Revisions of British and Irish Lichens

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Teloschistales

Cover image: *Teloschistes flavicans*, in maritime turf, Stackpole NNR, Pembrokeshire, Wales.

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. However, these are not comprehensive and there are many further records that have not yet been digitized. 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to compile new printed editions of the entire lichen biota of Britain and Ireland is extensive, and many parts are out-of-date even as they are published.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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Teloschistales

including *Brigantiaea* (Brigantiaeaceae), *Megalospora* (Megalosporaceae) and *Amundsenia*, *Athallia*, *Blastenia*, *Calogaya*, *Caloplaca*, *Cerothallia*, *Coppinsiella*, *Flavoplaca*, *Gyalolechia*, *Haloplaca*, *Huneckia*, *Kuettlingeria*, *Leproplaca*, *Marchantiana*, *Olegblumea*, *Polycauliona*, *Pyrenodesmia*, *Rufoplaca*, *Rusavskia*, *Sanguineodiscus*, *Scythioria*, *Solitaria*, *Squamulea*, *Teloschistes*, *Variospora*, *Xanthocarpia*, *Xanthomendoza* and *Xanthoria* (Teloschistaceae)

by

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

Ulf Arup
Biological Museum, Lund University, 221 00 Lund, Sweden

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

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

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

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

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

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TELOSCHISTALES D. Hawksw. & O.E. Erikss. (1986)

The Teloschistales comprises four families in the arrangement of Lücking *et al*. (2016), of which the Teloschistaceae is by far the largest in terms of species number. The other three are the Brigantiaeaceae (including the single genus *Brigantiaea*, one species of which is British), the Letrouitiaceae (none of which occur in our region) and the Megalosporaceae (three genera; *Megalospora* includes *M. tuberculosa* which is present in Britain and Ireland).

BRIGANTIAEACEAE Hafellner & Bellem. (1982)

The family contains the single genus *Brigantiaea*, so the description below constitutes that of the family. It occupies a clade sister to that of the *Letrouitaceae* (Gaya *et al.* 2012); that family also differs in ascus, ascospore, conidioma and chemical characteristics.

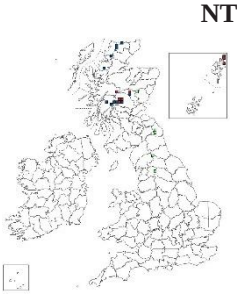
BRIGANTIAEA Trevis. (1853)

Thallus crustose, verrucose. **Photobiont** chlorococcoid; cells 6–14 µm diam. **Ascomata** apothecia, with a thick exciple, with yellow, orange or rust-brown discs. **Exciple** of thick, radiating hyphae. **Hamathecium** of narrow paraphyses, not or slightly thickened at the apex, indistinctly septate. **Asci** 1(-2)-spored, clavate-cylindrical, thick-walled, with a distinct K/I+ blue tholus and both external and inner ascus walls K/I–. **Ascospores** muriform, thin-walled, colourless. **Conidiomata** not known. **Chemistry**: β-orcinol depsides, parietin in the apothecia. **Ecology**: on soil, mosses and low-growing vegetation; montane; non-British species may be corticolous.

Previously included in *Lopadium*, which differs in having K– apothecia, paraphyses which are distinctly enlarged at their apices, and asci that lack a distinct I+ blue tholus. *Brigantiaea* resembles some species of *Caloplaca* s.l. but has muriform, not polarilocular ascospores and a K+ yellow thallus.

Literature:
Arup (2018), Gaya *et al.* (2012, 2015), Hafellner (1997), Wolseley & Purvis (2009).

Brigantiaea fuscolutea (Dicks.) R. Sant. (1981) **NT**



Thallus smooth, granular-verrucose or minutely squamulose, white (also reported as grey-green to yellowish white), in patches to *ca* 10 cm diam. Apothecia to 2 mm diam., scattered, sessile to slightly stalked, flat, becoming ± convex, golden yellow but occasionally tinged olive-black, surface pruinose, margin often prominent, irregularly wavy and inflexed; epithecium with numerous yellow crystals, K+ purple; hymenium to 250 µm tall, I+ blue. Asci 1-spored. Ascospores 48–100 × 24–55 µm, ellipsoidal, colourless, muriform. Thallus C–, K+ yellow, KC+ yellow, Pd-, UV– (atranorin, chloratranorin); apothecia K+ purple (unidentified anthraquinone; Hafellner 1997). **BLS 0186**.

Encrusting mosses and low-growing plants, occasionally on rocks or soil, mostly above 600 m., but descending to sea level; very local, but possibly overlooked when sterile. N. Scotland (Highlands, Sutherland, Shetland), also some old records from N. England.

MEGALOSPORACEAE Vězda ex Hafellner & Bellem. (1982)

Thallus crustose. **Photobiont** *Symbiochloris*. **Ascomata** apothecia, lecideine to biatorine. **Thalline margin** absent. **Exciple** thick, persistent, the disc often pruinose. **Hymenium** often inspersed with oil droplets. Hamathecium of thin, sparingly branched and anastomosed paraphyses, not differentiated at the apex. **Asci** clavate, with a distinct amyloid tholus lacking any internal differentiation, sometimes with a short, conical ocular chamber, and with an intensely amyloid outer coat, 2- to 8-spored. **Ascospores** large, 1-septate, multiseptate or muriform, sometimes with thickened walls. **Chemistry**: zeorin, either with the pannarin chemosyndrome, usnic acid or, in one species, lichexanthone.

The family contains three genera (Kantvilas & Lumbsch 2012), only one of which (*Megalospora*) occurs in Britain and Ireland. The family is sister to the Teloschistaceae according to analyses by Gaya *et al*. (2012), from which it is also separated by ascus and ascospore characteristics, and by the lack of anthraquinones.

The family description is largely adapted from Kantvilas & Lumbsch (2012).

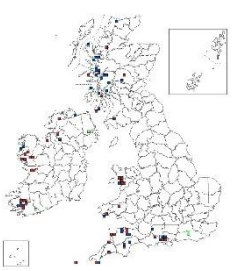
MEGALOSPORA Meyen (1843)

Thallus crustose, superficial, continuous, unstructured, filmy to tuberculate. **Soredia** present, in ± contiguous soralia. **Photobiont** chlorococcoid (*Symbiochloris*). **Ascomata** apothecia, sessile, concave to discoid; disc brown to black-brown, roughened, ± shining. **Thalline margin** absent. **Exciple** prominent, 3-layered, inner zone of thin-walled, radiating hyphae, median zone lax-arachnoid; outer edge of dense, conglutinated hyphae. **Epithecium** pigmented pale to deep red-brown. **Hymenium** I ± blue, with oil droplets. **Hypothecium** flat, pellucid. **Hamathecium** of narrow paraphyses, sparsely anastomosed above, the apices slightly thickened. **Asci** *Megalospora*-type, ovoid-ellipsoidal, 1- to 8-spored. **Ascospores** elongate, straight, multiseptate or muriform, colourless, without a perispore. **Conidiomata** pycnidia. **Conidiogenous cells** cylindrical to elongate ampulliform. **Conidia** bacilliform. **Chemistry**: zeorin, ± usnic acid, ± pannarin, ± lichexanthone, unidentified terpenoids. **Ecology**: on mosses on siliceous rocks and trees.

Externally, field characteristics show similarities with members of the Lecanorales including *Catinaria* and *Megalaria*, but the genus is immediately distinguished by features of the ascospores. Only one species is present in our region.

Literature:
Fletcher (2009), Gaya *et al.* (2012, 2015), Kantvilas & Lumbsch (2012), Sipman (1983, 1986).

Megalospora tuberculosa (Fée) Sipman (1983) **NT**



Thallus 0.05–0.15 mm thick, effuse, soft, filmy to powdery-granular, yellow or pale green-grey; prothallus absent or smooth, blue-black; thalline granules diffuse to aggregated, partly corticate initially and later disintegrating, greenish or glaucous blue-grey to yellow-grey, breaking down into irregular clusters of yellow-green to grey, soon confluent and *Lepraria*-like soralia, which may cover most of the thallus or remain as decorticate, convex tubercles to 1–2 mm diam. Apothecia extremely rare (only recently seen from Somerset and Argyll), rounded, flat; disc 0.5–2.0 mm diam., chestnut- to dark reddish brown, shining; margin (exciple) persistent, paler or concolorous with the disc; epithecium densely granular, the granules not dissolving in K; hymenium 130–180 µm tall, densely inspersed with oil droplets. Asci 1-spored. Ascospores 70–140 × 25–35 µm, 5- to 11-septate, the wall *ca* 2 µm thick and septa *ca* 0.5 µm thick. Thallus C–, K+ pale yellow, KC+ yellow, Pd–, UV– (usnic acid, zeorin, range of terpenoids, unknown UV+ blue). **BLS 0862**.

On bark of broad-leaved trees, especially *Quercus*, *Fagus* or *Fraxinus*, in sheltered, humid but well-lit glades in

ancient woodlands, also on mossy rocks and on the ground in coastal sites; rather local. S. & W. Britain, north to Skye; S & N.W. Ireland.

Fertile material is unmistakable having very large, 5- to 11-septate, thick-walled spores. Usually sterile and has then been confused with *Phyllopsora rosei*, which is Pd+ orange-red, K– (argopsin) and has scale-like flattened minute pubescent granules on an arachnoid prothallus. Old dried specimens become more glaucous and are covered in minute, needle-shaped crystals. The thallus of *Biatora vernalis* is not green-yellow and it is K–. *M. tuberculosa* may resemble *Ochrolechia* or *Pertusaria* s.l. or even *Lepraria* when vigorously spreading over mosses. When sterile, well-developed thalli of *Megalaria pulverea* are very similar; these are usually Pd+ red, but Pd– forms are not uncommon. They can be separated by these giving the K/UV (dry) + bright neon yellow spot test for atranorin. Where present, the paler corticate tubercles (appearing like "bald heads") on the pale green-grey thallus are very distinctive but are absent in fully granular specimens.

TELOSCHISTACEAE Zahlbr. (1898)

Thallus crustose (sometimes lobed towards the margins), foliose, fruticose or squamulose, leprose or granular; yellow-orange, grey or rarely black. **Isidia, soredia**, **schizidia** and **blastidia** present or absent. **Photobiont** trebouxioid. **Medulla** white. **Ascomata** apothecia, sessile or rarely stalked; disc usually green-yellow to orange, red, brown or black. **Thalline margin** and/or exciple present or absent, at times becoming excluded. **Epithecium** with numerous yellow-brown crystals. **Hymenium** usually colourless. **Hypothecium** colourless. **Hamathecium** of paraphyses, unbranched to branched, septate, the apical cells frequently enlarged. **Asci** almost always 8-spored, elongate-clavate, apically ± thickened with a broad internal beak, inner part of apex and external cap K/I+ blue, non-fissitunicate; *Teloschistes*-type. **Ascospores** ellipsoidal, polarilocular (rarely plurilocular or aseptate with unthickened walls), colourless. **Conidiomata** pycnidia, sometimes multilocular, immersed, inconspicuous, *Xanthoria*-type. **Conidia** small, aseptate, bacilliform or ellipsoidal, colourless. **Chemistry**: species with orange thalli are K± crimson; apothecia with orange- to brown-coloured granules in the epithecium and thecium are K+ dissolving crimson under the microscope (anthraquinones, especially parietin). **Ecology**: mainly on well-lit rocks and trees, often nutrient-rich or enriched, rarely on soil, mosses or wood.

A large and diverse family, with many species having bright yellow or orange coloration in at least part of their structure, and distinctive colourless polarilocular ascospores. The traditional generic segregation based on thallus form is only partially supported by molecular data. In particular, *Caloplaca* in the circumscription favoured by Fletcher & Laundon (2009) has been fragmented into a plethora of recently established genera, some of which are dubiously substantiated by phylogenetic data. We have tried to steer a middle course between recognizing that the traditionally circumscribed genera are largely artificial, and accepting a system where almost each individual species seems to be given its own genus.

Three subfamilies are recognized in various molecular phylogenetic research papers (e.g. Arup *et al*. 2013, Bungartz *et al*. 2020, Gaya *et al*. 2012, 2015), the Caloplacoideae, Teloschistoideae and Xanthorioideae. British and Irish species treated in *Caloplaca* by Fletcher & Laundon (2009) occur in all three subfamilies. Anthraquinones are present in the thallus in almost all species of the Teloschistoideae and Xanthorioideae, but have been lost in various groups of the Caloplacoideae (Gaya *et al*. 2015), though they may be present in the apothecia of those lacking these chemicals in the thallus.

Most of the genera accepted in this treatment have at least some diagnostic features in morphological terms, but separating them with a simple dichotomous key is problematic. The table below lists the distinctive features of each genus, and that is followed by a key to species for the entire family. The generic accounts also include keys to their included species. Habitat features such as growth on bark or rock are generally useful aids to identification, but many saxicolous species may occasionally occur on

lignum, especially if in close proximity to the sea. Collections from such environments should be identified with caution.

Literature:
Fletcher & Laundon (2009), Arup *et al*. (2013), Bungartz *et al*. (2020), Gaya *et al*. (2012, 2015), Lücking *et al*. (2015), Schumm & Aptroot (2019), Søchting *et al*. (2014).

Genus	Diagnostic features	GBI species
Amundsenia	Thallus crustose, orange. Isidia and soralia absent. Apothecia sparse, dispersed, orange, with a well-developed excipular margin. Ascospores, small, with a short septum. Saxicolous, montane.	*approximata*
Athallia	Thallus crustose, mainly inconspicuous or very thin, one species lobate. Cortex, when developed, mostly amorphous. Isidia and soralia absent. Apothecia with a well-developed exciple; ascospores with a medium to long septum. Pycnidia orange but usually absent; conidia ellipsoidal.	*cerinella*, *cerinelloides*, *holocarpa*, *pyracea*, *scopularis*, *vitellinula*
Blastenia	Thallus crustose, white to dark grey or rarely orange; cortex poorly differentiated. Isidia and soralia absent. Apothecia orange to dark rusty brown or blackish, margin various, ascospores with a medium to long septum. Pycnidia present or absent, orange to dark rusty or black; conidia bacilliform to narrowly ellipsoidal. Habitat various.	*ammiospila*, *coralliza*, *crenularia*, *ferruginea*, *herbidella*, *lauri*
Calogaya	Thallus crustose, yellow to bright orange, usually with a well-developed lobate margin; cortex sometimes with an epinecral layer. Soralia or blastidia present or not. Apothecia mainly without a well-defined exciple. Ascospores with short to medium-long septum. Pycnidia often present, orange, with bacilliform to ellipsoidal conidia. On calcareous rocks, or siliceous rock in coastal habitats.	*decipiens*, *oblitterata*, *pusilla*
Caloplaca s. str.	Thallus crustose, dark grey to white. Several species with soredia, blastidia or isidia. Apothecia with a strongly reduced exciple, the disc yellow to orange; ascospores with a medium to long septum. Pycnidia dark grey; conidia bacilliform. Mostly corticolous or on plant debris.	*cerina, chlorina, monacensis*, *stillicidiorum*, *turkuensis*, *virescens*
Cerothallia	Thallus waxy, poorly developed, the bright orange apothecia initially ± immersed; soredia and isidia absent. Exciple not well-differentiated; ascospores ± small with narrow septa. Pycnidia not known. Corticolous.	*luteoalba*
Coppinsiella	Thallus crustose, inconspicuous or very thin, grey to yellow-green with pustulate crateriform soralia. Apothecia orange, without a well-developed thalline margin; ascospores with a medium to long septum. Pycnidia not known. On base-rich bark.	*ulcerosa*
Flavoplaca	Thallus crustose or squamulose, sometimes with effigurate margin or distinct lobes. Many species with soralia. Apothecia with a well-defined exciple; ascospores with a medium to long septum. Pycnidia sometimes present; conidia bacilliform to ellipsoidal. On calcareous or siliceous (then maritime) rocks.	*arcis, austrocitrina*, *calcitrapa*, *citrina*, *dichroa*, *flavocitrina*, *granulosa*, *itiana*, *limonia*, *marina*, *maritima*, *microthallina*, *oasis*, *ruderum*, *sol*
Gyalolechia	Thallus crustose, squamulose to lobate, sometimes large, yellowish to orange. Apothecia with a ± well-defined exciple (sometimes becoming excluded), orange to brownish orange; ascospores variable, aseptate or with a short to long septum, fusiform to pyriform. Pycnidia orange; conidia bacilliform to ellipsoidal. On soil over limestone or in sand dunes or grassland.	*bracteata*, *flavorubescens*, *flavovirescens*, *fulgens*

Haloplaca	Thallus crustose, sometimes with a slightly effigurate margin, yellow or greyish, often sorediate or granulate. Apothecia often lacking; when present orange-yellow to yellow. Thalline margin present, concolorous with the thallus, sometimes excluded; sometimes sorediate. Ascospores polarilocular with a medium to long septum. Conidia ellipsoidal to narrowly ellipsoidal. In maritime habitats.	*britannica*, *sorediella*, *suaedae*
Huneckia	Thallus crustose, thin or warted-areolate, grey or pale yellowish, Isidia present in some species, pale and coralloid. Apothecia sessile, the disc dark rust-brown to almost black. Thalline margin persistent or soon excluded, greyish. Exciple persistent, sometimes slightly flexuose, variously pigmented. Ascospores polarilocular, ellipsoidal to fusiform with a broad septum and thickened at the apices. Pycnidia not known. On acid bark, apparently extinct in GBI.	*pollinii*
Kuettlingeria	Thallus crustose, white or grey; blastidia, soredia, isidia, or minute lobules sometimes present. Apothecia with a thin exciple always present; thalline margin when present concolorous with the thallus, disc and exciple usually of different tinges of red and yellow, or black, grey or brown. Ascospores polarilocular, ellipsoidal with a fairly thick septum. Pycnidia grey-black, visible as dark dots on the thallus. Conidia bacilliform to subglobose. On calcareous or siliceous (then maritime) rocks.	*albolutescens*, *atroflava*, *ceracea*, *neotaurica*, *soralifera*, *teicholyta*
Leproplaca	Thallus leprose and non-corticate, or crustose to placodioid with a thin amorphous cortex, then sometimes with ± distinct marginal lobes, the surface composed of powdery yellowish or dull orange convex granules, sorediate in most species. Ascomata absent or rare, when present with a persistent thalline margin, the disc deep orange. Ascospores polarilocular, narrowly ellipsoidal. Conidiomata not known. On calcareous rocks.	*chrysodeta*, *cirrochroa*, *obliterans*, *xantholyta*
Marchantiana	Thallus crustose, pale grey, glossy, sometimes reduced to small, dark greenish to dark brown areoles. Vegetative propagules not produced. Apothecia with thalline margin grey to blackish-brown, paler than the disc. Disc dull brownish orange to rust-red, sometimes becoming blackish. Ascospores variable in shape, ± ellipsoidal, sometimes ± curved, with narrow septa. Conidiomata not known. Corticolous, on twigs.	*asserigena*
Olegblumea	Thallus lobate, distinctly rosette-like, upper surface brown to brownish grey; lobes flat to subconvex, very narrow; soralia laminal, convex; soredia irregularly rounded, brown to brownish green; Chemistry: vicanicin and caloploicin.	*demissa*
Polycauliona	Thallus fruticose, foliose or crustose, sometimes with lobate margins; cortex varied in structure. Apothecia yellow to orange with a distinct thalline margin; spores polarilocular with a short to long septum. Pycnidia present in many species; conidia narrowly to broadly ellipsoidal or citriform.	*candelaria*, *polycarpa*, *ucrainica*, *verruculifera*
Pyrenodesmia	Thallus crustose, epilithic or endolithic, white, grey or brownish. Vegetative propagules (blastidia, soredia, minute granules and lobules, or pustulate outgrowths) present in some species. Apothecia various and sometimes appearing lecanorine. Thalline margin concolorous with the thallus. Disc and exciple brown, grey or black. Ascospores polarilocular with a thin to thick septum. Conidiomata pycnidia, grey or black. Conidia bacilliform to subglobose. On calcareous rock (hard limestones).	*alociza*, *chalybaea*, *variabilis*

Rufoplaca	Thallus crustose, pale to dark grey, or absent. Vegetative propagules absent. Apothecia orange to rusty red. Thalline margin absent or inconspicuous. Exciple prominent, persistent, sometimes raised above the disc, often paler than the disc. Ascospores polarilocular with a short to medium-long septum. Conidia bacilliform to narrowly ellipsoidal. On siliceous rocks.	*arenaria*, *subpallida*
Rusavskia	Thallus foliose, distinctly lobate with narrow, convex lobes, often with pseudocyphellae, partly attached with very short hapters. Soralia and isidia absent. Apothecia discoid, sessile, orange. Thalline margin present but narrow and sometimes becoming excluded. Ascospores ellipsoidal, polarilocular with medium septa. Pycnidia immersed. Conidia narrowly to broadly ellipsoidal. On calcareous and nutrient-enriched rocks.	*elegans*
Sanguineodiscus	Thallus crustose, white to dark grey. Vegetative propagules absent. Apothecia sometimes appearing lecanorine, with a thin exciple always present. Disc dark to pale red. Thalline margin the same colour as the thallus. Exciple orange to red, but its outer rim often grey, darker than the thallus and thalline margin. Ascospores polarilocular, ellipsoidal, with a thick long septum. Pycnidia grey-black. Conidia bacilliform. On bark or maritime rocks	*aractinus*, *haematites*
Scythioria	Thallus crustose, areolate or immersed in bark or rock, greenish white to bright yellow, richly sorediate, cortical layer composed of isodiametric cells, usually poorly developed. Apothecia at first with a thalline margin that is sometimes sorediate, later becoming excluded. Exciple composed of intertwined hyphal tissue. Chemistry: with or without anthraquinones (K± purple).	*phlogina*
Solitaria	Thallus immersed, or as a thin grey film. Soralia bright yellow-orange, flat to convex, erose to superficial; soredia farinose to minutely granular. Apothecia rare, absent in Britain; thalline margin sometimes present, yellow, sorediate; exciple well-developed; disc orange. Ascospores ellipsoidal, the septum thick. On bark.	*chrysophthalma*
Squamulea	Thallus crustose and areolate to squamulose, yellow to orange, often on a black prothallus. Asexual propagules lacking. Apothecia orange with a paraplectenchymatous exciple present, often together with a thin thalline margin. Ascospores polarilocular, ellipsoidal, with a medium to long septum. Pycnidia orange, conidia narrowly ellipsoidal to bacilliform. On rocks.	*subsoluta*
Teloschistes	Thallus shrubby, lobes terete to somewhat flattened and dorsiventral, sparingly to richly branched, often with fibrils or cilia, attached by a basal holdfast, or adhering by contact or entanglement; rhizines absent; bright yellow-orange, sometimes pale below. Soralia sometimes present. Apothecia with a persistent thalline margin, sometimes ciliate. Disc yellow to orange. Ascospores ellipsoidal, polarilocular. Pycnidia deep orange-red, immersed, usually multilocular. Conidia rod-shaped. Terricolous or on bark or twigs.	*chrysophthalmos*, *flavicans*
Variospora	Thallus crustose, large, bright yellow-orange to orange, placodioid, the lobes closely appressed, sometimes pruinose, the centre coarsely areolate. Vegetative propagules not produced. Apothecia often crowded. Thalline margin distinct at first but sometimes becoming excluded, yellow-orange. Disc flat at first, often becoming domed with age, orange to orange-brown. Ascospores polarilocular, swollen at the septum and typically lemon-shaped, the septum very variable in thickness. Conidiomata pycnidia, orange. Conidia bacilliform to ellipsoidal. On calcareous, or siliceous maritime rock.	*aurantia*, *flavescens*, *thallincola*

Xanthocarpia	Thallus usually reduced, inconspicuous or granular, yellow or rarely pale grey. Soredia and blastidia mostly absent. Apothecia yellow to red with a thalline margin that may be enlarged and crenulate in some species. Ascospores ellipsoidal, long and narrow, polarilocular (with three divisions in one species), the septa narrow, at least when mature. Conidia ellipsoidal or shortly bacilliform. On calcareous rock, concrete etc.	*crenulatella*, *diffusa*, *fulva*, *ochracea*
Xanthomendoza	Thallus foliose, or rarely crustose with well-developed marginal lobes. Rhizines often present on the lower surface, but in some species sparse or absent. Blastidia often well-developed but soralia and isidia absent. Apothecia laminal. Thalline margin well-developed, sometimes developing lobules with age. Ascospores polarilocular, narrowly ellipsoidal to ellipsoidal with medium to long septa. Conidia long, bacilliform to narrowly ellipsoidal. On bark, stone and human-made substrata.	*fulva*, *oregana*, *ulophyllodes*
Xanthoria	Thallus yellow-orange, subfruticose to foliose, horizontal or partly ascending, lobate, not pruinose, the underside pale, smooth, usually with attachment discs covering extensive areas of the central thallus (hapters). Isidia and soralia occur in some species. Apothecia laminal; disc smooth, orange. Thalline margin present, outer surface smooth, ± roughened, or ridged. Ascospores polarilocular, ellipsoidal. Pycnidia immersed in hemispherical warts, multilocular. Conidia ellipsoidal or bacilliform.	*aureola*, *calcicola*, *parietina*

1 Thallus foliose or crustose to squamulose 2
Thallus fruticose 108

2(1) Thallus foliose 3
Thallus crustose to squamulose 12

3(2) Thallus lobes narrow (<0.5 mm) and short (<10 mm), usually ascending or loosely attached; often with pale, true rhizines below 4
Thallus lobes often wide (>1 mm) or long (>10 mm) and wide-spreading, attached by hapters; appressed except at the tips 8

4(3) Lobes subfruticose, ± terete, <0.3 mm wide; rhizines absent; fertile or not .....***Polycauliona candelaria***
Lobes dorsiventral, foliose, >0.3 mm wide; rhizines present or sparse; rarely fertile 5

5(4) Upper cortex yellow-green to grey in the central part of the thallus or lobes; rhizines scarce or absent; conidia ellipsoidal, 2.2–2.5 × 1.2–1.5 µm ..... ***Polycauliona ucrainica***
Upper cortex yellow-orange-red, evenly pigmented; rhizines present; conidia rod-shaped (bacilliform), 3.7–4 × *ca* 1 µm 6

6(5) Thallus rosette-forming; marginal lobes horizontal, adpressed (central lobes can be raised); conidia bacilliform ..... ***Xanthomendoza ulophyllodes***
Thallus not rosette-forming; often several thalli confluent, lobes irregular; conidia bacilliform or ellipsoidal-bacilliform..... 7

7(6) Thallus dull to dark orange; lobe tips rounded, mostly unbranched; pycnidia prominent, darker than the upper cortex; conidia bacilliform .....***Xanthomendoza fulva***
Thallus bright yellow to light orange; lobe tips irregular, with fine branchlets; pycnidia immersed, concolorous with the upper cortex; conidia variable in shape, ellipsoidal to bacilliform .....***Xanthomendoza oregana***

8(3) On rock; lobes deep orange-red, closely appressed to tips, placodioid, <1.5 mm wide, not widened at the tips ..... ***Rusavskia elegans***
On bark or rock; lobes yellow-orange, foliose, loosely appressed at the tips, >1.5 mm wide, sometimes widened to 3–7 mm at the tips..... 9

9(8) Thallus small, <3 cm diam., of compact convex cushions, abundantly fertile; usually on small twigs ..... ***Polycauliona polycarpa***
Thallus large, 15 cm or more in diam., wide-spreading, fertile or not; on bark, branches or rocks 10

10(9) Lobes deep orange, with abundant coarse irregular knob-like isidia; apothecia few or absent, the outer margin roughened ..... ***Xanthoria calcicola***
Lobes yellow-orange, lacking isidia; sometimes fertile; outer margin of apothecia smooth 11

11(10) Lobes 1.5–3 mm wide, strap-shaped, scarcely overlapping near the apices, usually sterile; on coastal rocks ..... ***Xanthoria aureola***
Lobes 3–7 mm wide, broadened at the tips, ± overlapping, rounded, usually abundantly fertile; on base-rich tree bark or nutrient-enriched or coastal rocks ..... ***Xanthoria parietina***

12(2) Thallus usually pale yellow, squamulose or of discrete to contiguous convex areoles; on calcareous substrata, mainly soil; ascospores not polarilocular 13
Thallus varied, crustose or squamulose, on various substrata; ascospores polarilocular 14

13(12) Thallus warty-scaly, the marginal lobes not or only weakly differentiated, composed of dispersed groups and islands of areoles; ascospores mostly broadly ellipsoidal, 4–7 µm diam. ***Gyalolechia bracteata***
Thallus placodioid, the marginal lobes clearly differentiated; central part of the thallus ± continuous; ascospores ellipsoidal to pyriform, 3.5–5 µm diam. ..... ***Gyalolechia fulgens***

14(12) Isidia, blastidia or soredia present, or the thallus leprose 15
Vegetative propagules not produced, thallus entirely corticate (occasionally endolithic) 53

15(14) Isidia or blastidia present 16
Sorediate or leprose 26

16(15) On bark 17
On rock 18

17(16) Cortex white or grey, K± pale violet; isidia white-grey, ± nodulose, obscuring the thallus ..... ***Blastenia herbidella***
Cortex light beige to orange (rarely grey or green), isidia usually coralloid ..... ***Blastenia coralliza***

18(16) Soredia/blastidia blue-grey, ± spherical, poorly differentiated, on a dark grey areolate thallus ..... ***Caloplaca chlorina***
Thallus and isidia yellow or orange 19

19(18) Placodioid, marginal lobes mostly >2 mm long 20
Crustose or merely effigurate at the margins, lobes <1 mm long 21

20(19) Cortex bright yellow-orange, not pruinose; marginal lobes (1–) 2–3 mm long, concolorous with the rest of the thallus ..... ***Flavoplaca granulosa***
Cortex green-yellow, pruinose; marginal lobes 6–7 mm long, usually paler than the rest of the thallus..... ***Polycauliona verruculifera***

21(19) Thallus of isidium-like lobules, scattered; often on or overgrowing *Hydropunctaria maura* s.l. ..... ***Flavoplaca microthallina***
Thallus crustose; not associated with *Hydropunctaria maura* 22

22(21) Isidia finger-like; thallus deep yellow-orange, in sheltered crevices; xeric-supralittoral . ***Caloplaca littorea***
Isidia globose or in chains (blastidia); thallus pale yellow to orange; xeric-supralittoral or terrestrial 23

23(22) Coastal (mesic-supralittoral); isidia coarse, irregular-globose, numerous and often in mounds ± obscuring the thallus .....***Haloplaca britannica***
Not coastal; isidia (blastidia) forming short chains, at the margins of areoles 24

24(23) Thallus bright yellow to orange 25
Thallus lemon-yellow to green-yellow.....***Flavoplaca limonia***

25(24) Blastidia 30–60 µm diam., disintegrating into sparse soredia; ascospore lumina hour-glass-shaped, wall 1.2–2 µm thick .....***Flavoplaca dichroa***
Blastidia 50–100 µm diam.; areoles 0.5–2 mm across, convex; ascospores with angular walls, <1 µm thick ..... ***Flavoplaca arcis***

26(15) Thallus and/or soredia yellow to orange, K+ purple 27
Thallus and soredia white, grey, blue-grey or green, K- or rarely pale violet 44

27(26) Thallus placodioid, lobes >3 mm long 28
Thallus crustose or merely effigurate at the margins, lobes <1 mm long 30

28(27) Thallus grey to brownish, sometimes white-pruinose, K– .....***Olegblumea demissa***
Thallus green-orange to orange-brown, K+ purple 29

29(28) Soralia marginal or sometimes terminal, lip-shaped on short lobes, concolorous with the thallus; thallus deep green-orange, lobes 0.5–1.0 mm wide, pruinose .....***Calogaya decipiens***
Soralia laminal, circular, yellow and paler than the deep orange-brown thallus, lobes 0.2–0.5 mm wide .....***Leproplaca cirrochroa***

30(27) Thallus entirely sorediate, or leprose 31
Thallus corticate, at least at the margins (sometimes indistinctly so) 34

31(30) Thallus effigurate-lobate at the margin, soft-textured; always on calcareous substrata .....***Leproplaca xantholyta***
Thallus not effigurate at the margin, not soft-textured; on calcareous or other substrata 32

32(31) Thallus yellow-green, granular-sorediate, usually cracked into wide areoles, often fertile .....***Flavoplaca citrina***
Thallus mustard or brown-orange, of leprose granules, not cracked into areoles, always sterile 33

33(32) Thallus mustard-coloured; usually saxicolous .....***Leproplaca chrysodeta***
Thallus brown-orange; corticolous .....***Caloplaca borreri***

34(30) Thallus indistinctly corticate, not sorediate but sometimes reduced to granules .....***Flavoplaca calcitrapa***
Thallus sorediate 35

35(34) Soredia on margins of corticate areoles 36
Soredia laminal on the surface of areoles 38

36(35) Thallus areolate (rarely squamulose), to *ca* 250 µm thick, old thalli usually entirely covered by soredia; mainly on concrete ..... ***Flavoplaca austrocitrina***
Areoles/squamules smaller, to 180 µm thick; thallus usually not forming an entire sorediate crust 37

37(36) Soredia covering 10–50% of the thallus, mainly on slightly raised areole margins, granules 25–50 µm diam., pale yellow contrasting with the more orange thallus, areole surface usually flat; apothecia adnate, thalline margin not sorediate; average ascospore length 10–12 µm ..... ***Flavoplaca flavocitrina***
Thallus completely sorediate; granules 30–60 µm diam., soredia concolorous with the green-yellow thallus; areoles becoming convex, sometimes squamulose; apothecia sessile; thalline margin sorediate; average ascospore length 11–14 µm ..... ***Flavoplaca citrina***

38(35) Thallus yellow to orange 39
Thallus orange-brown or grey 40

39(38) Thallus to 300 (–550) µm thick, dull to bright green-yellow, sometimes with minute marginal lobes, sorediate; soredia coarse, mostly *ca* 100 µm diam.; old thalli may form a thick, entirely sorediate crust ..... ***Flavoplaca limonia***
Thallus to 150 (–210) µm thick, yellow or orange, without marginal lobes, areoles ± entirely sorediate/blastidiate, vegetative diaspores smaller, <60 µm diam., usually both orange and yellow thallus morphs present ..... ***Flavoplaca dichroa***

40(38) Cortex orange-brown, areoles sometimes scattered on an orange to white prothallus ..... ***Leproplaca obliterans***
Cortex white-grey or filmy, areoles contiguous 41

41(40) Areoles bullate, white to pale grey; soralia tiny, punctiform, bright golden yellow, sometimes in extensive sheets; on dead plant stems or coastal rock ..... ***Haloplaca sorediella***
Areoles flat or thallus filmy, pale grey; soralia punctiform or irregular, green to orange; on bark; usually terrestrial 42

42(41) Thallus immersed in bark, inconspicuous; soralia ulcer-like, round, dense, brown to green-orange; always sterile ..... ***Caloplaca lucifuga***
Thallus ± superficial; soralia punctiform or irregularly spreading, yellow; sometimes fertile 43

43(42) Soralia pale yellow-green, irregular; thallus thin, pale white-grey to green or pale yellow; sometimes with apothecia ..... ***Scythioria phlogina***
Soralia bright yellow-orange, crowded, flat to convex; thallus inconspicuous, very thin, pale grey; apothecia unknown in Britain & Ireland ..... ***Solitaria chrysophthalma***

44(26) Thallus placodioid or lobate-effigurate, thick; coarsely sorediate, forming conspicuous white-grey orbicular patches; on calcareous rocks, esp. in churchyards ..... ***Kuettlingeria teicholyta***
Thallus crustose, not lobate-effigurate; soredia usually discrete, spreading; on various substrata 45

