

LECIDEA

III-A. SAXICOLOUS.

Thallus sorediate or isidiate, or with cephalodia.

1. Thallus with cephalodia. 2
1. Thallus without cephalodia. 4
 2. Spores non-halonate (without an epispore), narrower than 10 um; hymenium less than 80 um high; epihymenium green to blue-green. 3
 2. Spores halonate (usually with a conspicuous gelatinous epispore); wider than 10 um; hymenium over 100 um high; epihymenium olive to brownish.
Amygdalaria
3. Thallus with large (up to 2 mm) verrucae, greenish yellow; cephalodia pink, containing Gloeocapsa; spores 9-12 x 5-7 um. Lecidea shushanii
3. Thallus with small verrucae (less than 1 mm) or subgranulose, grayish to yellowish gray; cephalodia brownish, with Nostocoid photobiont; spores 16-22 x 6-9 um.
..... Pilophorus pallidus
4. Thallus isidiate-furfuraceous, areolate, dark olive-brown to black, I-, P+ yellow, C+ red. Parasitic. ...(Rimularia furvella)
4. Thallus sorediate. 5
5. Thallus at least partly rusty or ochraceous. 6
5. Thallus gray, white, or yellowish, I-. 7
 6. Asci in K/I with dark blue apical dome and contrasting pale blue axial mass (Lecanora-type). Paraphyses mainly simple. Spores without halo, under 12 x 8 um.
..... Miriquidica atrofulva
 6. Asci in K/I with pale blue apical dome and constrasting dark blue axial tube (Porpidia-type). Paraphyses branched and anastomosed. Spores with halo when young, over 12 um long. Porpidia (and a few species of Amygdalaria)
7. Thallus yellowish. 8
7. Thallus gray or gray-white. 9
 8. Thallus C+ orange. Thallus yellow-white, Paraphyses free.
(Lecidella scabra)
 8. Thallus C-, with \pm confluent soralia, pale yellowish, uneven or smooth. Apothecia to 0.8 mm, dense or absent, convex, lead-gray. Spores 8-11 x 3-5 um. Hypothecium hyaline. Hymenium 50-70 um. Epihymenium pale. On steep siliceous rocks. L. orosthea
9. Thallus or at least exciple C+ red (gyrophoric acid). Asci Trapelia-type or Rimularia-type. 10

9. Thallus and exciple C-. Asci otherwise. Paraphyses over 1.5 um thick. 11

10. Asci Trapelia-type. Discs often reddish, especially when wet. Trapelia placodioides and T. obtegens

10. Asci Rimularia-type. Discs black. Rimularia gibbosa and R. badioatra

11. Thallus (medulla) K+ red. Thallus effuse, moderately thick, areolate; areoles \pm convex, 0.2-0.5 mm wide, contiguous and angular to here and there subdiscrete and rounded; surface matt, gray to blue-gray; soralia conspicuous, numerous, 0.4-0.5(-0.8) mm across, becoming confluent; soredia white, granular. Hypothallus indistinct. Apothecia numerous, dispersed to rarely confluent, adpressed but above thallus, 0.4-0.7 mm diam.; disc black, plane, shiny, epruinose, plane; margin thick, tumid, persistent, entire, often shiny. Escipulum in central part hyaline to pale brown, below hypothecium and towards margin darker, brown to brown-black. Hypothecium hyaline; hymenium 85-90 um, I+ blue then soon red-brown; epihymenium dark brown; paraphyses coherent, septate, towards tips slightly thickened. Asci pyriform. Spores often poorly developed, 13-16 x 6.5-8 um. West-central Canada. L. petsamoensis

11. Thallus K- or + yellow. 12

12. Thallus K-, poorly developed, membranaceous or verrucose, dirty gray, with inconspicuous indistinct white-punctate soralia. Apothecia to 1 mm wide, black, with thick, persistent margin. Hypothecium dark brown. Spores 16-20 x 7-8 um. Hymenium 100-110 um; epihymenium olive-brown to olive-black or blue-green-black. New York. L. sorediifera

12. Thallus K+ yellow. Spores 20 x 6.5-7 um. Thallus indistinctly rimose-areolate, with soralia, patchy? ("maculatum dissolutus"), the patches \pm linearly arranged and radiating toward periphery of thallus, thin, Apothecia rare, sessile, to 1.2 mm, plane, bluish pruinose, the margin black, slightly prominent. Epihymenium pale dirty yellowish granular, K+ yellow (dissolving the granules); hypothecium brown-black; paraphyses richly branched towards tips; tips unthickened. Medulla I+ blue. On shaded rock, Smoky Mts. L. degelii

III-B. SAXICOLOUS.

**Apothecia \pm pale or distinctly colored,
not definitely black.**

1. Hypothecium \pm dark brown. Spores 10-12 x 5.5-6 μ m. Hypothecium rather dark brown. Thallus gray, K-, C-, I-, or absent. Apothecia to 0.4 mm, sordid yellow-brown, smooth, plane, immarginate. Hymenium 60-70 μ m; epihymenium sordid yellow. On gneiss near a stream, Connecticut. L. rivulorum

1. Hypothecium hyaline to \pm pale. 2

2. Spores 5-7 x 2.5-3 μ m. Thallus crustose, ashy gray and darkening, continuous, smooth or slightly roughened. Apothecia 0.15-0.25 mm diam., adnate or partly immersed, flesh-colored to yellow-brown, flat to slightly convex; margin concolorous, inconspicuous, soon excluded. Hypothecium pale. Hymenium pale. Paraphyses sometimes distinct, but more commonly coherent and indistinct. Asci clavate. Spores ellipsoid. On pebbles in moist woods. Ohio. L. intropallida

2. Spores over 7 μ m long. 3

3. Hypothecium \pm brown. Spores 7-14 x 3-4 μ m. Thallus greenish to yellow-brown. Usually on bark. (L. flavidolivens)

3. Hypothecium hyaline to pale yellow. 4

4. Asci Trapelia-type, narrow, the tholus with weakly amyloid lateral areas and distinctly amyloid apical cap. Paraphyses under 1.5 μ m. Thallus or at least exciple usually C+ red. Trapelia

4. Asci otherwise. Paraphyses over 1.5 μ m. 6

5. Asci Fuscidea-type, subcylindrical, with K/I+ cap separated from K/I+ apical area by K/I- area. Thallus sometimes C+ red. Apothecia red-brown to black. Spores often brownish. Fuscidea

