from *Quercus* bark near Trefriw (Wales, Caernarvonshire). Other British and Irish collections from *Lepra* spp. originate from Scotland (Berwick, E. Lothian, Moray, W. Inverness), Wales (Carmarthen, Monmouth) and England (Devon); these might provisionally be identified as *S. vermiformis*. The original description is very sparse and there is no differential information available in morphological terms. Flakus *et al.* (2019) suggested that its anamorph might belong to *Cornutispora ciliata* s.l.

Spirographa giselae (Brackel) Flakus, Etayo & Miądl. (2019)

NE

Asteroglobulus giselae Brackel (2011)

Ascomata (not known in British material) 100–200 μm diam., becoming sessile on the host thallus, rounded, the margin distinct, dark-brown to black; disc orange-brown. Exciple 20–60 μm thick laterally, 35–40 μm thick at the base, with olivaceous-brown to brown pigments, composed of isodiametric cells. Hymenium colourless, I-, KI-, 60–80 μm tall. Paraphyses unbranched or slightly branched in the upper part, 1.5–2 μm diam., not or slightly capitate (to 2.5 μm) and covered by a yellow to orange-brown pigmented epithecium. Hypothecium colourless, 15–20 μm tall. Asci clavate, not thickened apically, ~ 32-spored, 48–90 \times 9–20 μm . Ascospores 11–20 \times 1.5–3.5 μm , colourless, acicular, curved to helicoid, with acute ends, 1-septate, not constricted at the septum, smooth, without a perispore.

Conidiomata superficial, (30–) 60–100 μm diam. and (30–) 40–90 μm high, globose or subglobose, opening irregularly by splitting of the upper wall; the wall composed of one or two layers of elongate, dark brown cells, intermixed with colourless or pale brown, thin-walled cells. Conidiophores branched, septate, becoming inconspicuous. Conidiogenous cells ca 4 \times 2 μm , appearing laterally and apically, subcylindrical, thin-walled, colourless, rarely polyblastic. Conidia embedded in a gelatinous matrix, (5–) 7–10 μm diam., colourless, tetrahedral to stellate, the base rounded, or pointed, or slightly truncate, expanding in the upper part and forming tapered projections. **BLS 2750.**

On blackened patches on thalli of *Ramalina farinacea*, Mull.

Only known from a single GBI collection with conidiomata only; the description of the ascomata is adapted from Flakus *et al.* (2019) and the conidiomata from Brackel (2011). Flakus and colleagues found that the species is a hyperparasite of the lichenicolous fungus *Lichenopeltella ramalinae*, but that was not observed in the British collection.

S. pyramidalis appears very similar but with smaller conidia; it occurs on species of *Hypotrachyna*.



Spirographa lichenicola (D. Hawksw. & Sutton) Flakus, Etayo & Miądl. (2019)

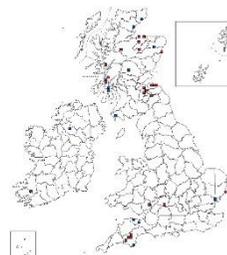
NE

Cornutispora lichenicola D. Hawksw. & Sutton (1976)

Ascomata not known. Conidiomata immersed in the host thallus, separate or occasionally aggregated, very pale brown, globose, unilocular, to 110 μm diam., dehiscing via disintegration of the upper wall; wall to 20 μm thick, composed of an outer layer of greenish-brown thick-walled elongated cells, and an inner layer of colourless isodiametric cells. Conidiophores thin-walled, branched, to 30 μm long and 1.5–2 μm diam. Conidiogenous cells 3.5–6 \times 1.5–2 μm , synchronous or sympodial, producing 1–3 conidia from minute loci. Conidia with a main axis

6–11.5 µm long and 1.5–2 µm diam., the apex extended into two divergent branches 2.5–6 µm long, the base truncate with a tapered unbranched cellular appendage 2.5–3 µm long. **BLS 2036.**

The type host is *Parmelia sulcata* (collected from South Devon), but the species has been recorded from numerous other lichens including *Flavoparmelia caperata*, *Hypogymnia physodes*, *H. tubulosa*, *Hypotrachyna laevigata*, *Imshaugia aleurites*, *Lecanora chlorotera*, *L. pulicaris*, *L. symmicta*, *Lobaria pulmonaria*, *Ochrolechia tartarea*, *Parmotrema perlatum*, *Phlyctis argena*, *Pseudevernia furfuracea*, *Pertusaria pertusa*, *Phaeophyscia orbicularis*, *Platismatia glauca* and *Punctelia borrieri*. It may be that many of these occurrences are of cryptic species within a broad *S. lichenicola* aggregate; in particular, collections from *Ochrolechia* spp. may be referable to *S. intermedia* (Punith. & D. Hawksw.) Flakus, Etayo & Miądl (2019). The description of *S. lichenicola* is adapted from Hawksworth (1976).



Spirographa pyramidalis (Etayo) Flakus, Etayo & Miądl. (2019)

NE

Ascomata (not known in British material) 100–200 µm diam., initially immersed in the host thallus but almost sessile when mature; disc exposed, concave, concolorous with the margin or paler, dark brown. Exciple 15–25 µm thick, with pale brown pigment. Hymenium 45–65 µm tall, paraphyses unbranched or slightly branched in the upper part, 1–1.5 µm diam., slightly thickened at the apices, with a honey-brown to orange brown epithecium. Asci ~ 32-spored, 40–50 × 10–15 µm. Ascospores 7–10 × 2–3 µm, colourless, 1-septate, narrowly ellipsoidal to almost fusiform, straight to curved or slightly sigmoid, smooth, without a perispore. Conidiomata immersed, becoming partially erumpent, cream-coloured, globose, 50–70 µm diam, opening by disintegration of the upper wall. Pycnidial wall composed of several layers of isodiametric cells, yellowish brown above, colourless at the base. Conidiophores and conidiogenous cells not clearly observed, even when young. Conidia 4–5 µm diam., colourless, aseptate, triangular or tetrahedral, the four angles without appendages, thin-walled. **BLS 2764.**

Several records on the thalli of *Hypotrachyna revoluta* s. lat. and once on *Platismatia glauca* on branches of *Crataegus*, *Fagus* and *Quercus* from Hampshire (New Forest). Usually growing near the edges of old lobes that are often bleached or flaky.

See also *S. giselae* (q.v.) with slightly larger ascospores, an inhabitant of *Ramalina* thalli.

Spirographa triangularis (Diederich & Etayo) Flakus, Etayo & Miądl. (2019)

NE

Cornutispora triangularis Diederich & Etayo (1995)

Ascomata (not known in British material) 100–170 µm diam., initially immersed in the host thallus but almost sessile when mature; disc exposed, concave, concolorous with the margin, dark brown to black. Exciple 10–50 µm thick, 15–20 µm thick below, brown to olivaceous. Hymenium 60–90 µm tall, paraphyses unbranched or slightly branched in the upper part, 1–3 µm diam., not thickened at the apices. Asci ~ 32-spored, 50–90 × 14–21 µm. Ascospores 30–48 × 1.5–2.5 µm, colourless, 1-septate, narrowly fusiform, straight to curved or slightly sigmoid, smooth, without a perispore. Conidiomata globose, immersed, 50–100 µm diam., pale brown, lacking an ostiole and dehiscing by disintegration of the upper wall; wall about 5 µm thick, of angular cells, colourless but brownish in the upper part. Conidiophores and conidiogenous cells not clearly distinguished, even when young; in very young conidiomata the cavity is filled with a hyaline gelatinous mass. Conidia 11–17 µm diam., triangular in face view (not tetrahedral) and flattened laterally, colourless, aseptate, with deep incisions in the middle of each side of the triangle, the three ends with an unbranched appendage of 3–4 µm long, thin-walled, smooth. **BLS 2324.**



Lichenicolous on thalli of *Pertusaria pertusa*, S. Scotland (Berwick, E. Lothian, Peebles).

The triangular (not tetrahedral) conidia are unique in the genus. The description of the ascomata is adapted from Flakus *et al.* (2019) and the conidiomata from Etayo & Diederich (1995).

Spirographa tricupulata (F. Berger & Er. Zimm.) Flakus, Etayo & Miádl. (2019) NE

Distinguished by small Y-shaped conidia with the main body and arms strongly swollen and of almost equal length, all three arms 4–5.2 µm long and 2.5–3 µm diam., with cilia 1.2–1.5 µm long. The conidiomata break through the cortex of the host, but remain mostly immersed, with only the ostiole visible. A teleomorph is not known.

On thalli of *Physcia stellaris*, Scotland (Moray); currently known only from a single collection in Britain.

This could be part of the *Spirographa ciliata* aggregate; according to Punithalingam (2003) the main axis of the conidia in that taxon is only marginally longer than the arms and all may be swollen to some extent.



STICTIDACEAE Fr. (1849)

Stromata absent or poorly developed, restricted to intramatrical hyphae. **Photobiont** (where present) chlorococcoid or trentepohlioid algae. **Ascomata** apothecia, often deeply immersed and almost perithecioid, usually with a well-developed margin formed largely of crystalline inclusions. **Hamathecium** usually of simple paraphyses, sometimes branched and pigmented, sometimes swollen at the apices. **Asci** usually narrowly cylindrical with a strongly thickened apex, not usually blueing in iodine, almost all 8-spored. **Ascospores** ellipsoidal, fusiform or often filiform, multiseptate, when filiform often fragmenting at the septa. **Anamorphs** coelomycetous, pycnidial or ± acervular, opening with an irregular pore, inconspicuous. **Conidiophores** short. **Conidiogenous cells** in clusters, annellidic and proliferating percurrently. **Conidia** elongate (then sometimes fragmenting) or bacillar. **Chemistry**: no lichen substances detected by TLC. **Ecology**: lichenized with green algae, lichenicolous or saprotrophic on woody and herbaceous material.

There are around fifteen genera accepted within the Stictidaceae. Lichenization appears to be fluid in several genera; for example, *Cryptodiscus* contains both lichenized species and bark saprotrophs (Baloch *et al.* 2009, 2010a), and in *Stictis* it appears that individual species may be lichenized or non-lichenized (Wedin *et al.* 2004, 2005). *Sphaeropezia* species can be either lichenicolous or saprotrophic (Thigarayaja *et al.* 2021), and most species of *Ramonia* accepted by Sanderson & Purvis (2009) are here included in the non-lichenized genus *Karstenia*.

Literature:

Aptroot *et al.* (2014b), Baloch *et al.* (2009, 2010a, 2013b), Sherwood (1977), Thigarayaja *et al.* (2021), Wedin *et al.* (2004, 2005, 2006).

- | | | |
|------|--|-----------------------------------|
| 1 | Lichenicolous [in GBI on <i>Cladonia</i> , <i>Pertusaria</i> or <i>Lobaria</i> thalli]..... | 2 |
| | Lichenized or saprotrophic on bark..... | 4 |
| 2(1) | Ascomata pale, remaining ± immersed; 30–44 × 2.5–3.5 µm, cylindrical or narrowly clavate, 3- to 7-septate; on <i>Lobaria</i> | <i>Nanostictis christiansenii</i> |
| | Ascomata erumpent to sessile; ascospores < 30 µm long..... | 3 |
| 3(2) | Exciple pale to orange; ascospores cylindrical to fusiform, (13.5–) 17–23 (– 26) × 2–3 (–3.5) µm; on <i>Cladonia</i> | <i>Cryptodiscus cladoniicola</i> |
| | Exciple dark; ascospores ellipsoidal, (11.5–) 12.5–15.5 (–16) × (4.5–) 4.7–5.5 (–6) µm; on <i>Pertusaria</i> | <i>Sphaeropezia pertusariae</i> |

4(1)	Ascomata lenticular to urceolate, initially with a pore but erumpent and opening widely, usually with radial splits in the exciple.....	5
	Ascomata ± globose with a broad poroid opening	6
5(4)	Asci multispored; overgrowing bryophytes and plant detritus; montane [uncertain position within Ostropales]	<i>Ramonia</i>
	Asci 8-spored	<i>Karstenia</i>
6(4)	Ascospores filiform; apothecial margin usually with conspicuous crystalline inclusions	<i>Stictis</i>
	Ascospores ± ellipsoidal; apothecial margin without extensive crystalline inclusions.....	7
7(6)	Hymenium K/I+ blue; ascus with a thin apex	<i>Cryptodiscus</i>
	Hymenium K/I–; ascus with a thick apical dome	<i>Abconditella</i>

ABSCONDITELLA Vězda (1965)

Thallus crustose, effuse, greenish or grey-green, usually intermixed with algal films, ± gelatinous when moist. **Photobiont** chlorococcoid. **Ascomata** apothecia; disc urceolate-concave, pale-coloured, immersed to emergent. **True exciple** entire, of pseudoparenchymatous or conglutinated parallel hyphae. **Hymenium** I± yellowish, K/I–. **Hypothecium** shallow, often indistinct. **Hamathecium** of unbranched, or rarely a few apically branched, indistinctly septate, slender paraphyses, the apices slightly to distinctly swollen. **Asci** cylindrical to cylindric-clavate, thin-walled, with a distinct apical dome that sometimes has a narrow ocular chamber, K/I– or rarely bluish, the apical dome K/I–, 8-spored. **Ascospores** ellipsoidal, fusiform or fusiform-acicular, 1- to 3(-9)-septate, colourless, thin-walled, smooth; perispore absent. **Conidiomata** not known. **Chemistry**: no lichen substances detected by TLC. **Ecology**: associated with algal films on bryophytes, lignum, plant debris, rock, or soil.

All species are inconspicuous with minute apothecia and are rarely collected. Distinguished from *Coenogonium* and *Gyalecta* by the absence of *Trentepohlia* as photobiont, and from *Cryptodiscus* by a thicker ascus apex and K/I– hymenium.

