

# Revisions of British and Irish Lichens



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**Arthoniales: Roccellaceae**

Cover image: *Roccella phycopsis*, on maritime granite, La Corbiere, St Brelade, Jersey.

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

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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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

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# *Revisions of British and Irish Lichens* vol. 16

## **Arthoniales: Roccellaceae**

including the genera *Cresponea*, *Dendrographa*, *Dirina*, *Enterographa*, *Gyrographa*, *Lecanactis*, *Pseudoschismatomma*, *Psoronactis*, *Roccella*, *Schismatomma* and *Syncesia*

by

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## ROCELLACEAE

**Thallus** crustose or fruticose, often corticate, usually pale, often pruinose, sometimes sorediate. **Photobiont** trentepohlioid. **Ascomata** apothecia, rounded, occasionally shortly lirellate,  $\pm$  sessile. **Thalline margin** present, sometimes undulating or contorted, concolorous with the thallus. **Exciple** reduced, not carbonized. **Hypothecium** dark brown. **Hamathecium** of paraphysoids, usually much branched and anastomosing. **Asci** mostly fissitunicate, thick-walled, cylindrical-clavate, often with a minute I+ apical ring, usually 8-spored. **Ascospores** septate, initially two-celled but often developing further, secondary septa, without a gelatinous sheath. **Conidiomata** pycnidia. **Conidia** filiform and curved, or bacilliform.

The Roccellaceae is one of four families within the Arthoniales, according to Ertz & Tehler (2011) and Ertz *et al.* (2014). Its circumscription is more restricted than before; the family used to include all the genera now considered as members of the Arthoniales. As with many lichen families, the number of diagnostic morphological features is restricted, but the phylogenetic evidence is clear of its definition and extent.

In addition to lichenized taxa, the family includes a few species that are partially lichenicolous, either as direct parasites or subsequently developing independent thalli. The only British representative of this biological strategy group is *Enterographa*, with *E. brezhonega* (q.v.) on *Coenogonium* species (Ostropales, Coenogoniaceae). *Paralecanographa grumulosa* (Opegraphaceae) is initially parasitic on *Dirina* and *Roccella*.

A key to genera of Roccellaceae is problematic, so a table of characters and direct key to species are presented instead.

### Literature

Aptroot & Schumm (2011), Ertz *et al.* (2009, 2014), Ertz & Tehler (2011), Follmann (2001), Huneck (1995), Tehler (1990), Tehler & Irested (2007).

<i>Cresponea</i>	Thallus crustose, pale, sometimes with a dark border; isidia and soralia absent; ascomata discoid, often strongly pruinose; ascospores narrowly fusiform, multiseptate; conidia cylindrical, short; chemistry: no reactions. Corticolous.
<i>Dendrographa</i>	Thallus crustose, effuse (fruticose in some non-GB species), pale, often pruinose, sometimes sorediate; ascomata rare, not strongly elongate; conidia filiform, curved; chemistry: no reactions (but UV $\pm$ ice blue). Corticolous.
<i>Dirina</i>	Thallus crustose, pale to grey-brown, usually pruinose, sometimes sorediate; ascomata discoid; conidia filiform, curved; thallus C $\pm$ red, KC+red, UV $\pm$ pale yellow. Usually saxicolous.
<i>Enterographa</i>	Thallus crustose (rarely lichenicolous), not pruinose, not sorediate; ascomata usually $\pm$ lirellate; conidia usually bacillar; thallus C+ red (rare), K?UV $\pm$ mauve, Pd $\pm$ yellow-orange. Corticolous and saxicolous.
<i>Gyrographa</i>	Thallus mostly shades of brown, not pruinose, sometimes sorediate; ascomata short, gyrose; conidia bacillar; thallus C $\pm$ reddish, KC+ reddish. Saxicolous.
<i>Lecanactis</i>	Thallus crustose, effuse, $\pm$ pruinose, not sorediate; ascomata round to elongate (often rare); pycnidia prominent, pruinose, the pruina C+ red; conidia bacillar; thallus UV+ yellow or glaucous grey. Corticolous.
<i>Pseudoschismatomma</i>	Thallus crustose, reddish brown, smooth, not pruinose, not sorediate; apothecia curved or $\pm$ stellate; conidia straight or curved; chemistry: no reactions. Corticolous.
<i>Psoronactis</i>	Thallus crustose, effuse, pale, $\pm$ tomentose-scurfy, not sorediate; apothecia mostly rounded; conidia bacillar; thallus Pd+ yellow-orange, medulla UV $\pm$ yellow-grey. Saxicolous.

<i>Roccella</i>	Thallus fruticose, ± pruinose, sorediate; apothecia ± round (rare); conidia ± filiform, curved; thallus and/or soralia C+ red, UV+ blue-white. Saxicolous.
<i>Schismatomma</i>	Thallus crustose, effuse, pale, ± pruinose, sometimes sorediate; apothecia ± round; conidia usually bacillar; chemistry: no reactions (but UV± ice blue). Corticolous or saxicolous.
<i>Syncesia</i>	Thallus crustose, effuse, ± pruinose, sometimes sorediate; ascomata round to elongate, strongly pruinose; conidia filiform, sometimes curved; thallus Pd+ red, UV+ cream; Mostly corticolous.

1	Thallus fruticose.....	2
	Thallus crustose, or parasitic on crustose lichens.....	3
2(1)	Thallus to 20 cm long, branches flattened, ± pendent; cortex C–, soralia C+ red; medulla whitish at the point of attachment .....	<i>Roccella fuciformis</i>
	Thallus to 5 cm long, branches ± rounded, tufted: cortex C+ red, soralia C–; medulla yellow at the point of attachment .....	<i>Roccella phycopsis</i>
3(1)	Thallus sorediate; apothecia rare.....	4
	Thallus not sorediate (or absent); pycnidia and/or apothecia frequent .....	15
4(3)	On rock or mosses on rock .....	5
	On bark or wood .....	11
5(4)	Thallus usually over 1 mm thick, or forming thick cushions .....	6
	Thallus thin .....	8
6(5)	Thallus C+ red .....	<i>Dirina massiliensis</i>
	Thallus C–.....	7
7(6)	Thallus thick, soft, brown or ochre-brown; prothallus dark; medulla UV+ glaucous .....	<i>Schismatomma umbrinum</i>
	Thallus often forming conspicuous hemispherical cushions, prothallus pale; medulla UV+ ice-blue.....	<i>Dendrographa latebrarum</i>
8(5)	Thallus dark to reddish brown, often tinged mauve .....	9
	Thallus whitish to pale brown .....	10
9(8)	Thallus C–.....	<i>Enterographa zonata</i>
	Thallus C+ red .....	<i>Gyroglypha gyrocarpa</i>
10(8)	On siliceous and basic (non-calcareous) rocks; thallus pale brownish grey, ± thin.....	<i>Dirina fallax</i>
	On limestone, mortar etc.; thallus usually chalk-like, often thick and irregular .....	<i>Dirina massiliensis</i>
11(4)	Thallus and/or soredia Pd+ rust red, orange or yellow-orange .....	12
	Thallus and soredia Pd– .....	14
12(11)	Soralia and medulla Pd+ orange to rust red, at least in places.....	13
	Thallus and soredia Pd+ strongly and evenly yellow; thallus pale pink or creamy white to glaucous grey; soralia initially ± raised, generally soon becoming confluent, pale pink or creamy .....	[Arthoniaceae] <i>Snippocia nivea</i>

- 13(12) Soralia discrete, punctiform and  $\pm$  excavate, not or rarely confluent, pinkish grey when dry; soredia strongly Pd+ orange or rust red ..... [Ostropales: Graphidaceae] *Schizotrema quercicola*  
Soralia irregular to confluent, white-grey, only occasionally pinkish when hydrated; abraded soralia and medulla Pd+ patchily rust red, sometimes yellow to orange where the reaction is weak .....sorediate morph of *Syncesia myrticola*
- 14(11) Thallus chalk-white; K+ yellow ..... [Arthoniaceae] *Sporodophoron cretaceum*  
Thallus thin, pale mauve-grey;  $\pm$  discrete; K-, UV- ..... *Dendrographa decolorans*
- 15(3) Thallus with stalked white pruinose pycnidia ..... 16  
Thallus without stalked, white pruinose pycnidia (or absent) ..... 17
- 16(15) Pruinose pycnidial tips C+ red, K-; conidia 12–17  $\mu$ m long ..... *Lecanactis abietina*  
Pruinose pycnidial tips C-, K+ yellow; conidia 3.7–5  $\mu$ m long [Arthoniaceae] *Inoderma subabietinum*
- 17(15) Thallus absent, parasitic on *Trentepohlia*-containing lichens, several lirelliform apothecia twisted together to form white superficial pseudostromata to 0.5 mm diam. .. *Enterographa brezhonega*  
Not lichenicolous, thallus thin to thick with black immersed and separated apothecia ..... 18
- 18(17) Apothecia with essentially round discs, not aggregated ..... 19  
Apothecia lirellae, punctiform to elliptical, sometimes aggregated ..... 21
- 19(18) Thallus mostly on trees; greenish-pruinose apothecial discs always present; ascospores (4-) 5-septate ..... *Cresponea premnea*  
Thallus on rock; with white-pruinose apothecial discs; ascospores 3-septate ..... 20
- 20(18) Thallus C+ red, Pd-; on calcareous rocks ..... *Dirina massiliensis*  
Thallus C-, Pd+ yellow-orange; on siliceous rocks ..... *Psoronactis dilleniana*
- 21(18) Apothecia with carbonized or dark brown hypothecium and/or exciple ..... 22  
Apothecia without carbonized or dark brown parts ..... 25
- 22(21) Apothecia aggregated in raised groups ..... fertile morph of *Syncesia myrticola*  
Apothecia not aggregated ..... 23
- 23(22) Exciple carbonized ..... 24  
Exciple pale, but hypothecium dark brown ..... *Schismatomma ricasolii*
- 24(23) On trees; disc open; ascospores often curved; thallus with whitish dot-like warts ..... *Pseudoschismatomma rufescens*  
Usually on rock; disc a slit; ascospores not curved; thallus without dots ..... *Gyrographa saxigena*
- 25(21) Ascospores 8- to 17-septate; apothecia 0.2–2 (–5) mm long; thallus Pd+ yellow-orange ..... *Enterographa elaborata*  
Ascospores (3-) 5- to 8-septate; apothecia to 1 mm long; thallus Pd- ..... 26
- 26(25) Apothecia lirellae, often forked, 0.2–1  $\times$  0.08–0.2 (–0.4) mm; ascospores 22–28 (–32)  $\mu$ m long ..... *Enterographa hutchinsiae*  
Apothecia punctiform to elliptical, 0.1–0.25  $\times$  0.05–0.1 mm; ascospores 27–38 (–40)  $\mu$ m long ..... 27
- 27(26) Thallus smooth, finely rimose to bullate; conidia 4–6  $\mu$ m long; mainly on trees, rarely on sheltered inland rocks in damp situations ..... *Enterographa crassa*  
Thallus areolate; conidia 6–8  $\mu$ m long; on dry overhanging coastal rocks ..... *Enterographa pitardii*

