

# Revisions of British and Irish Lichens



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**Arthoniales: Opegraphaceae**

Cover image: *Opegrapha vulgata*, on bark of *Fraxinus excelsior*, Ashton Court, Somerset.

*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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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. 13

## **Arthoniales: Opegraphaceae**

including the genera *Llimonaea*, *Opegrapha*, *Paralecanographa* and *Sparria*

*by*

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## OPEGRAPHACEAE Stizenb. (1862)

**Thallus** crustose (rarely dimorphic or subfruticose in non-GBI genera), thin to thick, smooth or ± rimose, sometimes partially or entirely immersed, absent in lichenicolous species; prothallus sometimes present. **Soralia** occasionally present. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, rounded to lirellate, sometimes branched or stellate, usually ± sessile, sometimes pruinose, when lirellate opening with a narrow slit, rarely immersed. **Thalline exciple** usually absent, but a thin thalline collar occasionally develops around the apothecia. **True exciple** colourless or black, continuous or not under the hypothecium. **Hymenium** I+ reddish brown or I+ blue. **Hypothecium** colourless to pale straw. **Hamathecium** of paraphysoids, septate, branched, often richly anastomosed, apices not or rarely slightly swollen. **Asci** usually 8-spored, clavate-cylindrical, usually with a minute K/I+ blue apical ring, dehiscence fissitunicate. **Ascospores** transversely multiseptate, rarely submuriform, fusiform or acicular, I–, colourless or brown, when colourless sometimes becoming ornamented and red-brown when senescent, usually with a distinct gelatinous perispore. **Conidiomata** pycnidia, immersed to sessile, flask-shaped, usually black, rarely white-pruinose. **Conidiogenous cells** mainly elongate-ampulliform, arising singly, proliferating percurrently. **Conidia** variable in size and shape; aseptate, colourless.

The Opegraphaceae contains fifteen genera according to the arrangement by Lücking *et al.* (2016) – along with the lichenicolous genus *Paralecanographa*. Of these, *Cresponea* is removed to the Roccellaceae, in accordance with phylogenetic evidence in Ertz *et al.* (2014). Five of these occur in Great Britain and Ireland. The family is dominated by the large genus *Opegrapha*; its circumscription has been tightened in recent years but is certainly still polyphyletic. There do not, alas, appear to be simple morphological characters that are diagnostic at family level, and the overall key to genera in Smith *et al.* (2009) must be consulted pending its revision.

### Literature

Ertz *et al.* (2009, 2014), Ertz & Tehler (2011), Frisch *et al.* (2014), Grube (1998), Lücking *et al.* (2016), Torrente & Egea (1989), Wiczorek (2018).

- |      |  |
|------|--|
| 1    | Thallus C+ red; lichenicolous on <i>Dirina</i> or <i>Roccella</i> , or directly on rock.....2<br>Thallus C– (but see also the sterile <i>O. fumosa</i> with C+ red soralia), or lichenicolous on other<br>hosts; corticolous or saxicolous..... <i>Opegrapha</i>   |
| 2(1) | Thallus sorediate, often pinkish when fresh; not a lichen parasite .....3<br>Thallus not sorediate, pale grey or absent; initially parasitic on <i>Dirina</i> and <i>Roccella</i> but<br>sometimes developing an independent thallus ..... <i>Paralecanographa</i> |
| 3(2) | Thallus tartareous, irregularly cracked, very uneven; soredia large (50–100 µm diam.)..... <i>Sparria</i><br>Thallus thin, areolate at the edge, rimose-polygonal in the centre; soredia small,<br>25–35 µm diam. .... <i>Llimonaea</i>                            |

## LLIMONAEA Egea & Torrente (1991)

**Thallus** crustose, cortex of mixed and intertwined hyaline hyphae. **Prothallus** distinct, black, delimiting. **Soralia** sometimes present. **Photobiont** *Trentepohlia*. **Ascomata** apothecia, rounded or lirelliform. **Thalline margin** present. **True exciple** black, carbonaceous, hyphae distinct. **Hamathecium** of branched and anastomosing paraphysoids. **Ascus** 8-spored, fissitunicate, wall K/I+ blue, weakly blue ring structures around the ocular chamber. **Ascospores** with thickened transverse

septa, to 14-septate, turning brown when old, sometimes constricted at the first septum. **Conidiomata** sometimes present. **Conidia** long, curved. **Chemistry**: orcinol and  $\beta$ -orcinol depsides, erythrin, and isoerythrin. **Ecology**: saxicolous, corticolous. **Distribution**: four species, W. Europe, N. America, N. Africa.

The species resemble *Lecanactis* externally and share the black true exciple but also have a thalline margin. Sequences confirm their inclusion within the Opegraphaceae, as advocated by Ertz & Tehler (2011) and Lücking *et al.* (2016).

#### Literature

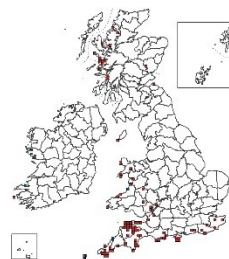
Ertz & Tehler (2011), Fletcher (2009). Sparrius (2004), Torrente & Egea (1991), van den Boom & Brand (2007).

#### *Llimonaea sorediata* van den Boom, Brand & Elix (2007)

Thallus on siliceous rock, crustose, to 3.5 cm diam., usually delimited by a conspicuous dark brown to blackish prothallus, corticate but the cortex poorly developed with intertwined colourless hyphae, containing crystals (erythrin), areolate at the edge, rimose-polygonal in the centre; rimose-areoles angular, 0.1–0.5 mm diam., or elongate, sometimes somewhat radiating, thin, to 0.25 (–0.3) mm thick, smooth to slightly uneven, pale cream-white, white-pink when fresh; soralia white, punctiform, becoming confluent, forming a granular covering in the thallus centre, granules 25–35  $\mu$ m diam. Apothecia very rare (not seen in British material), immersed to semi-immersed, rounded-ellipsoidal, 0.8–1.2  $\times$  0.4–0.7 mm diam.; disc flat, dark brown to black, white-pruinose; thalline margin concolorous with the thallus, thin, often flexuose and deformed, soon excluded, containing crystals; true exciple to 80  $\mu$ m thick, continuous with the hypothecium, dark brown to black, hyphal walls strongly gelatinized, the inner part pigmented brown-olive; epithecium brown to olive, K+ green intensifying, containing colourless crystals; hymenium colourless, 110–140  $\mu$ m high; hypothecium dark brown, to 25  $\mu$ m thick, continuous with the exciple; paraphysoids richly branched and anastomosing, 1.5–2.0  $\mu$ m diam., apical cells not widened or pigmented. Ascospores elongate-fusiform, rarely slightly curved, 35–50  $\times$  4.5–5.5 (–6)  $\mu$ m, 8- to 14-septate, with a gelatinous sheath *ca* 2  $\mu$ m thick, becoming brown with age. Pycnidia unknown. Thallus C+ red, K–, KC–, Pd– (erythrin, isoerythrin, traces of lecanoric and placodiolic acids and atranorin). **BLS 2466**.

On vertical or overhanging siliceous rocks on sea coasts, and N. walls of churches, associated with other commonly sterile crusts such as *Dirina* and *Roccellographa* spp.; also occasionally on bark of veteran *Quercus*. Possibly mistaken for the soreciate morph of *Dirina massiliensis* in the past. N.W. Scotland, S. England, Ireland (Connemara), Wales (widespread), Channel Islands, Isles of Scilly.

Nb



### OPEGRAPHA Ach. (1809)

**Thallus** crustose, thin to thick, smooth or  $\pm$  rimose, sometimes partially or entirely immersed, white, grey, mauve-grey, grey-brown, dark brown or olive-green when present; prothallus sometimes present and mosaic-forming. **Soralia** occasionally present,  $\pm$  discrete, rarely confluent. **Photobiont** *Trentepohlia*; some taxa lichenicolous on lichens with other photobionts. **Ascomata** lirellate apothecia, elongate, but rounded in many lichenicolous forms, sometimes branched or stellate, discrete or confluent, sometimes densely clustered and contiguous,  $\pm$  sessile, rarely immersed. **Thalline margin** usually absent, but a thin false one occasionally developed. **True exciple** black, continuous or not under the hypothecium, opaque, sometimes  $\pm$  swollen, the disc usually remaining slit-like, K $\pm$  red-brown or K $\pm$  olive-green in section, occasionally white-pruinose. **Epithecium** colourless in those species with a slit-like disc, greenish or brown where exposed. **Hymenium** I+

reddish brown or I+ blue. **Hypothecium** colourless to pale straw, K± olive-green. **Hamathecium** of paraphysoids, septate, branched, often richly anastomosed, apices not or rarely slightly swollen. **Asci** usually 8-spored, clavate-cylindrical, usually with a minute K/I+ blue apical ring; dehiscence fissitunicate. Several types of ascus structure that may be of taxonomic significance have been described by Torrente and Egea (1989) but require further study and assessment. **Ascospores** multiseptate, fusiform or acicular, I–, usually with a thin gelatinous sheath, colourless or becoming ornamented and red-brown when senescent. **Conidiomata** pycnidia, immersed to sessile, flask-shaped, black, rarely white-pruinose. **Conidiogenous cells** mainly elongate-ampulliform, arising singly, acrogenous. **Conidia** variable in size and shape; aseptate, ellipsoidal, rod- or sickle-shaped, colourless. **Chemistry**: lichen products usually absent. **Ecology**: on a wide range of young and mature broad-leaved trees, more rarely conifers and wood; also on sheltered, siliceous or basic rocks, rarely on soil and dead herbs, or lichenicolous. **Distribution**: ca 300 species, cosmopolitan. Most taxa are corticolous growing in deeply shaded forests, mainly in warm temperate and tropical regions. The distribution of the lichenicolous taxa is largely unknown.