5. Asci otherwise. Thallus and exciple (as far as known) C-. 6

6. Thallus greenish gray to dirty brown or darker, \pm scattered, verrucose. Spores 9.5-11 x 4.5-5 μ m. Apothecia to 1.8 mm, slightly to strongly convex, light to darker brown, the margin thin, surrounded by a very thin thalloid veil; when mature becoming irregular and furrowed. Hypothecium hyaline to pale yellowish. Epihymenium hyaline to pale yellowish or brownish. On granite, Ohio. L. congesta

6. Thallus straw yellow, K+ yellow, with \pm confluent soralia, C-, uneven or smooth. Spores 8-11 x 3-5 μ m. Apothecia to 0.8 mm, dense or absent, convex, lead-gray. Spores 8-11 x 3-5 μ m. Hypothecium hyaline. Hymenium 50-70 μ m. Epihymenium pale. On steep siliceous rocks. (L. orosthea)

ADD:

L. (Fuscidea?) scrupulosa

III-C. SAXICOLOUS. Thallus rusty or ochraceous.

1. Thallus (medulla) I+ blue-violet.2
1. Thallus I-.6
 2. Thallus K+ red.(see L. lactea)
 2. Thallus K-.3
3. Spores over 15 um long and 6 um wide, with "halo" at least when young.
(see Porpidia)
3. Spores under 13 um long and 6 um wide; without halo.4
 4. Thallus areolate-verrucose to bullate-areolate; areoles to 1.5 mm diam., distinctly convex, constricted at base, rusty red, ochre or red-brown (by iron oxides), matt, K- or K+ yellow, C-, KC-, P- or P+ orange (stictic acid, \pm porphyrylic acid, or no substances); prothallus indistinct. Cortex deep rust in section (iron oxides). Hypothecium \pm dark sordid to green. Apothecia to 1.5 mm, black, arising between the areoles, at first appearing \pm immersed but finally \pm sessile, long remaining plane and marginate, but then becoming strongly convex and immarginate. Exciple green-black at outer edge, internally pale. Epihymenium green-brown or dark green, bright green or blue-green, K+ blue-green, N+ reddish purple ("Lecidea-green"). Hymenium (40-)45-60(-80) um, hyaline. Hypothecium ochre-colored to pale brownish (or dark brown?), massively developed and almost stipe-like in section. Subhymenium distinctly pale bluish green. Paraphyses sparsely branched and anastomosed, the 2-4 final cells swollen, tips to 5 um wide, greenish. Asci Lecidea-type. Spores (7-)8.3-10.1(-14)[-17.5?] x (4.5-)5.2-6.1(-7.0) um, ellipsoid to broadly ellipsoid. Pycnospores 8-12 x 1 um, bacilliform. On metal-rich siliceous rocks, in humid areas, arctic-alpine. (This should perhaps also be keyed out with the L. atrobrunnea complex).L. silacea
 4. Thallus of \pm flat areoles, or rimose-areolate.5
5. Hymenium 50-70 um high; hypothecium \pm pale.(see L. lapicida)
5. Hymenium 100-125 um high; hypothecium dark.
.....(see L. confluens)
6. Thallus with blackish soralia. (Miriquidica atrofulva)
6. Thallus without soralia.7
7. Thallus K+ red.(Tephromela armeniaca)
7. Thallus K- (or + yellow?) 8
 8. Spores 15-23 x 6-12 um, with halo; hymenium 80-140 um high; hypothecium and inside of exciple brown-black.(see Porpidia and Amygdalaria)
 8. Spores under 15 um long and 9 um wide, without halo; hymenium to 85 um; exciple pale inside.9

9. Hypothecium \pm dark brown. 10
 9. Hypothecium \pm hyaline. 11

10. Thallus areolate. Apothecia immersed; hymenium 75 μ m high, I-; exciple thick.
 Alpine.(see Tremolecia atrata)

10. Thallus minutely verruculose. Apothecia \pm sessile, hymenium 50-55 μ m high;
 Apothecia usually moderately constricted below but varying from adnate to strongly
 constricted, black, to 0.3 mm, slightly to moderately convex, usually becoming strongly
 convex, immarginate or nearly so. Exciple thin or absent. Spores 6-8 x 3-3.5 μ m,
 ellipsoid to broadly ellipsoid or sometimes ovoid. Hypothecium rather bright yellow-
 brown due mostly to abundant granular matter, in K brighter, the hyphae 2-4 μ m diam.,
 moderately thick-walled, irregularly arranged. Hymenium sordid hyaline or sordid pale
 yellowish brown below, I+ intensely blue-black. Epihymenium dirty olive-blackish, with
 considerable granular matter, K+ pale bluish to intensely greenish black. Paraphyses
 highly gelatinized, inconspicuous, the lumen (?) ca. 1.5-2 μ m. Thallus reddish orange, K-,
 I-; verrucules compacted, strongly convex, firmly attached, ca. 0.1 mm across. Algae 4-
 10 μ m diam. On shaded iron-rich rocks, New York.L. amniculensis

11. Paraphyses free. Apothecia sessile; ascus with I+ blue tholus.(see
Lecidella spp.)

11. Paraphyses coherent. Apothecia \pm immersed; ascus without I+ blue tholus.
 12

12. Apothecia 0.7-1.3 mm diam., with exciple. Hypothecium hyaline. Thallus
continuous to rimose;(see L. lithophila)

12. Apothecia 0.15-0.25 mm diameter, , without exciple. Hypothecium pale orange-
brown. Thallus squamulose-areolate, the areoles swollen, continuous or scattered, \pm
 plainly lobed, sometimes radiately striate, yellow-orange, appearing greenish gray to
 brownish white due to pruina, K-, C-. Apothecia black, flat, \pm immersed in thallus.
 Epihymenium dark brown; hymenium 50-60 μ m. Spores 12-14 x (5-)6-7(8.5) μ m. Ascus
 with distinct, I- tholus. On calcareous rocks, Alabama.L. mamillana

III-D SAXICOLOUS.

Thallus \pm yellow.

