

IDENTIFYING WEST COAST FOREST LICHENS

A REFERENCE NOTEBOOK



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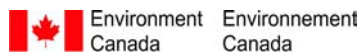
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Ecological Monitoring and Assessment Network
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Alectoria sarmentosa

Witch's hair

Description: Thallus fruticose with slender, hair-like pendent branches, pale greenish yellow; branches more or less filled with loose, cottony medulla, lacking a central cord, often twisted and somewhat flattened at the axils, with raised, oval to elongate, white spots (pseudocyphellae). Round, flat, brown apothecia not uncommon along the branches.

Chemistry: Cortex PD-, K-, KC+ gold, C- (usnic acid); medulla KC+ red (alectoronic acid) or KC-.

Habitat: Often draping conifer branches and trunks in cool, coastal areas and some moist inland sites.

Comments: Among the tree-dwelling species of *Alectoria*, *A. sarmentosa* is by far the most common. A coarser, somewhat grayer species, *A. vancouverensis*, occurs along the coast from northern California to Vancouver Island; its medulla is compact and dense, and it reacts C+ red and KC+ deep red (olivetic acid). Slender forms of *Ramalina menziesii* can closely resemble *A. sarmentosa*, but the branches are flatter throughout and the tips expand into fishnet-like expansions on at least some branches. The medulla of *R. menziesii* is KC-.



Importance: *Alectoria sarmentosa* is an important food for black-tailed deer, especially in winter when other forage is scarce. Scientists in British Columbia have experimented with reintroducing it after timber harvesting to improve second-growth forests as deer habitat. The Bella Coola Indians of coastal British Columbia used *A. sarmentosa* as artificial hair on dance masks. On Vancouver Island, the Nitinaht used it for making bandages and diapers.

Bryoria

Horsehair lichens

Description: Fruticose lichens with slender, hair-like branches, shrubby to pendent; very dark brown (almost black) to various shades of reddish or yellowish brown, and sometimes brownish grey to grey; cortex continuous, usually shiny, medulla dense or cottony; branches lacking any kind of central cord and therefore breaking cleanly when pulled apart; some species with soredia and sometimes isidia, produced in tiny wart-like or elliptical (fissural) soralia. Apothecia are rare, produced along the branches, flat to very convex.

Bryoria fuscescens

Pale-footed horsehair lichen

Description: Thallus pale to very dark brown (not reddish), sometimes dark olive, the base of the clump almost always paler than the rest of the thallus; mostly 5-15 cm long, with main branches (0.2-) 0.3-0.4(-0.6) mm thick, round in cross-section, or flattened at the axils, occasionally with spiny side branches; producing white, oval or pustular soralia (sometimes sparse); elliptical white spots (pseudocyphellae) absent.

Chemistry: Cortex and medulla usually PD- but weakly to strongly PD+ red in some populations; soralia PD+ red; thallus K-, KC-, C- (fumarprotocetraric acid).

Habitat: A forest species, on conifers.



Comments: This horsehair lichen is central to a group of similar, sorediate species with soralia that react PD+ red, K-, KC-, C- (fumarprotocetraric acid). *Bryoria glabra*, very common in the Pacific Northwest, is smoother and more uniformly olive, with regular dichotomous branching especially close to the base. *Bryoria lanestris* is a northern boreal species only likely to be encountered in interior, montane localities in the west. It has more slender, blacker branches with soralia that are usually flecked with black. Very spiny, dark brown to almost olive-black forms of *B. fuscescens* that occur in exposed montane forest habitats may constitute a different species.

Bryoria glabra

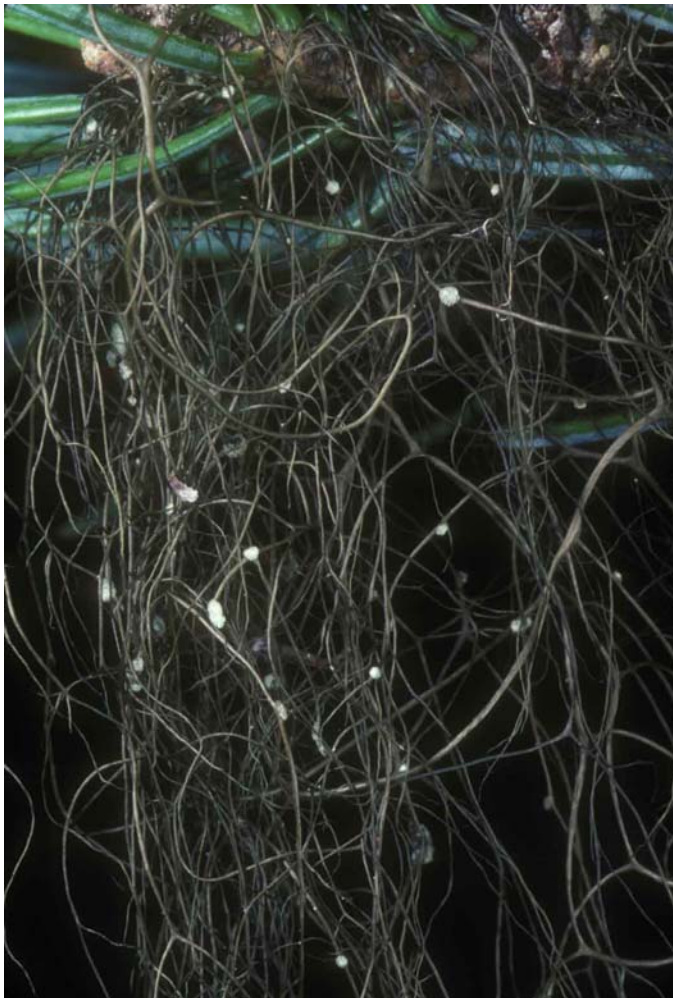
Shiny horsehair lichen

Description: Thallus olive-brown to greenish, shiny, forming pendent clumps 10-15 cm long; branches 0.2-0.4 mm thick, uniform in thickness, branching in wide, even dichotomies, not becoming twisted or flattened at the axils, with abundant or sparse, purely white, oval, fissural soralia; without spiny side branches or pseudocyphellae.

Chemistry: Cortex and medulla PD-, K-, KC-, C-; soralia PD+ red, K- (fumarprotocetraric acid).

Habitat: On conifers of all kinds from sea level to the subalpine, in the open.

Comments: This species almost intergrades with *B. fuscescens*, which has more uneven, narrower dichotomies, often twists and becomes flattened at the axils, and frequently has at least a few tuberculate soralia. *Bryoria lanestrus* is more slender and uneven, and the soralia are often black-spotted.



Evernia prunastri

Oakmoss lichen

Description: Thallus fruticose (attached by a single point) although appearing somewhat foliose because of its dichotomously branched, flattened branches; branches 2-4 mm wide, up to 70 mm long, pale greenish yellow above and white on the underside; round soralia frequent or rare along the margins and on the surface of the branches.

Chemistry: Thallus surface and medulla PD-, K-, C-; surface KC+ gold (usnic acid).

Habitat: Growing on trees of all kinds, more rarely on rock walls, in shade or sun.

Comments: *Evernia prunastri* resembles some species of *Ramalina*, especially *R. farinacea*, but is much softer more pliable, and the lower surface is distinctly paler than the upper. Branches of *E. mesomorpha* are angular rather than flattened, and the soredia are more granular and scattered. Although almost entirely restricted to the west coast in North America, *E. prunastri* is quite common throughout Europe. A few good specimens have been seen from the maritime provinces of Canada. Some very old herbarium specimens exist from scattered localities in Ontario close to the Great Lakes, but the species is now almost certainly extinct in that area.

Importance: In Europe, oakmoss is commercially important in the perfume industry. Its extracts are used as perfume fixatives, and at one time thousands of tons were collected every year in the Slavic republics to supply the cosmetics industry. Large quantities are still shipped from Macedonia to France for that purpose. The lichen is not abundant enough in North America to support commercial exploitation. *Evernia mesomorpha* has sometimes also been used for cosmetics. In Egypt, *E. prunastri* has been used as an additive in bread.