45(44) On rock 46
On bark 48

46(45) Apothecia with a well-developed persistent thalline margin; thallus with very fine soredia/blastidia ..... ***Caloplaca chlorina***
Thalline margin absent or poorly developed; thallus sorediate 47

47(46) On siliceous rock; soralia on margins of areoles; thallus grey ..... ***Kuettlingeria soralifera***
On calcareous or base-rich rock; soralia scattered or absent; thallus white to pale grey ..... ***Kuettlingeria albolutescens***

48(45) Soredia coarsely granular, forming a thick crust, ± blue-tinged ..... ***Caloplaca virescens***
Soredia fine, often in vesicles, not or sometimes blue-tinged 49

49(48) Soredia blue-grey, K+ mauve-purple, N+ violet 50
Soredia grey-green, green or green-yellow, derived from eroded, pimple-like vesicles; K–, N– 51

50(49) Soralia crateriform, to *ca* 150 µm diam. ..... ***Caloplaca ahtii***
Soralia ± superficial, often diffuse and coalescing to form extensive patches ..... ***Caloplaca turkuensis***

51(49) Apothecia brown; soredia grey-green ..... ***Caloplaca obscurella***
Apothecia orange/red; soredia pale green-yellow to bright green 52

52(51) Soralia dark-pigmented, splitting open and retaining the upper wall as a lid-like structure; soredia bright green ..... ***Caloplaca alstrupii***
Soralia concolorous with the thallus, the upper wall falling away; soralia pale to bright yellow-green ..... ***Coppinsiella ulcerosa***

53(14) On mosses or plant detritus 54
On rock, bark, *Suaeda* stems or wood 57

54(53) Thallus obvious, scurfy, green-grey; disc green-orange; widespread ..... ***Caloplaca stillicidiorum***
Thallus white to grey; disc red-brown; montane and/or in the far north 55

55(54) Thalline margin absent or inconspicuous; disc not pruinose, rust-red to brown-orange 56
Thalline margin present, pale to dark grey; disc pruinose; ascospores long and narrow (25–30 × 3–5 µm) with an indistinct septum ..... ***Caloplaca nivalis***

56(55) Apothecia 0.2–0.6 (–0.8) mm diam., sessile; ascospores 9.5–13 × 5–5.5 µm ..... ***Caloplaca caesiorufella***
Apothecia to 1.5 mm diam., slightly stipitate or with the base incised, ascospores (12–) 15–18 × 6–8 µm ..... ***Blastenia ammiospila***

57(53) On bark or *Suaeda* stems 58
On rock or wood 70

58(57) Cortex pale yellow, K+ purple ..... ***Gyalolechia flavorubescens***
Cortex white to grey, K- (in *Athallia* spp. may be yellowed around the apothecia) 59

59(58) Thalline margin thick (sometimes becoming thin when old) 60
Thalline margin absent 62

60(59) Thalline margin thick, flexuose; disc yellow-orange to yellow-green; ascospore septum 1/3–1/2 length of spore, ascospores 12–15 µm long 61
Thalline margin thin when old, not flexuose; apothecia red-brown; ascospore septum 1/4–1/2 length of spore, ascospores 11–14 µm long ..... ***Sanguineodiscus haematites***

61(60) Thallus ± smooth or warted, without granules; apothecia rarely pruinose ..... ***Caloplaca cerina***
Thallus granular; apothecia sometimes pruinose ..... ***Caloplaca monacensis***

62(59) Disc yellow-orange to bright orange or rust-red 63
Disc dark brown or black 69

63(62) Apothecia immersed at first, becoming crowded and convex, deep orange; ascospore septum 1/8 length of spore ..... ***Cerothallia luteoalba***
Apothecia sessile when young, disc flat, often pale yellow; ascospore septum 1/4 or more length of spore 64

64(63) Areoles spreading at thallus margin, effigurate, thick, grey; ascospores usually curved; on stems of *Suaeda maritima* in saltmarshes ..... ***Haloplaca suaedae***
Areoles effuse; ascospores straight, ellipsoidal 65

65(64) Ascospores 12-16 per ascus; apothecia pale yellow, circular ..... ***Athallia cerinella***
Ascospores 8 per ascus; apothecia yellow or orange-brown, sometimes ± angular 66

66(65) Apothecia pale yellow, circular ..... ***Athallia cerinelloides***
Apothecia deep yellow-orange, crowded-angular 67

67(66) Apothecia with a narrow yellowish and often flexuous thalline margin, visible at least when young; pycnidia not known ..... ***Athallia pyracea***
Apothecia with a raised ± concolorous exciple but no visible thalline margin; pycnidia often present, red-walled 68

68(67) Ascospores (13.5–) 14.5–17.5 (–19) µm long; northern distribution ..... ***Blastenia lauri***
Ascospores (11–) 13–14.5 (–17) µm long; southern England ..... ***Blastenia ferruginea***

69(62) Apothecia to 1 mm diam., the disc brown-black, convex..... ***Huneckia pollinii***
Apothecia 0.2–0.4 mm diam., the disc rust-red or red-brown, ± flat..... ***Marchantiana asserigena***

70(57) Thallus immersed in lignum, white; apothecia red-brown, flat, with a concolorous or indistinct margin; ascospores 9–13 µm long ..... ***Caloplaca caesiorufella***
Thallus usually on rock, if on lignum, apothecia not flat and red-brown 71

71(70) Cortex yellow-orange, K+ purple (the thallus sometimes inconspicuous) 72
Cortex white or grey, K- (disc and/or exciple sometimes K+ purple) 97

72(71) Thallus placodioid-lobate 73
Thallus crustose (rarely granular) 80

73(72) Thallus lobes 2–10 mm long; ascospores ± lemon-shaped, swollen around the septum 74
Thallus lobes <2 mm long; ascospores ellipsoidal, not swollen at the septum 76

74(73) Thallus lobes widening to *ca* 3 mm at the tip, flat and appressed, egg yolk-yellow, usually radiating with concentric white-pruinose zones ..... ***Variospora aurantia***
Thallus lobes widening to *ca* 1 mm at the tip, convex, orange, whitened only through abrasion 75

75(74) Thallus lobes 3–7 mm long, deep yellow-orange, not pruinose; on siliceous rocks, coastal (mesic-supralittoral) ..... ***Variospora thallincola***
Thallus lobes 2–5 mm long, pale yellow to pale orange, ± faintly pruinose; on calcareous rocks, coastal (xeric-supralittoral) and terrestrial ..... ***Variospora flavescens***

76(73) Marginal lobes isodiametric, prothallus often blackened; on coastal rocks, rarely on timber and metalwork (mesic-supralittoral) ..... ***Flavoplaca marina***
Marginal lobes 2–5 times longer than wide, not blackened; on terrestrial rocks 77

77(76) Lobes minute, <0.5 × 0.1 mm, fringing a granular-areolate thallus; sometimes lichenicolous or overgrowing *Baglietoa* species ..... ***Flavoplaca oasis***
Lobes 1 × 0.3 mm or more; thallus lobate, radiating from the centre; not overgrowing lichens 78

78(77) Lobes yellow, white-pruinose, turgid, around twice as long as broad (0.3–0.5 × 0.25–1.5 mm); on calcareous rocks, usually inland ..... ***Calogaya pusilla***
Lobes deep orange, not pruinose, not turgid, 4–5× as long as broad; on siliceous rocks, usually coastal ..79

79(78) Lobes *ca* 1 × 0.25 mm, loosely appressed just short of the tip; not on bird perches .... ***Calogaya oblitterata***
Lobes 2–3 × *ca* 0.5 mm, closely appressed throughout; on bird perches ..... ***Athallia scopularis***

80(72) Thallus dull, felt-like, scarcely cracked (sometimes ± endolithic); always on calcareous substrata.....81
Thallus shiny, areolate or verrucose; on calcareous or siliceous rocks 83

81(80) Ascospores two-celled; apothecia with a distinct yellow thalline margin, to 0.8 mm diam. 82
Ascospores four-celled, 12–15 × 5–7 µm; apothecia without a thalline margin, *ca* 0.5 mm diam.; thallus smooth, felted, matt-textured ..... ***Xanthocarpia ochracea***

82(81) Thallus finely areolate, ± shiny, yellow, sometimes intersected with fine black lines ..... ***Flavoplaca itiana***
Thallus endolithic or thin and discontinuous ..... ***Flavoplaca calcitrapa***

83(80) Thallus irregular, granular 84
Thallus ± evenly crustose or areolate 85

84(83) Thallus pruinose, of heaped convex warty granules; thalline margins thick ..... ***Flavoplaca ruderum***
Thallus not pruinose, areolate or bullate but often poorly developed ..... ***Flavoplaca calcitrapa***

85(83) Ascospores with ± pointed ends, the septum narrow (ca 1/8 length of spore) 86
Ascospores with rounded ends, septum 1/4–1/2 length of spore 87

86(85) Thallus margin diffuse, often with a pale prothallus; thalline margin often crenulate ***Xanthocarpia diffusa***
Thallus thin and rimose, sometimes reduced to isolated areoles surrounding the ± round apothecia ..... ***Xanthocarpia crenulatella***

87(85) Thallus mesic-supralittoral among *Hydropunctaria* spp. and *Lecanora helicopis*, warted-areolate with deep cracks, deep orange, with isodiametric lobes at the margin ..... ***Flavoplaca marina***
Thallus xeric-supralittoral or terrestrial 88

88(87) Thallus poorly developed, often ± endolithic 89
Thallus well-developed 93

89(88) Ascospore septum very thin, less than 1/4 of the spore length 90
Ascospore septum more than 1/4 of the spore length, with a distinct channel 91

90(89) Mainly on slate, siliceous stone, or slightly calcareous rocks; ascospores 8–13 × 3–6 µm ..... ***Amundsenia approximata***
On limestone, mortar and concrete; ascospores 15–20 × 6–10 µm ..... ***Xanthocarpia crenulatella***

91(89) Thallus inconspicuous, occurring around the apothecia only; apothecia 0.3–0.7 (−1) mm diam.; mean of spore septum length >4 µm ..... ***Athallia holocarpa***
Thallus yellow, usually visible but thin, continuous or of scattered areoles; apothecia 0.2–0.5 mm diam.; mean of spore septum length <4 µm 92

92(91) Apothecia orange to dark orange, usually abundant and crowded; on limestone, mortar and concrete; sometimes parasitic on *Baglietoa* spp. ..... ***Flavoplaca oasis***
Apothecia yellow to orange, usually scattered; on siliceous rocks or sometimes calcareous rocks, wood or bark, never parasitic ..... ***Athallia vitellinula***

93(88) Thallus very thick, rimose, pale yellow to greenish; apothecia deep yellow-orange; on calcareous substrata ..... ***Caloplaca flavovirescens***
Thallus thin to thick, areolate; mostly on siliceous rocks 94

94(93) Areoles widely scattered; prothallus black ..... ***Squamulea subsoluta***
Areoles contiguous; prothallus orange or inconspicuous 95

95(94) Thallus deep red-orange, with a yellow-orange, filmy prothallus; apothecia concolorous with the thallus; ascospores 4–6 µm diam. ..... ***Calogaya oblitterata***
Thallus yellow- to bright orange; apothecia distinctly darker than the thallus; ascospores usually broader 96

96(95) Thallus bright orange; areoles convex, often becoming isolated as the thallus ages; young apothecia often with a yellow crenulate thalline margin projecting beyond the exciple; maritime, usually in the splash zone ..... ***Flavoplaca maritima***
Thallus yellow-orange; areoles convex, remaining contiguous; thalline margin poorly developed; coastal but not in the splash zone, on dry sunny rocks ..... ***Flavoplaca sol***

97(71) Disc black when dry 98
Disc yellow, orange or rust-coloured when dry 101

98(97) On siliceous rock; apothecia sessile, disc black, turning rust-coloured when wet ..... ***Caloplaca concilians***
On calcareous rock; apothecia often immersed, disc unchanged in colour when wet 99

99(98) Apothecia sessile; thallus thin ..... ***Pyrenodesmia variabilis***
Apothecia immersed in rock; thallus thin or thick 100

100(99) Thallus thick, epilithic; ascospore septum *ca* 1/3 length of spore ..... ***Pyrenodesmia chalybaea***
Thallus immersed; ascospore septum 1/6-1/9 length of spore ..... ***Pyrenodesmia alociza***

101(97) Ascospore septum <1/8 length of spore ..... ***Xanthocarpia fulva***
Ascospore septum >1/8 length of spore 102

102(101) Thalline margin persistent, grey; on siliceous or serpentine rock ..... ***Sanguineodiscus aractinus***
Thalline margin inconspicuous or absent in mature apothecia, often with a conspicuous excipular rim ± concolorous with or paler than the disc 103

103(102) Disc pruinose, orange, turning green when wet, waxy-textured ..... ***Kuettlingeria ceracea***
Disc not pruinose, not turning green when wet, not waxy 104

104(103) Thallus grey and well-developed; apothecia dark red, brown-red to rust-coloured.....105
Thallus absent, poorly developed or if well-developed dark grey and disc orange with orange-yellow margin 106

105(104) Pycnidia deep red, often copiously covering the thallus ..... ***Blastenia crenularia***
Pycnidia grey, usually visible as darker spots on the thallus ..... ***Kuettlingeria neotaurica***

106(104) Thallus of convex warts; apothecia orange with a clearly paler, yellow-orange margin; spore septum 1/3 to 1/2 the spore length..... ***Kuettlingeria atroflava***
Thallus inconspicuous (endolithic) or cracked-areolate; apothecia mid orange to rust-coloured with a concolorous margin; spores septum less than 1/4 the spore length.....107

107(106) Apothecia red-orange; thallus usually inconspicuous, endolithic..... ***Rufoplaca arenaria***
Apothecia mid orange; thallus relatively well-developed, cracked-areolate ..... ***Rufoplaca subpallida***

108(1) Thallus forming small compact clumps to 2 cm diam., of flattened to ± terete radiating lobes 109
Thallus forming lax, entangled clumps 3–10 cm diam., of ± terete, slender branches; soralia present; apothecia not observed in British or Irish material ..... ***Teloschistes flavicans***

109(108) Thallus almost always fertile, soralia and blastidia absent, thallus lobes and apothecia with conspicuous marginal fibrils ..... ***Teloschistes chrysophthalmos***
Thallus often without apothecia, with farinose to minutely granular blastidia on the edge of the lobes; marginal fibrils absent ..... ***Polycauliona candelaria***

AMUNDSENIA Søchting, Garrido-Benavent, Arup & Frödén (2014)

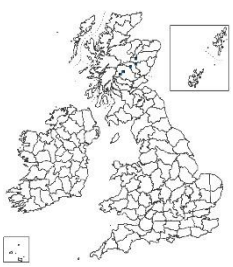
Thallus saxicolous, crustose, yellow to orange, usually poorly developed and reduced to squamule-like areoles. **Isidia, soredia** and **blastidia** absent. **Apothecia** bright yellow-orange to orange, thalline margin absent, exciple well-developed and raised above the disc. **Asci** 8-spored, clavate, *Teloschistes*-type. **Ascospores** polarilocular with a narrow septum. **Conidiomata** not known. **Chemistry**: Apothecia and thalli K+ purple, containing parietin (dominant) and small proportions of teloschistin, fallacinal, parietinic acid and emodin (Søchting *et al*. 2014). **Ecology**: on base-rich rocks.

Two species are known, one with a primarily arctic distribution and the other from Antarctica. The genus forms a monophyletic clade within the subfamily Xanthorioideae (Søchting *et al*. 2014), and is close in morphological terms to *Athallia* and *Flavoplaca* but the ascospores have narrow rather than broad septa.

Literature:
Hansen *et al*. (1987), Fletcher & Laundon (2009), Søchting *et al*. (2014).

Amundsenia approximata (Lynge) Søchting, Arup & Frödén (2014) **NT**

Caloplaca approximata (Lynge) H. Magn. (1946)



Thallus crustose, yellow-orange, of poorly developed squamule-like areoles. Apothecia to 0.5 mm diam., conspicuous, numerous, closely scattered, bright orange, persistently flat; with an ± elevated, regular exciple; paraphyses mostly unbranched, the cells only slightly enlarged towards the tips. Ascospores variable, mostly small and narrow, 9–11 (–13) × (3–) 3.5–4.5 (–6) µm, occasionally shorter and broader, then *ca* 8 × 5 µm, the septum 1 (–2) µm thick. Thallus and apothecia K+ purple. **BLS 1591**.

Below overhanging base-rich schist and limestone above 600 m; rare. C. Scotland (Ben Lawers, Blair Atholl, Caenlochan).

Closely resembles *Athallia* spp. (the old *Caloplaca holocarpa* agg.) but has a poorly developed yellow thallus and the ascospores are mostly narrower with a septum only about 1 µm thick, with an indistinct channel, thus appearing 1-septate rather than polarilocular. According to Hitch *et al*. (2009) this species may have a black prothallus, but it seems likely that this is due to cyanobacteria developing around the areoles.

ATHALLIA Arup, Frödén & Søchting (2013)

Thallus crustose, yellowish to grey, thin and usually poorly developed, one species with a well-developed lobate thallus, sometimes reduced to a dark prothallus. **Cortex** mostly an amorphous layer or consisting of indistinct isodiametric cells amongst dead algae. **Isidia, soredia** and **blastidia** absent. **Apothecia** with a narrow thalline margin and a distinguishable exciple, generally bright orange. **Asci** 8-spored, clavate, *Teloschistes*-type. **Ascospores** polarilocular with a broad septum. **Conidiomata** pycnidia, orange where present but usually absent. **Conidia** ellipsoidal. **Chemistry**: Thallus and apothecia K+ purple; parietin (dominant), with small proportions of teloschistin, fallacinal, parietinic acid and emodin. **Ecology**: on bark, wood and various rock types.

Athallia is characterized in general by a poorly developed thallus. Some species of *Flavoplaca* are difficult to distinguish in morphological terms, but tend to have better-developed thalli and are often sorediate or blastidiate. Species of those genera were included in the *Caloplaca holocarpa* group by Arup (2009). According to Arup *et al*. (2013) the genus is monophyletic, but its relationships with other groups in the Xanthorioideae needs further examination.

Caloplaca scopularis (Nyl.) Lettau was transferred to *Athallia* by Arup *et al*. (2013), although it has a better-developed thallus and different cortical anatomy compared with other members of that genus.

Literature

Arup (2009), Arup *et al*. (2013), Fletcher & Laundon (2009), Vondrák *et al*. (2012a, 2016b).

1 On siliceous and/or nutrient-enriched rock 2
On wood and bark 4

2(1) Thallus with well-developed lobes, maritime ..... ***scopularis***
Thallus without lobes, inconspicuous or thin, not maritime 3

3(2) Thallus inconspicuous, occurring around the apothecia only; apothecia 0.3–0.7 (−1.0) mm diam.; spore septum usually > 4 µm thick. ..... ***holocarpa***
Thallus yellow, usually visible but thin, continuous or of scattered areoles; apothecia 0.2–0.5 mm diam.; spore septum usually < 4 µm thick ..... ***vitellinula***

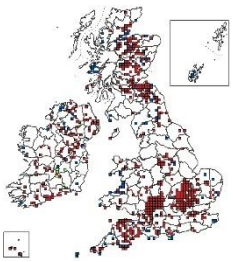
4(1) Ascospores 12–16 per ascus; apothecia pale yellow, circular ..... ***cerinella***
Ascospores 8 per ascus; apothecia yellow or orange-brown, sometimes ± angular 5

5(4) Thallus usually visible as low, slightly convex areoles; areoles greyish to pale orange; apothecia 0.5–1 mm diam., usually with a thin thalline margin ..... ***pyracea***
Thallus usually inconspicuous, greyish to yellow; apothecia 0.2–0.6 (−1.0) mm diam.; thalline margin not conspicuous 6

6(5) Apothecia 0.2–0.4 mm, pale yellow; hypothecium 10–45 µm thick ..... ***cerinelloides***
Apothecia 0.3–0.6 (−1.0) mm, orange-yellow; hypothecium 50–80 µm thick ..... ***holocarpa***

Athallia cerinella (Nyl.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca cerinella (Nyl.) Flagey (1896)



Thallus crustose, white to grey, thin, smooth and non-corticate, dried specimens developing crystals on the surface and appearing waxy, often almost immersed, or in small patches among other lichens. Apothecia to 0.3 mm diam., closely grouped or contiguous; exciple persistent, pale to yellow; discs flat, pale yellow to orange, rarely deeper orange; paraphyses with broad tips, to 6 µm diam. Asci (8-) 12- to 16-spored. Ascospores 10–13 × 6–7 µm, ellipsoidal, septum 3–5 µm thick, mostly 1/4–1/2 of the length of the ascospore. Thallus K–; apothecial margin and discs K+ purple. **BLS 0242**.

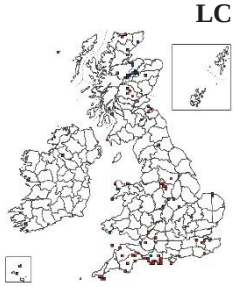
On bark, especially twigs and small branches of *Fraxinus* and *Sambucus nigra* in nutrient-rich communities, especially the *Xanthorion*; once considered scarce but probably overlooked and with many recent records. Throughout Britain and Ireland.

A tiny, inconspicuous but distinctive species occurring in small patches, often intermingled with *Lecania cyrtella* and *L. naegelii*. Distinguished by the closely grouped, minute apothecia with a pale yellow exciple and 12- to 16-spored asci. *A. cerinelloides* is almost identical in appearance but the asci have 8 spores, while *Caloplaca cerina* occurs in similar habitats but has larger apothecia with thick grey thalline margins.

Frequently host to *Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw. (1979) and *Muellerella lichenicola* (Sommerf.) D. Hawksw. (1979); *Intralichen* cf. *christiansenii* has also been reported.

Athallia cerinelloides (Erichsen) Arup, Frödén & Søchting (2013) **LC**

Caloplaca cerinelloides (Erichsen) Poelt (1982)



As *A. cerinella*, with numerous tiny pale yellow apothecia, but the asci contain eight ascospores. Thallus K–, apothecia K+ purple. **BLS 0279**.

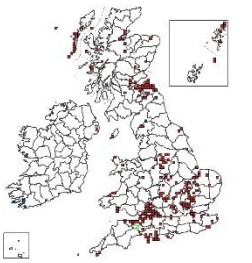
Found on base-rich bark of trees and shrubs including *Buddleja*, *Fraxinus*, *Juglans*, *Populus tremula* and *Sambucus*, especially in areas subjected to limestone quarry dust; apparently rare but probably much overlooked. Scattered throughout England and Wales, most frequent in the eastern Scottish Highlands and SW England, rare in Ireland, also Channel Is (Sark).

Difficult or impossible to distinguish from *A. cerinella* in the field, but the two species appear to be distinct in molecular terms (Vondrák *et al*. 2016b). *A. cerinelloides* has often been identified as *A. holocarpa*, which has slightly larger orange-yellow apothecia and is primarily saxicolous.

Lichenodiplis lecanorae has been recorded on this host.

Athallia holocarpa (Hoffm.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca holocarpa (Hoffm.) A.E. Wade (1965)



Thallus often immersed, inconspicuous or sometimes forming a thin continuous pale grey to black crust. Apothecia 0.1–0.3 (–0.8) mm diam., often very crowded, rounded becoming contorted and angular due to compression; thalline margin grey, poorly- or undeveloped, usually inconspicuous; exciple well-delimited, often glossy, orange, excluded when old; disc yellow-orange, flat to convex; paraphyses straight, broadened towards the tips, to 4–5 µm diam. Ascospores 10–15 × 5–10 µm, ellipsoidal, septum 3–5 µm thick, mostly 1/3 to 1/4 of the length of the ascospore. Thallus K–, apothecia K+ purple. **BLS 2527**. [NB: records where the name *Caloplaca holocarpa* has been used in a broad sense are referred to *Athallia holocarpa* s. lat., **BLS 0261**; see below].

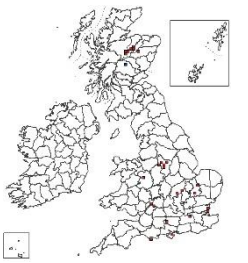
A pioneer species primarily of enriched siliceous rock, but less frequently found on calcareous stone, slate, mortar and concrete; also rarely on wood and eutrophicated bark. Throughout Britain and Ireland, though the distribution is difficult to assess due to historical confusion with other species (see below).

A. holocarpa in its traditional interpretation (Wade 1965) is an aggregate of various species, mostly now referable to *Athallia* or *Flavoplaca*, and the treatment in Fletcher & Laundon (2009) largely reflects that approach. Many historical records of this species on calcareous substrata should probably be assigned to *Flavoplaca oasis*, which may initially be a parasite of *Bagliettoa* species.

Host to *Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw.

Athallia pyracea (Ach.) Arup, Frödén & Søchting (2013) **NE**

Caloplaca pyracea (Ach.) Zwackh (1862)



Thallus very thin and sometimes (at least partially) immersed in bark, flat to weakly verruculose, often rimose; the areoles then 50–200 µm diam.; pale greyish to greyish yellow, orange-yellow to orange, rather often with a greyish base colour and yellow to orange scattered spots. Prothallus sometimes visible, thin and grey. Cortex usually poorly developed, composed of an amorphous layer of indistinct isodiametric cells. Apothecia normally present and abundant, scattered to crowded, rarely contiguous, adnate to sessile, round to somewhat irregular, 0.3–1.0 mm diam.; disc flat to slightly convex, orange; thalline margin mostly present but sometimes excluded; exciple (25–) 35–50 (–60) µm thick, slightly raised or level with the disc; epithecium orange, granular-inspersed; hymenium 70–90 (–100) µm thick, colourless; hypothecium (50–)70–100 µm thick, hyaline, sometimes oil-inspersed; paraphyses unbranched or branched above, the upper cells inflated to 4–7 µm diam.; asci 8-spored. Ascospores ellipsoidal to broadly ellipsoidal, (8.5–) 10–15.5 × (4.5–) 5.5–8 (–9) µm, polarilocular, the septum (3.3–) 3.8–5.5 (–6.5) µm thick, mostly 1/3–1/2 the spore length. Yellow parts of thallus and apothecia K+ purple.

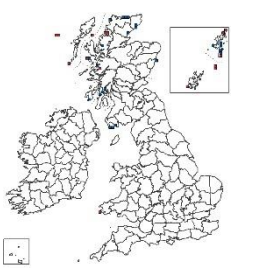
On base-rich bark, initially recorded exclusively on *Populus tremula* but more recently also on other *Populus* species, *Fraxinus* etc.; rarely on lignum. Throughout Britain but perhaps commoner in the north (especially Deeside and Strathspey).

Characterized by a greyish thallus that may appear piebald due to islands of yellow pigmentation, and relatively large apothecia with thin thalline margins. May be confused with morphs of *Caloplaca ahtii* with poorly developed soralia.

Host to *Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw.

Athallia scopularis (Nyl.) Arup, Frödén & Søchting (2013) **NT**

Caloplaca scopularis (Nyl.) Lettau (1912)



Thallus to 15 mm diam., rosette-like, frequently coalescing. Marginal lobes clearly differentiated, densely packed, irregularly divided, convex-flattened, mostly 1–2 mm long and 0.2–0.3 mm wide, smooth, yellow-orange, not pruinose. Central part areolate, usually densely covered with apothecia. Cortex composed of anticlinally arranged hyphae. Apothecia mostly clearly protruding to almost stalked, 0.2–0.5 (–1) mm diam., disc flat, orange-yellow, with a smooth narrow ± concolorous margin which may become excluded. Hymenium 70–80 µm high. Paraphyses branched and ± moniliform above, the terminal cells about 4–6 µm diam., ± spherical. Ascospores 11–13 × 5.5–6.5 µm, polarilocular, the septa mostly well-developed, around 3.5–4 µm thick. **BLS 0278**.

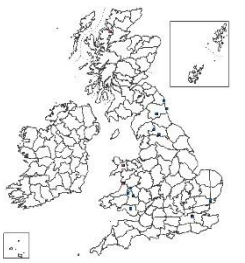
On sunny tops of coastal siliceous rocks manured by perching birds; scarce. N. & W.

Scotland from Wigtownshire to Kiincardineshire, Pembrokeshire (Skomer).

Like *Calogaya oblitterata*, but more robust with wider lobes which tend to fan out at the tips, apothecia are constricted at the base and have thicker exciples. It always lacks pruina. *Athallia scopularis* is similar to but much smaller than *Variospora thallincola* and is never in the mesic-supralittoral zone. In morphological terms the species is atypical of *Athallia* with its well-developed bright yellow lobate thallus with a cortex composed of anticlinally arranged hyphae, but morphs with reduced thalli have been recognized that are very similar to the *Athallia holocarpa* group (Vondrák *et al*. 2016b). These may well belong to a different species.

Athallia vitellinula (Nyl.) Arup, Frödén & Søchting (2013) **NE**

Caloplaca vitellinula (Nyl.) H. Olivier (1897)



Thallus pale greyish to yellow, discontinuous with scattered to continuous convex areoles or weakly cracked-areolate, 50–150 µm thick; areoles 0.1–0.5 mm diam., flat to slightly convex or uneven. Prothallus sometimes present, usually thin and film-like, white or pale yellow. Cortex poorly developed with indistinct isodiametric cells. Apothecia sometimes abundant but usually scattered, adnate to sessile, round to irregular, 0.3–0.5 (–0.6) mm diam.; disc flat to convex, yellow to orange (often dark orange in old apothecia); thalline margin very inconspicuous and often excluded, exciple (0–) 25–50 (–75) µm thick, sometimes slightly raised, concolorous with or paler than the disc; epithecium orange, granular-inspersed; hymenium 50–80 µm thick, colourless; hypothecium 35–80 µm thick, colourless; paraphyses sometimes branched above, the upper cells wider, to 6 µm diam.; asci cylindrical, 8-spored. Ascospores ellipsoidal, polarilocular, (8–) 9–12 (–14) × 4–6 (–7) µm, the septum (2.5–) 3–4.5 (–5) µm thick, 1/4–1/2 the length of the spore. Pycnidia rarely observed, immersed, orange. Conidia broadly ellipsoidal, 3–3.2 × *ca* 1.5 µm. Thallus and apothecia K+ purple.

On vertical siliceous rocks and walls, scattered throughout Britain; occasionally present on other substrata including lignum and calcareous rock in Scandinavia.

Similar to *A. holocarpa* (sensu stricto) which occurs on similar substrata, but with a thin but usually distinct yellowish thallus. The two species were placed in synonymy by Vondrák *et al*. (2016b) due to their discovery of intermediate ITS haplotypes from Turkey and Alaska, but more sampling is needed and they are kept separate for the time being.

BLASTENIA A. Massal. (1852)

Thallus crustose, areolate, often extensive but sometimes reduced to small areas around apothecia or inconspicuous; white to dark grey, or partly or completely yellow. **Prothallus** sometimes present, black, or only as zone lines between surrounding thalli. **Areoles** usually flat, but older areoles may be convex or uneven. **Soredia**, **blastidia** and **isidia** present in some species. **Cortex** not developed or inconspicuous, a thin epinecral layer often present. **Apothecia** sessile, sometimes with a constricted base, pale orange to dark red or blackish. **Exciple** thin, concolorous with or darker than the disc. **Epithecium** granular-crystalline. **Hypothecium** often partly yellowish or brownish, K–, N+ orange. **Paraphyses** sometimes branched and anastomosed, broadened at the apices. **Asci** clavate, 8-spored. **Ascospores** polarilocular, usually ellipsoidal with a medium to broad septum, colourless. **Conidiomata** pycnidia, usually forming low projections on the thallus, sometimes multichambered, the apices usually red or orange. **Conidia** ± bacilliform. **Chemistry**: two anthraquinone chemosyndromes may be present: (i) parietin (dominant), emodin, fallacinal, parietinic acid and teloschistin; (ii) 7-Cl-emodin (dominant), emodin, 7-Cl-citreorosein and 7-Cl-emodinal. Cinereorufa-green (green-grey pigment; K−, N+ violet in section) present but sometimes hardly detectable, Sedifolia-grey pigment absent. **Ecology**: on siiceous rocks in coastal and inland areas, or on coniferous and deciduous bark and lignum; rarely on plant debris and mosses.

A well-defined group with dark orange to reddish apothecia and (usually) grey thalli. The genus is monophyletic and sister to the *Gyalolechia* assemblage (Arup *et al*. 2013), within the subfamily Caloplacoideae. 24 species were recognized by Vondrák *et al*. (2020), of which six occur in Britain and Ireland.

Literature:
Arup & Åkelius (2009), Arup *et al*. (2013), Fletcher & Laundon (2009), Vondrák *et al*. (2020).

1 Thallus isidiate 2
Thallus without isidia 3

2(1) Cortex white or grey, K± pale violet; isidia white-grey, ± nodulose ..... ***herbidella***
Cortex light beige to orange (rarely grey or green), isidia usually coralloid ..... ***coralliza***

3(1) On siliceous or slightly base-rich rocks ..... ***crenularia***
On bark of broadleaved trees 4
On mosses, montane ..... ***ammiospila***

4(3) Ascospores (13.5–) 14.5–17.5 (–19) µm long; northern and western distribution ..... ***lauri***
Ascospores (11–) 13–14.5 (–17) µm long; southern England ..... ***ferruginea***

Blastenia ammiospila (Wahlenb. ex Ach.) Arup, Søchting & Frödén (2013) **EN (D)**

Caloplaca cinnamomea (Th. Fr.) H. Olivier (1909)

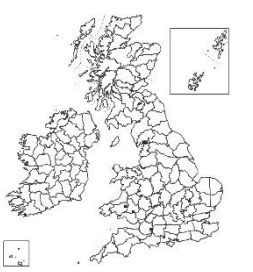
Thallus crustose, white to grey, thin, uneven or granular. Apothecia to 1.5 mm diam., crowded, contiguous, rounded or somewhat angular or flexuose, flat at first, becoming convex, sessile; exciple rust-red to brown-orange, irregular, somewhat swollen, uneven, grey below, excluded in old apothecia; discs rust-red to brown-orange; paraphyses flexuose, unbranched to forked, gradually broadening towards the tips. Ascospores (12–) 15–18 × 6–8 µm, elongate-ellipsoidal, septum 3-7 µm thick, 1/2–1/4 of the length of the ascospore. Thallus K–, apothecia K+ purple. **BLS 1746**.

Encrusting mosses above 1000 m; rare. Scotland (Ben Lawers).

Caloplaca cinnamomea was placed into syonymy with *C.* (*Blastenia*) *ammiospila* by Hansen *et al.* (1987), who considered that the two taxa were simply ecological variants. Little further information was given, but *C. ammiospila* was originally described from horizontal wooden posts while *C. cinnamomea* was considered to be a terricolous species. Hitch *et al.* (2009) suggested that the apothecia of *C. ammiospila* have a distinct thalline margin; this distinction could be related to maturity. Sequences identified as *C. cinnamomea* included in Gaya *et al*. (2015) confirm a close relationship with *B. ammiospila*.

