

I-A. SAXICOLOUS. Non-sorediate.

Thallus some shade of brown.

1. Apothecia lecidiene. Thallus crustose-squamulose, extensive (to 30 mm diam.), dark red-brown or brown-black, \pm shiny; squamules 0.4-1 mm diam., broadly ascending, partly confluent, mostly convex; upper surface folded and often funnel-shaped deepened; edges and underside green-black (edge often whitish according to Hasse), the edge swollen and smooth (finely crenulate according to Hasse); K-; hypothallus black. Upper cortex dark brown above, hyaline below; epinecral layer present; algae 10-12 μ m diam.; medulla spottily gray-brown; hyphae ca. 3.5 μ m diam., thin-walled; lower cortex brownish, rarely green-brown. Apothecia 0.5-1 mm diam., closely and broadly sessile, laminal on the squamules, mostly scattered; disk plane then convex, dark brown to almost black, shiny (dull according to Hasse); margin paler, grayish, at last obscured. Excipulum pale to medium brown towards outside, hyaline inside. Epihymenium 10-15 μ m, pale or medium brown; hymenium 40-44 μ m, I+ blue; paraphyses thin-walled, the apical cells brown; asci 55-60 x 12-14 μ m, the wall 2.5-3 μ m thick above; spores ovoid-ellipsoid, 8-11 x (3-)4-5 μ m. Thallus and apothecia K-, C-, KC-, P- (no substances). On siliceous rocks (sandstone, quartzose rocks), mostly coastal, California. L. scotophilis

I-B. SAXICOLOUS; non-sorediate;

Thallus or apo. margins yellowish.

I-C-2. Discs pruinose

1. Thallus cracked-areolate. Apothecia immersed at least when young. 2

1. Thallus areolate to subsquamulose or weakly lobate. Apothecia sessile.

(see subgenus Placodium)

2. Thallus P-, K- or + yellowish brown, KC+ yellow, C- (Ch: atranorin, gangaleoidin, α -collatolic and usnic acids, zeorin). Spores (9-)9.5-12.5(-16) x 4.5-5.5(-6) μ m. Thallus cracked-areolate, rather thick, forming \pm continuous crusts, greenish sulphur yellow or whitish yellow, yellow-green to yellow-gray or greenish yellow, matt; areoles flat to slightly convex; surface smooth to granular or roughened; prothallus green-black. Apothecia 1-1.5(-2.5) mm diam., initially immersed, scarcely extending to above the thallus surface; thalline margin entire, irregular, becoming \pm excluded; disc yellowish to pinkish brown, green-brown, blue-green or greenish black, flat to strongly convex, appearing bluish gray, when young with a fine, dense to thin grayish pruina, at a later stage sometimes epruinose. Epihymenium greenish or bluish gray, K+ green-black, interspersed with granular crystals dissolving in K; hymenium 55-90 μ m; paraphyses 2-2.5 μ m, sparsely branched, apices slightly thickened. Pycnospores 14-20 x 0.5-1 μ m, threadlike to arc-like. On exposed, somewhat nutrient rich, siliceous rocks, especially in the xeric supralittoral but also inland. Lecanora sulphurea (Hoffm.) Ach.

2. Thallus K+ yellow to red, C-, P+ orange to red (Ch: atranorin, chloratranorin, protocetraric, norstictic and connorstictic acids). Spores (8-)10-14 x (5-)6-8 μ m. Apothecia immersed to sessile and finally constricted below, to 0.4-1(-2) mm wide, aggregated; discs becoming convex to almost subglobose, pinkish to pale gray-brown, flesh-colored, usually \pm densely white or bluish white pruinose; thalline margin thin, often paler than thallus, entire or undulate, becoming crowded back. Thallus continuous

and finely rimose-areolate, clearly delimited, white or pale gray or yellowish white; areoles often uneven in height, \pm flat, margins crenulate; surface coarsely granular to warted; prothallus white, fibrous, generally well developed. Epihymenium brownish, granular, K+ red (with needle-like crystals); hymenium 60-80(-100) μ m; paraphyses 1.5-2 μ m, simple or sparsely branched, especially above, tips to 3.5 μ m wide, generally with the terminal cell subglobose. On siliceous rocks in dry recesses of base-rich maritime rocks, by lakes, or rarely on calcareous rocks in woodlands.L. subcarnea

