

Chrysothrix

1a Thallus vivid primary yellow, thick; granules 0.10.2 mm diam. Calycin and vulpinic acid. On acid rocks in very shaded, dry habitats beneath overhangs and in crevices, very rarely on trunks of conifers and on manmade substrata. (if thallus more finely powdery, somewhat duller greenish yellow, with rhizocarpic acid, see Psilolecia lucida). Chrysothrix chlorina

1b Thallus yellow, often with either a slightly orange or a greenish tinge, or rarely greenish yellow; thin; granules 0.010.1(0.2) mm diam. Thallus P or P+ orange, K and KC or + orange, darkening to redblack, C, containing calycin, or pinastric acid (C. citrina R. C. Harris ined.), rarely both. Often on bark, on the dry, shaded sides of trees (usually roughbarked), more rarely on shaded acid rocks and walls. Very common (at least in the north and west), often completely covering tree trunks. (if granules smooth, appearing corticate, see Candelariella xanthostigma; if soredia variable in size, see Candelariella efflorescens; if tiny lobes present, see Candelaria concolor var. effusa). C. candelaris s. lato. 2

2a With pinastric acid. Chrysothrix citrina R. Harris ined.

2b With calycin. 3

3a With unknown pulvinic acid derivative.
Chrysothrix sp. Harris ined.

3b Without unknown. Chrysothrix candelaris s. str.

Cliostomum

After Gowan (1990) and Fox (1992)

Rev. 2/94

A segregate of Catillaria, characterized by the ascus tips (tholus most reactive with IKI around the axial mass).

1. Apothecia bright eggolk yellow (brilliant orangeyellow).

Thallus continuous to effuse, verruocose, thin, the verrucae dissolving into scattered patches of soredia; soredia moderate in texture, whitish; corticate areas light greenish gray or yellowish. Apothecia flat to strongly convex, 0.20.5 mm diam. when mature; margin concolorous with disk, thin, smooth, sometimes evanescent. Pycnidia rare, 0.10.25 mm diam., ± regular in shape; pycnosporos subglobose to ellipsoid, 24 x 12 µm. Apothecial tissues hyaline; hymenium 2535 µm; epithecium granular, yellowish, with granules soluble in K. Spores 8 per ascus, hyaline, bacilliform, mostly 1septate, some 2 o4 3septate, 1120 x 23.5 µm, sometimes with biconcave septa. Thallus P+ redorange, with fumarportocetraric acid, smaller amounts of protocetraric acid, sometimes divaricatic acid, and sometimes atranorin. On acidbarked trees (Picea, Quercus). Massachusetts; New Brunswick. C. vitellinum

1. Apothecia pale yellow, orange or brownish to blackish. 2

2. Disk [usually?] weakly pruinose, pale yellowish to reddish brown, or light grayish to yellowish brown or brownish black, brownish, pinkish brown or livid, or becoming blackish, variable in color on same thallus, 0.30.8(1.1) mm diam. when mature; margin thin and smooth to crenulate, concolorous with disk or paler, often appearing like the thallus; hymenium colorless, 4050 µm thick; epithecium light brownish to olivegray; exciple hyaline to yellowish; spores elongateellipsoid to bacilliform, mostly 1septate, occasionally 2 and rarely 3septate, (7)1014(20) x (2)34 µm. Thallus sometimes immersed, usually superficial, continuous to subcontinuous, thin, verruculose, coarsely granulose, or subsorediate, greenish white. Apothecia usually present, flat to strongly convex. Pycnidia common, irregular in shape, 0.10.2(0.3) mm diam., usually present as black dots, the wall K+ purple; pycnosporos ellipsoid, (3)3.54 x (1)1.52 µm. Thallus usually containing atranorin and roccellic acid. On moderately acid bark and wood, often in rather dry situations (but often in coastal areas in Washington state), more rarely on other organic

substrates or on sheltered, ± vertical rock faces or walls.
Coastal, California, Oregon, Washington, British Columbia;
Maine..... C. griffithii