Sometimes confused with *Graphis*, which differs in having a hamathecium of unbranched paraphyses, I+ purple ascospores with lens-like cells and non-fissitunicate asci. Some *Arthonia* and *Melaspilea* species appear similar superficially but differ in their ascomata and spores. *Enterographa* is also similar but the apothecia are much narrower and grouped into clumps on thalline areoles. *Schismatomma* when fertile may be distinguished by the persistent thalline margin. The delimitation of *Opegrapha* from *Lecanactis*, *Lecanographa* and *Schismatomma* is currently imprecise and these genera should also be consulted in cases of difficulty. *Wadeana* has aseptate spores in multisporous, non-fissitunicate asci. The common non-lichenized genus *Hysterium*, on old bark, is sometimes mistaken for *Opegrapha*, but differs in the early browning of the ascospore walls before release from the asci and the prominent exciple.

The size and shape of the conidia in *Opegrapha* are a particularly important diagnostic feature of many species. In section, the inner edge of the true exciple, and sometimes the epithecium and hymenium, are tinged green-olive or red-brown, both colours ± intensified in K, according to the species. In those species with red-brown pigmentation, the ascospores in degenerating asci may become red-brown with age due to the uneven (often granular) deposition of a pigment on their outer wall. The number of septa of the spores is frequently diagnostic.

In the light of molecular phylogenetic evidence, the circumscription of *Opegrapha* in the sense of Pentecost & James (2009) has proved to be too broad, with a range of species transferred out of the genus, many to other families of the Arthoniales. These include: *O. atra* and *O. calcarea*, to *Arthonia* (Arthoniaceae); *Alyxoria* (Lecanographaceae) for *O. herbarum* (= *Alyxoria culmigena*), *O. mougeotii*, *O. subelevata*, *O. varia*, *O. viridipruinosa* and *O. xerica*; and *Zwackhia* (also Lecanographaceae) for *O. prosodea*, *O. sorediifera* and *O. viridis*. *O. gyrocarpa* and *O. saxigena* have been moved to a new genus *Gyrographa* (Roccellaceae); *O. zonata* returned to *Enterographa*; and *O. rufescens* to *Pseudoschismatomma* (also Roccellaceae). Two infertile species have even been transferred out of the Arthoniales altogether, *O. corticola* to the Gyalectaceae as *Thelopsis corticola*, and *O. multipuncta*, to the Porinaceae as *Porina multipuncta*.

Of the lichenicolous species, *Phacographa* (Lecanographaceae) contains the former *Opegrapha* species *O. glaucomaria* and *O. zwackhii*, and *Phacothecium* (uncertain position within Arthoniales) the species previously referred to as *O. physciaria*. Further movements are likely as more species are sequenced.

The number of parasitic species is rising, now that most are accepted as host-specific. All lichenicolous species described to date and present in the study area were listed by Vondrák & Kocourková (2008), with a useful host-parasite table, Diederich *et al.* (2018) provides a more comprehensive list, and Coppins *et al.* (2020) adds a further four species. There is a historical record of *Opegrapha lamyi* (O.J. Rich. ex Nyl.) Triebel (1989) from Scotland (Angus) and the species was included in the checklist of Hawksworth (2003), but further study indicates that it is a misidentification for *Phacographa glaucomaria* (Lecanographaceae). Apparently undescribed

species of *Opegrapha* s. lat. are known from *Leproplaca cirrochroa* (Lismore, Argyll), *Pertusaria pertusa* (Kent) and *Xanthoparmelia conspersa* (Jersey).

### Literature

Coppins *et al.* (2021), Diederich *et al.* (2018), Ertz (2009), Ertz & Tehler (2011), Ertz *et al.* (2004, 2009, 2019), Frisch *et al.* (2014), Hafellner (2009), Pentecost & James (2009), Torrente & Egea (1989), Vondrák & Kocourková (2008).

The key below includes all species accepted in the genus by Pentecost & James (2009), and those recognized subsequently.

- |        |   |  |
|--------|---|--|
| 1      | Photobiont present; not on other lichens (not lichenicolous) .....  | 2  |
|        | Photobiont absent; on other lichens (lichenicolous) .....   | 40   |
| 2(1)   | Thallus without soredia; apothecia present .....  | 3  |
|        | Thallus sorediate or with numerous pycnidia; soralia punctiform to effuse; apothecia rare or absent .....   | 31   |
| 3(2)   | Ascospores 3-septate .....  | 4  |
|        | Ascospores 4- to 15-septate .....   | 17   |
| 4(3)   | On bark, wood or plant remains .....  | 5  |
|        | On rock, soil, mortar or brick .....  | 9  |
| 5(4)   | Ascospores 4–8 µm diam.; ascomata often with yellow-green pruina; exciple red-brown, K– .....   | [Lecanographaceae] <i>Alyxoria culmigena</i>       |
|        | Ascospores 2.5–5 µm diam.; ascomata never with yellow-green pruina; exciple brown to magenta-red, K+ olive-green .....                            | 6  |
| 6(5)   | Apothecia immersed to semi-immersed; exciple thin, sometimes with a pale pseudothalline margin; ascospores (15–) 17–27 µm long, ± curved .....    | [Roccellaceae] <i>Pseudoschismatomma rufescens</i> |
|        | Apothecia sessile or emergent; exciple well-developed; pseudothalline margin absent; ascospores 13–18 (–22) µm long, ellipsoidal to clavate ..... | 7  |
| 7(6)   | Thallus dark brown; apothecia rounded or ± square or pentagonal, sometimes shortly elongate .....   | <i>trochodes</i>                                   |
|        | (cf. also rare, corticolous morphs of <i>Gyroglyphia saxigena</i> )   |  |
|        | Thallus pale or inconspicuous; apothecia narrowly lirelliform .....   | 8  |
| 8(7)   | Disc partially open; exciple brownish in section, K+ diffusing magenta; conidia 10–20 µm long .....   | [Lecanographaceae] <i>Alyxoria ochrocheila</i>     |
|        | Disc a persistent slit; exciple greenish in section, K+ olive-green; conidia 4–5 µm long .....  | [Arthoniaceae] <i>Arthonia atra</i>                |
| 9(4)   | Ascospores 18–25 (–30) µm long .....  | 10   |
|        | Ascospores 14–18 (–22) µm long .....  | 13   |
| 10(9)  | Apothecial disc widely exposed, grey- or white-pruinose; exciple smooth, not pruinose .....   | 11   |
|        | Apothecial disc ±exposed or a slit, not pruinose or yellow-green-pruinose; exciple smooth or uneven, not pruinose .....                           | 12   |
| 11(10) | Thallus and apothecial pruina Pd+ yellow; ascomata rounded .....  | [Roccellaceae] <i>Psoronactis dilleniana</i>       |
|        | Thallus and apothecial pruina Pd–; ascomata lirelliform .....   | [Lecanographaceae] <i>Alyxoria subelevata</i>      |