Blastenia coralliza (Arup & Åkelius) Arup, Søchting & Frödén (2013) **DD**

Caloplaca coralliza Arup & Åkelius (2009)



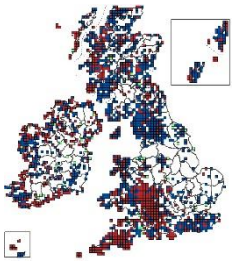
Thallus flat to slightly scurfy-granular, usually ± completely covered by isidia, light beige to orange, sometimes dark orange or brown, occasionally grey or green. Isidia mostly 50–90 µm, concolorous with or slightly darker than the thallus, normally branched and forming a delicate coral-like structure, often layered and forming a cracked-areolate crust. Apothecia rare and sparse when present, adnate to sessile, round to irregular or lobate, at first orange to light red, darkening to a more ferruginous red with age; disc strongly concave to convex, the exciple slightly raised or level with the disc, 60–85 µm thick; thalline margin usually absent; epithecium orange, granular-inspersed; hymenium colourless; hypothecium frequently with shades of brown, often with oil droplets; paraphyses unbranched or branched above, the upper cells sometimes slightly broader. Asci clavate, 8-spored. Ascospores ellipsoidal, polarilocular, (10–) 11.5–14 (–15) × (4–) 6–8 (–9) µm, septum (3–) 3.5–4 (–5) µm thick. Pycnidia rare but abundant when they occur, immersed, the ostiole red and slightly raised. Conidia 3–5 × 0.8–2 µm, bacilliform to narrowly ellipsoidal. Thallus K+ purple, C+ light red. **BLS 2538**.

On bark of old *Quercus* trees in deer parks and old woodland, western England (New Forest, Somerset, Cumbria) and Wales (Brecon, Carmarthen, Radnor). Very few recent records.

Similar to *B. herbidella* but with pale beige to orange thalli and coralloid isidia; first reported for Britain by Arup & Åkelius (2009), and with some older records formerly assigned to that species.

Blastenia crenularia (With.) Arup, Søchting & Frödén (2013) **LC**

Caloplaca crenularia (With.) J.R. Laundon (1984)



Thallus crustose, dark grey, occasionally pale grey or rarely immersed and inconspicuous, usually forming a roughened, continuous or cracked-areolate surface. Apothecia to 1 mm diam., scattered to contiguous, rounded but occasionally slightly flexuose, flat to convex; exciple well-defined and glossy when young, brown-red, lacking a thalline margin, algae absent below the hymenium; disc rust-red to red-brown, unchanged in colour when wet; paraphyses flexuose, the tips only slightly broadened, to *ca* 3.5 µm diam. Ascospores 12–14 × 6–8 µm, ellipsoidal, septum *ca* 5 µm thick, to 1/2 of the length of the ascospore. Pycnidia 0.1–0.2 µm diam., brown-red, often densely covering the thallus. Thallus K–, epithecium K+ purple. **BLS 0253**.

On soft-textured siliceous or slightly base-rich rocks, in sheltered, preferably rather damp situations, also occasionally on walls; frequent. In unpolluted areas of coastal and lowland Britain, submontane Wales and the Pennines.

Distinguished by the deep brown-red, almost rust-coloured apothecia on a grey, roughened thallus. The ascospores have a particularly broad septum. Occasionally forms extensive thalli with only tiny rust-red pimple-like incipient apothecia; this morph is often characteristic of pollution-stressed sites. Much confused with *Kuettlingeria ceracea* which has paler red, flat to slightly convex apothecia with a thick algal layer below the hymenium, the disc turning waxy, green when wetted.

Host to *Lichenodiplis lecanorae*, *Muellerella ventosicola* (Mudd) D. Hawksw. (2003), *Pyrenidum actinellum* Nyl. (1865) and *Sclerococcum* (*Dactylospora*) *tegularum* (Arnold) Ertz & Diederich (2018)

Blastenia ferruginea (Huds.) A. Massal. (1852) **NE**

Caloplaca ferruginea (Huds.) Th. Fr. (1860)

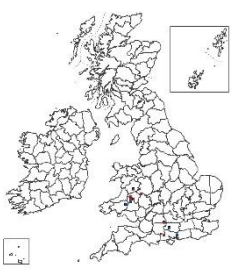
Like *B. crenularia*, but on bark, and further differing in the entire or immersed, thin, usually smooth white-grey (rarely darker) thallus and apothecia that often have a markedly unevenly flexuose margin. Ascospores are 13.2–14.5 (–17.0) µm in length (Vondrák *et al.* 2020). The photobiont is scanty or lacking below the hymenium. Thallus K–, apothecia K+ purple. **BLS 2886**.

On bark of broadleaved trees, mostly on *Fagus* and *Quercus* in old woodlands and parklands, England (Middlesex, Sussex, New Forest). Very rare and appears to be declining.

Blastenia lauri has recently been split from this species (Vondrák *et al*. 2020), which has slightly larger ascospores and is a primarily oceanic species. *B. ferruginea* is a primarily Mediterranean species, and our populations are at the northern edge of its distribution. A new conservation assessment is needed for *B. ferruginea*; it is likely to be listed as Critically Endangered.

Blastenia herbidella (Hue) Servít (1934) **VU (C, D1)**

Caloplaca herbidella (Hue) H. Magn. (1932)



Thallus crustose, wide-spreading, white-grey to grey, thin and continuous; isidia numerous, crowded, usually obscuring the thallus, simple or branched, elongate, warted-papillate, nodulose or coralloid, white-grey, sometimes with a yellow tinge or suffused brown at the tips, matt, soft-textured. Apothecia to 1–3 mm diam., occasional, scattered, rounded to flexuose; exciple concolorous with the disc, persistent, smooth; disc flat to slightly convex, rough, deep orange-rust red; paraphyses unbranched or forked, septate, broadening towards the apices. Ascospores 10–14 × 6–8 µm, ellipsoidal, septum *ca* 5 µm thick, 1/3–1/2 of the length of the ascospore. Thallus and isidia K– or isidial tips K+ faint purple, apothecia K+ purple. **BLS 2539**.

On old trees in wood pasture, especially well-lit *Quercus* trunks, rarely *Fraxinus*; rare and declining. S & S.E. England, mid Wales, Westmorland.

Distinguished by the numerous white-grey isidia which cover much of the thallus. The apothecia resemble those of *B. ferruginea* and appear to be intermittent and rather short-lived. Sterile thalli resemble delicate morphs of *Porina* species that have *Trentepohlia* as the photobiont. *Caloplaca chlorina* is dark grey with a blue tinge but occurs on rock. *Pertusaria coronata* is K+ yellow, Pd+ orange.

Blastenia lauri Vondrák (2020) **LC**

Thallus crustose, almost white to pale grey, smooth, <100 µm thick; soredia and isidia absent; apothecia sessile, mostly scattered, orange-red, 0.7–1.3 (–1.7) mm diam., with a well-developed concolorous, often flexuose exciple raised above the disc; thalline margin absent. Ascospores ellipsoidal to cylindric-ellipsoidal, (13.5–) 15.5–17.2 (–19.0) × 8.0–9.5 µm, septum 7–8.5 µm thick, around half of the length of the ascospore. Pycnidia red. Thallus K–, apothecia K+ purple. **BLS 0252**.

On twigs and branches, on neutral to base-rich bark of *Corylus*, *Populus tremula*, *Fraxinus* and *Sorbus*, fairly common. W. Britain and Ireland, most frequent in oceanic areas of Scotland.

Distinguished from *B. ferruginea* by the somewhat larger ascospores and different habitat, occurring primarily in western Scotland rather than southern England. The species are quite distinct in molecular terms.

Host to *Lichenodiplis lecanorae* and a *Sporoschisma* sp. in the apothecia, with colourless 7-septate conidia.

CALOGAYA Arup, Frödén & Søchting (2013)

Thallus crustose, usually with a well-developed lobate margin, yellow to orange, sometimes conspicuously pruinose. **Cortex** either hyphal or composed of isodiametric cells, sometimes with an epinecral layer. **Soralia** or **blastidia** sometimes present; in some species (not from our region) the thallus is reduced to punctiform soralia or a thin film. **Photobiont** trebouxioid. **Apothecia** mainly appearing lecanorine, with a yellow to orange disc, raised thalline margin and distinct exciple. **Epithecium** crystalline. **Hymenium** colourless. **Hypothecium** colourless. **Hamathecium** of paraphyses, sometimes branched, septate, apical cells frequently enlarged. **Asci** 8-spored, clavate, *Teloschistes*-type. **Ascospores** polarilocular, with a short to medium-long septum. **Pycnidia** often present, orange, with bacilliform to ellipsoidal conidia. **Chemistry**: most species with parietin (dominant), with small proportions of teloschistin, fallacinal, parietinic acid and emodin.

Most species have large and conspicuous bright yellow to orange placodioid thalli, although this is not diagnostic for the genus. *Calogaya* was considered by Arup *et al*. (2013) to be closely related to *Flavoplaca*, most species of which have crustose, non-placodioid and sometimes reduced thalli. The genus is not well understood, with some taxa (including *C. oblitterata*) considered as species complexes (Gaya 2009, Gaya *et al*. 2011).

Around 20 species are known, three of which occur in Britain and Ireland.

Literature

Arup *et al*. (2013), Fletcher & Laundon (2009), Gaya (2009), Gaya *et al*. (2011), Vondrák *et al*. (2016a).

1 Thallus sorediate, the soralia marginal or sometimes terminal, lip-shaped on short lobes, concolorous with the thallus; thallus deep green-orange, lobes 0.5–1.0 mm wide, pruinose ..... ***decipiens***
Thallus not sorediate, though sometimes granular in the centre..... 2

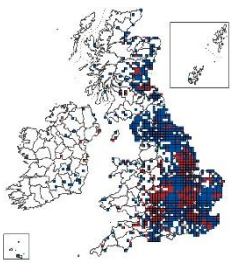
2(1) Thallus lobes yellow to pinkish, white-pruinose, turgid, around twice as long as broad; on calcareous rocks, usually inland .....***pusilla***
Lobes deep orange, not pruinose, not turgid, around four times as long as broad; mostly on siliceous rocks, usually coastal.....***oblitterata***

Calogaya decipiens (Arnold) Arup, Frödén & Søchting (2013) **LC**

Caloplaca decipiens (Arnold) Blomb. & Forssell (1880)

Thallus placodioid, of closely contiguous appressed lobes forming rounded rosettes to 3 cm across, green-yellow (in shade) to deep orange-yellow; lobe-ends to *ca* 1 mm wide, convex, densely pruinose, palmately branched, areolate in the centre; soralia usually present, lip-shaped, on small inner lateral lobes, often spreading over the inner areoles; soredia minutely granular, concolorous with the thallus. Apothecia occasional, to 1.0 mm diam., thalline margin swollen, persistent; disc concave at first, becoming rounded, constricted at the base and flat when mature, orange; paraphyses lax, unbranched, most tips broadened, apical cells 2–6 µm diam. Ascospores 10–15 × 5–8 µm, ellipsoidal, septum 2–3 µm thick, about 1/4–1/3 of the length of the ascospore. All parts K+ purple. **BLS 0250**.

On calcareous walls, mortar and asbestos-cement, scarce on natural limestone rock outcrops where it is almost restricted to bird-perches on the coast, rarely on timber; abundant, especially in built-up areas. Lowland & E. Britain, scarce in the west, Ireland & Wales; apparently avoiding high rainfall.



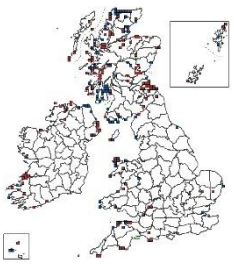
The lip-shaped, marginal soralia of this placodioid lichen are distinctive; *Lepraplaca cirrochroa* has laminal, round, bright yellow soralia and has a western distribution. Pale yellow morphs closely resemble *Candelariella medians* which is distinguished by the K– thallus.

A host of *Arthonia molendoi* (q.v.).

Calogaya oblitterata (Pers.) P.F. Cannon & Coppins (2024) **LC**

Calogaya arnoldii (Wedd.) Arup, Søchting & Frödén (2013)

Caloplaca arnoldii subsp. *oblitterata* (Pers.) Gaya (2009)



Thallus minutely lobate at the margin, crustose in the centre, starting out as a yellow-orange, filmy prothallus which may erode away when lobes are mature, becoming deep red-orange, not pruinose, radiating, the lobes convex, ± parallel, loosening from the substratum just short of the tips, but tips appressed, forming round rosettes 1-2 cm diam.; lobes 0.5–1 mm long, *ca* 0.25 mm wide. Apothecia flat, orange-red, 0.2–0.5 mm diam., with a well-developed orange thalline margin; paraphyses slightly branched, apical cell clavate, *ca* 7 µm diam. Asci 35–40 × 10–12 µm. Ascospores ellipsoidal, 9–12 × 4–6 µm, septum 3–4 µm thick. Conidia 2.5–3 × *ca* 1 µm. All parts K+ purple. **BLS 0236**.

Widespread but scarce, on sunny coastal siliceous rocks and walls. N. & W. Britain and Ireland.

Fletcher & Laundon (2009) observed that British and Irish material did not correspond to the central European holotype, but did not resolve this inconsistency. *C. arnoldii* was considered to be a polymorphic species, divided into several infraspecific taxa by Gaya (2009), with British material assigned to subsp. *oblitterata*. More detailed studies are needed, but a phylogenetic study by Gaya *et al*. (2011) could not resolve the subspecies that she recognized in the 2009 paper and they are not adopted here. The earliest name at specific rank for the aggregate is in fact *Lichen oblitteratus* Pers. (1794), which needs to be taken up whether or not the aggregate is divided. Original material of *L. oblitteratus* appears not to exist, but the name was neotypified by Gaya with a Scottish specimen.

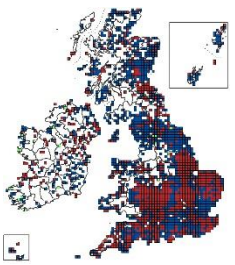
Often confused with *Calogaya pusilla* (but see below), the latter being on calcareous rocks and cement, with white pruina densely covering rounded, somewhat inflated lobes, and lobes which do not leave the substratum just short of the tips. It can also be confused with the much rarer *Athallia scopularis* from bird-perched siliceous rocks, which has longer lobes.

Host to *Arthonia molendoi* (q.v.), *Tremella caloplacae* (Zahlbr.) Diederich (2003), *Verrucula latericola* s. lat., and an *Endococcus* sp. (from Caithness) with spores 11–13 × 4–5 µm.

Calogaya pusilla (A. Massal.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca pusilla (A. Massal.) Zahlbr. (1927)

Caloplaca saxicola auct. br., *non* (Hoffm.) Nordin (1972)



Thallus placodioid, forming closely appressed neat rosette-like thalli 1-3 cm diam., yellow to orange, sometimes with a pinkish hue, the margin of short broad flattened contiguous lobes *ca* 2 × 1.5 mm, convex, swollen (tubby), sometimes divided by furrows, usually densely white-pruinose, the central area of convex granules with crowded apothecia. Apothecia to 1.0 mm diam., abundant and crowded, usually obscuring the central area of the thallus; exciple conspicuous, yellow to orange, excluded when mature; disc orange to brown-orange, flat at first but convex at maturity; paraphyses tips capitate, 6–8 µm diam. Ascospores 10–15 × 5–7 (–8) µm, ellipsoidal, septum 2–4 µm thick, about 1/4–1/5 of the length of the ascospore. Thallus and apothecia K+ purple. **BLS 0277**.

On calcareous rocks and walls, often in dry sheltered situations, rarely on siliceous rock affected by calcareous seepage water; often the commonest species of *Caloplaca* s.l. on building stones on eastern churches, rare on bark and wood. Throughout Britain and Ireland but with a marked eastern tendency.

Identified by the short, often contiguous lobes and centrally crowded apothecia which become convex when mature. Pruina may be washed off in exposed situations. *C. oblitterata*, on siliceous rock, is deep orange, lacks pruina, has longer, narrower shiny lobes which detach from just short of the tip, and slightly smaller ascospores

(9–12 × 4–6 µm). However, molecular data indicate that *C. arnoldii* can occur on both siliceous and calcareous substrata. On walls including siliceous rocks that are kept together by concrete or mortar *C. arnoldii* often grows on both, but on the basic substrate the prothallus disappears and the colour is usually more yellow. It may be that the two species as recognized in Britain and Ireland are merely ecological variants, but they are retained for the present pending further phylogenetic studies.

C. pusilla has often been considered synonymous with *C. saxicola* (Hoffm.) Vondrák (2016) but the two taxa as recognized by Gaya (2009) and Gaya *et al.* (2011) can be distinguished by ITS sequence and also by some morphological traits. Type material of *C. saxicola* (basionym *Psora saxicola* Hoffm. 1790, ≡ *Lichen murorum* Hoffm. 1784, *non* Neck. 1771) does not exist, but unfortunately the neotype designated by Gaya (2009) cannot stand as an illustration was provided by Hoffmann which must be treated as a lectotype. Considering that this cannot reliably be assigned at species level, conservation of the name *Psora saxicola* would be needed to preserve its use under its current circumscription.

Of other similar species of Teloschistaceae in Britain and Ireland, *Variospora flavescens* is much larger, with lemon-shaped ascospores, and *V. aurantia* has large flattened lobes which spread at the tips. *Rusavskia* (*Xanthoria*) *elegans* is deep orange, and has convex, distinctly separated, almost tubular lobes, which have a white lower cortex.

Host to *Arthonia molendoi*, *Endococcus* cf. *parietinarius*, *Intralichen* cf. *christiansenii* and *Tremella caloplacae*.

CALOPLACA Th. Fr. (1860)

Thallus crustose, not placodioid, dark grey to white, lacking anthraquinones but with Sedifolia-grey pigment (K+ violet in section). **Cortex** composed of isodiametric cells. **Soredia**, **blastidia** and **isidia** present in some species. **Photobiont** trebouxioid. **Apothecia** with a yellow to orange disc. **Thalline margin** distinct and usually persistent, concolorous with the thallus. **Exciple** thin and poorly developed. **Epithecium** crystalline. **Hymenium** colourless. **Hypothecium** colourless. **Hamathecium** of paraphyses, sometimes branched, septate, apical cells frequently enlarged. **Asci** 8-spored, clavate, *Teloschistes*-type. **Ascospores** ellipsoidal, colourless, polarilocular, with a medium to long septum. **Pycnidia** dark grey. **Conidia** bacilliform. **Chemistry**: parietin (dominant), with small proportions of teloschistin, fallacinal, parietinic acid and emodin. Anthraquinones only present in the apothecia.

Caloplaca s. str. is much reduced from the concept adopted by Fletcher & Laundon (2009) and many other traditional treatments. It is characterized especially by a grey rather than yellow thallus and lecanorine apothecia with yellow discs, and many species are corticolous. It appears to be related to *Leproplaca* and *Variospora* (Arup *et al*. 2013, Gaya *et al*. 2015), both of which have yellow thalli containing anthraquinones.

Not all species from Britain and Ireland have been sequenced, so their phylogenetic affinities are therefore uncertain, and several others do not have established positions in the system. They are listed separately in this account, after the species that have been confirmed as belonging to *Caloplaca* s. str., and are included in the general key to Teloschistaceae.

Literature:
Arup *et al.* (2013), Fletcher & Laundon (2009), Gaya *et al.* (2015), Šoun *et al*. (2011), Vondrák *et al.* (2012a).

1 Thallus without any vegetative diaspores 2
Thallus with vegetative diaspores (lobules, isidia, granules, soredia or blastidia) 3

2(1) Thallus pale to dark grey; apothecial disc yellow-orange to yellow-green; mostly on bark and twigs of trees and shrubs ..... ***cerina***
Thallus greenish grey; apothecial disc greenish; on mosses and plant debris, rarely extending onto ± calcareous rocks ..... ***stillicidiorum***

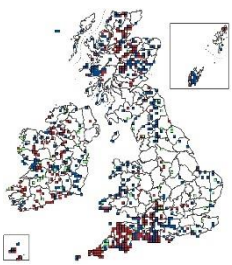
3(2) Thallus granular (granules usually > 50 µm diam.) 4
Thallus with soredia/blastidia (usually up to 50 µm diam.) 5

4(3) Thallus without distinct areoles, sometimes entirely granular; granules (50–) 70–120 (–160) µm diam; apothecia common ..... ***monacensis***
Thallus well-developed, areolate, with a thick layer of small granules (45–70 µm diam.); rarely fertile..... ***virescens***

5(3) Soralia ulcerose, becoming crater-like; soredia blue-green..... ***ahtii***
Soralia arising from areole margins, often spreading and becoming confluent; soralia/blastidia pale to dark grey..... 6

6(5) Areoles usually relatively large, to 1.2 mm diam.; soredia/blastidia mostly 25–50 µm diam.; apothecia common, apothecial margin not sorediate; saxicolous or on nutrient-rich tree bases ..... ***chlorina***
Thallus with very small areoles to 0.2 mm diam., usually very soon entirely sorediate; soredia mostly 20–25 µm diam.; apothecial margin often sorediate, at least in part; corticolous or lignicolous ..... ***turkuensis***

Caloplaca cerina (Hedw.) Th. Fr. (1861) **LC**



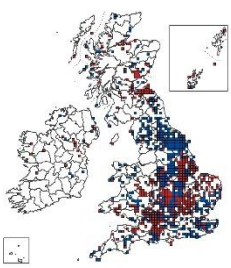
Thallus crustose, pale to dark grey, often tinged glaucous or blue, usually rather thick, occasionally immersed and inconspicuous, continuous, somewhat waxy, the surface smooth or rarely warted; prothallus pale or absent. Apothecia to 1.5 (–2) mm diam., scattered to contiguous, sometimes overlapping, often angular, sessile, constricted at the base; thalline margin persistent, even, swollen, raised, flexuose, grey; discs orange, orange-yellow or green, concave when young but becoming flat when mature; paraphyses broadening towards the tips, to 4 µm diam. Ascospores 12–15 × 7–9 µm, ellipsoidal, septum 5–8 µm thick, about 1/3–1/2 of the length of the ascospore. Thallus and thalline margin K–; discs K+ purple. **BLS 0241**.

On bark and twigs, sometimes on wood, especially with a high pH (*Acer pseudoplatanus*, *Populus tremula*, *Fraxinus*, *Sambucus*, *Ulmus*), or where affected by nutrients, also overgrowing mosses and plant debris over base-rich rocks and earth, rarely directly on calcareous rocks. Formerly frequent throughout Britain and Ireland, now decreased and rather rare in polluted habitats, but shows signs of recovery in some less severely impacted areas.

Readily identified by the frequently flexuose apothecia with orange to green-yellow discs, concave when young, surrounded by a distinctive persistent smooth grey thalline margin. *C. chlorina* and *C. virescens* are closely related but they reproduce asexually and are infrequently fertile. A polymorphic species that may contain several cryptic segregates, according to Šoun *et al*. (2011).

Host to *Didymocyrtis consimilis* Vain. (1921).

Caloplaca chlorina (Flot.) H. Olivier (1912) **LC**



Thallus crustose, wide-spreading, dark grey, often with a blue tinge, thin to thick, usually coarsely cracked-areolate, irregular, the surface unevenly granular; soredia/blastidia very small, fine (mostly 25–50 µm diam.; use ×20 lens), spherical, coralloid, starting along the edges of areoles, often completely covering the thallus, usually poorly differentiated and giving the surface a mealy appearance. Apothecia to 1.5 mm diam., rather rare, scattered, often irregular, immersed in the granules; thalline margin thick, grey, corticate; disc yellow to dull orange, flat to convex; paraphyses unbranched, apical cell swollen to *ca* 5 µm diam. Ascospores 10–15 × 5–7 µm, septum 3–5 µm thick, about 1/3 of the length of the ascospore. Thallus and isidia K± pale violet, apothecial discs K+ purple. **BLS 0263**.

On damp or shaded siliceous rocks, neutral to slightly base-rich magnesian limestone, etc., particularly on the horizontal tops of walls or limestone tombs, rarely on mortar and nutrient-rich bark; frequent, probably under-recorded. Throughout lowland Britain and Ireland, especially E. England, scarce in western districts.

Distinguished by the sorediate/blastidiate, blue-tinged thallus (Šoun *et al.* 2011). The blastidia are sometimes poorly differentiated and may pass unnoticed in the field. Fertile material resembles *C. cerina* but has darker orange

discs. *C. virescens* has a blue tinge but is sorediate. *Kuettlingeria soralifera*, on coastal shingle, has apothecia lacking a thalline margin and the disc is darker orange to orange-brown. *Rinodina teichophila* is granular and not blue-tinged, and *Rinodina pityrea* has in general more blastidia and a crenulate thalline margin, that is sometimes so strongly blastidiate that it appears to be crumbling (Arup & Ligander 2023).

Caloplaca monacensis (Leder.) Lettau (1912) **NE**

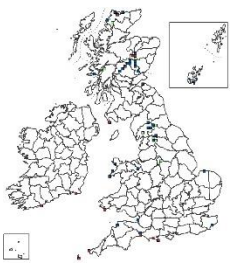
Thallus predominantly to entirely granular, areoles rarely distinct but sometimes developing around apothecia, thin to thick, non-pruinose, pale to dark grey; granules (50–) 70–120 (–160) µm diam., sometimes minutely tomentose with inconspicuous hairs formed by projecting hyphae (visible in section); prothallus not differentiated. Apothecia lecanorine, to 1.2 mm diam., sessile, sometimes pruinose; disc flat to slightly convex, yellow-orange to orange, sometimes pruinose, especially when young; exciple indistinct, very thin; thalline margin grey, often whitish pruinose, raised above the disc when young; epithecium orange, with inspersed granules; paraphyses sometimes branched, the upper cells wider, 4–6 µm diam. Ascospores ellipsoidal, (11–) 12–15 (–16) × (5–) 6–7 (–8) µm, septum (3–) 4–7 µm thick, 1/3–1/2 the length of the ascospore. Pycnidia rare to scattered, immersed, made distinct by an elevated darker ostiole; conidia bacilliform, 3–4 × *ca* 1 µm. **BLS 2496**.

On lignum in a churchyard, England (Somerset).

Only a single record of this species, and its identity needs confirmation. Possibly a synonym of *C. virescens* which has a better-developed, more strongly areolate thallus, but no sequences are available of the latter species.

Caloplaca stillicidiorum (Vahl.) Lynge (1921) **LC**

Caloplaca cerina var. *chloroleuca* (Sm.) Th. Fr. (1871)



Similar to *Caloplaca cerina* but with a scurfy green-grey thallus, and apothecia with thick grey somewhat flexuose thalline margins, and a flat, often green, pruinose disk. K reactions as for *C. cerina*. The ascospores are sometimes stated to be slightly longer than var. *cerina*, but this needs to be further tested by careful measurement. **BLS 1991**.

Overgrowing mosses and dead vascular plants on calcareous soil, rarely extending onto limestone or calcareous schistose rock; scarce. Inland N. Pennines to Scottish Highlands and Islands, with more southern coastal populations (map right).

A variable species that appears to be monophyletic (Šoun *et al.* 2011), but with multiple ITS haplotypes that may indicate cryptic speciation. More data are needed to elucidate these possible taxa and to draw a clearer distinction between *C. stillicidiorum* and *C. cerina*.

Caloplaca turkuensis (Vain.) Zahlbr. (1932) **NE**

Thallus with very small areoles, sorediate, not pruinose, to 0.13 (–0.3) mm thick; areoles dirty white to pale grey, initially convex but later flat, to 0.2 mm diam., soon becoming entirely sorediate. Soralia pale to dark grey or greenish grey, with bluish tinge, arising from the upper surface or areole margins, scattered to confluent, slightly convex; soredia (15–) 20–25 (–30) µm diam.; prothallus sometimes present, very thin, grey to black. Apothecia lecanorine, sometimes absent, to 0.8 mm diam., sessile; disc flat to slightly convex, yellow-orange, rarely pruinose; exciple indistinct; thalline margin grey to white, rarely pruinose, raised above the disc when young, 50–85 µm thick, sometimes becoming sorediate; epithecium orange, with inspersed granules; paraphyses sometimes branched, the upper cells wider, 3–5 µm diam.; ascospores ellipsoidal, (10–) 11–13 (–15) × 6–8 (–9) µm, septum (3–) 4–5 (–6) µm thick, 1/3–1/2 the length of the ascospore. Pycnidia sometimes present, immersed, with an elevated darker ostiole; conidia bacilliform, 3–4 × *ca* 1 µm. **BLS 2574**.

A single specimen from Scotland (Elgin) is cited by Šoun *et al.* (2011), with no information on ecology; otherwise the species occurs primarily on bark of broadleaved trees, more rarely on coniferous bark, stumps, wood fences etc.

Caloplaca turkuensis is similar to *C. chlorina* but with smaller areoles and soredia, with the apothecial margins sometimes becoming sorediate.

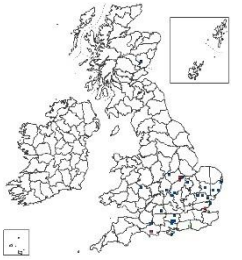
Caloplaca virescens (Sm.) Coppins (1980) **EN (A, C, D)**

Thallus crustose, wide-spreading, pale to dark grey, often tinged blue, green-grey when fresh, thick, coarsely areolate, unevenly coarsely granular, becoming mostly sorediate; soredia granular, forming a thick crust of irregular thickness over the surface; isidia corticate-granular or absent. Apothecia 0.4–1 mm diam., scarce, scattered or a few contiguous, rounded to irregular and contorted, flat or uneven; thalline margin granular, grey, becoming excluded; disc pale orange; paraphyses flexuose, sometimes forked, some apical cells swollen to *ca* 6 µm diam. Ascospores 11–13 × 4–5 µm, narrowly ellipsoidal, septum 1–3 µm thick, to 1/4 of the length of the ascospore.

Thallus K–, apothecia K+ purple. **BLS 0287**.

On the base of nutrient-enriched trunks of wayside trees, especially *Ulmus*, also *Fraxinus, Acer pseudoplatanus, Juglans, Aesculus*, often spreading extensively; usually in parkland; formerly widespread, now decreasing and very rare. Lowland S., E. & Midland England, one record from E. Scotland.

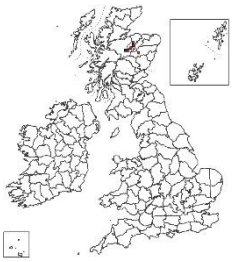
Identified by the thick, green to dirty grey, often blue-tinged, granular-sorediate thallus. It can be confused with *C. chlorina* which has rounded blastidia. *C. obscurella* and *C. ulcerosa* have discrete, ulcerose soralia.



Species provisionally assigned to *Caloplaca*, of uncertain phylogenetic position

Caloplaca ahtii Søchting (1994) **DD**

Thallus effuse, mostly inconspicuous, pale grey with a blue tinge, sometimes (though not in British material) with confluent squamule-like areoles 0.1–0.2 mm diam.; soralia few to numerous, 0.1–0.15 (–0.2) mm diam., ulcerose, starting as pustules that burst to reveal dark green to blue soredia; soredia 15–30 (–40) µm diam., with outer hyphae having a blue-green pigment, K+ purple, N+ violet. Apothecia (not seen in British material) dispersed, *ca* 0.4 mm diam., bright yellow to orange, sometimes with a pale grey thalline margin which is soon excluded when young. Ascospores 10.5–13 × 5–7 µm, septum 2.5–4 µm thick. Thallus K–, soredia and disc K+ purple. **BLS 2318**.



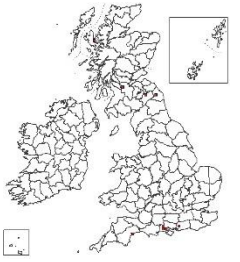
On *Populus tremula* bark in open woodland at 200–250 m alt.; rare. C. Scotland (Strathspey).

The sterile thallus is similar to that of *Caloplaca obscurella* [of uncertain placement in this treatment] which has grey-green (K–, N–) soredia. *C. alstrupii* [of uncertain position] and *Coppinsiella ulcerosa* have pale green-yellow to bright green soredia that are also K–, N–. *C. ahtii* can also be confused with *Buellia griseovirens* (thallus K+ red, norstictic acid), which has mostly larger soralia with soredia having a green, K–, N+ red pigment.

A single sequence of *C. ahtii* has been generated, from a Central Asian collection (Vondrák *et al*. 2019). It does not appear to be closely related to any other species of *Caloplaca* s.l. for which molecular data are available.

Caloplaca alstrupii Søchting (1999) **NE**

Thallus crustose, smooth, thin, with a few inconspicuous areoles 0.5–2 mm diam., forming extensive continuous crusts separated by bluish black hypothallus borders, which can be up to 0.2 mm wide. Thallus light grey to olive grey, covered with numerous dark olive semiglobose to globose soralia 0.1–0.25 mm diam., mostly regular, constricted at the base, developing from below the thallus cortex, which may in some cases be visible as a whitish necrotic rim, after dispersal of the soredia appearing as concave craters. Soredia loose, bright yellowish green, 15-30 µm diam. Apothecia very sparse, broadly sessile, 0.2–0.3 mm diam., lecanorine with an inconspicuous thalline margin; disc flat, orange; exciple concolorous with the disc but slightly olive at the outer rim; hypothecium with oil droplets; hymenium *ca* 40 µm high, epithecium distinct, coarse-crystalling; paraphyses not inflated towards the apex. Asci 8-spores. Ascospores polarilocular, *ca* 10.5 × 6.5 µm, septa 4–5 µm thick. **BLS 2612**.



On bark of broadleaved trees, S. England (Devon to Cambridge), N. England (Cumbria, Northumberland), S. and W. Scotland. Probably widespread and much over-looked.

Diagnostic features include the thallus with bluish black hypothallus borders, abundant small soralia 100–250 µm diam., and very pale yellowish green soredia. Similar to *Coppinsiella ulcerosa*, but with greener soralia erumpent from the thallus, the thallus cortex is at least partly retained but lifts away to expose the crateriform soralia. However, available sequence data do not show clear relationships with *Coppinsiella* or any other currently recognized Teloschistaceae genera. It might also be compared with *Caloplaca obscurella* (see below), but again sequence data do not indicate similarity.

The description has been largely adapted from Søchting (1999). *Taeniolella delicata* M.S. Christ. & D. Hawksw. (1979) has been reported on this host.

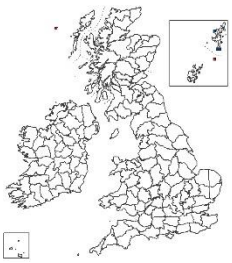
Caloplaca borreri J.R. Laundon (2005) **Ex**

Thallus of scattered patches of minute brownish orange leprose granules, <0.05 µm diam., thin, non-areolate. Apothecia not known. Thallus K+ purple (parietin). **BLS 2430**.

On bark and mosses growing on old trees. Known from four localities in Sussex and East Anglia.

Possibly a corticolous morph of *Leproplaca chrysodeta*, though the granules of *C. borreri* are reported to be smaller and the thallus thinner. Collected only in the early 19th century; the status of this species needs further investigation.

Caloplaca caesiorufella (Nyl.) Zahlbr. (1930) **VU (D2)**

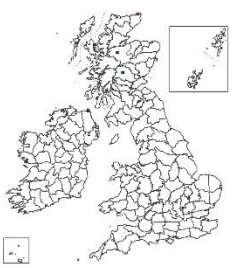


Thallus to *ca* 10 mm diam., mostly immersed in the substratum, the surface white to pale silver grey, sometimes slightly farinose. Apothecia 200–600 (–800) µm diam., scattered to somewhat crowded, sessile, disc flat to slightly concave, red-brown, sometimes faintly granular but not pruinose; margin concolorous to slightly paler than the disc, initially prominent but usually eventually becoming excluded, rarely flexuous; exciple 25–50 µm wide, with few or no algal cells; the inner part narrow and poorly developed, composed of interwoven hyphae in a gelatinous matrix, the outer part pale brownish; hypothecium colourless, containing oil droplets; hymenium to 60 µm high, colourless or with a diffuse reddish to brownish coloration in the upper part; paraphyses branched and sometimes gelatinized, terminal cells simple or swollen, 2–5.5 µm diam., colourless or eventually conglutinated and coloured reddish brown. Ascospores 9.5–13 × 5–5.5 µm, ellipsoidal, polarilocular, the septum 3–4.5 µm thick. Chemistry: thallus K–, apothecia K+ purple. **BLS 0232**.