Graphis scripta

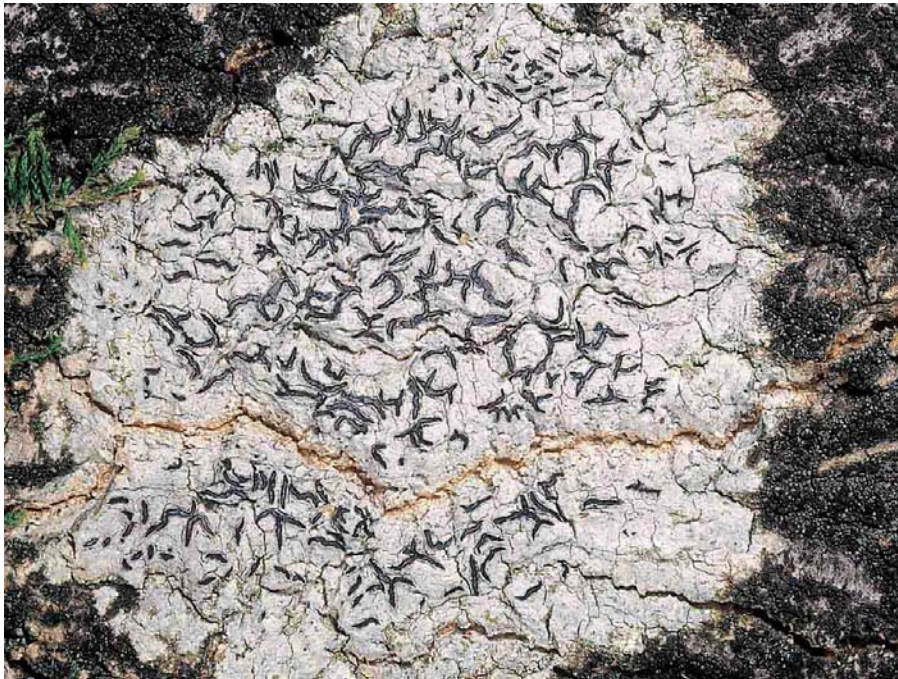
Common script lichen

Description: Thallus crustose, within bark tissues and barely visible or forming circular, yellowish white to greenish gray patches. Fruiting bodies are elongate “lirellae” that are black, variable in length and breadth, branching and shape; mostly 1-7 mm long, 0.15-0.3 mm wide, unbranched (especially on birch bark) or, more typically, branched once or twice, pointed at the ends; walls thin, black, prominent; disk barely visible under a slit like opening or relatively broad and lightly pruinose; spores 6- to 14-celled with lens-shaped cells, 20-70 x 6-10 μm , IKI+ violet.

Chemistry: All reactions negative (no lichen substances).

Habitat: On bark of all types of trees, usually in partial shade.

Comments: The script lichen is named for its slender, elongate fruiting bodies that look like scribbles on the bark, especially in the form having lirellae that branch and curve. On bark with a pronounced grain such as birch, the linear apothecia often follow the bark texture, choosing to “go with the flow.” There are no other common species like *Graphis scripta* in the west coast area. The genus *Opegrapha* can be superficially similar to *Graphis*, but the cells of the spores are square in outline, not lens-shaped, and they do not turn violet with IKI.



***Hypogymnia enteromorpha* Budding tube lichen, gut lichen**

Description: A large lichen with hollow, tube-like lobes commonly 3-6 mm broad and 5-10 cm long, the lobes relatively short and round on horizontal surfaces but becoming quite elongated on vertical surfaces; irregularly branched; branches alternately constricted and bloated, with numerous tiny round lobules along the margins; medullary ceiling dark.

Chemistry: Medulla PD+ red, K-, KC+ pink, C- (protocetraric, physodalic, physodic, and diffractaic acids).

Habitat: On conifer bark or over dry wood in full sun or partial shade.

Comments: The beaded tube lichen is the most common and conspicuous nonsorediate tube lichen in many parts of the west and also one of the largest. *Hypogymnia imshaugii* is another common western PD+ red tube lichen. It and its PD- counterpart, *H. inactiva*, have neatly forked branches that are usually distinctly ascending, especially when growing on twigs. In addition, *H. imshaugii* has a white medullary ceiling. *Hypogymnia duplicata*, a species of bogs and coastal muskeg, is much more slender and pendent, turning up at the tips. Several PD- lichens with irregular branching are similar to *H. enteromorpha*: *H. occidentalis* also has round lobules but is smaller, without constrictions in the branches; *H. apinnata* lacks the little lobules along the margins; and *H. metaphysodes* is much more flattened to the substrate than any of the previous and often has somewhat concave or up-turned lobe tips.



Hypogymnia imshaugii

Forked tube lichen

Description: Thallus gray to gray-green, often blackening in highly exposed sites, with relatively slender, hollow lobes (1.5-2 mm wide) that are regularly dichotomously branched and ascending; medullary ceiling white. Apothecia common, constricted at the base.

Chemistry: Medulla PD+ red, K-, KC+ pink, C- (physodalic, protocetraric, physodic, and diffractaic acids).

Habitat: Common on conifer branches, mainly in moderately dry inland habitats.

Comments: *Hypogymnia inactiva* is very similar to *H. imshaugii* but is PD- with a black medullary ceiling. It generally shows more black on the thallus, especially up the sides of the lobes and sometimes partially invading the edges of the upper surface. *Hypogymnia inactiva* is more common along the moister coastal zone than *H. imshaugii*. *Hypogymnia heterophylla* has very irregular branching and a dark medullary ceiling. *Hypogymnia enteromorpha* is a larger lichen with broader, irregularly branched lobes that are constricted at intervals; its medullary ceiling is dark.



Hypogymnia physodes

**Monk's-hood lichen, hooded
tube lichen, puffed lichen**

Description: Thallus extremely variable; usually pale greenish gray and smooth; lobes hollow, long or short, appressed or ascending, usually fanning out at the tips; lobe tips mostly 1-2.5 mm wide but can broaden to 5 mm; underside of tips bursting open into lip-shaped soralia containing coarsely granular soredia; medullary ceiling usually white. Apothecia rare.

Chemistry: Medulla PD+ red, K-, KC+ pink, C- (physodalic, protocetraric, physodic, and other acids).

Habitat: On bark and wood, primarily of conifers; rarely on moss or soil.

Comments: This is one of the most common tree lichens in the coniferous forest region, including the Pacific Northwest. It is usually easy to identify because of its hood-like soralia at the lobe tips. Unfortunately, one often finds thalli that are almost devoid of soredia, but a diligent search usually uncovers one or two sorediate lobes. *Hypogymnia vittata* is a more slender, longer, more irregularly branched species also having lip- or hood-shaped soralia. It has a dark medullary ceiling, black margins, and a PD- medulla. It is much rarer than *H. physodes*. *Hypogymnia tubulosa* is a much smaller PD- lichen with soredia produced on the upper surface of the lobe tips.



Lecanora pacifica

Multicoloured rim-lichen

Description: Thallus very thin to slightly verruculose, very pale yellowish gray, often with a thin blue-black prothallus. Apothecia large and flat, mostly 0.7-1.2 mm in diameter; disks sometimes yellow, sometimes almost black, and sometimes multicoloured on the same disk, frequently "frosted" with a light pruina; rims white, prominent and fairly smooth; amphithecium containing algae as well as large, irregular crystals; epihymenium coarsely granular on the surface; cortex distinct and relatively uniform in thickness; spores broadly ellipsoid, mostly 12-17 x 7.5-9.5 μm .

Chemistry: Apothecial sections PD-, K+ yellow, C-, KC- (atranorin and roccellic acid).

Habitat: Mainly on the smooth bark of deciduous trees such as alder, willow, maple, dogwood, and ash.

Comments: *Lecanora pacifica* is probably the most common species of *Lecanora* on the west coast. Spore size and chemistry distinguish *L. pacifica* from other rim-lichens with yellow apothecia such as *L. symmetrica* and *L. confusa*, both of which have narrowly ellipsoid spores (3-5 μm wide) and contain usnic acid and zeorin. *Lecanora confusa* also contains xanthonones, which produce a C+ orange reaction on the apothecial disks and thallus.



Lobaria oregana

Lettuce lichen, lettuce lung

Description: Thallus large, leafy, pale yellowish green, containing green algae; lobes commonly 10-30 mm across; margins usually richly decorated with tiny lobules that can resemble isidia, some occurring on the surface of the lobes as well; upper surface with a network of sharp ridges; lower surface pale tan, with a fuzzy tomenum except close to the margins, sometimes with raised, almost white areas. Cephalodia forming very small warts on the lower, or sometimes the upper thallus surface.

Chemistry: Cortex KC+ yellow (usnic acid); medulla PD+ orange, K+ yellow darkening to red, KC-, C- (stictic, constictic, cryptostictic, and norstictic acids).

Habitat: Characteristically on the upper limbs of trees in northwestern old growth forests, and on the trunks of conifers closer to the coast.

Comments: The color of *L. oregana* in the dry state, due to the yellow pigment, usnic acid, in the upper cortex, is unlike that of any other lungwort.



Importance:

In the interior, the lettuce lichen can be used as an indicator of old growth forests. Because of its great abundance in some northwestern forests (often more than 1 one ton per hectare), *L. oregana* contributes a significant amount of nitrogen to these forest ecosystems, thanks to the nitrogen-fixing cyanobacteria found in its cephalodia. The lichen is also a minor component of the fall and winter diet of the Columbia black-tailed deer on Vancouver Island.