- 12(10) Apothecial disc a slit or only narrowly exposed; apothecia often short, gnarled-gyrose, not pruinose.....*dolomitica*  
 Apothecial disc  $\pm$  widely exposed; apothecia  $\pm$  elongate; often yellow-green pruinose  
 .....[Lecanographaceae] *Alyxoria culmigena*
- 13(9) Thallus conspicuous, dark brown to chocolate-coloured, thin and even, often mosaic-forming  
 ..... [Roccellaceae] *Gyrographa saxigena*  
 Thallus pale or  $\pm$  inconspicuous, not mosaic-forming, even or irregular ..... 14
- 14(13) Apothecia white-pruinose ..... 15  
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- 16(14) Exciple K<sup>+</sup> diffusing magenta-purple in section; margin  $\pm$  orange-pruinose; disc  
 $\pm$  widely exposed ..... [Lecanographaceae] *Alyxoria ochrocheila*  
 Exciple K<sup>-</sup> or olive-green in section; margin not pruinose; disc a slit or occasionally  
 slightly exposed ..... [Arthoniaceae] *Arthonia calcarea*
- 17(3) Apothecial disc expanded, white-pruinose; ascospores 3–4.5  $\mu$ m diam.  
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- 23(20) Exciple K<sup>+</sup> brown in section; ascospores (5–) 6–9  $\mu$ m in width ..... [Lecanographaceae] *Alyxoria varia*  
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- 24(23) Ascospores (3–) 4–5.5  $\mu$ m in width; pycnidia small, *ca* 0.1 mm diam.  
 ..... [Lecanographaceae] *Alyxoria xerica*  
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- 25(19) Ascospores 5–9  $\mu$ m diam. .... 26  
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 of apothecia acute ..... [Lecanographaceae] *Alyxoria mougeotii*  
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Soralia pale greenish inside, dark orange-ochre at the surface, 0.2–0.8 (–1) mm diam., remaining discrete, soredia coarse ((25–) 30–50 (–70) µm diam.); on trees ... [Gyalectaceae] *Francisrosea bicolor*

- Soralia bright orange, minute, punctiform, 0.1–0.3 mm diam., often becoming irregular and confluent; on trees and shaded damp rock ..... [Porinaceae, Ostropales] *Porina multipuncta*  
 Soralia dark brown or lilac-white, pale when abraded; thallus dark chocolate brown, often with a mauve tinge, K /UV+ mauve (with confluent acid); on rocks ..... [Roccellaceae] *Enterographa zonata*
- 40(1) On Arthoniaceae (*Arthonia*, *Coniocarpon*) ..... 41  
 On Graphidaceae (*Crutarndina*, *Thelotrema*) ..... 42  
 On Hymeneliaceae (*Ionaspis*); ascospores (17.5–) 20–24 × 5–7 µm ..... *reactiva*  
 On Lecanoraceae (*Lecanora*) ..... [Lecanographaceae] *Phacographa glaucomaria*  
 On Megasporaceae (*Circinaria*); ascospores 16–22 × 6–8 µm, 3-septate ..... *parasitica*  
 On Ochrolechiaceae (*Lepra*); ascospores 17–26 × 6.5–9 µm, 3-septate ..... *anomea*  
 On Pertusariaceae (*Pertusaria*); ascospores 21–28 × 4.5–6 µm, (5-) 6-septate ..... *pertusariicola*  
 On Phlyctidaceae (*Phlyctis*) ..... [Lecanographaceae] *Phacographa zwackhii*  
 On Physciaceae (*Physconia*); ascospores 18–22 × 5–6 µm, 3-septate ..... *rotunda*  
 On Sphaerophoraceae (*Sphaerophorus*); ascospores 19–22 × 5.5–6 µm, 3-septate ..... *sphaerophoricola*  
 On Teloschistaceae (*Xanthoria*); ascospores 12–17 × 4–6 µm, 3-septate  
 ..... [Arthoniales, uncertain position] *Phacothecium varium*  
 On Verrucariaceae (*Bagliettoa*, *Dermatocarpon*, *Verrucaria*) ..... 43
- 41(40) Exciple only well-developed laterally; ascomata in clusters on thalli of *Arthonia radiata*, not causing necrosis ..... *arthoniicola*  
 Exciple with a dark brown basal layer; ascomata scattered on thalli of *Coniocarpon cinnabarinum*, causing some necrosis ..... *sawyeriana*
- 42(40) Asci 4-spored; on *Crutarndina petraetoides* ..... *brevis*  
 Asci 8-spored; on *Thelotrema lepadinum* and *T. macrosporum* ..... *thelotrematis*
- 43(40) On *Dermatocarpon miniatum* aggr.; asci 8-spored; ascospores 18–26 × 6–8 µm ..... *pulvinata*  
 On *Bagliettoa* spp.; asci 8-spored; ascospores 14–22 × 5–8 µm ..... *rupesstris*  
 On *Verrucaria hochstetteri* and *V. muralis*; asci mostly 6-spored; ascospores 15–19 × 4.7–6 µm ..... *hochstetteri*  
 On *Verrucaria nigrescens* and *V. viridula*; asci 4- to 6-spored; ascospores 12.5–17.3 × 3.4–4.8 µm ..... *opaca*

### **Opegrapha anomea** Nyl. (1857)

Lichenicolous, thallus absent. Ascomata black, not pruinose, 0.2–0.6 (–0.9) mm diam., when young roundish, partly immersed in the host thallus and breaking through the host cortex; mature ascomata regularly appearing aggregated in groups reaching 4 mm diam., unilocular to multilocular; exciple laterally and basally very variable in thickness, dark brown, K–; epithecium brownish, K–; hymenium colourless, K–, I+ blue, then red, K/I+ blue, 75–85 µm thick; hypothecium colourless, reduced; paraphysoids branched and anastomosed, 2–2.5 mm diam., indistinctly swollen at the apex; asci 4(–8)-spored, 35–40 × 8–13 µm, wall I–, K/I–, except for an apical K/I+ blue ring. Ascospores colourless, becoming brown and coarsely verrucose at maturity, narrowly ellipsoidal, 3-septate, slightly constricted at the medium septum, 17–26 × 6.5–9 µm, with a distinct colourless gelatinous sheath ca 0.5 µm thick. Pycnidia unknown. **BLS 2466.**

On *Lepra amara* on *Acer pseudoplatanus*; first recorded in our region in 2007. Scotland (Taynish, Kintyre).

The species was examined in detail by Ertz *et al.* (2004), who found populations on various other members of the Ochrolechiaceae, including *Ochrolechia androgyna* and *Varicellaria velata*. Collections on *Pertusaria* sensu stricto are likely to be *O. pertusariicola* (q.v.).

### **Opegrapha areniseda** Nyl. (1875)

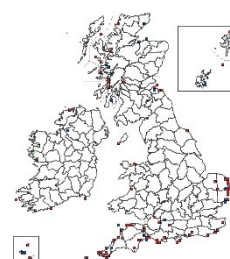
Thallus thin to thick and then cretaceous, pale whitish grey or inconspicuous and immersed, indeterminate. Apothecia 1–2 × 0.15–0.3 mm, elongate, sessile, occasionally furcate; exciple K+ greenish; disc a slit; epithecium



pale brown; hymenium 75–90  $\mu\text{m}$  tall, I+ red. Ascospores (14–) 20–30 (–40)  $\times$  (4–) 5–6  $\mu\text{m}$ , 3- to 5(-8)-septate, cells all similar in size, often with a thin gelatinous sheath. Pycnidia 0.1–0.4 mm diam., numerous, often clustered; conidia 3–5  $\times$  (1–) 1.2–1.5 (–1.7)  $\mu\text{m}$ , bacilliform. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0937**.

On consolidated soil and sand, rarely on decaying wooden posts, friable rock or church walls, mostly on or near the coast; scarce. Scattered throughout Great Britain but mainly in the south and west, also E. Anglia and the Channel Is, and a few scattered records in Ireland.

Differs from *Alyxoria mougeotii* which has larger ascospores and an enlarged penultimate cell. *O. areniseda* frequently occurs without apothecia and is then distinguished by the large, prominent, black, sessile pycnidia which are nearly always abundant.

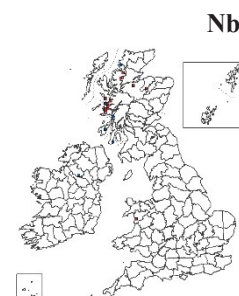


### **Opegrapha arthoniicola** Coppins & S.Y. Kondr. (2021)

Thallus absent (lichenicolous). Ascomata developing below, and bursting through the host thalli, later becoming superficial, in scattered clusters 0.7–1.0 mm across, each containing up to seven ascomata. Individual ascomata black, not pruinose, lirellate, (0.14–) 0.3–0.8 (–1) mm long, (0.9–) 0.1–0.14 (–0.2) mm broad and 0.07–0.1 mm tall in section, usually 1–2-furcate, straight or curved, disc slit-like or eventually gaping. Exciple well-developed only laterally,  $\pm$  spreading outwards below, (9–) 19–29 (–33)  $\mu\text{m}$  thick, dark brown to blackish brown, K $\pm$  tinged faintly olivaceous, with a paler inner layer 4.8–6.7  $\mu\text{m}$  thick, consisting of rounded cells 3–4.8  $\mu\text{m}$  diam.; basal exciple not developed. Hymenium colourless at the base, (54–) 61–67  $\mu\text{m}$  tall, I+ blue then reddish brown in places, K/I+ blue; epithecium very thick, (14.4–) 20–24  $\mu\text{m}$  thick, olivaceous owing to external minute brown granules, K $\pm$  becoming more olivaceous blackish. Subhymenium indistinctly yellowish, K–, 6.5–10 (–12.0)  $\mu\text{m}$  tall. Paraphyses sparingly branched, 1.4–1.9  $\mu\text{m}$  diam. (in KOH) with slightly swollen tips 2.3–3.4  $\mu\text{m}$  diam. with abundant external minute brown granules. Asci shortly cylindrical-clavate, (34–) 38.5–44  $\times$  10–12.5  $\mu\text{m}$ , with a minute K/I+ blue ring around the top of the ocular chamber, (4–)6(–8)-spored. Ascospores long remaining hyaline, (1–) 3-septate, the upper two cells usually broader than the lower cells, (10.6–) 12.5–14.5  $\times$  3.4–4.2 (–4.8)  $\mu\text{m}$ ; perispore thin, often indistinct; old spores sometimes becoming brown owing to presence of brown granules in the perispore. Pycnidia not seen.