**I-C-2. Apothecial margin yellowish.
Discs blue-black to green black, epruinose.**

1. Apothecia appearing lecideoid. Thallus well developed, continuous or cracked-areolate, rarely dispersed, lemon-yellow to yellowish white or rarely deep yellow; prothallus prominent, white or bluish gray. Apothecia 0.5-1.5(-2.5) mm diam., immersed, eventually becoming almost sessile; thalline exciple soon becoming excluded; true exciple persistent, black; discs flat to somewhat convex, not pruinose. Epihymenium yellow-green to greenish black; hymenium 55-75 μ m; paraphyses 1.5-2.5 μ m wide, simple or sparsely branched and anastomosed, apices 3.5-5(-6) μ m wide, swollen, capitate, brown; spores (8-)10-14 x (4-)4.5-6(-7.5) μ m, narrowly ellipsoid. Pycnidia frequent; pycnospores 11-15 x 0.5-1 μ m, vermiform to arc-like. Thallus P- or weakly orange, K+ yellow, K+ yellow, KC+ yellow, C- (usnic acid; atranorin also reported). On hard, calcareous or base-rich rocks. L. marginata

1. Apothecia clearly lecanorine. Thallus C-. 2

2. Thallus K+ yellow (atranorin). Thallus glebulose-verrucose, yellowish to white. Discs red-brown to pure black; thalline margin persistent. Spores 8-13 x 6-7 μ m. (see L. argopholis)

2. Thallus K- or K+ pale yellow (without atranorin). Thallus areolate or coarsely granulose to squamulose. Apothecia mostly to 1 mm diameter. 3

3. Growing in Mexico. L. ryanii Nash ined. [need to get description from Tom]

3. Growing in more northerly areas. 4

4. Thallus well-developed, areolate, of contiguous or sometimes partly scattered areoles; areoles subsquamulose, flattened, gray-green or yellow-green, smooth or finely wrinkled; margins crenulate (jigsaw puzzle-like); slightly lobate along the edge; prothallus when present black. Apothecia (0.4-)0.8-1(-1.5) mm diam., immersed or sessile, not constricted at base, 1-2/areole; discs flat to slightly concave or convex, blackish green or greenish brown, epruinose; thalline margin prominent to disappearing, at first entire and slightly raised but becoming flexuous. Epihymenium green-brown or brown, interspersed with granules dissolving in K; hymenium 60-70 μ m; paraphyses simple or sparsely branched, apices slightly swollen to 2.5 μ m wide. Spores (8-)10-13(-15) x (4.5-)5-7 μ m. Pycnospores 23-25 x 0.5-1 μ m, arc-like. Thallus P-, K- or K+ yellow, KC+ yellow, C- (usnic acid, zeorin). On siliceous rocks, more rarely worked timber, xeric-supralittoral to upland, boreal-arctic. Mountains of New Hampshire. Var. soralifera Suza has been reported from Europe.L. intricata (Schrad.) Ach.

4. Thallus poorly developed, chinky-areolate. Discs flat to strongly convex; thalline margin often disappearing. Spores oblong-ellipsoid to ellipsoid, 8.5-11.5 x 5-6.5 μ m. Areoles crenate to subentire, dispersed to crowded and forming a rimose-areolate crust, or obsolete, thin to rather thick, greenish gray to ashy. Apothecia on the surface of the

crust, initially or soon black to olive-black, becoming convex to subglobose, 0.4-1 mm wide; exciple concolorous with thallus. Alpine. (Also see L. polytropa v. melaenoides).L. melaena

**I-C-3. Thallus/apothecial margins yellowish.
Discs pale yellowish to red-brown, or \pm brownish-black,
Epruinose**

1. Apothecia \pm immersed, pale flesh color, epruinose, concave. Thallus yellow-white to slightly brownish, rimose-areolate. Spores 20-25 x 12-15 μ m. Hymenium 100 μ m. Paraphyses thin, easily free. Eastern Arctic. Not mentioned by Thomson 1997. L.
(*Hymenelia?*) *poluninii*

1. Apothecia sessile. 2

2. Thallus K+ yellow. Chem.: atranorin, usually with epanorin, zeorin, and fatty acids, less often with other combinations of substances in addition to atranorin. Discs mostly dark red-brown to black; thalline margin persistent. Thallus thick, pulvinate-verruculose or glebulose-areolate to subfruticose, yellowish white, pale greenish yellow, greyish greenish yellow, pale yellow or grayish yellow; young areoles at first adnate and semi-globular (ca. 0.2-0.3 mm diam.), later becoming globose to irregular, 0.8-1.5(-2.3) mm high, ca. 1(-1.5) mm diam., dispersed or tightly aggregated; sometimes becoming narrow, \pm cylindric (ca. 0.5 mm diam.) and finally branching \pm coralloidly, 1-5(-6) mm high; thallus towards margin sometimes weakly lobed (rosulate). Prothallus seldom visible, radiate, the outermost edges gray to blackish blue, the inner edges soon covered by white or yellowish white raditate hyphal layers. Apothecia very frequent, dispersed or aggregated, (0.5-)1.2(-3) mm diam., broadly then narrowly sessile; discs epruinose, mostly shiny, plane then \pm convex; margins usually thin, \pm repand, subcrenulate, mostly 120-140 μ m wide, concolorous with thallus, somewhat prominent when young. Epithymenium light to dark brown, the surface finely granular (soluble in K and N, but not in HCl); hymenium mostly 70-75 μ m high; paraphyses 2 μ m thick, tips partly short and slightly expanded; spores broadly ellipsoid to ellipsoid, (9.5-)12.7(-16.2) x (5.7-)7.3(-9.5) μ m. On siliceous or calcareous rocks, sometimes spreading to detritus, moss, or other lichens. Very common and widespread in the Rocky Mountains and Great Basin region; reported across the northern U.S. and S to California, as well as in Canada and Alaska. L. argopholis