1. **Thallus C+ orange or red.** 2
1. **Thallus C-, or endolithic.** 3
 2. **Thallus rimose-areolate, I+ slightly blue. Hypothecium brown.** Thallus K-.(see Lecidea labradorica)
 2. **Thallus \pm granular, to verrucose, rounded-squamulose or squamulose-areolate, scurfy-blastidiate, or sorediate, I-.** Hypothecium brown or hyaline. Paraphyses lax; asci with I+ blue tholus. Lecidella
3. **Thallus with \pm confluent soralia**, pale yellowish, C-, uneven or smooth. Apothecia to 0.8 mm, dense or absent, convex, lead-gray. Spores 8-11 x 3-5 μ m. Hypothecium hyaline. Hymenium 50-70 μ m. Epihymenium pale. On steep siliceous rocks. L. orosthea
3. **Thallus without soralia.** 4
 4. **Spores (7-)8-10 x 2.5-3 μ m. Hypothecium olive-blue.** Apothecia to 2 mm, epruinose. Hymenium 45-50 μ m. Thallus rimose-areolate, ochre-white. (L. theodori)
 4. **Spores over 3 μ m wide, and mostly longer. Hypothecium brownish, reddish, yellowish, or hyaline.** 5
5. **Hypothecium \pm brown.** Thallus K-. Spores 13-16 x 6.5-7.5 μ m. Apothecia 0.5-1 mm, K+ yellow; hymenium 75-85 μ m; epihymenium \pm blue-green. Thallus yellowish gray-white, rimose-areolate. (L. amabilis)
5. **Hypothecium hyaline to pale or ochre.** 6
 6. **Asci with distinct I+ blue tholus (either entirely I+ blue, or with an I- axial mass).** 7
 6. **Asci without such a tholus.** 8
7. **Thallus continuous or rimose-areolate, mostly pale lemon yellow (to straw-colored), chalk-white, rarely deep yellow**, thick, well-developed, on whitish prothallus. Apothecia sessile, soon convex-immarginate, to 1.5(-2.5) mm, black (even when wet). Epihymenium yellow- to black-green. Hypothecium hyaline or pale; exciple at least partly pale. Spores 8-14 x 4.5-7.5 μ m. Tholus entirely I+ blue. Thallus K+ yellow (K- according to ?). Alpine, on calcareous rocks. Lecanora marginata
7. **Thallus very finely granular, yellowish grey to mostly distinctly greenish-yellow**, forming small patches among other lichens. Hymenium not inspersed (but hypothecium often with large granules) [If hymenium inspersed, and thallus continuous to rimose-warty and almost squamulose, at most dirty yellowish, see Lecidella spitsbergensis). Lecidella viridans v. chodatii
8. **Thallus K+ yellow or red.** 9
8. **Thallus K-.** Hypothecium hyaline. Spores 8-12 x 5-6 μ m. Apothecia to 1 mm, soon

adnate, epruinose. Hymenium 50-60 um. Epihymenium olive green. Thallus yellowish white or white, \pm lobed, on black hypothallus. Alpine. (L. atromarginata)

9. Paraphyses over 3 um thick, greatly swelling in water. Tephromela armeniaca and T. aglaea

9. Paraphyses thinner, not swelling. 10

10. L. suberratica

10. Not as above. 11

11. Spores (9-)11-14 x (5-)6-7(-8) um. Epihymenium dirty olivaceous green-brown or bright green-black; Thallus pale yellowish, yellow, or grayish yellow, C- or + yellow, K+ yellow (sometimes turning orange), KC+ orange, P-, I-, rimose to areolate, of scattered, convex granules 0.4 mm wide, usually compacted into thick, deeply cracked verruculose areoles 0.7-1.3 mm wide, \pm matt, sometimes finely cracked, almost tartareous; hypothallus absent. Apothecia abundant, crowded to scattered, 0.4-0.7(-1.8) mm, black, becoming convex, the margin initially thin, weakly swollen, raised, eventually becoming reduced or excluded, \pm shiny, initially sometimes pale yellow like thallus, then becoming black, or initially black; disc round to irregular-oval, plane to slightly convex (occasionally very convex), often minutely roughened especially with age, \pm matt, initially immersed, usually becoming sessile or adnate, occasionally just level with thallus even with age, black, epruinose or rarely with a light bluish pruina. Hypothecium \pm hyaline to light fulvous or ochre; exciple externally dark green-black, pale internally; hymenium (45-)52-60(-80) um, hyaline or light green above, I+ blue; epithecium often with brownish granules; paraphyses slender, coherent, with enlarged apical cell, usually branched near apices; spores oval-ellipsoid. On siliceous rock (especially sandstone, also on conglomerate and granites). Maritime, often in the supralittoral zone. British Columbia. L. sulphurea

11. Spores 8-10 x 5-6 um. Epihymenium green-black or blue-green. Thallus \pm yellow-white, thick, areolate, the areoles plane, to 0.5 mm diameter. Apothecia to 1 mm, sessile, plane, the margin thick. Edge of exciple concolorous with epihymenium; hypothecium hyaline or pale; hymenium 60 um. L. crisima

III-E-1 SAXICOLOUS.

Thallus areolate to almost squamulose, ± brown to black.

Parasitic on other lichens.

Medulla I-.

1. Areoles isidiate-furfuraceous, cracky, thick, dark olive-brown to black. Apothecia rare. Medulla P+ yellow, C+ red. (Rimularia furvella)

1. Areole surface ± smooth. Apothecia usually present, to ca. 0.5 mm diameter.2

2. Spores (12-)15-24(-26) x (6-)8-12(-14) um. Thallus crustose, small to very large, irregularly spreading, distinctly cracked-areolate, yellowish brown, dark brown, gray, olive brownish to ± blackened, ± glossy, covered by epinecral layer; areoles angular, subconcave, flat or subconvex, separated by deep cracks; hypothallus black, occasionally visible at margins. Medulla I+ violet, P-, K-, KC-, C-, containing confluent and 2'-O-methylperlatolic acids. Apothecia (0.2-)0.5-1.2(-1.8) mm diam., rounded or deformed through mutual pressure, flat to subconvex at maturity, numerous, scattered or crowded in groups, immersed then flat, often aspicilioid, between areoles; disc black (to gray), non-umbonate, roughened, not pruinose, ± marginate; margins thin, raised, persistent, black. Hypothecium hyaline to brown; hymenium 70-110(-120) um tall, orange-red in Lugol's solution; paraphyses under 2 um thick. Conidia 5-12(-14) x 1-1.5(-2) um. On somewhat metal-rich or basaltic rocks and on schists, often on other lichens (Aspicilia). Immersaria athroocarpa (Ach.) Rambold & Pietschm.