Parasitic on thalli of *Arthonia radiata*, but showing little if any sign of damage; recorded from oceanic western Scotland, Wales (Carmarthen, Merioneth) and Northern Ireland (Fermanagh).

Further information on this species can be found in Coppins *et al.* (2021). Despite the wide and often abundant occurrence of its host, *Opegrapha arthoniicola* appears to be confined to western Britain and Ireland, with most finds being from western Scotland. It should be sought elsewhere, especially in S.W. England, Norway and the Iberian peninsula.

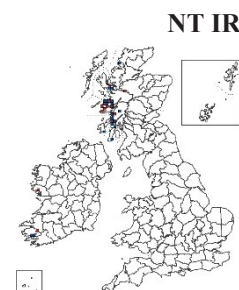


### **Opegrapha brevis** Coppins (1987)

Thallus absent (lichenicolous). Ascomata scattered or somewhat clustered, black, not pruinose, at first shortly lirellate with a slit-like disc, but the disc soon widely expanded and ascomata becoming elliptical or disciform, 0.14–0.46  $\times$  0.12–0.24 mm, 0.1–0.14 mm high; exciple well-developed laterally, 23–30  $\mu\text{m}$  thick, brown-black, K+ greenish, at the base narrower and more irregular; epithecium dilute fuscous brown, K–; hymenium 45–60  $\mu\text{m}$  tall, colourless, I+ blue or, in the lower half, reddish; paraphysoids sparingly branched, 1.7–2 (–2.7)  $\mu\text{m}$  thick, widening to ca 3.5  $\mu\text{m}$  in the epithecium; asci clavate, 38–50  $\times$  12–15  $\mu\text{m}$ , with a minute dark amyloid apical ring, 4-spored at maturity; ascospores 3-septate, the upper two cells slightly wider, ends obtuse, colourless or becoming brown due to deposition of minute pigment granules in the sheath, (14–) 15–18  $\times$  4.5–5 (–6)  $\mu\text{m}$ . Pycnidia inconspicuous,  $\pm$  immersed, 50–70  $\mu\text{m}$  diam.; conidia cylindrical, straight, 5–7  $\times$  ca 0.8  $\mu\text{m}$ . **BLS 1841**.

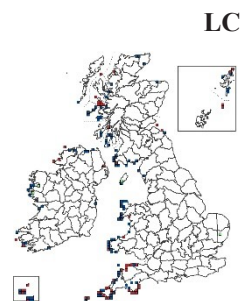
On *Crutarndina petractoides* on *Corylus*, often producing fawn-coloured necrotic patches; local. W. Scotland, Ireland. Endemic.

The species should be placed in the Lecanographaceae close to *Phacographa* according to Frisch *et al.* (2014), but an appropriate generic placement is not available.



**Opegrapha cesareensis** Nyl. (1868)

Thallus thin, even and smooth, sometimes rimose-cracked, rarely inconspicuous, effuse or delimited, pale lilac-brown or grey-lilac, often forming extensive mosaics; a thin grey-black prothallus often present. Apothecia 0.3–1 (–2) × 0.15–0.3 (–0.45) mm, 0.2–0.6 mm high, scattered, infrequently branched, rarely contiguous, sessile, straight or curved, prominent, sometimes elevated on a small thalline cushion; disc a persistent slit; exciple thick, somewhat swollen, K± dull green; epithecium brown; hymenium 80–90 µm, I+ blue in the upper part. Ascospores (13–) 15–22 (–26) × 4–5 µm, (3–) 4- to 5 (–6) septate, the cells elongate, equal in size. Conidia 6–7.5 × 0.7–1 µm, bacilliform, straight. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0941.**



On sheltered faces or beneath overhangs of moist or dry siliceous rocks in the xeric-supralittoral zone; locally frequent, but mainly on the western coasts; frequent. S.W. England (Devon), Wales, extending to N. Scotland (Shetland), Ireland.

The lilac tinge of the often mosaic-forming thalli and 4- to 5-septate ascospores are diagnostic.

**Opegrapha demutata** Nyl. (1879)

Thallus thin, effuse or of small rounded areoles, cream-white. Apothecia (0.3–) 0.4–0.7 (–1) × 0.12–0.2 mm, 40–80 µm tall, semi-immersed to sessile, frequently branched, sometimes surrounded by a pseudothalline exciple; disc slit-like or partly open; disc and exciple white-pruinose; exciple K–; epithecium brown; hymenium 60–70 µm tall, I+ blue in parts, the remainder I+ red. Ascospores (12–) 14–18 × 3–5 µm, 3-septate. Conidia 11–15 (–20) × ca 2 µm, straight or slightly curved. C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 1555.**

On brickwork and shaded flint; rare and very local. E. & S. England; Lincolnshire (Gibraltar Point), Suffolk, Bedfordshire, Sussex (Eridge Park).

*O. demutata* is distinguished from *Alyxoria ochrocheila* (Lecanographaceae) by the white (K–), not orange (K+ purple) pruina and saxicolous habit. It should certainly be transferred to *Alyxoria*, but more research is needed to determine whether it is phylogenetically distinct from *A. ochrocheila*. *A. subelevata* has apothecia with a broad, open, blue-grey pruinose disc, a conspicuous, non-pruinose exciple, larger ascospores and shorter conidia.

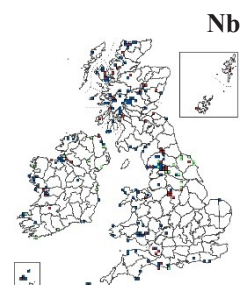
**Opegrapha dolomitica** (Arnold) Clauzade & Cl. Roux (1989)

Thallus often ± immersed and inconspicuous, or thin and smooth or finely cracked, creamy white, grey, greenish to brown-red. Apothecia 0.5–1.8 (–3) × 0.16–0.25 (–0.35) mm, sessile to semi-immersed, scattered, infrequently furcate, sometimes elliptical and gnarled, sub-gyrose or longitudinally furrowed; disc irregular but usually persistently slit-like (often partially exposed in gnarled specimens); exciple K–; epithecium brown, K–; hymenium 90–120 µm tall. Ascospores (20–) 22–26 (–31) × 5–8 µm, 3-septate, clavate, usually with a thin sheath. Conidia 4–6 × 0.5–0.7 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0960.**

On sheltered moist limestone or calcareous schists (especially beneath overhangs), sides of clints in limestone pavement, mortar or associated base-enriched siliceous rock; local. Throughout upland Britain and Ireland.

Distinguished from *Arthonia calcarea* by the K– brown pigmentation of the apothecial tissues and longer ascospores, as well as the usually longitudinally furrowed or gnarled-subgyrose shape of the apothecia. The phylogenetic position of *O. dolomitica* needs to be more fully investigated.

Sometimes associated with *Sclerococcum griseisporodochium* Etayo (1995); their biological relationship requires further investigation.

**Opegrapha fumosa** Coppins & P. James (1992)

Thallus thin, wide-spreading, effuse, immersed, inconspicuous, grey-brown; soralia numerous, pale fawn, minutely mottled brown (never orange even when fresh), sometimes erumpent-punctiform or elliptical, 0.2–1 × 0.2–0.6 mm, flat or regularly convex with loosely heaped soredia, often confluent and diffuse but never forming

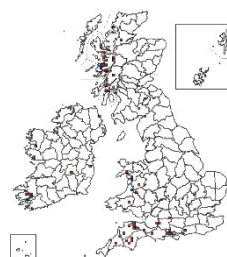
**Nb IR**



a continuous leprose crust; soredia finely granular, 20–50 µm diam., pale fawn, those on the surface often brown. Apothecia and pycnidia unknown. Soralia C+ red, K–, KC+ pink, Pd–, UV– (gyrophoric acid). **BLS 1635.**

On trunks of mature *Quercus* and more rarely *Ilex* in sheltered sites in ancient woodland and parkland; rare. W. Scotland, Ireland, C. & N. Wales, S. England (Cornwall to Hampshire, New Forest).