## CRESPONEA Egea & Torrente (1993)

**Thallus** crustose, effuse, smooth, cracked or rarely areolate, whitish, greyish or greenish, sometimes with a dark brown border, not corticate. **Photobiont** *Trentepohlia*. **Isidia** and **soralia** absent. **Ascomata** apothecia, sessile, the base constricted, roundish. **Thalline margin** absent. **Exciple** prominent, raised above the level of the disc, sometimes crenulate, dark brown to black, not pruinose. **Disc** flat to slightly convex, covered by a  $\pm$  dense pruina, sometimes only present in younger ascomata. **Hymenium** colourless, I+ blue/reddish or reddish, K/I+ blue. **Hamathecium** of paraphysoids, unbranched or sparsely branched, the apical cell clavate, with a distinct brown cap, forming a granulose, dark brown epithecium, K+ yellow or rarely purple. **Asci** fissitunicate, clavate to cylindrical-clavate, 8-spored. **Ascospores** with 3 to 19 transverse septa, narrowly fusiform, thick-walled, colourless. **Conidiomata** pycnidia  $\pm$  immersed in the thallus, dark brown above. **Conidia** cylindrical, straight and short. **Ecology**: epiphytic, some are old forest indicator species, rarely saxicolous.

Similar to *Lecanactis*, but the apothecia have a glossy black, non-pruinose exciple, and lichen compounds are mostly lacking. There is only one British species.

### Literature

Egea & Torrente (1993), Kantvilas (2020), Wolseley *et al.* (2009a).

### *Cresponea premnea* (Ach.) Egea & Torrente (1993)

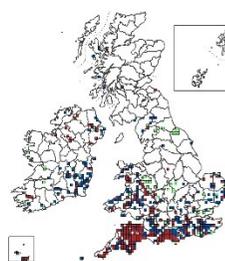
Thallus thin, effuse and greyish, or evanescent. Apothecia 0.4–1.5 (–2) mm diam., disciform, large, black, sessile; disc glabrous or thinly grey-green-pruinose, flat; true exciple persistent, prominent,  $\pm$  crenate. Ascospores 18–25  $\times$  4.5–6 (–7)  $\mu$ m, cylindrical, (4–) 5-septate, often curved, with pointed ends. Pycnidia occasional, mostly arranged in lines or groups, black, half-immersed to sessile, 60–100  $\mu$ m diam.; conidia bacilliform, 3.5–4.6  $\times$  ca 0.8  $\mu$ m. Thallus and medulla K–, C–, KC–, Pd–. **BLS 0605.**

On dry, rough, usually well-lit bark of mature *Quercus*, *Taxus* and (rarely) *Fagus*; intolerant of nutrient enrichment. The dominant species of the post-climax *Lecanactidetum premneae* association on old trees, often with *Lecanographa lyncea*. It occurs primarily in ancient, usually open, parklands or forests, sometimes in hedges and roadsides, more rarely on hard, acid rocks under dry overhangs. Most frequent in S., rare in N. England (N. to Cumberland), W. Scotland, Wales, Ireland.

Specimens on rocks have been named as *Lecanactis plocina sensu auct. brit.*, but no differences, other than substratum, are apparent. *L. plocina* is now often classified as *Cresponea premnea* var. *saxicola* (Leight.) Egea & Torrente (1993), and occurs throughout the distribution range of the species, although considerably rarer.

There are two reports of this species being parasitized by *Milospium graphideorum* D. Hawksw.

### Nb IR



## DENDROGRAPHA Darb. (1895)

**Thallus** crustose or fruticose, usually white, greyish or pinkish when fresh, often pruinose, calcium oxalate crystals sometimes present. Cortex with hyphae periclinally arranged; hypomedullary plectenchyma sometimes present. **Soralia** present in some species. **Photobiont** trentepohlioid. **Apothecia** single or as locules in stromatic structures, erumpent from the thallus, circular in outline or rarely elongate, sessile, the disc exposed, with a white pruinose layer. **Thalline margin** formed by

the breaking up of the cortex. **Exciple** not well-developed. **Epithecium** brownish, with granular brown gel interspersed with the tips of paraphysoids. **Hypothecium** distinct, dark brown. **Hamathecium** of paraphysoids, richly branched above, the apices clavate, brownish. **Asci** clavate. **Ascospores** fusiform, with one end tapering more than other, curved, smooth, 3-septate, colourless. **Pycnidia** black. **Conidia** filiform, semicircular to almost straight. **Chemistry**: varied, reactions mostly negative in British species.

Phylogenetic studies by Ertz & Tehler (2011) demonstrated that *Dendrographa* includes crustose as well as fruticose species, leading to the inclusion of two British species, one from *Lecanactis* and the other from *Schismatomma*. They are retained in the keys for those genera.

#### Literature

Ertz & Tehler (2011), Lohtander *et al.* (1998), Sundin & Tehler (1996).

- 1      Thallus thin, ± rimose, UV–; apothecia circular to elongate (rarely found) ..... *decolorans*  
       Thallus often forming conspicuous hemispherical cushions, UV+ ice-blue; apothecia  
       unknown..... *latebrarum*

#### *Dendrographa decolorans* (Turner & Borrer) Ertz & Tehler (2011)

*Schismatomma decolorans* (Turner & Borrer) Clauzade & Vězda (1965)

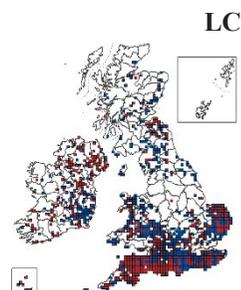
Thallus thin, white to lilac- to pinkish grey, becoming grey to brownish grey in dried collections, ± rimose; a grey-black prothallus often present; soralia punctiform when young, spreading and becoming confluent, mauve-grey to pale lilac-grey, occasionally with an ochre tinge. Apothecia rare, elongate to circular, 0.5–1.3 mm diameter, disc convex, persistently pruinose. Ascospores fusiform, curved, 30–37 × 4–5 µm. Pycnidia rare; conidia 6–7 × 2 µm, bacilliform, straight to slightly curved, 1-septate, pale olive-brown or colourless. Thallus C–, K–, KC–, Pd–, UV– (unidentified fatty acids). **BLS 1315**.

On the dry sides of young to old deciduous trees in wayside and woodland sites, tolerant of relatively high levels of agricultural chemicals and fertilizers; often abundant. S. & E. Britain (fertile material found rarely in southern Britain), rare to the north, extending to E. Ireland, rare in the west.

The sorediate morph of *Syncestia myrticola* (formerly referred to as *Enterographa sorediata*) is very similar but is patchily Pd+ rust-red (weak Pd reactions are more visible in UV light) thus distinguishing it from *D. decolorans* (Pd–) and *Snippocia nivea* (Pd+ yellow-orange); also expanding thalli of that species can have a distinctive brown fimbriate prothallus that is diagnostic in the dry bark habitat. Both *D. decolorans* and *S. myrticola* often occur in a mosaic. With practice the slightly waxier thallus and paler soralia of *S. myrticola* can help pick out candidates for confirmation with Pd. *Pachnolepia pruinata* also resembles *D. decolorans* in the field but is C+ red and usually fertile.

Mixed populations of *D. decolorans* and *Enterographa crassa* occur widely. In these the *D. decolorans* is growing over or through *E. crassa*, with the soralia of *D. decolorans* first developed along the areole margins, while the *E. crassa* apothecia are still visible.

There are many records of this species being parasitized by *Milospium graphideorum* and *Tylophoron hibernicum*. Other reported lichenicolous fungi are *Licheniconium erodens* M.S. Christ. & D. Hawksw., *L. lecanorae* (Jaap) D. Hawksw. and *Psammia stipitata* D. Hawksw.