2. Spores under 15 um long and 8 um wide. 3

3. Hypothecium dark, at least in lower part. On Lecanora rupicola.4

3. Hypothecium entirely hyaline. Usually on thallus of Rhizocarpon disporum. Thallus to ca. 1 cm diam., commonly much less than 5 mm across, areolate-squamulose, brownish; areoles rarely to 1 mm diam., mostly much smaller, contiguous, roundish, soon becoming sublobate or lobate, concave to plane, usually gray-margined, I-, K-, C-, P-. Apothecia black or brown-black, to 0.4 mm diam., roundish, immersed and sublecanorine, rarely becoming somewhat sessile; disk plane to slightly convex; margin thin and sometimes becoming ± distinct, usually indistinct and poorly developed. Excipulum blue-green at edge, colorless elsewhere, commonly weakly developed, I-, K-, C-, P-. Hymenium colorless, 45-50 um, I+ red-brown. Epihymenium olive-brown to partly blue-green, K-, C-, P-. Spores 8-15 x 4-8.5 um. Upper montane and subalpine, Colorado. L. "rhizocarpicola" Anderson ined. ("L. sp. 18" in Anderson's dissertation)

4. Epihymenium brown or olive brown. Areoles to 0.4(-1) mm wide. Discs slightly concave to plane. Spores 8-12 x 4-6 um. Thallus brownish to dark brown-grey, ± shiny, on black hypothallus,Rimularia insularis

4. Epihymenium ± blue-green. Areoles 1-3 mm wide. Discs convex, ± immarginate. Spores 8-10 x 3-4 um. Thallus black, brown inside.Miriquidica intrudens

III-E-2 SAXICOLOUS.

Thallus areolate to almost squamulose, ± brown to black.

Not parasitic on other lichens.

Medulla I+ violet.

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1. Spores globose, 4.5-7 um diameter. Thallus peltate, prolonged downward into a stout irregular stem, and with a broad top (4-10 mm wide) of imbricate lobules, which form squamules of as seen from above; squamules "medium-sized", rigid, leafy, thickish, densely crowded, ascendant or imbricate, concave or undulate, sometimes revolute; surface finely reticulate and wrinkled to form convex areoles.; surface dull chestnut brown or yellow-brown; underside of lobules black; stems dusky ashen. Thallus KC+ dusky olive. Thallus indeterminate. Apothecia small, usually numerous, black, at first flat with a thin, rather rentire and slightly paler margin, then convex and ± immarginate, sometimes conglomerate or clustered and irregular. Hypothecium brown or brownish; paraphyses confluent or agglutinate, slender, threadlike; hymenium pale greenish, I+ blue; asci ventricose, rarely developed; epihymenium green. On hard siliceous rocks (e.g., rhyolite), ± alpine. Sierra Nevada Mtns., northern California/Nevada (to Cascades of Washington?).L. truckeei

1. Spores ellipsoid, or (quite frequently!) not developed. Thallus as a whole not peltate (but individual labels may be so).2

2. Cortex K+ red (main substance: norstictic acid). Apothecia to 3 mm diameter, to 1.5 mm thick, dispersed to several contiguous in a tight, convex cluster, round to roundish angular, commonly lobate or incompletely subdivided (cracked), sessile among the areoles, ± broadly adnate to narrowly constricted, rarely short-stalked (but not much elevated), level with areoles or elevated above them, disc black, somewhat shiny, or matt and grayish to whitish pruinose, slightly concave to flat then slightly convex, rarely ± globose, commonly convex-undulate to even subtuberculate; margin moderately thick and swollen to thin, elevated or not, persistent or excluded, matt, pruinose to epruinose. Thallus to 15 cm across, yellow-ochre, brown to pale brownish or greenish brown to olivaceous green or pale greenish, shiny, to 1(-1.5) mm thick, strongly rimose to areolate or squamulose-areolate; areoles moderately dispersed to usually contiguous or rarely even subimbricate, round to irregularly angular or sublobate, 0.8-2(-3) mm diam., slightly concave or flat to usually strongly convex or undulate, sometimes incompletely subdivided; margin concolorous or whitish or blackish; surface matt to subnitid-cereus, commonly cracked or verrucose; hypothallus black to dark bluegreen or rarely whitish in places, usually evident between the areoles and/or at thallus margin. Spores 6.6-11.6(-15) x 3.5-6.0(-7.5) um; L:W = 1.8-2.7 um. Excipulum C-. Ectal excipulum blue-green or greenish to olivaceous at the edge (or throughout when very thin), ± colorless or slightly yellowish inside, nubiolous from deposits of norstictic acid which obscure the hyphae, 40-140 um thick lateral to hymenium and upper hypothecium, 10-80 um thick along the flank, the entire excipulum 15-180 um thick at the flank; at the side composed of compact, parallel-radiate, branched and anastomosing hyphae 3-5 um thick, the hyphae adjacent to the hymenium originating in the hypothecium, along the flank composed of compact, ± parallel, short-celled hyphae to 7 um thick, the hyphae often passing beyond

the surface of the excipulum to form a mat of irregularly arranged hyphae; I- or weak blue in places. Medullary excipulum \pm whitish or colorless, with granular deposits, well developed laterally near ectal region or nearly absent, I+ blue (purple). Hypothecium colorless in upper 50-80 μ m, brownish or pale to dark brown in broadly conical lower zone 50-380 μ m thick at center, commonly interspersed with colorless or slightly yellowish crystals adjacent to medullary excipulum, I+ blue or blue-green. Hymenium 30-55(-65) μ m, I+ blue-green, the asci red-brown; epihymenium olive gray to (blue-) green, K= or rarely K+ red. Paraphyses subdiscrete to discrete in water, branched (especially above) and in places anastomosed, some simple, 1-2 μ m thick below; apical cells clavate to irregular, 2-5 μ m thick. Asci clavate, 8-spored. Spores usually ellipsoid or oblong, rarely ovoid, 5.5-13 x 3-5(-6) μ m. Upper montane and subalpine, sometimes on moist surfaces. Colorado; California. L. syncarpa Zahlbr. (syn. L. "saxosa" Anderson ined.)