Forming extensive patches, sometimes to several square metres, characterized by diffuse, grey-brown stains with inconspicuous, punctiform to erose, fawn-coloured, C+ red (fleeting) soralia.



### ***Opegrapha hochstetteri* Coppins (2021)**

Thallus absent (lichenicolous). Ascomata often forming loose rounded clusters, 0.4–1.2 mm diam. with more irregular clusters to 1.8 × 1.4 mm, and to 0.4 mm high; clusters with 2 to ca 20 ascomata. Individual ascomata usually discernible, black, not pruinose, lirellate, unbranched or shortly 1–2-furcate, mainly not open but sometimes a few open around the centre exposing the non-pruinose disc, 0.2–0.5 (–0.7) mm long, (0.1–) 0.15–0.2 mm broad and 0.16–0.2 mm tall in section. Exciple well-developed, entire, 36–48 µm wide laterally, dark brown to blackish brown, K– or K+ reddish enhancing (never greenish). Hymenium 50–62 µm tall, hyaline, I+ red to reddish brown, K/I+ blue; epithecium well-developed, brownish and I+ blue, 19–24 µm tall. Subhymenium 12–28 µm tall, slightly brownish, K–. Paraphyses sparingly branched, 1.4–2 µm diam. (in KOH), with slightly swollen tips to ca 3.5 µm diam., which are covered with abundant minute brown granules. Asci broadly clavate, 48–61 × 16–17 µm, with a K /I+ blue ring around the top of the ocular chamber, (4–) 6 (–8) spored. Ascospores long remaining colourless, 3-septate, the upper two or only the cell second from the top somewhat more swollen than the lower cells, (15–) 16–19 × (4.7–) 5–6 µm whilst colourless, old brown ascospores to 21 µm long and 7 µm diam., usually with a distinct perispore 1–2 µm thick; surface of old spores released from the asci minutely warted (at ×1000), but without brown granules in the perispore. Pycnidia ca 80 µm diam., immersed in the host thallus, with a dark brown wall, conidiogenous cells elongate-ampulliform, 8–12 × ca 2 µm; conidia aseptate, bacilliform to narrowly ellipsoidal, colourless, 4.3–4.8 × ca 1 µm.

Parasitic on thalli of *Verrucaria hochstetteri* Fr. and *V. muralis* Ach., showing few if any signs of damage; on calcareous rock and stonework, southern and eastern England, also recorded from Luxembourg. Surely overlooked elsewhere, considering the wide distribution of the host lichens.

This species is similar to *Opegrapha opaca*, but differs principally in the somewhat larger dimensions of the ascospores, asci and hymenium height, and the larger, but less tightly compacted ascomatal clusters. These differences remain consistent when comparing collections on the respective hosts, *Verrucaria hochstetteri* and *V. nigrescens*. *O. rupestris* (on *Bagliettoa* species) has 8-spored asci and slightly broader ascomata.

NR



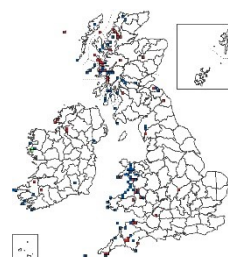
### ***Opegrapha lithyriga* Ach. (1810)**

Thallus thin, film-like, smooth, membranous, pale to dull grey, deep olive, rarely rusty brown; prothallus inconspicuous but colonies occasionally mosaic-forming. Apothecia 0.1–1.5 (–2) × 0.07–0.2 (–0.25) mm, 50–80 µm high, scattered or becoming crowded-contiguous, sessile, delicate, serpentine-sinuate, unbranched or rarely branched or stellate; disc a persistent slit, rarely surrounded by a pale pseudothalline exciple; exciple in section K+ dull green; hymenium 60–80 µm tall, I+ red. Ascospores 20–35 × 3–5 µm, 5- to 7-septate, slender, acicular, ends tapered. Conidia of two types, 10–14 × 0.5–0.7 µm, curved, filiform and 3–5 × 1–1.2 µm, bacilliform. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0951.**

On deeply shaded siliceous rocks, often in deep clefts and ravines, sometimes with *Enterographa hutchinsiae*; local. Throughout W. Britain and Ireland, rare or absent elsewhere.

Closely related to *O. vulgata* but differing in the substratum, the more delicate apothecia and internal characters.

Nb



### ***Opegrapha niveoatra* (Borrer) Laundon (1963)**

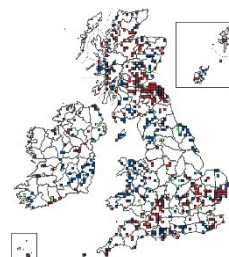
Thallus thin, superficial, minutely cracked or smooth, effuse, occasionally inconspicuous, dull grey to olive-brown. Apothecia 0.3–1 (–1.5) × (0.08–) 0.1–0.2 mm, 50–90 µm tall, small, sessile, scattered or contiguous,

LC

straight or curved-sinuate, occasionally branched or stellate; disc at first a slit, becoming partially exposed with age; exciple somewhat uneven, K+ olivaceous in section, epithecium brown; hymenium 40–70  $\mu\text{m}$ , I+ red. Ascospores 20–30  $\times$  2.5–4  $\mu\text{m}$ , 4- to 7(-8)-septate, acicular. Pycnidia abundant, without pruina; conidia short and curved, of two types, 4–8  $\times$  1–1.5  $\mu\text{m}$  and 7–9  $\times$  ca 0.7  $\mu\text{m}$ . Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0953**.

On neutral and basic deciduous bark, particularly *Fraxinus*, *Acer* and *Ulmus*, in wayside and woodland situations, more rarely on conifers and wood; frequent. Throughout Britain and Ireland.

Often sterile but distinguished by the abundant pycnidia. Can be confused with *O. vulgata* but the shorter, worm-like conidia are distinctive; the species also shows a stronger preference for basic bark. Pycnidia of *Laeviomyces opegraphae* D. Hawksw. (1981), producing aseptate brown conidia, often occur on the thallus and in the hymenium.



### **Opegrapha opaca** Nyl. (1853)

Thallus absent (lichenicolous). Ascomata forming black spots between host thallus areoles and sometimes forming dense wart-like clusters, (0.2–) 0.3–0.8 (–1.0) mm across and 0.1–0.2 mm high. Individual ascomata often difficult to discern, black, not pruinose, lirellate, unbranched or shortly 1–2-furcate, rather short and broad, mainly  $\pm$  closed but sometimes widely open, 0.3–0.4 mm long, (0.12–) 0.15–0.2 (–0.3) mm wide and (80–) 95–110 (–125)  $\mu\text{m}$  tall in section, mainly pressed together in compact rounded wart-like clusters of 2–6, which under a  $\times$  10 lens resemble large, rough-walled perithecia. Exciple well-developed, entire, 14–30  $\mu\text{m}$  thick laterally, dark brown to blackish brown, K– (never greenish). Hymenium 48–55  $\mu\text{m}$  tall, colourless, I+ red to reddish brown, K/I+ blue; epithecium well-developed, brownish and I+ blue quickly red, 19–24  $\mu\text{m}$  tall. Subhymenium 12–15  $\mu\text{m}$  tall, slightly brownish, K–. Paraphyses sparingly branched, 1.4–2  $\mu\text{m}$  diam. (in KOH), with slightly swollen tips to 3.4  $\mu\text{m}$  diam., which are covered with abundant minute brown granules. Asci broadly clavate, 42–50  $\times$  (11.5–) 12.5–14.5  $\mu\text{m}$ , with a K/I+ blue ring around the top of the ocular chamber, 4–6-spored. Ascospores long remaining colourless, (1–) 3-septate, the upper two or only the second cell from the top somewhat more swollen than the lower cells, (12.5–) 13.4–15.3 (–17.3)  $\times$  (3.4–) 3.8–4.8  $\mu\text{m}$ , old brown ascospores up to 19  $\mu\text{m}$  long and 6  $\mu\text{m}$  diam., sometimes with a thin perispore ca 1  $\mu\text{m}$  thick; old spores released from the asci (or in undehisced, over-mature asci) very often with pale brown to brown walls [without brown granules in the perispore]. Pycnidia ca 80  $\mu\text{m}$  diam., immersed, with a dark brown wall, conidiogenous cells elongate-ampulliform, 10–15  $\times$  ca 2  $\mu\text{m}$ ; conidia aseptate, ellipsoidal, colourless, 3–4  $\times$  ca 1  $\mu\text{m}$ .