Lobaria pulmonaria

Lungwort, lung lichen

Description: Thallus pale brown to olive-brown when dry and quite green when wet, containing green algae, with a strongly ridged and pitted surface that gives the lichen the appearance of lung tissue; lobes 8-30 mm wide, up to 7 cm long, branching in dichotomies and trichotomies; soralia developing on the lobe margins and along the thallus ridges, often with isidia emerging among the soredia. Tiny, wart-like cephalodia, 0.5-1.5 mm in diameter, common or sparse on the lower surface: cut one open to see the dark blue-green cyanobacteria inside, quite different from the grass-green layer in the main part of the thallus. Apothecia infrequent, usually on or near the lobe margins or along ridges on the upper surface.

Chemistry: Medulla PD+ orange, K+ yellow to red, KC-, C- (stictic and norstictic acids), or PD+ yellow, K+ red, KC-, C- (norstictic acid alone).

Habitat: On trees, mossy rocks, and wood in mature forests, usually in the shade.



Comments: *Lobaria pulmonaria* is the most widely distributed and common *Lobaria* in North America. In western North America, several lichens with reticulate ridged, lung-like lobes are easily confusable. *Lobaria linita* is PD- and lacks any isidia or soredia. *Pseudocyphellaria anthraspis* and *P. anomala*, besides having pseudocyphellae, are darker brown and contain cyanobacteria as the principal photobiont.

Importance: All species of *Lobaria*, but especially *L. retigera*, are good indicators of rich, unpolluted and often very old forests. Despite its diminishing abundance, *L. pulmonaria* has long been prized as an important source of boiling water dyes. Herbalists have recommended *L. pulmonaria* as a remedy for tuberculosis because of its resemblance to

lung tissue, and in India, it has been used to treat lung diseases, asthma, hemorrhages, and even eczema on the head. Lungwort has also been used for brewing in India and Europe. It is apparently a favourite food for moose in the northeast.

Melanelia fuliginosa

Shiny camouflage lichen

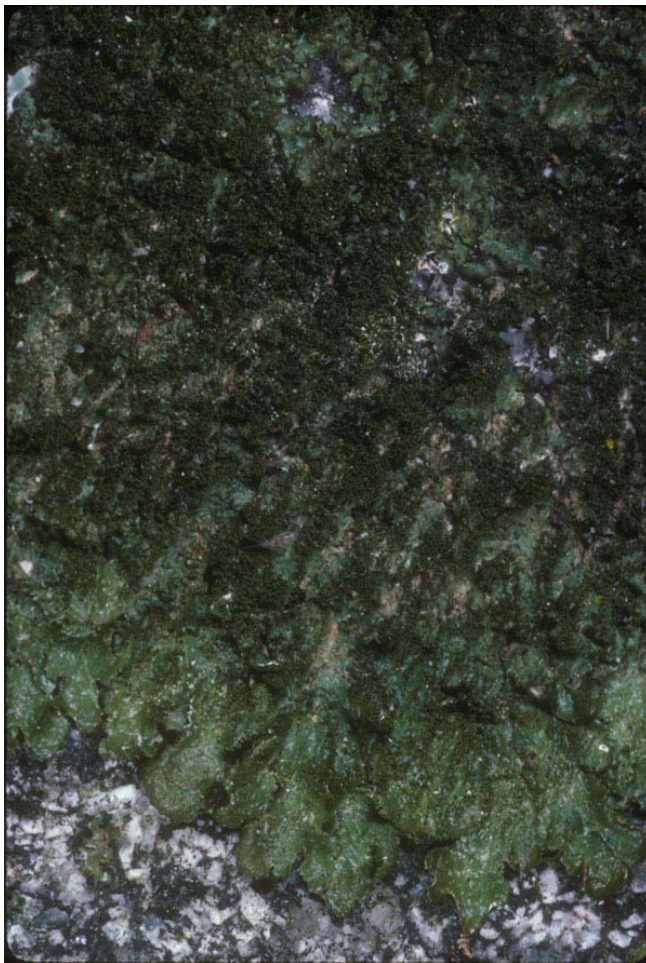
Syn. *M. glabratula*, *Parmelia glabratula*

Description: Thallus olive-green to dark brown, thin with branched or, rarely, unbranched cylindrical isidia, 0.2-0.8 mm long; lobes mostly 1-3 mm wide, usually shiny, tending to be pitted or wrinkled, without white spots (pseudocyphellae); medulla white, but occasionally with patches of orange. Apothecia frequently seen, up to 6 mm in diameter.

Chemistry: Medulla PD-, K- (or K+ violet in orange pigmented spots), KC+ red, C+ red (lecanoric acid, and sometimes the anthraquinone rhodophyscin).

Habitat: On bark of coniferous or deciduous trees, or acid rock.

Comments: *Melanelia subaurifera*, also C+ red with isidia, is duller and browner, and the unbranched isidia (shorter than 0.3 mm) are easily rubbed off, leaving yellowish patches of soredia behind.



Melanelia subaurifera

Abraded camouflage lichen

Syn. *Parmelia subaurifera*

Description: Thallus olive to chocolate brown, usually dull, but occasionally shiny especially at the edge, not pruinose; lobes rounded, 1-4(-6) mm wide, flat, sorediate or isidiate, usually both, with short, cylindrical, unbranched isidia (mostly less than 0.2 mm long) breaking down into granular soredia on the thallus surface, leaving yellowish patches where they are rubbed off; white spots (pseudocyphellae) absent or very inconspicuous. Apothecia uncommon.

Chemistry: Medulla PD-, K-, KC+ red, C+ red (lecanoric acid).

Habitat: On bark of all kinds, sometimes wood, rarely rock.

Comments: *Melanelia subaurifera* is very common and widespread camouflage lichen. Specimens that are mostly isidiate rather than sorediate can resemble *M. fuliginosa*, a species that never becomes sorediate and has longer, usually branched isidia (up to 0.8 mm long). *Melanelia subargentifera*, a much less common species, has mainly marginal soredia without true isidia.



Menegazzia terebrata

Treeflute

Description: Thallus greenish gray, paler toward the centre, smooth; lobes 1-2 mm wide, puffed and hollow, with large, round perforations in the upper surface; usually with laminal, cuff-shaped to tuberculate, somewhat raised soralia, containing flat to hemispherical mounds of powdery soredia; lower surface black, wrinkled without rhizines. Photobiont green. Apothecia very rare.

Chemistry: Cortex PD-, K+ yellow, KC-, C- (atranorin); medulla PD+ orange, K+ dark yellow, KC-, C- (stictic, menegazziaic, and constictic acids).

Habitat: On bark, usually deciduous trees, in damp forests.

Comments: *Menegazzia* resembles a *Hypogymnia*, except that its perforations are on the upper surface of the lobes. Perforations in *Hypogymnia*, when present, are on the lobe tips or axils, and no species of *Hypogymnia* contains stictic acid. *Cavernularia* species are much smaller lichens and have pits on the lower surface. *Menegazzia subsimilis* differs from *M. terebrata* only in the shape of the soralia. In the former, mature soralia are split and very irregular in shape, often occurring on the lobe tips as well as on the thallus surface, and they have coarsely granular soredia (see photo in LNA, plate 510). In *M. terebrata*, which is equally common, the soralia are entirely confined to the thallus surface and remain round and intact into maturity; the soredia are granular to powdery.



Ochrolechia laevigata

Smooth saucer lichen

Description: Thallus crustose, very thin, smooth and continuous, white to pale yellowish gray or pinkish gray. Apothecia up to 3 mm broad, light orange; margins thick and smooth, without a secondary ring of pink tissue; algae in margin very sparse and scattered.

Chemistry: Apothecial disk and margin cortex, and part of the medulla C+ dark red, UV- (gyrophoric and olivetoric acids).

Habitat: Abundant on alder trees (especially red alder) and other deciduous trees, very rarely on conifers.

Comments: Three similar western species, *O. laevigata*, *O. oregonensis*, and *O. subpallidescens*, are compared under *O. oregonensis*.