2. Thallus K-, KC+ yellow or orange. Chem.: usnic acid or related substances, or sometimes xanthenes; without atranorin and epanorin. Discs pale yellowish to medium red-brown. 3

3. Thallus well-developed, continuous to distinctly areolate or squamulose or weakly lobate. 4

3. Thallus poorly developed and \pm granulose, or absent. Thalline margin of apothecia disappearing, or absent from the beginning. L. polytropa group (Key 1-A-4)

4. Thallus of discrete areoles, often becoming \pm squamulose to lobate.
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4. Thallus continuous to rimose-areolate, pale yellow. Key I-A-3

5. Thallus C+ orange, UV+ orange. Chem.: xanthenes. Growing on nutrient-enriched

rocks on the seashore, arctic. Lecanora contractula

5. **Thallus C-, UV-. Chem.: usnic acid. Not on the seashore.** 6

6. **Thallus thick, forming small (to 1-2 cm) convex mounds of whitish squamules.**

Cortex thick. Discs pruinose or not. Dry areas, western.(Squamarina subg. Petroplaca; L. kofae Ryan & Nash and L. "navajoensis" Ryan & Nash ined. will also key out here)

6. **Thallus mostly thinner, scattered to contiguous, flattened, not forming distinct mounds. Cortex mostly thin.** 7

7. **Apothecia ± immersed when young**, often several per areole, epruinose. Usnic acid, triterpenes.(see subg. Placodium: L. laatokkaensis and L. mazatzalensis)

7. **Apothecia sessile.** 8

8. **Apothecial margins thick, usually blackening; discs usually weakly pruinose.**

Squamules often black-edged, usually scattered among other lichens. California to British Columbia, east to the northern Rocky Mts.(subg. Placodium: L. semitensis s. lato)

8. **Apothecial margins mostly thin, usually pale; discs epruinose.**

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9. **Thallus whitish.** Apothecia yellow-brown. Alpine, Rocky Mts., Colorado.(subg. Placodium: L. albula)

(if spores narrowly ellipsoid, see L. dispersoareolata)

9. **Thallus yellowish or grayish green.** 10

10. **Thallus thick, ± areolate to subsquamulose.** 11

10. **Thallus thin, smoothish.** 13

11. **Thallus mostly pruinose and appearing yellowish white. Alaska.** Thallus fragmentary, removed from rock, ca. 3 cm across, thickish, somewhat imbricate, areolate-squamulose; squamules 0.5-1 mm across, rounded to somewhat irregular or weakly and coarsely crenate, thick, plane to convex; upper surface yellower than medium orangish yellow (), mostly pruinose and appearing yellowish white (92); lower surface appearing to have black rhizoidal strands, but possibly this is just cyanobacteria from the substrate; upper cortex 60 µm; upper 20 µm interspersed with yellowish granules; lower part yellowish orange, with bundles penetrating algal layer; hyphae anticlinal, 2-3 µm, with threadlike lumina; algal layer strongly interrupted, 50 µm thick, consisting of rounded, ca. 50 µm across groups of algal cells; algae 10-15 µm. Apothecia common, becoming crowded, to 1 mm diameter, more or less sessile; discs epruinose, strong yellowish brown () to dark orangish yellow (72); margins level with disc, 0.1 mm wide, becoming flexuous, persistent; cortex indistinct; algal layer absent from margin, present below hypothecium, to 200 µm thick, strongly interrupted, consisting of anticlinally elongated groups of algae; medulla not differentiated; excipulum yellowish, conglutinate; hyphae ca. 2-3 µm wide, with elongated lumina, radiating in margin, anticlinal in hypothecium, with bundles penetrating algal layer; hypothecium 100-300 µm; subhymenium indistinct; hymenium 75-100 µm, yellowish; epihymenium brown, 10 µm; paraphyses coherent, 1.5 µm, the tips not thickened; asci

few, clavate, thick-walled; spores few and immature, in KOH ellipsoid, 10 x 5 um. Chem.: usnic acid, zeorin. Thallus K-, C-. Alaska (Behring's Strait). Lecanora wrightii Ryan, sp. nov.?