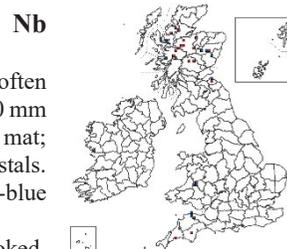


#### *Dendrographa latebrarum* (Ach.) Ertz & Tehler (2011)

*Lecanactis latebrarum* (Ach.) Arnold (1885)

Thallus greyish white, tinged pink-violet, becoming paler in dried collections, often forming conspicuous hemispherical powdery spongy cushions to 5 mm tall and 10 mm diam.; prothallus, when developed, whitish or pale brown, forming a lax, felted mat; thallus of photobiont cells interwoven by coarse hyphae heavily incrustated by crystals. Apothecia and pycnidia unknown. Thallus C–, K–, KC–, Pd–; medulla UV+ ice-blue (leprarie, and ± roccelic acids). **BLS 1587**.

On very shaded acidic rock under dry overhangs in humid conditions; overlooked.



Widespread in the Scottish Highlands, very rare to the south (E. Lothian, central Wales, Exmoor and Dartmoor).

Easily mistaken for a species of *Lepraria* which, however, do not have *Trentepohlia* as photobiont. May also be confused with *Arthonia arthonioides* which has no lichen chemistry.

## DIRINA Fr. (1825)

**Thallus** crustose, superficial, effuse or delimited, the surface becoming cracked, often slightly verruculose or areolate, white to grey-brown, usually  $\pm$  pruinose; prothallus present, brown to black-brown. **Upper cortex** with anticlinally arranged, colourless hyphae immersed in a pale yellow-brown gelatinous matrix, often with crystals; epicortex absent. **Soralia** when present punctiform or maculate, concolorous with or paler than the surrounding thallus. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, discrete or aggregated, sessile, concolorous with the thallus, strongly pruinose. **Thalline margin** present, often undulating or contorted. **True exciple** thin or inconspicuous. **Epithecium** brownish. **Hymenium** colourless. **Hypothecium** black, opaque, or dark brown, clearly defined. **Hamathecium** of narrow paraphysoids, branched and intertwined, the apices smooth or ornamented,  $\pm$  coloured. **Asci** 8-spored, clavate, fissi- or semi-fissitunicate, the apex thickened with a small internal K/I+ blue ring, *Opegrapha*-type. **Ascospores** 3-septate, colourless, fusiform, straight or  $\pm$  curved. **Conidiomata** pycnidia, immersed or slightly elevated, appearing as black or dark brown dots. **Conidia** filiform and sickle-shaped. **Chemistry**: orcinol depsides, erythrin, and unidentified substances. **Ecology**: below dry overhangs and shaded rock faces in calcareous and siliceous environments and on bark.

The lichen *Paralecanographa grumulosa* (Opegraphaceae) is initially parasitic on thalli of *Dirina* species (Ertz & Tehler (2011), and eventually produces its own thallus. Lichenicolous fungi associated with *Dirina* include the hyphomycetes *Verrucocladosporium dirinae* (Crous et al. 2007) and *Milospium graphideorum* (Hawksworth 1975).

### Literature

Crous et al. (2007), Ertz & Tehler (2011), Giavarini & Purvis (2009), Hawksworth (1975), Tehler (1983), Tehler et al. (2013).

- 1 On siliceous and basic (non-calcareous) rocks; thallus pale brownish grey,  $\pm$  thin.....*fallax*  
On limestone, mortar etc.; thallus usually chalk-like, often thick and irregular..... *massiliensis*

### *Dirina fallax* De Not. (1846)

Thallus 0.1–1.5 mm thick, flat to slightly rugose-verruculose, pale grey-brown; cortex 30–60  $\mu$ m thick, not pruinose; medulla chalk-like but with loose hyphae near the base, white. Soralia (usually in the absence of ascomata) punctiform to maculate, similar to those of *D. massiliensis*; soredia 20–50  $\mu$ m diam., coarsely granular. Apothecia rarely seen [and not in British material], 0.1–2 mm diam., sessile, circular in outline, the base constricted; thalline margin present, entire to undulating; disc pale grey, pruinose, often with an irregularly cracked surface. Ascospores 18–24  $\times$  5–6  $\mu$ m, 3-septate. Thallus (cortex) C+ faintly red, K–, KC+ red, Pd–, UV–; medulla C–, K–, KC–, Pd–, UV $\pm$  pale yellow (erythrin, lecanoric acid). **BLS 2622**.

On vertical or overhanging calcareous siliceous rocks, usually in shaded habitats near the coast; S.W. England and Channel Is, N. Ireland, Northumberland. GBI distribution currently under investigation; the map does not contain historical records on acid rocks formerly identified as *D. massiliensis*. *Dirina* populations that rarely occur on dry bark on old trees are probably also this species.



There is currently no correct name at forma level for the sorediate morph (Tehler *et al.* 2013), which is the only one encountered in our region to date; see discussion under *D. massiliensis*.

*Llimonaea sorediata* is somewhat similar to the sorediate morph of *D. fallax* but differs in its thallus with pinkish rather than grey-brown tinges. The C+ red reaction is instantaneous in *L. sorediata* but much slower in *D. fallax*. The rare *Sparria endlicheri* (coastal in our region), which is also C+ red but contains lecanoric acid, resembles *D. fallax* but with slightly larger soredia. TLC may be needed for confirmation.

### **Dirina massiliensis** Durieu & Mont. (1847)

LC

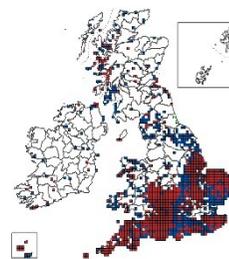
*Dirina massiliensis* f. *sorediata* sensu auct. br., *non* (Müll. Arg.) Tehler (1983)

Thallus 0.2–3.5 mm thick, chalk-like, usually smooth, but sometimes uneven or verruculose or ± rimose-cracked, white to pale grey, often with a violet tinge; cortex 40–70 µm thick, pruinose, densely packed with small crystals; medulla chalk-like throughout; prothallus brown or black-brown, often with black zone lines separating colonies. Soralia where present to 0.4 mm diam., usually paler than the thallus, pale brown-grey, yellowish or whitish grey, at first punctiform, becoming confluent and spot-like, flat or convex; soredia 20–50 µm diam., coarsely granular. Apothecia 0.5–3 mm diam., ± sessile; disc whitish dark grey, concolorous with the thallus, ± white-pruinose; thalline exciple smooth, at first regular, often becoming ± undulate, sometimes contorted; hymenium 50–140 µm tall; pseudoparaphyses 1–2 µm diam., apices 1–3 µm diam. Asci 70–120 × 12–18 µm. Ascospores 20–24 × 4–6 µm, 3-septate. Thallus surface C+ red; medulla C–; disc C+ faintly red yellowish (erythrin, ± lecanoric acid); in sorediate morphs UV– or glaucous, the medulla UV+ glaucous or rarely ± yellowish. **BLS 0499.**

On dry vertical or overhanging calcareous rocks, plaster or mortared walls, especially on the E. & N. sides of churches; throughout Britain, common and apparently increasing. Morphs with apothecia are rare and local, found on dry, hard limestones, usually on ± vertical cliffs and rocky outcrops on or near the coast of S. & S.W. Britain to N. Wales. Throughout Europe and the Mediterranean region.

Sorediate forms are much more common in Britain and Ireland, while apothecial morphs predominate in southern Europe and the Mediterranean. The sorediate morphs were distinguished as *D. massiliensis* f. *sorediata* (**BLS 0500**) by Giavarini & Purvis (2009), but according to Tehler *et al.* (2013) the type of that taxon is a synonym of the Socotran species *D. immersa* Müll. Arg. (1882). The correct name at forma level for the sorediate morph would probably need to be based on *Lecidea stenhammarii* Fr. ex Stenhammar (1848), but the necessary combination has not been made. None of the sorediate morphs of *Dirina* species appear to be phylogenetically separable from their apothecial counterparts, and while recording morphs separately is a valuable exercise the need to refer to them with Latin names is questionable.

No lichenicolous fungi are reported from the apothecial morph in the study area. The sorediate morph can be parasitized by *Milospium graphideorum*, *Spiloma auratum* Sm. and *Verrucocladosporium dirinae* K. Schub. *et al.* There is also a report of an unidentified *Taeniolella* species.



## **ENTEROGRAPHA** Fée (1824)

**Thallus** crustose, not layered, smooth or cracked-areolate, white-grey to dark olive-green or brown, frequently forming mosaics; prothallus grey to black, separating the thalli. Thallus absent in lichenicolous species. **Photobiont** *Trentepohlia*. **Ascوماتа** apothecia, immersed, punctiform, elliptical or lirellate, rarely stellate; disc flat, brown to black, not pruinose. **True exciple** thin, immersed, pale to brown. **Hamathecium** of paraphyses, very slender, anastomosing, becoming more branched above, conglutinated, without swollen tips. **Asci** 4- or 8-spored, cylindrical or cylindrical-clavate, fissitunicate, the apical dome with a short ocular chamber surrounded by a minute K/I+ dark blue ring; remaining part of apical dome and inner wall of ascus often K/I+ pale blue. **Ascospores** 3- to 16-septate, fusiform, colourless. **Conidiomata** pycnidia, immersed, visible as minute pallid to brown specks; wall colourless, or pale brown above. **Conidiogenous cells** cylindrical, proliferating

percurrently. **Conidia** bacilliform or rarely filiform, aseptate, colourless. **Chemistry:** confluent, gyrophoric, protocetraric, psoromic and consporomic acids and unidentified pigments may be present. **Ecology:** on rock, wood, bark and leaves, or lichenicolous.