The terricolous lichenized *Abconditella synchogonioides* (Nitschke) Suija and Van den Boom (2023; see also Aptroot *et al.* 2014b as *Geisleria*) has not yet been reported from our region, but could well occur.

Literature:

Aptroot *et al.* (2014b), Bielczyk & Kiszka (2001), Coppins (2009), Stenroos *et al.* (2010), Suija & Van den Boom (2023).

1	Ascospores 1-septate	2
	Ascospores 3- or more septate	3
2(1)	Apothecia 0.2–0.4 mm diam.; on bryophytes	<i>sphagnum</i>
	Apothecia 0.07–0.2 (–0.26) mm diam.; on stone or soil	<i>delutula</i>
3(1)	Ascospores acicular-fusiform, <3 µm diam.	<i>pauvilla</i>
	Ascospores fusiform to fusiform-ellipsoidal, ≥3 µm diam.....	4
4(3)	Apothecia red-brownish	<i>celata</i>
	Apothecia whitish or pale yellowish	5

- 5(4) Ascospores 5- to 7-septate *annexa*
 Ascospores 3-septate 6
- 6(5) Ascospores (17-) 19–24 (–28) × 4.7–5.5 (–6) µm; apothecia 0.18–0.4 mm diam. *trivialis*
 Ascospores 10–15 × 4.5–6.5 µm; apothecia 0.1–0.2 mm diam. *lignicola*

***Absconditella annexa* (Arnold) Vězda (1965)**

LC

Thallus crustose, forming minute patches of a thin pale grey to olivaceous subgelatinous film. Apothecia scattered or in clusters (then sometimes distorted by mutual compression), minute, yellowish-white to pale yellow-brown, translucent when wet, 0.3–0.4 mm diam., initially cupulate but becoming ± flat, with a thick slightly raised paler margin. True exciple colourless, to 35 µm thick laterally and 20 µm thick at the base; epitecium indistinct, colourless; hymenium colourless, 70–90 µm high; paraphyses mostly unbranched, rarely forked in the upper part, not or only slightly thickened at the tips; hypothecium very thin, colourless. Asci 8-spored, long-cylindrical, thin-walled, the upper part with a rather indistinct K/I- apical dome penetrated by a narrow tube. Ascospores (3-) 5-7 (-9)-septate, colourless, narrowly fusiform to almost needle-like, straight or slightly curved, 35–40 (–50) × 2.5–3.5 µm. **BLS 0765.**



On rotting conifer logs and plant debris, also on bark of *Juniperus*; probably under-recorded but certainly rare. Scotland (Angus), England (Westmorland).

Similar to *A. pauxilla* which has smaller apothecia and spores that are shorter (25–28 µm) and 3(-5)-septate. *Absconditonia rubra* (Van den Boom, M. Brand & Suija) Suija & Van den Boom (2023) has not yet been recorded from Britain and Ireland, but could be mistaken for *A. annexa*; it has smaller, cream to reddish brown apothecia with an exciple composed of radially oriented hyphae and ascospores that are only 1.2–1.8 µm in diameter.

***Absconditella celata* Döbberle & Poelt (1977)**

LC

Thallus thin, greenish, film-like and sometimes very inconspicuous. Apothecia 0.05–0.12 mm diam., reddish brown, initially ± immersed and strongly urceolate but becoming superficial with a concave disc and a usually slightly darker margin; true exciple 7–16 µm thick below, increasing to ca 30 µm thick above, chestnut brown; hymenium 85–100 µm tall; hamathecium with copious paraphyses that are slightly swollen at the tip; hypothecium brown. Asci cylindrical, 110–130 × 8–9 µm. Ascospores 13–19 × 4–5 µm, fusiform, the ends acute, 3-septate, thin-walled, colourless to very pale yellow, without a perispore. **BLS 0001.**



On rotting wood and soil, Scotland (Selkirk, E. Inverness) and Orkney, C. & N. Wales, and on china clay spoil in S.W. England; rare; recorded elsewhere on various ephemeral substrata including dung.

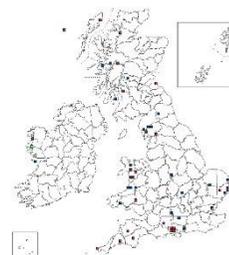
Differs from *A. trivialis* in having darker coloured apothecia and shorter ascospores. *A. fossarum* Vězda & Pišút (1985), not yet recorded from our region, may be conspecific but was contrasted with *A. celata* by Bielczyk & Kiszka (2002) and Spribille *et al.* (2009). They considered that *A. celata* had ascospores 15–16 × 6–7 µm and *A. fossarum* 12–14 × 4–4.5 µm in size.

***Absconditella delutula* (Nyl.) Coppins & H. Kiliás (1980)**

LC

Thallus a thin greenish ± glossy gelatinous film. Apothecia 0.07–0.2 (–0.26) mm diam., whitish, scattered, initially ± immersed but becoming superficial, the disc concave, pale brown, the margin persistent; true exciple 15–20 µm thick below, increasing to ca 30 µm thick above; hymenium 70–90 µm tall. Ascus wall sometimes K/I+ bluish, with a distinct apical cap. Ascospores 10–15 (–17) × 3–5 (–6.5) µm, ellipsoidal to cylindrical-ellipsoidal, 1-septate. **BLS 0002.**

On shaded stones, compacted soil and turf, in ephemeral pools, knot holes and on *Fagus* roots. Scattered throughout S. England, W. & N. Wales, Cumbria, Scotland, W.



Ireland. It has been reported elsewhere on moribund thalli of *Peltigera* (Czarnota & Hernik 2014). *A. modesta* (Stizenb.) Vězda, from the Alps, is possibly the same as this species. Suija & Van den Boom (2023) indicated that *A. delutula* is somewhat distant in phylogenetic terms from other members of the genus, but the material they sequenced originated from Argentina and might not be conspecific with the Irish type.

A. sphagnorum (q.v.) also has 1-septate spores but the apothecia are larger, although Czarnota & Kukwa (2008) observed that populations of *A. sphagnorum* on wood have smaller apothecia than bryophilous material. They suggested that *A. sphagnorum* has a thicker exciple, to 50 µm wide in the upper part, thus protruding distinctly above the apothecial disc. In the field, *A. delutula* is reminiscent of a depauperate version of *Coenogonium pineti* (Ostropales: Coenogoniaceae), but that species normally occurs on bark and has a more prominent thallus, slightly larger apothecia and narrower ascospores.

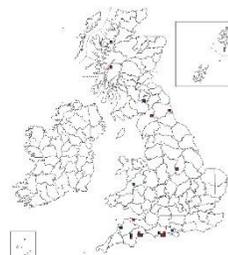
***Absconditella lignicola* Vězda & Pišút (1985)**

Thallus thin, dark green, ± granular, gelatinous when moist. Apothecia 0.1–0.2 (–0.27) mm diam., pale cream, discoid; true exciple entire, 10–15 µm thick below, increasing to 40–50 µm above, colourless; hymenium 60–65 µm tall. Asci with a distinct apical dome. Ascospores 10–15 × 4.5–6.5 µm, 3-septate, fusiform, the apices obtuse. **BLS 1203.**

On moribund *Peltigera*, moss, and decaying coniferous stumps, roots, heather stems, bark crevices and wood; rare, probably under-collected. England (New Forest, Dorset, Dartmoor, Nottinghamshire, N. Pennines), Scotland (Selkirk, Argyll, W. Ross), Wales (Montgomeryshire).

Similar to *A. trivialis* but has smaller apothecia and ascospores. Sequences show that the species is closely related to the type of *Absconditella*, *A. sphagnorum* (Suija & Van den Boom 2023).

LC



***Absconditella pauxilla* Vězda & Vivant (1975)**

Thallus inconspicuous, olivaceous to dark green, gelatinous. Apothecia scattered, partly immersed in the thallus, 0.1–0.25 mm diam., yellowish white, the disc ± concave; true exciple 10–12 µm thick below, increasing to 25–30 µm thick above; hymenium 45–55 µm tall. Asci cylindrical, thickened at the apex. Ascospores 25–28 × 1.5–2 µm, fusiform-acicular, the apices acuminate, 3(-5)-septate. **BLS 1738.**

On coniferous wood of fallen trunks and stumps, old stems of *Juniperus* and dead spruce twigs. E. Scotland (S. Aberdeenshire, Argyll, East Lothian), Cumbria & S. England (Hampshire, New Forest, Exmoor).

Most likely to be confused with *Cryptodiscus gloeocapsa* which overgrows bryophytes, has larger apothecia, a thinner ascus apex and a K/I+ blue or yellow-brown hymenium. *A. annexa* has similarly shaped ascospores, but they and the apothecia are larger. Sequences confirm placement of this species in *Absconditella* (Suija & Van den Boom 2023).

LC



***Absconditella sphagnorum* Vězda & Poelt (1965)**

Apothecia 0.2–0.4 mm diam., entirely whitish or with a yellowish, flesh-coloured or pinkish disc; true exciple ca 20 µm thick below, increasing to ca 50 µm thick above; hymenium 65–85 µm tall. Ascospores 9.5–14.3 × 2.5–4 (–5) µm, ellipsoidal to cylindrical-ellipsoidal, 1-septate. **BLS 0003.**

On *Sphagnum* spp. in bogs and on mountain rock ledges. C. & E. Scotland (Angus, Berwickshire, Mid-Perthshire), Peak District, Mid Wales, S.W. England (Dorset, Dartmoor).

Gives the surface of the *Sphagnum* cushions a grey-brown hue. Most likely to be confused with *Cryptodiscus gloeocapsa*, which has much narrower, 3- or 4-septate ascospores. See also under *A. delutula* (q.v.).

Stenroos *et al.* (2010) considered that *A. sphagnorum* is a necrotrophic parasite, and its status as a lichen needs confirmation. It is the type species of *Absconditella*.

NT



***Absconditella trivialis* (Willey ex Tuck.) Vězda (1965)**

Thallus inconspicuous. Apothecia 0.18–0.4 mm diam., whitish to pale yellowish, strongly concave but sometimes eventually becoming discoid; true exciple 18–24 µm thick below, increasing to 45–50 µm thick above;

LC

hymenium 90–100 µm tall. Asci with thickened apices. Ascospores (17–) 19–24 (–28) × 4.7–5.5 (–6) µm, fusiform, 3-septate. **BLS 1652.**

On mosses on heavy metal-contaminated river gravels, wet rock faces and clay soil. C. Wales, scattered throughout England north to Yorkshire, Isle of Man.

An inconspicuous species, often difficult to see beneath algal and cyanobacterial crusts. *A. lignicola* has smaller apothecia and spores (10–15 × 4.5–6.5 µm). *A. celata* has reddish-brown apothecia and shorter ascospores.



CRYPTODISCUS Corda (1838)

Thallus (where present) thin and gelatinous, of irregular algal colonies penetrated by narrow branched hyphae. **Photobiont** (where present) *Gloeocystis*-like, cells globose or elongate, compacted into colonies. **Ascomata** apothecia, round to elliptical in outline, initially closed and immersed in the substratum, eventually opening by a round pore that may subsequently opens widely, rarely erumpent in a fully mature state. **Disc** yellowish, pale orange or dark brown, concave. **Margin** colourless or brownish, entire, periphysoids absent. **Subhymenium** thin, **hymenium** I+ reddish-brown to I– and KOH/I+ blue (Lugol). **Hamathecium** of numerous paraphyses, filiform, unbranched or sometimes slightly forked in the upper part, apices often enlarged, sometimes knob-like. **Asci** cylindrical to cylindrical-clavate, the wall usually KOH/I+ faintly blue (Lugol); apical dome present, without apical structures, 8-spored. **Ascospores** colourless, ovoid to narrowly ellipsoidal or rarely filiform, with 1–7 (–9) transverse septa or rarely muriform. **Conidiomata** pycnidia, pyriform, immersed. **Conidia** short-cylindrical. **Chemistry**: no lichen products detected by TLC. **Ecology**: either saprotrophic and immersed in dead, decorticated wood, or lichenized on mosses.

A genus of around fifteen species with very varied nutritional modes; they may be saprotrophic in rotten wood (Baloch *et al.* 2009, 2010b), grow on old bracket fungi (Sherwood 1977), parasitize lichens (Pino-Bodas *et al.* 2017) or be lichenized (then often overgrowing mosses). Lichenized species were previously included in the genus *Bryophagus* Nitschke ex Arnold (1862), placed into synonymy by Baloch *et al.* (2009). Three species were included in *Bryophagus* and thus assumed to be lichens, there are several other poorly known tropical taxa found overgrowing bryophytes that might also belong in this category. Of similar genera, *Absconditella* has much smaller ascomata, the hymenium is K/I–, and the asci are thicker-walled.

In Britain and Ireland, six species are represented, one lichenized, one lichenicolous and the remaining four saprotrophs of wood and bark. A key to British species (including non-lichenized taxa) can be found in Baloch *et al.* (2010b), from which the key below has largely been adapted. Those authors excluded *C. microstomus* (Carmich. ex W. Phillips) Sacc. (1889) from the genus, but did not suggest a more appropriate generic placement. It is included in the key below based on information from Sherwood (1977). Similarly, *C. angularis* (P. Karsten) P. Karsten (1885) does not belong to the genus; according to information in an unpublished key by Baral (*in litt.*) it might be placed in *Mellitiosporella* (Rhytismatales, Marthamycetaceae).

Literature:

Baloch *et al.* (2009, 2010b), Fletcher *et al.* (2009), Pino-Bodas *et al.* (2017), Sherwood (1977).