2. **Cortex K- or + yellow.** Apothecia to 1(-1.5) mm diam.3
3. **Apothecia immersed 1 to several per areole; discs concave.** 4
3. **Apothecia \pm sessile, discs \pm flat or convex.** 5
 4. **Paraphyses conglutinate. Exciple dark. Spores 12-12.5 x 6.5-7.5 μ m, biseriate,** frequently with gelatinous halo. Apothecia sunken in the areoles, usually 1 per areole, sometimes with multiple discs; discs black, concave, matt, epruinose; margin thin or indistinct. Thallus to 13 cm across; areoles flat, 0.1-0.3(-1.0) mm across, very angular, mutually pressed together, the chinks running deeply between them, the thallus thin at the edges, to 1 mm thick centrally; surface very dark sooty brown, bordered by a black hypothallus and pale gray margin about 3 areoles (1 mm) wide. Exciple dark brown, paraplectenchymatous, full of crystals, joining the hypothecium which is also dark brown. Hymenium 65-75 μ m, pale below; epihymenium brown. Paraphyses unbranched, non-moniliform, septate, 3 μ m thick, with tips thickened to 6 μ m and brown. Asci clavate, ca. 68 x 12 μ m. On sandstone, Arctic (Alaska). Immersaria carbonoides
 4. **Paraphyses lax. Exciple pale. Spores 8.5-10.5 x 6.5 μ m, uniseriate.** Alaska. Fuscidea lowensis (syn. L. aleutica)
5. **Hypothecium and lower hymenium pale to deep green.** Thallus rusty red or red-brown, C-.(L. silacea)
5. **Hypothecium hyaline or brown, not green.**6
 6. **Hypothecium at least partly \pm dark brown.** Thallus C-. 7
 6. **Hypothecium \pm hyaline or pale.** Spores under 14 μ m long. Epihymenium \pm green or blue. Apothecia often 0.5 mm or more in diameter. 11
7. **Areoles \pm convex.** Epihymenium bluish or greenish. Discs epruinose. 8
7. **Areoles concave (to rarely convex).** Note: Rhizocarpon bolanderi, which is extremely common especially in California, can be superficially very similar to these species; it has very small, dark, shiny areoles, and brown, muriform spores).

8. Areoles small (0.3-0.6 mm), very uneven, with protuberances, dark grayish brown or chestnut-brown, frequently black margined, usually without distinct hypothallus. Cortex thin (10-16 μm thick). Hypothecium dark. Exciple tissue conglutinate-fragile, not appearing pseudoparenchymatous. Spores 11-14 x 4-4.5(-5) μm . Thallus to 8 cm or more across, indeterminate, 0.3-0.45 mm thick, squamulose-areolate; areoles subcontiguous, loosely affixed by medullary hyphae, irregularly convex to strongly uneven, with smaller or larger protuberances giving the thallus a very rough and irregular surface, matt; margin not adpressed. Hypothecium \pm conical, 65-100 μm , violet brown, deeper brown in K. Apothecia frequent, 0.4-0.6 mm diam., 0.3-0.4 mm thick, rounded, subimmersed to adnate; disc plane to strongly convex, black, smooth, epruinose; margin thin, concolorous with disc, not prominent, sometimes disappearing. Cortex colorless, the outer 3-4 μm reddish brown; cells ca. 2 μm diam., irregular, thin-walled; epinecral layer present 10-20 μm . Algae 8-17 μm diam., forming dense continuous layer 85-100 μm thick, with single algae protruding into cortex. Medulla chalky, with granules dissolving in HCl; hyphae very lax, 2-3 μm thick, long-celled with thin walls. Exciple 60-80 μm thick in margin, to 100 μm thick below, the structure arising from outer part of hypothecium, sometimes poorly developed, above greenish black externally and paler to nearly hyaline within, below changing to violet brown in external 4-6 μm , N+ dark violet, K-. Hymenium 50-60(-80) μm , colorless or bluegreen, I+ dark blue. Epihymenium 6-8 μm , green-black. Paraphyses coherent even in K, unbranched, 2-3 μm wide, tips to 5 μm . Spores not always developed, narrowly ellipsoid to oblong. On granitic rocks. Northeastern U.S. (New York).L. brunneofusca

8. Areoles larger, mostly > 0.5 mm across. 9

9. Spores 7-9(-12) x 3-5(-6) μm . Areoles large, (0.2-)-0.6-1.5(-2.5) mm, \pm smooth and even, yellowish to reddish or grayish brown, convex to plane, not at all to rarely thinly whitish to ashy marginate, on distinct black hypothallus. Cortex thicker (80-100 μm). Hypothecium pale to partly intense brown (or hyaline according to Th. Fr.). Exciple of different structure. Thallus thick to moderately thick, areolate; areoles contiguous to scattered (usually discrete at the periphery), smooth, matt to slightly nitid, angular to round or difform, here and there subsquamulose; hypothallus black, \pm distinct and conspicuous at least at periphery. Cortical hyphae 4-6 μm thick, irregularly arranged, conglutinate, often rounded-cellular, moderately thick-walled, hyaline, brown above; epinecral layer 5-10 μm thick. Apothecia dispersed to partly crowded, sometimes affixed to hypothallus. 0.6-1.2(-1.5) mm diam., becoming rather thick, adnate, slightly constricted at base; discs plane then convex, black, matt, epruinose; margin moderately thick, black, epruinose, matt, sometimes becoming excluded. Exciple blue-green-black externally, inside pale; hyphae radiating, 4-5 μm thick, rather leptodermatous, conglutinate, not continuous below hypothecium. Hypothecium rather thin, ca. 140 μm , of erect, conglutinate hyphae. Hymenium 40-70 μm , I+ blue; paraphyses simple, infrequently septate, 1.5 μm with tips to 3 μm ; epihymenium blue-green, to brownish black in uppermost part. Paraphyses strongly coherent, slightly gelatinous. Asci clavate, with moderately thickened wall. Spores ellipsoid to subglobose. Pycnospores filiform, straight to slightly curved, 9-13 μm long. Extremely polymorphic, probably consisting of several species. Very common, montane to alpine. Reported from Alaska to California and New Mexico in the west, and to Hudson's Bay in the east. Arctic and Rocky Mountains, and at high altitudes in Mexico.L. atrobrunnea (sensu lato--see key to variants)

9. Thallus ± shiny. Thallus 3-6 cm across; areoles contiguous or sometimes scattered, squamule-like, ca. turgid, strongly convex, 1-2 mm diameter, pale to dark reddish brown, rounded or angular, occasionally fissured and lobulate; margins and undersides darker; hypothallus black. Apothecia sessile, single or grouped, 0.5-2 mm; disc black, shiny, smooth, convex; margin thin, smooth, gradually crowded back. Hymenium 45-50 µm, almost hyaline at center of disc, darkening and intergrading with hypothecium at the circumference, I+ blue; epihymenium thin, blue-black; paraphyses strict, closely coherent. Hypothecium brown-black, thick. Exciple dark, continuous with hypothecium. Asci narrowly clavate. Spores oblong-ellipsoid, 10-12 x 4-5 µm. On hard siliceous rocks (e.g., granite) at higher elevations. Southern California; Washington; Noble's report from British Columbia is based on a C+ red, I- species. According to Magnusson the type of L. protabacina is missing from Nylander's herbarium. Hasse specimens under this name in CAS are rather variable. (Note: a taxon somewhat similar to this but often with very distinctly radiating marginal lobes is common in the Sierras).L. protabacina