11. Thallus epruinose, yellowish. Eastern or Southwestern. 12

12. Hypothallus usually not evident. Eastern. (See long description). (also see L. "geiseriae" Ryan in herb.).....L. chlorophaeoides

12. Hypothallus evident. California. Thallus scattered, becoming subcontiguous and vaguely effigurate towards the margin, areolate; areoles 0.5-1.5 mm diam., irregular in outline, becoming crenate, especially towards the margin, tightly attached, very thin, plane to slightly convex; upper surface slightly more greenish than yellowish white (paler than pale greenish yellow 104), gradually blackening toward edges, epruinose, matt; edges level; hypothallus \pm evident, black, rough, thickish, cracked; upper cortex ca. 40 um thick, inspersed with yellowish granules (soluble in K), composed of anticlinal hyphae; epinecral layer 5-10 um; algal layer ca. 120 um thick, subcontinuous, inspersed with network of granules (soluble in K); algal cells 6-8 um diam.; medulla dense; hyphae ca. 5 um diam., randomly oriented, mostly appearing rounded or very short. Apothecia few, often lacking, borne submarginally on the areoles, adnate then soon somewhat constricted sessile, round to flexuous, to ca. 1 mm diam.; disks medium yellowish brown to grayish yellowish brown to blackish, epruinose, becoming convex or lumpy, matt to slightly shiny; margin ca. 0.1 mm wide, concolorous with thallus or blackish towards outside when young, slightly raised, then level, becoming excluded; cortex ca. 25 um; algal layer present in margin, somewhat scattered below hypothecium; hypothecium ca. 100 um, hyaline, of randomly oriented short conglutinate hyphae; subhymenium with oil drops; hymenium ca. 65 um; epihymenium 10-15 um, yellow-rown, inspersed with granules (soluble in K); paraphyses 2-2.5 um thick below; tips slightly swollen, ca. 3-4 um, olive-brown in K; asci to 50 um long; spores not easily released, ellipsoid, 10-15 x 5-7 um. Pycnidia common; ostioles grayish yellow-brown; spermatia filiform, 20-35 um long. On siliceous rock, associated with cyanobacteria, Umbilicaria phaea, Rhizocarpon bolanderi, and L. cf. semitensis. Chem.: usnic acid (and ___?). Northern California. Similar to L. chlorophaeodes but with hypothallus more evident, and ___? L. "shacklefordensis" Ryan sp. nov.?

13. Apothecial discs \pm brown (pale tan to brownish or olivaceous, or red-brown). Apothecia 0.4-0.75 mm diam.; margin mostly regular, persistent, thick, prominent, verrucose to crenulate, yellowish; cortex thin, indistinct, not gelatinous or expanded; amphithecium usually packed with algae; paraphyses tips swollen. Spores 8-12 x 4-7 um, broadly ellipsoid. Containing usnic acid. Usually on wood.(L. saligna)

13. Apothecial discs \pm yellow (?). 14

14. Areoles crenate at edge; apothecial margin mostly entire and even.
..... 15

14. Areoles mostly not crenate; apothecial margin very irregular. Colorado. Algae 8-10 um diameter. Apothecia cortex 30 um thick; outer 15 um inspersed with yellowish brown granules (insoluble in KOH); algal layer filling most of margin; under hypothecium, very strongly and unevenly thickened, 100-200 um; medulla filled with

whitish granules; excipulum hyaline, dense, not much gelatinized; hyphae ca. 2 µm wide, with narrow lumina; parathecium with hyphae randomly oriented, hypothecium 50-200 µm thick, very uneven; hyphae mostly vertically oriented; hymenium 45 µm; epihymenium 12-14 µm, inspersed; spores oblong-ellipsoid (L:W = 3-4), 11-14 x 3-4 µm. Chem.: usnic, rangiformic, fatty acid 2A,2B,3C; unknown 6C; unknown (UV+ after charring) 4-5B,5-6C or UV+ blue-green 6A,5-6B,6C and 3C.L. "fontanorum" Ryan ined.

15. Areoles contiguous (to imbricate?); hypothallus not evident. Growing in California. "L. cf. polytropa"

15. Areoles scattered on thin black hypothallus. Growing in Arizona. Thallus areolate, tightly attached, thin, determinate; areoles more or less plane, 0.5-0.8 mm across, becoming strongly crenulate, especially towards periphery; upper surface pale greenish yellow (104); edges concolorous. Apothecia common, adnate to sessile, borne 1-several submarginally on areoles, 0.5 mm diameter; discs pale yellow (89) to grayish yellowish brown (80), epruinose, plane; margins 0.1 mm wide, entire to slightly flexuous, level, persistent, pale greenish yellow (104) to grayish yellow (90). Chem.: no substances (???). Arizona: Mt. Baldy Wilderness Area.Lecanora baldyensis Ryan & Nash, sp. nov.?