2. Disk nonpruinose, pale orange or yellow. 3

3. Disk light to medium orange (according to Gowan; pale yellow to creamy white according to Fox). Thallus rugose and corrugate, consisting of scattered or clustered corticate rugae, with areas between rugae endoxylic; rugae pale orange to brownish. Apothecia 0.4-1.1 mm diam. when mature, sometimes absent; disk flat to convex; margin smooth, pale yellow to whitish, paler than disk, sometimes evanescent in old apothecia. Hymenium colorless, 3050 µm thick; epithecium brown to olivebrown or almost colorless; exciple hyaline to light yellowish brown. Spores elongate ellipsoid, 812 x 23.5 µm, 1-septate or rarely nonseptate. Pycnidia common, irregular in shape, 0.2-0.9 mm diam; pycnosporangia subglobose to ellipsoid, 1.54 x 1.52 µm. Atranorin in thallus; usually usnic acid in apothecia, and sometimes also isousnic acid. Usually on bark, especially Quercus, less commonly on wood. Coastal British Columbia. C. corrugatum sensu Gowan (synonym C. graniforme)

3. Disk pale yellow to light yellow-orange. Thallus effuse sorediate. Thallus continuous, white or greenish white. Pycnidia common, irregular in shape, 0.2-0.5 mm diam.; pycnosporangia subglobose to ellipsoid, 1.52 µm. Apothecia 0.4-0.9 mm diam. when mature; disk flat when young, becoming convex and tuberculate; margin smooth, paler than disk, evanescent in old apothecia. Hymenium colorless, 3045 µm thick; epithecium brown to olivebrown or almost colorless; exciple hyaline to light yellowish brown. Spores elongate ellipsoid or short bacilliform, 811 x 2.5-3.5 µm. Containing atranorin. On Picea, New Brunswick. C. luteolum

Discs pale yellow to creamy white, sometimes a little reddish. Thallus granulose, pale yellow, greenish yellow or greenish white. Apothecia 0.8-1.2 mm diam.; spores 812 x 24 µm. On bark or wood. C. corrugatum sensu Ozenda & Clauzade?

Crocynia

1. Thallus forming rosettes to ca. 35 cm across, with distinct marginal lobes (superficially resembling a foliose lichens until the ecorticate nature is seen under a hand lens). On bark of broadleaved plants, Florida. C. pyxinoides (see Harris, 1987, 1990; the description above is from memory of my own specimens only)

1. Thallus forming irregular heaps to ca. 15 cm across, without lobes, white throughout (according to Plitt's table, but "quite yellowish" according to his text!), K+ faint yellowish. Hyphae 56 um diam., appearing rugulose. C. gossypina

Prothallus whitish, usually distinct. Thallus ± whitish to yellowish gray, tightly to almost loosely attached to substratum, effuse, smooth or with low, radiating ridges, entire, 0.15-0.30 mm thick; photobiont cells ca. 611 x 47 μm; isidia many, granular, 0.1-0.3 mm; soralia absent. Pycnidia few, in connection zone between two thalli, slightly elevated, solitary, black; conidiophores of ca. 10-15 μm long conidiogenous cells; conidia bacilliform, (5)-6-7(8) x 1 μm. Thallus C+ red, K, P, UV+ pale graywhite, containing gyrophoric acid (major) and traces of unknown substances. On rough or rarely smooth bark in sheltered and shaded habitats in moist and dense subtropical and tropical forests, often in hammocks (hardwood forests) and swamps which have standing water at least for part of the year; also common in oak or oakpine scrub, often associated with C. rubrotincta. Florida and SE Georgia west to eastern Texas.
Cryptothecia striata

Thallus to 6 cm diam., often smaller and coalescing, ± crustose at the center with radiating, closely contiguous, apparently pleated, convex marginal lobes, glaucousgraywhite, sometimes becoming darker, more verruculose and ± cracked and areolate towards the center; lobes 0.51 mm wide, wider at margins, matt, densely whitepruinose, sorediate. Soralia scattered, coalescing to form erose patches, mainly laminal; soredia white or concolorous, granular, ± farinose. Apothecia rare, 0.30.9 mm diam.; proper exciple dark brown, opaque, with marginal zone of crystals; spores (9)1113(15) x (4.5)5.56)7.5) um. Pycnidia rare; pycnosporos 67 x 1 um. Thallus P, K± yellow, KC, UV+ dull orange or UV, containing atranorin, chloratranorin, diploicin and a xanthone. On calcareous (or siliceous?) rocks, walls and trees in mainly dry, often ± sheltered, nutrientenriched habitats, also on bird perch rocks in the xeric supralittoral.