Ochrolechia oregonensis

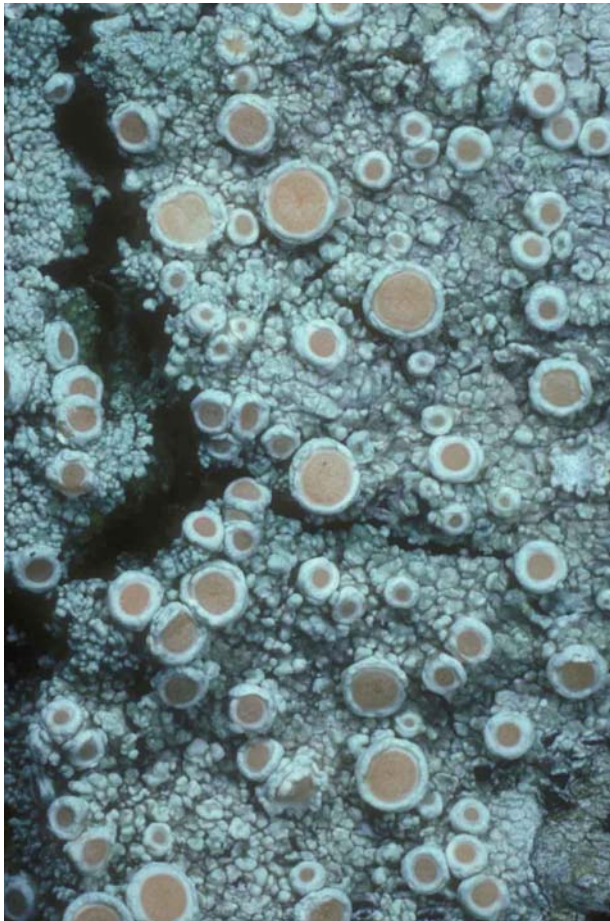
Double-rim saucer lichen

Description: Thallus crustose, thick, rough to verrucose, yellowish gray to creamy white, with large apothecia (up to 4 mm in diameter) pinkish orange with double margins: an outer, often discontinuous, warty, thallus-colored margin, and an inner, pink or disk-colored, somewhat raised ring around the disk; algae relatively abundant in the margins but not normally forming a continuous layer below the hymenium.

Chemistry: Apothecial disk and thick cortex of the thallus and apothecial margin C+ red, UV-; medulla C- (gyrophoric acid alone).

Habitat: On conifer bark and wood, particularly common on Douglas-fir.

Comments: Most saucer lichens with a thick, C+ red thallus growing on conifer bark in the west are *O. oregonensis*, a very common species. *Ochrolechia subpallescens* is another saucer lichen with a strong C+ red reaction in both the apothecial and thallus cortex. It lacks the double margin of *O. oregonensis* and has a thicker, more verruculose thallus than *O. laevigata*. Both *O. subpallescens* and *O. laevigata* are almost exclusively found on deciduous trees, unlike *O. oregonensis*. However, the algal layer in the apothecia is the best morphological character to separate the confusing western C+ red *Ochrolechia* species: in *O. subpallescens*, the algae form an unbroken layer under the hymenium; in *O. oregonensis*, the layer is spotty and broken into clumps; in *O. laevigata*, the thick margin has almost no algae at all.



Parmelia hygrophila

Western shield lichen

Description: Thallus bluish gray to pale green; lobes 3-5 mm wide; white pseudocyphellae forming a network of white spots extending to the lobe margins; with dull isidia (often appearing like large granular soredia) on the upper surface; rhizines unbranched or occasionally forked. Apothecia rare.

Chemistry: Medulla PD+ yellow, K+ yellow changing to red, KC-, C- (salazinic acid).

Habitat: On bark (rarely rock) in rainy, oceanic areas.

Comments: This is a fairly common lichen along the west coast. It resembles the more common *P. sulcata*, except it has unbranched to dichotomously branched rhizines rather than bottlebrush (squarrose) rhizines. In addition, *P. hygrophila* has coarsely granular, dull isidia rather than powdery soredia, and they are scattered over the thallus surface rather than being confined to ridges or margins. *Parmelia saxatilis* has unbranched rhizines, like *P. hygrophila*, but its isidia are clearly smooth and shiny (often with brown tips) rather than 'soft' and soredia-like.



Parmelia sulcata

Hammered shield lichen

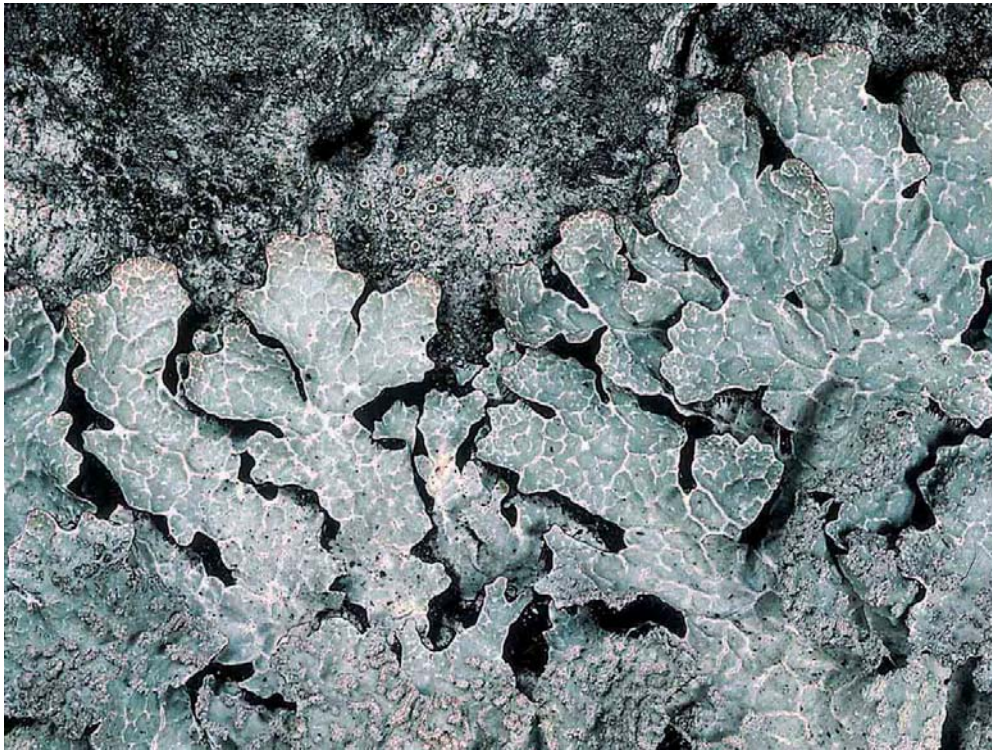
Description: Thallus blue-gray and often browned at the edges, or entirely brownish when in exposed habitats; lobes 2-5 mm wide, with a network of sharp ridges and depressions and whitish pseudocyphellae; powdery soredia along the ridges and lobe margins where the cortex develops cracks; rhizines densely branched like a bottle-brush (squarrose) when fully developed, but on young lobes slender and unbranched. Apothecia rare.

Chemistry: Medulla PD+ yellow to orange, K+ yellow turning blood-red, KC-, C- (salazinic acid).

Habitat: Mostly on bark, but also on mossy rocks, wood and even soil in both shade and sun.

Comments: This is an extremely widespread, even weedy species in the north and west. As it is one of the first lichens to invade trees and picnic benches in suburban areas, *P. sulcata* is the lichen most familiar to casual observers in many parts of the continent. It is, unfortunately, also quite variable. For example, soredia can be abundant or hardly produced at all. In the west, *P. sulcata* should be compared with the more coarsely sorediate *P. hygrophila*.

Importance: Like other shield lichens containing salazinic acid, *P. sulcata* can be used for dyeing wool.



Parmotrema arnoldii

Powdered ruffle lichen

Description: A rather large, loosely attached, foliose lichen; thallus uniform pale grey, without white spots or blotches on the upper surface; lobes 6-15 mm wide, somewhat divided; soredia developing on the upper surface of lobe tips close to the margins, making the tips turn downward; with abundant, long cilia especially on nonsorediate lobes; lower surface black to brown with a broad naked zone (lacking rhizines) close to the margin. Apothecia not produced.

Chemistry: Cortex K+ yellow; medulla PD-, K-, KC+ reddish, C-, UV+ blue-white (alectoronic acid).

Habitat: On bark of all kinds in open forests, and occasionally on rock.

Comments: Of the three common, sorediate species of *Parmotrema* that occur along the west coast (*P. arnoldii*, *P. stuppeum* and *P. chinense*), only *Parmotrema arnoldii* has a K-, KC+ pink, UV+ white medullary reaction. The others are UV- and either K+ yellow or K+ red.



Physcia adscendens

Hooded rosette lichen

Description: A very small foliose lichen with a pale gray to pale greenish gray thallus, spotted with white blotches (maculae), forming small clusters of ascending lobes, many of which expand at the tip to produce inflated and hollow, helmet-shaped soralia, which are formed from a separation of the upper and lower cortices and contain greenish, granular soredia; lobes mostly under 1 mm broad except for the helmets, which can be up to 2 mm across; long, white, mostly unbranched cilia (some with darkened tips) grow from lobe margins and tips; lower surface white. Apothecia not common.

Chemistry: Cortex PD-, K+ yellow (atranorin), KC-, C-. Medulla K-.

Habitat: On bark, twigs, and wood of a variety of trees, less frequently on rock, in well-lit or slightly shaded sites.

Comments: This is the only clearly "hooded" *Physcia*. *Physcia tenella*, a common bark-dwelling, ciliate lichen along the east and west coasts, has lip-shaped soralia on the lobe tips but does not form hollow hoods or helmets. *Physcia leptalea* (syn. *Ph. semipinnata*), a rare, nonsorediate species along the west coast, also has long, pale, marginal cilia.