On old, unrotted fence posts near the sea, and on maritime turf; very rare. Scotland (Shetland, Fair Isle, St Kilda).

In the field, *C. caesiorufella* resembles a *Lecanora* or *Lecania* but the K+ purple epithecium is diagnostic. It could be confused with *Blastenia ammiospila* (see Vondrák *et al*. 2021), which has somewhat larger, ± stipitate apothecia with a thicker exciple, and larger ascospores of 15 µm or more in length. The rather sparse sequence data currently available do not suggest obvious relatives.

Caloplaca concilians (Nyl.) H. Olivier (1909) **DD**

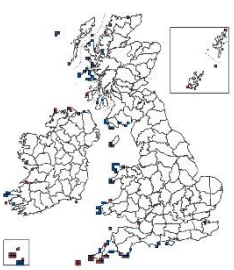


Thallus crustose, dark grey to black, thick, coarsely rimose-areolate, the surface irregular. Apothecia to 0.8 mm diam., crowded, discrete or contiguous, rounded, flat at first, becoming markedly convex, dark rust-red when young, becoming red-black to black; thalline margin even but later excluded; paraphyses branched, with narrow or clavate apices. Ascospores 12–17 × 6–9 µm, broadly ellipsoidal, the septum about 1/3 of the length of the ascospore. Thallus K–, epithecium K+ purple. **BLS 0248**.

On base-rich schistose upland and coastal rocks; very rare. A few records from Scotland (central and northern Highlands, Skye, Kintyre), old records from N.E. Ireland.

A very rare lichen identified by the very dark, areolate thallus and convex apothecia which are black when dry, dark rust-red when wet. The only black-fruited *Caloplaca* on siliceous rocks, it resembles a small *Lecidea* or *Buellia*. No sequence data are available.

Caloplaca littorea Tav. (1956) **Nb**



Thallus crustose in small to extensive patches, deep yellow-orange, thin, continuous to minutely cracked-areolate, sometimes poorly formed and film-like, prothallus pale yellow or absent; isidia usually very numerous, small, crowded, simple and finger-like to branched-coralloid, often forming a thin to thick and coarsely areolate orange isidiate crust. Apothecia rare, to 0.8 mm diam., often scattered and few, sometimes in groups, rounded, flat; exciple orange, often becoming excluded; disc orange to deep orange; paraphyses lax, branched, apices swollen to 4 µm diam. Ascospores 11–15 × 5–7 µm, ellipsoidal, septum 1–4 µm thick, to about 1/4 of the length of the ascospore. All parts K+ purple. **BLS 0265**.

In dry sheltered recesses and below overhangs in the xeric-supralittoral zone on sunny siliceous rocky sea-shores; scarce. Western seashores from Channel Islands, Isle of Wight to N. Scotland, S.W. & N.E. Ireland.

Readily distinguished by the crowded, deep orange, finger-like isidia on a small, crustose thallus in sheltered recesses of coastal rocks. *Haloplaca britannica* has minute radiating lobes, irregular, globular isidia, and is paler

yellow. No sequences are available, but it is likely that the species also belongs in *Haloplaca*.

Caloplaca lucifuga G. Thor (1988) **VU**

Lendemeriella lucifuga (G. Thor) S.Y. Kondr. (2020)

Thallus immersed in bark, inconspicuous or visible as a thin, grey film; soralia numerous, 0.15–0.35 mm diam., initially blister-like, pale yellow to dirty yellow- or orange-brown, very crowded, often contiguous, flat and ulcer-like, becoming convex, rounded; soredia farinose to granular, 17–25 µm diam. Apothecia unknown. Thallus K–, soralia K+ purple. **BLS 1642**.

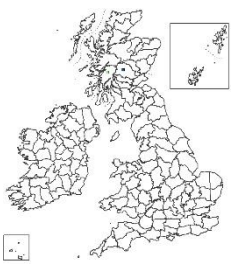
In crevices of rough bark of old trees, especially *Quercus*, in wood-pasture; rare. Mid Wales, Herefordshire, southern England (N. Devon to Oxford), Northumberland, Scotland (Peebles, Perth, Nairn and Moray).

Distinguished by the dull-coloured, crowded, erose soralia. *Coppinsiella ulcerosa* and *C. obscurella* have more scattered, discrete, K– soralia. The isidiate (and quite unrelated) *Porina hibernica* is K– with *Trentepohlia* as a photobiont.

This and *Caloplaca nivalis* (see below) were transferred to a separate genus *Lendemeriella* by Kondratyuk *et al*. (2020), but neither species is closely related to the type of that genus, the North American *L. reptans* (= *Caloplaca reptans*; Hodkinson & Lendemer 2012). The phylogenetic position of *C. lucifuga* is not clear, so it is retained in *Caloplaca* for the time being; it does not appear to be closely related to *C. nivalis*.

Caloplaca nivalis (Körb.) Th. Fr. (1871) **CR**

Lendemeriella nivalis (Körb.) S.Y. Kondr. (2020)

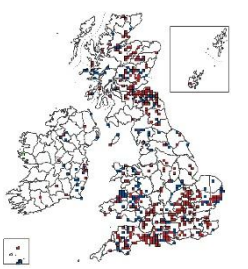


Thallus crustose, spreading over mosses, thin, skin-like or coarsely crowded-granular, pale to dark grey; prothallus conspicuous. Apothecia to 0.7 mm diam., numerous, crowded, contiguous, rounded, sessile, somewhat concave at first, becoming flat or convex; thalline margin pale to dark grey; exciple blackish at the outside and merging into orange at the inside (sometimes ± entirely blackish or entirely orange), persistent or excluded; disc roughened, orange to rust-coloured or black-orange, pruinose; paraphyses 1–3 µm diam., lax, unbranched or sparsely branched, in submoniliform chains of obovoid cells, the apical cell slightly enlarged. Ascospores 25–30 × 3–5 µm, narrowly ellipsoidal, sometimes with a median indentation and then slipper-shaped, straight to curved, aseptate, occasionally with signs of a pseudoseptum. Thallus K–, apothecia K+ purple. **BLS 0269**.

Overgrowing mosses such as *Racomitrium* spp. on siliceous rocks at altitudes exceeding 1000 m; rare, possibly extinct, in the British Isles. N. Scotland (Perthshire, Ben Lawers range).

Distinguished by the orange apothecia on mosses in arctic-alpine situations. The ascospores are unlike any other species of *Caloplaca* s.l. in Britain and Ireland, being long and narrowly ellipsoidal, with only a faint and incomplete septum. See under *C. lucifuga* (above) for comments on the placement of this species.

Caloplaca obscurella (J. Lahm) Th. Fr. (1871) **LC**



Thallus crustose, initially thin and continuous, smooth to uneven or weakly areolate (areoles 0.1–0.3 (–0.8) mm diam.), pale to dark grey, vivid green when wet, becoming uneven-scurfy, with scattered to contiguous minute rounded erose soralia; soralia 0.1–0.3 mm diam., white to grey, usually concave and crater-like, derived from the rupture of convex, pimple-like vesicles, often found ± emptied of soredia; soredia grey-green to blue-grey, (12–) 20–25 (–30) µm diam., exposed hyphae with grey, K– (rarely K+ violet), N± reddish pigment; prothallus sometimes present, grey or blue-black. Apothecia to 0.8 mm diam., rather rare, small, inconspicuous, scattered, rounded, flat or slightly swollen; thalline margin and exciple at first both distinct but soon excluded, dull to dark brown, pellucid when wet; epithecium pale grey-brown due to the colour of the paraphysis tips; paraphyses lax, unbranched or forked, septate, with dark globose apical cells 3–6 µm diam. Ascospores 10–13 × 6–8 µm, ellipsoidal, septum 4–8 µm thick, about 1/2 (or more) of the length of the ascospore. Thallus and apothecia K– (lacking anthraquinone pigments). **BLS 0271**.

On nutrient-enriched basic bark, or rarely shaded rocks and stones, in damp situations; inconspicuous; common. Throughout Britain and Ireland.

Unusual in the K– reaction of thallus and apothecia. It resembles a small *Lecania* or *Lecanora* but has colourless,

polarilocular spores with a thick septum. The scurfy texture of the older parts of the thallus is derived from the numerous blisters which break down to form soralia, though in sheltered habitats their margins may remain intact. The apothecia are distinctive, being brown, rounded, flat or somewhat swollen, constricted at the base and soon immarginate, containing paraphyses with dark globose apical cells. Specimens are often sterile and these may be recognized by the rounded erose pale spots scattered over the grey, uneven thallus. The erose spots of *Coppinsiella ulcerosa* are similar, but usually more scattered and contain grey-green soredia; the thallus in this species is pale and smooth. *Caloplaca alstrupii* has brighter green soralia with the broken thallus cortex typically at least partly retained around the concave craters with the soredia. *Caloplaca ahtii* has dark green-blue soredia with a K+ purple, N+ violet pigment.

Phylogenetic studies indicate that this species is related to the *Pyrenodesmia* group (Vondrák *et al*. 2012b, Frolov *et al*. 2020), but it occupies an isolated position and more work is needed before a new generic placement can be decided upon.

Host to *Sclerococcum* (*Dactylospora) parasitaster* (Nyl.) Ertz & Diederich (2018) and a *Stigmidium* sp. (in the apothecia) with 4-spored asci.

CEROTHALLIA Arup, Frödén & Søchting (2013)

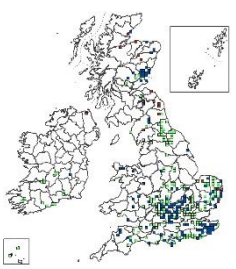
Thallus crustose, grey-white to greenish grey, thin and continuous or diffuse and immersed, uneven, without a cortex, developing a characteristic waxy pruinose 'tomentum' of crystals in dried collections, prothallus pale or absent. **Apothecia** numerous, crowded and often contiguous, rounded, immersed at first, becoming superficial. **Thalline margin** absent, or sometimes thinly enveloping sides of young apothecia. **Exciple** orange, narrow and becoming excluded. **Disc** yellow to orange, flat to convex when mature. **Paraphyses** lax, apical cell often swollen, oil cells sometimes present. **Ascospores** ellipsoidal, polarilocular, with a narrow septum. **Conidiomata** pycnidia where known, orange-red, ± emergent. **Conidia** bacilliform. **Chemistry**: thallus K–, apothecial discs K+ purple.

A small genus primarily characterized by a waxy thallus and ascospores with narrow septa. According to Arup *et al*. (2013), *Cerothallia* is related to a group of Southern Hemisphere taxa, which collectively form a clade sister to *Xanthocarpia*. Only one species is known from Britain and Ireland.

Literature:
Arup *et al*. (2013).

Cerothallia luteoalba (Turner) Arup, Frödén & Søchting (2013) **EN**

Caloplaca luteoalba (Turner) Th. Fr. (1861)



Thallus crustose, wide-spreading, grey-white, thin, continuous, uneven, without a cortex, developing a characteristic waxy pruinose 'tomentum' of crystals in dried collections, prothallus pale or absent. Apothecia 0.3–0.5 (–0.8) mm diam., numerous, crowded, often contiguous, rounded, immersed at first, becoming superficial; thalline margin undeveloped, or sometimes thinly enveloping sides of young apothecia; exciple orange, excluded; disc bright orange, deeply concave when young and becoming flat to convex when mature; paraphyses lax, apical cell often swollen, to *ca* 5 µm diam. Ascospores 8–12 × 3–6 µm, ellipsoidal, septum *ca* 1 µm thick, about 1/8 of the length of the ascospore. Pycnidia orange-red, ± emergent; conidia 3–4 × *ca* 1 µm, straight. Thallus K–, apothecial discs K+ purple. **BLS 0266**.

On rough bark of *Ulmus* or lignum of *Acer campestre*, *A. pseudoplatanus*, *Fraxinus* and *Ulmus*, especially in the wound tracks of injured, old trunks in parklands, rarely on soft, calcareous stone (e.g. chalk pebbles) or mortar; scarce. Much declined due to the loss of *Ulmus* through Dutch Elm Disease. Formerly widespread in lowland S. & E. England, N. to E. Scotland, S.W. Ireland, now very rare and mostly confined to high rainfall areas.

Conspicuous as deep orange patches of continuous apothecia on lignum of wayside trees where damaged by wounding and in nutrient-rich water runnels. The thin, grey thallus is dominated by clusters of rounded bright

orange apothecia which are immersed at first but become convex and superficial, lacking a persistent thalline margin, and with narrowly septate ascospores. The thallus is unusual in becoming waxy and pruinose in dried collections. The species often occurs with *Bellicidia incompta* (Ramalinaceae). It has been confused with *Coppinsiella ulcerosa* which has pustular soralia. *Athallia cerinella, A. cerinelloides* and the *A. holocarpa* agg. can also be a source of confusion; none of these have the small ascospores and narrow spore septum of *C. luteoalba*. Saxicolous forms usually have proven to be *Rufoplaca arenaria* or *Xanthocarpia fulva* s.l., which have larger ascospores.

COPPINSIELLA S.Y. Kondr. et L. Lőkös (2018)

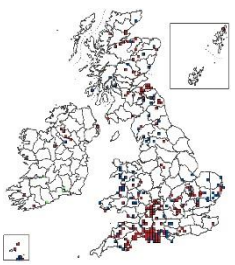
Thallus crustose, sometimes minutely squamulose, very thin and film-like, or immersed in rock or bark, grey to whitish. **Soralia** scattered, hardly distinct or immersed, crater-like to irregular and confluent, sometimes on the margins of thalline squamules or in substrate crevices. **Soredia** light greenish grey, without greenish blue pigment. **Apothecia** with a thin grey-whitish **thalline margin**, soon disappearing. **Exciple** concolorous with the disc. **Disc** orange to bright orange, from concave to flat or convex. **Ascospores** colourless, polarilocular, widely ellipsoidal with a thick septum. **Chemistry**: thallus, soralia and soredia if greenish white or greyish white K–, if yellowish K+ violet; apothecia K+ purple.

Species now assigned to *Coppinsiella* were not treated by Arup *et al*. (2013), but were recognized as belonging to a distinct clade by Vondrák *et al*. (2013, 2017) and transferred to a new genus by Kondratyuk *et al*. (2018). It appears to be related to *Athallia*, and is unusual in that constituent species have thalli both with and without anthraquinones. The type species, *C. ulcerosa* is the only one found in Britain and Ireland.

Literature:
Fletcher & Laundon (2009), Kondratyuk *et al*. (2018), Vondrák *et al*. (2013, 2017).

Coppinsiella ulcerosa (Coppins & P. James) S.Y. Kondr. & L. Lőkös (2018) **LC**

Caloplaca ulcerosa Coppins & P. James (1979)



Thallus crustose, wide-spreading, grey-white, forming a thin continuous non-areolate film; soralia rather scattered, discrete, rarely coalescing, very small, concave, rounded, to 0.3 mm diam., grey to pale yellow-green, arising from low, bursting pustules forming ulcer-like craters in the thallus; soredia coarsely farinose. Apothecia to 0.6 mm diam., usually present, usually scattered, soon emerging to sessile; thalline margin thin, grey-white; exciple orange, both exciples may become excluded; disc concave at first, soon becoming flat then convex, bright orange; paraphysis tips swollen, to 6 µm diam. Ascospores 8–12 × 4–8 µm, broadly ellipsoidal, septum 3–6 µm thick, between 1/3–1/2 of the length of the ascospore. Thallus and soredia K–, apothecia K+ purple. **BLS 0283**.

On nutrient-rich/base-rich bark of well-lit wayside trees, especially on mature trunks, of *Ulmus*, *Acer pseudoplatanus* and *Fraxinus*. Throughout lowland Britain but rare in Ireland; formerly considered as scarce but has perhaps extended its range in recent years.

Identified by the small, discrete vesicles which erupt into green soredia. Easily confused with *Caloplaca obscurella* which has papillose vesicles, blue-grey soredia and brown apothecia which are K–, and a darker grey thallus. Abundantly fertile forms can be taken for *Cerothallia luteoalba*, which lacks soredia and has smaller ascospores with narrower septa. *Scythioria phlogina* has irregular, green-yellow soralia. *Solitaria chrysophthalma* has bright yellow, round, ulcerose soralia. *Caloplaca alstrupii* has brighter green soralia, typically with the broken thallus cortex at least partly retained around the concave crateriform soralia.

A *Stigmidium* sp. with spores 12.5–15 × 2.3–3.5 µm has been reported on this host.

FLAVOPLACA Arup, Søchting & Frödén (2013)

Thallus crustose or squamulose, sometimes with an effigurate margin or distinct lobes. **Cortex** varied in structure, well-developed or sometimes indistinct. **Vegetative propagules** (soredia, isidia, blastidia or granules) produced by many species, sometimes obscuring the thallus. **Apothecia** usually present, usually with a distinct thalline margin and exciple. **Ascospores** polarilocular with a medium to long septum. **Conidiomata** pycnidia, present or lacking. **Conidia** bacilliform to ellipsoidal. **Chemistry**: (i) mostly with parietin (dominant), emodin, fallacinal, parietinic acid and teloschistin; a few with 7-Cl-emodin (dominant), emodin, 7-Cl-citreorosein and 7-Cl-emodinal. (Søchting 1997, 2001). **Ecology**: on calcareous rocks and human-made substrata or on maritime siliceous rocks, rarely corticolous.

Flavoplaca is composed partly of the largely sorediate *Caloplaca citrina* aggregate (Arup 2006), but also includes isidiate species and a number of taxa that do not produce vegetative propagules. It is thus somewhat difficult to define in morphological terms, and the distinction is hazy between *Flavoplaca* and *Athallia* (the old *Caloplaca holocarpa* group). Some species have well-developed lobate thalli, and show morphological similarities to species of *Calogaya*. Further studies may subdivide the genus further.

Literature:
Arup (2006), Arup *et al*. (2013), Powell & Vondrák (2011, 2012a, b), Rosato & Arup (2010), Vondrák *et al*. (2009).

1 Isidia, blastidia or soredia present 2
Vegetative propagules not produced, thallus entirely corticate (occasionally endolithic) 12

2(1) Thallus with isidia or blastidia 3
Thallus sorediate, or at least granular..... 6

3(2) Placodioid, marginal lobes usually >2 mm long .....***granulosa***
Crustose or merely effigurate at the margins, lobes <1 mm long 4

4(3) Thallus of isidium-like lobules, scattered; often on or overgrowing *Hydropunctaria maura* s.l. ..... ***microthallina***
Thallus crustose; not associated with *Hydropunctaria maura* 5

5(4) Thallus bright yellow to orange 6
Thallus lemon-yellow to green-yellow.....***limonia***

6(5) Blastidia 30–60 µm diam., disintegrating into sparse soredia; ascospore lumina hourglass-shaped, wall 1.2–2 µm thick .....***dichroa***
Blastidia 50–100 µm diam.; areoles 0.5–2 mm across, convex; ascospores with angular walls, <1 µm thick .....***arcis***

7(5) Thallus indistinctly corticate, not sorediate but sometimes reduced to granules ..... ***calcitrapa***
Thallus sorediate 8

8(7) Soredia on margins of corticate areoles 9
Soredia laminal on the surface of areoles 11

9(8) Soredia covering 10-50% of the thallus, mainly on slightly raised areole margins.....***flavocitrina***
Thallus ± completely sorediate, at least when old.....10

10(9) Thallus areolate (rarely squamulose), the areoles *ca* 250 µm thick; apothecial rim not sorediate ..... ***austrocitrina***
Areoles/squamules to 180 µm thick; apothecial rim usually sorediate.....***citrina***

11(8) Thallus to 300 (–550) µm thick, dull to bright yellow, sometimes with minute marginal lobes, sorediate; soredia coarse, mostly *ca* 100 µm diam.; old thalli may form a thick, entirely sorediate crust ..... ***limonia***
Thallus to 150 (–210) µm thick, yellow or orange, without marginal lobes, areoles ± entirely sorediate/blastidiate, vegetative diaspores smaller, <60 µm diam., usually both orange and yellow thallus morphs present ..... ***dichroa***

12(1) Thallus placodioid-lobate 13
Thallus crustose (rarely granular) 14

13(12) Marginal lobes isodiametric, prothallus often blackened; mesic-supralittoral ..... ***marina***
Marginal lobes 2-5 times longer than wide, not blackened; coastal on bird-perch rocks ***Athallia scopularis***

14(12) Thallus irregular, granular ..... ***calcitrapa***
Thallus ± evenly crustose or areolate 15

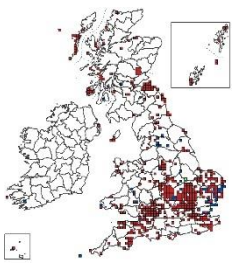
15(14) Thallus mesic-supralittoral among *Hydropunctaria* spp. and *Lecanora helicopis*, warted-areolate with deep cracks, deep orange, with isodiametric lobes at the margin; prothallus blackening ..... ***marina***
Thallus xeric-supralittoral or terrestrial 16

16(15) Thallus poorly developed, often ± endolithic and ± reduced to a blackish prothallus; non-maritime ... ***oasis***
Thallus well-developed; xeric-littoral or coastal 17

17(16) Areoles expanding into minutely lobed or fimbriate margins; prothallus absent or evanescent ..... ***sol***
Areoles becoming smaller towards the thallus margin; prothallus persistent ..... ***maritima***

Flavoplaca arcis (Poelt & Vězda) Arup, Frödén & Søchting (2013) **LC**

Caloplaca arcis (Poelt & Vězda) Arup (2006)



Thallus crustose, minutely rosette-like, areolate, minutely lobate at the margin, bright yellow, prothallus not evident. Margins of areoles rimmed with coarse shiny ± spherical blastidia, 50–100 µm diam. Apothecia adnate to sessile, thalline margin usually obvious, sometimes excluded. Paraphyses widening to *ca* 6 µm at the tips. Ascospores (10–) 11–14.5 (–15) × (5.5–) 6–8.5 (–9.0) µm, with angular walls. All parts K+ purple. **BLS 2442**.

On limestone, cement and weakly calcareous rocks such as dolomite. Common in churchyards and on lowland walls, throughout Britain and especially frequent in lowland areas of England. Hardly reported from Ireland, though probably common there also.

Much confused with *Flavoplaca citrina* and *F. flavocitrina* which are sorediate and lack marginal lobes. Seashore specimens on limestone may be confused with *Haloplaca britannica* which is strictly coastal in distribution, has coarse isidia, and is usually in dusty crevices on siliceous rock. This entity was known informally as *Caloplaca* 'A' by British churchyard recording groups. British reports of *F. coronata* appear to be of *F. arcis*.

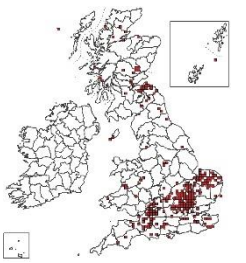
Intralichen cf. *christiansenii* has been reported on this host.

Flavoplaca austrocitrina (Vondrák, Říha, Arup & Søchting) Arup, Søchting & Frödén (2013) **LC**

Caloplaca austrocitrina Vondrák, Říha, Arup & Søchting (2012)

Thallus yellow (rarely orange in some Mediterranean collections), areolate or formed of tightly aggregated squamules. Areoles/squamules to 250 (–380) µm thick and (0.25–) 0.5–1 (–1.7) mm diam., flat, smooth, with marginal soralia; in old thalli, soralia may cover the whole thallus surface. Soredia 25–50 (–60) µm diam., sometimes aggregated into consoredia. Apothecia often present, 0.35–0.6 mm diam.; disc in mature apothecia flat to convex; exciple 50–100 (–130) µm thick; thalline margin hidden below the exciple in young apothecia, well-

developed and persisting in old apothecia. Hymenium 60–80 µm thick. Paraphysis tips widened to 4–6 µm diam. Ascospores (8.5–) 9.5–12 (–14) × (4.5–) 5.5–6 (–6.5) µm, the septum 4–5 µm thick, about 40% of the length of the ascospore. Conidia (2–) 2.5–3.5 (–4) × 1–1.5 µm.



On calcareous sandstone, limestone, concrete, mortar, brick etc., throughout lowland England, scattered in Wales and Scotland, apparently absent (though surely not reported) from Ireland.

Distinguished by its rather thick areolate (rarely squamulose) thallus, relatively large areoles (squamules), and soralia at the margins of areoles, though old thalli are usually entirely covered by soredia. The identity of British material is doubtful; a single sequence showed differences with that of the type of *F. austrocitrina* (Powell & Vondrák 2012b) and it may be that a separate taxon is involved.

Flavoplaca calcitrapa (Nav.-Ros., Gaya & Cl. Roux) Arup, Frödén & Søchting (2013) **NE**

Caloplaca calcitrapa Nav.-Ros., Gaya & Cl. Roux (2000)

Caloplaca itiana sensu auct. br., *non* Cl. Roux, M. Boulanger & Malle (2009)

Thallus yellow, rarely orange, areolate or bullate, occasionally thin and ± endolithic. Areoles (80–) 100–170 (–210) µm thick and 0.3–0.7 (–1.0) mm diam. Soredia and isidia absent. Cortex indistinct, epinecral layer usually with intermixed crystals. *Apothecia* frequent, 0.3–0.9 (–1.5) mm diam.; disc flat to strongly convex in old apothecia; margin (40–) 70–130 (–210) µm thick with distinct but variably developed thalline and excipular components. Hymenium 60–80 µm thick. Paraphyses tips widened to 4–7 µm diam. Ascospores (10–) 11.5–15 (–17.5) × (5–) 6–8 (–9) µm, the septum (3–) 3.5–5.5 (–6.5) µm thick, *ca* 40% of the length of the ascospore. Conidia (2.5–) 3–4 × 1–1.5 µm. **BLS 2609**.

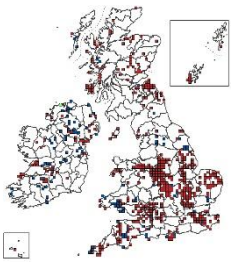
On maritime and inland limestone, Wales (Caernarvon, Glamorgan, Pembrokeshire) and on a limestone balustrade, England (Buckinghamshire – there possibly introduced; Powell & Vondrák 2012a).

Most similar to *Flavoplaca arcis* but with thalli that lack blastidia. *Xanthocarpia crenulatella* also resembles *F. calcitrapa* but has a less bullate and glossy thallus. Snail-grazed forms with flat areoles are common, according to Vondrák *et al*. (2009). The description is adapted from Navarro-Rosinés *et al*. (2000) and Vondrák *et al*. (2009).

Caloplaca itiana as treated by Orange (2018) seems to be a synonym of *F. calcitrapa*; material from the type locality of the former species sequenced by Orange was placed in the *F. calcitrapa* clade, but sequences from an isotype indicates that *C. itiana* is close to *C. dalmatica* auct. br. See Arup *et al.* (2024) for more information.

Flavoplaca citrina (Hoffm.) Arup, Frödén & Søchting (2013) **NE**

Caloplaca citrina (Hoffm.) Th. Fr. (1860)



Thallus very variable, a few mm to many cm diam., 0.1–0.6 mm thick, consisting of scattered to continuous areoles that become largely to completely sorediate; areoles 0.1–1.0 (–1.5) mm diam., flat to convex, often irregular and flexuose or almost squamulose, pale greyish or greenish yellow to intense yellow or orange-yellow. Soredia (25–) 30–60 (–75) µm diam., usually concolorous with or paler than the thallus. Prothallus normally not present, sometimes very thin, white or pale yellow. Cortex usually poorly developed. Apothecia often present, sometimes abundant, adnate to sessile, 0.3–1.5 mm diam.; disc slightly concave to convex, sometimes flexuose, beige-yellow to yellow-orange, sometimes with a thin white pruina; exciple slightly raised or level with the disc; thalline margin mostly present, but sometimes excluded, even or crenulate, sometimes sorediate. Hymenium 70–80 µm thick, colourless; hypothecium 40–75 µm thick, colourless; paraphyses unbranched or branched once above, 2–2.5 µm diam. with upper cells wider, to 7 µm diam. Ascospores ellipsoidal to broadly ellipsoidal, 10–15 × (4–) 5–7.5 (–8) µm, septum (2.5–) 3–5 (–5.5) µm thick, 25–40% of the length of the ascospore. Pycnidia often present, immersed, orange. Conidia bacilliform to broadly ellipsoidal, 2.5–3.8 × 1.0–1.5 µm. **BLS 2351**.

On limestone, mortar and brickwork. Confirmed recent records from Cumbria, N. Wales, the Peak District and Gloucestershire, probably more widespread. Older records refer to *Flavoplaca citrina* s. lat., which includes most species of the genus as currently circumscribed, from a broad range of calcareous and nutrient-enriched habitats.

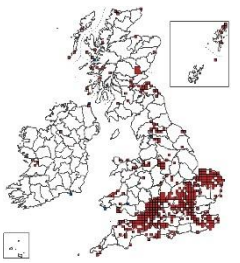
The description is adapted from Arup (2006). Of similar species, *Flavoplaca flavocitrina* has tiny squamules, especially when young, with farinose soredia at the tips, which may spread and obscure about 50% of the thallus, but the apothecia lack soredia and the thalline margins are smooth, ascospores are slightly longer, and sterile areoles are flat, regular, with margins upturned where sorediate and soredia are brighter yellow than the thallus. *Scythioria*

phlogina has a paler, white to green-yellow, areolate thallus with pale yellow soredia, smaller spores, smooth thalline margins and broadly ellipsoidal conidia. *Haloplaca britannica* and *F. microthallina* in seashore crevices have larger, isidiate granules. *H. sorediella* is on dead seashore plants and has ulcerose soralia. *Candelariella reflexa* is K–. *F. arcis* has also been erroneously recorded as *F. citrina* or as *H. brittanica*. *Lepraplaca chrysodeta* can be confused with sterile *F. citrina* agg. but the latter has larger, brighter yellow, globose soredia, around 0.1 mm diam., and grows on smooth, well-lit, calcareous surfaces. *Caloplaca borreri* is corticolous and is composed entirely of leprose granules, <0.05 mm diam.

Verrucula latericola s. l. is parasitic on *F. citrina* agg. and other *Flavoplaca* spp. Also recorded are *Intralichen* cf. *christiansenii* and *Llimoniella groendlandiae* (Alstrup & D. Hawksw.) Triebel & Hafellner (1993).

Flavoplaca dichroa (Arup) Arup, Frödén & Søchting (2013) **LC**

Caloplaca dichroa Arup (2006)



Thallus crustose, granular-areolate with deep cracks, effuse at the margin, pale yellow-orange to orange; areoles flat to convex, round to flexuose or sub-lobate at the margin; surface dissolved into blastidia or granules, (25–) 30–60 (–70) µm diam., which can appear sorediate; prothallus absent or pale yellow. Apothecia frequent, adnate to sessile, 0.3–1 mm diam., constricted at the base, round to irregular, disc K+ purple, flat or somewhat convex, orange, lacking pruina, often uneven or crenulate, rarely blastidiate; thalline margin thick, exciple present; paraphyses widened to *ca* 6 µm at the apex. Ascospores polarilocular, (11–) 12–16.5 (–17) µm, septum 2.5–4 µm thick, often poorly developed, 1/5–1/3 length of ascospore, spore wall uniformly *ca* 2 µm thick, lumen characteristically hour-glass (sand-clock) shaped. All parts K+ purple. **BLS 2443**.

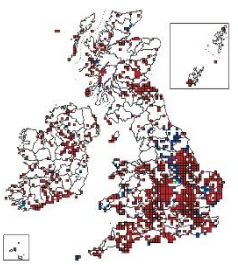
On limestone rocks, concrete, calcareous sandstone etc., often on walls and gravestones in sunny, exposed sites; locally abundant and very common in the south and east.

Distinguished by the thick-walled ascospores with small globose or hour-glass shaped lumina, but these could be interpreted as immature as the apothecia can also contain normal polarilocular spores. Two colour forms exist, one yellow and one orange, which frequently coexist. The blastidia can resemble isidia. Once probably overlooked as *F. citrina* which is green-yellow to yellow-orange. *F. flavocitrina* has smaller blastidia. *F. coronata*, incorrectly reported for Britain and Ireland, is a Mediterranean species with a thinner thallus.

Reported to be a host for *Verrucula helvetica* (q.v.).

Flavoplaca flavocitrina (Nyl.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca flavocitrina (Nyl.) H. Olivier (1909)



Thallus similar to *F. citrina*, of contiguous and rather smaller areoles or squamules, flat to flexuose, margin dissolved into fine soredia that eventually cover much of the surface; pale yellow to pale orange, paler than the thallus, (20–) 25–50 (–55) µm diam. Apothecia frequent, adnate, 0.3–0.8 mm diam., disc flat to slightly convex, deeper colour than the thallus, yellow-orange, thalline margin rarely sorediate; paraphyses broadening to *ca* 7 µm at the tip. Ascospores (9–) 9.5–13 (–14) × (4.5–) 5–7 (–8) µm., septum 2.5–4 µm thick. Pycnidia bacilliform. All parts K+ purple. **BLS 2315**.

Saxicolous and corticolous; on calcareous rocks, cement, mortar, asbestos and limestone, or base-rich bark of *Ulmus*, *Fraxinus*, *Acer*, etc., in open situations; very common. Throughout Britain and Ireland.

Previously subsumed within the *F. citrina* aggregate. The flat areoles, bright yellow farinose soredia which are paler than the cortex, and smooth-margined apothecia and often corticolous habitat make it distinctive. *F. arcis* has gross blastidia bordering areoles and minute lobes at the thallus margin. *Scythioria phlogina* lacks squamules, and is corticolous.

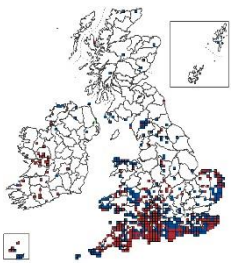
Recorded on this host are *Intralichen* cf. *lichenicola* and a *Stigmidium* sp. with spores 13–15 × *ca* 3.5 µm.

Flavoplaca granulosa (Müll. Arg.) Arup, Frödén & Søchting (2013) **NT**

Caloplaca granulosa (Müll. Arg.) Jatta (1900)

Thallus placodioid, forming closely-appressed orbicular thalli, yellow to orange, the margin of short convex finger-like lobes, centrally granular-areolate; lobes to 2–3 × 0.5 mm, convex, contiguous, divided by furrows, palmately branched; isidia abundant, variable in size, to 0.1 mm diam., globose, usually obscuring the centre of the thallus as a granular-areolate crust. Apothecia to 1 mm diam., scattered, rounded, sessile, constricted at the base; disc concave

becoming convex; thalline margin smooth, swollen, later granular-crenulate. Paraphyses broadened towards the tips, apical cell to 8 µm diam. Ascospores 11–13 ×7–9 µm, broadly ellipsoidal, septum 3-6 µm thick, about1/4–1/2 of the length of the ascospore. All parts K+ purple. **BLS 0257**.



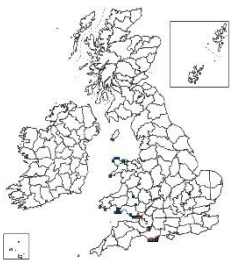
On sunny sheltered coastal limestone and medieval castle walls; rare. Recent records from Wales (Caernarvon, Anglesey, Pembrokeshire, Glamorgan), Isle of Man, England (Somerset, Dorset).

Distinguished by the bright yellow-orange, placodioid and isidiate thallus. The finger-like isidia resemble those of the crustose "*Caloplaca*" *littorea* which lacks marginal lobes. *Polycauliona verruculifera* is larger (with lobes 6–7 mm long), has a green-grey-yellow thallus densely covered with globose flattened isidia, and is confined to nutrient-enriched bird-perching rocks on or near the coast.