Parasitic on thalli of *Verrucaria nigrescens* Pers. and *V. viridula* (Schrad.) Ach., but showing few if any signs of damage; on calcareous rocks or stonework, southern England and S. Wales, also known from France, Luxembourg, Spain and Israel.

*Opegrapha opaca* differs from *O. hochstetteri* (on *Verrucaria* species from a quite different clade to the host lichens of *O. opaca*; Gueidan *et al.* 2009) by its more tightly knit ascomatal clusters with flatter ascomata that are often difficult to distinguish individually, and somewhat smaller ascospores. Of British and Irish *Opegrapha* species parasitising other members of the Verrucariaceae, *O. opaca* differs from *O. pulvinata*, known from *Dermatocarpon minutum* aggr. in our region, as well as from *O. rupestris* (from *Bagliettoa baldensis* and its close relatives), mainly by its much smaller ascospores, but also other characters, such as size and habit of ascomatal clusters, development of individual ascomata, number of ascospores in the asci, and host range.

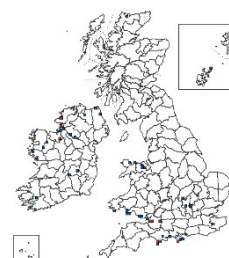


### **Opegrapha parasitica** (A. Massal.) H. Olivier (1906)

Thallus absent (lichenicolous). Apothecia small, (0.28–) 0.4–0.5 (–0.64)  $\times$  0.18–0.3 mm, black, occasionally aggregated into small clumps, partly immersed in the host tissues, initially with a prominent slit-like exciple 30–70  $\mu\text{m}$  thick hiding the hymenium but with the disc becoming exposed at maturity. Ascospores 16–22  $\times$  6–8  $\mu\text{m}$ , 3-septate, at first hyaline, becoming brown with age. **BLS 1842**.

On the thallus of *Circinaria calcarea* and related species on limestone. Scattered throughout Great Britain, mainly southern, also throughout Ireland, often coastal.

The name is often misapplied to other lichenicolous *Opegrapha* species, especially



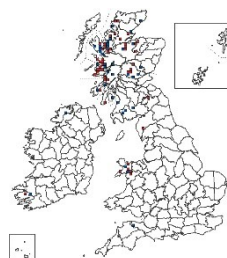
*O. rupestris*. Some data have been taken from Vondrák & Kocourková (2008).

### **Opegrapha pertusariicola** Coppins & P. James (1979)

Thallus absent (lichenicolous). Apothecia lirellate, black, sometimes once-branched, straight or slightly curved but not serpentine, 0.2–1.0 mm long, 0.15–0.2 mm broad, slightly spreading at the base, the ends obtuse or abruptly pointed; disc slit-like, sometimes ± exposed at the middle; exciple well-developed laterally, brown-black, K+ green-black, thin and irregular below the hymenium; epithecium fuscous-brown, K–; hymenium 55–65 µm tall, colourless to dilute pale fuscous-brown in older ascomata, I+ persistent blue; asci clavate, 48–60 × 12–17 µm, 4-spored; ascospores (5-) 6-septate, the median cell usually enlarged, cylindrical or slightly curved, colourless, 21–28 × 4.5–6 µm, with a thin gelatinous sheath, sometimes becoming brown with age. Pycnidia immersed in the outer cortical cells of the bark, 30–60 µm diam, cupulate with widely gaping ostioles; walls fuscous brown with numerous brown granules, K–, often paler at the base; conidia cylindrical-ellipsoidal, often tapering towards the lower end, colourless, aseptate, 3.5–4 × 0.8–1 µm. **BLS 1843**.

On *Pertusaria leioplaca* on *Corylus*, also reported (rarely) on *P. hymenea*, appearing as fawn-coloured necrotic patches on the surface of the host; common but overlooked. Throughout W. Britain, a few scattered records in S.W. Ireland.

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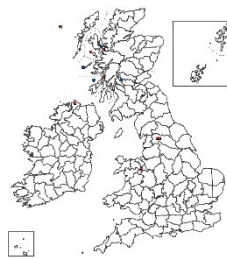
### **Opegrapha pulvinata** Rehm (1869)

Thallus absent (lichenicolous). Apothecia aggregated in sometimes large clusters to 3 (–4) mm diam., 0.2–0.5 × 0.16–0.3 mm, 0.2–0.24 mm tall, straight or curved with a narrow slit-like disc; exciple 35–50 µm thick, K+ brown-yellow or brown-red; hymenium pale brown, 12–25 µm tall; asci 8-spored; ascospores 3–septate, (18–) 20–24 (–26) × 6–8 µm, becoming dark brown, the pigment in the spore wall, surrounded by a thick gelatinous perispore. Conidia 6.5–7 × 1–1.5 µm, straight. **BLS 1954**.

On *Dermatocarpon minutum* agg.; rare. W. Scotland (S. Ebudes, Colonsay; Argyll, Lismore; St Kilda).

According to Coppins (1987), the species is unusual in that the ascospore pigment is in the spore wall and not laid down on the surface as in other lichenicolous *Opegrapha* species (there presumably following degeneration of the perispore). Probably not a species of *Opegrapha* according to Ertz *et al.* (2004) and Hafellner (2009), but no more suitable generic placement is available. Some descriptive data have been taken from Ertz & Egea (2007).

Nb



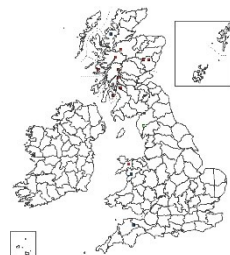
### **Opegrapha reactiva** (Alstrup & D. Hawksw.) Etayo & Diederich (2008)

*Kalaallia reactiva* Alstrup & D. Hawksw. (1990)

Thallus absent (lichenicolous). Ascomata developing in small groups, (50–) 60–100 µm diam., not lirellate, somewhat irregular in outline and sometimes appearing almost perithecial in form, erumpent, black, with a gaping opening; exciple dark brown, K+ olivaceous; epithecium not differentiated; hymenium colourless, I+ pale blue; hypothecium pale to mid brown, narrow; paraphysoids 1.5–2.5 µm diam., much branched and anastomosed; asci clavate, short-stalked, 8-spored, with a small I+ blue ring; ascospores narrowly clavate to clavate-ellipsoidal, colourless, 3-septate, slightly constricted at the septa, (17.5–) 20–24 × 5–7 µm. Pycnidia not known. **BLS 2075**.

On thalli of *Ionaspis lacustris*, scattered throughout Scotland, also N. Wales and Somerset; perhaps uncommon but likely to be overlooked.

NR



### **Opegrapha rotunda** Hafellner (1994)

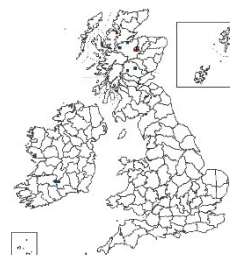
Thallus absent (lichenicolous). Ascomata black, roundish, 0.5–1 mm diam., in external view similar to apothecia of a *Dactylospora*, but with a rough surface and thin and somewhat prominent margins; exciple dark brown; hypothecium brown; hymenium colourless with gel I+ blue then orange, K/I+ blue; paraphysoids branched and

Nb

anastomosing, the terminal cells enlarged and embedded in brownish gel; asci (4-) to 8-spored, broadly cylindrical to somewhat clavate,  $60\text{--}80 \times 15\text{--}20 \mu\text{m}$ , no reaction with K/I; ascospores colourless, 3-septate, somewhat clavate with the second cell being the broadest,  $18\text{--}22 \times 5\text{--}6 \mu\text{m}$ , with a thin sheath. **BLS 1067.**

On the thallus of *Physconia distorta* on *Fraxinus* and *Populus*; rare. Scottish Highlands.

Not a species of *Opegrapha* and probably belonging within the Lecanographaceae, according to Hafellner (2009). No molecular data are available.

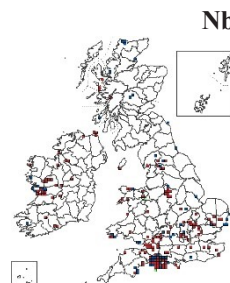


### **Opegrapha rupestris** Pers. (1794)

Thallus absent (lichenicolous). Apothecia scattered or in loose clusters to 1 mm across, the individual ascomata easily discernible, sometimes widely gaping and deeply concave;  $0.2\text{--}0.6$  mm long,  $0.2\text{--}0.3$  mm wide,  $0.15\text{--}0.21$  mm tall; exciple in section K+ brown-red; asci 8-spored; ascospores 3-septate,  $14\text{--}22 \times 5\text{--}8 \mu\text{m}$ , with a pigmented gelatinous sheath. Conidia  $3.5\text{--}5 \times ca 0.8 \mu\text{m}$ . **BLS 2132.**

On *Baglietto baldensis* and *B. calciseda*, on hard limestone; local. Scattered throughout Britain and Ireland, common in S. and S.E. England and also W. Ireland.