- | | | |
|---|---|---|
| 1 | Lichenized or associated with lichens | 2 |
| | Saprotrophic on wood or herbaceous material | 4 |

- 2(1) Lichenicolous 3
Lichenized, overgrowing mosses and liverworts; disc remaining urceolate.....*gloeocapsa*
- 3(2) Parasitic on *Cladonia*; disc becoming flat to convex; asci 8-spored*cladoniicola*
On moribund thalli of *Lobaria pulmonaria*, ± remaining immersed;
asci 4-spored*Nanostictis christiansenii*
- 4(1) Ascospores 1-septate 5
Ascospores with 3 or more septa 6
- 5(4) Ascomata light-coloured and deeply immersed, disc ochraceous to yellowish-orange, on wood
of either coniferous or broad-leaved trees; ascospores 6–9 µm long*Cryptodiscus foveolaris* (Rehm) Rehm 1888
Ascomata dark brown, becoming ± erumpent when mature, disc pale brownish, on weathered
pine wood; ascospores 9–13 µm long*Cryptodiscus pini* (Romell) Baloch, Gilenstam & Wedin 2009
- 6(4) Exciple dark brown, the apothecia poroid
..... "*Cryptodiscus*" *microstomus* (Carmich. ex W. Phillips) Sacc. 1889
Exciple pale, the apothecia opening widely 7
- 7(6) Apothecia with irregular teeth that expand outwards when wet; disc grey, strongly pruinose;
ascospores 16–21.5 × 3–4.7 µm; on bark of *Salix*.... "*Cryptodiscus*" *angulosus* (P. Karst.) P. Karst. 1885
Apothecia not toothed; disc yellowish to orange-brown 8
- 8(7) Ascomata elliptical in outline, splitting the substratum lengthwise, disc pale ochraceous,
mature ascospores 3-septate with constrictions at the septa, 12–16 × 3.5–5 µm; usually on wood
of broad-leaved trees*Cryptodiscus pallidus* (Pers.) Corda 1838
Ascomata roundish, not splitting the substratum, disc yellowish-orange, ascospores 3–7-septate,
constrictions at septa only if spores have more than 3 septa, 12–18 (–25) × 2.4–4 µm; on
weathered pine wood.....*Cryptodiscus tabularum* Kirschst. 1936

Cryptodiscus cladoniicola (D. Hawksw. & R. Sant.) Pino-Bodas, Zhurb. & S. Stenroos (2017) NE

Lettauia cladoniicola D. Hawksw. & R. Sant. (1990).

Thallus absent (lichenicolous). Apothecia initially immersed but soon sessile, ± round in outline, slightly constricted at the base, 180–300 (–430) µm diam.; disc initially flat, pale yellow to orange-yellow, becoming convex and pale to mid orange under aging, the margin initially slightly raised, white, 20–40 (–60) µm thick, becoming lacerated or reduced. True exciple colourless except for a light orange-yellow outermost part, 25–40 µm thick. Epithecium pale orange-yellow. Hymenium 30–50 µm tall, I+ fleetingly, K/I+ blue or partly red. Paraphyses filiform, often branched above, the apices occasionally slightly swollen. Asci narrowly clavate to subcylindrical, short-stalked, 43–50 × 6.5–10 µm, the apical cap to 5 µm tall, I–, K/I–, 8-spored. Ascospores colourless, cylindrical to slightly fusiform, the apices rounded or occasionally acute, (13.5–) 17–23 (–26) × 2–3 (–3.5) µm, (2–)3(–4)-septate, not constricted at the septa, without a perispore. Conidiomata not known. **BLS 2084.**



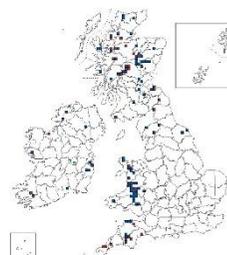
Parasitic on *Cladonia arbuscula* and possibly other *Cladonia* spp., Scotland (Ayrshire, Moray, Orkney) and Wales (Caernarvonshire).

Pino-Bodas *et al.* (2017) provided a very detailed description of this species (from which that above has been abstracted) and compared it with two other *Cryptodiscus* species parasitic on *Cladonia*. *C. epicladonia* has urceolate ascomata with a pruinose margin and filiform to cylindrical ascospores 50–73 × 1.5–2 µm, mostly with 7–11 septa. *C. galaninae* also has urceolate ascomata, but with smaller ascospores 9.5–12.5 × 1.5–2 µm that are mostly 1-septate. Neither has been recorded from our region.

The distinction between this species and *C. gloeocapsa* below is rather obscure apart from their nutritional status, but there do appear to be differences between sequenced specimens.

Cryptodiscus gloeocapsa (Nitschke ex Arnold) Baloch, Gilenstam & Wedin (2009)**Nb***Bryophagus gloeocapsa* Nitschke ex Arnold (1862)

Thallus membranous or filmy, ± shining, very thin when dry, pale fawn to green, becoming gelatinous when wet, effuse or vaguely delimited. Apothecia 0.2–0.5 mm diam., ± circular in outline, mostly scattered and discrete, rarely crowded, at first immersed with a narrow pore, becoming emergent and deeply concave; disc pale yellow-brown to orange-red, rarely dark brown; true exciple 25–70 µm thick, pale yellow to pale brown or concolorous; hymenium 50–60 µm high, KOH/I+ faint blue. Paraphyses narrow, not thickened at the apex. Asci 40–60 × 4–6 µm. Ascospores cylindrical-fusiform, often tapering at one end, 20–30 × 1.5–2 µm, 3- to 4-septate. Pycnidia immersed, pyriform. Conidia shortly cylindrical. **BLS 0187.**



On bryophytes, more rarely hepatics, especially on recently disturbed soil, on acid dunes, shaded road-cuttings and banks, as well as mineralized acid soil associated with old mine-workings; frequent and widespread, but often overlooked. W. & N. Britain, scattered throughout Ireland.

The thallus forms distinctive, pale yellow-fawn necrotic patches on bryophytes on soil; the tiny pale urceolate apothecia are often concolorous with the thallus.

KARSTENIA Fr. (1885)

Thallus absent (non-lichenized), but perhaps sometimes facultatively associated with *Trentepohlia*. **Apothecia** at first immersed, urceolate to ± lenticular, raising the substrate into small pustules, initially with a narrow pore but finally rupturing the exciple to form a margin of irregular teeth, not becoming erumpent, the disc pinkish or grey-white. **Exciple** well-developed, usually colourless to brownish, rarely dark brown-black not containing copious crystals, the inner layer of short-celled vertically-oriented hyphae ending in a fringe of hairlike projections. **Hamathecium** of numerous filiform paraphyses, KI+ blue or KI-. **Asci** clavate, short-stalked, uniformly thin-walled, without an apical apparatus, KI-, 8-spored. **Ascospores** colourless, thin-walled, transversely multiseptate or muriform. **Conidiomata** not known. **Chemistry:** lichen products not detected by TLC. **Ecology:** in wood and bark, rarely on rock.

A poorly known genus that has been confused in the past with *Ramonia* (treated here under Ostropales of uncertain position). Most of the species accepted in the latter genus by Sanderson & Purvis (2009) belong here, although further studies are needed to confirm synonymies and relationships. Very few molecular data are available, and several species have not been recently collected.

Four further species of *Karstenia* have been reported from Britain and Ireland, but have never been implicated as lichenized; they are all saprotrophs of wood and bark. These are *K. clematidis* (W. Phillips) Sherwood (1980), *K. gregaria* Graddon (1986), *K. idaei* (Fuckel) Sherwood (1977) and *K. loniceriae* (Velen.) Sherwood (1977). They are included in the key below, but descriptions have not been provided. All are rather poorly known from our region.

Literature:

Sanderson & Purvis (2009), Sherwood (1977, 1980).

- | | | |
|------|--|----------------------------|
| 1 | Asci multispored; overgrowing bryophytes and plant detritus; montane | <i>Ramonia methathelia</i> |
| | Asci 8-spored | 2 |
| 2(1) | Ascospores <6 µm diam., 3- or more septate, fusiform, elongate-fusiform or needle-shaped | 3 |
| | Ascospores >7 µm diam., muriform, ellipsoidal or cylindrical | 9 |

- 3(2) Ascospores 3- to 5(-7)-septate, 15-23 μm long; on limestone *Ramonia calcicola*
Ascospores mostly 6- or more septate, >24 μm long; on bark 4
- 4(3) Ascospores mostly >40 μm long, needle-shaped, 8- to 14-septate 5
Ascospores 25-45 μm , elongate-clavate to cylindrical, 6- to 9-septate 7
- 5(4) Ascospores (60-) 68-75 (-80) \times ca 3 μm , cylindrical to narrowly clavate; apothecia in large
clusters *Karstenia gregaria* Graddon 1986
Ascospores 38-65 \times 3-4 μm , cylindrical, hardly tapered below; apothecia not strongly aggregated 6
- 6(5) Exciple 70-100 μm thick above, the inner wall lined with periphysoids to 15 μm long
and 1.5 μm diam. *chrysophaea*
Exciple ca 60 μm thick above, the inner wall lined with periphysoids to 10 μm long
and 2.5 μm diam. *Karstenia idaei* (Fuckel) Sherwood 1977
- 7(4) Ascospores 3-4 μm diam., cylindrical, hardly tapering below 8
Ascospores 5.5-6.5 μm diam., narrowly clavate with a long tapering base *rhopaloides*
- 8(7) Ascospores 25-35 \times 3-4 μm , minutely punctate; on *Lonicera*
..... *Karstenia lonicerae* (Velen.) Sherwood 1977
Ascospores 35-45 \times 3-4 μm , smooth-walled; on *Clematis*
..... *Karstenia clematidis* (W. Phillips) Sherwood 1980
- 9(2) Ascospores >25 μm diam., >100 μm long *Topeliopsis azorica*
Ascospores <20 μm diam., <60 μm long 10
- 10(9) Apothecia pale *dictyospora*
Apothecia black *nigra*

Karstenia chrysophaea (Pers.) Coppins, Aptroot & P.F. Cannon (2024)

NT IR

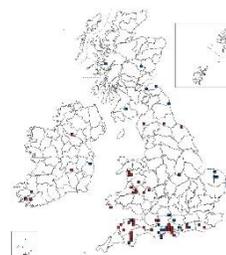
Ramonia chrysophaea (Pers.) Vězda (1966)

Thallus inconspicuous, evanescent. Apothecia scattered or in small groups, 0.4-0.7 mm diam., pale to brownish yellow; the pore to 0.5 mm diam., sometimes with a notched margin; disc cupulate, pinkish to greyish-white; exciple yellow-brown; hymenium 90-120 μm tall. Asci cylindrical to cylindric-clavate, 70-90 \times 10-14 μm , 8-spored. Ascospores (36-) 45-74 \times (3-) 3.5-4 (-5) μm , cylindrical to narrowly fusiform, the apices rounded, 8- to 14-septate, with a distinct perispore. **BLS 1243.**

Ephemeral in bare patches on rather 'spongy' base-rich bark of mature or old trees of *Quercus*, *Fraxinus* and *Ulmus* and wood inside hollow *Ilex*, in shaded old woodland situations; uncommon. Throughout Britain and Ireland, but most frequent to the south west.

Karstenia sorbina (P. Karst.) P. Karst. (1885), type of the genus, appears to be a synonym of *K. chrysophaea*, but is rarely reported and the name would not have priority over *K. chrysophaea*. *Karstenia rhopaloides* is similar but has shorter, narrowly clavate ascospores.

Ramonia subsphaeroides (probably a species of *Karstenia* but not yet reported from our region) has ascospores that are similar in size to *K. chrysophaea* but narrowly fusiform rather than \pm cylindrical, and smaller ascomata; they are 0.2-0.4 μm diam. with a pore to 0.2 mm in size (see Vězda 1966b).



Karstenia dictyospora (Coppins) Coppins, Aptroot & P.F. Cannon (2024)

NT IR

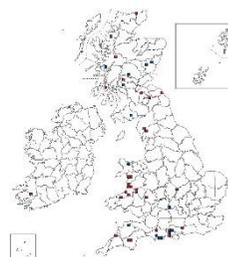
Ramonia dictyospora Coppins (1987)

Thallus inconspicuous, immersed in bark. Apothecia 0.5-0.7 mm diam with a pore up to 0.4 mm diam. Exciple \pm colourless, 35-60 μm thick, below hymenium 12-18 μm thick, the inner surface lined with a palisade of vertically oriented hyphae 9-12 \times ca 2 μm ; hymenium 95-120 μm tall. Asci cylindric-clavate, 95-105 \times 12-19

μm , with a minute KI+ blue apical ring, usually 8-spored, but sometimes some spores aborting with as few as two reaching maturity (these spores tending to be larger than usual, *ca* 40–45 μm long). Ascospores cylindrical or ellipsoidal, 21–38 (–45) \times 9–15 μm , at first (5-)7-septate, but soon becoming muriform. **BLS 1574.**

On bark of *Acer pseudoplatanus*, *Fagus*, *Fraxinus*, *Quercus*, *Ulmus* in old woodlands and wood inside hollow *Ilex* and sometimes in wayside situations and secondary woodlands; very scattered. S. England (Devon to Sussex and Oxford), N.W. England (Cumbria), Wales, Scotland, S.W. Ireland, more frequent to the north than *R. chrysophaea*. Endemic.

Like *K. chrysophaea*, but with smaller ascospores that are at first (5-)7-septate, soon becoming muriform. The only *Karstenia* with both pale apothecia and large muriform spores. The otherwise similar *K. nigra* has black apothecia.