*Roccellographa* (Roccellographaceae) superficially resembles an *Enterographa*, but has brown ascospores. *Schismatomma* differs from *Enterographa* by the presence of a rudimentary thalline margin, and a poorly developed true exciple.

*Enterographa soredata* has been found to be a sorediate morph of *Syncesia myrticola* (Ertz *et al.* 2018).

### Literature

Ertz *et al.* (2009, 2018), Sanderson *et al.* (2009), Seavey & Seavey (2014), Sparrius (2004), Sparrius & Aptroot (2007).

- |      |  |  |
|------|--|--|
| 1    | Thallus absent, lichenicolous on <i>Trentepohlia</i> -containing lichens, several lirelliform apothecia twisted together to form white superficial pseudostromata to 0.5 mm diam. .... | <i>brezhonega</i>                            |
|      | Not lichenicolous, thallus thin to thick with black immersed and separated apothecia .....   | 2  |
| 2(1) | Thallus sorediate; apothecia rare.....   | 3  |
|      | Thallus not sorediate; apothecia frequent; thallus Pd± yellow-orange .....   | 4  |
| 3(2) | Thallus grey or pale brown; abraded soralia and medulla Pd+ rust red .....   | sorediate morph of <i>Syncesia myrticola</i> |
|      | Thallus dark brown, tinged mauve; soralia and medulla Pd-.....   | <i>zonata</i>                                |
| 4(2) | Ascospores 8- to 17-septate; apothecia 0.2–2 (–5) mm long; thallus Pd+ yellow-orange .....   | <i>elaborata</i>                             |
|      | Ascospores (3-) 5- to 8-septate; apothecia to 1 mm long; thallus Pd- .....   | 5  |
| 5(4) | Apothecia lirellae, often forked, 0.2–1 × 0.08–0.2 (–0.4) mm; ascospores 22–28 (–32) µm long .....   | <i>hutchinsiae</i>                           |
|      | Apothecia punctiform to elliptical, 0.1–0.25 × 0.05–0.1 mm; ascospores 27–38 (–40) µm long .....   | 6  |
| 6(5) | Thallus smooth, finely rimose to bullate; conidia 4–6 µm long; mainly on trees, rarely sheltered inland rocks in damp situations .....   | <i>crassa</i>                                |
|      | Thallus areolate; conidia 6–8 µm long; on dry overhanging coastal rocks .....  | <i>pitardii</i>                              |

### *Enterographa brezhonega* Sparrius & Aptroot (2007)

Thallus absent, lichenicolous. Apothecia mainly in pseudostromata formed from 2–5 apothecia twisted together, 0.2–0.5 mm diam., occasionally as single apothecia; pseudostromata white with thin white pruina. Apothecia immersed within pseudostromata, lirelliform, often branched, 0.03–0.1 × 0.1 × 0.6 mm, disc shiny pale grey, orange-brown, dark brown to black, not pruinose, narrowly exposed when wet, obscured when dry; epithecium orange-brown; paraphyses 0.8 µm diam. Asci 4-spored. Ascospores (12–) 15–20 × 2.5–3 µm, (4-) 6-septate, with one of the middle cells sometimes enlarged, straight to slightly curved, epispore to *ca* 1 µm thick. Pycnidia not formed but conidia sometimes produced by ill-defined conidiogenous tissue in outer parts of the exciple, *ca* 3 × 1 µm in size. Pseudostromata C–, K–, Pd–, UV– (no substances detected by TLC). **BLS 2491.**

Lichenicolous on *Coenogonium confusum* (see *Revisions of British and Irish Lichens* vol. 3), a species previously mistaken for *Porina rosei*, and also rarely on *C. luteum*, on old *Quercus* in old growth woodland; potentially overlooked throughout the main host range. S. & S.W. England (Hampshire, New Forest, Dartmoor), W. Ireland (Killarney, Tipperary, Sligo).

The small pseudostromata could be easily overlooked as myxomycete fruits, but if looked at closely the convoluted white lirellae are highly distinctive.

VU (D2)



### **Enterographa crassa** (DC.) Fée (1824)

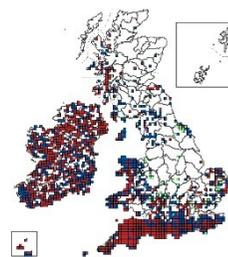
Thallus thin to thick, continuous, smooth or faintly rimose-cracked, even or becoming coarsely and unevenly low-warted, often forming wide-spreading complex mosaics, pale grey to pale brown, dark brown or dark olive-green,  $\pm$  refractive with closely packed granules, K $-$ ; prothallus between the thalli, thin, persistent, dark brown to black. Apothecia usually very numerous, brown-black, deeply immersed, without a rim, minutely punctiform or  $\pm$  broadly elliptical in surface view,  $0.1\text{--}0.25 \times 0.05\text{--}0.1$  mm, often in dotted or thread-like lines; epithecium pale to dark brown, semi-opaque, non-granular; paraphyses  $0.8\text{--}1$   $\mu\text{m}$  diam. Asci 8-spored. Ascospores  $28\text{--}38 \times 4\text{--}6$   $\mu\text{m}$ , 4- to 6(-7)-septate, straight to slightly curved. Pycnidia  $40\text{--}50$   $\mu\text{m}$  diam., frequent; conidia  $4\text{--}6 \times 0.9\text{--}1.2$   $\mu\text{m}$ . Thallus C $-$ , K $-$ , K/UV $+$  mauve, Pd $-$ , UV $-$  (confluent acid). **BLS 0504.**

On shaded bases and trunks of mature or senescent broad-leaved trees and shrubs, especially in woodlands, rarely on very shaded, siliceous rock, tolerant of low illumination and moderate levels of pollution; locally abundant. S. & S.W. England, Wales, N. England, W. Scotland, throughout Ireland.

The shape of the apothecia and thallus colour are both very variable. Some populations on old trees with a typically pale thallus and longer branched lirellae, for which the name *E. venosa* (Pers.) A. Massal. (1860) has been used, are referable to *E. hutchinsiae* not *E. crassa* (Ertz *et al.* 2009). See *E. hutchinsiae* and *E. elaborata* for differences.

The initially lichenicolous *Tylophoron hibernicum* (Arthoniaceae, q.v.) can be found establishing on and spreading over *Enterographa crassa* on the bases of old trees in S.W. Britain & Ireland.

LC



### **Enterographa elaborata** (Leight.) Coppins & P. James (1979)

Like *E. crassa* but thallus pale pink-brown to pallid brown, densely granular-refractive, K $+$  dissolving; apothecia  $0.2\text{--}2$  ( $-5$ ) mm  $\times$   $0.08\text{--}0.15$  mm long, extended, more conspicuous, serpentine, often branched or stellate; paraphyses  $0.8\text{--}1$   $\mu\text{m}$  diam. Asci 8-spored. Ascospores  $32\text{--}65 \times 2.5\text{--}4.5$   $\mu\text{m}$ , 8- to 17-septate, often  $\pm$  curved, with a thin episore. Pycnidia very rare, dark brown, *ca* 0.1 mm diam.; conidia filiform,  $12\text{--}17 \times ca$  0.7  $\mu\text{m}$ . Thallus C $\pm$  red, K $-$  or faint yellow, Pd $+$  yellow-orange (psoromic, 2'-O-demethylpsoromic acids and minor amounts of gyrophoric acid). Gyrophoric acid is only present in the apothecial margins but the C $+$  red reaction is not easily visible in the field. **BLS 0505.**

Habitat similar to *E. crassa*, but on more flushed bark; very rare. Hampshire, New Forest on *Fagus*, Kent, Hatch Park on *Carpinus*, N. Ireland (Fermanagh) on *Fraxinus*.

Rediscovered in the Britain and Ireland in the 1990s, formerly also recorded from Isle of Wight & S.W. Ireland (Limerick). The Pd $+$  yellow-orange reaction readily separates it from *E. crassa*, while the very long angular lirellae are very distinctive once known.

CR (D)

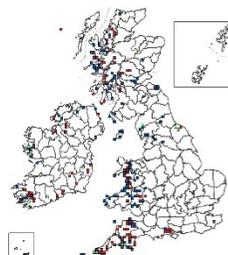


### **Enterographa hutchinsiae** (Leight.) A. Massal. (1860)

Thallus thin to moderately thick, continuous, smooth or finely rimose, even, often forming elaborate wide-spreading mosaics, dark grey to dull or dark olive-green or olive-brown, pallid yellow-brown in rain tracks on veteran trees, densely packed with minute crystals, K $-$ ; prothallus black, criss-crossing the thalli. Asci 8-spored. Apothecia  $0.25\text{--}1 \times 0.08\text{--}0.2$  ( $-0.4$ ) mm, immersed, comma-like to lirelliform, often branched; disc fully exposed, flat or slightly convex (when wet), black or grey-brown-black, matt, slightly raised and sometimes surrounded by a whitish rim (pseudothalline exciple); epithecium brown to black-brown, semi-opaque, non-granular, K $-$ ; paraphyses  $0.8\text{--}1$   $\mu\text{m}$  diam. Ascospores (22-)  $24\text{--}28$  ( $-32$ )  $\times$   $4\text{--}5$   $\mu\text{m}$ , 4- to 6 (-8)-septate, straight or  $\pm$  curved. Pycnidia dark brown, punctiform; conidia rod-shaped,  $5\text{--}6 \times 1.2\text{--}1.5$   $\mu\text{m}$ . Thallus C $-$ , K $-$ , K/UV $+$  mauve, KC $-$ , Pd $-$ , UV $-$  (confluent acid). **BLS 0506.**

On shaded  $\pm$  permanently damp, often vertical siliceous rock faces, especially in small, deep ravines or on shaded seepage tracks on rock faces on or near the coast; occasionally on the smooth bark of exposed tree roots and buttresses by sheltered streams; rare higher on the trunks of veteran trees, especially *Fagus*, *Ilex* and *Carpinus* in rain tracks away from rocky habitat; local. W. Britain, extending to N.E. England, very rare in the lowlands

LC



on veteran trees along the south coast as far east as Hampshire, New Forest & Kent, Hatch Park. Local in upland Ireland.