*O. hochstetteri*, on *Verrucaria hochstetteri* and *V. muralis*, has slightly narrower apothecia and usually 6-spored asci, and *O. opaca* (on *V. nigrescens* and *V. viridula*) has apothecia in dense wart-like clusters and 4- to 6-spored asci.



### **Opegrapha sawyeriana** Coppins (2021)

Thallus absent (lichenicolous). Ascomata developing just below the bark surface, but soon bursting through this and the host thallus and becoming superficial; single or in small groups of 2–4. Individual ascomata lirellate,  $(0.14\text{--})0.16\text{--}0.64 \times 0.1\text{--}0.16$  mm, to 0.11 mm tall, unbranched and straight or curved, or occasionally 1-furcate, black, not pruinose; disc slit-like or sometimes a few eventually gaping. Exciple well-developed laterally,  $\pm$  spreading outwards below,  $(12\text{--})20\text{--}27$  ( $\text{--}39$ )  $\mu\text{m}$  thick, dark brown to blackish brown, K $\pm$  faint olivaceous tinge; basal exciple brown (slightly less intensely pigmented than the lateral exciple),  $9\text{--}15 \mu\text{m}$  thick. Hymenium colourless or with the upper part dilute brownish,  $50\text{--}60 \mu\text{m}$  tall, I+ blue, K/I+ blue; epithecium indistinct. Subhymenium indistinctly yellowish, K-,  $5\text{--}10 \mu\text{m}$  tall. Paraphysoids sparingly branched,  $1.3\text{--}1.7 \mu\text{m}$  diam. (in KOH), slightly widening above to *ca*  $2.3 \mu\text{m}$  and sometimes with a few external minute brown granules. Asci shortly cylindrical-clavate,  $30\text{--}39 \times 11\text{--}12 \mu\text{m}$ , with a minute K/I+ blue ring around the top of the ocular chamber, 8-spored. Ascospores long remaining colourless, 3-septate, the upper two cells usually broader than the lower cells,  $13\text{--}14.5$  ( $\text{--}16$ )  $\times 3.5\text{--}4 \mu\text{m}$ ; perispore thin, often indistinct; old spores sometimes becoming brown owing to presence of brown granules from the degenerating perispore. Pycnidia not seen.

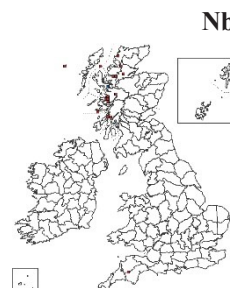
Lichenicolous on thalli of *Coniocarpon cinnabarinum*, all records from bark of *Corylus*; western Scotland (Argyll, Mull) and Ireland (N. and S. Kerry, Co. Down). Further information can be found in Coppins *et al.* (2021).

Similar to *O. arthoniicola*, but differs in forming distinct brown-grey necrotic patches on the host thallus, the ascomata being scattered rather than clustered, and in section with a thin ( $9\text{--}12 \mu\text{m}$ ) dark brown base to the exciple. As with *O. arthoniicola*, this species appears to have a much more restricted distribution than that of its host lichen, though it could well be overlooked.

### **Opegrapha sphaerophorica** Isbrand & Alstrup (1992)

Thallus absent (lichenicolous). Ascomata dispersed to aggregated, rounded, not branched, strongly convex, sessile or immersed at the base, black, to about 1 mm diam.; exciple contiguous with the hypothecium, when young almost closed, the hymenium later becoming widely exposed; epithecium  $5\text{--}10 \mu\text{m}$  high, brown-black; hymenium  $60\text{--}70 \mu\text{m}$  high, colourless; hypothecium brown-black,  $50\text{--}60 \mu\text{m}$  high; paraphysoids branched and anastomosing, *ca*  $2 \mu\text{m}$  thick; asci clavate,  $50\text{--}65 \times 13\text{--}16 \mu\text{m}$ , 8-spored; ascospores narrowly ellipsoidal, the ends rounded, 3-septate, at first colourless, with age pigmented by an irregular deposition of dark granules,  $19\text{--}22.5 \times 5.5\text{--}6 \mu\text{m}$ . **BLS 2380.**

Forming random or localized groups of apothecia on the thallus of *Sphaerophorus*





*globosus*. Devon (Dartmoor) and W. Scotland (Mull, W. Ross, Westerness, St Kilda).

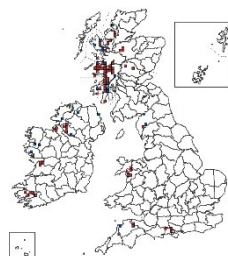
### **Opegrapha thelotrematis** Coppins (1984)

Thallus absent (lichenicolous). Ascomata scattered or frequently in dense clusters to 1 mm diam., black, not pruinose, lirellate, unbranched or occasionally shortly 1- to 3-furcate, with a persistently slit-like disc, 0.14–0.6 (–0.8) × 0.1–0.14 mm wide, 0.1–0.12 mm high; exciple well-developed laterally, 20–36 μm thick, brown-black, K+ greenish, at the base often irregular; epithecium absent, the exciple remaining incurved over the top of the hymenium except for the narrow slit; hymenium 45–60 μm tall, colourless, I+ blue gradually turning reddish; paraphysoids richly branched, 1–2 μm diam., most with their apices remaining attached to the overlying exciple; asci clavate, 35–50 × 12–13 μm, with a minute, dark amyloid apical ring, 6- to 8-spored at maturity; ascospores 3-septate, the upper two cells slightly wider, ends obtuse, colourless or becoming brown due to deposition of minute pigment granules from the sheath, 13.5–17 × (4–) 4.5–5.5 (–6) μm. Pycnidia inconspicuous, ± immersed, 50–70 μm diam.; conidia short-cylindrical or slightly broader towards the proximal end, straight, 3.5–4.8 × ca 0.8 μm. **BLS 1844**.

On *Thelotrema lepadinum* and *T. macrosporum*, on *Corylus*, often producing fawn-coloured necrotic patches; local. Widespread in W. Scotland, rare in Cumbria, S.W. England, W. Ireland, Wales (Merionethshire).

Compared with *O. arthonicola* by Coppins *et al.* (2021) and perhaps closely related, but the host lichen is quite different and *O. thelotrematis* has somewhat longer and broader ascospores.

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### **Opegrapha trochodes** Coppins, F. Berger & Ertz (2008)

Thallus effuse, immersed, giving the bark a dull grey to brown-grey coloration, or very thin, continuous to finely cracked, smooth to finely warted, dark green to brownish, matt. Apothecia 0.15–0.4 (–0.5) mm diam., scattered, black, not pruinose, rounded or ± square or pentagonal, sometimes shortly elongated; exciple 60–140 μm thick, comprising 4–5 segments; central part of apothecia (covering most of the hymenium) eventually becoming umbonate; in section with 2–4 hymenial locules; true exciple brown-black, K+ distinctly greenish, closed at the base of the apothecium, laterally 25–55 μm thick, at the base 15–50 μm thick; epithecium colourless to pale brown; hymenium 54–75 μm tall, I+ directly orange-red, K/I+ blue. Ascospores (11–) 13–18 (–21) × (3–) 3.8–5 μm, 3-septate, septation starting with one median septum, not constricted at the septa, the outer spore wall enclosing four cells that become rounded when old, cells ± equal in size except the outer cells are slightly longer; old spores sometimes becoming brownish owing to an even browning of the outer wall and without a coating of pigmented granules; gelatinous sheath not evident. Pycnidia not found. No lichen products detected by TLC. **BLS 2510**.

On bark of mature trunks of *Fraxinus* and *Quercus* in ancient woodlands; rare. S.W. England (Devon, Somerset) and Wales (Cardigan).

Probably related to *Gyroglyphax saxigena*, and therefore belonging to that genus; *G. saxigena* is saxicolous and has more robust and elongated apothecia. The occasionally corticolous *G. gyrocarpa* has similar apothecia, but a C+ red, sorediate thallus.