Karstenia nigra (Coppins) Coppins, Aptroot & P.F. Cannon (2024)

Ramonia nigra Coppins (1987)

Thallus inconspicuous, immersed. Apothecia 0.4–0.6 mm diam, scattered or a few \pm confluent, at first immersed with a minute pore, becoming \pm erumpent with the pore broadening to *ca* 0.3 mm diam., black but often appearing white 'pruinose' due to adhering bark cells, disc pale grey. Exciple \pm colourless but the outer layer dark brown, 70–80 μm thick, 14–22 μm thick below, the inner surface lined with vertically oriented hyphae 5–10 \times 2–2.5 μm . Hymenium 120–160 μm tall, colourless, KI+ pale blue. Asci \pm cylindrical, 120–140 \times 14–17 μm ; apices rounded, with a KI+ blue ring structure, (4- to) 8-spored. Ascospores cylindrical or cylindric-ellipsoidal, muriform, 28–45 (–50) \times 8–13 μm . **BLS 1725.**

On wood inside hollowed trunks of old *Fagus*, *Fraxinus* and *Ilex*, also 'spongy' bark of old *Quercus* trees, in old woodlands; very rare. Nearly impossible to see on bark unless wet so may be overlooked in this habitat. N.W. England (Cumberland), S. England (Devon, Hampshire, Sussex), Exmoor, Dartmoor and Cornwall; also E. Ireland (Wicklow). Endemic.

Like *K. dictyospora*, but with black apothecia. Species of *Xerotrema* (Odontotremataceae) have 1-spored asci with very large, richly muriform ascospores and a different exciple structure.

CR D IR



Karstenia rhopaloides (Sacc.) Baral (2015)

Cryptodiscus rhopaloides Sacc. (1881)

Ramonia interjecta Coppins (1994)

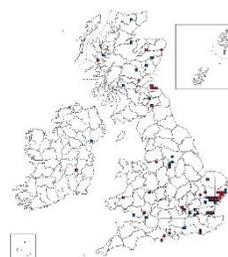
Often doubtfully lichenized, the thallus (if present) immersed in bark and effuse. Apothecia scattered, 0.3–0.4 mm diam., at first immersed with the exciple almost covering the disc; later becoming urceolate and sometimes partially emergent, and opening by a pore 0.1–0.2 (–0.26) mm diam. at maturity. Hymenium 60–85 μm tall; KI+ blue, at least in the upper part. Asci 60–90 \times 12–17 μm , with a KI+ blue apical pore. Ascospores narrowly clavate to fusiform, (5-) 7–9 (–11)-septate, 24–43 \times 4.5–7 μm , without a distinct perispore. **BLS 0456.**

On more nutrient-enriched bark than other ephemeral *Karstenia* species, especially on *Salix*, *Sambucus*, *Fagus*, *Fraxinus* and *Ulmus*; widely distributed. Scotland, England (possibly mainly in the east), a few records in Wales and E. Ireland. The map is incomplete as records from the non-lichenized fungal records databases have not been incorporated.

Like *K. chrysophaea*, but with ascospores 24–43 \times 4–6 μm , symmetrically elongate-fusiform to subulate at one end and rounded at the other, (3-) 6- to 9 (–11)-septate.

Differs from the central European *Ramonia luteola* Vězda (1967; not yet transferred to *Karstenia*) in having somewhat larger ascospores which lack a distinct perispore. *Gyalecta derivata* has 7- to 11-septate ascospores and sometimes 1–3 cells with a longitudinal septum. *Pachyphiale fagicola* ascospores are 15–21 (–35) \times 3.5–5 μm , 3- to 7-septate and the asci have 16–32 ascospores.

LC



NANOSTICTIS M.S. Christ. (1954)

Thallus absent (lichenicolous). **Apothecia** at first immersed, opening by a pore, sometimes not becoming erumpent, minute, colourless, with an entire, non-crystalline margin and a deeply-immersed disc which does not split away from the margin when dry. **Exciple** not differentiated into layers, composed of short-celled conglutinate hyphae or prismatic cells, the structure sometimes obscure. **Hamathecium** of numerous filiform paraphyses, not blueing in iodine. **Asci** cylindrical, with thin lateral walls and a distinct apical cap, I–. **Ascospores** colourless, filiform, transversely multiseptate. **Conidiomata**: not known.

The distinction between *Nanostictis* and *Cryptodiscus* seems rather obscure. Presumably the former genus was introduced mostly due to the filiform ascospores of its type species which contrast well with the shorter \pm cylindrical spores of the species of *Cryptodiscus* then published, and the lichenicolous habit. The inclusion in *Cryptodiscus* of lichenicolous species with elongate spores such as *C. epicladonia* (Pino-Bodas *et al.* 2017) confuses the picture, but until species of *Nanostictis* are sequenced it will not be practical to revise the generic limits. Most species of *Cryptodiscus* are parasites of members of the Peltigeraceae, and this association may be correlated with phylogeny.

Only one species of *Nanostictis* is currently included in the British and Irish list.

Literature:

Christiansen (1954), Etayo & Diederich (1996), Etayo & Sancho (2008), Pino-Bodas *et al.* (2017).

Nanostictis christiansenii Etayo & Diederich (1996)

Apothecia at first immersed, breaking through the cortex but not strongly erumpent and sometimes remaining below the host thallus surface, 200–450 μm diam., whitish to cream, opening by a pore; margin thick and smooth to rugose; disc flat, concolorous with the margin. Exciple 90–110 μm thick laterally and 25–35 μm thick at the base, composed of branched colourless hyphae 1–2 μm diam, lined with paraphysoids, without crystals. Subhymenium colourless; hymenium 60–70 μm tall. Paraphyses numerous, filiform, unbranched, 0.5–1 μm thick, slightly thickened at the apex, embedded in an amorphous gel which turns KI+ blue and I+ red. Asci cylindrical, 4-spored, 54–62 \times 6–8 μm , ascus wall apically thickened, KI+ blue. Ascospores 30–44 \times 2.5–3.5 μm , cylindrical or narrowly clavate, 3- to 7-septate, without a perispore.

On decaying thalli of *Lobaria pulmonaria*, W. Scotland (Argyll, Eigg, W. Ross) and Caithness. The description has been adapted from Etayo & Diederich (1996).

NT



SPHAEROPEZIA Sacc. (1884)

Thallus absent (saprotrophic or fungicolous). **Ascomata** apothecia, roundish, initially immersed in the substratum, mostly becoming partly or fully erumpent, deeply urceolate, opening by a round, radiate-fissured pore, dark grey to brown, sometimes white-pruinose. **Exciple** hyphal, merging into a periphysoidal layer. **Hamathecium** of unbranched or apically branched filiform paraphyses. **Hymenial gel** I+ blue. **Asci** cylindrical, with a distinct apical cap, I– or diffusely I+ blue, 8- or polyspored. **Ascospores** ellipsoidal, cylindrical, fusiform to filiform, in one species fragmenting to form small, thin, one-celled spores. **Conidiomata** not known. **Ecology**: either saprotrophic on wood or herbaceous material, or parasitic/commensal on bryophytes, lichenized and non-lichenized ascomycetes.

Distinguished from the non-lichenized *Odontotrema* primarily by molecular data, and differences in habitat/ecology (Baloch *et al.* 2013b). *Odontotrema* species are found primarily on bleached

decorticated wood. Around fifteen species of *Sphaeropezia* are currently accepted, of which only one is known from Britain and Ireland.

Literature:

Baloch *et al.* (2010a, 2013b), Diederich *et al.* (2002), Thigayaraja *et al.* (2021).

Sphaeropezia pertusariae (Etayo, Diederich & Coppins) Baloch & Wedin (2013)

NE

Odontotrema pertusariae Etayo, Diederich & Coppins (2002)

Thallus absent, lichenicolous. Ascomata immersed, at first closed, opening by dentate cracks, slightly erumpent, brownish black, (140–) 170–260 (–310) μm diam.; pore relatively large, (20–) 40–110 (–150) μm ; margin ascending towards the pore, (50–) 60–80 (–100) μm thick. Exciple laterally 50–65 μm thick, 10–18 μm thick at the base, periphysoids poorly developed, 1- to 3-celled, 2.5–3 μm diam. Subhymenium 18–25 μm thick. Hymenium KI+ blue, 50–60 μm tall. Paraphyses 1–1.5 μm diam., not thickened at the apices. Asci 50–57 \times 7–11 μm . Ascospores ellipsoidal, 1- to 3-septate, (11.5–) 12.5–15.5 (–16) \times (4.5–) 4.7–5.5 (–6) μm , perispore not observed. Conidiomata not known. **BLS 2376.**



On thalli of *Pertusaria hymenea*, apparently weakly pathogenic; Scotland (Argyll, E. Perthshire).

Distinctive for its erumpent, initially perithecioid dark-walled ascomata with a dentate to fimbriate, inwardly oriented margin. Species of *Skyttea* (Helotiales) can superficially resemble *Sphaeropezia* species, but have ascomata with short excipular hairs.

Diederich *et al.* (2002) referred to a possible second species, on *Pertusaria coronata*, with smaller ascomata and a thinner margin; more material is needed to confirm its status.

STICTIS Pers. (1800)

Thallus usually absent (most species are exclusively saprotrophic); when present crustose, whitish, poorly developed, associated with coccoid algae. **Apothecia** at first immersed, opening by a pore, sometimes becoming erumpent or splitting the overlying substratum irregularly, the margin entire to lacerate, typically with a prominent white pruinose rim, tough or somewhat gelatinous, white, flesh-coloured, yellowish, brown or black, the disc moderately to very deeply immersed, pale ochraceous to flesh-coloured, brown or black, sometimes pruinose. **Exciple** typically 3-layered, with or without a spurious thalline margin of compressed host tissue invaded by vegetative hyphae, composed of interwoven, narrow hyphae, colourless or some shade of brown, gelatinous in some species. **Periphysoids** developing from a usually crystalline layer, usually filamentous, sometimes branched, colourless or some shade of brown. **Paraphyses** numerous, filiform, sometimes apically branched or enlarged, often embedded in a I+ blue gelatinous matrix. **Asci** cylindrical, somewhat thick-walled when young, functionally unitunicate, with a \pm prominent apical non-refractive cap pierced by a I–apical pore, 4- or 8-spored. **Ascospores** typically long-cylindrical to filiform, colourless, transversely septate, sometimes with a gelatinous perispore. **Conidiomata** apparently absent. **Ecology:** saprotrophic on woody and herbaceous material, a few species facultatively lichenized.

Research by Wedin *et al.* (2004, 2005, 2006) established that some species of *Stictis* may have lichenized populations, which were historically treated within the genus *Conotrema* Tuck. (1848). The anamorphic genus *Eriospora* Berk. & Broome (1850) has recently been linked with a species formerly referred to *Stictis*, but it appears not to be congeneric with the type of that genus and can therefore be maintained as a separate taxon (Aplin 2021).

Research by Thiyagaraja *et al.* (2021) suggests that *S. mollis* and the other lichenized species of *Stictis* are not congeneric with the type of the genus, but further revisionary work is needed before a

formal separation should take place.

Around a dozen species of *Stictis* have been recorded from Britain and Ireland, only one of which (*S. mollis* Pers.) has been implicated as lichenized and is therefore described here. The key includes all species currently known in our region. A historical record of *S. chrysopsis* is unlikely to be correct; according to Sherwood (1977) it is a species of western North America.

Literature:

Aplin (2021), Graddon (1977), Sherwood (1977), Wedin *et al.* (2004, 2005, 2006).

1	Exciple dark brown, ± white-pruinose	2
	Exciple colourless to pale yellow	5
2(1)	Paraphyses brown, at least apically; ascospores 4.5–5 µm diam. <i>Stictis pachyspora</i> (Rehm) Rehm 1888 Paraphyses colourless; ascospores narrower	3
3(2)	Periphysoids filamentous	4
	Periphysoids short, composed of small angular cells 3–5 × 5–8 µm in size <i>Stictis elevata</i> (P. Karst.) P. Karst. 1885	
4(3)	Mostly graminicolous; internal crystalline layer well-developed..... <i>Stictis arundinacea</i> Pers. 1822 On wood or bark, or lichenized; crystalline layer poorly developed	<i>mollis</i>
5(1)	Ascospores 55–70 × 2.5–3.5 µm, very narrowly clavate <i>Stictis friabilis</i> (W. Phillips & Plowr.) Sacc. & Traverso 1911 Ascospores >80 µm long, filiform	6
6(5)	Ascospores to 340 µm long, helically coiled within the ascus <i>Eriospora leucostoma</i> Berk. & Broome 1850 Ascospores 80–200 (–250) µm long, in a cylindrical fascicle within the ascus	7
7(6)	Ascospores 80–100 × 0.75–1 µm; on rotten leaves of <i>Carex</i> and <i>Juncus</i> in GBI. <i>Stictis graminicola</i> Lasch 1858 Ascospores 1.5–3 µm diam.; on wood and bark or herbaceous stems.....	8
8(7)	Periphysoids unbranched, 10–20 × 1.5–2.0 µm; hymenium usually I–; ascus with an apical cap 2.5–3 µm thick..... <i>Stictis stellata</i> Wallr. 1833 Periphysoids branched, 15–30 × 1.0–1.5 µm; hymenium usually I+ blue; ascus with an apical cap 3.5 µm thick..... <i>Stictis radiata</i> (L.) Pers. 1800	

Stictis mollis Pers. (1822)

NE

Thallus (where present) forming small greyish patches, loosely organized, containing unidentified coccoid green algae. Ascomata 0.4–0.8 (–1.7) mm diam. (saprotrophic morph) or 0.2–0.4 mm diam. (lichenized morph). Exciple grey-white, ± pruinose, 75–120 µm thick, four-layered, with an outer layer including remnants of host tissue and scattered algae; a layer of strongly pigmented thick-walled hyphae that may be strongly carbonized; a poorly delimited crystalline layer; and an inner layer of gelatinized branched periphysoids 40–50 µm in length (saprotrophic morph) or 10–30 µm long (lichenized morph); disc brownish, often with a greyish pruina; hymenium I+ blue, 120–190 µm high. Paraphyses colourless, not forming a distinct epithecium but with olivaceous amorphous pigmentation in the uppermost parts. Asci 120–190 × 8–12 mm. Ascospores 120–180 × 2–2.5 (–3) µm, filiform, multiseptate. **BLS 2871.**

On a dead attached twig of *Salix* sp., Scotland (Moray).