10. Areoles not stalked, rather dark red-brown (rarely ashy brown or pale to dark gray), the margins often ashy; dispersed to contiguous, moderately thick to usually rather thin, on black hypothallus; areoles small, plane to slightly convex or rarely partly depressed-convex, smooth or partly becoming irregularly uneven. Hymenium high (well over 50 µm); epihymenium blue-green, to brown-black especially in uppermost part; hypothecium brown-black or rarely pale in upper part. Paraphyses strongly coherent, slightly gelatinous. Asci clavate to broadly clavate. Apothecia (0.3-)0.5-1.3 mm diam., at first developing on hypothallus between areoles, then adnate, not constricted at base; disc plane or rarely convex, black, epruinose, slightly shiny; margin usually rather thin, blackish or at first dark ashy, subnitid, smooth, entire, usually not very prominent, persistent. Spores (5-)7-12(-16) x (3-)5-6 µm, ellipsoid to subglobose or oblong. On tops of large siliceous boulders (granite, sandstone, etc.). Arctic-alpine, S to Labrador, Utah and Washington. Similar to L. fuscoatra but thallus a darker, ± reddish brown, and medulla I+ blue, P+ orange, K+ yellow, KC-, C- (stictic acid).L. paupercula

10. Areoles ± stalked, dull chestnut brown or yellow-brown, concave or undulate, sometimes revolute; surface finely reticulately wrinkled to form convex areoles.; Epihymenium green. Sierra Nevada Mtns. (to Cascades?).(see L. truckeei)

11. Thallus copper color to grey-brown or brick red to clay color or soiled tawny yellow, on black hypothallus.L. atrobrunnea sensu lato

11. Thallus pale brownish to brown grey with a faint blue-green tinge to brownish gray or grayish; hypothallus dark, weakly developed, sometimes evident at thallus margin. Thallus rimose-areolate to mostly areolate; areoles to 0.8-0.9 mm diam., contiguous, angular, plane to moderately convex. Apothecia black, to 1 mm diam., dispersed to 5-6-contiguous, roundish to angular, sessile, at first ± immersed; disc concave to moderately convex; margin thin, ± distinct, persistent to ± excluded. Ectal excipulum rather weakly developed, pale to moderately bluegreen throughout or at least externally, I-, K-, C-, P-; medullary excipulum extensive, nubilous from granular crystals, containing a few algal cells at the side, I+ blue-purple. Hypothecium floccose-brown below, faintly blue-green above in a moderately thick layer.

Epihymenium blue-green. Hymenium faintly blue-green below, 50-60 μm . Spores ovoid to ellipsoid, 6.5-12 x 3.5-5.5 μm . On periodically inundated boulders in larger subalpine streams. Colorado. "Possibly belonging to the Lecidea atrobrunnea group."L. sp. 9 (Anderson)

ADD:

Thallus determinate, chestnut brown to darker, squamulose-areolate; squamules mostly approximate or contiguous, lobulate or flexuose to undulate and convex, glistening, the border blackening. Apothecia sessile, the disk flat or flattish-convex, black, with a thin, entire proper margin slightly paler than disk. Epithecium subgranulose. Hymenium hyaline. Paraphyses strict, coherent, some of them abruptly capitate above. Hypothecium yellowish to brown. Asci inflated-clavate, nearly as high as the hymenium. Spores 8, elongate-ellipsoid, 8-11 x 3-4 μm . 300-2000 m. S. California. L. atrobrunnea sensu Hasse

L. atrobrunnea s. lato

**Very preliminary,
based on TLC of ASU specimens by Rambold**

Morphological and anatomical notes on these chemotypes are needed. Some of these may be species that are included in the key above. Several of the chemotypes show considerable external variability in appearance.

1. **Thallus or exciple K+ red, P+ orange (norstictic acid).** [L. rapax, which is lichenicolous on Bellemeria alpina, also keys out here]. 2
1. **Thallus and exciple K- or K+ yellow, P+ or P-.** 4
 2. **Thallus distinctly lobed at margin.** California. L. "californica" ined.
 2. **Thallus not lobed.** 3
3. **Upper surface pale.** L. syncarpa
3. **Upper surface dark.** L. sp.
 4. **Thallus or exciple K+ yellow, P+ orange (stictic acid).** [L. subfumosa, with a dark hypothecium, and L. protecta, with colorless to pale brown hypothecium, hymenium 40-50 μ m, and apothecia 0.5-0.8 mm diam., also key out here]. 5
 4. **Thallus or exciple K-, P-.** 9
5. **Ascospores 9.2-15.5 x 5.3-8 μ m, L:W = 1.5-2.5. Hymenium 50-75 μ m.** On calcium-free rock. In cool-humid regions, often on rocks partly immersed in soil. 6
5. **[Morphology and anatomy not studied yet].** 7
 6. **Hypothecium dark brown to brown-black.** L. paupercula
 6. **Hypothecium pale to medium brown.** L. praenubila
7. **With substances in addition to stictic acid.** 8
7. **With stictic acid only.** California, Oregon. L. sp.
 8. **With confluent acid.** Utah. L. sp.
 8. **With 2-O-methyl-planaic acid.** Wyoming. L. sp.]
9. **Thallus or exciple C+ reddish, with gyrophoric acid and confluent acid.** Need to check I reaction of medulla. May belong to L. fuscoatra group. Oregon, Washington. L. sp.
9. **Thallus and exciple C-, without gyrophoric acid.** 10
 10. **Without lichen substances in TLC.** [an uncommon chemotype of L. paupercula also keys out here]. L. sp.
 10. **With lichen substances.** 11
11. **With two unknown substances (not the same in the two species).** L. spp.
11. **With confluent acid or 2-O-methyl-perlatolic acid.** 12
 12. **With confluent acid.** [L. placodiiformis from Antarctica also keys out here]. L. sp.
 12. **With 2-O-methyl-perlatolic acid (syn.: 2-O-methyl-planaic acid) as the major product, plus confluent acid.** Thallus medium brown to dark brown, glossy (due to an unpigmented epinecral layer). Apothecia 0.8-1.5(-3) mm diam., highly overtopping areoles, dispersed (2-60 per square cm). Ascospores (5-)6.7-9.3(-12) x 3.2-4.3(-5.0) μ m, L:W = 1.8-2.7 μ m [larger in v. chamaelepis]. Hymenium unpigmented, (30-)35-55(-60) μ m; epihymenium olive green to bluish green ("Lecidea-green" usually present). Exciple C-. Hypothecium unpigmented to ochre-color to medium brown (seen in sections 14-20

um thin). Pycnospores 10.5-20.0 um long. On calcium-free rocks, alpine. Widespread, southwestern to northwestern. L. atrobrunnea s. str.