More frequent in W. Scotland than *E. crassa*, with which it is often confused. *E. crassa* has smaller, often inconspicuous apothecia and occurs predominantly on bark. Possibly overlooked on old trees in the lowlands in the past, where populations with pale thalli and apothecia forming forked lirellae may be growth forms of *E. hutchinsiae* in more exposed situations (Ertz *et al.* 2009).

### **Enterographa pitardii** (B. de Lesd.) Redinger (1938)

Thallus moderately thick, continuous, strongly rimose-areolate, even to warted, lead-grey to dark brownish grey; prothallus thin, black. Apothecia dark brown to black, immersed, punctiform to elliptical in surface view, 0.1–0.2 × 0.07–0.1 mm, regularly dispersed across the thallus; epithecium orange-brown; paraphyses 1–1.5 µm diam. Asci 8-spored. Ascospores 27–35 × 3–5 µm, 5- to 6-septate. Pycnidia black, punctiform; conidia 6–8 × 0.8–1 µm. Thallus C–, K–, Pd–, UV– (confluent acid). **BLS 2440.**

On vertical or overhanging dry siliceous coastal acid rocks (including chert in limestone, rarely on associated limestone) within the Sclerophytetum circumscriptae community, in more exposed and drier sites than *E. crassa* or *E. hutchinsiae*; very rare. S.W. coast from Dorset (Portland) to N. Devon (Valley of the Rocks). Some old records of *E. crassa* from coastal rocks may also be referable here.



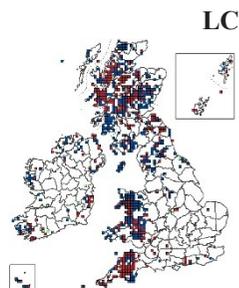
### **Enterographa zonata** (Körb.) Källsten ex Torrente & Gea (1989)

*Opegrapha zonata* Körb. (1855)

Thallus thin to rather thick, smooth, even or ± finely rimose-cracked, superficial, often delimited by a dark prothallus, often forming extensive mosaics, dark chocolate-brown, often tinged mauve; soralia (0.2–) 0.5–1 (–1.5) mm diam., C–, small, punctiform, rarely confluent, dark brown or ± to lilac-white, pale when abraded. Apothecia rather rare, 0.2–0.3 (–0.4) × 0.1–0.3 mm, 0.08–0.12 mm high, scattered, sessile, rounded or elliptical in surface view, unbranched, disc a slit; exciple K–; epithecium brown; hymenium 75–90 µm tall, I+ blue. Ascospores 24–28 (–32) × 3.5–6 µm, 5- to 7(–11)-septate, with pointed ends. Conidia 5–6 × ca 0.5 µm, straight. Soralia C–, K–, K/UV+ mauve, KC–, Pd–, UV± deep blue (confluent, 2'-O-methylmicrophyllinic and 2'-O-methylperlatolic acids). **BLS 0967.**

On deeply shaded siliceous rock overhangs in humid situations, rarely on shaded smooth deciduous bark, e.g. *Fagus* and *Ilex*; locally frequent in the uplands, rare in lowlands, often associated with *Gyroglypha gyrocarpa* (C+ red) and *G. saxigena* (no soralia). W. Britain, upland Ireland.

Distinguished by the dark thallus with rounded, ± dark or lilac-mauve-white soralia and the thallus chemistry. Sequencing has shown *E. zonata* to be closely related to *E. crassa* (Ertz *et al.* 2009).



## **GYROGRAPHA** Ertz & Tehler (2014)

**Thallus** crustose, non-corticate, sorediate or not, greyish, cream to dark brown or purplish brown, sometimes pinkish when fresh, to 2 mm thick but often thinner. **Soralia** when present becoming confluent, dull yellow-grey to pinkish or brownish, with the pinkish colour fading in dried collections. **Prothallus** dark brown. **Photobiont** trentepohlioid. **Ascomata** knot-like or clustered-gyrose to lirelliform, sessile, black, not pruinose, with a persistent conspicuous dark brown to black, K+ olivaceous true exciple; hymenial disc not pruinose, sometimes narrowly exposed, black. **Hypothecium** carbonised, very thick. **Hymenium** I+ red. **Hamathecium** of branched and anastomosed paraphyses, with slightly enlarged apices. **Asci** cylindric-clavate. **Ascospores**

colourless, ellipsoidal to slightly clavate, straight, 3-septate, without a gelatinous sheath. **Conidia** bacilliform,  $4-7 \times 0.3-0.8 \mu\text{m}$ . **Chemistry:** Thallus C- or C+ reddish, K-, KC+ reddish, P-. TLC: Gyrophoric acid and/or schizopeltic acid or without secondary metabolites.

A segregate from *Opegrapha* (Opegraphaceae) introduced by Ertz *et al.* (2014), with affinities instead to the Roccellaceae. Distinguished from that genus in morphological terms by the ascomata with a very thick carbonized hypothecium and ascospores without a gelatinous sheath.

#### Literature

Ertz *et al.* (2014), Pentecost & James (2009).

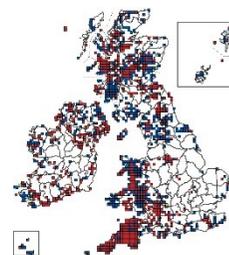
- 1 Thallus with punctiform to effuse soralia, C+ red; apothecia rare ..... *gyrocarpa*  
Thallus without soralia, C-; apothecia usually present ..... *saxigena*

### **Gyrographa gyrocarpa** (Flotow) Ertz & Tehler (2014)

LC

*Opegrapha gyrocarpa* Flotow (1825)

Thallus thin to medium, effuse or finely rimose-cracked, often forming extensive mosaics, pale tan to deep chocolate-brown, sometimes with paler, pinkish areas; prothallus dark, delimiting or absent; soralia 0.4–1.5 (–2.5) mm diam., scattered, often in patches or becoming confluent, dull yellow-grey, ochraceous, rarely brown, fading to pale buff-grey in dried collections. Apothecia occasional, 0.7–1.6 (–2) mm across, knot-like or clustered-gyrose, rounded, sessile, scattered, rarely crowded and contiguous, disc a persistent slit; exciple and hypothecium K+ olive-green; epithecium pale; hymenium 80–120  $\mu\text{m}$  tall, I-. Ascospores (12–) 17–25 (–30)  $\times$  (3–) 4–6  $\mu\text{m}$ , slightly clavate, 3-septate, straight. Conidia 3.8–6  $\times$  0.5–0.7  $\mu\text{m}$ , bacilliform. Soralia C+ red, K-, KC+ red, Pd-, UV+ glaucous or pale yellow (gyrophoric, schizopeltic acids, unidentified xanthone and accessory substances). **BLS 0947.**



On humid, often vertical or overhanging, shaded neutral or siliceous rock faces, especially in old woodlands, often on old dry-stone walls; scarce on deciduous or conifer bark and *Ilex*. Widespread in W. and N. Britain, scarce but scattered in S.E. England, absent from the central plain in Ireland.

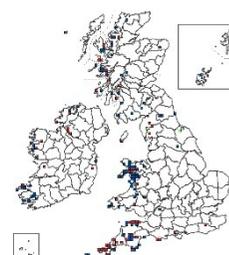
*G. gyrocarpa* can be confused with *Gyalecta nidarosiensis* which has soralia which are C- and is mainly restricted to limestone rocks, cement and mortar. *G. gyrocarpa* is often associated with *G. saxigena* which lacks soredia and is usually well fertile, and *Enterographa zonata* which has  $\pm$  punctiform, dark brown soralia which become  $\pm$  lilac-white when abraded and are C- and K/UV+ mauve (confluent acid and related substances). Specimens of *G. gyrocarpa* on bark should be compared with *Opegrapha corticola* in which the soralia are C- (without gyrophoric acid).

### **Gyrographa saxigena** (Taylor) Ertz & Tehler (2014)

LC

*Opegrapha saxigena* Taylor (1836)

Thallus thin, continuous, smooth or partially rimose-cracked, superficial, dark chocolate to deep purplish brown, rarely partially grey-brown surrounded by a thin, dark prothallus, often forming extensive mosaics. Apothecia 0.5–1.2 (–1.4)  $\times$  (0.15–) 0.2–0.35 (–0.45) mm, 0.15–0.20 mm tall, scattered, rarely contiguous, short, sessile, infrequently branched, often sparse; disc a persistent slit, rarely partially exposed; exciple occasionally furrowed, K+ olive-green; epithecium brown; hymenium 80–120  $\mu\text{m}$  tall, I+ red or occasionally I+ blue below. Ascospores (15–) 16–20 (–22)  $\times$  4–5 (–6)  $\mu\text{m}$ , 3-septate, ellipsoidal, rarely slightly clavate. Conidia 4–7  $\times$  0.3–0.8  $\mu\text{m}$ , bacilliform. Thallus C-, K-, KC-, Pd-, UV- (no lichen products detected by TLC). **BLS 0961.**



On deeply shaded siliceous rock, especially in old woodlands, rarely on smooth bark (e.g. *Ilex*), often forming extensive communities with *G. gyrocarpa* and *Enterographa zonata*; locally frequent. S.W. & W. Britain, sparsely recorded in upland Ireland.