Only recorded from Britain and Ireland on one occasion, but could well be more widespread. It is not clear whether this represents a lichenized morph; in view of the substratum this seems unlikely. Wedin *et al.* (2006) found some morphological differences between lichenized and non-lichenized morphs, but the significance of these needs further attention with the benefit of more extensive sequencing. The description has been adapted from that work.

THROMBIACEAE Poelt & Vězda ex J.C. David & D. Hawksw. (1991)

The family contains the single genus *Thrombium*, so the description below constitutes that of the family.

THROMBIUM Wallr. (1831)

Thallus crustose, granular, membranous, filmy and subgelatinous when wet, indeterminate, inconspicuous and evanescent. **Photobiont** *Leptosira*. **Ascomata** perithecia, immersed except for the ostiole. **Involucellum** absent. **Exciple** brown, thickened towards the ostiole, the upper part of the ascomatal wall K+ blue-green. **Hamathecium** of thin, mostly unbranched paraphyses; paraphyses and periphysoids absent. **Asci** elongate- cylindrical or narrowly clavate, thin-walled, without a clearly defined apical cap but with a broad thin K/I+ blue apical ring; 8-spored. **Ascospores** aseptate, colourless, thin-walled, without a distinct perispore. **Conidiomata** not known. **Chemistry**: lichens products not detected by TLC. **Ecology**: on soil.

Traditionally assumed to be related to the Verrucariales, but molecular data (Resl *et al.* (2015) indicate that a placement within the Ostropales is appropriate. The aseptate ascospores are most unusual for the order. The ascomata appear to be perithecial in structure, but may be ontogenetically similar to other families of the Ostropales. The genus is in need of revision.

Species once included that are quite unrelated to the type *Thrombium epigaeum* have been transferred to genera of the Lichinales; *T. thelostomum* is referred to *Pyrenocarpon* and *T. cretaceum* to *Watsoniomyces*.

Literature:

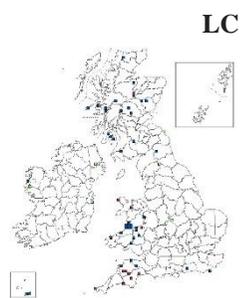
Díaz-Escandón *et al.* (2021), Orange (2013), Purvis & Orange (2009), Resl *et al.* (2015).

Thrombium epigaeum (Pers.) Wallr. (1831)

Thallus wide-spreading, a yellow-green or grey-green film, smooth or slightly uneven, subgelatinous when wet, or indistinct. Ascomata perithecia, immersed in the substratum, 0.25–0.4 mm diam., visible only by the grey to black ostiole; exciple pale to dark brown, the wall 20–30 µm thick, becoming 50–100 µm thick towards the ostiole; paraphyses few to abundant, ca 1 µm diam., unbranched. Asci 130–170 µm long, cylindrical to cylindric-clavate with a tapering stalk. Ascospores (15–) 18–25 (–30) × 5–10 (–12) µm, ellipsoidal or elongate-ellipsoidal, often somewhat clavate, containing numerous oil droplets. **BLS 1414**.

On recently disturbed consolidated, neutral to acidic soil of sheltered cuttings and earth banks by roadsides, especially in well-wooded sites, also on cliff tops; very local. Sussex, W. & N. Britain, W. Ireland.

The thallus is host to the lichenicolous fungus *Leightoniomyces phillipsii* (Berk. & Leight.) D. Hawksw. & B. Sutton (1977).



Genera of the Ostropales not assigned to a family

FRANCISROSEA Ertz & Sanderson (2021)

The genus is monotypic, so the description of *Francisrosea bicolor* below constitutes that of the genus.

Literature:

Ertz *et al.* (2021).

Francisrosea bicolor Ertz & Sanderson (2021)

NE

Thallus inconspicuous, immersed in bark, only visible due to the soralia. Soralia erumpent, at first punctiform, later becoming \pm rounded to elliptical in outline, erose, slightly convex and elevated above the substratum, 0.2–0.8 (–1) mm diam., pale greenish inside, orange-ochre at the surface and mainly at the margins, discrete, scattered or rarely becoming confluent in clusters of up to four and forming patches up to *ca* 1.5 mm diam. Soredia without projecting hyphae, (25–) 30–50 (–70) μ m diam., composed of colourless smooth hyphae 4–6 (–7) μ m diam., I–, KI– and trentepohlioid cells 6–13 μ m diam. in short chains of 2–6 (–8) cells. Crystals absent (polarized light). Apothecia and pycnidia unknown. Chemistry: no compounds detected with TLC. **BLS 2788**.

Most frequently found in wound tracks on senescent *Fagus sylvatica*, but has also been found in similar habitat on *Quercus robur*; Hampshire (New Forest) and Cumbria, probably also present in Exmoor and North Wales.

Diastinguished by the inconspicuous thallus with small discrete erumpent soralia, that are pale greenish inside but orange-ochre at the surface. Formerly confused with *Thelopsis corticola* (q.v.), which is usually found sterile; it also has ochre-coloured soralia but these are finer and more compacted, with individual soralia 10–17 μ m across, and of a more even colour with the deeper orange tints mostly absent and the internal green colouring paler and less often visible unless damaged, and a thallus that is always visible at least near the soralia. It is also typically found in more stable rain track communities.

NEOPETRACTIS Ertz (2021)

Thallus crustose, endolithic or semi-epilithic, continuous, rarely with fine cracks, smooth to minutely rugose, whitish grey or pale pink, not corticate. **Photobiont** trentepohlioid. **Apothecia** immersed, at first perithecioid, finally with a \pm expanded disc; margin slightly raised, concolorous with the thallus or slightly paler, with or without radial cracks; disc beige-pink to pale brown, smooth, concave or flat, sunken below the level of the margin. **Exciple** thin, colourless or yellowish. **Hymenium** colourless, I– or I+ faint blue, KI+ blue. **Hypothecium** thin, colourless. **Hamathecium** of unbranched paraphyses, the apex not or slightly swollen. **Asci** narrowly clavate, thin-walled, 8-spored, KI+ blue. **Ascospores** colourless, ellipsoidal, 3–5-transversely septate to submuriform (with one or two additional longitudinal septa), with a distinct perispore. **Conidiomata** pycnidia, immersed in the thallus. **Conidia** colourless, aseptate or formed in irregular multicellular clusters. **Chemistry**: no lichen substances detected with TLC. **Ecology**: on calcareous rocks.

Distinguished from *Petractis* in having a trentepohlioid photobiont and from *Gyalecta* s.l. in having ascospores with a thick gelatinous sheath. Phylogenetic analysis indicates that the genus is close to *Ramonia*, and distant from *Petractis*, in which both species were formerly placed. Only one occurs in our region.

Literature:

Ertz *et al.* (2021), Orange (2009).

Neopetractis nodispora (Orange) Ertz (2021)

Petractis nodispora Orange (2009)

Thallus crustose, diffuse, endolithic, pale pink, matt, continuous or with a few fine cracks; c. 250–320 µm thick. Apothecia immersed, the margin not or scarcely distinguishable from the surrounding thallus, at most slightly raised and then 60–100 µm thick; apothecia often surrounded by an irregular concentric crack; radial cracks absent; disc pale pink, smooth, concave, 120–260 µm diam. Exciple thin, colourless, 25–50 µm thick at the apex, colourless, below the subhymenium thin and indistinct. Hymenium *ca* 90 µm thick, colourless, K/I+ blue. Paraphyses unbranched, 2–3 µm diam., the apex not or scarcely swollen. Asci thin-walled, K/I+ blue, 8-spored. Ascospores colourless, 3-septate, 16.5–25 × 5.5–7.5 µm with a diffuse perispore 2–4 µm thick. Pycnidia immersed in the thallus, abundant, ostioles easily visible as a pit or an irregular, sometimes triradiate. Conidia colourless, irregularly shaped but mostly cylindrical-ellipsoidal, 9–18.5 × 5.5–10.5 µm, formed of irregular clusters of 5–15 or more cells. **BLS 2529.**

On limestone and cement-mortar on old, unshaded to lightly shaded walls, coastal; Wales (Anglesey, Caernarvon, Denbighshire, Glamorgan), England (Cotswolds, Dorset, Isle of Wight). Endemic.

Petractis clausa has apothecia with a narrowly exposed disc and radially fissured margin, and a *Scytonema*-like rather than trentepohlioid photobiont. Other lichens from similar habitats include *Gyalecta biformis* and *G. hypoleuca* with 5- to 9-septate ascospores, and *Ramonia calcicola* (exciple with paraphyses on inner face, asci K/I–).

Nb**PETRACTIS** Fr. (1845)

Thallus crustose, effuse, immersed. **Photobiont** *Scytonema*. **Ascomata** apothecia, perithecioid to urceolate, immersed, leaving pits in rock when decayed, globose or depressed-globose, developing below a circular thalline cover which splits radially from a central pore as the structure expands; disc pore-like, exposed when wet, or, if thalline, with a cover that disintegrates with age. **True exciple** pale, thin, inconspicuous, detached from the thalline cover when dry, composed of conglutinated, narrow hyphae. **Hymenium** colourless, I+ blue. **Hamathecium** of slender unbranched thinly septate paraphyses, scarcely swollen at the colourless apices; paraphyses absent. **Asci** ± cylindrical; wall thin, with a single functional layer, I+ blue; without a distinct apical dome, 8-spored. **Ascospores** colourless, septate, perispore ± distinct. **Conidiomata** pycnidia, ± immersed. **Conidia** aseptate, colourless, bacilliform. **Chemistry:** lichen products not detected by TLC. **Ecology:** on calcareous rocks.

Distinguished from *Gyalecta* by the radially fissured, thalline covering layer of the apothecia and lack of orange (carotenoid) globules in the paraphyses or excipular hyphae. *Ramonia* differs in its true exciple of angular cells. *Neopetractis* has complex multicellular conidia and a trentepohlioid photobiont.

Literature:

Baloch *et al.* (2010a), Ertz *et al.* (2021), Orange (2009), Seaward & Aptroot (2009).

- 1 Ascospores mostly 3- to 5-septate with a distinct perispore, the disc mostly covered by a thalline margin with radiate fissures.....2
 Ascospores 5- to 9-septate or submuriform, without a perispore; disc ± open.....*Gyalecta hypoleuca*

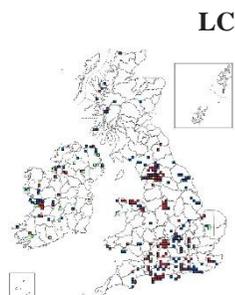
- 2(1) Photobiont *Scytonema*; apothecia 0.4–0.7 µm diam. *Petractis clausa*
 Photobiont *Trentepohlia*; apothecia 0.12–0.4 µm diam. 3
- 3(2) Ascospores 3- to 5- (to 7-) septate; true exciple lined with periphysoids; anamorph unknown
 *Ramonia calcicola*
 Ascospores 3-septate; periphysoids not present; conidia multicellular *Neopetractis nodispora*

Petractis clausa (Hoffm.) Kremp. (1861)

Thallus endolithic, whitish or yellowish-white, sometimes with scattered blue-grey flecks; photobiont *Scytonema*. Apothecia 0.4–0.7 mm diam., flat to convex, with a usually paler ± persistent thalline margin which initially covers the apothecia and has (3–) 4–6 (–8) distinct, radiating fissures; disc pinkish to pale orange to pale yellow-orange when moist, sometimes drying reddish-brown; thalline margin 10–15 µm thick, ± expanding to ca 30 µm in the uppermost part; true exciple very thin or inconspicuous, pale; hymenium 200–320 µm tall; paraphyses 1–1.5 µm diam. Asci 150–250 × 12–18 µm. Ascospores (15–) 17–23 (–35) × 5–7 µm (excluding perispore), mostly 3-septate, rarely submuriform, fusiform, with a distinct perispore. Pycnidia not seen. **BLS 1098.**

On highly calcareous rocks, usually in ± damp situations, especially where partly shaded; often on loose limestone or chalk pebbles on the ground; scattered, but sometimes locally abundant. Throughout Britain and Ireland but rare in Scotland and absent from parts of England and Wales without limestone outcrops.

Recognized by the immersed apothecia with a ± raised thalline covering layer with fissures that create a star-like appearance; the young apothecia can be misinterpreted as perithecia. *Ramonia calcicola* has a very similar appearance, but its apothecia are smaller (<0.4 mm diam.) with the true exciple composed of angular cells.



RAMONIA Stizenb. (1862)

Thallus crustose, usually immersed, cortex not differentiated, non-layered, effuse. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, urceolate, at first immersed with the exciple overtopping and hiding the hymenium except for a minute pore, later ± erumpent and the exciple splitting radially and exposing the sunken, pinkish or grey-white disc. **True exciple** well-developed laterally, of small thin-walled angular cells, becoming rectangular along the inner surface, ending in periphysoids with ± pointed apices, colourless or dark brown in the outer part. **Hymenium** colourless, I+ bluish at least in the uppermost part. **Hamathecium** of paraphyses, slender, numerous, septate, unbranched, usually ± swollen above. **Asci** (2-) 8- to 180-spored, clavate to ± cylindrical, the apex rounded or with a short, blunt apex, with a single thin (>1 µm) wall layer, K/I-, some species with a minute K/I+ blue ring-structure in the apex. **Ascospores** aseptate, 1- to many-septate or muriform, variously shaped, colourless, smooth-walled, sometimes with a distinct perispore. **Conidiomata** unknown. **Chemistry:** lichen products not detected by TLC. **Ecology:** on bark or wood, rarely on rock.