ADD:

With hypostictic acid as main substance. Europe. L. "mira" Hertel, nom. nud.

III-E-3 SAXICOLOUS.

Thallus areolate to almost squamulose, ± brown to black.

Not parasitic on other lichens.

Medulla I-; thallus C+ red or rose.

Rev. 6/90

Thallus C+ red. Paraphyses coherent. Apothecia to 3 mm diameter. Hymenium ca. 60 µm.

1. Hypothecium at least partly ± hyaline or pale. 2

1. Hypothecium dark brown to brown-black. 3

2. Thallus pale, yellowish-greyish to fawn color or olive-brown, glossy-cartilaginous, some areoles white edged (from either a light pruina or a disruption of the cortex, sometimes increasing to give the areoles a tartareous appearance, then usually ± thin and plane); hypothallus black, usually inconspicuous, or absent. Hypothecium ± hyaline immediately below hymenium, then fulvous to light brown, grayish, yellowish, or occasionally medium brown. Thallus rimose-areolate to areolate, 0.3-0.8 mm thick, ; areoles 0.6-1.3(-2) mm wide, slightly to strongly convex or undulate and almost squamulose, contiguous and fusing or separated by deep cracks. Spores 11-14(-17) x 5-6(-7) µm, ellipsoid or oblong-ellipsoid, sometimes not abundantly produced. Apothecia 0.3-2(-3) mm diam., common, sometimes abundant, usually ± scattered, occasionally appearing white because of heavy pruina; disc innate, usually quickly adnate, or slowly and then with margin appearing white and thalline; not to only slightly constricted, ± plane to a little convex, round to often a little irregular or lobulate, black, ± lightly white pruinose; margin persistent or not. Exciple of lithophila-type, dark externally, ± hyaline internally or grayish with granular deposits, C+ red; epithecium greenish brown to greenish black; hymenium 55-70 µm, light greenish to hyaline below and light green above, I+ blue. Paraphyses strongly coherent, mostly simple and unbranched, the apical cell weakly thickened, to 4 µm diam. Asci clavate, 45-55 x 10-14 µm. Cortex C+ red, medulla C-. On siliceous rocks (sandstone, conglomerate, granite, igneous rocks). California to Washington; coastal British Columbia. L. manni

2. Thallus dark, brownish gray, I-, C+ and especially KC+ red, rimose-areolate, rather poorly delimited. Apothecia to 0.3 mm, immersed, aspicilioid, irregular in shape, generally elongated, not clearly marginate. Epihymenium brownish, K-, N-; hypothecium ± hyaline; Paraphyses coherent but rather lax. Spores 10-17 x 8-11 µm, sometimes spherical. On siliceous rock. L. umbriniformis

3. Epithecium C-. Thallus whitish gray to pale yellowish brown or grey-brown (to pale red-brown), ± continuous, rimose-areolate, areoles to 3 mm diam., ± flat to somewhat convex, glossy, slightly rugose; on black hypothallus, Hypothecium dark brown to brown-black, well developed and stipe-like. Spores (7-)9-14(-17) x (3.5-)4.4-6.5(-10) µm, ellipsoid to narrowly ellipsoid, or sometimes spherical. Apothecia 0.5-2(-3) mm diam., ± immersed, sunken into or between the areoles, flat to slightly convex, black to densely gray-pruinose; exciple usually persistent, slightly raised, of irregular chains of subglobose cells, the outer brown and to 5 µm wide, ± colorless within, C+ pink. Paraphyses simple or sparsely branched near tips, ca.

1.5-2 um wide, not swollen or gradually widening to 3(-5) um at tips, tips sometimes with olive-brown pigment. Asci Lecidea-type. Epithecium olive-green to olive-brown, olive in K; hymenium 55-75 um. Pycnospores (7-)8.3-10(-12) x 0.5-0.8 um, bacilliform. Thallus P-, K-; cortex and/or excipulum C+ red, containing gyrophoric and \pm lecanoric acids. Morphs with gray thalli \pm lacking a brown tinge are sometimes treated as var. grisella (Flörke ex Schaerer) Nyl. Usually on rather smooth, slightly nutrient-rich siliceous rocks in temperate to warm, wind-protected, sun-exposed sites, meso- to xerophytic, widespread in steppe and mediterranean climates. Common, at least in California. L. fuscoatra

3. Epithecium C+ red. Thallus dark tawny brown, sometimes almost reddish brown with some edges indistinctly blackened (or more rarely whitened) or not; areolate; areoles clustered to separate, usually of groups irregularly placed on the hypothallus; areoles 0.6-1.2 mm wide, round to oval, slightly convex in a "shield" shape or sometimes angular by compression, steep-sided, occasionally cracked and slightly lobulate; surface slightly shiny, \pm smooth, Hypothallus black, indistinct. Hypothecium dark (reddish) brown, often granular. Apothecia common, abundant, scattered to grouped, 0.8-1.5(-2.0) mm wide; proper margin thin, even with disc or a little raised, \pm persistent, black; disc adnate, not constricted, initially round to angular when among grouped areoles, becoming lobulate and cracked or fissured with age; initially plane but then slightly convex or undulate and then often appearing almost concave, minutely roughened, black, \pm lightly white pruinose. Hymenium 65 um, light greenish or greenish brown above and \pm a little reddish brown below; paraphyses strongly coherent but branched only at apices. Exciple dark on outer edge, light internally. Spores not found. Cortex and medulla C+ red in section; exciple C+ red. On igneous rock. British Columbia. "L. cf. protabacina" of Noble.