THALLUS at first somewhat scattered, or contiguous and forming irregular low moundlike rosettes ca. 1 cm across; thallus center areolate-squamulose, somewhat arched up off the substrate; squamules ca. 0.5-1 mm across, crenate, rimosely divided into a few secondary areoles; lobes plane to convex, somewhat arched up from substrate, weakly (to distinctly) separated from each other, 1-1.5 mm long, 0.5-1 mm long, crenate-incised, the ultimate segments 0.3-0.7 mm wide; upper surface yellowish white with slight grayish tinge; upper cortex ca. 70 µm thick, the upper 20 µm inspersed with fine yellowish granules (soluble in K) and coarse whitish granules (insoluble in K), the lower part mostly hyaline, but penetrated by narrow extensions of the inspersed layer; algal layer more or less interrupted, ca. 30 µm thick; medulla filled with whitish granules; lower cortex developed at least near margins or tips, ca. 50 µm thick, the outer 10 µm brown. Apothecia common, becoming crowded in thallus center, constricted sessile but appressed, to 1(-2) mm diameter, becoming distorted and lobed; discs plane to irregularly convex, epruinose, light yellow (86) when young, then mostly dark orangish yellow (72), to light olive brown (94) or deep yellowish brown (75), sometimes discolored dark grayish yellowish brown (81); margins 0.1(-0.2) mm wide, becoming flexuous, more or less level with disc, persistent or becoming crowded back, densely pruinose, appearing more or less pure white (); cortex indistinct, ca. 30-50 µm thick, inspersed; algal layer present in margin and below hypothecium, interrupted, ca. 30 µm thick; medulla filled with whitish granules; excipulum hyaline, strongly conglutinate and "brittle"; hypothecium ca. 50 µm thick; subhymenium ca. 30 µm thick; hymenium ca. 65 µm high; epihymenium inspersed with yellowish granules (soluble in K); paraphyses _____; asci ____; spores ellipsoid to broadly ellipsoid (L:W = 1.4-2), 8-10 x 4-5(-6) µm. Spermatogonia not seen. Chem.: _____. Arizona? (Nash 5238). Somewhat resembles L. valesiaca, but has thicker, more convex and loosely attached lobes or squamules. It may be close to Squamarina degelii. Lecanora (Petroplaca?) navahoensis Ryan, sp. nov.?

Thallus to 5 cm across, ≤ 1 mm thick, effuse, areolate-squamulose; areoles roundish to crenate,

0.3-0.7 mm across, plane to moderately convex, scattered, thin and tightly attached, or becoming aggregated and \pm imbricated into groups c. 1.5-2.5 mm across, to 1 mm thick with \pm free margins; upper surface pale yellowish green to paler than grayish yellowish green, matt to slightly shiny, epruinose, edges often paler; upper cortex 50 μ m thick, with numerous dead algal cells; algal layer 50 μ m, continuous; algae 12-17 μ m. Apothecia soon sessile and constricted, numerous, becoming crowded and \pm imbricate, to 1 mm across; discs light yellowish brown to light orangish yellow, epruinose, matt to shiny, plane to convex; margin pale greenish yellow, scarcely raised, entire to flexuous, 0.1 mm wide; cortex 40 μ m thick; algal layer present in margin and below hypothecium, continuous, c. 50 μ m thick; hypothecium hyaline, to 200 μ m thick in center, hyphae conglutinate, unoriented, c. 3 μ m wide, lumina 3-5 x 0.5 μ m; subhymenium c. 30 μ m; hymenium. 70 μ m; paraphyses 2 μ m, tips 2-2.5 μ m; spores ellipsoid, 10-13 x 5-6 μ m, rather thick walled. Thallus P-, containing usnic acid and unknown gray-brown 3ABC. On rocks, Arizona (San Francisco Peaks), Geiser NV 01225. L. "geiseri"
Ryan in herb.

Detailed description of Lecanora chlorophaeodes Nyl,

Description below is based on the protologue of L. chlorophaeodes and the description by Hawksworth & Dalby, supplemented by information given in square brackets [] based on material in CANL unless noted otherwise.

THALLUS [forming patches to 3 cm across], areolate or verrucose-granulose [to subsquamulose], [mostly tightly attached], [not rosette-forming], [mostly rather thin, 0.5-1 mm]; **hypothallus** thin, black [sometimes extending beyond the peripheral areoles], or absent; **areoles** [starting as granules, becoming up to 1 mm across, entire to coarsely crenate, plane or mostly convex, often divided into coarse granules, discrete and more or less scattered, or contiguous to aggregated but not imbricate, the marginal ones similar to the central ones]; **upper surface** [epruinose, matt], warted, yellow-glaucous [pale yellowish green (121), the edges of the areoles concolorous, in herbarium becoming a dirty yellowish color paler than yellowish gray (93) and becoming covered with terpene crystals]; **upper cortex** [ca. 30 µm thick, the upper 15-20 µm inspersed with yellowish granules (soluble in KOH)]; **algal layer** [ca. 50 µm thick, apparently continuous--need thinner sections]; **medulla** [filled with grayish matter (insoluble in KOH)]; **lower cortex** [absent].