Physcia aipolia

Hoary rosette lichen

Description: Thallus pale to dark gray, conspicuously spotted with white blotches (maculae); lobes narrow and radiating, flat to slightly concave or upturned at the tips, sometimes overlapping, 1-2(-3) mm across, without any soredia or isidia; lower surface white to pale brown with many pale rhizines. Apothecia very common, 1-2(-3) mm in diameter, very dark brown but typically with a heavy white “frosting” of pruina (giving the lichen its English name);

Chemistry: Cortex PD-, K+ yellow (atranorin), KC-, C-. Medulla K+ yellow.

Habitat: On bark and wood of different kinds of trees in open habitats.

Comments: *Physcia biziana* is another western *Physcia* without soredia, but it almost always has a frost-like pruina on the upper surface, and the medulla is K-. *Physcia stellaris* is a very similar species with about the same range as *Ph. aipolia*, although apparently absent on southwestern British Columbia. It lacks conspicuous white spotting, has flat or somewhat convex lobes, and has a K- reaction in the medulla.



Physconia enteroxantha

Yellow-edged frost lichen

Description: Thallus brownish gray to dark brown, with a white pruina over at least the tips of the lobes; medulla pale yellow or yellowish white, rarely white; lobes 0.6-2(-3) mm broad, with long, continuous, marginal soralia containing yellowish green, granular soredia; lower surface pale at the edge, becoming brown to black in the center, with black, squarrose rhizines. Apothecia rare.

Chemistry: Medulla K+ yellow, KC+ yellow-orange, sometimes only in parts of the thallus, C- (secalonic acid A).

Habitat: On bark, wood, and occasionally rock.

Comments: *Physconia americana* is a western *Physconia* that also has pruinose lobes, but lacks soredia having, instead, numerous narrow lobules on the thallus and apothecial margins.



Platismatia glauca

Varied rag lichen, ragbag

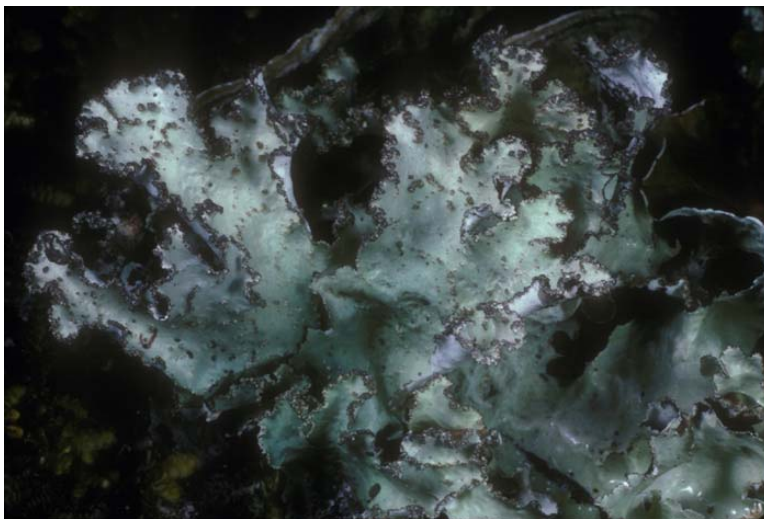
Description: Thallus pale greenish gray, often browning at the edges, uniform, without white spots from pseudocyphellae or maculae; lobes (3-)5-20 mm wide, ascending and irregular, margins often divided into small rounded to angular lobes with abundant isidia, soredia or mixtures of isidia and soredia on the lobe margins and sometimes the surface; lower surface brown and shiny at the edge, black in the centre, but with scattered to continuous patches of ivory-white close to the edge, rhizines sparse; cilia absent. Apothecia and pycnidia very rare.

Habitat: Extremely common in spruce, fir or Douglas fir forests, especially on branches.

Comments: *Platismatia glauca* is the only rag lichen with marginal soredia. The species varies, however, between almost purely sorediate and almost entirely isidiate, with all intermediates. The lobes can be quite broad or they can be relatively narrow, resembling the less common *P. herrei*, with lobes 0.5-3(-4) mm across. *Platismatia herrei* only produces isidia, not soredia.



Platismatia glauca
Isidiate form



Platismatia glauca
Sorediate form

Ramalina "dilacerate"

Syn. *Fistulariella dilacerata*

Punctured ramalina

Description: Thallus pale, short and densely shrubby, with relatively thin cortex and loose medulla; branches 1-2 (-3) cm long, 0.4-1.3 mm wide, rather smooth, always more or less hollow with many perforations into the medulla, without pseudocyphellae or soredia. Apothecia abundant, marginal, or mainly at or close to the branch tips, with pale yellow, pruinose disks.

Chemistry: Medulla PD-, K-, KC-, C- (divaricatic acid).

Habitat: On twigs and branches of various trees in the open, typically in open, humid, coastal forests.

Comments: The thickness of the cortex varies: some thalli are thin and almost translucent, and others are tough and shiny. The large, robust, west coast populations called "*Ramalina dilacerata*" appear to be an unnamed species more closely related to the southern hemisphere species *R. geniculata*. *Ramalina americana* has a similar aspect but is not hollow or perforate and usually has pseudocyphellae. It seems to be absent from southwestern B.C.



Ramalina farinacea

Dotted ramalina, the dotted line

Description: Thallus pale to dark yellowish green, almost pendent to bushy, with broad to narrow branches, 0.5-3 (-4) mm wide, 3-7 cm long, usually strongly flattened but sometimes almost round in cross-section; numerous discrete, elliptical soralia containing greenish, powdery soredia, dotted along the branch margins, but occasionally on the surface as well. Apothecia very rarely seen.

Chemistry: Medulla and soralia PD-, K-, KC-, C- (hypoprotocetraric acid or without lichen substances); or PD+ red-orange, K-, KC+ pink, C- (protocetraric acid); or PD+ yellow, K+ red, KC-, C- (salazinic and/or norstictic acids).

Habitat: On all kinds of trees and shrubs, rarely on rock, in regions with a mild, humid climate.

Comments: This is an extremely variable species, both morphologically and chemically. *Ramalina subleptocarpha* is a similar species, but it has long, mostly uninterrupted soralia along the branch margins and the branches tend to be broader (2-4[-10] mm across); it contains only zeorin besides usnic acid (PD-, K-). *Ramalina farinacea* can sometimes resemble *Evernia prunastri*, but *Evernia* is usually broader, more regularly dichotomously branched, lighter colored on one side and "flabbier," i.e., less stiff. In addition, the soralia on *Evernia* are more widely scattered across the



lobes, whereas those of *R. farinacea* always occur on the margins of the lobes. *Ramalina roesleri* is a very small sorediate *Ramalina* found close to the coast and in humid habitats. Its branches are almost hollow and translucent and are perforated with slits and holes close to the base. The granular soredia are mostly at the tips of the branches, which tend to be curled.

Sphaerophorus globosus

Coral Lichen

Description: Thallus forming loosely or densely branched shrubby clumps extremely variable in form and color: sometimes with a few, stout main branches (up to 2 mm thick) and tufts of fine side branches, or sometimes dichotomously branched, gradually tapering at the branch tips; green to pale greenish gray, or quite brown, generally shiny and blotched with white areas (maculae); side branches sometimes slightly constricted at the base. Apothecia spherical, black on the inside, commonly seen on branch tips, 1-2.5 mm in diameter.

Chemistry: Medulla always IKI+ blue; PD-, K-, KC-, C-; or PD+ yellow, K+ yellow, CK-, C- (thamnolic acid); or PD-, K+ slowly becoming purple, KC+ red or violet-red (fading), C- (hypothamnolic acid); squamatic acid also sometimes present.

Habitat: On trees, especially mossy trunks and branches, in humid, exposed to shaded coastal forests.

Comments: The bewildering diversity in form and chemistry of this species has led to its division into more than one species. Because the finely branched and coarser morphotypes have intermediates, only one broadly defined species is recognized at present. The range of color of *Sphaerophorus globosus* does not include the yellow-green or greenish yellow of *Usnea* species.



Tuckermannopsis chlorophylla

Powdered wrinkle-lichen

Syn. *Cetraria chlorophylla*

Description: Thallus chocolate-brown to greenish brown, paler in the shade; lobes divided and branched, concave and crisped, 0.7-2.5 mm wide; soredia produced in soralia all along the lobe margins and sometimes in irregular patches on the surface, fine powdery, white to greenish but flecked with black; lower surface somewhat paler than upper surface, shiny, with sparse, short, pale rhizines. Apothecia rarely present.

Chemistry: Medulla PD-, K-, KC-, C-, UV- (protolichesterinic acid).

Habitat: On bark and wood, rarely rock, in sun or shade.