Flavoplaca itiana (Cl. Roux, M. Boulanger & Malle) Arup & Søchting (2024) **LC**

Caloplaca dalmatica auct. br., *non* (A. Massal.) H. Olivier (1909)

Thallus crustose, yellow-orange to orange-brown in bright sunlight, occasionally white in parts, fairly smooth to minutely roughened, continuous, sometimes pruinose, usually finely rimose-areolate, intersected by black lines of the hypothallus; prothallus grey-black or absent. Apothecia to 0.8 mm diam., scattered or grouped, rounded, immersed at first, sometimes becoming sessile, later sub-convex; thalline margin conspicuous, often becoming excluded in old apothecia; disc yellow to pale brown-orange, often concolorous with the exciple; paraphyses straight, sparsely branched, most tips broadened, the apical cell 2–8 µm diam. Ascospores 9–13 × 5–9 µm, broadly ellipsoidal, septum 3–5 µm thick, 1/4–1/2 of the length of the ascospore. Thallus and apothecia K+ purple. **BLS 0285**.



On hard limestone in sunny situations, especially on walls and churchyard tombstones in areas of low air pollution; local. Mainly S. England & Wales, becoming scarcer in N. England, N. Ireland & coastal Scotland.

A conspicuous species, readily identified by the yellow to orange thallus, intersected by fine, black lines, the subconvex and immarginate apothecia, often with paler areas (possibly due to browsing by molluscs), bordered by a black prothallus often forming a mosaic.

This species was transferred to *Flavoplaca* by Arup *et al.* (2024). *Caloplaca dalmatica* as interpreted by British authors (e.g. Fletcher & Laundon 2009, Orange 2018) belongs to *F. itiana*, but the type specimen of *C. dalmatica* differs from British material in having a smooth, non-areolate, orange thallus with immersed apothecia. It was transferred to *Variospora* by Roux (2022), and while DNA sequences are lacking, this seems an appropriate placement.

In N. England (N. Yorkshire) thalli are reported to be often reduced and poorly developed. *Xanthocarpia ochracea* is similar but has a thin thallus with a felt-like texture and 4-celled ascospores. *Gyalolechia flavovirescens* has larger, darker apothecia and larger ascospores (13–19 × 9–14 µm) with a broader septum. *Flavoplaca oasis* forms orbicular, effigurate patches and is parasitic on endolithic *Verrucaria* spp.

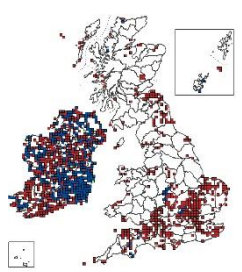
Fletcher & Laundon (2009) included *Caloplaca schaereri* (Arnold) Zahlbr. (1890) and *C. velana* (Massal.) Du Rietz (1925) in synonymy with *C. dalmatica*, but both of these species belong in *Variospora* and their status in Britain and Ireland is unknown.

Reported on this host are *Muellerella lichenicola* and *Tremella caloplacae*.

Flavoplaca limonia (Nimis & Poelt) Arup, Frödén & Søchting (2013) **NE**

Caloplaca limonia Nimis & Poelt (1994)

Thallus pale to bright lemon-yellow or green-yellow, often white-pruinose, forming a thick continuous flat areolate crust, the areoles irregular in shape, mostly (100–) 200–400 (–550) µm thick and 0.6–1.5 mm diam., the margin sometimes slightly lobate, covered by blastidia or (more rarely) erumpent laminal soralia; soredia and blastidia mostly 50–100 µm diam. Apothecia frequent, 0.4–1 (–1.5) mm diam., with a slightly concave to flat yellow-orange disc, with a persistent thalline margin that is often covered by blastidia; hymenium 60–90 µm thick; paraphyses broadened at the tips to 4–5 µm diam. Ascospores (9–) 11.5–14.5 (–16) × 4.5–7 µm; length/breadth ratio variable but usually *ca* 2.0:1, the septa 4–7 µm thick, *ca* 40% of the ascospore length. **BLS 2607**.



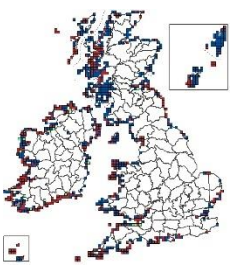
On limestone and calcareous sandstone, especially on church walls and gravestones,

not present in areas of copper run-off. Very common in S. England, but extending locally as far north as Orkney and Shetland. The Irish records indicated on the map are almost all erroneous.

Until recently, British and Irish populations of *F. limonia* were identified as *Caloplaca* (*Flavoplaca*) *citrina* (Powell & Vondrák 2012b), which is similar but has erumpent soralia with small soredia (to *ca* 60 µm diam.), rather than the larger blastidia that dominate in *F. limonia*. *Caloplaca ruderum* is very similar and occurs in similar habitats, but does not produce blastidia.

Flavoplaca marina (Wedd.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca marina (Wedd.) Zahlbr. (1921)



Thallus crustose, deep orange, paler in shade, moderately thick, continuous and deeply areolate, sometimes warted with black stains between, usually growing in rounded patches, sometimes with poorly defined isodiametric convex lobes 0.3–0.5 mm wide at the margin; a pale yellow to white prothallus is sometimes present. Apothecia to 0.8 mm diam., scattered to crowded, rounded, soon becoming sessile; thalline margin swollen, becoming narrower when old; exciple sometimes also conspicuous; disc becoming subconvex, concolorous with the thallus or deeper orange; paraphyses broadened towards the tips, to 5 µm diam. Ascospores 11–15 × 5–8 µm, ellipsoidal, septum 3.5–5 µm thick, about 1/3 of the length of the ascospore. All parts K+ purple. **BLS 2067**.

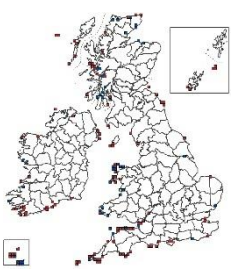
On sunny, siliceous and calcareous coastal rocks, in the mesic-supralittoral or sometimes within the upper part of the littoral zone with the black *Hydropunctaria maura* s.l.; also on wood and concrete sea defences, flints on shingle beaches, or periodically submerged consolidated shingle; very common. All coastline of Britain and Ireland where suitable substrata occur.

The marginal 'lobules' are indistinct and are interpreted here as areoles. Distinguished by the irregularly spreading, areolate to warted thallus without elongate marginal lobes, bearing rounded, flat apothecia, constricted at the base with swollen margins when young. *Variospora thallincola*, which grows in the same part of the seashore, has well-defined elongate radiating marginal lobes 3–5 mm long, and a preference for more shaded and sheltered habitats. *F. maritima* occurs on siliceous rocks and walls in the xeric-supralittoral and coastal terrestrial region and is never inundated; its thallus is yellow-orange, knobbly-areolate and lacks marginal lobules. Forms on coastal timber can resemble *Gyalolechia flavovirescens*, but this has larger ascospores with a narrower septum.

Reported on this host are *Stigmidium epistigmellum* (Nyl. ex Vouaux) Kocourk. & K. Knudsen (2009) and possibly also *Verrucula latericola* s. lat.

Flavoplaca maritima (B. de Lesd.) Arup, Frödén & Søchting (2013) **Nb**

Caloplaca maritima (B. de Lesd.) B. de Lesd. (1953)



Thallus golden-yellow to pale orange, crustose, extensively cracked-areolate, with flat, uneven-knobbly areoles, limited by an orange prothallus, often in extensive patches; apothecia usually numerous, sessile, flat, yellow to yellow-orange, with a thin thalline margin. Ascospores 11–15 × 5–8 µm, septum 3.5–5.5 µm thick. All parts K+ purple. **BLS 0280**.

On sunny siliceous, occasionally weakly calcareous walls, vertical rocks and rarely on timber, in the xeric-supralittoral and seashore terrrestrial region and coastal sites; probably overlooked. Mostly W. Britain and Ireland but rarer in Scotland, Channel Is.

An overlooked species much confused with *F. marina*. The two species often occur together and then often (but not exclusively) may be distinguished by the contrasting thallus colour; bright orange in *F. marina*, yellow-orange in *F. marina*. Truly crustose, the areoles get smaller towards the margin and isodiametric lobules are lacking. Though exclusively coastal to 1 km inland, it is never mesic-supralittoral and is often in sheltered places. Sometimes, when subject to downwash from mortar, it may resemble *Gyalolechia flavovirescens*, although the latter is on calcareous rock, has rimose flat smooth areoles, and larger ascospores 13–19 × 7–10 µm in size, with broader septa, 4.5–7 µm thick.

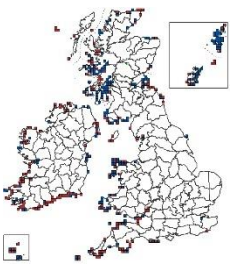
Reported to host *Verrucula maritimaria* (q.v.).

Flavoplaca microthallina (Wedd.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca microthallina (Wedd.) Zahlbr. (1931)

Thallus of contiguous or often scattered, small microsquamules or lobules (often isidium-like), rounded or elongate, 0.5–2 mm diam., convex, pruinose, yellow-orange. Apothecia to 1 mm diam., scattered, sometimes isolated; flat but becoming convex; exciple conspicuous, yellow-orange at first, reduced or crenulate when mature; disc orange;

paraphyses with the apical cell often swollen, to 7 µm diam. Ascospores 12–15 × 6–8 µm, ellipsoidal, the septum (1–) 3 µm thick, about 1/4 of the length of the ascospore. All parts K+ purple. **BLS 0268**.



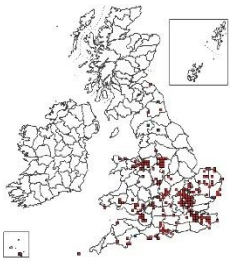
On siliceous and calcareous coastal rocks in the mesic-supralittoral zone, often following cracks and overgrowing *Hydropunctaria maura* s.l.; frequent. W. & N. Britain, more or less absent from Hampshire eastwards to Berwick due to lack of suitable hard rocks; all around Ireland.

The minute yellow-orange scattered K+ purple squamules resemble lobules intermixed with decumbent isidia. They usually overgrow *Hydropunctaria maura*, or appear as yellow lines following cracks in rock. The colour tends to be paler than the deep orange of the large areoles of *F. marina* and is darker than the yellow of *F. maritima* with which it often occurs. All other coastal, yellow, crustose *Caloplaca* s.l. bear true isidia or soredia.

Flavoplaca oasis (A. Massal.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca oasis (A. Massal.) Szatala (1932)

Caloplaca polycarpa auct. br., non (A. Massal.) Zahlbr. (1919)



Thallus discontinuous to continuous, very thin and sometimes almost absent, composed of scattered to contiguous areoles or cracked-areolate; areoles 0.1–1.0 mm diam., pale yellow to yellow, sometimes greyish yellow. Margin indistinct, of scattered areoles or more distinct with contiguous areoles. Prothallus usually absent, or yellow and film-like. Apothecia usually abundant, scattered to crowded, sometimes contiguous, ± immersed to adnate, round to somewhat angular, 0.2–0.4 (–0.7) mm diam.; disc flat to slightly convex, orange to brownish orange, often overgrown by cyanobacteria; exciple slightly raised or level with the disc, concolorous with or slightly paler; thalline margin often inconspicuous; epithecium orange, of inspersed granules; paraphyses sometimes branched above with upper cells swollen to 4–6 µm diam. Ascospores ellipsoidal, (8–) 9.5–13 (–14) × (4–) 4.5–6.5 (–7) µm, the septum 2.5–4.5 µm thick, about 1/4 to 1/3 of the length of the spore. Pycnidia rarely observed, immersed, orange; conidia broadly ellipsoidal, 2.0–3.5 × 1.3–1.7 µm. **BLS 2461**.

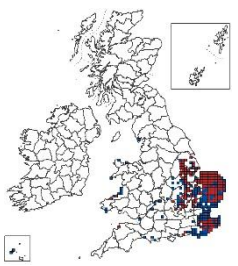
On limestone, concrete and mortar, more rarely on asbestos, chalk pebbles, bone and flint. Very common throughout England and Wales north to around Manchester, scattered further north, hardly reported from Ireland but must be much under-recorded.

One of the species included in the *Caloplaca* (*Athallia*) *holocarpa* agg.; most older records of that species on calcareous substrata are likely to be *F. oasis*. British and Irish records of *F. polycarpa* (A. Massal.) Arup, Frödén & Søchting (syn. *Caloplaca polycarpa* (A. Massal.) Zahlbr.) are also likely to belong here. It is frequently associated with thalli of *Bagliettoa* spp. on limestone and has been considered as a parasite (Arup 2009).

Muellerella lichenicola has been reported on this host.

Flavoplaca ruderum (Malbr.) Arup & Søchting (2024) **LC**

Caloplaca ruderum (Malbr.) J.R. Laundon (1976)



Thallus crustose, yellow to yellow-white, thick, very irregular and uneven, of prominent white-pruinose markedly convex to spherical contiguous irregularly-shaped, sometimes almost squamulose areoles 0.5–1.5 mm diam. Apothecia to 1.5 mm diam., scattered to crowded, rounded but often distorted by compression when old; exciple obvious, surrounded by a thick (*ca* 0.2 mm) pruinose thalline margin, disc brown-orange, at first urceolate, becoming flat; paraphyses unbranched, many with swollen apical cells to 5 µm diam. Ascospores 10–15 × 6–8 µm, ellipsoidal, septum 2.5–5 µm thick, between 1/5–1/3 of length of the ascospore. Thallus and apothecia K+ purple. **BLS 0275**.

On soft, calcareous walls and mortar, especially on the S. side of medieval churches, rarely on base-rich coastal rocks; common in S.E. England and E. Anglia, local in N. & W. Wales and Cumbria.

Characterized by the pure yellow (never orange), usually densely white-pruinose thallus of rough, convex areoles and the urceolate young apothecia with thick swollen thalline margins; the thallus has an overall hoary appearance, on soft limestone or mortar. It may resemble contorted specimens of the lobulate *Calogaya pusilla* or *C. decipiens*. *Gyalolechia flavovirescens* has a flat, non-areolate and non-pruinose green-yellow thallus and convex, orange apothecia.

The species has been studied by Arup *et al*. (2024), and its position confirmed in *Flavoplaca*. Reported on this host are *Intralichen christiansenii* and *Muellerella lichenicola*.

Flavoplaca sol (Orange) Arup & Søchting (2024) **NE**

Caloplaca sol Orange (2018)

Thallus well-developed, to 280 µm thick, orange-yellow, the margin well-defined, thin and often fimbriate, cracked-areolate, flat, uneven or gently convex; young thallus orange-yellow, older parts orange-yellow or yellow, or yellow with white mottling (possibly due to damage to the cortex). Apothecia sparse to numerous, mostly not contiguous, to 0.6 mm diam., becoming sessile early in development, constricted at the base when mature; exciple yellow-orange, disc slightly darker, flat to slightly convex, smooth or slightly yellow-pruinose when young; thalline margin mostly absent. Paraphyses with the uppermost cells swollen to 5–7.5 µm diam. Asci 8-spored. Ascospores (10–) 11.5–12.5 (–14.5) × (5·5–) 6.5–7 (–7.5) µm, septum 4–5 (–6.5) µm thick, around 2/5 of the length of the spore. Pycnidia not seen. **BLS 2707**.

On vertical or overhanging dry sunny faces on limestone or base-rich siliceous cliffs and boulders; S. and W. Britain from Dorset and Cornwall to North Wales.

According to Orange (2018), although this is a striking species in the field, it is likely that it has been overlooked as a morph of *Flavoplaca marina*. However, that species is normally darker orange in colour and the areoles are more convex, and it occurs primarily in the mesic-supralittoral zone of the seashore. *F. maritima* differs in the more convex areoles, which tend to become isolated as the thallus ages, and the young apothecia often have a yellow crenulate thalline margin. *Gyalolechia flavovirescens* has large (often to 1 mm diam.) orange apothecia that contrast strongly in colour with the yellow epilithic thallus.

GYALOLECHIA A. Massal. (1852)

Thallus crustose or squamulose, dispersed to placodioid, yellow to orange-yellow, sometimes with schizidia. **Soralia** and **isidia** not present. **Photobiont** chlorococcoid. **Ascomata** apothecia, sessile; disc orange-brown, usually distinctly different in coloration from the thallus. **Thalline margin** usually present, concolorous with the thallus or somewhat darker, often becoming excluded. **Asci** 8-spored, *Teloschistes*-type. **Ascospores** colourless, ellipsoidal to pyriform or fusiform, aseptate or polarilocular, sometimes 1-septate and then hardly polarilocular. **Conidiomata** pycnidia, rare, immersed, sometimes multilocular. **Conidiogenous cells** lining locules within the pycnidial cavity, ± subglobose to short-ampulliform. **Conidia** ellipsoidal, aseptate, colourless. **Chemistry**: fragilin (major), parietin, emodin, caloploicin, ± callacinol. **Ecology**: on bark, calcareous rock, soil or mosses.

Distinctive for the presence of fragilin as a major chemical substance, and for apothecia that are usually darker in coloration in contrast to the pale yellow thalli. Arup *et al*. (2013) adopted a rather broad concept of *Gyalolechia* with diverse thalline morphology, but the genus in this circumscription is monophyletic and chemically homogenous. The further subdivisions advocated by Kondratyuk *et al.* (2017, 2022) are not adopted.

Of the four species recorded from Britain and Ireland, two were included in the genus *Fulgensia* by Gilbert *et al*. (2009), and the others in *Caloplaca* s.l.

Literature:

Arup *et al.* (2013), Gilbert (2009), Kondratyuk *et al.* (2017, 2022), Vondrák *et al.* (2016a), Westberg & Kärnefelt (1998).

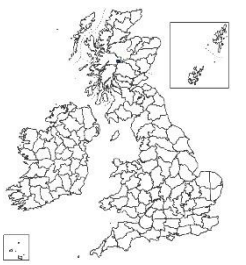
1 Thallus crustose, on rock or bark; ascospores polarilocular with thick septa 2
Thallus ± placodioid or of large convex areoles, on soil or over mosses; ascospores aseptate or with narrow septa 3

2(1) Thallus cracked-areolate; on limestone or concrete etc., common ..... ***flavovirescens***
Thallus smooth; on bark, rare ..... ***flavorubescens***

3(1) Thallus warty-scaly, the marginal lobes not or only weakly differentiated, composed of dispersed groups and islands of areoles; ascospores mostly broadly ellipsoidal, 4–7 µm diam. ..... ***bracteata***
Thallus placodioid, the marginal lobes clearly differentiated; inner part of thallus ± continuous; ascospores ellipsoidal to pyriform, 3.5–5 µm diam. ..... ***fulgens***

Gyalolechia bracteata (Hoffm.) A. Massal. (1852) **VU**

Fulgensia bracteata (Hoffm.) Räsänen (1943)



Thallus 1–2 cm diam., golden-yellow, roughened, sparingly pruinose, of dispersed or ± contiguous groups of ± convex areoles, the margin not or indistinctly lobed, the lobes scarcely longer than broad, the centre strongly scaly-warty, often ± overlapping and forming congested clusters, occasionally becoming detached as schizidia. Apothecia 0.5–1 (–1.2) mm diam., frequent; disc orange-brown. Ascospores 9–13 × 4–7 µm, aseptate, broadly ellipsoidal. Thallus K+ purple (parietin and its precursor emodin), UV± salmon-orange (physcion), small amount of fallacinol and fallacinal (trace) are present, apothecia K+ purple (physcion). **BLS 0512**.

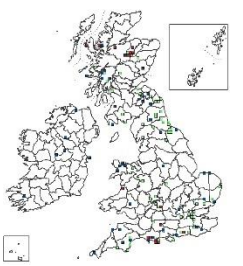
On rock, soil and mosses on a buttress of metamorphosed 'sugar limestone' above 1000 m; very rare. N. Scotland (E. Inverness, Ben Alder range).

Several minor infraspecific taxa have been described; the Scottish material matches *Fulgensia bracteata* var. *alpina* (Th. Fr.) Räsänen (1943) according to Gilbert (2009), but the varietal name has not been combined into *Gyalolechia* and its status is uncertain.

Gyalolechia flavorubescens (Huds.) Søchting, Frödén & Arup (2013) **EN**

Caloplaca flavorubescens (Huds.) J.R. Laundon (1976)

Opeltia flavorubescens (Huds.) S.Y. Kondr. & Hur (2020)



Thallus crustose, white-yellow-green, sometimes suffused grey, continuous, smooth, uncracked and even to coarsely convex-granular-papillate, often delimited by a conspicuous smooth white-grey to blue-grey prothallus. Apothecia to 3 mm diam., scattered to crowded, rounded, flat to slightly convex, becoming irregular and distorted when old; thalline margin thin, grey-yellow, crenulate, soon becoming excluded, retained on the underside of the apothecia; exciple prominent, somewhat elevated, smooth, yellow-orange to orange; disc orange to deep orange, flat. Lower part of hymenium and hypothecium with numerous oil droplets; paraphyses forked mainly towards the tips, the apices often broadened to *ca* 4 µm diam. Ascospores 15–18 × 6–10 µm, ellipsoidal, the septum 5–9 µm thick, to 1/2 of the length of the ascospore. All parts K+ purple. **BLS 0254**.

On wayside and parkland *Fraxinus*, particularly in limestone areas, and on *Populus tremula* (Scottish Highlands), scarce on wood; endangered, decreasing. Common and widespread before the Industrial Revolution but now rare and reduced to a few localities in unpolluted areas of lowland England, N. Wales, Scotland & Ireland.

Distinguished by its corticolous habit and grey to pale yellow thallus with bright orange apothecia containing oil droplets in the hypothecium, forming irregular patches between other lichens on bark. The saxicolous *G. flavovirescens* has smaller, darker apothecia which lack oil droplets in the hypothecium.

Molecular data places this species within *Gyalolechia* s.l. (Arup *et al*. 2013), but it is very different in phenotypic terms from the type of that genus and it occupies a different, well-supported subclade. However, the transfer of *C. flavorubescens* to *Opeltia* by Kondratyuk & Hur (in Mishra *et al*. 2020) needs further thought; it appears that *C. flavorubescens* is polyphyletic and the phylogenetic evidence provided in support of both genus and transfer is not robust.

The plurivorous *Marchandiomyces corallinus* (Roberge) Diederich & D. Hawksw. (1990) has been reported on this host.

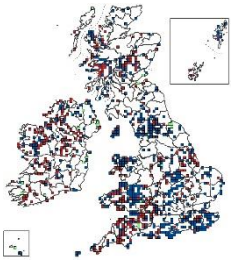
Gyalolechia flavovirescens (Wulfen) Søchting, Frödén & Arup (2013) **LC**

Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth. (1902)

Laundonia flavovirescens (Wulfen) S.Y. Kondr., Lőkös & Hur (2017)

Like *C. flavorubescens* but differing in the saxicolous habitat, rimose-areolate (not smooth and entire) thallus, smaller (to 1.1 mm diam.), darker apothecia, and with orange-brown, often darker and more convex discs; the

hymenium lacks oil droplets. All parts K+ purple. **BLS 0255**.



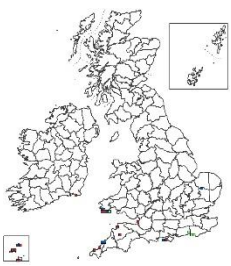
Common and widely distributed in limestone areas at low to moderate altitude, and on base-rich human-made substrata such as concrete; sometimes on siliceous stonework subject to cement downwash, such as walls and bridges; frequent but overlooked on seashores in the xeric-supralittoral zone, rarely on salt marsh timbers. Usually occurs as large, conspicuous single thalli.

The yellow to greenish-brown thallus contrasting with orange-brown apothecia as a good indicator for identification. Included within a broad concept of *Gyalolechia* by Arup *et al*. (2013) and given its own genus *Laundonia* by Kondratyuk *et al.* (2017), but its phylogenetic position needs further study. It is related to the corticolous *C. flavorubescens* but has smaller, deep orange apothecia and the hypothecium lacks oil droplets.

Apparently commonly parasitized by *Verrucula latericola*, and also host to the plurivorous *Muellerella lichenicola*.

Gyalolechia fulgens (Sw.) Søchting, Frödén & Arup (2013) **EN**

Fulgensia fulgens (Sw.) Elenkin (1907)



Thallus 1–3 cm diam., orange-yellow to whitish, rosette-like or often irregular and fragmented, ± placodioid; marginal lobes neat, clearly differentiated, longer than broad, mostly over 1 mm wide, remaining ± discrete or often overlapping especially towards the centre, which often becomes verrucose-bullate with age, ± coarsely pale pruinose; schizidia variable, in most populations part of the thallus surface is given over to their production which when shed, exposes the white medulla. Apothecia often present, 0.5–1.5 diam., at first concave with a thalline margin, becoming convex with an ± excluded margin, deep orange contrasting with the paler thallus. Ascospores 9–12 × 3.5–5 µm, 0(-1)-septate, ellipsoidal, pyriform or clavate. Thallus K+ purple (parietin and its precursor emodin), UV± dull pale orange (fragilin, caloploicin), apothecia K+ purple (physcion). **BLS 0513**.

On well-consolidated and well-lit freely drained basic substrata, such as chalk grassland and compacted shell-sand, in warm sheltered but open sites, mostly adjacent to dunes and near sea-level, often associated with the moss *Trichostomum crispulum*; rare and vulnerable from vegetation overgrowth. W. Wales (Pembrokeshire), with scattered sites on the N. coast of Somerset, Devon & Cornwall; also in S. England (Isle of Wight, Channel Isles) and one site in E. Ireland; formerly also in Breckland and on the Sussex coast.

British populations have an unusually high proportion of pyriform spores. The formation of schizidia appears to be environmentally controlled.

Host to *Lichenochora epifulgens* Nav.-Ros. & Cl. Roux (1998) and *Muellerella lichenicola*.

HALOPLACA Arup, Søchting & Frödén (2013)

Thallus crustose, in some species with slightly effigurate margin, yellow to pale yellow or sometimes greyish, often **sorediate** or **granulate**. **Cortex** poorly developed or composed of angular cells. **Apothecia** often lacking; when present orange-yellow to yellow. **Thalline margin** present, concolorous with the thallus, but sometimes becoming excluded; sometimes sorediate. **Ascospores** polarilocular with a medium to long septum. **Conidiomata** pycnidia where known. **Conidia** ellipsoidal to narrowly ellipsoidal. **Chemistry**: thallus and apothecia K+ purple; anthraquinones with parietin dominant.

A small group of lichens from maritime habitats, superficially appearing similar to the *Athallia* (*Caloplaca*) *holocarpa* aggregate but belonging to the Teloschistoideae rather than the Xanthorioideae. Its relatives all appear to have Southern Hemisphere distributions.

Literature:

Arup *et al*. (2013), Fletcher & Laundon (2009), Wilk *et al.* (2021).

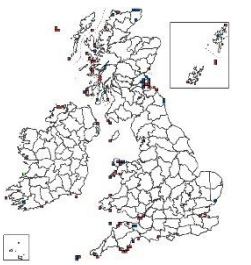
1 Thallus pale yellow to orange, granular or isidiate; on maritime rocks 2
Thallus white to pale green-grey; on herbaceous or woody stems or on other lichens 3

2(1) Isidia finger-like; thallus deep yellow-orange, in sheltered crevices ..... "***Caloplaca***" ***littorea***
Isidia granular, globose or in chains (blastidia); thallus pale yellow to orange ..... ***britannica***

3(2) Thallus sorediate, the soralia bright yellow; apothecia very rare ..... ***sorediella***
Thallus not sorediate, apothecia frequent ..... ***suaedae***

Haloplaca britannica (R. Sant.) Arup, Søchting & Frödén (2013) **Nb**

Caloplaca britannica R. Sant. (1992)



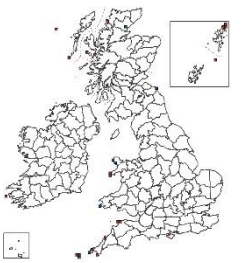
Thallus entirely of small swollen convex granular lobes or subsquamules to 1 mm diam., pale yellow to orange, in places forming a thick, cracked-areolate thallus, the marginal lobes radiating, short, 0.1–0.3 mm in length; irregular, isidium-like granules to 0.1 mm diam., often numerous, shiny, in groups and often forming mounds on inner areas of the thallus. Apothecia uncommon, to 0.5 mm diam., widely scattered, flat, orbicular to inflexed; thalline margin persistent, orange-yellow; disc pale orange; paraphyses lax, variable, some with narrow apical cells, others swollen to 7 µm diam. Ascospores 11–14 × 4–6 µm, ellipsoidal, septum 3–5 µm thick, about 1/3 of the length of the ascospore. Conidiomata not seen. Thallus and granules/isidia K+ purple. **BLS 1689**.

In dry, dusty crevices in the mesic-supralittoral zone on siliceous rocky shores and also on sheltered bird- perching rocks; scarce. Throughout rocky areas of coastal Britain and Ireland, mostly absent in the south east and east of England, probably under-recorded.

The convex subsquamules, bearing numerous spherical isidia (or blastidia?) of irregular sizes, are distinctive. Eroded forms can resemble "*Caloplaca*" *littorea* which is entirely crustose on a golden-yellow prothallus and has finger-like isidia. Also occurring with *H. britannica* may be *Flavoplaca flavocitrina* with sorediate squamules and *F. microthallina* with lobule-like isidia. Specimens referred to *H. britannica* from inland churchyards may be *F. arcis*, which has smaller blastidia on the margins of areoles.

Haloplaca sorediella (Arup) Arup, Søchting & Frödén (2013) **Nb**

Caloplaca sorediella Arup (2006)



Thallus often in tiny patches <5 mm diam., white to pale grey, of tiny bullate areoles; prothallus indistinct; soralia punctiform, becoming crowded, markedly convex, rounded, discrete, developing from bullate areoles which turn orange, breaking into bright golden-yellow farinose soredia, 10–20 µm diam. Apothecia rare, known from one gathering in Britain, to 0.3 (–1) mm diam., scattered, elevated, orbicular, concave at first but becoming flat; thalline margin present when young, yellow, becoming sorediate; exciple well-developed; disc orange. Ascospores not examined for fear of destroying the specimen. Thallus K–, soredia and apothecia K+ purple. **BLS 2459**.

In coastal situations on dead roots and stems of *Armeria maritima* and other maritime plants (*Crithmum maritimum*, *Halimione portulacoides*, *Spergularia maritima*) in crevices, xeric-supralittoral; also recorded associated with *Lecania aipospila* and *Hydropunctaria* sp. S.W. England (Cornwall, Devon), Hampshire, Scilly Is, W. Wales from Pembrokeshire to Anglesey, Scotland (Berwick, Sutherland, N. Ebudes, Outer Hebrides, Shetland). Ireland (Cork). Also known from France (Finistère) and Portugal (Porto Santo).

Characterized by the bright orange-yellow, punctiform, delimited soralia contrasting with the white to pale grey, bullate thallus areoles. *Scythioria phlogina* has more flattened soralia which are pale yellow. *H. sorediella* could be confused with *Flavoplaca flavocitrina* which has yellow squamules with coarse soredia which coalesce. "*Caloplaca*" *lucifuga* has a dirty yellow-orange brown thallus and is an inland species of pasture woodland. The rare *Solitaria chrysophthalma* has an immersed thallus on tree bark.

Haloplaca suaedae (O.L.Gilbert & Coppins) Arup, Søchting & Frödén (2013) **NT**

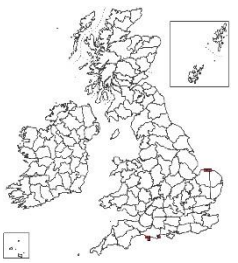
Caloplaca suaedae O.L.Gilbert & Coppins (2001)

Thallus wide-spreading, formed of coherent convex pale to green-grey areoles, which are often effigurate at the thallus edge. Apothecia numerous and mostly crowded, 0.2–0.4 (–0.6) mm diam., with an orange disc, paler yellow exciple and a sometimes persistent crenulate grey thalline margin. Ascospores narrowly ellipsoidal and often

slightly curved, 12–14 × 4.5–4.8 µm, with septum 3.5-4 µm thick. Thallus K–, apothecia K+ purple. **BLS 2321**.

Epiphytic on old stems of *Suaeda vera* on coastal shingle ridges beside saline lagoons and salt marshes; rare. Norfolk, Dorset (Chesil Beach); also known from France (Finistère).

Resembles the *Athallia holocarpa* agg., but is distinguished by its thicker thallus with marginal, effigurate areoles, and by its narrowly ellipsoidal, often bowed or curved ascospores; also resembles *Cerothallia luteoalba* which has shorter ascospores with a narrower septum.



HUNECKIA S.Y. Kondr., Elix, Kärnefelt, A. Thell & Hur (2014)

Thallus crustose, wide-spreading or discontinuous, very thin to warted-areolate, pale to dark grey or pale yellowish, cortical layer poorly developed, the algal layer discontinuous. **Prothallus** inconspicuous or blackened and carbonaceous. **Isidia** present in some species, pale and coralloid. **Apothecia** sessile, the disc dark rust-brown to almost black. **Thalline margin** persistent or soon excluded, greyish. **Exciple** persistent, sometimes slightly flexuose, variously pigmented. **Epithecium** yellowish to dark orange-brown. **Hymenium** with or without oil droplets. **Ascospores** polarilocular, 8 per ascus, ellipsoidal to fusiform with a broad septum and thickened at the apices. **Pycnidia** not known. **Chemistry**: exciple and epithecium K+ reddish violet, thallus K–.

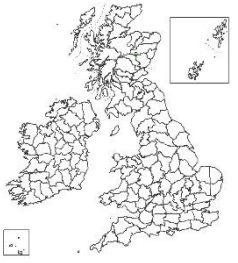
A well-defined monophyletic group within the Caloplacoideae, currently containing three species (Kondratyuk *et al*. 2014a, Bungartz *et al.* 2020, Wilk 2021). Its closest relatives are not clear. It was contrasted with *Blastenia* by Kondratyuk *et al*. (2014a), which differs by its ascospores without thickened apices.

Literature:
Bungartz *et al*. (2020), Fletcher & Laundon (2009), Kondratyuk *et al*. (2014a), Wilk (2021).

Huneckia pollinii (A. Massal.) S.Y. Kondr. *et al.* (2014) **Ex**

Caloplaca pollinii (A. Massal.) Jatta (1900)

Thallus crustose, wide-spreading, inconspicuous and immersed to superficial, uneven or warted and rimose-cracked, pale to dark grey; prothallus inconspicuous or pale. Apothecia to 1 mm diam., scattered to crowded-contiguous, rounded or flexuose, flat, becoming convex when mature; exciple at first thick, excluded as the apothecium becomes convex, red-brown to black; epithecium and hymenium patchily yellow-brown; disc concolorous, the pigmentation variable, often darker towards the centre of the discs and sometimes with a reddish tinge, especially towards the exciple; paraphyses branched, thickened to *ca* 3 µm diam. towards the tips. Ascospores 13–15 × 7–10 µm, ellipsoidal, septum 3–5 µm thick, 1/5–1/3 of length of the ascospore which is thick-walled at the apices. Thallus K–, apothecia K+ purple. **BLS 0274**.



On acid bark of trees and timber; not collected since the 19th century; probably extinct in Britain. N. England (Yorkshire) on timber, S. Scotland (Grampian Region) on ‘Fir’.