APOTHECIA to 0.4-1(-2) mm diameter, [numerous], scattered, or crowded, constricted at the base, [adnate then broadly sessile, borne laminally to marginally one to several per areole, partly appearing to develop between the areoles]; **disks** plane to strongly convex and uneven, [epruinose--Kopaczewskaja, et al., and specimens in CANL], often somewhat shiny [matt], reddish brown to reddish-testaceous (black according to Hawksworth & Dalby; rather dark brown according to James, 19 ; sometimes olive-black according to Hedlund, 1892) [brownish orange (52) to moderate, deep or strong brown (55-56, 58), or becoming discolored to dark grayish brown (62), pale orangish yellow (73) when young]; **margin** thick [0.1-0.2 mm], [rather flat-topped in vertical section], entire to [soon strongly] crenate or crenulate, [scarcely raised], [persistent according to Hedlund, 1892; becoming crowded back on specimens in CANL], [towards outside concolorous with thallus or slightly paler, next to disk with distinct pale "inner margin" (proper exciple)]; **cortex** [apparently rather indistinct and similar to that of thallus--based on thick sections; need more critical study]; **algal layer** [apparently continuous in margin and below hypothecium]; **exciple** [hyaline to yellowish, composed of dense, crowded, thick-walled, gelatinized hyphae]; **hypothecium** becoming massively developed [bowl-shaped, to 150 µm thick]; **hymenium** 60-75 µm high; gelatin I+ blue then yellow; **epihymenium** [15 µm thick] brown (bluish green according to Hawksworth & Dalby), [densely] inspersed with granules [soluble in KOH], N+ weakly purple-red; **paraphyses** not very discrete, simple or sparsely branched, occasionally anastomosed below, ca. 1-2 µm thick below, the tips not or only slightly thickened, 2.5-3[-5] µm thick, olive, K+ green; **asci** 45-55 x 12-18 µm, broadly clavate, long-stalked, I+ blue then yellowish brown; **spores** 8 per ascus, [sometimes few and poorly developed], [broadly to] narrowly ellipsoid [L:W = 1.7-2.3:1], (9)10-12(-13) x 4-5(-8) µm, occasionally 1-septate.

SPERMOGONIA [immersed; cavity globose, ca. 100 µm diam.]; **spermatia** filiform, more or less curved, 18-27(-30) x 1-1.5 µm.

SPOT TESTS AND CHEMISTRY Thallus K+ yellow, P-, C- or weakly yellowish; **Cortex** KC+ yellow (usnic acid); **medulla** KC- (zeorin; most specimens other than Wong 3899 also contain a fatty acid with R_F 4-5A, 2-3B, 3C and sometimes one with R_F 6A, 5?B, 5C; without the pertusaric-constipatic group).

DISTRIBUTION AND ECOLOGY: Eastern Canada (Ontario and Quebec), on siliceous rocks (granitic) in deciduous forests or in the open.

DISCUSSION: According to Deglius (1931), there are two forms of this species, which are not sharply separated from each other: one with well developed thallus composed of large, rounded verrucae and usually blackish disks (probably another species), the other with smaller verrucae or almost athalline and with usually pale and very numerous discs (probably at least partly true L. chlorophaeodes). Magnusson (1946) also refers to the variability of the material that has been included in this species and specifically mentions two forms, one with epruinose apothecia (probably true L. chlorophaeodes), the other with densely bluish pruinose apothecia (probably another species). European material with pruinose apothecia and growing on soil is mostly L. leptacina.

As discussed by Brodo & Wong (1990) and Wong & Brodo (1992), North American material with pruinose apothecia is L. weberi Ryan, which differs especially in chemistry (lacking zeorin, and containing fatty acids of the pertusaric-constipatic group) and usually has a rosulate to imbricate-squamulose thallus.

Canadian material of L. chlorophaeodes compares quite well with European material, except that the thallus is somewhat more greenish and the disks are somewhat more yellowish. The specimen from Ontario (Wong 3899) is damaged by a parasite, and the hymenium is degenerated, without asci or spores; the thallus and apothecia are distorted and in regenerating.

Several other species of Lecanora are at least superficially similar to L. chlorophaeodes, and also need further investigation. In western North America, some specimens, tentatively identified as L. semitensis (Tuck.) Zahlbr., but having epruinose disks and containing terpenes, need further study.

ADD?:

Lecanora (Petroplaca?) aurantiodisca Ryan, sp. nov.?

TYPE: S-26072 (COLO!).

THALLUS scattered to contiguous, squamulose, forming irregular patches or low mounds ca. 0.5 cm across, to 1-2 mm thick; **squamules** 0.5-1 mm across, irregular in outline, becoming rather strongly crenate-incised; **upper surface** pruinose, with pruina appearing yellowish white (92); **upper cortex** uniformly ca. 25 μ m thick, the upper 15 μ m interspersed with granules; **algal layer** ca. 40 μ m thick, subcontinuous; **medulla** filled with whitish granules.