Comments: This very common, brown, foliose lichen of the western conifer forests is one of only a few small, brown, foliose lichens in the northwest with soredia. Some particularly brown specimens of *Nephroma parile* can be confused with *T. chlorophylla*, but that species contains blue-green cyanobacteria rather than grass-green algae, and the soredia are much coarser. Camouflage lichens (*Melanelia* and *Neofuscelia*) can also be dark brown, but no species in the Pacific Northwest have marginal soredia.



Tuckermannopsis orbata
(syn. Cetraria orbata)

Variable wrinkle-lichen

Description: Thallus olive-brown to pale green (shade forms), or brown, with ascending or appressed, ruffled lobes, 1.5-3.5 mm broad, the margins bearing prominent black pycnidia, flattened and branched lobules, or brown to black cilia, or various combinations, including none of the above; soredia and true isidia absent, although the lobules, especially when branched and bearing pycnidia, often appear isidia-like; lower surface pale brown, strongly wrinkled, sometimes with scattered, pale rhizines. Apothecia very common and often abundant, originating on the lower or upper sides of the lobe margins, or on the lobe surface; pycnidia can be on the lobe surface as well as on the margins.

Chemistry: Medulla PD-, K-, KC-, C- (protolichesterinic acid).

Habitat: On branches and twigs of conifers and birch, rarely other hardwoods.

Comments: The only character that does not seem to vary in this species is the chemistry. Eastern populations are more frequently ciliate or lobulate than western populations, but there are all intergradations. *Tuckermannopsis platyphylla* resembles *T. orbata* in having lobules, but they are on the upper surface rather than the margins, and the lobe surface is rougher, warty, and more wrinkled. The lobes of *T. platyphylla* are considerably broader than those of *T. orbata* (up to 10 mm across). The presence of a yellow medullary pigment (K⁺ orange, KC⁺ orange) in *T. platyphylla* is unique in the genus.

Usnea

Beard lichens

Description: Fruticose lichens with slender to tapered, hair-like branches, shrubby to pendent; yellowish green to green, never brown or grey; cortex thin or thick, sometimes interrupted by cracks around the branch, medulla thin to thick, dense to cottony; branches always with an elastic cartilaginous central cord that can be revealed by gently pulling the branch apart; many species with isidia and some with soredia or mixtures of isidia and soredia, produced in small spots or scattered over the surface of the branches. Apothecia common on a few species, usually on or close to the branch tips, but rarely produced in most species.

Chemistry: Cortex PD-, K-, KC+ gold (usnic acid).

Comments: The genus *Usnea* is represented by more than 20, often confusing, species in the Pacific Northwest. In southwestern B.C., frequently encountered species include: (1) *U. subfloridana* and its relative, all rather shrubby to almost pendent species, most with a blackened base, and lacking conspicuous constrictions at the axils (2) *U. cornuta* and its close relatives such as *U. fragilesceus*, all having a thick, loose medulla and very slender central axis with constrictions at the axils (they are distinguished by how much basal blackening there is, details of the soredia and isidia, and chemistry); (3) *U. longissima*, only in the wettest parts of the region, with very long, slender branches with abundant perpendicular side branches (like a bottle-brush); and (4) *U. rigida*, a shrubby species close to *U. subfloridana*, but producing abundant apothecia and lacking soredia or isidia. Since all these species are extremely sensitive to air pollution, they will be considered as a group. Pictured here with a description is *U. subfloridana* in the broad sense.

***Usnea subfloridana* group**

Ragged beard lichens

Description & Comments: *Usnea subfloridana* is a common boreal species. It has branches in equal dichotomies, only slightly constricted and a clearly blackened base. It is shrubby to almost pendent and has a thick cortex and rather cottony medulla. This species is similar to *Usnea diplotypus*, which has a denser medulla and unequal branching as well as a different chemistry (salazinic acid). *Usnea pacificana* also has unequal branching and a dense medulla, but always contains baeomycesic acid in addition to squamatic acid, and so the medulla reacts PD+ yellow instead of PD-



Xanthoria candelaria

Shrubby sunburst lichen

Description: Thallus foliose to almost fruticose, yellow to yellow-orange, forming small cushions up to about 3 cm across, or forming extensive, continuous colonies; lobes narrow, branched, flattened or almost cylindrical, 0.2-0.5 mm wide, usually ascending and even erect; fine to granular soredia or granules produced along the margins and on the lower surface of the lobe tips; lower surface white, or yellow on erect lobes, generally without rhizines or holdfasts. Apothecia not common, but they can be large and conspicuous (up to 4 mm in diameter); pycnidia immersed and inconspicuous; conidia ellipsoid, 2-3(-3.5) x 1-1.5 μm .

Chemistry: Cortex K+ deep red-purple.

Habitat: On bark and branches, especially spruce, or on rock. This species is one of the lichens that is particularly characteristic of bird-perches and other highly fertilized sites such as trees near farmyards, or places where it is subjected to mineral-rich dust or ocean spray.



Comments: The ascending, narrow lobes of *X. candelaria* often appear almost fruticose, especially on twigs, where it sometimes forms extremely dense and colourful colonies. Because of its variability, *X. candelaria* can be confused with several other sorediate, orange lichens. *Xanthoria oregana* is widespread in the west, especially in drier areas, and is commonly found on the bark of deciduous trees. Its soredia are marginal or close to the margin, or cover the lower surface of the lobes, which can be curled inward and approach helmet-shaped. See also comments under *X. fallax*.

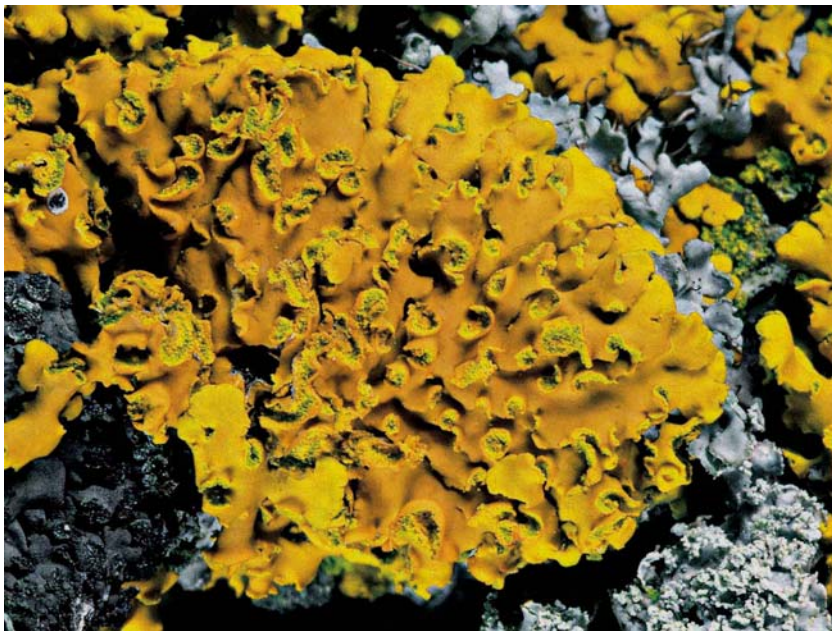
Xanthoria fallax**Hooded sunburst lichen**

Description: Thallus yellow-orange to dark orange, with rather short, narrow to broad lobes with rounded, somewhat divided tips, 0.8-2 mm broad, appressed or raised; soralia labriform on the lobe tips, with greenish yellow, powdery soredia (30-50 μm in diameter) that develop within a split between the upper and lower cortices, forming a kind of rounded hood; lower surface white, with white rhizines. Apothecia occasionally seen, mostly 0.7-1 mm in diameter; pycnidia immersed, not common or conspicuous; conidia bacilliform, 3-4.5 μm long.

Chemistry: Cortex K+ deep red-purple.

Habitat: On the bark of a variety of trees, especially oaks, elms and poplars, less commonly on wood, and rarely on rock. It is mainly a low elevation species and is commonly seen on roadside trees or trees close to farms.

Comments: Among the sorediate species of *Xanthoria* on the bark of deciduous trees, *X. fulva*, *X. ulophyllodes*, and *X. oregana* are most similar to *X. fallax*. *Xanthoria fulva* has narrower, more ascending lobes, lacks rhizines, and the granular soredia are mostly on the lower surface. *Xanthoria ulophyllodes*, rare in the Pacific Northwest, has rhizines like *X. fallax*, but the thallus is more ascending and the coarsely granular soredia develop on the margins or on the upper surface, not between the cortices of the lobe tips. In *X. oregana*, a widespread western lichen, the lobes dissolve into granular soredia along the margins (as well as having soredia on the lower surface), but the lobes can roll inward and resemble hoods as in *X. fallax*. It usually has rhizines. See Comments under *X. candelaria*.