Distinguished by the large, dark apothecia, which become convex when mature, resembling a *Lecidea*, the K+ purple epithecium, and the thick-walled polarilocular ascospores. The Yorkshire specimen with dark brown apothecia falls within the range of variation of *H. pollinii*, though its identity needs confirmation; it may be *Blastenia ammiospila*. The Scottish specimen has darker apothecia and accords with *Caloplaca phaeocarpella* (Nyl.) Zahlbr. (1931), which has been claimed as a synonym of *H. pollinii* but has apothecia that are dark brown with an orange tinge on the disc and a exciple that is darker. Occasionally, the whole apothecium may be blackish. Further research is needed.

KUETTLINGERIA Trevis. (1857)

Thallus crustose, epilithic or rarely endolithic, white or grey; cortex usually composed of interwined chains of isodiametric fungal cells amongst dead algal cells. **Vegetative propagules** (blastidia, soredia, isidia, or minute lobules) sometimes present. **Apothecia** varied, with a thin exciple always present; **thalline margin** when present concolorous with the thallus, **disc** and **exciple** usually of different tinges of red and yellow, in some individuals black, grey or brown. **Ascospores** polarilocular, ellipsoidal with a fairly thick septum. **Conidiomata** pycnidia where present, grey-black, visible as dark dots on the thallus. **Conidia** bacilliform to subglobose. **Chemistry**: Thallus and thalline margin always without anthraquinones (K–), but with *Sedifolia*-grey pigment. Epithecium and upper part of exciple usually with anthraquinones, either dominated by non-chlorinated parietin or by chlorinated 7-Cl-emodin, fragilin, or 7-Cl-citreorosein.

Part of a broader *Pyrenodesmia* group as defined by Arup *et al*. (2013), with grey thalli that lack anthraquinone pigments, and apothecia with an inconspicuous or evanescent thalline margin but prominent exciple; they are yellow-orange to dark red or brown-red with anthraquinones of chemosyndromes A, C1, C2, or C5 (sensu Søchting 1997, 2001). *Sanguineodiscus* (represented in our region by *S. aractina* and *S. haematites*) has grey thalli and apothecia with red discs and persistent grey thalline margins.

Literature:
Arup *et al.* (2013), Frolov *et al*. (2020), Gaya *et al*. (2015), Vondrák *et al*. (2012b).

1 Thallus sorediate or with blastidia; apothecia often rare 2
Vegetative propagules not produced; apothecia present..... 4

2(1) Thallus placodioid or lobate-effigurate, thick; coarsely sorediate, forming conspicuous white-grey orbicular patches; on calcareous rocks, esp. in churchyards .....***teicholyta***
Thallus crustose, not lobate-effigurate; soredia usually discrete, spreading; on various substrata 3

3(2) On siliceous rock (esp. seashore shingle); soralia on margins of areoles; thallus grey .....***soralifera***
On calcareous or base-rich rock, cement etc.; soralia scattered, sometimes infrequent; thallus white to pale grey .....***albolutescens***

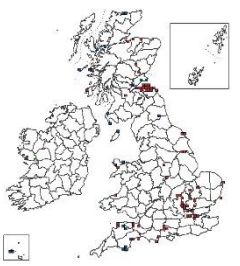
4(1) Disc pruinose, orange, turning green when wet, waxy-textured .....***ceracea***
Disc not pruinose, not turning green when wet, not waxy 5

5(4) Disc orange (to rust-coloured in S. Europe); thallus pale grey (in British material); apothecia C+ orange-red .....***neotaurica***
Disc yellow-orange to brown; thallus dark grey to black; apothecia C– .....***atroflava***

Kuettlingeria albolutescens (Nyl.) I.V. Frolov, Vondrák & Arup (2020) **LC**

Caloplaca albolutescens (Nyl.) H. Olivier (1909)

Similar to *Kuettlingeria teicholyta*, but the thallus is thin and leprose, effuse at the margin and lacks the thickened lobes seen in that species. The surface lacks a cortex and is irregularly covered with grey soredia which are K+ dull violet. Apothecia are similar to those in *K. teicholyta*. **BLS 2503**.

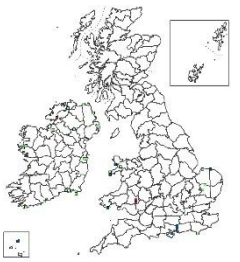


On calcareous rocks, especially concrete and cement, also on base-rich siliceous rocks and brick, rarely on compacted soil (Portugal). Southern and S.W. England, scattered in Wales, Scotland (mainly in the south), apparently no recent records from Ireland.

Often occurring with *K. teicholyta* and much confused with that species, but probably replacing it in the northern part of its range and extending into E. Scotland.

Kuettlingeria atroflava (Turner) I.V. Frolov, Vondrák & Arup (2020) **CR D**

Caloplaca atroflava (Turner) Mong. (1914)



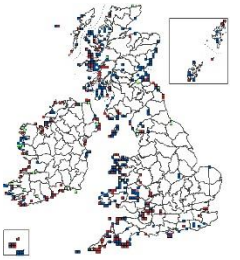
Thallus crustose, dark grey to black, thin, cracked-areolate when well-developed; areoles convex, *ca* 0.5 mm diam.; prothallus well-developed, black, ± fimbriate. Apothecia to 0.5 mm diam., scattered to crowded, rounded to flexuose, flat, constricted at the base; thalline margin absent; exciple persistent, prominent, even, convex, glossy, bright orange; discs brown-orange; paraphyses slender and flexuose, septate, not or only slightly broadened at the apices. Ascospores 13–16 × 9–10 µm, broadly ellipsoidal, the septum 5–7 µm thick, 1/3–1/2 (or more) of the length of the ascospore. Thallus K+ faintly purple in places; apothecia K+ purple. **BLS 0237**.

Recently seen on sunny rocks by a lowland river, previously also on flint pebbles on chalk downland and on pebbles and shingle near the coast; rare. Channel Islands, England (Hampshire, Norfolk), Wales (Anglesey, River Usk in Breconshire and Caernarfonshire), Ireland.

Resembles forms of *Athallia* (*Caloplaca*) *holocarpa* agg. but the thallus is composed of almost black, convex warts on a black prothallus. The wide ascospores with a broad septum are distinctive. Specimens named as var. *submersa* (Nyl.) Magnusson (1944), recorded from Ireland (Galway), are possibly a misidentification; the status of this name needs investigation.

Kuettlingeria ceracea (J.R. Laundon) P.F. Cannon & Coppins (2024) **LC**

Caloplaca ceracea J.R. Laundon (1992)



Thallus crustose, wide-spreading, pale to dark grey, areolate, often thick, the surface roughened; prothallus pale or absent. Apothecia to 1 mm diam., usually crowded, contiguous, rounded to flexuose, flat, constricted at the base; exciple persistent, swollen, matt, orange, pruinose, yellow-orange and waxy when wet; thalline margin present only in young apothecia, disappearing or occasionally persisting as a cushion under the lower surface of apothecia; disc orange-brown pruinose; algae forming a dense green layer of closely packed cells running beneath a colourless hypothecium (visible in sections); paraphyses slightly swollen at the apices. Ascospores 13–15 × *ca* 8 µm, ellipsoidal, septum 3–5 µm thick, about 1/3 of the length of the ascospore. Thallus K–; apothecia (exciple and and disc) K+ purple. **BLS 1644**.

On siliceous, xeric-supralittoral to terrestrial-halophilic coastal rocks in brackish seepage, as well as in a few inland localities; common. W. and S.W. Britain (occasional records in S.E. England) to N. Scotland, throughout coastal Ireland.

Sequences from authentic material are closely similar to those of the Mediterranean species *Kuettlingeria fuscoatroides* (J. Steiner) I.V. Frolov, Vondrák & Arup (2020), which may prove to be an earlier name for *K. ceracea* (Redchenko *et al*. 2012). As that epithet is well-used in Britain and Ireland, it is retained for the present in a new combination.

In morphological terms, distinguished from *Blastenia crenularia* by the apothecial discs becoming dull green-orange and waxy when wet due to the thick layer of algae beneath and at the sides of the apothecium; in *B. crenularia* the exciple is glossy and remains rusty or brown-red when wet and the algal layer is lacking or discontinuous below the apothecium. Thalli with yellow apothecia have been named *Rufoplaca oxfordensis* (Fink) Arup, Søchting & Frödén (2013) but such specimens need comparing with North American material.

Lichenodiplis lecanorae and *Muellerella lichenicola* have been reported from this host.

Kuettlingeria neotaurica (Vondrák, Khodos., Arup & Søchting) I.V. Frolov, Vondrák & Arup (2020)

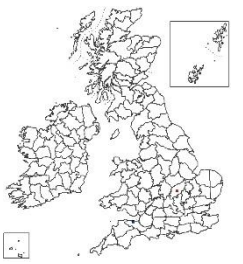
Caloplaca neotaurica Vondrák, Khodos., Arup & Søchting (2012) **NE**

Thallus thin, to 150 (–250) µm high, pale grey (to brown-black in S. Europe), rarely white-pruinose, indistinctly areolate; areoles mostly 200–400 µm diam.; prothallus present, dark grey; marginal squamules, soralia and isidia absent; cortex largely absent. Apothecia to 0.7 mm diam., orange to red (grey in variants without anthraquinones, not known in our region), the margin usually paler than the disc. Hymenium 90–110 µm tall. Paraphyses branched and anastomosed, tips widened to (3.5–) 4–5 (–6) µm diam. Ascospores (13–) 14–16 (–17.5) × (7–) 8–10 (–11.5) µm, the septum (3.5–) 5–7 (–8) µm thick, one third to one half the length of the spore. Pycnidia common, as darker spots on the thallus. Conidia ellipsoidal, 2.5–3.5 × 1–1.5 µm. Thallus K–, apothecia K+ purple. **BLS 2595**.

On siliceous rocks, either sea cliffs or outcrops close to the coast, Wales (Pembrokeshire); reported by Vondrák *et al*. (2012) without full ecological data.

Kuettlingeria soralifera (Vondrák & Hrouzek) I.V. Frolov, Vondrák & Arup (2020) **DD**

Caloplaca soralifera Vondrák & Hrouzek (2006)



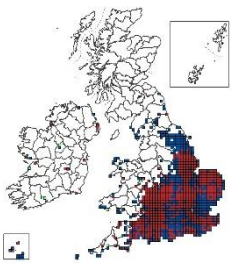
Thallus epilithic, ± thin, areolate, irregular in shape, pale to dark grey, usually white-pruinose; soralia marginal, the soredia dark violet-grey, 20–50 µm diam.; areoles flat to strongly convex, scattered or crowded; cortex inconspicuous, almost completely obscured by colourless crystals. Apothecia crowded or more rarely scattered, sessile, round or angular and flexuous due to mutual compression, 0.3–0.8 mm diam.; disc flat, orange to dark orange; exciple thick, persistent, raised above the disc, smooth, paler than the disc; thalline margin thin, usually white-pruinose; epithecium granular, yellowish orange; hymenium 70–80 (–110) µm tall; paraphyses sometimes slightly branched, apical cells to 5 µm diam. Ascospores polarilocular, thin-walled, broadly ellipsoidal, 12–15 (–17) × 5–8.5 (–10) µm, the septum 3.5–5.5 (–7) µm thick. Pycnidia inconspicuous, immersed in the thallus; conidia ellipsoidal, 2.5–3.5 × *ca* 1.5 µm. Thallus and soredia K+ violet, N+ violet; apothecial disc and exciple K+ red. **BLS 2460**.

On sandstone pebbles in seashore shingle, England (S. Somerset) and on concrete, Northamptonshire.

When sterile, like *Caloplaca chlorina* but always on rock, especially seashore shingle; that species is more common on weakly basic rock inland. The apothecia lack a grey, persistent thalline margin as seen in *C. chlorina*. The description is largely derived from Wilk & Śliwa (2012). British material is questionably identified.

Kuettlingeria teicholyta (Ach.) I.V. Frolov, Vondrák & Arup (2020) **LC**

Caloplaca teicholyta (Ach.) J. Steiner (1895)



Thallus obscurely placodioid, forming closely appressed rounded thalli, thin to thick, white-grey; lobe-ends often poorly differentiated, rounded, flat or slightly convex, without furrows, forming a complete zone around the edge of the thallus; surface uniform and scurfy towards the centre, often with small granules, sometimes very weakly areolate; soredia granular, white, formed by the erosion of the surface in the central area. Apothecia to 0.8 mm diam., uncommon but conspicuous when present, scattered, sometimes crowded, immersed in the thallus and deeply concave at first, becoming flat; thalline margin sometimes also present, white, undulate; exciple flexuose, swollen, bright orange; discs orange-red-brown, sometimes white-pruinose; paraphyses slender, flexuose, branched, not notably swollen at the apices. Ascospores 15–18 × 7–10 µm, ellipsoidal, septum often under 4 µm thick, up to 1/4 of the length of the ascospore. Thallus K–, apothecia K+ purple red. **BLS 0281**.

On calcareous stone, especially Jurassic limestone and mortar, also ironstone and (more rarely) brick; mostly on buildings, walls and monuments, especially chest-tombs in churchyards; common. S. & E. England from Devon to Yorkshire, rare in N. & W. England, Wales, Scotland and Ireland.

The mealy white-grey rounded patches of this lichen are distinctive. It is usually sterile but apothecia, of striking bright orange colour, do occasionally occur, especially on natural substrata. *Kuettlingeria teicholyta* may be confused with *Pyrenodesmia chalybeia* which lacks marginal lobes, or *Rinodina teichophila* which also lacks lobes, is dark grey and has granular isidia. Sterile thalli of *Diploicia canescens* are usually in shade, with distinctly placodioid-lobate margins and dense white pruina. Probably *K. teicholyta* is much over-recorded, especially in N. England and Scotland, having been confused with *K. albolutescens* which lacks definite marginal lobules and is leprose with scattered soredia.

Rarely parasitised by *Diplotomma murorum*. Also host to *Muellerella lichenicola* and *Pyrenidium actinellum*.

LEPROPLACA (Nyl.) Nyl. (1888)

Thallus leprose and non-corticate, or crustose to placodioid with a thin amorphous cortex composed of angular cells, then sometimes with ± distinct marginal lobes, the surface composed of powdery yellowish or dull orange convex granules, **sorediate** in most species. **Medulla** white. **Prothallus** not differentiated, or pale and ± fimbriate. **Ascomata** absent or rare, when present with a persistent thalline

margin, the disc deep orange. **Hamathecium** of paraphyses with hardly swollen tips. **Ascospores** polarilocular, narrowly ellipsoidal. **Conidiomata** not known. **Chemistry**: K+ purple; anthraquinones, parietin dominant. **Ecology**: on calcareous rocks.

According to Arup *et al*. (2013), *Leproplaca* forms a sister group to *Caloplaca s. str.*, from which it differs mainly in the yellow thallus containing athraquinones and the rarity of apothecia. The genus was accepted by Laundon (1974) to contain species with a leprose, non-corticate thallus, but subsumed into a broad concept of *Caloplaca* by Fletcher & Laundon (2009). Not all the species currently accepted correspond to the genus as defined by Laundon (1974) as some have a poorly defined thallus cortex.

Literature:
Arup *et al*. (2013), Fletcher & Laundon (2009), Laundon (1974).

1 Thallus entirely (or almost so) composed of leprose granules, sometimes with poorly developed marginal lobes 2
Thallus areolate, with a weakly developed cortex, sometimes placodioid 3

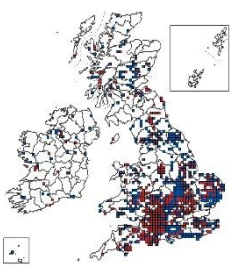
2(1) Thallus dull brownish yellow, without marginal lobes ..... ***chrysodeta***
Thallus bright yellow, with ± distinct marginal lobes ..... ***xantholyta***

3(1) Thallus placodioid, lobes >3 mm long ..... ***cirrochroa***
Thallus crustose or merely effigurate at the margins, lobes <1 mm long ..... ***obliterans***

Leproplaca chrysodeta (Vain.) J.R. Laundon ex Ahti (2015) **LC**

Caloplaca chrysodeta (Vain. ex Räsänen) Dombr. (1970); *nom. inval.*

Leproplaca chrysodeta (Vain. ex Räsänen) J.R. Laundon (1974); *nom. inval.*



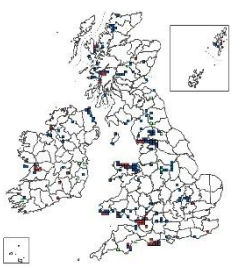
Thallus crustose, forming scattered granules at first which later form irregularly scattered patches, which finally converge to produce a thick, often areolate crust; orange-brown to greyish yellow. Thallus margin indefinite, without lobes; prothallus not differentiated. Thallus surface composed entirely of a mass of powdery spherical granules, *ca* 100 µm diam.; cortex absent. Apothecia and pycnidia absent. Leprose surface K+ purple. **BLS 0825**.

On limestone cliffs and other dry shaded calcareous rocks, often overgrowing mosses, occasionally extending to the mortar of shaded walls; common. Throughout Britain and Ireland, especially common in the south and east.

Easily identified by the dull orange-yellow, powdery, globose granules in shaded, calcareous habitats. Sterile *Flavoplaca citrina* agg. are sometimes similar, but have brighter yellow, convex (not globose) soredia around 20–70 µm diam., and grow on smooth, well-lit, calcareous surfaces.

Leproplaca cirrochroa (Ach.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca cirrochroa (Ach.) Th. Fr. (1871)



Thallus to 5 cm across, placodioid, forming narrow finger-like closely appressed divided lobes in irregularly rounded or small, scattered or contiguous thalli, dirty or brown-orange, the lobe-ends often pruinose and paler orange; lobe-ends 0.2–0.5 mm wide, rounded, forked, shallowly convex, elongated, contiguous, separated by almost parallel-aligned furrows; soralia usually present, laminal, scattered, small, flat, ulcer-like, rounded, to 0.8 mm diam.; soredia farinose, lemon-yellow. Apothecia rare, to 0.5 mm diam., scattered, flat; thalline margin persistent, orange; disc deeper orange; paraphyses flexuose, mostly not swollen at the tips. Ascospores 10–15 × *ca* 5 µm, narrowly ellipsoidal, the septum 2-3 µm thick, less than 1/3 of the length of the ascospore. All parts K+ purple. **BLS 0246**.

On inclined and vertical hard limestone, mostly in sheltered, often dry and shaded situations such as sea-cliffs; rarely on medieval buildings and walls; local. Throughout Britain and Ireland in limestone areas, extending locally eastwards.

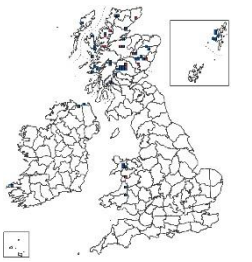
The more common *Calogaya decipiens* has marginal and terminal soralia on small lateral lobes and is from

lowland, eastern England, especially on church walls. The elongate finger-like lobes are reminiscent of *Rusavskia* (*Xanthoria*) *elegans*, but the lobes are paler brown-orange not brown-red; the contrasting punctiform, yellow soralia make this lichen unmistakable.

Host to *Lichenodiplis lecanorae*, *Verrucula helvetica* (q.v.) and an undescribed *Opegrapha* sp. (from Lismore, Argyll).

Leproplaca obliterans (Nyl.) Arup, Frödén & Søchting (2013) **Nb**

Caloplaca obliterans (Nyl.) Blomb. & Forssell (1880)



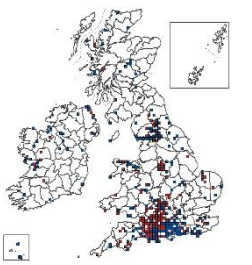
Thallus of contiguous or scattered areoles to 0.3 mm broad, often elongate-irregular and somewhat sparingly branched, very closely appressed, flat to convex, orange to brown-orange; prothallus sometimes present, pale, occasionally fimbriate; soralia few and scattered to numerous and continuous, punctiform or irregular in shape; soredia small-granular. Apothecia rare, not known in British material, to 0.5 mm diam., becoming convex. Ascospores *ca* 14 × 6 µm, the septum about 1/3 of length of ascospore. All parts K+ purple. **BLS 0270**.

Under sheltered overhangs on vertical faces of base-rich rocks, especially basalt; scarce. Upland Wales, Scotland (C. & W. Highlands and Islands), Ireland (Antrim, Kerry).

Identified by the small punctiform orange soralia on an orange thallus of contiguous to scattered, irregular areoles; marginal lobes being absent. In highly sheltered situations the areoles become very small and scattered, often with a white to orange, partially fimbriate interconnecting prothallus and very few soralia. It could be mistaken for a reduced form of *L. cirrochroa* or *Haloplaca sorediella*.

Leproplaca xantholyta (Nyl.) Hue (1887) **LC**

Caloplaca xantholyta (Nyl.) Jatta (1902)



Thallus crustose, delimited, orbicular where well-developed but often becoming irregular and scattered; thin, bright lemon-yellow, the margin of radiating flat pulverulent lobes; prothallus not apparent. Thallus surface usually continuous and ± flat, but rarely of convex granules *ca* 0.2 mm diam., rarely areolate, not corticate but for the most part pulverulent. Surface K+ purple. **BLS 0826**.

On damp limestone cliffs and walls; locally abundant in uplands, rare in lowlands. Throughout Britain and Ireland.

Readily distinguished by its yellow, powdery thallus with marginal lobes which react K+ crimson. *Chrysothrix chlorina*, on siliceous rocks, is K–.

MARCHANTIANA S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur (2014)

Thallus crustose, thin to rather thick, pale grey, glossy, sometimes reduced to small, dark greenish to dark brown areoles along cracks in the substratum, the cortical layer often very thin. **Vegetative propagules** not produced. **Apothecia** usually numerous. **Thalline margin** grey to brownish or blackish-brown, paler than the disc, sometimes irregular or becoming excluded. **Exciple** varied in development, sometimes ± absent. **Disc** dull orange to rust-red, sometimes becoming blackish, flat to weakly concave. **Hamathecium** of paraphyses, branched towards the ± swollen apices. **Asci** 8-spored. **Ascospores** colourless, variable in shape, ± ellipsoidal, sometimes ± curved, with narrow septa. **Conidiomata** not known. **Chemistry**: Thallus K– or K+ purple, hymenium slightly to distinctly K+ purple, containing neochloroemodin.

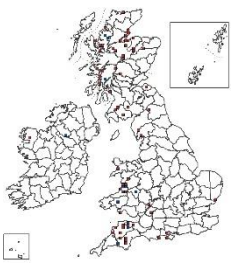
Marchantiana species have a chemistry that is unique within the Teloschistaceae, according to Søchting & Arup (2018), and the genus occupies a basal clade within the subfamily Caloplacoideae. Their phylogeny needs further study; the type *M. occidentalis* appears to belong to a separate subclade from the rest of the genus, and Kondratyuk *et al*. (2015a) transferred most of the species included in

Marchantiana only the previous year (Kondratyuk *et al*. 2014a) to a separate genus *Streimanniella*. However, Bungartz *et al.* (2020) confirmed that *Marchantiana* was monophyletic in its original circumscription, and that the sole British and Irish species clustered within that clade.

Literature:
Bungartz *et al*. (2020), Kondratyuk *et al*. (2014a, 2015a), Søchting & Arup (2018).

Marchantiana asserigena (J. Lahm) Søchting & Arup (2018) **Nb**

Caloplaca asserigena (J. Lahm.) H. Oliver (1909)



Thallus crustose, 1–2 mm diam., grey, thin and sometimes ± immersed, densely covered with apothecia 0.2–0.4 mm diam., thalline margin pale to mid grey or yellowish grey, irregular, thin and often becoming evanescent; disc ± flat, brown-orange to rust-red, brownish in shade conditions, sometimes becoming black (continental material); paraphyses *ca* 1.5 µm diam., apically branched, slightly inflated to *ca* 4 µm diam. Ascospores rather varied in shape but mostly ellipsoidal, 9–12 × 5–6.5 µm, rather thick-walled, septum 1/3–1/4 the length of the spore. Thallus K–, hymenium slightly K+ purple. Chemistry: contains neochloroemodin. **BLS 2371**.

On *Calluna*, *Ulex* and the twigs of trees; local but probably overlooked; known from conifer twigs in Europe. S.W. England, Wales, Lake District and Scotland; a few records elsewhere in England (possibly spreading east) and in Ireland.

The minute grey thalli with orange rust-red apothecia on acid-barked twigs, with a faintly K+ purple hymenium distinguish this from other species of *Caloplaca* s.l.

OLEGBLUMEA S.Y. Kondr., Lőkös & Hur (2020)

The genus is monotypic, so the description of the species below constitutes that of the genus. It was invalidly published by Kondratyuk *et al*. (2015b) but validated five years later. According to Frolov *et al*. (2020) it is not closely related to other genera of the Teloschistaceae with grey thalli.

Olegblumea demissa (Flot. ex Körb.) S.Y. Kondr. *et al.* (2020) **NE**

Caloplaca demissa (Flot. ex Körb.) Arup & Grube (1999)

Thallus crustose, lobate, distinctly rosette-like, 5–8 mm diam., often in large clusters; upper surface brown to greenish brown in peripheral portions and greyish brown or pale grey in the centre, often whitish pruinose. Lobes 1–1.5 (–2) mm long, flat to subconvex, very narrow (0.1–0.2 (–0.3) mm broad), branched or divided towards the tips. Soralia mainly in the centre of the thallus, at first punctiform or regularly rounded, (0.1–) 0.2–0.3 mm diam., soon becoming elongate and fissure-like along the lobe. Soredia irregularly rounded, (20–) 30–50 µm diam., brown to dark brown or brownish green, contrasting with the paler medulla. Apothecia not known. Pycnidia present, with bacilliform to narrowly ellipsoidal conidia 3.5–5 × 0.8–1 µm. Thallus K–. Chemistry: contains vicanicin and caloploicin. **BLS 2593**.

On a terracotta urn, England (Gloucestershire); possibly introduced.

Caloplaca demissa has been compared with *Hyperphyscia adglutinata* (Physciaceae), but the lobes are described as more stubby and convex. The description is largely adapted from Kondratyuk *et al*. (2015b).

POLYCAULIONA Hue (1908)

Thallus varied in form, fruticose, foliose or crustose, sometimes with lobate margins, sometimes granular in the centre of the thallus; pale greenish to bright yellow to orange or brownish orange; cortex composed of isodiametric cells or intertwined hyphae. **Vegetative propagules** not produced, or with

nodular granules or soralia. **Apothecia** usually concolorous with the thallus, yellow to orange. **Thalline margin** at first well-developed but often becoming excluded, paler than or concolorous with the disc. **Hamathecium** of paraphyses, branched towards the ± swollen apices. **Asci** 8-spored. **Ascospores** polarilocular with a short to long septum. **Conidiomata** present in many species; conidia narrowly to broadly ellipsoidal or citriform. **Chemistry**: Thallus K+ purple, parietin dominant, with lesser amounts of teloschistin, fallacinal, parietinic acid and emodin.

This large genus consists of the smaller-sized foliose and fruticose species formerly included in *Xanthoria*, but also with some crustose, placodioid and leprose species once included within *Caloplaca*. The thallus form does not appear to be phylogenetically significant, with closely related species (e.g. within the former *Xanthoria candelaria* group) with crustose, placoid or delicately foliose thalli. However, the species of the genus as circumscribed here from Britain and Ireland are relatively uniform in appearance.

Polycauliona in the circumscription of Arup *et al*. (2013) is monophyletic but morphologically diverse, and contains three well-supported subclades which were recognized as genera by Kondratyuk *et al.* (2014b). The British and Irish species fall into two of these subclades, four previously included in *Xanthoria* by Hitch *et al.* (2009) that belong in the one containing the type of *Polycauliona* (see below), and one into a separate subclade recognized as *Scythioria* by Kondratyuk and his colleagues. *Scythioria* as a genus is not reliably distinguished in morphological terms from *Polycauliona* s. str., but its type is *S. phlogina* (syn. *Caloplaca phlogina* (Ach.) Flagey) which is a sorediate corticolous species completely different in appearance. While there may not be strong reasons for the separation of *Scythioria* on a global basis, it makes sense on a local level.

Literature:
Arup *et al.* (2013), Kondratyuk *et al.* (2014b).

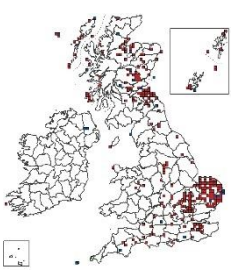
1 Thallus crustose, with green-yellow pruinose lobes to 6–7 mm in length and 0.5–1 mm wide; isidia flattened-globular; maritime ..... ***verruculifera***
Thallus foliose to subfruticose, lobes varied but not especially elongate; blastidiate or without vegetative propagules; not strongly maritime 2

2(1) Thallus with pale, true rhizines below, usually ascending or loosely attached, or absent; lobes narrow (<0.5 mm) and short (<10 mm) 3
Thallus attached by hapters; appressed except at the tips; lobes often wide (>1 mm) or long (>10 mm) and wide-spreading ..... ***polycarpa***

3(2) Thallus subfruticose, the lobes <0.3 mm wide; rhizines absent; fertile or not ..... ***candelaria***
Thallus foliose, the lobes dorsiventral, >0.3 mm wide; rhizines present or sparse; rarely fertile ... ***ucrainica***

Polycauliona candelaria (L.) Frödén, Arup & Søchting (2013) **LC**

Xanthoria candelaria (L.) Th. Fr. (1861)



Thallus subfruticose, in small compact clusters to 2 cm diam., lobes ± terete, not dorsiventral, vertically arranged, 0.6–1.0 (–1.5) × 0.1–0.3 (–0.5) mm, slightly widening at the tips, deep yellow-orange to orange, evenly pigmented, occasionally grey-green (in shade); rhizines usually absent; blastidia farinose to minutely granular, 25–35 µm diam., on the edges of the lobes, extending to the underside, occasionally appearing almost continuously blastidiate, conblastidia (40–) 45–70 (–110) µm in size. Apothecia occasional, terminal, to 2 mm diam., with a conspicuous thalline margin and sunken red- or brown-orange discs when young, becoming flat, the margin excluded and contorted when old. Ascospores ellipsoidal, 11.5–14.5 × 4.5–6.5 µm. Conidia ellipsoidal, 2.5–3 × 1–1.5 µm. **BLS 2364**.

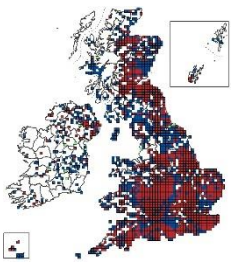
Widespread and often common on nutrient-enriched substrata, especially decaying tops of old wooden gate-posts used as bird perches and tops of vertical monuments, also on bark, less frequent on natural outcrops of siliceous and calcareous rocks, and walls usually in association with bird colonies or farm animals. Throughout Britain and Ireland. but much commoner in the east.

Typical morphs are easily identified by the subfruticose, strongly incurved, non-dorsiventral, ascending compact cushions with blastidiate lobe-ends and no, or very few, rhizines. In very shaded situations, the thallus may be reduced to minute nodular spiky lobes with scattered, granular blastidia. *P. ucrainica* has broader weakly incised fan-shaped lobes that are mostly ascending or oriented horizontally; intermediate forms are common and not all authors separate the two species, at least on morphological grounds. There may be another entity similar in morphology, but much smaller; a strict calcicole mostly of east-facing walls of churches.

The plurivorous *Athelia arachnoidea* (Berk.) Jülich (1972) and *Marchandiomyces corallinus* have been reported on this host.

Polycauliona polycarpa (Hoffm.) Frödén, Arup & Søchting (2013) **LC**

Xanthoria polycarpa (Hoffm.) Th. Fr. ex Rieber (1891)



Thallus <3 cm diam., of small appressed rosettes of crenulate lobes, orange-yellow to yellow, with grey morphs mostly occurring in shade; forming small orbicular hummocks; lobes broadening towards the apices, which are finely divided into many tiny lobe-ends <1 mm across; attached by hapters; soredia and isidia absent; upper surface with crowded apothecia, often completely covering and obscuring the underlying thallus. Apothecia to 4 mm diam., contorted, erect, peltate, often with short stalks, flat and orbicular when young with prominent raised margins, becoming contorted when old, the thalline margin sometimes becoming excluded; thalline margin grey-yellow (grey in shade); disc brown-orange. Ascospores 11–15 × 6–8 µm. Conidia ellipsoidal, 2–3 µm long. **BLS 1531**.

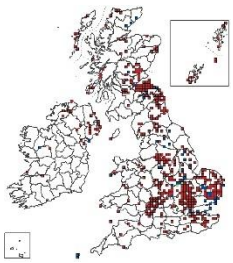
Most commonly on the nodes, axils and leaf scars of dead twigs on shrubs with wide-spreading branches, especially *Populus* spp., *Salix* spp., *Fraxinus*, *Larix* and *Sambucus niger*, also on a wide variety of tree-twigs, wooden fences and rock outcrops in farmland, and churchyards, where polluted with agricultural nitrogen; common and increasing. Throughout Britain and Ireland.

The small hummocks of crowded apothecia on twigs obscuring the diminutive, finely divided thallus make this lichen unmistakable; the thallus is much paler or grey in shade although the apothecial disc usually remains bright orange. Related species have blastidia. *P. polycarpa* has become very common in urban and agricultural areas. Another entity appears to exist which is much flatter, spreading and relatively infertile; it has been found in Suffolk and Scotland.

Reported on this host are *Lichenoconium xanthoriae* M.S. Christ. (1956) (commonest), *L. erodens* M.S. Christ. & D. Hawksw. (1977), *Erythricium aurantiacum* (Lasch) D. Hawksw. & A. Henrici (2015), *Illosporiopsis* cf. *christiansenii*, *Marchandiomyces corallinus* and *Spirographa* sp. (as *Cornutispora ciliata*).

Polycauliona ucrainica (S.Y. Kondr.) Frödén, Arup & Søchting (2013) **LC**

Xanthoria ucrainica S.Y. Kondr. (1997)



Thallus in patches <0.35 cm diam., foliose, of umbilicate to minutely scale-like (cf. *Hypocenomyce*) dorsiventral lobes, clustered or with a few ± vertically oriented, 0.7–1.2 (–1.7) × 0.7–1.0 (–1.2) mm, widening to 0.7–1.0 (–1.2) mm at tips, undulate at the margins; upper side pale lemon- to green-yellow, rarely grey, in the centre; rhizines and hapters absent; with abundant blastidia at the margins and the lower surface, (35–) 40–60 µm diam.; conblastidia absent. Apothecia unknown. Pycnidia frequent in red-orange warts. Conidia broadly ellipsoidal, (0.9–) 2.2–2.5 (–3.1) × 1.2–1.5 (–1.8) µm. **BLS 0950**.

On bark of broad-leaved trees, stone and human-made substrata; very common but under-recorded. Throughout Britain and Ireland.

Differs from *Xanthomendoza fulva* and *X. ulophyllodes* in the thallus pigmentation and widened lobe tips with undulating margins, also in conidium shape and in the position and size of the blastidia. Some authors consider *P. ucrainica* to be a form of *P. candelaria* when in animal-manured habitats. However, entities here described as *P. ucrainica* appear to differ from *P. candelaria* in their foliose, dorsiventral thallus, wider lobe tips, larger blastidia and absence of conblastidia. Both of these species were transferred to *Polycauliona* by Arup *et al*. (2013).

Polycauliona verruculifera (Vain.) Arup, Frödén & Søchting (2013) **LC**

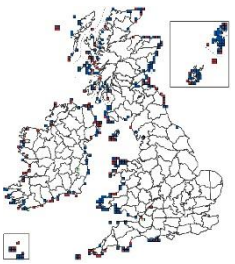
Caloplaca verruculifera (Vain.) Zahlbr. (1931)

Verrucoplaca verruculifera (Vain.) S.Y. Kondr. *et al*. (2014)

Like *Flavoplaca granulosa* but differing in the larger size; with longer lobes to 6–7 mm in length and 0.5–1 mm

wide, and the green-yellow, pruinose surface; isidia are flattened-globular; ascospores are narrower with a narrower septum, 1–3 µm thick, typically narrowly ellipsoidal with parallel sides, 12–14 × 5–6 µm. All parts K+ purple. **BLS 0286**.