APOTHECIA to 1-1.5 mm diameter, borne submarginally mostly 1 per areole, more or less sessile; **discs** epruinose, medium or deep orange (51, 53) or almost dark reddish orange (58); **margins** 0.1-0.2 mm wide, becoming flexuous to crenate, persistent, concolorous with thallus.

SPOT TESTS AND CHEMISTRY: Thallus K+ yellow; discs K+ yellow.

DISTRIBUTION AND ECOLOGY: ?--can't find my notes on the label data of the type.

DISCUSSION: I made slides of the anatomy of this species, but have not studied them yet.

I-C-4. Thallus/apothecial margins yellowish.

Thallus continuous to rimose-areolate, pale yellow.

Discs yellowish, reddish, or brownish, epruinose

1. Spores 10-14 x 4-5 um. Thallus K-. Prothallus lacking. Thallus effuse, indeterminate, smooth to tartareous, very indistinctly if at all marginally lobate, to 2 mm thick, irregularly rimose-areolate or continuous, pale yellow. Pseudocortex prosenchymatous, 30-40 um thick, of erect hyphae; algal layer 30-50 um thick, continuous; medulla very dense, white, becoming discolored brownish below, K-, KC+ yellow. Apothecia usually absent, but when present froming clusters in small plaques of the thallus, immersed to adnate, to 2 mm diameter; discs plane to slightly convex, flesh colored; thalline margin vestigial or represented by a few small bead-like remnants. Proper exciple of erect parallel hyphae; epihymenium hyaline, granulose, the granules dissolving in K; hymenium 50-60 um high, difficult to differentiate from subhymenium of vertical hyphae; hypothecium hyaline, with continuous or broken algal layer below; paraphyses simple, 2 um diam., not capitate; asci I+ blue; spores narrowly ellipsoid, straight or somewhat curved. Pycnidia appearing as black dots; ostiole aeruginose; cavity 200 um; pycnospores acicular, curved in a semicircle, 10-15 x 0.5 um. Chem.: usnic acid, atranorin (trace); zeorin, unknown triterpenes, unknown phenolic compound (yellow after charring, A3, B2-3, C5). On vertical surfaces of granite rocks. Texas.L. texana

I-C-5. Apothecial margins yellowish.
Thallus poorly developed, granulose or immersed.
Disks yellowish, reddish or brownish, epruinose.

1. Disks reddish brown to yellow-brown or sordid testaceous (when moistened light flesh-colored). Algal layer well developed below hypothecium. Thallus K+ orange, C-. Thallus granulose-pulverulent, very thin (0.2 mm), not distinctly areolate or cracky, indeterminate, nearly obsolete, sordid yellowish. Apothecia 0.5-0.6 mm diam., 0.3 mm thick, round, smooth, grouped or crowded, sessile; disks planoconvex; margin indistinct, with a pulverulent, spurious thalline margin; cortex 35-50 µm thick, gelatinous, pale, ± dark sordid yellow at the surface, visible ± far in on the underside; algal layer ± continuous at bottom of apothecium, ca. 65 µm thick in the margin and 100-150 µm thick at the center, ± air-filled; algal cells 12-15 µm diam.; exciple gelatinous, 35-55 µm thick, intergrading with hypothecium, the hyphae of both in K distinct, intricate; hypothecium 20-35 µm thick; hymenium 60-65 µm high, grayish cloudy, I+ blue; epihymenium 15-18 µm, greenish yellow interspersed, K+ pale violet, the granules not dissolving, surface uneven; paraphyses firmly coherent (but also "lax" according to Hasse), indistinct, in K + HCl 1-1.5 µm thick, apices pale, not thickened, granules ± free, undissolved; asci ca. 45 x 12 µm, clavate to inflated-clavate; spores (8-)9-10(-11) x (4-)5-6 µm (16 x 7 µm according to Stizenberger), broadly ellipsoid (oblong-ellipsoid according to Stizenberger and Hasse), regular in size. Spermatogonia not found. Apothecial tissues C-, N-, K- or very pale yellow. On calcareous rock, Santa Catalina Island, California.L. phaeophora