Distinguished from *G. gyrocarpa* by the absence of soralia and lack of lichen products. Rare corticolous morphs should be compared with *Opegrapha trochodes*.

## LECANACTIS Körb. (1855)

**Thallus** crustose, thin, continuous, scurfy or cracked, to irregularly areolate or verrucose, rarely leprose, effuse or delimited by a brown-black hypothallus; cortex absent or poorly differentiated. **Photobiont** Trentepohlia. **Ascomata** apothecia, discoid to elongate (lirelliform), mostly sessile, black, but often densely pruinose. **Thalline margin** absent. **True exciple** well developed, often persistent, raised, dark brown to black, pruinose. **Epithecium** pale to dark brown, exciple and hypothecium dark brown; pigment usually K+ greenish. **Hymenium** I+ reddish or blue. **Hamathecium** of sparsely and irregularly branched paraphyses (paraphysoids) with swollen apices. **Asci** 8-spored, clavate to cylindric-clavate, fissitunicate, apex with a narrow, K/I± pale blue apical dome penetrated by a small ocular chamber that is sometimes surrounded by a small, K/I+ dark blue, ring-like zone. **Ascospores** fusiform or spermatoid, mostly 3- to 7(-8)-septate, thin-walled, not widening at septa with a thin epispore and undifferentiated endospore, colourless. **Conidiomata** pycnidia, borne on large, prominent, cylindrical, and white-pruinose protuberances; walls dark brown, usually K+ greenish. **Conidiogenous cells** elongate, ampulliform to subcylindrical, arising in a single layer. **Conidia** colourless, simple, bacilliform. **Chemistry**: orcinol depsides and β-orcinol depsidones, erythrin, and several unidentified substances. **Ecology**: mostly on humid, shaded rocks, and dry recesses of bark, particularly in oceanic areas.

Circumscription of the genus *Lecanactis* has been rather unstable over the past few years; a number of species formerly included in the genus were assigned to other genera by Wolseley *et al.* (2009), including to *Bactrospora*, *Cresponea*, *Lecanographa* and *Schismatomma*. Of the species retained in *Lecanactis* by those authors, *L. latebrarum* was transferred to *Dendrographa* (Roccellaceae) by Ertz & Tehler (2011), *L. dilleniana* to *Psoronactis* (Roccellaceae) by Ertz *et al.* (2014), and *L. subabietina* to *Inoderma* (Arthoniaceae) by Frisch *et al.* (2015). The common species *L. abietina* is the only survivor of this phylogenetic research to occur in Great Britain and Ireland.

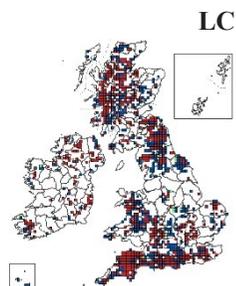
### Literature

Egea & Torrente (1994), Ertz & Tehler (2011), Ertz *et al.* (2014), Frisch *et al.* (2015), Tehler & Egea (1997), Wolseley *et al.* (2009b).

- |      |   |                                |
|------|---|--------------------------------|
| 1    | On bark or wood .....   | 2                              |
|      | On rock or mosses on rock .....   | 3                              |
| 2(1) | Pruinose pycnidial tips C+ red, K-; conidia 12–17 µm long .....   | <i>abietina</i>                |
|      | Pruinose pycnidial tips C-, K+ yellow; conidia 3.7–5 µm long .....  | <i>Inoderma subabietinum</i>   |
| 3(1) | Thallus Pd+ yellow-orange; white-pruinose apothecial discs usually present;<br>ascospores 3-septate ..... | <i>Psoronactis dilleniana</i>  |
|      | Thallus Pd-, without apothecia or pycnidia .....  | <i>Dendrographa latebrarum</i> |

### *Lecanactis abietina* (Ach.) Körb. (1855)

Thallus thin, effuse, mauve-grey to whitish grey. Apothecia (not always present) 0.7–2 mm diam., circular, sessile or appressed, thickly yellow-grey pruinose over the brown-black disc, which has a prominent, persistent true exciple. Ascospores fusiform to acicular, 3(-4)-septate, ± curved, 28–40 × 3–6 µm. Pycnidia 0.2–0.3 mm diam., numerous and evenly scattered, cylindrical, knob-like, with white-pruinose apices; walls 25–50 µm thick, dark brown in water mount, green-black in K; conidiogenous cells 8–12 × 1.9–2.4 µm; conidia cylindrical, 12–17 × 2–3 µm. Pycnidial pruina C+ red, K-; apothecial pruina and thallus C-, K-, KC-, Pd-; medulla UV+ yellow- or glaucous grey (lecanoric and schizopeltic acids, unknown UV-1 positive substances). **BLS 0592.**



On dry, often shaded acid bark and exposed wood in medium-aged to mature woodland on deciduous and,

sometimes, coniferous trees; best developed in vertical crevices on N. or N.E. sides of trunks; occasionally under overhangs of acid rocks, bryophytes or plant debris; locally common. Throughout Britain, except in extremely oceanic situations, local in Ireland, rare in the central plain.

When sterile, distinguished from *Inoderma subabietinum* and *Opegrapha vermicellifera* by the C+ red pycnidial pruina and large conidia.

Thalli occasionally parasitized by *Milospium graphideorum* or *Tylophoron hibernicum*. Other lichenicolous fungi include *Chaenothecopsis vainioana*, an unidentified *Chaenothecopsis* with non-septate ascospores and *Taeniolella arthoniae* (M.S. Christ. & D. Hawksw.) Heuchert & U. Braun.

## PSEUDOSCHISMATOMMA Ertz & Tehler (2014)

The genus is monotypic, so the description of *P. rufescens* below constitutes that of the genus. As the generic name implies, it is similar to *Schismatomma*. The type species was included in a broadly circumscribed *Opegrapha* in the second edition of this publication, and can be keyed out from the treatment of that genus in the current work.

### Literature

Ertz *et al.* (2014), Pentecost & James (2009).

### **Pseudoschismatomma rufescens** (Pers.) Ertz & Tehler (2014)

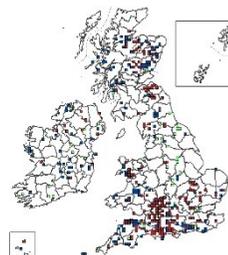
*Opegrapha rufescens* Pers. (1794)

Thallus thin, smooth or finely rimose-cracked with white dotting (either hyphal bundles or crystalline deposits), sometimes delimited by a dark prothallus and mosaic-forming, dull olive to red-brown, rarely grey. Apothecia (0.25–) 0.32–0.5 (–1) × 0.09–0.15 (–0.3) mm, immersed, sometimes elevated on a thalline cushion, curved or substellate, usually numerous and often contiguous; disc fully exposed, surrounded by a very thin exciple (K–) and sometimes a thin persistent whitish raised pseudothalline exciple formed from aggregations of the thalline dots; exciple K–; epithecium brown; hymenium 50–60 µm tall, K–. Ascospores 3-septate, (15–) 17–27 × 3–5 µm, fusiform, often curved, without a gelatinous sheath. Conidia 4–8 × 0.8–2 µm, variable, straight or curved. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0958.**

On smooth shaded nutrient-rich bark of broad-leaved trees, particularly *Fraxinus* but also *Acer*, *Corylus*, *Fagus* and *Ulmus*, in wayside and woodland sites; local and possibly increasing (though threatened by decline of *Fraxinus*, currently its principal phorophyte). Throughout Britain, scattered in Ireland.

Characterized by the small, immersed, often slightly raised apothecia with a fully exposed disc, thin true exciple that is often surrounded by a thin whitish pseudothalline margin, and curved, fusiform ascospores. *O. rufescens* resembles the rare *Schismatomma ricasolii*, but the true exciple of the former species is always clearly visible in sections and the ascospores are shorter.

LC



## PSORONACTIS Ertz & Tehler (2014)

The genus is monotypic, so the description of *P. dilleniana* below constitutes that of the genus. Ertz *et al.* (2014) observed that the species occupies a distinct lineage within the Roccellaceae; it can be distinguished chemically from *Lecanactis* by the production of psoromic and 2'-O-demethylpsoromic acids in the thallus. It was placed in *Lecanographa* (Lecanographaceae) by Obermayer (2013) based

on the generic concepts of Egea & Torrente (1994), but no further information was provided, and the molecular data of Ertz *et al.* appear conclusive.

#### Literature

Egea & Torrente (1994), Ertz *et al.* (2014), Obermayer (2013), Wolseley *et al.* (2009b).

#### **Psoronactis dilleniana** (Ach.) Ertz & Tehler (2014)

*Lecanactis dilleniana* (Ach.) Körb. (1855)

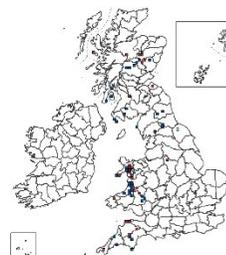
*Lecanographa dilleniana* (Ach.) Hafellner & Obermayer (2013)

Thallus pale white-grey, tinged mauve or orange-pink (pale greyish in dried collections), thin, effuse, ± tomentose-scurfy, areolate to verrucose, non-sorediate. Apothecia (0.3–) 0.5–1.5 (–2) mm diam., rounded, a few becoming angular or elongate, mostly emergent or sessile; disc ± exposed at maturity, grey-pruinose or rarely glabrous; true exciple usually not pruinose, persistent. Ascospores 18–32 (–40) × 4–5 µm, fusiform, straight or slightly curved, 3(–5)-septate. Pycnidia to 0.1 mm diam., rare, semi-immersed, blackish; conidia 5–8 × 1–1.5 µm, bacilliform. Thallus and apothecial pruina, C–, K–, KC–, Pd+ yellow-orange; medulla UV± yellow-grey, rarely glaucous (psoromic, 2'-O-demethylpsoromic and ± schizopeltic acids). **BLS 0596.**

In dry shaded siliceous rock crevices and under overhangs; rather rare. W. & N. Britain.