Almost exclusively coastal, on nutrient-rich siliceous and calcareous rocks, especially bird-perches where it forms extensive green-yellow colonies, rarely on timber of coastal fence-posts; locally common. W. & N. Britain from Dorset to Northumberland, all around coasts in Scotland and Ireland.



Most old records of the considerably rarer *Flavoplaca granulosa* belong here. Kondratyuk *et al*. (2014b) transferred *P. verruculifera* to the new genus *Verrucoplaca*, but this and the type of *Polycauliona* occupy a monophyletic clade according to Arup *et al*. (2013) and so the change is not accepted here.

Rarely, *P. verruculifera* is parasitized by *Diplotomma vezdanum* (q.v.).

PYRENODESMIA A. Massal. (1852)

Thallus crustose, epilithic or endolithic, white, grey or brownish. **Cortex** usually composed of interwined chains of isodiametric fungal cells amongst dead algal cells (rarely well-developed and thick, in extralimital taxa). **Vegetative propagules** (blastidia, soredia, minute granules and lobules, or pustulate outgrowths) present in some species. **Apothecia** varied and sometimes appearing lecanorine, but a thin exciple is always present. **Thalline margin** the same colour as the thallus. **Disc** and **exciple** brown, grey or black. **Ascospores** polarilocular with a thin to thick septum. **Conidiomata** pycnidia, present or absent, grey or black. **Conidia** bacilliform to subglobose. **Chemistry**: thallus, apothecia, and pycnidia always without anthraquinones, but with *Sedifolia*-gray pigment. An unknown brown pigment (K−) sometimes present in the epithecium.

One of the genera of Teloschistaceae that lack anthraquinones in the thallus, which therefore appears white or greyish to almost black rather than yellow. In *Pyrenodesmia* anthraquinones are absent also in apothecia, which are brown or black rather than brightly coloured. *Kuettlingeria* is similar to *Pyrenodesmia* but with anthraquinones in the apothecia, and *Sanguineodiscus* has brightly coloured apothecial discs with a grey thalline margin. The three genera are phylogenetically separate, as presented by Frolov *et al*. (2020).

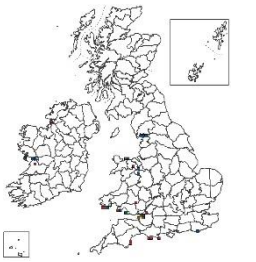
Literature:
Arup *et al.* (2013), Frolov *et al*. (2020), Gaya *et al*. (2015), Vondrák *et al*. (2012b).

1 Apothecia sessile; thallus thin ..... ***variabilis***
Apothecia immersed in rock; thallus thin or thick 2

2(1) Thallus thick, epilithic; ascospore septum *ca* 1/3 length of spore ..... ***chalybaea***
Thallus immersed; ascospore septum 1/6-1/9 length of spore ..... ***alociza***

Pyrenodesmia alociza (A. Massal.) Arnold (1884) **LC**
Caloplaca alociza (A. Massal.) Mig. (1925)
Thallus crustose, inconspicuous, immersed, sometimes forming a very thin ± scurfy dark grey film, often limited by a black prothallus. Apothecia to 0.5 mm diam., numerous, closely scattered, sunk in depressions, the top of the disc level with the surface or occasionally slightly emergent, flat to slightly convex, black, sometimes thinly white-grey pruinose, leaving pale shallow pits when shed; at first with a grey thalline margin, becoming excluded; epithecium grey, with colourless crystals; paraphyses with apical cells 2–5 µm diam. Ascospores 15–18 × 7–8 µm,

ellipsoidal, septum 1–3 µm thick, about 1/6–1/9 of length of ascospore. Apothecia K–, epithecium and upper part of exciple K+ mauve-lilac. **BLS 0233**.

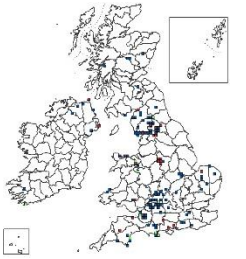


On hard sunny, mainly carboniferous limestone in unpolluted areas, especially on or near the coast; scarce. S. and W. Britain from Dorset to N. Lancashire, also W. Ireland.

Superficially resembles a small-fruited *Clauzadea*, *Sarcogyne regularis*, or even a black-fruited pyrenocarpous species, but the polarilocular ascospores etc. indicate that it belongs to *Caloplaca* s.l. The ± immersed thallus and narrow ascospore septum distinguish it from other species of *Pyrenodesmia*.

Pyrenodesmia chalybaea (Fr.) A. Massal. (1852) **LC**

Caloplaca chalybaea (Fr.) Müll. Arg. (1862)



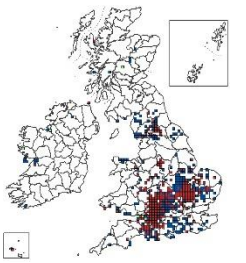
Thallus distinct, smooth, even, markedly coarsely rimose-cracked, black-brown to lead-grey, sometimes with a blue or purple tinge, well delimited by a conspicuous black prothallus, sometimes with a zoned and radiate margin, thallus occasionally thinner, appearing spotted grey on a dark prothallus. Apothecia to 0.5 mm diam., closely scattered, several per areole, deeply immersed in the thallus at first; thalline margin distinct, often paler than the disc; epithecium grey, with colourless crystals; disc flat, level with the areole surface, black when mature, often blue-pruinose; paraphyses broadening towards the tips, to 4 µm diam. Ascospores 10–16 × 6–8 µm, septum (1–) 3–5 µm thick, to 1/3 of the length of the ascospore. Thallus and apothecia K± pale purple; epithecium and upper part of the hymenium K+ mauve-lilac. **BLS 0243**.

On hard limestones, on natural boulders, buildings (e.g. bridges) and chest-tombs in churchyards, especially when nutrient-enriched; scarce. Upland England, Wales, Scotland, some coastal sites in Wales and Ireland, probably incorrectly reported from soft limestones in S.E. England.

Superficially resembles a *Circinaria* (e.g. *C. calcarea*) in habit but readily distinguished by the polarilocular ascospores. *Pyrenodesmia variabilis* has a thinner, areolate thallus and sessile, darker, thinner apothecia.

Pyrenodesmia variabilis (Pers.) A. Massal. (1852) **LC**

Caloplaca variabilis (Pers.) Müll. Arg. (1862)



Thallus crustose, grey to grey-brown, rather thin, fairly smooth but markedly areolate, rounded, with the central area darker and the margin occasionally surrounded by a black prothallus. Apothecia to 1 mm diam., scattered to crowded, sessile, flat, becoming slightly convex; thalline margin often present, dense, grey-blue pruinose, persistent; disc black; epithecium pale; paraphyses broadening and becoming rather stout towards the tips, to *ca* 3 µm diam. Ascospores 14–16 (–21) × 7–9 µm, ellipsoidal, the septum 2–3 (–5) µm thick, at times up to 1/3 of the length of the ascospore. Thallus K–, epithecium K+ purple. **BLS 0284**.

On nutrient-rich limestone of both natural boulders and stonework, especially horizontal surfaces of chest-tombs, copings of walls and bridges; local. Throughout England & Wales, most frequent in the English Midlands, extending locally to Scotland and W. Ireland.

Distinguished by the dark areolate thallus, and sessile, black apothecia with often pruinose exciples, stout paraphyses, and large ascospores. Old records often include *Pyrenodesmia aloiza*. It may resemble *Rinodina bischoffii*, but has a K+ purple exciple, colourless polarilocular spores and a different habitat. *P. chalybaea* has a thicker, paler grey thallus with immersed apothecia, resembles a *Circinaria*, and occurs on hard limestones.

Muellerella lichenicola has been reported on this host.

RUFOPLACA Arup, Søchting & Frödén (2013)

Thallus crustose, thin to thick or absent, pale to dark grey, with Sedifolia-grey pigment. **Vegetative propagules** absent. **Apothecia** orange to rusty red. **Thalline margin** absent or inconspicuous (only present below the apothecia). **Exciple** prominent, persistent, sometimes raised above the disc, often paler than the disc. **Ascospores** polarilocular with a short to medium-long septum. **Conidiomata**

pycnidia, present or absent. **Conidia** bacilliform to narrowly ellipsoidal. **Chemistry**: thallus with *Sedifolia*-grey pigment, lacking anthraquinones, apothecia with non-chlorinated anthraquinones, parietin dominant.

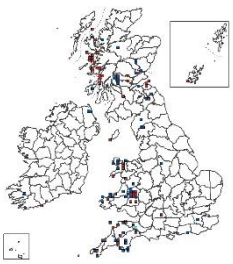
The grey crustose thallus, inconspicuous in some species, and brightly coloured apothecia that lack a thalline margin indicates a morphological similarity to *Blastenia*, which has a different chemistry, the apothecia with chlorinated anthraquinones with emodin dominant. There are around a dozen species, only two of which definitely occur in Britain and Ireland.

Literature:
Arup *et al.* (2013), Fletcher & Laundon (2009).

1 Thallus inconspicuous, or thin and uneven; discs and exciple dark orange to red-orange ..... ***arenaria***
Thallus well-developed, cracked-areolate; discs and exciple pale to mid orange.....***subpallida***

Rufoplaca arenaria (Pers.) Arup, Søchting & Frödén (2013) **Nb**

Caloplaca arenaria (Pers.) Müll. Arg. (1862)



Thallus crustose, inconspicuous, often immersed or overgrowing other lichens and then thin and uneven, pale to dark grey-brown. Apothecia to 0.5 mm diam., scattered to crowded, rounded to flexuose, flat; discs dark to dull orange; exciple red-orange, prominent, ± elevated, persistent; paraphyses broadening gradually to 2–3 µm diam. at the apices. Ascospores 13–17 × 5–8 µm, ellipsoidal, the septum 2–3.5 µm thick, *ca* 1/5–1/6 of the length of the spore. Thallus K–, apothecia K+ purple. **BLS 0235**.

On siliceous rocks, especially nutrient-enriched slates and basalt, also on roofs, frequently overgrowing other crustose lichens; scarce. In lowland and coastal areas but with some inland records. S.W. England, mid- & N. Wales, Derbyshire, Lake District to Scotland, Ireland. NB: the map displayed here includes records of *R. subpallida*.

Characterized by the small red-orange flat apothecia with a persistent exciple, on an immersed, inconspicuous thallus. Resembles a small morph of *Kuettlingeria ceracea* with an inconspicuous grey thallus, or a dark "*Athallia holocarpa* agg.", but the ascospores have a narrower septum. *Cerothallia luteoalba*, on trees, has much shorter ascospores.

Cercidospora caudata Kernst. (1894) and *Sclerococcum* (*Dactylospora*) *tegularum* have been reported on *R. arenaria* but the host may have been *R. subpallida*.

Rufoplaca subpallida (H. Magn.) Arup, Søchting & Frödén (2013) **NE**

Caloplaca subpallida H. Magn. (1945)

Similar to *R. arenaria* but with paler apothecia (pale to mid orange rather than red-orange) and a fairly well-developed, cracked-areolate thallus. It also commonly overgrows other lichens. **BLS 2895**.

Recorded several times in southern Scotland (as *Caloplaca subpallida*), and also perhaps in N. Wales (Anglesey).

R. subpallida was placed in synonymy with *R. arenaria* by Fletcher & Laundon (2009), on the basis that there was a continuum in apothecium coloration from orange to red-orange. Molecular data suggest that the two taxa are distinct, but no British material has been sequenced so the status of this species in Britain and Ireland remains uncertain. Further collections are needed; it may be that many records of *R. arenaria* should be referred here.

RUSAVSKIA S.Y. Kondr. & Kärnefelt (2003)

Thallus foliose and distinctly lobate with usually narrow, convex and sometimes radiating lobes, often with pseudocyphellae, partly attached with very short hapters. **Soralia** and **isidia** absent. **Apothecia** discoid, sessile, orange. **Thalline margin** present but narrow and sometimes becoming excluded. **Ascospores** ellipsoidal, polarilocular with medium septa. **Conidiomata** pycnidia, often present,

immersed. **Conidia** narrowly to broadly ellipsoidal.

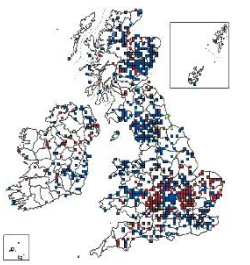
A small group corresponding to the *Xanthoria elegans* group but clearly distinct in phylogenetic terms, characterized primarily by the thalli with narrow convex lobes. There is only one British and Irish species.

Literature:
Arup *et al*. (2013), Hitch *et al*. (2009), Kondratyuk & Kärnefelt (2003).

Rusavskia elegans (Link) S.Y. Kondr. & Kärnefelt (2003) **LC**

Xanthoria elegans (Link) Th. Fr. (1861)

Thallus to 4 cm diam., occasionally to 15–20 cm as a ring, forming ± regular, dark orange to orange-red rosettes, radiating, sometimes incomplete; lobes ± uniformly 0.5–1.0 mm wide throughout their length, discrete for much of their length, contiguous or ± overlapping at the centre, markedly plicate, strongly convex, attached by hapters. Apothecia usually abundant throughout the central area of the thallus, to 1.5 mm diam., often crowded but rarely contorted, sessile, orbicular, flat, with a persistent smooth thalline margin. Ascospores ellipsoidal or ovoid, (9–) 11–16 × 5–7 (–9) µm. Conidia ellipsoidal, 2–3.5 × 1–1.5 µm. **BLS 1528**.



On well-lit nutrient-enriched siliceous and calcareous rocks used as bird perches, on mountain rocks, but also in human-made habitats, concrete, especially on roofs of slate and asbestos-cement, occasionally on lignum; local. Throughout Britain and Ireland.

Recognized by the bright orange-red rosettes of narrow ± discrete radiating finger-like convex lobes. *R. elegans* often occurs as isolated individuals, seldom forming colonies. *Calogaya pusilla* has much shorter, more appressed lobes, is orange, white-pruinose, lacks a lower cortex and the apothecia are abundant to the edge of the thallus.

SANGUINEODISCUS I.V. Frolov & Vondrák (2020)

Thallus crustose, epilithic or epiphytic, white to dark grey. **Cortex** composed of interwined chains of isodiametric fungal cells amongst dead algal cells, but well-developed in the lower part of the thalline margin. **Vegetative propagules** absent. **Apothecia** sometimes appearing lecanorine, with a thin exciple always present. **Disc** dark to pale red (occasionally some individuals have black or brown discs without anthraquinones). **Thalline margin** the same colour as the thallus. **Exciple** orange to red, but its outer rim often grey, darker than the thallus and thalline margin. **Ascospores** polarilocular, ellipsoidal, with a thick long septum. **Conidiomata** pycnidia, often present, grey-black. **Conidia** bacilliform. **Chemistry**: thallus and thalline margin always without anthraquinones, usually with *Sedifolia*-grey pigment. Epithecium and inner rim of exciple usually with anthraquinones; the outer rim may contain only anthraquinones or both anthraquinones and *Sedifolia*-grey.

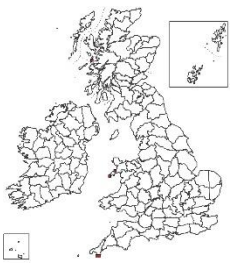
Part of the *Pyrenodesmia* group, distinguished by its apothecial discs that are pale to dark red, a exciple that may be grey-black or the same colour as the disc, and thalli and thalline margin with Sedifolia-grey pigment, lacking anthraquinones.

Literature:
Frolov *et al*. (2020), Vondrák & Vitikainen (2008).

1 On coastal siliceous rock (esp. serpentine); thallus uneven but smooth ..... ***aractinus***
On smooth base-rich bark; thallus of convex granules but smooth towards the margin..... ***haematites***

Sanguineodiscus aractinus (Fr.) I.V. Frolov & Vondrák (2020) **VU D2**

Caloplaca aractina (Fr.) Häyrén (1914)



Thallus wide-spreading, crustose, dark grey to black, the surface uneven but smooth, somewhat oily in texture, sometimes distinctly rimose to cracked-areolate, often with a zoned margin bounded by a black prothallus. Apothecia to 1 mm diam., widely scattered, often scarce, flat, immersed, soon becoming emergent to sessile; thalline margin persistent, dark grey; discs brown-orange, roughened; paraphyses with scarcely swollen apical cells. Ascospores 10–15 × 5–8 µm, broadly ellipsoidal, septum 3–5 µm thick, about 1/3 of the length of the ascospore. Thallus K–, discs of apothecia K+ purple. **BLS 0234**.

On acid sunny mesic-supralittoral seashores, on serpentine rocks or rarely on granite; rare but frequent where present. S.W. England (Cornwall, Lizard Peninsula), Wales (Caernarvon, Lleyn Peninsula) and the Hebrides (Muck and Pabbay).

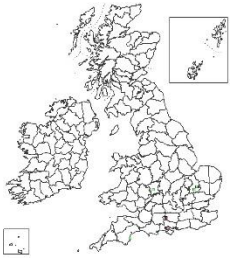
The dark leaden grey oily thallus with a black prothallus resembles that of *Halecania ralfsii*, but bears scattered, ± sessile apothecia with orange-brown discs surrounded by a persistent even narrow dark grey thalline margin.

Morphologically similar to the montane European species *Sanguineodiscus viridirufus* (Ach.) I.V. Frolov & Vondrák (Vondrák & Vitikainen 2008), but more data are needed before synonymy can be established.

Verrucula latericola s.l. has been reported associated with this species in Cornwall.

Sanguineodiscus haematites (Chaub. ex St.-Amans) I.V. Frolov & Vondrák (2020) **DD**

Caloplaca haematites (Chaub. ex St.-Amans) Zwackh (1862)



Thallus crustose, grey, moderately thick, of convex granules but smooth towards the margin, unevenly areolate towards the centre, often surrounded by a broad pale grey blue-tinged prothallus. Apothecia to 1 mm diam., contiguous, rounded to angular by mutual compression, constricted at the base; thalline margin grey, smooth and swollen at first, becoming thinner when old; disc brown-red, concave when young, becoming flat when mature; paraphyses unbranched or forked, septate, broadening towards the tips, the apical cells *ca* 3 µm diam. Ascospores 11–14 × 5–8 µm, ellipsoidal, septum 3–5 µm thick, about 1/4–1/2 of the length of the ascospore. Thallus K–, apothecial discs K+ purple. **BLS 0258.**

On smooth base-rich bark, especially twigs of fruit trees, *Juglans* and *Populus.* England (Hampshire), formerly known from S. Devon, Worcester and Cambridge.

A distinctive species, similar to *Caloplaca cerina* but differing in the brown-red rather than orange apothecial discs (Wetmore 2007b).

SCYTHIORIA S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur (2014)

Thallus crustose, areolate or immersed in bark or rock, greenish white to bright yellow, richly **sorediate**, cortical layer composed of isodiametric cells, usually poorly developed. **Apothecia** at first with a **thalline margin** that is sometimes sorediate, later becoming excluded. **Exciple** composed of intertwined hyphal tissue. **Chemistry**: with or without anthraquinones (K± purple).

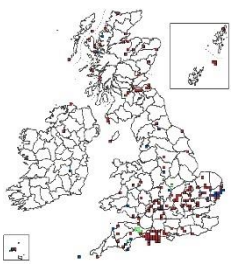
Arup *et al*. (2013) found that *Scythioria* (type *S. phlogina*) occupied a distinct clade within the broadly circumscribed genus *Polycauliona*, but that assemblage is diverse in both phylogenetic and phenetic terms. Kondratyuk *et al*. (2014b) subdivided the species of *Polycauliona* into a number of new taxa and made *Caloplaca phlogina* the type of a new genus *Scythioria*. The three species included in *Scythioria* (only one of which occurs in our region) are also diverse in morphological terms, and it is not practical to separate *Scythioria* from the rest of *Polycauliona* except using molecular data. However, the type of *Scythioria* is very distinct in morphology from the species of *Polycauliona* s. str. that occur in Britain and Ireland, and its exclusion leaves *Polycauliona* in our region relatively uniform in appearance.

Literature:
Arup *et al.* (2013), Kondratyuk *et al*. (2014b), Vondrák *et al.* (2010).

Scythioria phlogina (Ach.) S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur (2014) **Nb**

Caloplaca phlogina (Ach.) Flagey (1886)

Polycauliona phlogina (Ach.) Arup, Frödén & Søchting (2013)



Thallus crustose, pale, white-grey to green- or pale yellow, very smooth and film-like, occasionally with shallow bullate areoles, not clearly separated except near the thallus margin; areoles develop extensive pale yellow nodules erupting into circular pale green-yellow soralia, irregularly spreading over the entire thallus; soredia (25–) 30–50 (–60) µm diam.; prothallus absent. Apothecia 0.3–0.8 mm diam., the disc deeper yellow than the thallus, often white-pruinose, thalline margin often without soredia when mature; paraphyses broadening to *ca* 7 µm at the tips. Ascospores (9–) 10–13 (–13.5) × 4–6 µm, septum 3–4 µm thick. Pycnidia broadly ellipsoidal. Thallus and soredia K–, apothecia K– purple. **BLS 2317**.

Once mostly on *Ulmus* bark, but now found on base-rich bark of other broadleaved trees, lignum, dead plant stems and roots. Throughout S. England, scattered in Wales, N. England, Scotland and Ireland.

S. phlogina has either been much overlooked in the past, or has undergone a rapid expansion of its range. The thin thallus and pale yellow soralia separate *S. phlogina* from *Solitaria chrysophthalma*. *Flavoplaca citrina* s.l. is on rock and has slightly larger soredia with orange apothecial discs which are crenulate-sorediate around the margin; the ascospores are also slightly larger. *F. flavocitrina* has distinct squamules which become brightly yellow-sorediate at the tips, and usually remains incompletely sorediate, while the soredia are a little smaller.

A *Stigmidium* sp. with spores 10–12 (–14) × 2–3 µm has been reported on this host.

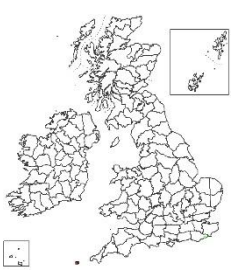
SOLITARIA Arup, Søchting & Frödén (2013)

This is a monotypic genus, so the description of the species below constitutes that of the genus.

The phylogenetic position of this lichen needs further invesigation; it appears to occupy an isolated clade within the Xanthorioideae.

Solitaria chrysophthalma (Degel.) Arup, Søchting & Frödén (2013) **DD**

Caloplaca chrysophthalma Degel. (1944)



Thallus immersed, inconspicuous or as a thin grey film; prothallus indistinct; soralia bright yellow-orange, crowded, flat to convex, ± rounded, discrete, erose to superficial; soredia farinose to minutely granular. Apothecia rare, absent in Britain, to 1 mm diam., scattered, ± elevated, orbicular, concave at first but becoming flat; thalline margin sometimes present, yellow, sorediate; exciple well-developed; disc orange; paraphyses *ca* 2 µm diam., unbranched, the apices thickened to *ca* 3 µm diam. Ascospores (10–) 13–20 × 7–10 µm, ellipsoidal, the septum 3–5 µm thick, about 1/4 of the length of the ascospore. Thallus K–, soralia and apothecia K+ purple. **BLS 0245**.

On nutrient-rich bark in open situations; rare. Isles of Scilly; there are also two doubtful 18th century records from S. England (Sussex).

Characterized by the bright yellow-orange, delimited soralia contrasting with the deep orange apothecia and inconspicuous thallus; the British material is poorly developed and its identity needs confirmation using molecular methods. *Haloplaca sorediella* has often more extensive farinose, golden-yellow soredia erupting from minute pustules on a grey, finely areolate to bullate thallus, and is found on rock and dead plant material in coastal habitats.

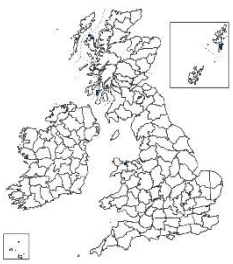
SQUAMULEA Arup, Søchting & Frödén (2013)

Thallus squamulose or crustose with marginal lobes, the cortex composed of isodiametric cells; one species with **soralia**. **Apothecia** with a margin that becomes excluded, the exciple composed of isodiametric cells. Ascospores polarilocular with medium to long septa. **Conidiomata** present or absent; **conidia** ellipsoidal to bacilliform. **Chemistry**: thallus and apothecia K+ purple.

Squamulea is a well-delimited genus (Arup *et al.* 2013) characterized by in most species a squamulose thallus (lobate in one species). Squamulose species also occur in some other genera, e.g. the non-British *Wetmoreana* Arup, Søchting & Frödén (2013), but none of them has an exciple composed of isodiametric cells or (usually) a cortex of similar structure. There are around 20 species currently known, only one of which has been recorded in our region.

Squamulea subsoluta (Nyl.) Arup, Søchting & Frödén (2013) **DD**

Caloplaca irrubescens (Nyl.) Zahlbr. (1898)



Thallus crustose, in small orange patches of small, scattered to contiguous, cracked-areolate to subsquamulose units to 0.5 mm diam., flat, angular or irregularly rounded, on a black prothallus, often associated with cyanobacteria. Apothecia to 0.2–0.3 (–0.5) mm diam., numerous, scattered, rounded, orange; exciple becoming excluded with age; disc concolorous or brown-orange, flat to convex; paraphyses simple, broadening towards the tips, the apical cells 2–3 µm diam. Ascospores 10–13 × 6–7 µm, broadly ellipsoidal, the septum 3–5 µm thick, about 1/3–1/2 of the length of the ascospore. All parts K+ purple. **BLS 0262**.

On steeply inclined base-rich siliceous rock (basalt); rare. Known from a single 19th century collection from mid Wales (Merioneth, Barmouth), and modern records from N. Wales (Caernarvon), W. Scotland (from Kintyre to Sutherland) and Shetland.

It is not not known whether the 19th century specimen was from a coastal or montane site. Distinctive in the widely spaced, deep orange-brown areoles, sunken into concavities of the soft rock, on a black hypothallus. Apothecia are similarly widely scattered on a dark background (like orange stars in the sky).

Following Wetmore (2003), *Caloplaca irrubescens* is considered a synonym of *Squamulea subsoluta* (Arup *et al.* 2013), in which the thallus may be squamulose with a slightly lobed margin (Wetmore 2003, 2007a).

TELOSCHISTES Norman (1853)

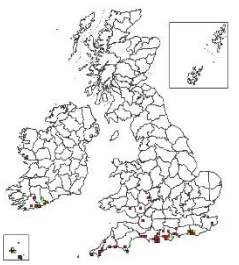
Thallus shrubby, lobes terete to somewhat flattened and dorsiventral, sparingly to richly branched, often with fibrils or cilia, attached by a basal holdfast, or adhering by contact or entanglement; rhizines absent. **Upper surface** entirely bright yellow-orange, sometimes pale below, grey-green to ash-grey in some non-British species. **Soralia** sometimes present. **Cortex** of periclinally arranged, conglutinated hyphae. **Photobiont** trebouxioid. **Medulla** of ± parallel, vertically aligned, loosely interwoven hyphae. **Ascomata** apothecia, laminal, terminal or marginal. **Thalline margin** present, persistent, sometimes ciliate. **Disc** yellow to orange. **Epithecium** granular, yellow, K+ purple-crimson. **Hymenium** and **hypothecium** colourless. **Hamathecium** of paraphyses, septate, unbranched; apices capitate. Asci 8-spored, elongate-clavate, of several layers, apically ± thickened with a broad internal beak, inner part of apex and external cap K/I+ blue, non-fissitunicate. **Ascospores** colourless, ellipsoidal, polarilocular. **Conidiomata** pycnidia, round, deep orange-red, immersed, usually multilocular. **Conidia** rod-shaped, aseptate, colourless. **Chemistry**: anthraquinones, particularly parietin, depsidones and some unknown substances. **Ecology**: on bark, rock and soil in humid regions.

Teloschistes species are unmistakeable, resembling a bright orange *Ramalina*.

Literature:
Arup *et al*. (2013), Fletcher & Purvis (2009), Frödén & Kärnefelt (2007), Kondratyuk *et al.* (2013), Søchting & Frödén (2002).

1 Thallus forming compact orbicular clumps to 2 cm diam. of flattened radiating lobes; soralia absent, usually abundantly fertile .....***chrysophthalmos***
Thallus forming lax entangled clumps 3–10 cm diam., of ± terete, slender branches; soralia present; apothecia not observed in Britain and Ireland.....***flavicans***

Teloschistes chrysophthalmos (L.) Th. Fr. (1860) **CR**



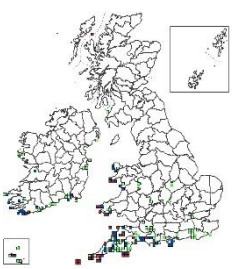
Thallus 1–2 cm diam., forming small compact ± orbicular tufts 0.5–1 cm tall; lobes 0.5–2.5 mm wide, radiating from the centre, ascending or erect, flat, convex, somewhat channelled below, dorsiventral, irregularly branched with numerous marginal fibrils; upper surface orange-yellow (greenish yellow in shade), matt, smooth or slightly longitudinally ridged; lower surface white or grey, often longitudinally veined and wrinkled. Apothecia ± stalked, marginal or terminal; disc 1–6 mm diam., orange-yellow, flat; thalline margin thin, often with abundant concolorous or grey fibrils 0.5–1.5 mm long. Ascospores 10–15 × 5–8 µm. Pycnidia frequent, immersed below shallow orange-red warts *ca* 0.1 mm diam. Cortex K+ purple-crimson (physcion). **BLS 1380**.

On well-lit, nutrient-enriched twigs of shrubs and small trees, particularly Rosaceae, in sunny, south-facing situations, in old orchards and hedgerows. England (South Downs, Herefordshire), S.W. Ireland, Channel Islands.

This attractive species was formerly more widespread in S. England and appeared to be extinct at the time of publication of the second edition of *Lichens of Great Britain and Ireland*. However, it has recolonised and appears to have established persistent populations; it is now not infrequent in hedgerows all along the southern coast of England (especially on twigs of *Crataegus* and *Prunus spinosa*) and shows some indication of spreading northward with recent records in Gloucestershire, Hereford and S. Wales. It also appears to be expanding its range in S.W. Ireland.

The species was transferred to a new genus *Niorma* by Kondratyuk *et al.* (2013) but this and *Teloschistes* form a monophyletic unit and there does not seem to be strong justification for the change. The epithet has commonly been spelt "*chrysophthalmus*" but this is incorrect.

Teloschistes flavicans (Sw.) Norman (1853) **VU**



Thallus richly and intricately branched, forming loosely ascending entangled tufts 3–10 cm diam., often loosely attached, wind-blown, or entangling small herbs and lichens; branches 0.5–1 mm diam., rounded or somewhat flattened or angled, slender, matt, smooth or rarely slightly pubescent, ± dichotomously branched, uniformly golden yellow to orange-red, sometimes paler below and becoming overall green-grey in shaded habitats, with few to numerous scattered fibrils; soralia yellow, tubercle-like, rounded or elongate, frequent. Pycnidia frequent, immersed in orange-red tubercles, 0.15–0.2 mm diam. Apothecia not observed in British material, 1–4 mm diam., lateral; thalline margin sparingly ciliate. Cortex K+ purple-crimson (physcion). **BLS 1381**.

On siliceous rocks, stony soil, wood, twigs and bark, or in short turf, usually in well-lit and wind-mist-exposed sites especially on or near the coast, occasionally in more sheltered inland boggy sites, *Salix* carr and high up in tree crowns; local and decreasing. Known from Dorset, west and northwards to Lundy, Skomer and Anglesey, & S.W. Ireland; recently discovered on an island of the Outer Hebrides (Scotland).

A very distinctive species resembling a bright orange *Ramalina farinacea* or *Usnea*. Formerly more widespread and extending on trees into the English Midlands; its recent decline has been attributed to loss of habitat and the spread of air pollution. Small forms of *Xanthoria parietina* or *X. aureola* have been mistaken for *T. flavicans* when growing in moss cushions on the seashore or in turf of fixed dunes.

Lichenoconium usneae (Anzi) D. Hawksw. (1977) has been reported on this host.

VARIOSPORA Arup, Søchting & Frödén (2013)

Thallus crustose, large, bright yellow-orange to orange, placodioid, the lobes closely appressed, flat or convex, the ends partially or entirely rounded, sometimes pruinose, the centre coarsely areolate, uneven. **Vegetative propagules** not produced. **Apothecia** mainly confined to the centre of the thallus, often crowded. **Thalline margin** distinct at first but sometimes becoming excluded, yellow-orange. **Disc** flat at first, often becoming domed with age, orange to orange-brown. **Hamathecium** of slender paraphyses, not or only slightly swollen at the apices. **Asci** 8-spored. **Ascospores** polarilocular, swollen at the septum and typically lemon-shaped, the septum very variable in thickness. **Conidiomata** pycnidia, orange. **Conidia** bacilliform to ellipsoidal. **Chemistry**: thallus and apothecia K+ purple.

The three species treated here have placodioid thalli in contrast to other species assigned to *Variospora* by Arup *et al*. (2013), and they form a monophyletic subclade within that genus. That led Kondratyuk *et al*. (2017) to transfer them to a separate genus *Klauderuiella*, but *Variospora* in Arup *et al*.'s concept is also monophyletic and there does not seem to be a strong case to establish yet another genus within the Teloschistaceae.

The ascospores of *Variospora aurantia*, *V. flavescens* and *V. thallincola* differ from those of all other British species of *Caloplca* s.l. in being characteristically lemon-shaped. *Calogaya* species also form large conspicuous placodioid thalli, but the outer lobes are not so well-developed as in *Variospora* and the ascospores do not have swollen septa, being ellipsoidal rather than lemon-shaped. The two genera are not at all closely related.

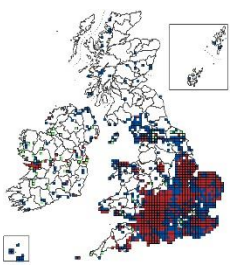
References:
Arup *et al*. (2013), Fletcher & Laundon (2009), Kondratyuk *et al*. (2017).

1 Thallus lobes widening to *ca* 3 mm at the tip, flat and appressed, egg yolk-yellow, usually radiating with concentric white-pruinose zones ..... ***aurantia***
Thallus lobes widening to *ca* 1 mm at the tip, convex, orange, whitened only through abrasion 2

2(1) Thallus lobes 3–7 mm long, deep yellow-orange, not pruinose; on siliceous (occasionally calcareous) rocks, coastal (mesic-supralittoral) ..... ***thallincola***
Thallus lobes 2–5 mm long, pale yellow to pale orange, ± faintly pruinose; on calcareous rocks, rarely on brick and bark, coastal (xeric-supralittoral) and inland ..... ***flavescens***

Variospora aurantia (Pers.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca aurantia (Pers.) Hellb. (1890)



Thallus placodioid, forming large closely appressed, partially or entirely rounded thalli to 12 cm across, usually zoned or piebald with white pruina; lobe-ends rounded and flat, without furrows, bright orange-yellow, older parts frequently paler or white due to loss of pigment, the central area cracked-areolate, in part brown-orange due to the presence of apothecia. Apothecia to 1–1.5 mm diam., confined to the central area, usually abundant and crowded, flat with a distinct orange-yellow thalline margin, often becoming convex and immarginate when old; disc orange-brown, deeper coloured in strong light; paraphyses 1–2 µm diam., slender and straight, septate, not or only slightly swollen at the apices. Ascospores 10–13 × 8–10 µm, swollen at the septum, typically lemon-shaped, the septum variable in width, to 5 µm thick. Thallus and apothecia K+ purple. **BLS 0239**.