1. Disks usually ± yellow. Algal layer poorly developed or absent. Thallus K-. Spores (9-)10-14(-15) x (4.5-)5-6(-7) µm, ellipsoid. Apothecia sessile, constricted below, tending to arise singly on areoles which are then obscured; scattered or often clustered, round to irregular, to 0.3-1(-1.5) mm diameter, disc ± yellow (pale yellow to pale yellow-brown or pale yellow-green, occasionally greenish brown or pale brown, rarely darkening with age--see L. melaena), [reddish yellow, brownish red or carmine red according to Kopaczewska, et al. (1971)]; concave and marginate at first, then convex and emarginate, epruinose, glaucous; margin lacking algae, entire to ± crenulate, pale yellow (paler than disc), initially well developed, then becoming very thin, disappearing. Thallus greenish yellow to pale gray-green or yellow-brown, ± warted-areolate or almost squamulose, sometimes forming a ± continuous, areolate crust; areoles when present ± rounded, surface flat, ± smooth and with ± even and not crenulate margins; often reduced to scattered granules or areoles on a black prothallus (often absent), or immersed. Epihymenium hyaline to yellowish or reddish brown, interspersed with granular crystals dissolving in K; hymenium 45-60; paraphyses 1.5-2(-2.5) µm, sparsely branched, apices slightly thickened. Pycnosporos (12-)18-22(-25) x 1 µm, acicular to arcuate. Thallus P-, K+ yellow, KC+ yellow, C- (Ch: usnic acid, zeorin, rangiformic acid). On siliceous rocks especially in montane to alpine areas, rarely on worked timber. Common, temperate to arctic.L. polytropa s. lato

Key to L. polytropa s. lato

1. Apothecia 0.3-0.6(-0.8) mm diam. Thallus dispersed-granular to obsolete (little developed or almost absent, very inconspicuous and evanescent). Apothecia pale, subsessile on the substrate or minute subtended thallus areas; disk flat to convex, pale brown; thalline part of excipulum commonly well developed (according to Hedlund; thin, very inconspicuous and evanescent according to Fink). Spores 9-12 x 5-6.5 µm wide. Wyoming. Fink questions whether this taxon

belongs in this species or even in Lecanora. L. polytropa v. illusoria (Ach.) Th. Fr.

1. Apothecia 0.5-1.5 mm or more diam. 2

2. Apothecia very large (to 6 mm diam. according to Migula; 0.5-1.5 mm according to Fink), clustered or crowded, adnate, often irregular from pressure, lobed or cracked; thalline exciple thin, concolorous with thallus, disappearing; proper exciple becoming conspicuous and prominent, then entirely crowded back, almost concolorous with disk. Thallus thin, indistinct, sometimes disappearing. Disks flat or strongly convex. Alpine, Oregon. L. polytropa v. alpigena (Ach.) Schaerer [Rabenh.?)

2. Apothecia 0.4-1.3(-2) mm wide, adnate to sessile (elevated if thallus developed), pale; thalline part of exciple commonly well developed. Thallus thin to moderately thick, somewhat rough, rimose to areolate, subsquamulose, or rarely granulose, greenish to yellowish or whitish, sometimes scattered and disappearing. Disks flat convex, yellowish flesh-colored to brownish; exciple thin, concolorous with thallus, flexuous, subcrenulate, sometimes disappearing. Widely distributed in northern U.S. and in California. Spores 10-15 x 5-7 um, ellipsoid. L. polytropa v. polytropa ("v. vulgaris"). 3

3. Thallus thick to thin, commonly straw-colored, shiny, to sometimes almost obsolete. L. polytropa f. polytropa

3. Thallus thick, pale to white, matt, or sometimes obsolete. Apothecial margin towards outside pale or white, matt. L. polytropa f. leucococca (Sommerf.) Th. Fr.

Description of "lecideoid" specimens of L. polytropa (after Rambold, 1989):

Thallus immersed, to 40 mm diam.; hypothallus not obvious. Apothecia irregularly roundish to angular, crowded, ca. 40/square cm, constricted at the base, ca. 0.6-0.8 mm, max. 0.8-1.5 mm diam.; disk subconvex to convex, pale brownish, matt, epruinose; margin at first obvious, later \pm vanishing, pale whitish, matt. Excipulum max. 70-100 um, laterally 60-80 um thick; ectal zone colorless; hyphae ca. 6 um diam., with lumina 2-3 um; inner zone colorless, incrustated with lichen substances; hyphae 3-4 um diam., with lumina ca. 1.2-1.5 um; medullary zone at basal part with algal cells; hypothecium colorless; hyphae ca. 3 um diam.; subhymenium colorless; hymenium 50-55 um tall, colorless, I_{\pm} blue; epihymenium pale brown, ca. 15 um; paraphyses occasionally branched, not anastomosing, ca. 1.7-2 um, apices 3 um thick; asci ca. 30-45 x 10-12 um; tholus max. ca. 10 um, min. 2.5-3 um thick; amyloid zone above axial masse not obvious; outer amyloid wall layer ca. 0.2 um thick, I_{\pm} blue or-. $I_{conc.} \pm$ brown or -; non-amyloid wall layer ca. 0.2 um thick; spores ellipsoid, 9-12 x 4-5.5 um. Pycnidia not observed. Thallus K-, C-, P-; cortex KC+ yellow; medulla KC-. Chem.: usnic acid, zeorin (traces), rangiformic acid (traces). On siliceous rocks, alpine.

ADD? (not yet reported for N. America, but might be expected here):

Thallus thin to very thin. Spores 4.5-6 um wide. L. stenospora

L. polytropa v. calciseda Zahlbr.