Distinguished from *Lecanographa abscondita* and *Paralecanographa grumulosa* by the Pd+ yellow-orange thallus, and longer ascospores.

**Nb**



### **ROCCELLA DC. (1805)**

**Thallus** shrubby, tufted, strap-shaped or of ± rounded branches attached by a basal sheath. Cortex of perpendicular hyphae, arising from outermost part of the medulla and not always forming a distinct layer; in addition, irregular patches of hyphae orientated partly parallel to the surface may occur. **Photobiont** *Trentepohlia*. Medulla of densely interwoven hyphae. **Ascomata** apothecia, rounded or elongate. **Thalline margin** present or absent. **Hypothecium** dark brown to black, dense. **Hamathecium** of branched, sparsely anastomosing paraphysoids *ca* 2 µm diam. **Asci** 8-spored, thick-walled, fissitunicate, with an internal beak and a small K/I+ blue ring in the thickened apex. **Ascospores** usually 3-septate, cylindrical-fusiform, colourless or pale brown. **Conidiomata** pycnidia. **Conidia** cylindrical, curved. **Chemistry**: various para-depsides and tridepsides, fatty acids, chromones. **Ecology**: coastal.

The only genus of *Roccellaceae* in Great Britain and Ireland with fruticose thalli. The two British species can be distinguished from *Ramalina* species by the pale mauve-grey (not green-grey) thallus, the large bluish white soralia and the C+ red reaction of the cortex or soralia. The S. European and Mediterranean *Roccella tinctoria* DC. (1805) was formerly used as a source of the purple dye, orchil and the tropical *R. montagnei* Bél. (1846) for litmus. The genus is unexpectedly absent from Ireland.

#### Literature

Benfield & Purvis (2009), Tehler *et al.* (2004, 2009, 2010), Tehler & Irestedt (2007),

- Thallus to 20 cm long, branches flattened, ± pendent; cortex C–, soralia C+ red; medulla whitish at the point of attachment ..... *fuciformis*  
Thallus to 5 cm long, branches ± rounded, tufted: cortex C+ red, soralia C–; medulla yellow at the point of attachment ..... *phycopsis*

**Rocella fuciformis** (L.) DC. (1805)

Thallus to 20 cm long, pale mauve-grey, flattened, strap-shaped, pendent, irregularly branched, to 1.5 cm broad; medulla not yellow within the basal sheath; soralia grey-white, tubercle-like or in dense confluent masses. Apothecia very rare, marginal or laminal, single or forming regular or gnarled clusters; disc to 1 mm diam., black, often white-pruinose, flat to convex, with both a thalline margin and true exciple; paraphysoids  $\pm$  anastomosing. Ascospores (18–) 22–30  $\times$  4–6  $\mu\text{m}$ , elongate-fusiform. Conidia 10–15  $\times$  ca 1  $\mu\text{m}$ ,  $\pm$  curved. Cortex and medulla C–; soralia C+ red, soralia and medulla UV+ blue-white (erythrin, roccellic and lepralic acids). **BLS 1301.**

On dry, vertical or overhanging E- or N-facing rocks, in sunny, frost-free coastal sites, rarely on the dry sheltered sides of old trees and walls, near the coast; local. S.W. England, S. Wales (Pembrokeshire), Isles of Scilly, Channel Islands.

Often occurring with *R. phycopsis* but much rarer, attaining a larger size with ribbon-like mauve-grey branches. Only the soralia are C+ red.



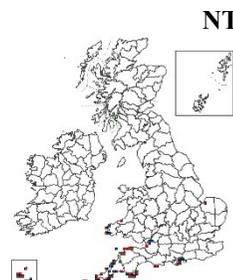
NT

**Rocella phycopsis** Ach. (1810)

Thallus to 5 cm, usually erect and tufted, branches pale blue-grey or buff, rounded, sometimes angular or slightly flattened, irregularly branched; medulla yellow within the basal sheath; soralia abundant, at first tubercle-like, later  $\pm$  globose-efflorescent. Apothecia very rare, prominent, rounded to oblong, often deformed, without a thalline margin, disc black; paraphysoids unbranched below, branched above. Ascospores (14–) 18–21 (–23)  $\times$  4–6  $\mu\text{m}$ , becoming pale brown when old, straight or slightly curved. Conidia 12–17  $\times$  ca 1  $\mu\text{m}$ , curved. Cortex C+ red; soralia C–; medulla UV+ blue-white (erythrin, roccellic and  $\pm$  lecanoric acids). **BLS 1302.**

On dry, vertical or overhanging rock faces with an E- or N-facing aspect, on churches, memorials, walls and the dry sides of old sheltered trees, near the coast; local. S. & S. W. England (W. Sussex to Cornwall), Channel Islands, Isles of Scilly, S. Wales (Pembrokeshire, Cardiganshire). Unexpectedly discovered recently on a church wall in Norfolk.

The purple-grey cortex (C+ red) and yellow medulla exposed within the basal sheath are diagnostic.



NT

**SCHISMATOMMA** Flot. & Körb. ex A. Massal. (1852)

**Thallus** crustose, mainly superficial; prothallus when present, usually dark brown or black; without or with soralia which obscure the thallus in some species. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, immersed or sessile, rounded or somewhat irregular in shape. **Thalline margin** present. **True exciple** poorly developed. **Epithecium** pale to dark brown. **Hymenium** I+ blue. **Hypothecium** dark olivaceous to black, inconspicuous in some species. **Hamathecium** of branched and anastomosing paraphysoids. **Asci** 8-spored, clavate, with two functional wall layers, thickened at the apex, with an internal K/I+ blue ring, discharge fissitunicate. **Ascospores** fusiform to curved, multiseptate, cells sometimes unequal in size, colourless, sometimes brownish when old, thin-walled, smooth, sometimes coiled in the ascus. **Conidiomata** pycnidia, immersed. **Conidiogenous cells**  $\pm$  elongate ampulliform, lining the pycnidial cavity, proliferating percurrently. **Conidia** bacilliform, straight or slightly curved to kidney-shaped, aseptate, colourless. **Chemistry:**  $\pm$  orcinol para-depsides (e.g. lecanoric acid, erythrin),  $\beta$ -orcinol depsides (e.g. fumarprotocetraric acid, psoromic acid), chromones (e.g. lepralic acid), fatty acids, and unidentified substances; very variable. **Ecology:** on dry bark and rocks.

The genus is close morphologically to both *Enterographa* and *Lecanactis*, differing from both in

the presence of a thalline margin and a poorly developed true exciple. All species have *Trentepohlia* as the photobiont, demonstrated in the field or when fresh by scratching the thallus when the orange pigment of the photobiont becomes apparent. When thalli have been kept in dried collections for a short time they become paler or brighter white than on collection; this is due to the rapid loss of orange pigmentation of the photobiont.

The circumscription of the genus has changed substantially in recent years, with several species being excluded. *S. cretaceum* is now included in the genus *Sporodophoron* (Arthoniaceae), according to Frisch *et al.* (2015). *S. decolorans* was transferred to *Dendrographa* (Roccellaceae) by Ertz & Tehler (2011). *S. niveum* is now placed in the monotypic genus *Snippocia* (Arthoniaceae) by Ertz *et al.* (2018). *Schismatomma quercicola* is now known to belong to the genus *Schizotrema* in the Graphidaceae (Ostropales); see Ertz *et al.* (2019).

### Literature

Ertz *et al.* (2014, 2018, 2019), Ertz & Tehler (2011), Frisch *et al.* (2015), Wolseley & Hawksworth (2009).