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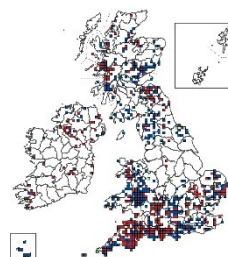


### **Opegrapha vermicellifera** (Kunze) J.R. Laundon (1963)

Thallus thin, smooth, continuous or finely rimose-cracked, often forming extensive pale grey or medium grey patches. Apothecia (0.3–) 0.6–1.2 (–1.6) × 0.09–0.15 (–0.25) mm, 0.02–0.50 mm high, rather rare and often confined to restricted areas on the thallus, elongate, narrow, semi-immersed, serpentine, infrequently furcate or in scattered stellate clusters; disc a slit, occasionally partially exposed; exciple sometimes furrowed and/or grey-pruinose, K–; epithecium brown; hymenium 50–60 μm tall, I–. Ascospores 16–25 (–30) × 3–4 μm, 4- to 7-septate, with rather pointed ends. Pycnidia prominent, white- to pale grey-pruinose, (0.1–) 0.15–0.25 mm diam. and 0.15–0.2 (–0.4) mm high; young pycnidia semi-immersed, chestnut-brown with a pale ostiole, K–; conidia (3–) 4–7 × 1–1.5 μm, straight, bacilliform. Thallus and pycnidia C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0965**.

On neutral to basic bark, particularly dry sides of *Ulmus*, *Acer*, *Fagus* and *Fraxinus*, rarely on rock. Throughout

LC



Great Britain, but scarce in the English Midlands; scattered in Ireland, mainly in the north.

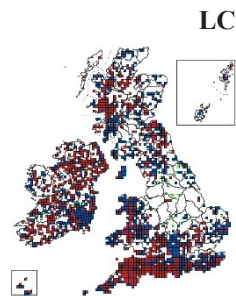
Sterile thalli of *Lecanactis abietina* and *Inoderma subabietinum* with only pruinose pycnidia differ in having larger pycnidia with K+ green walls, a different thallus chemistry (UV± glaucous) and a preference for more acid bark (*Betula*, *Quercus*, conifers). In *L. abietina* the conidia are larger, 12–17 × 2–3 µm and apices of the pycnidia are C+ red. The thallus of *Inoderma subabietinum* is K/UV+ mauve (with confluent acid) and the pycnidia K+ lemon-yellow, UV intensified.

### **Opegrapha vulgata** (Ach.) Ach. (1803)

Thallus thin, sometimes effuse or conspicuous, smooth or ± rimose-cracked, white, grey, pale or deep brown, often with an olive tinge. Apothecia (0.5–) 0.8–2 (–3) × 0.15–0.25 mm, 0.05–0.10 mm high, very variable, sessile or semi-immersed, elongate, serpentine-sinuate, unbranched or often furcate, sometimes stellate or forming an interlinking network; disc persisting as a slit, only rarely becoming partially exposed in older apothecia; exciple K–; epithecium dull chocolate-brown; hymenium 45–60 µm tall, I+ red. Ascospores (15–) 20–30 (–40) × 2.5–4 (–4.5) µm, 4- to 7(-8)-septate, elongate-acicular, tapered at one end, straight or somewhat curved, septate, thin-walled. Pycnidia black, often numerous, intermixed with the lirellae; conidia of three types, sickle-shaped and 9–18 × 1–1.5 µm or 9–14 (–17) × 1–1.5 (–1.8) µm, or bacilliform and 3–5 × 1–1.8 µm. Thallus C–, K–, KC–, Pd–, UV– (no lichen products detected by TLC). **BLS 0943**.

On shaded smooth young bark, or smooth and rough areas of old trunks of a wide range of tree species; common. Throughout Britain and Ireland, except the English Midlands.

This widespread and variable species is distinguished from *O. niveoatra* by the characteristic, longer, curved conidia. The saxicolous *O. lithyriga* is very similar.



## **PARALECANOGRAPHA** Ertz & Tehler (2011)

*Paralecanographa* only contains one confirmed species (though a probable second is listed by Diederich *et al.* 2018), so the description below constitutes that of the genus.

### **Literature**

Diederich *et al.* (2018), Ertz & Tehler (2011), Wolseley (2009).

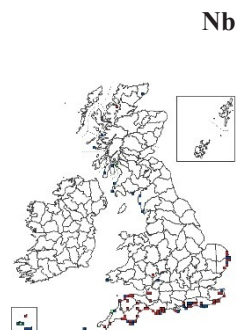
### **Paralecanographa grumulosa** (Dufour) Ertz & Tehler (2011)

*Lecanographa grumulosa* (Dufour) Egea & Torrente (1994)

Thallus usually thick, rarely thin, greyish white to pale brownish grey, continuous, farinose or cracked-areolate. Mature apothecia rare, black, at first immersed then sessile, roundish to angular, 0.2–1.1 mm diam., or elliptical to elongate and then to 2 mm long, sometimes substellate; disc flat, usually white or bluish-white pruinose; true exciple thin, dark brown, often prominent or becoming excluded; exciple and hypothecium K– (not greenish); epithecium colourless to dark brown (K+ greenish); hymenium 50–70 (–85) µm tall, colourless, I+ red, with branching and anastomosing paraphysoids with swollen and pigmented tips. Asci cylindrical-clavate, 50–75 × 11–13 µm. Ascospores 12–17 (–19) × 3–4 (–5) µm, 3(4-5)-septate, ellipsoidal to fusiform and surrounded by a thin gelatinous sheath, ± constricted at the middle septum. Pycnidia not found; conidia said to be curved, 5–7 × ca 1 µm. Thallus and apothecial pruina C+ red, K–, Pd–, UV– (lecanoric and gyrophoric acids and erythrin). **BLS 0597**.

Often beneath sheltered overhangs and on shaded walls, in a number of different forms, those on siliceous rocks having a thin thallus with areoles and inconspicuous medulla, and those on limestone or mortar having a thick whitish thallus with a well-differentiated medulla. S. & W. Britain, E. Anglia.

At least sometimes initially parasitic on thalli of *Dirina* and *Roccella*, but developing an independent thallus.



A form with globose apothecia that exclude the exciple has been described as *Lecanactis hemisphaerica* J.R. Laundon (1976), occurring on plaster, rarely mortar, on shaded vertical walls of churches in coastal situations.

### SPARRIA Ertz & Tehler (2011)

**Thallus** crustose, epilithic, thick, continuous to rimose or verrucose, sometimes bullate, corticate. **Photobiont** *Trentepohlia*. **Ascomata** lirelliform, angular to rounded, immersed in the thallus, in one species usually aggregated into rounded or elongate stromatic structures; hymenial disc usually narrow, white-pruinose. **Thalline margin** absent. **True exciple** dark brown. **Hypothecium** dark brown, extending into the substrate. **Hamathecium** of branched and anastomosing paraphysoids. **Asci** cylindrical to clavate, 8-spored. **Ascospores** cylindrical-ellipsoidal or fusiform, attenuated at one end, colourless when young, sometimes brown at maturity, multiseptate or submuriform, with a distinct gelatinous sheath. **Conidiomata** pycnidia, immersed in the thallus, the wall colourless. **Conidia** filiform, curved. **Chemistry**: lecanoric acid, sometimes also erythrin.

*Sparria* contains two species (Ertz & Tehler 2011), the type *S. cerebriformis* from Baja California and the European *S. endlicheri*. *S. cerebriformis* has submuriform ascospores that are brown at maturity, formed within multilocular ascomata.

#### Literature

Ertz & Tehler (2011), Coppins & Aptroot (2009), Egea & Torrente (1995).

#### *Sparria endlicheri* (Garov.) Ertz & Tehler (2011)

*Arthonia endlicheri* (Garov.) Oxner (1956)

Thallus 0.3–0.5 (–2) mm thick, tartareous, irregularly cracked, very uneven, often forming bullate ridges or lobe-like proliferations, white-pink when fresh becoming pale brown-grey in dried collections, matt to finely scabrous; in places with erose soralia; soredia 50–100 µm diam., internally densely packed with minute crystals. Apothecia to 0.8 mm diam., very rare, pale, angular to rounded or shortly elongate, white-pruinose; epithecium red-brown; hymenium 50–60 µm tall; hypothecium 50–70 (–100) µm tall, ± colourless. Ascospores 14–20 × 5–7 µm, 3- to 5-septate, ovoid, upper cell not enlarged. Pycnidia 120–200 µm diam., frequent but immersed and inconspicuous, the wall colourless; conidia 15–26 × ca 1 µm, short thread-like, often curved or sigmoid. Thallus C+ red, K–, KC+ red, Pd–, UV– (lecanoric acid). **BLS 0059**.

On siliceous rocks below dry, sheltered overhangs, especially near the coast; frequent. S. England, Wales & Channel Islands, scattered in coastal Scotland, S.W. Ireland.

Ertz & Tehler (2011) questioned whether the apothecia of this species, which are very rarely encountered, might belong to a parasite.

The sorediate morph of *Dirina massiliensis* on siliceous rocks can usually be distinguished by the generally thinner thallus, ± delimited convex soralia with smaller soredia (30–50 µm diam.) and the presence of erythrin; TLC may be required for certainty.

Nb



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