Xanthoria hasseana**Poplar sunburst lichen**

Description: Thallus yellow-orange to orange, in small, loosely attached rosettes with finely divided, overlapping lobes, 0.3-0.9 mm wide, without soredia or isidia; lower surface white, with abundant, relatively long rhizines. Apothecia almost always present, 0.6-3 mm in diameter, confined to the center of the thallus, with dark orange disks and thallus-colored margins that can develop white rhizines on the lower half; spores ellipsoid, (14.5-)15.5-18(-20) x (6-)7.5-9.5(-10) μm , with a broad central septum (mostly 5-8.5 μm); pycnidia frequent, immersed or protruding, dark orange; conidia bacilliform, 3-4 μm long.

Chemistry: Cortex K+ deep red-purple.

Habitat: On bark, especially poplars, in open or partially shaded sites, rarely on wood or rock.

Comments: This is the most common and widespread of the nonsorediate, corticolous species of *Xanthoria*, and can be recognized in the field by its minutely lobed, loosely attached thallus and abundant rhizines. It should be compared with *X. polycarpa*, which has no true rhizines and has ellipsoid conidia. *Xanthoria montana*, a common species of the arid western interior, has smaller, cylindrical spores (13-15.5 x 5-7.5 μm) that have a narrow septum.



Xanthoria polycarpa

Syn. *X. ramulosa*, *X. alaskana*

Pin-cushion sunburst lichen

Description: Thallus yellow-orange to orange, forming small cushions up to 2.5 cm across; lobes very narrow (0.2-0.7 mm wide), abundantly branched and irregular, without soredia or isidia; lower surface white, wrinkled, without true rhizines but sometimes with broad holdfasts. Apothecia abundant, crowding the centre of the cushions, 1-4.5 mm in diameter, with dark orange disks and thallus-colored margins lacking a fringe of rhizines; pycnidia immersed and inconspicuous; conidia ellipsoid, 2-3 μm long.

Chemistry: Cortex K+ deep red-purple.

Habitat: On bark, especially twigs and branches of spruce, oak and fir, on rock or wood. In the east, this is a largely coastal species, conspicuous on exposed trees and rocks close to the ocean. In the west, it is more tolerant of inland sites.

Comments: *Xanthoria hasseana* is superficially similar but has abundant rhizines. Specimens of *X. candelaria* that have very sparse soredia can be distinguished by their erect, almost cylindrical lobes.



Key to Some Common Lichens on Deciduous Trees in Lowland Southwestern Canada

Irwin M. Brodo, 18 April 2004

1. Thallus fruticose, hanging down and pendent or growing upward or outward, usually branched and “shrubby,” typically attached at a single point2
1. Thallus foliose or crustose, not pendent or shrubby, attached by broad areas of the lower surface and/or by bristle-like rhizines 6
2. Main branches of the thallus round in cross-section..... 3
2. Main branches of the thallus flattened or angular in cross section4
3. Thallus yellowish green, pendent and hair-like or shrubby; branches with a somewhat elastic central cord surrounded by thin or loose medulla; fruiting bodies, if present, are yellowish disk-shaped apothecia, usually on, or close to, the branch tips*Usnea species*
3. Thallus dark to pale brown or grey, greenish grey, or pale green, lacking a yellowish tint, shrubby; main branches thick, not hair-like, medulla thick and white, lacking a central cord; fruiting bodies common, spherical, black where they are broken open, at the tips of the branches*Sphaerophorus globosus*
4. Thallus relatively stiff, with branches that are the same colour on both sides, somewhat shiny, with an irregular branching pattern; with or without soredia 5
4. Thallus soft and pliable with branches that are clearly paler (sometimes almost white) on the lower side, very dull, branching in regular dichotomies; soredia, when present, on both the surface and margins of the branches.....*Evernia prunastri*
5. Branches with soredia in elongate or oval patches on the margins; apothecia absent.....*Ramalina farinacea*
5. Branches without soredia; pale yellow apothecia abundantly produced..... *Ramalina “dilacerata”*
6. Thallus foliose, with distinct upper and lower surfaces, loosely or closely attached to substrate; lobes ranging from minute and scale-like to broad and leaf-like.....7
6. Thallus crustose, intimately attached to substrate and cannot be separated from it intact 23
7. Thallus orange, K+ deep purple, with minute, finely divided, scale-like lobes less than 1 mm broad, without soredia, typically with numerous apothecia 8
7. Thallus grey, grey-green, yellowish green, olive, brown or black, K- or K+ yellow; lobes small or large, 0.5-30 mm broad10

8. Soredia present on or under lobe tips or margins *Xanthoria fallax* group
8. Soredia absent 9
9. Hair-like rhizines absent, thallus attached to substrate directly by the lower surface of the thallus or by broad holdfasts; apothecia always abundant, almost obscuring the minute thallus lobes *Xanthoria polycarpa*
9. Hair-like rhizines abundant on the lower surface; apothecia abundant, or sparse in young thalli; thallus lobes usually well developed around the cluster of apothecia *Xanthoria hasseana*
10. Lobes, especially tips, somewhat inflated and hollow or tube-like 11
10. Lobes flat and solid, not hollow 12
11. Upper surface of thallus perforated with many conspicuous round pores or holes; thallus closely attached to the bark throughout; soredia produced in hemispherical or perforated soralia on the thallus surface as well as on the lobe tips *Menegazzia terebrata* or *M. subsimilis*
11. Upper surface of thallus not perforated; thallus usually loosely attached, ascending at least at the lobe tips; soredia produced on the undersurface of the lobe tips, which break open and bend back giving a lip-shaped appearance..... *Hypogymnia physodes*
12. Lobes large, 5-30 mm broad, ascending and/or loosely attached to the substrate 13
12. Lobes 0.5- 5 mm broad, closely or loosely attached, ascending or lying flat against the substrate..... 15
13. Lobes with a network of ridges and depressions; lower surface pale brown to tan, dull, with a fuzzy surface; lobe margins lacking cilia; soredia, if present, coarsely granular 14
13. Lobes smooth or wrinkled, lacking a network of ridges and depressions; lower surface dark brown at margins, black in the center; lobe margins with conspicuous black hair-like outgrowths (cilia); rhizines absent from the lower surface in a broad zone close to the margins, otherwise abundant; powdery soredia produced along the lobe margins *Parmotrema arnoldii*
14. Thallus yellowish green to grass-green when dry; lobe margins more or less covered with tiny lobules *Lobaria oregana*
14. Thallus olive to brown when dry; lobe margins and ridges on the thallus surface with coarse soredia and/or isidia, not lobules *Lobaria pulmonaria*
15. Thallus dark olive to brown or greyish brown when dry..... 16
15. Thallus pale grey to dark grey or greenish grey when dry, brownish only at the lobe margins if at all 19
16. Thallus lobes distinctly “frosted” with a coarse to fine white pruina, at least at the lobe tips; mature rhizines densely branched (squamrose: like a bottle-

- brush), forming a mat on the lower surface; soredia produced along the lobe margins..... *Physconia enteroxantha*
16. Thallus lacking any pruina; rhizines, if present, unbranched or forked, not squarrose; soredia, if present, produced on the lobe margins or surface 17
17. Thallus ascending and loosely attached to bark, with few rhizines on the lower surface; medulla C- . Lobe margins with powdery soredia, but without lobules, black pycnidia, cilia or apothecia *Tuckermannopsis chlorophylla*
17. Thallus closely attached to bark by hundreds of rhizines on the lower surface; medulla C+ pink to red..... 18
18. Upper surface of thallus with large patches of granular soredia or very fine, unbranched isidia that easily rub off leaving greenish yellow sorediate patches*Melanelia subaurifera*
18. Upper surface of thallus with scattered branched isidia that do not rub off to leave greenish yellow patches*Melanelia fuliginosa*
19. Thallus without isidia or soredia, but frequently producing abundant dark brown to black apothecia that usually are “frosted” with a white pruina; lower surface white with white rhizines *Physcia aipolia*
19. Thallus producing soredia or isidia20
20. Lower surface white, with white rhizines; thallus ascending, loosely attached; lobes narrow, under 2 mm across; white, hair-like “cilia” growing from lobe tips; soredia produced in inflated or expanded, hood-shaped lobe tips..... *Physcia adscendens*
- [Note: Specimens that key out here, but have soredia on lobe tips that are *not* expanded and hood-like, are probably *Physcia tenella*.]
20. Lower surface black to dark brown; rhizines black; thallus usually closely attached, flat against the bark; lobes 2-5 mm across, with a net-like pattern of ridges and depressions, like hammered metal; cilia absent; soredia or isidia not confined to lobe tips21
21. Thallus with slender, cylindrical isidia produced on thallus surface and along the lobe margins; rhizines branched like a bottle-brush (squarrose)..... *Parmelia squarrosa*
21. Thallus with soredia or dull (“soft”) isidia that are more granular in appearance than cylindrical, produced on the thallus surface and sometimes the margins 22
22. Soredia powdery, along margins of lobes or along ridges; rhizines on the older, central parts of the lower surface are squarrose *Parmelia sulcata*
22. Soredia or isidia granular, coarse, produced all over the upper thallus surface and sometimes on the margins; mature rhizines are unbranched, or forked, not squarrose *Parmelia hygrophila*

23. Fruiting bodies elongate, sometimes branched, black ***Graphis scripta***
 23. Fruiting bodies disk- or cup-shaped (apothecia), variously coloured 24
24. Apothecia orange-pink, with thick, thallus-coloured margins; medulla of apothecia and thallus, and apothecial disk (when scratched) usually C+ red...
 ***Ochrolechia* species**

[Note: The most common species of *Ochrolechia* on deciduous trees are *O. laevigata* and *O. subpallenscens*.]