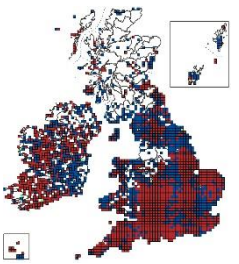
On well-lit limestone in nutrient-rich habitats; common. Lowland England, Wales and Ireland. Most records from Scotland and some from N. England are doubtful.

Closely related to *Variospora flavescens*, with which it often grows but which is uniformly orange, though old specimens may have a white, eroded centre, with convex unwidened pleated lobe-ends and sparse pruina; *V. aurantia* is often concentrically zoned in colour with orange-yellow, flattened and widened lobe-ends which are often pruinose. *V. flavescens* is sometimes zoned by the death of the central part of the thallus, leaving it with either dark or white necrotic areas.

Muellerella lichenicola has been reported on this host.

Variospora flavescens (Huds.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca flavescens (Huds.) J.R. Laundon (1984)



Thallus placodioid, forming large even circular patches, 10 cm diam. or more. Lobes closely appressed, rounded or irregular, surface matt, pale to deep orange; lobe-ends not widened, rounded, convex, sometimes faintly pruinose, lobes contiguous, pleated, sometimes overlapping, centre coarsely areolate, uneven, of sometimes contorted and congested lobes, white and non-pigmented, dotted with orange apothecia. Apothecia to 1.5 mm diam., mainly confined to the centre of the thallus, usually abundant and crowded, flat at first, becoming convex when old; thalline margin concolorous with the thallus, later becoming excluded; disc orange to orange-brown; paraphyses slender and straight to flexuose, not notably swollen at the apices. Ascospores 12–15 × 8–10 µm, swollen at the septum, lemon-shaped, septum variable in breadth, to 5 µm thick. All parts K+ purple. **BLS 0259**.

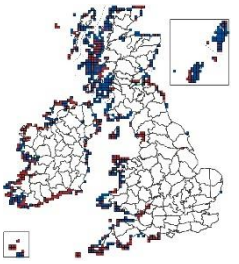
On calcareous stone, especially limestone, walls, cement, mortar, and asbestos cement, possibly preferring nutrient-rich habitats, very rarely on bark (usually trees near dusty lime quarries). The commonest placodioid *Caloplaca* s.l. found throughout England, Wales and Ireland, though more rarely recorded from historically highly SO_2-polluted areas such as the Scottish lowlands and industrial N. of England.

Closely related to *V. aurantia* and confusable with limestone specimens of *V. thallincola* which also have lemon-shaped ascospores, but pruina are almost always present at least at the lobe tips, except on wave-exposed limestone seashores. Lobe tips of *V. aurantia* are flattened and broadened. *Calogaya pusilla* is much smaller, has dense pruina, cushion-like lobes and ellipsoidal ascospores.

Reported on this host are *Intralichen* cf. *christiansenii*, *Lichenodiplis lecanorae*, *Muellerella lichenicola*, *Verruculopsis flavescentaria* (q.v.), *Weddellomyces epicallopisma* (Wedd.) D. Hawksw. (1986) and an *Endococcus* sp.

Variospora thallincola (Wedd.) Arup, Frödén & Søchting (2013) **LC**

Caloplaca thallincola (Wedd.) Du Rietz (1921)



Thallus placodioid, forming bright orange, closely appressed, very regular round "cartwheels" 30–40 mm diam., lobe-ends 0.3–0.7 mm broad, convex, finger-like, contiguous, divided by frequently parallel furrows; the central area convex-areolate, lacking pruina. Apothecia to 0.8 mm diam., mostly confined to the central area, usually scattered; thalline margin orange, excluded when old; discs brown-orange, at first flat but becoming convex; paraphyses lax, some unbranched but most forked towards the tips, which are slightly swollen. Ascospores 11–14 × 8–11 µm, swollen, lemon-shaped, septum 4–5 µm thick, between 1/3–1/2 of the length of the ascospore. Thallus and apothecia K+ purple. **BLS 0282**.

On siliceous rocky coasts; in the mesic to submesic-supralittoral zone, occasionally on coastal limestone seashores, preferring shade and northern faces, often overgrowing *Hydropunctaria maura* s.l., with *Lecanora helicopis*, rarely alongside *Flavoplaca marina* which prefers sun; common. S.W., W. & N. Britain, Ireland, wherever hard rocks are found.

Closely related to *V. flavescens* which may lack pruina on wave-exposed sea shores; distinguished by its divided finger-like lobes and bright orange, almost shiny, as opposed to matt, yellow-orange colour. Most paraphyses of *V. thallincola* are branched, whereas in *V. flavescens* most are unbranched. *V. thallincola* generally inhabits different habitats from *V. flavescens*, but both may occur together on sea-walls. Lobes of *V. thallincola* are much larger than those of *Calogaya arnoldii* and *Athallia scopularis*.

Reported on this host are *Arthonia molendoi* (q.v.), *Muellerella lichenicola*, *Tremella caloplacae* and *Verrucula latericola* s.l.

XANTHOCARPIA A. Massal. & De Not. (1853)

Thallus usually reduced, inconspicuous or granular (rarely areolate or exceptionally subsquamulose or peltate), yellow or rarely pale grey. **Cortex** absent, of angular cells or alveolate (see Vondrák *et al.* 2009). **Soredia** and **blastidia** mostly absent (always so in British and Irish species). **Prothallus**

indistinct or pale grey. **Apothecia** yellow to red with a thalline margin that may be enlarged and crenulate in some species. **Ascospores** ellipsoidal, long and narrow, polarilocular (with three divisions in one species), the septa narrow, at least when mature. **Conidiomata** pycnidia, only known in some species. **Conidia** ellipsoidal or shortly bacilliform. **Chemistry**: anthraquinones, parietin dominant with traces of emodin, fallacinal, parietinic acid, and teloschistin.

A genus of Teloschistaceae with thalli that are usually poorly developed, and ascospores with notably narrow septa compared with other genera. One species has 3-septate rather than 1-septate ascospores. *Cerothallia* also has ascospores with narrow septa, but that genus was confirmed as phylogenetically distinct by Arup *et al*. (2013). It belongs to the subfamily Xanthorioideae, and corresponds to the *Caloplaca lactea* group as recognized by Navarro-Rosinés & Hladun (1996).

Literature:
Arup *et al.* (2013, 2023), Fletcher & Laundon (2009), Navarro-Rosinés & Hladun (1996), Powell & Vondrák (2011), Vondrák *et al*. (2009, 2011, 2016c).

1 Ascospores four-celled, 12–15 × 5–7 µm; apothecia without a thalline margin, *ca* 0.5 mm diam.; thallus smooth, felted, matt-textured ..... ***ochracea***
Ascospores polarilocular with a single septum 1–4 µm thick 2

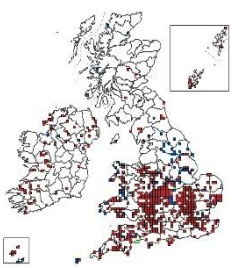
2(1) Thallus yellow to grey-yellow, well-developed 3
Thallus not yellow, or if yellow then poorly developed 4

3(2) Thallus of granules, squamules or diffuse convex areoles surrounding apothecia ..... ***crenulatella***
Thallus areolate, diffuse at the margin, often with a distinct grey-white prothallus ..... ***diffusa***

4(2) Apothecia small, to 0.5 mm diam.; ascospores ellipsoidal, (12–) 14–19 (–21) × 5.5–7 (–8) µm ..... ***fulva***
Apothecia larger, 0.5–1 mm diam. when mature; ascospores (10–) 12–22 (–28) × (3–) 4–7.5 µm ..... ***crenulatella***

Xanthocarpia crenulatella (Nyl.) Frödén, Arup & Søchting (2013) **LC**

Caloplaca crenulatella (Nyl.) H. Olivier (1909)



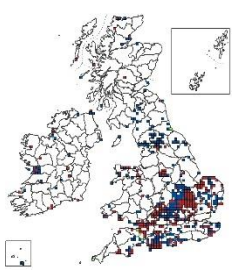
Thallus crustose, poorly delimited, grey-yellow, of granules, squamules or diffuse convex areoles surrounding apothecia, not shiny or pruinose. Apothecia yellow, to 1 mm diam., becoming crowded, contiguous, rounded and not angular, flat; exciple surrounded by a slightly warted thalline margin; paraphyses unbranched, broadening to 4 µm diam. towards the tips. Ascospores (10–) 12–22 (–28) × (3–) 4–7.5 µm, ellipsoidal, septum 1.5–2.5 µm thick, under 1/8 of the length of the ascospore. All parts K+ purple. **BLS 0249**.

On flat concrete such as drain covers and disused airfield runways, rarely on inland limestone; frequent. Throughout lowland England and Wales, rarely recorded from N. England and Scotland, throughout Ireland.

The yellow thallus and ascospores with thin septum and pointed apices distinguish this species from *Caloplaca flavovirescens*. *Athallia holocarpa* agg. and *Xanthocarpia lactea* have whitish thalli, and rounded ascospores while the former has a much thicker septum about 1/3 the length of the ascospore.

Xanthocarpia diffusa (Vondrák & Llimona) Frödén, Arup & Søchting (2013) **NE**

Caloplaca diffusa Vondrák & Llimona (2011)



Thallus yellow, ochre-yellow or grey-yellow, areolate, forming patches to several cm diam.; areoles angular, to *ca* 1 mm diam. and 150 µm thick; thallus margin diffuse, prothallus often visible at the margin, white or pale grey; a thin alveolate cortex (see Vondrák *et al*. 2009) sometimes present, to 20 µm thick. Apothecia 0.4–0.7 (–1.0) mm diam., disc pale to dark orange; exciple yellow-orange; thalline margin yellow, often crenulate. Paraphyses, branched, thickened in the upper part to 3–5 µm diam. Ascospores

(11–) 14–16.5 (–17.5) × (5–) 6–8 (–9) µm, the septum thin (2–3.5 µm thick), less than 1/5 of the length of the spore. Pycnidia indistinct or forming orange spots, to *ca* 170 µm diam. Conidia 2.7–3.2 × 1.0–1.7 µm, narrowly ellipsoidal or shortly bacilliform. **BLS 2592**.

On limestone or siliceous riverine rocks, also on calcareous gravestones and concrete; Wales (Brecon, Glamorgan, Monmouthshire) and England (W. Suffolk); probably elsewhere.

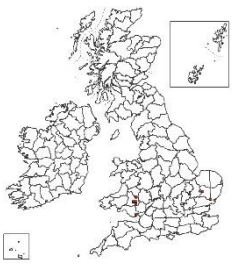
Similar to *Xanthocarpia crenulatella* but with a better-developed yellowish-grey thallus with a diffuse margin and whitish prothallus, though the last feature may be difficult to distinguish on calcareous substrata. Sequencing is recommended.

Xanthocarpia fulva (Harm.) Nav.-Ros. & Roux (2023) **DD**

Xanthocarpia marmorata auct., non (Bagl.) Frödén, Arup & Søchting (2013)

Caloplaca marmorata auct., non (Bagl.) Jatta (1900)

Caloplaca lactea (A. Massal.) Zahlbr. (1901), sensu auct. br.



Thallus crustose, endolithic or reduced to sparse whitish granules; soredia not present, prothallus not differentiated. Apothecia 0.2–0.5 mm diam., orange-red to ferruginous; thalline margin not present; exciple variably developed, concolorous with or paler than the disc. Asci mostly 8-spored but occasionally 2- or 4-spored. Ascospores (12–) 14–19 (–21) × 5.5–7 (–8) µm, polarilocular, the septum 2–3 µm thick, less than 1/6 of the length of the spore. Apothecia K+ purple. **BLS 0264**.

On limestone, soft chalk (especially pebbles), and on shells on the seashore; local. Throughout England, scarce in Wales, Scotland & Ireland.

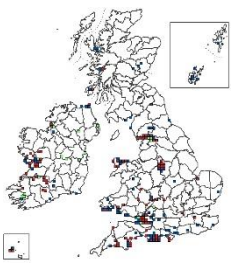
Specimens resembling the *Athallia holocarpa* agg. with small apothecia on a white thallus should be examined carefully for spores with a narrow septum indicating *X. fulva*. Their apothecia are yellow and often appear pellucid with an irregularly concave disc when moist. *X. crenulatella*, also with spores with a narrow septum, has a yellowish thallus.

Arup *et al*. (2023) re-examined the type of *X. marmorata* and found a quite different species from collections formerly identified as that lichen. Sequenced material placed the species within *Gyalolechia* s.l. A new name was thus required for *X. marmorata* auct., based on *Lecanora lactea* f. *fulva* Harm. (1913). Material of *X. fulva* from Mediterranean areas has dark orange-red apothecia in contrast to the orange-yellow fruit-bodies typical of British collections.

Two collections, from worked limestone in Gloucestershire and mortar of a church in Huntingdonshire, have been sequenced and confirmed as *X. fulva* (Powell & Vondrák 2011, as *Caloplaca marmorata*). Assumptions have been made that all GB material formerly identified as *X. lactea* (A. Massal.) Zahlbr. should be transferred here [hence the broad distribution on the map]. However, the possibility remains that the genuine *X. lactea* also occurs in our region, although the status of that species needs further investigation. Collections from Dolomitic limestone in Yorkshire (Malham) have the relatively broad ascospores (11–16 × 6–9 µm) reported for *X. lactea*, so sequencing of multiple specimens should be encouraged.

Xanthocarpia ochracea (Schaer.) A. Massal. & De Not. (1853) **Nb**

Caloplaca ochracea (Schaer.) Flagey (1886)



Thallus crustose, yellow, mottled white, forming a very thin even film, rarely finely areolate, the surface not corticate, of hyphae and crystals giving a ‘felted’ matt appearance; prothallus thin, black, sometimes mosaic-forming. Apothecia to 1.0 mm diam., frequent, scattered, rounded, urceolate, immersed at first, becoming sessile, rounded; exciple swollen, waxy, orange; disc concave to flat, concolorous; paraphyses with apical cells widened at the tip to 2–4 µm. Ascospores 12–15 × 5–7 µm, ellipsoid, internal locules dumb-bell-shaped, with the two end loculi connected by a wide canal which divides into two, becoming four-loculate when mature. All parts K+ purple. **BLS 0272**.

On sunny, hard limestones; scarce. Chiefly S. & S.W. England extending to Wales, N. England (Peak District, Lake District), scattered in Scotland as far north as Shetland, found widely in Ireland but rare in the Midlands Plain.

Distinguished by the unusual thick-walled, 4-celled ascospores with a dumb-bell-shaped internal cavity when mature. The non-corticate, patchily yellow thallus, with small regular waxy orange-brown concave apothecia, immersed in the thallus at first, are useful field characters. *Flavoplaca itiana* is corticate, finely areolate, intersected by black lines, and has 2-celled ascospores.

XANTHOMENDOZA S.Y. Kondr. & Kärnefelt (1997)

Thallus foliose, or rarely crustose with well-developed marginal lobes. **Rhizines** often present on the lower surface, but in some species sparse or absent. **Blastidia** often well-developed but **soralia** and **isidia** absent. **Apothecia** laminal. **Thalline margin** well-developed, sometimes developing lobules with age. **Ascospores** polarilocular, narrowly ellipsoidal to ellipsoidal with medium to long septa. **Conidiomata** pycnidia, present or absent. **Conidia** long, bacilliform to narrowly ellipsoidal.

Difficult to separate from *Xanthoria* using morphological features, but species have rhizines rather than hapters as attachment organs, though the rhizines may be poorly developed. More work is needed to elucidate the phylogeny of this group, and while it seems clear that the species concerned are not closely related to *Xanthoria*, the delineation of *Xanthomendoza* needs further thought.

There are three species currently claimed from Britain and Ireland, including *X. oregana* that has very recently been detected. *X. huculica* (S.Y. Kondr.) Diederich (2014) may well also occur in our region. *X. huculica* may be compared with *X. ulophyllodes*, but has large, helmet-like soralia and more rounded lobes (Malíček *et al.* 2018); it appears to be widespread in continental Europe.

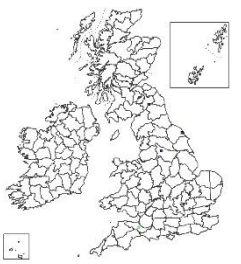
Literature:
Arup *et al.* (2013), Hitch *et al.* (2009), Kondratyuk & Kärnefelt (1997), Kondratyuk *et al.* (2014b), Lindblom (1997), Lindblom & Blom (2014), Lindblom *et al.* (2019), Malíček *et al.* (2018), Søchting *et al.* (2002).

1 Thallus rosette-forming; marginal lobes horizontal, adpressed (central lobes can be raised); conidia bacilliform ..... ***ulophyllodes***
Thallus not rosette-forming; often several thalli confluent, lobes irregular; conidia bacilliform or ellipsoidal-bacilliform..... 2

2(1) Thallus dull to dark orange; lobe tips rounded, mostly unbranched; pycnidia prominent, darker than the upper cortex; conidia bacilliform ..... ***fulva***
Thallus bright yellow to light orange; lobe tips irregular, with fine branchlets; pycnidia immersed, concolorous with the upper cortex; conidia variable in shape, ellipsoidal to bacilliform..... ***oregana***

Xanthomendoza fulva (Hoffm.) Søchting, Kärnefelt & S. Kondr. (2002) **DD**

Xanthoria fulva (Hoffm.) Poelt & Petutschnig (1992)



Thallus foliose, 0.1–0.3 cm diam., of umbilicate, mainly vertical and distinctly dorsiventral lobes, reddish or brownish orange, evenly pigmented; lobes 1–2 mm long and 0.3–0.8 mm wide, with rhizines on the white lower surface, but not generally attached to the substratum; blastidia 25–30 (–40) µm diam., over almost the whole of the lower surface; conblastidia at the margins, 50–60 µm diam., rarely present. Apothecia rather rare. Ascospores 13.5–17.5 × 8–10.5 µm. Conidia bacilliform, 3.7–4.0 × 0.9–1.2 µm. **BLS 1918**.

On *Quercus* and *Ulmus* bark and wood, rarely on rock; very rare. Scottish Borders, Yorkshire (nr Halifax), Somerset.

It is not yet clear whether this taxon is correctly represented in Britain, as specimens are similar in appearance to some forms of *Polycauliona candelaria* and *P. ucrainica*. More specimens with conidia are needed to ascertain its exact status.

Xanthomendoza oregana (Gyeln.) Søchting, Kärnefelt & S.Y. Kondr. (2002) **NE**

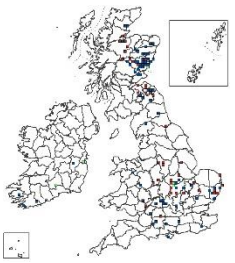
Thallus to 30 mm diam., not rosette-forming, consisting of slightly raised to ascending lobes forming ± large irregular clusters (tufts); upper surface bright yellow to orange, smooth or sometimes slightly wrinkled; rhizines scattered, free or attached to the substratum; soralia irregular in outline, marginal or submarginal; soredia orange. Apothecia rare, not observed in British material; located on vertical lobes, 0.5–1.0 mm diam., thalline margin raised, very thick, concolorous with the thallus; exciple poorly developed; epithecium thin, yellow or brightly brownish; subhymenium colourless, 12–15 µm thick; paraphyses lax with the uppermost cells extremely swollen, 4–6 (–7) µm diam.; ascospores (10–) 11–13 (–15) × (6–) 7–8.5 µm, the septum 5–6 µm thick. Pycnidia common, 0.1–0.2 µm diam., immersed to protruding, darker than the upper cortex; conidia variable in form, ellipsoidal to cylindric-ellipsoidal or bacilliform, (3.0–) 3.5–4 × 1–1.5 µm. **BLS 2894**.

Currently known from a single site on *Acer pseudoplatanus* in E. Perthshire (Kindrogan), but likely to be confused with *X. ulophyllodes* and it may be that many records of that species should be referred here.

X. oregana is similar to *X. fulva* but with irregular branched lobe tips and less prominent pycnidia (Lindblom *et al*. 2019). The description and key above has been adapted from Lindblom (1997), Kondratyuk & Kärnefelt (1997) and Lindblom *et al.* (2019).

Xanthomendoza ulophyllodes (Räsänen) Søchting, Kärnefelt & S.Y. Kondr. (2002) **LC**

Xanthoria ulophyllodes Räsänen (1931)



Thallus initially of small rosettes to 1–1.5 (–3.5) cm diam. which coalesce into larger expanses, foliose, dorsiventral, of horizontally spreading to overlapping lobes, lobes 5–8 mm long by 0.3–0.5 (–1.5) mm wide, yellow-orange, evenly pigmented; attached to the substratum by rhizines on the lower surface and edges which may become yellow; blastidia 20–30 µm diam., marginal, in a lip-like zone, rarely on the lower side; conblastidia at the margins 40–50 (–60) µm. Apothecia rare, 2–3 mm diam., laminal, with a plain disc and pronounced margin which may sprout lobules with age. Ascospores 10.5–12.5 (–14.5) × (5.5–) 7–8 µm. Conidia bacilliform, 3.8–4.1 × 0.9–1.1 µm. **BLS 1909**.

In well-lit humid situations on bark of broad-leaved trees, stone and human-made substrata (churchyards). Probably widespread in eastern England and Scotland, a few records from S. Ireland [but see also *X. oregana* above].

X. ulophyllodes has been incorrectly called *Xanthoria fallax* (Hepp ex Arnold) Arnold (1880) in Britain in the past; the latter, which is not British, has a thick, leathery thallus and lip-shaped soralia on the margins of the lobes. *Polycauliona candelaria* has ascending, subfruticose lobes, ellipsoidal conidia and lacks rhizines. *P. ucrainica* also lacks rhizines but is typically partly greyish to pale lemon-yellow. *Xanthomendoza fulva* has rhizines but lobes are vertical, with blastidia on the entire lower surface as well as marginally. *Candelaria concolor* (Candelariales: Candelariaceae) is somewhat similar but the thallus is K–.

XANTHORIA (Fr.) Th. Fr. (1860)

Thallus yellow-orange to deep orange, but grey-green morphs occur, these usually associated with shade, subfruticose to foliose, horizontal or partly ascending, lobate, not pruinose, the underside pale, smooth, usually with attachment discs covering extensive areas of the central thallus (hapters). **Isidia** and **soralia** occur in some species. **Cortex** continuous on both surfaces. **Photobiont** trebouxioid. **Medulla** distinct, white. **Ascomata** apothecia, laminal, orbicular to contorted; disc smooth, orange, the margin involute, entire or crenulate, often paler than the disc, usually persistent. **Thalline margin** present, outer surface smooth, ± roughened, or ridged. **Epithecium** golden, K+ purple. **Hymenium** staining K+ purple in the uppermost part. **Hamathecium** of loosely packed coarse septate paraphyses, the apical cells swollen and capitate, K+ purple. **Hypothecium** colourless. **Asci** 8-spored, clavate, *Teloschistes*-type. **Ascospores** colourless, polarilocular, ellipsoidal. **Conidiomata** pycnidia, laminal, immersed in hemispherical warts, inconspicuous, generally concolorous with the thallus, multilocular. **Conidiogenous cells** lining the locules, ± barrel-shaped. **Conidia** mostly small, ellipsoidal or bacilliform, colourless. **Chemistry**: anthraquinones, especially physcion (=parietin) (K+ purple). **Ecology**: especially associated with areas where high levels of nitrogen (animal excreta) are encountered, such as bird perches, sea-cliffs and tree bases, but also with man, from effluents due to farming and transport.

Xanthoria is one of the best-known-lichen genera on account of its conspicuous yellow-orange leafy thalli, in habitats associated with people and livestock. It is K+ deep purple, a colour test which distinguishes it from *Candelaria* (Candelariales: Candelariaceae), which is K–. Placodioid species of

Caloplaca s.l. (especially *Calogaya* spp.) differ in lacking a lower cortex and therefore not being readily separable from the substratum.

Generic segregates from *Xanthoria* with British and Irish representatives include *Rusavskia* S.Y. Kondr. & Kärnefelt (2003) and *Xanthomendoza* S.Y. Kondr. & Kärnefelt (1997). *Rusavskia* species have narrower lobes than in *Xanthoria*, and the genus corresponds to the *X. elegans* group. There is no straightforward way to distinguish *Xanthomendoza* (as treated by Arup *et al.* 2013) from *Xanthoria*, but *Xanthomendoza* species have thalli that are generally attached with simple rhizines rather than hapters. *Xanthoria candelaria* and *X. ucrainica* were transferred to the genus *Polycauliona* Hue (1908) by Arup *et al*. (2013); they require careful dissection after wetting to reveal their differing lower surface structures.

Literature:
Arup *et al.* (2013), Hitch *et al.* (2009), Lindblom & Ekman (2005), Lindblom *et al*. (2005), Tsurikau & Etayo (2017), Tsurykau *et al.* (2020).

1 Thallus with pale, true rhizines below, usually ascending or loosely attached, or absent; lobes narrow (<0.5 mm) and short (<10 mm) 2
Thallus attached by hapters; appressed except at the tips; lobes often wide (>1 mm) or long (>10 mm) and wide-spreading 5

2(1) Thallus subfruticose, the lobes <0.3 mm wide; rhizines absent; fertile or not .....***Polycauliona candelaria***
Thallus foliose, the lobes dorsiventral, >0.3 mm wide; rhizines present or sparse; rarely fertile 3

3(2) Upper cortex yellow-green to grey in the central part of the thallus or lobes; rhizines scarce or absent; conidia ellipsoidal, 2.2–2.5 × 1.2–1.5 µm ..... ***Polycauliona ucrainica***
Upper cortex yellow-orange or orange-red, evenly pigmented; rhizines present; conidia rod-shaped (bacilliform), 3.7–4 × *ca* 1 µm 4

4(3) Thallus lobes mostly ascending, 1–2 mm long; blastidia covering entire lower surface, visible when viewed from above .....***Xanthomendoza fulva***
Lobes horizontal, appressed, 5–8 mm long; blastidia marginal, often sparse ..... ***Xanthomendoza ulophyllodes***

5(1) On rock; thallus lobes deep orange-red, closely appressed to the tips, placodioid, <1.5 mm wide, not widened at the tips .....***Rusavskia elegans***
On bark or rock; lobes yellow-orange, foliose, loosely appressed at the tips, >1.5 mm wide, sometimes widened to 3–7 mm at tips 6

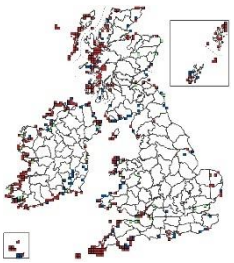
6(5) Thallus small, <3 cm diam, of compact convex cushions, abundantly fertile; usually on small twigs .....***Polycauliona polycarpa***
Thallus large, 15 cm or more in diam., wide-spreading, fertile or not; on bark, branches or rocks 7

7(6) Lobes deep orange, with abundant coarse irregular knob-like isidia; apothecia few or absent, the outer margin roughened .....***calcicola***
Lobes yellow-orange, lacking isidia; sometimes fertile; outer margin of apothecia smooth 8

8(7) Lobes 1.5–3 mm wide, strap-shaped, usually sterile; on coastal rocks .....***aureola***
Lobes 3–7 mm wide, broadened at the tips, rounded, usually well-fertile; on base-rich tree bark or nutrient-enriched or coastal rocks .....***parietina***

Xanthoria aureola (Ach.) Erichsen (1930) **LC**
Like *X. parietina*, but the thallus is irregular to circular, the lobes appressed, not or sparingly overlapping towards the apices, spreading, strap-shaped; lobe-ends ligulate and axils well-developed, apices of lobes 1.5–3 mm wide, truncated to rounded and ± flat; attached by hapters. Apothecia usually absent but occasionally plentiful. Conidia

ellipsoidal, 2–2.5 × 0.7–1 µm. **BLS 1538**.

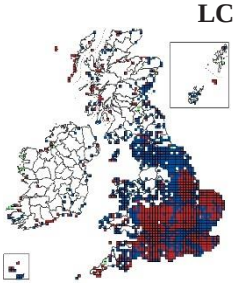


On exposed nutrient-rich siliceous or, rarely, basic rock, chiefly on sea-cliffs and on tall ruins in wind-swept flat open country on or near the coast; locally common. Throughout Britain and Ireland, rare inland.

Characterized by sterile or rarely fertile thalli and sparingly overlapping, discrete, crenulate-indented to strap-shaped lobes. *X. aureola* can sometimes be confused with a morph of *X. parietina*, which has flattened lobules, rarely becoming ligulate with lobes that are usually densely overlapping; such lobules are invariably smaller than the lobes of *X. aureola* and are usually borne on rosette-like thalli. *X. aureola* has been reported to have a dull upper surface due to the presence of crystals.

Reported lichenicolous fungi are: *Arthonia parietinarium* (q.v.), *Phacothecium varium* (q.v.), *Sphaerellothecium parietinarium* (Linds.) Hafellner & V. John (2006) and *Xanthoriicola physciae* (Kalchbr.) D. Hawksw. (1973).

Xanthoria calcicola Oxner (1937) **LC**



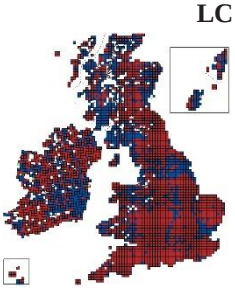
Like *X. parietina* but the upper surface orange to deep orange-brown, becoming ± densely isidiate throughout the central area of the thallus; isidia coarse, 0.1–0.7 mm diam., ± simple, typically erect, irregularly globose-capitate or peg-like, sometimes becoming flattened and lobule-like, often crowded and partially obscuring the thallus. Apothecia rare, ± stalked, urceolate to concave, the outer part of the thalline margin involute and roughened. Ascospores 10–12.5 (–15) × 7.5–9 (–10) µm, broadly ellipsoidal. Conidia rare, ellipsoidal, 2–2.4 × *ca* 0.7 µm. **BLS 1526**.

Lowlands, especially on calcareous nutrient-rich stonework, brickwork, tiles, monuments, rare on bark and wood; frequent. E., N. and C. England, extending locally to the west and to Scotland; scattered in Ireland.

Characterized by the central area of the mature thallus being covered with typically convex, coarse, knobbly isidia, with a few scattered cup-shaped urceolate apothecia with involute, roughened margins. The flattened regeneration lobules of damaged thalli of *X. parietina* can resemble the isidia of *X. calcicola* and are sometimes a cause of confusion, the former are usually more randomly scattered and the numerous apothecia usually sessile, ± flattened, smooth and with only slightly raised margins. *X. calcicola* is usually a much deeper orange than *X. parietina*.

Reported on this host are *Phacothecium varium*, *Sphaerellothecium parietinarium* and *Telogalla olivieri* (Vouaux) Nik. Hoffm. & Hafellner (2000).

Xanthoria parietina (L.) Th. Fr. (1860) **LC**



Thallus <15 cm diam., often forming extensive patches, forming ± regular yellow-orange appressed, somewhat wrinkled rosettes (sometimes yellow-green or green-grey, then mostly in shade); lobes ± overlapping, plicate, broadened towards the apices, indented, the apices 3–7 mm wide, rounded or somewhat notched and ± flat; coarse, flat, subsquamulose to ligulate lobules are sometimes present towards the centre of the rosette, usually scattered, but occasionally abundant, apparently the result of regeneration; attached by hapters. Apothecia usually numerous, to 4 mm diam., scattered to clustered, sessile to peltate (sometimes ± stalked when on twigs), orbicular to contorted, concave when young, becoming flat when mature, with a slightly raised smooth concolorous thalline margin; old apothecia on moribund thalli becoming convex and immarginate. Ascospores (10–) 12–16 × (6–) 7–9 µm. Conidia ellipsoidal, 2.5–4 × 1–1.5 µm. **BLS 1530**.

On a wide variety of nutrient-rich and -enriched substrata, including wayside trees and roofing tiles, the wood of farmyard fences, on both inland and coastal siliceous and calcareous rocks, old bones in drift on beaches and stable dunes; the principal component of the *Xanthorion*; very common throughout much of Britain and Ireland, but more restricted to naturally enriched habitats in inland clean air areas.

This common and conspicuous lichen is usually easily identified by its uniformly orange-yellow rosettes with plentiful apothecia of varied age. Due to human-induced nitrification of the environment, the distribution of this lichen has dramatically increased. Rocks near the sea, farmhouse environs and *Sambucus niger* are often brilliantly coloured by this lichen. Grey thalli, with greatly reduced amounts of yellow pigmentation (physcion) are found mostly in shaded habitats, but are not entirely restricted to them, sometimes occurring on sunny branches. Morphs with lobules are sometimes difficult to distinguish from *X. calcicola* and *X. aureola*.

Probably the most prolific host for lichenicolous fungi in our area. So far reported are: *Arthonia parietinarium*, *Athelia arachnoidea*, *Burgoa moriformis* Diederich, Ertz & Coppins (2007), *Cladosporium licheniphilum* Heuchert & U. Braun (2006), *Didymocyrtis epiphyscia* s.l., *D. slaptoniensis* (D. Hawksw.) Hafellner & Ertz (2015), *Epithamnolia xanthoriae* (Etayo & Diederich) Diederich & Suija (2017), *Erythricium aurantiacum*, *Gonatophragmium lichenophilum* F. Berger & U. Braun (2015), *Illosporiopsis christiansenii*, *Laetisaria lichenicola* Diederich, Lawrey & Van den Broeck (2011), *Lichenoconium xanthoriae*, *Lichenodiplis poeltii* S.Y. Kondr. & D. Hawksw. (1996), *Marchandiomyces corallinus*, *Monodictys fuliginosa* Etayo (1996), *Nectriopsis indigens* (Arnold) Diederich & Schroers (1999), *N. physciicola* D. Hawksw. & Earl.-Benn. (2006), *Phacothecium varium*, *Pronectria xanthoriae* Lowen & Diederich (1990), *Pyrenochaeta xanthoriae* Diederich (1990), *Sphaerellothecium parietinarium*, *Taeniolella scripta* (P. Karst.) P.M. Kirk (1981), *Telogalla olivieri*, *Tremella occultixanthoriae* Diederich, Geyselings & Millanes (2022), *T. parietinae* Freire-Rallo, Diederich, Millanes & Wedin (2023), *Xanthoriicola physciae* and *Zwackhiomyces coepulonus* (Norman) Grube & R. Sant. (1990). A guide to the commoner species can be found in Newbery (2024).

Nomenclature

Calogaya oblitterata (Pers.) P.F. Cannon & Coppins, **comb. nov.** **IF 902430**

Basionym: *Lichen oblitteratus* Pers., *Ann. Bot. (Usteri)* **11**: 15 (1794).

Typification: holotype is no longer extant. Neotype: Great Britain: Scotland: Berwickshire (VC 81), *ca* 3km E of Cockburnspath, Siccar Point, abundant on cliff of ± calcareous basaltic rock, 0-50 m alt., NT8070, 21 Mar. 1993, *B.J. Coppins* & *A.M. O'Dare* 15597; **BCN –** neotype, **E –** isoneotype (Designated by Gaya, *Biblthca Lichenol.* **101**: 39. 2009).

Kuettlingeria ceracea (J.R. Laundon) P.F. Cannon & Coppins, **comb. nov**. **IF 902431**

Basionym: *Caloplaca ceracea* J.R. Laundon, *Lichenologist* **24**: 4 (1992).

Typification: Great Britain: Wales, Gwynedd (V.C. 49, Caernarvon), Lleyn Peninsula, Rhos-y-llan, on hard maritime slate rocks at high-water mark, April 1961, *J. Embrey* (**BM** – holotype).

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