Gyalecta and *Petractis* differ in having a true exciple composed of narrow, never distinctly angular cells and lacking periphysoids. *Xerotrema* has an inconspicuous thallus and the excipular tissue is formed from black, irregularly septate hyphae in a gelatinous matrix.

Four species included in *Ramonia* by Sanderson & Purvis (2009) have been excluded from the genus and are now placed within *Karstenia* Fr. (1885). *Ramonia azorica* is now treated in *Topeliopsis* (Graphidaceae); it has densely muriform ascospores and lacks the angular exciple cells.

Literature:

Aptroot *et al.* (2015), Canals & Gómez-Bolea (1992), Coppins (1987), Coppins *et al.* (1994), Ertz *et al.* (2021), Rivas Plata *et al.* (2013), Sanderson & Purvis (2009), Vězda (1966b, 1973b).

- 1 Asci multispored; overgrowing bryophytes and plant detritus; montane *methathelia*
 Asci 8-spored 2
- 2(1) Ascospores <6 µm diam., 3- or more septate, fusiform, elongate-fusiform or needle-shaped 3
 Ascospores >7 µm diam., muriform, ellipsoidal or cylindrical 5
- 3(2) Ascospores 3- to 5(-7)-septate, 15-23 µm long; on limestone *calcicola*
 Ascospores mostly 6- or more septate, >24 µm long; on bark 4
- 4(3) Ascospores 24-43 µm, elongate-fusiform, 6- to 9-septate *Karstenia rhopaloides*
 Ascospores mostly >45 µm, needle-shaped, 8- to 14-septate *Karstenia chrysophaea*
- 5(2) Ascospores >25 µm diam., >100 µm long *Topeliopsis azorica*
 Ascospores <20 µm diam., <60 µm long 6
- 6(5) Apothecia pale *Karstenia dictyospora*
 Apothecia black *Karstenia nigra*

Ramonia calcicola Canals & Gómez-Bolea (1992)

Thallus thin and epilithic or partly endolithic, pink when fresh and well-illuminated, or pale greenish grey in the shade. Apothecia white to flesh-coloured, 0.2–0.4 mm diam., with a pore to *ca* 0.3 mm diam.; margin radially split; disc pinkish; true exciple colourless, of angular cells (best seen in a water mount), lined with periphysoids 5–7 µm long; hymenium 85–120 µm tall, KI–. Asci clavate to ± cylindrical, 90–100 × 12–16 µm, 8-spored. Ascospores (15–) 18–23 × 4–6 µm, fusiform, 3- to 5(-7)-septate, with a conspicuous perispore. **BLS 2484.**

On fragments of Portland limestone in scree and low scrub on sheltered coastal undercliff, very rare; England (Dorset).

Closely resembles a diminutive form of *Petractis clausa*, which differs in having much larger apothecia and *Scytonema* as photobiont. *Gyalecta hypoleuca* also has *Trentepohlia* and pore-like apothecia but differs in the larger, 5- to 9-septate or submuriform ascospores.

The placement of this species is uncertain and is retained here pending molecular research.

Nb



Ramonia melathelia (Nyl.) Ertz (2021)

Thelopsis melathelia Nyl. (1864)

Thallus superficial, normally orange-red to red-brown when fresh, becoming grey-green in the herbarium. Ascospores black, half-immersed, 0.5-0.8 mm diam., surface wrinkled. Exciple two-layered, inner layer colourless, outer layer dark orange-brown. Asci 200-250 × 15-25 µm, multispored; ascospores 11-20 × 4-7 µm, with a thickened perispore. **BLS 1407.**

Overgrowing bryophytes and plant detritus, often ± in sheltered crevices in basic rocks on upland crags; very rare. N. Scotland (Highlands, Breadalbane Mountains), N. Wales.

Placed in *Thelopsis* until recently due to its multispored asci, but most other characters fit well with *Ramonia* and sequencing has confirmed the relationship (Ertz *et al.* 2021).

NT



Nomenclature

Clathroporinopsis nidarosiensis (Kindt.) P.F. Cannon, **comb. nov.** **IF 900670**

Basionym: *Microglæna nidarosiensis* Kindt, *Kgl. norske vidensk. Selsk. Skr.*: 4 (1884).

Synonyms:

- ≡ *Belonia nidarosiensis* (Kindt) P.M. Jørg. & Vězda, in Jørgensen, Vězda & Botnen, *Lichenologist* **15**: 51 (1983).
- ≡ *Gyalecta nidarosiensis* (Kindt) Baloch & Lücking, in Baloch, Lumbsch, Lücking & Wedin, *Lichenologist* **45**: 725 (2013).
- ≡ *Clathroporina calcarea* Walt. Watson, *J. Bot.*, Lond. **63**: 131 (1925).

GYALECTA Ach., *K. Vetensk-Acad. Nya Handl.* **29**: 228 (1808)

Type: *Urceolaria geoica* Wahlenb., in Acharius, *Methodus*, Sectio prior (Stockholmia): 149 (1803), **here designated.** **IF 900957**

Synonym:

- ≡ *Gyalecta geoica* (Wahlenb.) Ach., *K. Vetensk-Acad. Nya Handl.* **29**: 229 (1808).

Surprisingly, it appears that the well-known genus *Gyalecta* Ach. has never been lectotypified. Acharius (1808) included three species in the original publication of *Gyalecta*, *G. geoica* (Wahlenb.) Ach., *G. wahlenbergiana* Ach. and *G. atrata* Ach. The first of these has been accepted in *Gyalecta* since its introduction, and is described elsewhere in this paper. *G. wahlenbergiana* is not a well-known taxon, but it appears to be a synonym of *Gyalecta foveolaris* (Ach.) Schaer. (1836), also currently recognized as a species of *Gyalecta*. *G. atrata* is the basionym of *Tremolecia atrata* (Ach.) Hertel (1977), a well-known and completely unrelated species. Either of the first two species would be appropriate as lectotype, but we choose *G. geoica* as the more familiar of the two. It was listed as type by Singh & Sinha (2010), but a formal lectotypification was not carried out.

Karstenia chrysophaea (Pers.) Coppins, Aptroot & P.F. Cannon, **comb. nov.** **IF 900671**

Basionym: *Peziza chrysophaea* Pers., *Icon. Desc. Fung. Min. Cognit.* (Leipzig) **2**: 17 (1798).

Synonyms:

- ≡ *Stictis chrysophaea* (Pers.) Pers., *Mycol. eur.* (Erlanga) **1**: 335 (1822).
- ≡ *Schmitzomia chrysophaea* (Pers.) Fr., *Summa veg. Scand.*, Sectio Post. (Stockholm): 363 (1849).
- ≡ *Lecidea chrysophaea* (Pers.) Nyl., *Mém. Soc. Imp. Sci. Nat. Cherbourg* **3**: 182 (1855).
- ≡ *Ocellaria chrysophaea* (Pers.) Quél., *Enchir. fung.* (Paris): 332 (1886).
- ≡ *Propolis chrysophaea* (Pers.) W. Phillips, *Man. Brit. Discomyc.* (London): 376 (1887).
- ≡ *Gyalecta carneola* var. *chrysophaea* (Pers.) Boistel, *Nouv. Fl. Lich.* (Paris): 68 (1896).
- ≡ *Gyalecta chrysophaea* (Pers.) Nyl., *Lich. Envir. Paris*: 76 (1896).
- ≡ *Ramonia chrysophaea* (Pers.) Vězda, *Folia geobot. phytotax. bohemoslov.* **1**: 166 (1966).

Karstenia dictyospora (Coppins) Coppins, Aptroot & P.F. Cannon, **comb. nov.** **IF 900672**

Basionym: *Ramonia dictyospora* Coppins, *Lichenologist* **19**(4): 414 (1987).

Karstenia nigra (Coppins) Coppins, Aptroot & P.F. Cannon, **comb. nov.** **IF 900673**

Basionym: *Ramonia nigra* Coppins, *Lichenologist* **19**(4): 416 (1987).

SECOLIGA Norman, *Conat. Praem. Gen. Lich.*: 19 (1852)

Type: *Lichen cupularis* Hedw., *Descr. micr.-anal. musc. frond.* (Lipsiae) 2: 58 (1789); **here designated**

IF 900956.

Synonyms:

- ≡ *Verrucaria cupularis* Hoffm., *Deutschl. Fl.*, Zweiter Theil (Erlangen): 176 (1796) [1795]
- ≡ *Patellaria cupularis* (Hedw.) Wibel, *Primit. Fl. Werthem.*: 324 (1799)
- ≡ *Lecidea cupularis* (Hedw.) Ach., *Methodus*, Sectio prior (Stockholmiaë): 56 (1803)
- ≡ *Lecidea marmorea* var. *cupularis* (Hedw.) Ach., *Lich. Univ.*: 193 (1810)
- ≡ *Gyalecta cupularis* (Hedw.) Schaer., *Lich. helv. spicil.* 2: 79 (1826)
- ≡ *Biatora marmorea* var. *cupularis* (Hedw.) Steud. & Hochst., *Enum. Pl. Germ.*: 209 (1826).
- ≡ *Lecidea foveolaris* var. *cupularis* (Hedw.) Sommerf., *Suppl. Fl. lapp.* (Oslo): 171 (1826)
- ≡ *Lecanora cupularis* (Hedw.) Duby, *Bot. Gall.*, Edn 2 (Paris) 2: 665 (1830)
- ≡ *Secoliga cupularis* (Hedw.) Norman, *Conat. Praem. Gen. Lich.*: 19 (1852).
- ≡ *Cappellettia cupularis* (Hedw.) Tomas. & Cif., *Archo. bot. ital.* 28: 8 (1952)
- ≡ *Peziza jenensis* Batsch, *Elench. fung.* (Halle): 123 (1783)
- = *Gyalecta jenensis* (Batsch) Zahlbr., *Cat. Lich. Univers.* 2: 720 (1924)

Secoliga Norman (1852) was disparate when published and greatly confused shortly afterwards by Stizenberger (1862), and the name has not been used in modern times. It has been used for a great variety of taxa (including non-lichenized Hypocreales).

Secoliga was typified with *S. cupularis* (a synonym of *Gyalecta jenensis*) by Fink (1910) but this is regarded as inadmissible as it was carried out under the American code of nomenclature which adopted an arbitrary “first species” rule. It was also listed as type by Hafellner (1984), but with a direct reference to the Fink lectotypification so this also is inadmissible. The table below lists the original species of *Secoliga*.

Name in Norman 1852	Current placement	Reasons for lectotypification	Reasons against lectotypification
<i>cupularis</i>	<i>Gyalecta jenensis</i>	Broadly fits description. Would regularize previous attempts at lectotypification	
<i>lutea</i>	<i>Coenogonium luteum</i>	Would not threaten <i>Coenogonium</i> Ehrenb. 1820	Conflicts with description (disc not red-brown)
<i>exanthematica</i>	<i>Petractis clausa</i>	Would not threaten <i>Petractis</i> Fr. 1845	Does not fit description very well
<i>repanda</i>	<i>Dirina massiliensis</i>	Would not directly threaten <i>Dirina</i> Fr. 1825 (type is <i>D. ceratoniae</i>)	Conflicts with description (ascomata blackish)
<i>rubra</i>	“ <i>Gyalecta</i> ” <i>ulmi</i>	Broadly fits description	<i>Phialopsis</i> Körb. 1855 available
<i>vernalis</i>	<i>Biatora vernalis</i>	Would not threaten <i>Biatora</i> Fr. 1817	Conflicts with description (spores not 4-locular)

Validating the lectotypification by Fink (1910) would maintain current usage, such as there is. The species description conforms well to Norman’s admittedly sparse generic diagnosis, and that choice will then allow adoption of the genus *Phialopsis* Körb. (1855) for *P. (Gyalecta) ulmi*.

Secoliga jenensis (Batsch) P.F. Cannon, **comb. nov.**

IF 900674

Basionym: *Peziza jenensis* Batsch, *Elench. fung.* (Halle): 123 (1783).

Secoliga macrospora (Vězda) P.F. Cannon, **comb. nov.**

IF 900675

Basionym: *Gyalecta jenensis* var. *macrospora* Vězda, *Folia geobot. phytotax.* 4(4): 443 (1969).