24. Apothecia black, brown, yellow or any variation of these colours; thallus surface and apothecial disks C- or C+ orange, not C+ red ... ***Lecanora* species**

[Note: There are many species of *Lecanora* on deciduous trees in the west. The most common are *Lecanora pacifica*, with large, flat apothecia (up to 1.2 mm in diameter) varying in colour from greenish or brownish black to beige or pale yellow, often on the same thallus or even the same apothecium; disks sometimes lightly pruinose (“frosted”), disks and thallus C-; and *L. confusa*, with small, flat to convex apothecia (up to 0.7 mm in diameter), pale yellow to beige, usually lightly pruinose; disks and thallus react C+ orange).

[Note: Situated in the heart of a rich western lichen flora, the number of potential species one might encounter in a pollution survey is very large, unlike the very limited number of species one would encounter in and close to cities or large towns in southeastern Canada. This will make the likelihood rather great that species not included in this key will, nevertheless, be seen in the transects. It remains to be seen if this will present a serious obstacle to the success of the EMAN program.]

**Key to Some Common Lichens on Conifers
in Lowland Southwestern Canada**

Irwin M. Brodo, 19 April 2004

1. Thallus fruticose, hanging down (pendent) and hair-like, or growing upward or outward, usually branched and “shrubby,” typically attached at a single point2
1. Thallus foliose or crustose, not pendent or shrubby; broadly attached to substrate, at least in part 8
2. Thallus round in cross-section, hair-like or bristly; thallus brown, yellowish green or grey3
2. Thallus flattened or angular in cross section; thallus yellowish green or orange6
3. Thallus yellowish green..... 4
3. Thallus dark to pale brown or grey, greenish grey, or pale green, lacking a yellowish tint 5
4. Branches having a somewhat elastic central cord surrounded by thin or loose medulla; often with many perpendicular side branches that give the lichen a bristly appearance*Usnea species*
4. Branches lacking a central cord, but rather filled with compact or loose medulla; side branches rarely perpendicular and bristly ..*Alectoria sarmentosa*
5. Thallus pendent, at least in part; branches slender and hair-like; some species with patches of soredia; fruiting bodies rarely seen, disk-shaped with thin margins, distributed along the branches*Bryoria species*
5. Thallus shrubby, main branches thick, not hair-like; never with soredia; fruiting bodies common, spherical, at the tips of the branches*Sphaerophorus globosus*
6. Thallus orange, K+ deep purple-red; branches very short (up to about 5 mm long), with coarse granular soredia at the tips..... *Xanthoria candelaria*
6. Thallus yellow-green, K-; branches much longer than 5 mm; soredia not confined to the branch tips 7
7. Thallus relatively stiff, with branches that are the same colour on both sides, somewhat shiny, with an irregular branching pattern; soredia in elongate or oval patches almost entirely confined to the margins.....*Ramalina farinacea*
7. Thallus soft and pliable with branches that are clearly paler (sometimes almost white) on the lower side, very dull, branching in regular dichotomies; soredia, when present, on both the surface and margins of the branches.*Evernia prunastri*

8. Thallus foliose, with distinct upper and lower surfaces, loosely or closely attached to substrate; lobes ranging from minute and scale-like to broad and leaf-like.....9
8. Thallus crustose, intimately attached to substrate and cannot be separated from it intact 24
9. Thallus orange, outer surface K+ deep purple, with minute, finely divided, scale-like lobes less than 1 mm broad 10
9. Thallus grey, grey-green, yellowish green, olive, brown or black; outer surface K- or K+ yellow; lobes small or large, 0.5-30 mm broad.....11
10. Thallus without soredia, with numerous apothecia almost obscuring the minute thallus lobes..... *Xanthoria polycarpa*
10. Thallus granular sorediate on the tips of the lobes, which are more or less erect and conspicuous; apothecia varying from abundant to absent *Xanthoria candelaria*
11. Lobes, especially tips, somewhat inflated and hollow or tube-like 12
11. Lobes flat and solid, not hollow14
12. Soredia produced on the undersurface of the lobe tips, which break open and bend back giving a lip-shaped appearance..... *Hypogymnia physodes*
12. Soredia absent 13
13. Lobes slender, up to 2 mm broad, branching in regular dichotomies*Hypogymnia imshaugii* and *H. inactiva*
13. Lobes 2-6 mm broad, with very irregular branching, not in dichotomies *Hypogymnia enteromorpha* and *H. apinnata*
14. Lobes large, 5-30 mm broad, ascending and or loosely attached to the substrate 15
14. Lobes 0.5- 5 mm broad, closely or loosely attached, ascending or lying flat against the substrate.....18
15. Lobes with a network of ridges and depressions; lower surface pale brown to tan, dull, with a fuzzy surface 16
15. Lobes lacking a network of ridges and depressions; lower surface dark brown at margins, black in the center, sometimes blotched with white patches, shiny, not fuzzy17
16. Thallus yellowish green to grass-green when dry; lobe margins more or less covered with tiny lobules *Lobaria oregana*
16. Thallus olive to brown when dry; lobe margins and ridges on the thallus surface with coarse soredia and/or isidia, not lobules*Lobaria pulmonaria*

17. Lobe margins with conspicuous, black, hair-like outgrowths (cilia); rhizines absent from the lower surface in a broad zone close to the margins, otherwise abundant; powdery soredia produced along the lobe margins
..... *Parmotrema arnoldii*
17. Lobe margins lacking any cilia; rhizines entirely absent from lower surface; lobe margins with coarse granular soredia and/or isidia *Platismatia glauca*
18. Thallus dark olive to brown or greyish brown when dry 19
18. Thallus pale grey to dark grey or greenish grey 22
19. Thallus ascending and loosely attached to bark, with few rhizines on the lower surface; medulla C- 20
19. Thallus closely attached to bark by hundreds of rhizines on the lower surface; medulla C+ pink to red..... 21
20. Lobe margins usually producing abundant tiny lobes (lobules) and sometimes tiny, black, barrel-shaped structures called pycnidia, and occasionally black hair-like structures (cilia); large brown apothecia commonly developing on the lobe margin; soredia absent *Tuckermannopsis orbata*
20. Lobe margins with powdery soredia all along the lobe margins, but without lobules, black pycnidia, cilia or apothecia..... *Tuckermannopsis chlorophylla*
21. Upper surface of thallus with large patches of granular soredia or very fine, unbranched isidia that easily rub off leaving greenish yellow sorediate patches
..... *Melanelia subaurifera*
21. Upper surface of thallus with scattered branched isidia that do not rub off to leave greenish yellow patches *Melanelia fuliginosa*
22. Thallus lacking soredia or isidia; lower surface white with white rhizines; apothecia abundant, dark brown to black often covered with a white pruina
..... *Physcia aipolia*
22. Thallus with isidia or soredia on upper surface, lobe tips or margins; apothecia infrequent to rare 23
23. Thallus ascending, loosely attached; lobes very small, under 2 mm broad, smooth, without ridges and depressions; rhizines white, abundant on lower surface and merging with hair-like “cilia” growing from lobe tips; soredia produced in inflated or expanded, hood-shaped lobe tips .. *Physcia adscendens*
23. Thallus usually closely attached, flat against the bark; lobes 2-5 mm across, with a net-like pattern of ridges and depressions, like hammered metal; lower surface black to dark brown; rhizines black; cilia absent; soredia along margins of lobes or along ridges..... *Parmelia sulcata*
24. Fruiting bodies elongate and usually branched, black; thallus forming a whitish stain on the substrate *Graphis scripta*
24. Fruiting bodies disk- or saucer-shaped, usually with a distinct rim. One common crustose lichen that will key out here has large (up to 4 mm diameter), orange-pink apothecial disks with a conspicuous thallus-colored

margins; the thallus medulla and apothecial disk (when scratched) turns red
with C *Ochrolechia oregonensis*

[Note: Situated in the heart of a rich Pacific Northwest lichen flora, the number of potential species one might encounter in a pollution survey is very large, unlike the very limited number of species one would encounter in and close to cities or large towns in southern Canada. This will make the likelihood rather great that species not included in this key will, nevertheless, be seen in the transects. It remains to be seen if this will present a serious obstacle to the success of the EMAN program.]