Southwestern. Diploicia canescens

Thallus verrucose, pustulate; pustules often forming erect plates or columns by the disintegration of the pustule summits, leaving the vertical portions of the walls intact, but sometimes breaking down into coarse granular soredia. With elatinic acid as a rare accessory. Primarily in the eastern United States.
Loxospora pustulata

Thallus whitish gray, KC, P+ orange, containing pannarin and zeorin, smooth and chinky to wrinkled, sorediate. On conifers, Quebec to Georgia, west to Michigan. Megaspora porphyrites

Thallus sorediate, gray or graygreen, matt, continuous, containing large colorless crystals; soralia initially erose and punctiform but expanding with age and even becoming somewhat capitate; soredia rather coarse and irregular, white. Thallus K, P+ red (protocetraric acid). On bark, Florida.
Myriotrema erodens R. C. Harris

Ochrolechia

Thallus sorediate, isidiate or granularisidiate.

1. Thallus distinctly isidiate, or with isidia breaking down into granules. Apothecial margin medulla C or C+ red. Disks C+ pink or red. Without variolaric acid, except in O. subisidiata. 2

1. Thallus sorediate, without isidia. Apothecial margin medulla C or C+ red. Disks sometimes (e.g., O. farinacea) C. Without variolaric acid, except in O. gowardii, and in the European species O. alboflavescens and O. turneri] 5

2. Thallus medulla C; cortex C+ red. Isidia coarse, 0.1-0.3 mm diam. to 1.2 mm long, knobby, persistent, growing out of or merging into verrucae; thallus rather thick. Thallus yellowish gray, thick, verrucose, ± covered by isidia; prothallus often conspicuous, paler than thallus. Apothecia often present; discs C+ red, rugose to almost pruinose, pale yellowish pink, sometimes becoming rosulate; margins thick, usually verrucose to isidiate, sometimes radiately striate. Spores (36)45665 x (17)2536 µm. On bark of deciduous trees (especially Quercus), in mostly hardwood forests, 760-1500 m, Appalachian and Ozark regions. [Note: Ochrolechia subviridis, a European species that has been reported from N. America, apparently incorrectly, also keys out here; it has a very thick, radiating prothallus and smaller isidia soon breaking into granules]
Ochrolechia yasudae Vainio

2. Thallus medulla C+ red, cortex C+ red or C. Isidia less than 0.2 mm diam., sometimes breaking into granules and forming a granular crust. On bark or wood. Southern to tropical. 3

3. Isidia largely remaining cylindrical and discrete; thallus cortex C+ red, usually containing lichexanthone (UV+ yelloworange). West Indies, Mexico and South America. [Ochrolechia isidiata (Malme) Vers.]

3. "Isidia" (pseudoisidia) soon breaking into granules and forming a granular crust; thallus cortex C or C+ pale pink, lacking lichexanthone (UV). 4

4. Contains variolaric acid; lacks hiascic acids. Apothecial discs pruinose-scabrose, C+ red. Apothecia adnate to ± immersed,

1.52.5 mm diam.; margins verruculose, flexuose, distinctly double, sometimes smooth adjacent to disk and rough on outside. Thallus yellowish white to yellowish gray, rugose to granuloseisidiate, thick. Thallus and apothecia UV. Spores 2538 x 1418 um. Almost always on conifer wood and bark, in JuniperusPinus edulis woodlands, 15002250 m. Arizona and SW Texas. Ochrolechia subisidiata Brodo4. Lacks variolaric acid; containis 50methyhlhiascic acid. Apothecial discs lightly white pruinose, C+ red, K+ vivid yellow; with inner excipular ring; outer margin coarsely granulose, ecorticate. Hymenium densely inspersed; algal layer sparse. Thallus yellowish white, thin at edge, becoming thick and rimose. On bark, usually of palms. West Indies (esp. Lesser Antilles) and Florida. Ochrolechia antillarum Brodo