Literature

- Aptroot, A. & Lücking, R.** (2002). Phenotype-based phylogenetic analysis does not support generic separation of *Gyalidea* and *Solorinella* (Ostropales: Asterothyriaceae). *Bibliotheca Lichenologica* **85**: 53–78.
- Aptroot, A., Mendonça, C. de O., Ferraro, L.I. & Cáceres, M.E. da S.** (2014a). A world key to species of the genera *Topelia* and *Thelopsis* (Stictidaceae), with the description of three new species from Brazil and Argentina. *Lichenologist* **46**: 801–807.
- Aptroot, A., Parmen, S., Lücking, R., Baloch, E., Jungbluth, P., Cáceres, M.E. da S. & Lumbsch, H.T.** (2014b). Molecular phylogeny resolves a taxonomic misunderstanding and places *Geisleria* close to *Absconditella* s. str. (Ostropales: Stictidaceae). *Lichenologist* **46**: 115–128.
- Aptroot, A., Sobreira, P.N. Bezerra & Cáceres, M.E. da Silva** (2015). A remarkable new *Ramonia* (Gyalectaceae) from Brazil, with a key to the species. *Lichenologist* **47**: 21–29.
- Baloch, E., Döring, H. & Spooner, B.M.** (2010b). The genus *Cryptodiscus* in Great Britain. *Field Mycology* **11**: 26–32.
- Baloch, E., Gilenstam, G. & Wedin, M.** (2009). Phylogeny and classification of *Cryptodiscus*, with a taxonomic synopsis of the Swedish species. *Fungal Diversity* **38**: 51–68.
- Baloch, E., Gilenstam, G. & Wedin, M.** (2013b). The relationships of *Odontotrema* (Odontotremataceae) and the resurrected *Sphaeropezia* (Stictidaceae) – new combinations and three new *Sphaeropezia* species. *Mycologia* **105**: 384–397.
- Baloch, E., Lücking, R., Lumbsch, H.T. & Wedin, M.** (2010a). Major clades and phylogenetic relationships between lichenized and non-lichenized lineages in Ostropales (Ascomycota: Lecanoromycetes). *Taxon* **59**: 1483–1494.
- Baloch, E., Lumbsch, H.T., Lücking, R. & Wedin, M.** (2013a). New combinations and names in *Gyalecta* for former *Belonia* and *Pachyphiale* (Ascomycota, Ostropales) species. *Lichenologist* **45**: 723–727.
- Benfield, B., James, P.W. & Hitch, C.J.B.** (2009). *Phlyctis*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 695–696. London: British Lichen Society.
- Bielczyk, U. & Kiszka, J.** (2002). *Absconditella celata* (Stictidaceae) – a lichen species new to Poland. *Polish Botanical Journal* **47**: 70–71.
- Brackel, W. von** (2011). Lichenicolous fungi and lichens from Puglia and Basilicata (southern Italy). *Herzogia* **24**: 65–101.
- Brodo, I.M.** (2020). *Xerotrema megalospora* (Ascomycetes: Odontotremataceae), a new fungus for Canada. *Evansia* **37**: 152–155.
- Canals, A. & Gómez-Bolea, A.** (1992). *Ramonia calcicola*, a new lichen species from Catalonia, Spain. *Lichenologist* **24**: 308–311.
- Christiansen, M.S.** (1954). *Nanostictis*, a new genus of scolecosporous discomycetes. *Botanisk Tidsskrift* **51**: 59–65.
- Coppins, B.J.** (1987). The genus *Ramonia* in the British Isles. *Lichenologist* **19**: 409–417.
- Coppins, B.J.** (2009). *Absconditella*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 123–124. London: British Lichen Society.
- Coppins, B.J., Giavarini, V. & James, P.W.** (2009). *Gyalideopsis*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 423–424. London: British Lichen Society.
- Coppins, B. J., Thor, G. & Nordin, A.** (1994) The genus *Ramonia* in Sweden. *Graphis Scripta* **6**: 89–92.
- Czarnota, P. & Kukwa, M.** (2008). Contribution to the knowledge of some poorly known lichens in Poland. I. The genus *Absconditella*. *Folia Cryptogamica Estonica* **44**: 1–7.
- Czarnota, P. & Hernik, E.** (2014). Some peltigericolous microlichens from southern Poland. *Acta Botanica Croatica* **73**: 159–170.
- Darmostuk, V. & Flakus, A.** (2023). First molecular evidence of lichen-inhabiting *Acrospermum* and new insights into the evolution of lifestyles of Acrospermales (Dothideomycetes). *Mycologia* <https://doi.org/10.1080/00275514.2023.2264131>.
- Díaz-Escandón, D., Hawksworth, D.L., Powell, M., Resl, P. & Spribille, T.** (2021). The British chalk specialist *Lecidea lichenicola* auct. revealed as a new genus of Lichinomycetes. *Fungal Biology* **125**: 495–504.

- Diederich, P., Common, R.S., Braun, U., Heuchert, B., Millanes, A., Suija, A. & Ertz, D.** (2019). Lichenicolous fungi from Florida growing on Graphidales. *Plant and Fungal Systematics* **64**: 249–282.
- Diederich, P. & Etayo, J.** (2000). A synopsis of the genera *Skyttea*, *Llimoniella* and *Rhymboecarpus* (lichenicolous Ascomycota, Leotiales). *Lichenologist* **32**: 423–485.
- Diederich, P., Zhurbenko, M.P. & Etayo, J.** (2002). The lichenicolous species of *Odontotrema* (syn. *Lethariicola*) (Ascomycota, Ostropales). *Lichenologist* **34**: 479–501.
- Döbbeler, P. & Hertel, H.** (2013). Bryophilous ascomycetes everywhere: distribution maps of selected species on liverworts, mosses and Polytrichaceae. *Herzogia* **26**: 361–404.
- Dobson, F.S., James, P.W. & Brightman, F.H.** (2009). *Gomphillus*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 413–414. London: British Lichen Society.
- Ertz, D., Sanderson, N. & Lebouvier, M.** (2021). *Thelopsis* challenges the generic circumscription in the Gyalectaceae and brings new insights to the taxonomy of *Ramonia*. *Lichenologist* **53**: 45–61.
- Ertz, D. & Tønberg, T.** (2021). A new species of *Sagiolechia* (Sagiolechiaceae) from Norway, with lirelliform ascomata and 1-septate ascospores. *Graphis Scripta* **33**: 1–11.
- Etayo, J. & Diederich, P.** (1995). Lichenicolous fungi from the Western Pyrenees, France and Spain. I. New species of Deuteromycetes. *Flechten Follmann*. Contributions to Lichenology in Honour of Gerhard Follmann (Cologne): 205–221.
- Etayo, J. & Diederich, P.** (1996). Lichenicolous fungi from the Western Pyrenees, France and Spain. III. Species on *Lobaria pulmonaria*. *Bulletin de la Société des Naturalistes luxembourgeois* **97**: 93–118.
- Etayo, J. & Sancho, L.G.** (2008). Hongos liquenícolas del sur de Sudamérica, especialmente de Isla Navarino (Chile). *Bibliotheca Lichenologica* **98**: 1–302.
- Ferraro, L.I. & R. Lücking.** (2005). The genus *Gomphillus* (Ostropales: Gomphillaceae) in the Americas, with the new species *Gomphillus pedersenii* from Argentina. *Bryologist* **108**: 491–496.
- Fink, B.** (1910). Lichens of Minnesota. *Contributions from the United States National Herbarium* **14**: 1–xvii, 1–269.
- Flakus, A., Etayo, J., Miadlikowska, J., Lutzoni, F., Kukwa, M., Matura, N. & Rodriguez-Flakus, P.** (2019). Biodiversity assessment of ascomycetes inhabiting *Lobariella* lichens in Andean cloud forests led to one new family, three new genera and 13 new species of lichenicolous fungi. *Plant and Fungal Systematics* **64**: 283–344.
- Fletcher, A., Purvis, O.W. & James, P.W.** (2009). *Bryophagus*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 223. London: British Lichen Society.
- Gilbert, O.L.** (2009). *Rhexophiale*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 792. London: British Lichen Society.
- Gilbert, O.L. & Hawksworth, D.L.** (2009). *Cryptolechia*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 364–365. London: British Lichen Society.
- Gilbert, O.L., Coppins, B.J. & James, P.W.** (2009c). *Sagiolechia*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 828–829. London: British Lichen Society.
- Gilbert, O.L., James, P.W. & Woods, R.G.** (2009a). *Gyalecta*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 417–421. London: British Lichen Society.
- Gilbert, O.L., James, P.W. & Woods, R.G.** (2009b). *Gyalidea*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 421–423. London: British Lichen Society.
- Graddon, W.D.** (1977). Some new discomycete species: 4. *Transactions of the British Mycological Society* **69**: 255–273.
- Graddon, W.D.** (1986). Some new discomycete species: 7. *Transactions of the British Mycological Society* **87**: 328–333.
- Hafellner, J.** (1984). Studien in Richtung einer natürlicheren Gliederung der Sammelfamilien Lecanoraceae und Lecideaceae. *Beihefte zur Nova Hedwigia* **79**: 241–371.
- Hawksworth, D.L.** (1976). New and interesting microfungi from Slapton, South Devonshire: Deuteromycotina III. *Transactions of the British Mycological Society* **67**: 51–59.

- Hawksworth, D.L.** (1980). Notes on British lichenicolous fungi: III. *Notes from the Royal Botanic Garden, Edinburgh* **38**: 165–183.
- Hawksworth, D.L. & Santesson, R.** (1990). A revision of the lichenicolous fungi previously referred to *Phragmonaevia*. *Bibliotheca Lichenologica* **38**: 121–143.
- Henssen, A.** (1995). *Sagiolechia atlantica*, eine neue Flechte von den Atlantischen Inseln (Ascomycotina, Ostropales). *Bibliotheca Lichenologica* **58**: 123–136.
- Holien, H. & Triebel, D.** (1995). *Spirographa vinosa*, a new odontotremoid fungus on *Ochrolechia* and *Pertusaria*. *Lichenologist* **28**: 307–313.
- Jørgensen, P.M., Vězda, A. & Botnen, A.** (1983). *Clathroporina calcarea*, a misunderstood lichen species, and a note on the genus *Clathroporina* in Europe. *Lichenologist* **15**: 45–55.
- Kauff, F. & Büdel, B.** (2005). Ascoma ontogeny and apothecial anatomy in the Gyalectaceae (Ostropales, Ascomycota) support the re-establishment of the Coenogoniaceae. *Bryologist* **108**: 272–281.
- Lücking, R.** (2008). Foliicolous lichenized fungi. *Flora Neotropica Monograph* **103**: 866 pp.
- Lücking, R., Aptroot, A., Umaña, L., Chaves, J.L., Sipman, H.J.M. & Nelsen, M.P.** (2006). A first assessment of the Ticholichen biodiversity inventory in Costa Rica: the genus *Gyalideopsis* and its segregates (Ostropales: Gomphillaceae), with a world-wide key and name status checklist. *Lichenologist* **38**: 131–160.
- Lücking, R., Buck, W.R. & Rivas Plata, E.** (2007). The lichen family Gomphillaceae (Ostropales) in eastern North America, with notes on hyphophore development in *Gomphillus* and *Gyalideopsis*. *Bryologist* **110**: 622–672.
- Lücking, R., Moncada, B. & Hawksworth, D.L.** (2019). Gone with the wind: sequencing its type species supports inclusion of *Cryptolechia* in *Gyalecta* (Ostropales: Gyalectaceae). *Lichenologist* **51**: 287–299.
- Lücking, R., Sérusiaux, E. & Vězda, A.** (2005). Phylogeny and systematics of the lichen family Gomphillaceae (Ostropales) inferred from cladistic analysis of phenotype data. *Lichenologist* **37**: 123–170.
- Lücking, R., Sérusiaux, E. & Vězda, A.** (2009). *Jamesiella*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 447–448. London: British Lichen Society.
- Muscavitch, Z.M., Lendemer, J.C. & Harris, R.C.** (2017a). A review of the lichen genus *Phlyctis* in North America (Phlyctidaceae) including the description of a new widespread saxicolous species from eastern North America. *Bryologist* **120**: 388–417.
- Muscavitch, Z.M., Lendemer, J.C. & Harris, R.C.** (2017b). A synopsis of the lichenicolous fungi occurring on *Phlyctis* including description of a new *Monodictys* widespread on *P. speirea*. *Bryologist* **120**: 418–426.
- Navarro-Rosinés, P. & Llimona, X.** (1997). *Belonia mediterranea*, a new calcicolous lichen species from Catalonia (NE Spain). *Lichenologist* **29**: 15–27.
- Nimis, P.L.** (2023). ITALIC - The Information System on Italian Lichens. Version 7.0. University of Trieste, Dept. of Biology (<https://dryades.units.it/italic>), accessed on 12 Dec. 2023.
- Norman, J.M.** (1852). *Conatus praemissus redactionis novae generum nunnulorum lichenum*. *Nytt Magazin for Naturvidenskaberne* **7**: 213–252.
- Orange, A.** (2009). A new species of *Petractis* (Ostropales s. lat., lichenized Ascomycota) from Wales. *Lichenologist* **41**: 213–221.
- Orange, A.** (2013). *British and Other Pyrenocarpous Lichens*. Version 2. 250 pp. Cardiff: National Museum of Wales, available at <https://museum.wales/media/13849/Orange-A-2013-British-and-other-pyrenocarpous-lichens.pdf>
- Pino-Bodas, R., Zhurbenko, M.P. & Stenroos, S.** (2017). Phylogenetic placement within Lecanoromycetes of lichenicolous fungi associated with *Cladonia* and some other genera. *Persoonia* **39**: 91–117.
- Punithalingam, E.** (2003). Nuclei, micronuclei and appendages in tri- and tetra-radiate conidia of *Cornutispora* and four other coelomycete genera. *Mycological Research* **107**: 917–948.
- Purvis, O.W. & Orange, A.** (2009a). *Belonia*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 211–212. London: British Lichen Society.
- Purvis, O.W. & Orange, A.** (2009b). *Thrombium*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 894. London: British Lichen Society.