- |      |   |                                |
|------|---|--------------------------------|
| 1    | Thallus lacking soredia; apothecia present .....  | <i>ricasolii</i>               |
|      | Thallus sorediate, often abundantly so; apothecia rare .....  | 2                              |
| 2(1) | Thallus and soredia Pd+ orange or yellow orange .....   | 3                              |
|      | Thallus and soredia Pd- .....   | 4                              |
| 3(2) | Thallus pale brownish grey to greyish white; soralia discrete, punctiform initially ± excavate, not or rarely confluent, pinkish grey; Pd+ orange .....         | <i>Schizotrema quercicola</i>  |
|      | Thallus pale pink or creamy white to glaucous grey; soralia initially ± raised, generally soon becoming confluent, pale pink or creamy; Pd+ yellow orange ..... | <i>Snippocia nivea</i>         |
| 4(2) | Thallus chalk-white; K+ yellow .....  | <i>Sporodophoron cretaceum</i> |
|      | Thallus grey or brown; K- .....   | 5                              |
| 5(4) | Thallus thick, soft, brown or ochre-brown; UV+ glaucous; on shaded rock .....   | <i>umbrinum</i>                |
|      | Thallus thin, pale mauve-grey; ± discrete; UV-; on trees .....  | <i>Dendrographa decolorans</i> |

### *Schismatomma ricasolii* (A. Massal.) Egea & Torrente (1989)

*Schismatomma graphidioides* (Leight.) Zahlbr. (1919)

Thallus white to pale grey, often cracked, with calcium oxalate crystals; prothallus black when present; soralia absent. Apothecia very irregular in shape, simple or branched, ± elongate, 0.3–1.5 (–2) × 0.08–0.2 mm, immersed or slightly raised; thalline margin ± white; epithecium reddish brown; hymenium 55–80 µm tall, I+ blue; hypothecium 40–115 µm tall, base root-like, dark red-brown, K+ olivaceous green to black; paraphysoids sparsely branched, pale brown above. Ascospores 24–36 (–40) × (2.5–) 3–3.5 µm, 3-septate, narrowly fusiform to arcuate or sigmoid, coiled together in the ascus. Pycnidia 60–100 µm diam., immersed, black; conidia 4–5 × 1.3–1.5 µm, aseptate, bacilliform, curved or straight. Thallus C–, K–, KC–, Pd–, I–, UV– (no lichen products detected by TLC). **BLS 1316.**

On trunks of deciduous trees (including *Carpinus*, *Fagus*, *Fraxinus*, *Quercus*, *Populus*) in parklands or well-lit woodland with less acid bark; rare but appears to be spreading; S. England (Devon to S. Hampshire), Lake District, previously recorded from Shropshire; W. Wales, Scotland, frequent in N.E. Highlands, rare in S. Scotland; Ireland, rare, no recent records

*Pseudoschismatomma rufescens* is similar but the true exciple is always clearly visible in sections and the ascospores are shorter.

### VU (B, D1) IR



**Schismatomma umbrinum** (Coppins & P. James) P.M. Jørg. & Tønsberg (1988)

Nb IR

Thallus glaucous green or yellowish- to pale brown, forming discrete delimited rosettes or in a mosaic with other lichens, mostly continuous, soon becoming sorediate in the central part; prothallus very distinct, brownish to purple-black, delimiting a wide (0.5–3 mm) marginal border; upper surface smooth towards the margin, distinctly tuberculate, often coarsely rimose, tuberculae usually bursting apically to form soralia; soralia concolorous with esorediate parts of the thallus, irregular, becoming confluent. Apothecia rare in British material. Apothecia sessile, lecanorine, round to irregular or lobate, to 1.5 mm diam., with a ± prominent thalline margin concolorous with the thallus; disc blackish-brown, convex at maturity; paraphysoids straight, branched only in the upper part. Ascospores 18–22 × 3–5 µm, fusiform, slightly curved. Pycnidia, observed only in a corticolous specimen in Norway; conidia filiform, curved, (10–) 15–20 (–30) × ca 1 µm. Thallus C–, K–, KC–, Pd–, medulla and abraded soralia UV+ ice-blue (schizopeltic acid, 2-3 unidentified UV+ substances). **BLS 0607**.



On sheltered siliceous rocks, particularly on vertical faces and undersides of overhangs in old moist sheltered woodlands, rarely on bark (*Quercus*, *Sorbus*) on dry undersides of overhanging trunks; very local. W. & N. Britain, very rare in S. Ireland.

**SYNCESIA** Taylor (1836)

**Thallus** crustose, mainly superficial. **Prothallus**, when present, usually brown; ecorticate or with a poorly developed cortex of interwoven hyphae. **Photobiont** *Trentepohlia*. **Soralia** sometimes present, farinose, pale grey, with packed, highly refractive crystals. **Ascomata** apothecia, circular to elongate, embedded in a rounded or somewhat irregular, elevated stroma, often constricted at the base, 0.1–0.5 mm diam, containing 5–15 discs; discs exposed, pruinose, numerous, often ± irregular in outline. **Thalline margin** present. **True exciple** poorly developed, brown. **Epithecium** pale to dark brown or rarely colourless. **Hypothecium** usually dark brown and extending down to the substrate. **Hymenium** of sparsely branched hyaline septate paraphysoids in a clear hyaline gel, I+ blue. **Asci** 8-spored, clavate, with two functional wall layers, thickened at the apex, with an internal KI ± blue ring, discharge fissitunicate. **Ascospores** fusiform, usually with one end tapering more than the other, curved, sometimes straight, 3-septate, colourless. **Conidiomata** pycnidia, solitary, elevated or immersed, brown to black, rarely with a thalline margin, 50–200 µm diam. **Conidia** filiform, straight to curved, aseptate, colourless. **Chemistry**: orcinol and β-orcinol depsides, fatty acids and dibenzofurans. **Ecology**: on bark and occasionally rocks.

Formerly included in *Chiodecton* due to the stromatoid ascomata, but differing in the pruinose or tomentose stroma with innate, discoid ascomata. Most species contain protocetraric acid. There is only one species recorded from Great Britain and Ireland.

The sorediate morph of the type species *S. myrticola* has recently been discovered masquerading as a species of *Enterographa* (Ertz *et al.* 2018). The two morphs have different BLS numbers and can continue to be recorded separately.

**Literature**

Ertz *et al.* (2018), Sanderson *et al.* (2009), Tehler (1997), Wolseley (2009).

### *Syncesia myrticola* (Fée) Tehler (1997)

*Enterographa sorediata* Coppins & P. James (1979)

**Sorediate morph:** thallus thin, continuous, even, scurfy, ± coarsely rimose, grey or pale brown; soralia farinose, white-grey, concolorous with or paler than the thallus, rounded and discrete, to 0.5 mm diam., sometimes in lines along margins of cracks bordering the areoles, or, in better lit situations, becoming ± confluent forming larger erose sorediate patches, with packed, highly refractive crystals. Expanding thalli have zoned brown fimbriate margins. Pycnidia and apothecia initials occur very rarely. Medulla and soralia C<sup>-</sup>, K<sup>-</sup>, KC<sup>-</sup>, Pd<sup>+</sup> rust-red, UV<sup>+</sup> cream-coloured (protocetraric acid and roccellic acids).

**Apothecial morph:** thallus wide-spreading, smooth, warted or ± dispersed in coarse irregular patches, continuous or ± rimose, chalk- or grey-white to grey, water repellent. Ascomata wart-like, starkly white-pruinose with discs often ± obscured by dense white pruina; thalline margin level with the disc; hypothecium dark brown and carbonaceous extending into the substrate, K<sup>+</sup> olive-black; hymenium 80 µm tall; paraphysoids inseparable; epithecium 30–40 µm thick; hyphae richly branched, interwoven, hyaline, calcium oxalate crystals disappearing in K. Asci ca 70 × 16 µm. Ascospores fusiform, 35–44 × 4–5 µm. Thallus C<sup>-</sup>, K<sup>-</sup>, Pd<sup>+</sup> orange-red, UV<sup>+</sup> cream-coloured (protocetraric and roccellic acids).

The sorediate morph (**BLS 0352**) is found on the dry side of trunks of *Quercus*, rarely *Alnus*, *Fraxinus*, *Fagus*, not directly wetted by rain in old growth woodland; widespread but scarce in S., SW. & E. England (Devon to Sussex; East Anglia), rare in Wales and Ireland.

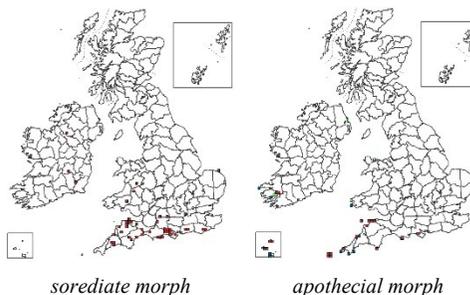
The apothecial morph (**BLS 0507**) is found in coastal habitats on dry bark, rocks and mosses, often below sheltered overhangs, also *Armeria* tufts and plant debris in sheltered situations, coastal *Quercus* and *Ilex* and *Fraxinus* inland in S.W. Ireland; rare. Wales (Pembrokeshire, Anglesey), S.W. England, Channel Islands, Isles of Scilly, S.W. Ireland. It is distinguished by the very uneven, often conspicuously white-nodulose thallus with ± raised, concolorous or paler pruinose ± rounded and notably convex stroma with a closely packed mosaic of irregular, innate discs.

The Pd<sup>+</sup> rust-red reaction distinguishes the sorediate morph from *Dendrographa decolorans* (Pd<sup>-</sup>), and *Snippocia nivea* (Pd<sup>+</sup> yellow-orange); *Schizotrema quercicola* is also Pd<sup>+</sup> red but contains fumarprotocetraric acid (TLC) and has more pink, rounded soralia. Most similar to *D. decolorans*, which normally dominates where both species are present, and *Syncesia myrticola* can then be difficult to identify in mixed mosaics; with practice the slightly waxier thallus and paler soralia can help pick out candidates for confirmation with Pd. The Pd reaction is often patchy to absent or weak and is yellow rather than rust red on the edges of reactive patches, (weak Pd reactions are more visible in UV light), in the case of expanding thalli the zoned brown fimbriate margin is highly diagnostic within the dry bark habitat.

The sorediate morph was originally described as rarely producing ascomata, with much smaller ascospores than those recorded for *S. myrticola*; but these are now thought to have been relic *Enterographa crassa* apothecia from thalli that *S. myrticola* was growing over or through (Ertz *et al.* 2018). Mixed specimens with either the sorediate morph of *S. myrticola* or *Dendrographa decolorans* and *Enterographa crassa* occur widely. In these the soralia of either invading species first develop along the areole margins, while the *E. crassa* apothecia are still visible.

The thallus is rarely partly blackened by the lichenicolous *Milospium graphideorum* D. Hawksw. (1975).

NT IR



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