5. Soredia effuse, on the surface of thick, white, verrucose thallus; all tissues C. (see Ochrolechia farinacea)
 5. Soredia usually in more or less discrete soralia (sometimes confluent in places); soredia or apothecial disk C+ red [Note: "O. sorediosa", apparently a rare, perhaps diseaseinduced, sorediate morph of O. szatalansis from western Canada, also keys out here; the discs and apparently also the soredia are C] 6

6. Thallus and soredia C. Apothecia common, 1.03.5 mm diam.; disks yellowish pink to pale orange, heavily pruinosesescabrose, C+ red, K+ yellow; margin somewhat prominent, matt, even to rugose or verruocse; algal layer almost continuous below hypothecium; spores 2945 x 1928 um. Thallus gray to yellowish gray, thick, rugose to verruculose, with patches of white, coarsely granular soredia. Usually on conifer bark, especially Picea and Pinus. Europe; reported from Washington and Pennsylvania, but not confirmed. [Note: Ochrolechia turneri, a European species apparently incorrectly reported from British Columbia, might key here; it contains variolaric acid] [Ochrolechia alboflavescens]

6. Thallus and (or) soredia C+ pink to red (gyrophoric acid). 7

7. Thallus (soralia) UV+ orange (lichexanthone). 8

7. Thallus UV± white. 9

8. Thallus thin, becoming somewhat thicker in central areas but rarely verruculose or verrucose, usually yellowish gray. Soralia

abundant, small, pale, C+ red, K. North temperate to southern boreal, mostly eastern (especially Great Lakes area), with scattered populations in the northwestern part of the continent; on bark of deciduous or coniferous trees, in a variety of welllighted forest types. Apothecai rare. Contains gyrophoric and lecanoric acids and lichexanthone, without hiascic acids. [Note: Howard's records of O. subviridis are based mostly on misidentification of this species]. Ochrolechia arborea (Kreyer) Almb.

8. Thallus verruculose to undulating verrucose. New Mexico to Texas and Mexico; on conifer wood or bark. Alsocontains 4,5diOmethylhiascic acid. (sorediate morph of Ochrolechia mexicana Vainio)

9. Thallus thin to partly immersed, membranous, yellowish white, with discrete but irregular excavate soralia breaking through thallus leaving ragged margins, 0.51.0 mm diam.; soredia coarsley granular, yellowish white; thallus C; only soredia C+ red. Apothecia commonly present, 0.61.5 mm diam.; disc pruinose to pruinosecabrose, C+ red, K+ yellow; margins C; spores (2)4/ascus, 4465 x 2233 um. Contains variolaric acid. On bark of Abies lasiocarpa, 13001650 m. Oroboreal, in western mountains (Idaho and Montana to NE British Columbia, rare. Ochrolechia gowardii Brodo

9. Thallus usually thick, verrucose, often somewhat shiny, yellowish white or gray, cortex and soredia both C+ red (even when thallus thin). Apothecia rare (unknown in N. America); discs epruinose; margins C+ red (cortex). Lacking variolaric acid; UV (or pale white). Soralia large, irregular, usually beginning as small, scattered hemispherical masses of coarse granular soredia, yellowish white to pale orange. On deciduous and conifer tree bark and wood, in humid, forested habitats, such as along lake shores, in bogs, etc. Mostly boreal and subarctic, south to Wyoming, and in the Sierra Nevada range in California. Ochrolechia androgyna (Hoffm.) Arn.

Not sorediate or isidiate.