- Resl, P., Schneider, K., Westberg, M., Printzen, C., Palice, Z., Thor, G., Fryday, A., Mayrhofer, H. & Spribille, T.** (2015). Diagnostics for a troubled backbone: testing topological hypotheses of trapelioid lichenized fungi in a large-scale phylogeny of Ostropomycetidae (Lecanoromycetes). *Fungal Diversity* **73**: 239–258.
- Rivas Plata, E., Parmen, S., Staiger, B., Mangold, A., Frisch, A., Weerakoon, G., Hernández, J.E., Cáceres, M.E.S., Kalb, K., Sipman, H.J.M., Common, R.S., Nelsen, M.P., Lücking, R. & Lumbsch, H.T.** (2013). A molecular phylogeny of Graphidaceae (Ascomycota, Lecanoromycetes, Ostropales) including 428 species. *Myckeys* **6**: 55–94.
- Rose, F., James, P.W. & Orange, A.** (2009). *Thelopsis*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 889–891. London: British Lichen Society.
- Roux, C., Pinault, P. & Ertz, D.** (2022). *Corticifraga ramalinae* P. Pinault, Ertz et Cl. Roux sp. nov., champignon lichénicole non lichénisé (Ascomycota, Gomphillaceae). *Bulletin de la Société linnéenne de Provence* **73**: 29–35.
- Sanderson, N.A. & Hawksworth, D.L.** (2009). *Xerotrema*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 972. London: British Lichen Society.
- Sanderson, N.A. & Purvis, O.L.** (2009). *Ramonia*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 788–790. London: British Lichen Society.
- Seaward, M.R.D. & Aptroot, A.** (2009). *Petractis*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 689–690. London: British Lichen Society.
- Senn-Irlet, B.** (2014). A rare desiccation-tolerant species with single-spored asci: *Mellitiosporium propolidoides* (Rhytismatales). *Ascomycete.org* **6**: 151–153.
- Sérusiaux, E.** (1998). Notes on the Gomphillaceae (Lichens) from Guadeloupe (West Indies), with four new species of *Gyalideopsis*. *Nova Hedwigia* **67**: 381–402.
- Sherwood, M.A.** (1977). The Ostropalean fungi. *Mycotaxon* **5**: 1–277.
- Sherwood, M.A.** (1980). Taxonomic studies in the Phacidiales: the genus *Coccomyces* (Rhytismataceae). *Occasional Papers of the Farlow Herbarium of Cryptogamic Botany* **15**: 1–120.
- Sherwood, M.A. & Coppins, B.J.** (1980). *Xerotrema*, a new genus of odontotremoid fungi from Scotland. *Notes from the Royal Botanic Garden, Edinburgh* **38**: 367–371.
- Sherwood-Pike, M.A.** (1987). The Ostropalean fungi III: the Odontotremataceae. *Mycotaxon* **28**: 137–177.
- Singh, K.P. & Sinha, G.P.** (2010). *Indian Lichens. An Annotated Checklist*. 572 pp. Kolkata: Botanical Survey of India.
- Spribille, T., Björk, C.R., Ekman, S., Elix, J.A., Goward, T., Printzen, C., Tønsberg, T. & Wheeler, T.** (2009). Contributions to an epiphytic lichen flora of northwest North America: I. Eight new species from British Columbia inland rain forests. *Bryologist* **112**: 109–137.
- Spribille, T., Fryday, A.M., Pérez-Ortega, S., Svensson, M., Tønsberg, T., Ekman, S., Holien, H., Resl, P., Schneider, K., Stabentheiner, E., Thüs, H., Vondrák, J. & Sharman, L.** (2020). Lichens and associated fungi from Glacier Bay National Park, Alaska. *Lichenologist* **52**: 61–181.
- Stenroos, S., Laukka, T., Huhtinen, S., Döbbeler, P., Myllys, L., Syrjänen, K. & Hyvönen, J.** (2010). Multiple origins of symbioses between ascomycetes and bryophytes suggested by a five-gene phylogeny. *Cladistics* **26**: 281–300.
- Stizenberger, E.** (1862). Beitrag zur Flechtensystematik. *Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen Gesellschaft* **3**: 124–182.
- Suija, A. & Van den Boom, P.** (2023). Phylogenetic relationships, taxonomic novelties, and combinations within Stictidaceae (Ostropales, Lecanoromycetes, Ascomycota): focus on *Abconditella*. *Mycological Progress* **22**: 46.
- Thigayaraja, V., Lücking, R., Ertz, D., Karunarathna, S.C., Wanasinghe, D.N., Lumyong, S. & Hyde, K.D.** (2021). The evolution of life modes in Stictidaceae, with three novel taxa. *Journal of Fungi* **7**: 105.
- Thüs, H. & Schultz, M.** (2009). Fungi. Vol.1 part 1: Lichens. In Bödel, B., Gärtner, G., Krienitz, L., Preisig, H.-R. & Schagerl, M. (eds), *Stüßwasserflora von Mitteleuropa* **21**(1): 223 pp.
- Van den Boom, P.P.G.** (2015). Further new or interesting lichens and lichenicolous fungi from Madeira with notes on the genus *Gyalidea* in Macaronesia. *Folia Cryptogamica Estonica* **52**: 73–79.

- Van den Boom, P.P.G. & Vězda, A.** (1995). A new species and a new variety of the lichen genus *Gyalidea* from Western Europe. *Mycotaxon* **54**: 421–426.
- Vězda, A.** (1966a). Flechtensystematische Studien IV. Die Gattung *Gyalidea* Lett. *Folia Geobotanica et Phytotaxonomica* **1**: 311–340.
- Vězda, A.** (1966b). Flechtensystematische Studien III. Die Gattungen *Ramonia* Stiz. und *Gloeolecta* Lett. *Folia Geobotanica et Phytotaxonomica* **8**: 154–175.
- Vězda, A.** (1968). Taxonomische Revision der Gattung *Thelopsis* Nyl. (Lichenisierte Fungi). *Folia Geobotanica et Phytotaxonomica* **3**: 363–406.
- Vězda, A.** (1973a). Foliicole Flechten aus der Republik Guinea (W.-Afrika). I. *Acta Musei Silesiae* Opava, ser. A, **22**: 67–90.
- Vězda, A.** (1973b). Flechtensystematische Studien IX. Die Gattung *Ramonia* Stiz. Zusätze 2. *Folia Geobotanica et Phytotaxonomica* **8**: 417–424.
- Vězda, A.** (1978). Neue oder wenig bekannte Flechten in der Tschechoslowakei. II. *Folia Geobotanica et Phytotaxonomica* **13**: 397–420.
- Vězda, A. & Poelt, J.** (1991). Die Flechtengattung *Gyalidea* Lett. ex Vězda (Solorinellaceae). Eine Übersicht mit Bestimmungsschlüssel. *Nova Hedwigia* **53**: 99–113.
- Wedin, M., Döring, H. & Gilenstam, G.** (2004). Saprotrophy and lichenization as options for the same fungal species on different substrata: environmental plasticity and fungal lifestyles in the *Stictis–Conotrema* complex. *New Phytologist* **164**: 459–465.
- Wedin, M., Döring, H. & Gilenstam, G.** (2006). *Stictis* s. lat. (Ostropales, Ascomycota) in northern Scandinavia, with a key and notes on morphological variation in relation to lifestyle. *Mycological Research* **110**: 773–789.
- Wedin, M., Döring, H., Könberg, K. & Gilenstam, G.** (2005). Generic delimitations in the family Stictidaceae (Ostropales, Ascomycota): the *Stictis–Conotrema* problem. *Lichenologist* **37**: 67–75.
- Woods, R.G., Rose, F. & James, P.W.** (2009). *Pachyphiale*. In *Lichens of Great Britain and Ireland* (Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. eds): 649–650. London: British Lichen Society.
- Xavier-Leite, A.B., Cáceres, M.E. da Silva, Aptroot, A., Moncada, B., Lücking, R. &** (2022). Phylogenetic revision of the lichenized family Gomphillaceae (Ascomycota: Graphidales) suggests post-K–Pg boundary diversification and phylogenetic signal in asexual reproductive structures. *Molecular Phylogenetics and Evolution* **168**: 107380.
- Xavier-Leite, A.B., Cáceres, M.E. da Silva, Goto, B.T., Tomio, B. & Lücking, R.** (2018). The genus *Gyalideopsis* (lichenized Ascomycota: Gomphillaceae) in Brazil: updated checklist, key to species, and two novel taxa with unique hyphophores. *Bryologist* **121**: 32–40.
- Xavier-Leite, A.B., Goto, B.T., Lücking, R. & Cáceres, M.E. da Silva** (2023). New genera in the lichenized family Gomphillaceae (Ascomycota: Graphidales) focusing on neotropical taxa. *Mycological Progress* **22**: 88.
- Zhurbenko, M.P.** (2009). Lichenicolous fungi and lichens from the Holarctic. Part II. *Opuscula Philolichenum* **7**: 121–186.
- Zhurbenko, M.P., Tadome, K. & Ohmura, Y.** (2018). *Pronectria japonica* species nova and a key to the lichenicolous fungi and lichens growing on *Ochrolechia*. *Herzogia* **31**: 494–504.

Index

ABSCONDITELLA, 35
Absconditella annexa, 36
Absconditella celata, 36
Absconditella delutula, 36
Absconditella lignicola, 37

Absconditella pauxilla, 37
Absconditella sphagnorum, 37
Absconditella trivialis, 37
Asteroglobulus giselae, 32
BELONIA, 13

- Belonia calcicola**, 13
Belonia incarnata, 14
Belonia nidarosiensis, 15, 51
Belonia russula, 14
Bryophagus gloeocapsa, 40
Clathroporina calcarea, 51
CLATHROPORINOPSIS, 14
Clathroporinopsis nidarosiensis, 15, 51
Cornutispora lichenicola, 32
Cornutispora triangularis, 33
CORTICIFRAGA, 2
Corticifraga fuckelii, 3
Corticifraga peltigerae, 3
CRYPTODISCUS, 38
Cryptodiscus cladoniicola, 39
Cryptodiscus gloeocapsa, 40
Cryptodiscus rhopaloides, 42
CRYPTOLECHIA, 15
Cryptolechia carneolutea, 16
FRANCISROSEA, 47
Francisrosea bicolor, 47
GOMPHILLACEAE, 2
GOMPHILLUS, 3
Gomphillus calycioides, 4
GYALECTA, 16, 51
Gyalecta biformis, 18
Gyalecta calcicola, 13
Gyalecta carneola, 20
Gyalecta carneolutea, 16
Gyalecta derivata, 18
Gyalecta fagicola, 21
Gyalecta flotowii, 19
Gyalecta foveolaris, 19
Gyalecta geoica, 19, 51
Gyalecta hypoleuca, 19
Gyalecta incarnata, 14
Gyalecta jenensis, 22
Gyalecta jenensis var. macrospora, 23, 52
Gyalecta nidarosiensis, 15, 51
Gyalecta ophiospora, 21
Gyalecta rivularis, 7
Gyalecta russula, 14
Gyalecta truncigena, 20
Gyalecta ulmi, 22
GYALECTACEAE, 10
GYALIDEA, 4
Gyalidea diaphana, 5
Gyalidea fritzei (, 6
Gyalidea hyalinescens, 6
Gyalidea hyalinescens var. pauciseptata, 6
Gyalidea lecideopsis, 6
Gyalidea roseola, 7
Gyalidea subscutellaris, 7
GYALIDEOPSIS, 7
Gyalideopsis crenulata, 8
Gyalideopsis cyanophila, 8
Gyalideopsis muscicola, 8
JAMESIELLA, 9
Jamesiella anastomosans, 9
Jamesiella scotica, 9
KARSTENIA, 40
Karstenia chrysophaea, 41, 51
Karstenia dictyospora, 51
Karstenia nigra, 42, 51
Karstenia rhopaloides, 42
Lettauia cladoniicola, 39
Lichen cupularis, 52
Microglæna nidarosiensis, 51
NANOSTICTIS, 43
Nanostictis christiansenii, 43
NEOPETRACTIS, 47
Neopetractis nodispora, 48
Odontotrema pertusariae, 44
ODONTOTREMATACEAE, 25
Opegrapha corticola, 24
PACHYPHIALE, 20
Pachyphiale carneola, 20
Pachyphiale fagicola, 21
Pachyphiale ophiospora, 21
PETRACTIS, 48
Petractis clausa, 49
Petractis nodispora, 48
Peziza chrysophaea, 51
Peziza jenensis, 52

- PHIALOPSIS**, 21
Phialopsis ulmi, 22
PHLYCTIDACEAE, 27
PHLYCTIS, 27
Phlyctis agelaea, 27
Phlyctis argena, 28
RAMONIA, 49
Ramonia calcicola, 50
Ramonia chrysophaea, 41
Ramonia dictyospora, 41, 51
Ramonia interjecta, 42
Ramonia melathelia, 50
Ramonia nigra, 42, 51
Rhexophiale rhexoblephara, 29
SAGIOLECHIA, 28
Sagiolechia protuberans, 29
Sagiolechia rhexoblephara, 29
SAGIOLECHIACEAE, 28
SECOLIGA, 22, 52
Secoliga cupularis, 52
Secoliga jenensis, 22, 52
Secoliga macrospora, 23, 52
SPHAEROPEZIA, 43
Sphaeropezia pertusariae, 44
SPIROGRAPHA, 30
Spirographa ascaridiella, 32
Spirographa ciliata, 31
Spirographa fusisporella, 31
Spirographa giselae, 32
Spirographa lichenicola, 32
Spirographa pyramidalis, 33
Spirographa triangularis, 33
Spirographa tricupulata, 34
Spirographa vermiformis, 32
SPIROGRAPHACEAE, 30
STICTIDACEAE, 34
STICTIS, 44
Stictis mollis, 45
THELOPSIS, 23
Thelopsis corticola, 24
Thelopsis isiaca, 24
Thelopsis melathelia, 50
Thelopsis rubella, 25
THROMBIACEAE, 46
THROMBIUM, 46
Thrombium epigaeum, 46
Urceolaria geoica, 51
XEROTREMA, 26
Xerotrema megalosporum, 26
Xerotrema quercicola, 26