Thallus usually thin at edge, becoming thick and rugose or verruculose in older portions, yellowish white or gray. Apothecia with white, thick, prominent margins (usually white, often matt, rough, or decomposing), 0.81.5(2.5) mm across; disks often hardly expanded, giving the apothecium a pertusarioid appearance, usually heavily pruinosecabrose, C+ pink, K+ bright yellow. Algal layer sparse, mainly in margin. Spores 3862(69) x (18)2233 um. Contains lichesterinic acid. Usually on conifer

bark or lignum, especially Pinus, 01800 m. Pacific NW (central California to the Queen Charlotte Islands, BC, east to NW Montana), common. Ochrolechia juvenalis Brodo.

Pertusaria

IA. With Isidia

(also see P. globularis in subg. Pertusaria)

1. Isidia small (always less than 1 mm tall). Thallus C+ orange or red, UV+ dark red (xanthonenes, with or without gyrophoric acid). Thallus K, P, C+ orange, UV+ dark red, containing only xanthonenes (arthothelin and granulysin, in N. American material; thiophanic acid in British material). Isidia pale yellow, with a soft surface, to 0.6 mm tall. On bark (Alnus and Populus), near seal level to 30 m, in Alaska (on tops of calcareous, schistose boulders in Britain). Pertusaria flavocorallina Coppins & Muhr

1. Isidia large (generally more than 1 mm tall. Thallus C or C+ red (gyrophoric acid), UV, without xanthonenes. Isidia frequent, columnar or coralloid, but never sorediate, predominantly associated with fruit bodies. Isidia mainly coralloid, thallus gray, medulla K+ yellow becoming redbrown, P+ yellow becoming orangered (fumarprotocetraric acid), and KC+ red (gyrophoric acid); Pertusaria oculata

IB Without Isidia; With Soredia (or apparently so)

Medulla never C+ red or KC+ red (if so, see IC).

IB1 On bark or wood

1. Medulla with at least one spot test positive; thallus variously colored. 2

1. Medulla with all chemical tests negative (or spot tests uncertain); thallus always gray. 12

2. Thallus yellowgreen or sulfuryellow; soralia concolorous; cortex UV+ orange or orangered, K+ yellow, C+ deep yellow, KC+ yelloworange (thiophaninic acid); medulla K+ yellow, P+ yellow becoming orange (stictic acid); restricted to California; infrequently found in this sterile form. (P. flavicunda)

2. Thallus grayish to yellowish but not distinctly yellow; soralia white. Thallus C, UV+ yellow (lichexanthone) or UV+ pink (coronatone), or UV.

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3. Medulla C but KC+ roseviolet, K+ or K, P+ or P. 4

3. Medulla C, KC, K+, P+. 6

4. Medulla K+ yellow becoming lavender, C (?), KC+ reddish or finally violet, P, containing hypothamnolic acid. Cortex UV+ yellow (lichexanthone). Usually fertile; On hardwoods (less often conifers); widespread throughout the eastern

U.S.A. P.
hypothamnolica

4. Medulla K or K+ yellow becoming redbrown, C, P, KC+violet (picrolichenic acid). 5

5. Cortex UV+ yellow (lichexanthone). Sterile.

Florida. P. ventosa

5. Cortex UV. Medulla K or K+ yellow becoming redbrown, P or P+ yellow becoming orangered (\pm protocetraric acid), C, but always KC+ instantly roseviolet fading to wine red (picrolichenic acid); Corticolous on hardwoods (less often conifers). Widespread throughout eastern and western temperate North

America. P. amara

7. Thallus UV+ pinkish (coronatone). Medulla K+ yellow, C, KC, P+ pinkorange (stictic acid agg.). Sterile. Thallus pale greengray, whitish at margins, with a very smooth, shiny, "greasy" cortex which frequently cracks and pulls away from the medulla. Soralia mostly forming from breaks in cortex, often irregular and pustular but sometimes orbicular and weakly capitate; soredia coarse and irregular.

Florida. P. expolita R. C. Harris

7. Thallus UV+ yellow (lichexanthone) or UV (no xanthenes).
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8. Medulla K (or K+ yellow becoming redbrown?), P+ orangered (fumarprotocetraric acid); soralia initially pruinose but later higharched. 9

8. Medulla or K+ yellow, becoming deep yellow or finally brown, P+ yellow or orange (baeomycesic, thamnolic, or haemathamnolic acids); discs heavily pruinose rather than truly sorediate. 10

9. Thallus margin characteristically zoned; medulla contains fumarprotocetraric and succinprotocetraric acids; usually fertile; Corticolous on hardwoods (less often conifers); widespread throughout eastern temperate North

America. P.
multipunctoides

9. Thallus margin never zoned; medulla contains fumarprotocetraric and protocetraric acids; known only sterile.

Corticolous on hardwoods (only); restricted to the western arctoboreal coast. P. borealis

10. Thallus usually UV+ yellow (lichexanthone). (If containing thamnolic acid or stictic acid and growing in Florida, see P. spp. of Harris, 1990). 11

10. Thallus UV. Medulla K+ yellow becoming deep yellow, P+ yellow or yelloworange (thamnolic acid), C, KC; verrucae well elevated (often 2 or more mm high), usually fertile; Corticolous on hardwoods or conifers; widespread throughout eastern temperate North America. P. trachythallina

11. Medulla K+ yellow then brownish, P+ orange, containing haemathamnolic acid. Rarely fertile. Discs yellowbrown or pink; epihymenium K; spores 1, 36(+8) x 124(+30) um. Widespread throughout the coastal plain. P. copiosa

12. Cortex often UV+ yellow or yelloworange (lichexanthone); medulla containing hypothamnolic acid; usually fertile. On hardwoods (less often conifers), widespread throughout the eastern U.S. (see Pertusaria hypothamnolica)

12. Cortex always UV (xanthones absent). 13

13. Medulla KC+ redviolet, containing picrolichenic acid (rarely KC, P+ redorange, with protocetraric acid); on hardwoods (less often conifers); Widespread throughout eastern temperate North America (Pertusaria amara)

13. Medulla K, C, KC, P, without lichen substances. 14

14. Verrucae small (to 1.2 mm broad) and never scutellate; black disc commonly present beneath young soralium; On conifers or hardwoods, panboreal. Pertusaria ophthalmiza

14 Verrucae large (up to 4.6 mm broad) and often scutellate; black disc rarely present beneath young soralium; known only as sterile in North America. Restricted to the Southwest on hardwoods (less often conifers). Pertusaria albescens

IE Not soresdiate or isidiolate. Corticolous/Lignicolous

3. Medulla C, but KC+ rose becoming finally violet (hypothamnolic acid); cortex often UV+ yellow or yelloworange (lichexanthone); Usually fertile. Corticolous on hardwoods (less often conifers); widespread throughout the eastern U.S. Pertusaria hypothamnolica

3. Medulla C and/or KC+ red (gyrophoric and/or lecanoric acids). 5

5. Thallus UV+ yellow (lichexanthone); medulla K, P. Growing in Florida. Usually sterile. Pertusaria pulchella

5. Thallus UV, without xanthonenes (except P. santamonicae). Growing in western or northern areas (except P. velata) 6

Thallus sometimes with + soresdiate verrucae; thallus margin characteristically broadly zoned; Usually fertile. Medulla contains fumarprotocetraric and succinprotocetraric acids. Corticolous on hardwoods (less often conifers) or saxicolous; widespread throughout eastern temperate North America. Pertusaria multipunctoides

Medulla K+ yellow becoming deep yellow, P+ yellow or yelloworange (thamnolic acid); cortex UV (xanthone absent); Corticolous on hardwoods or conifers; widespread throughout eastern temperate N. America. Pertusaria trachythallina

Cortex generally UV+ yellow or yelloworange (lichexanthone); medulla containing hypothamnolic acid; spores 1 (rarely sterile), 53(±16 x 163(±24) um. Corticolous on hardwoods (less often conifers); widespread throughout the eastern U.S. Pertusaria hypothamnolica

Thallus dark gray, shiny, and (+) marginally zoned; Corticolous on hardwoods or conifers; panboreal in distribution. Pertusaria ophthalmiza

Thallus areolate, greenish; soredia greenish; prothallus brown.
Containing perlatolic acid and related substances. On Betula
close to sea level on the Pacific coast. British
Columbia. Ropalospora viridis