L. mannii

THALLUS Thallus areolate to subsquamulose, (0.18-)0.3-0.6(-0.8) mm thick; **areoles** contiguous to dispersed towards thallus margin, sometimes dispersed throughout, rounded-angular to roundish, not or slightly constricted at base, 0.6-2(-3.5) mm wide, concave or flat (teratoid forms) to usually slightly (to strongly?) convex or undulate and almost squamulose, contiguous and fusing or separated by deep cracks. **Surface** pale, yellowish-greyish to fawn color or olive-brown, ochre-colored to pale brown, or to pale reddish brown (when dry; considerably paler and often olive tinged when wet), glossy-cartilaginous (thin pigmented zone of cortex, covered by hyaline epinecral layer), some areoles with a narrow whitish or grayish rim (from either a light pruina or a disruption of the cortex, sometimes increasing to give the areoles a tartareous appearance, then usually \pm thin and plane); **hypothallus** usually inconspicuous, grayish or blackish, sometimes dendroid.

APOTHECIA (0.3-)0.5-1.4(-3.0) mm diam., common, sometimes abundant, 20-160 per square cm, usually \pm scattered, not or only slightly constricted at base; **disc** innate, usually quickly adnate, or slowly and then with margin appearing white and thalline; not or only slightly constricted, \pm plane to a little convex, round to often a little irregular or lobulate, black, unchanged when wet, epruinose; **margin** persistent or eventually disappearing, not or occasionally (in large apothecia) slightly flexuous **Exciple** of lithophila-type, well developed, 45-80 um thick, \pm hyaline internally or grayish with dense deposit of tiny crystals of gyrophoric acid, with a 8-20 um thick blackish rim, K-, P-, C+ red, I-; hyphae parallel-radiate, 2.5-4.0 um diam.; **Hypothecium** \pm hyaline to pale blue-green. **Subhymenium (ascogenous layer)** distinguishable only after staining with cotton blue, 25-55 um thick. **Epithecium** olive-green to

brownish green, rarely blue-green, which may or (usually) may not contain Lecidea-green; **hymenium** (47-)55-70 um, light greenish to hyaline below and light green above, I+ blue.

Paraphyses strongly coherent, mostly simple and unbranched, the apical cell weakly thickened, to 4 um diam. **Asci** clavate, 45-55 x 10-14 um. **Spores** (7.0-)9.7-14.7(-22.0) x (4.0-)4.8-6.5(-7.5) um, ellipsoid or oblong-ellipsoid (L:W = 1.7-2.5; mean spore volume 150-330 cubic um), sometimes not abundantly produced.

PYCNIDIA only occasionally developed, immersed, often lens-shaped, with dark ostiole; **pycnospores** formed apically, bacilliform, (7-)9.0-10.0(-11.5) um long.

CHEMISTRY: Cortex K-, P-, C+ red, KC+ red, or C-, KC-, medulla K-, P-, C-, KC-, I-. Gyrophoric acid chemosyndrome

ECOLOGY AND DISTRIBUTION: On siliceous rocks (sandstone, conglomerate, granite, igneous rocks). Mediterranean climate, coast of California; also reported from Washington and coastal British Columbia.

NOTES: Differs from L. fuscoatra in having a ± hyaline (rather than dark brown) hypothecium.

III-E-4 SAXICOLOUS.

Thallus areolate to almost squamulose, \pm brown to black.

Not parasitic on other lichens.

Medulla I-; thallus C-, K+ red or orange.

1. Hymenium 45-60 μ m; epihymenium sordid blue green to olive. Thallus to 1(-3) cm diam., sometimes coalescing to 15-20 cm across, areolate to squamulose-areolate, usually with dark overall color due to predominance of hypothallus; areoles pale to dark brownish or greenish, slightly concave to convex, 0.1-0.7(-0.85) mm across, usually less than 0.2 mm thick, some convex or globose ones to 0.6 mm thick, \pm dispersed to \pm contiguous, round to roundish-angular, slightly concave to usually \pm plane to convex or rarely even globose or short-stalked; margins concolorous or often whitish or grayish; surface smooth or sometimes slightly furrowed or cracked, matt to subnitic, epruinose; hypothallus black or somewhat blue-green, usually well developed, rugose or ridged to somewhat verrucose-areolate, usually dendritic-lobate at margin, evident between areoles and at margin, rarely only a thin network among the areoles. Apothecia dispersed to often grouped, roundish to roundish-angular, usually gyrose and/or umbonate, sessile or somewhat stalked, strongly constricted at base, borne on hypothallus or at edge of areoles, to 0.6 mm; disc concave to plane, black, epruinose, minutely roughened or uneven, subnitic; margin moderately thick, distinct, elevated, persistent, usually very irregular and folded. Ectal excipulum brownish or somewhat violet-brownish throughout (darker externally), sometimes bluegreen in places (e.g., externally along the flank) or rarely \pm blue-green throughout, the inner two-thirds interspersed with deposits of norstictic acid, 15-25 μ m thick lateral to hymenium, 20-30(-50) μ m thick along the flank, composed of compact, globose- to ellipsoid-celled hyphae 3-7(-8) μ m thick, in places commonly appearing subcellular; I-. Medullary excipulum colorless, moderately developed below the hypothecium but usually not sharply differentiated from it, continuous downward in the stalk to the hypothallus or rarely continuous with thalline medulla, composed of fairly dense network of globose- to ovoid-celled hyphae 3-5 μ m thick, the hyphae separated by small air spaces or below by deposits of norstictic acid, I- or weak blue in places. Hypothecium colorless or faintly blue-green, 30-60 μ m thick, with thin-walled, irregular-shaped vesicular hyphae to 10 μ m diam., scattered throughout among the vertical paraphyses bases. Hymenium colorless to faintly bluish green, I+ bluish then brownish red. Epithecium paler in K. Paraphyses subdiscrete to discrete in water, sparingly branched to predominantly branched and anastomosed, 1-2 μ m thick below; apical cells \pm cylindrical to clavate, 1.5-3.5 μ m. Asci commonly broadly clavate or inflated clavate. Spores globose or subglobose to ovoid, 6-10 x 4.5-7.0 μ m. Spores 6-10 x 4.5-7 μ m. Thallus K+ red, P+ yellow (norstictic acid). Under overhangs on siliceous rocks. Colorado. [Note: herbarium specimens of Tephromela armeniaca that have turned brown may also key out here; they have apothecia 0.8-2 mm or more across and spores only 3.5-4 μ m wide].L. "americana" Anderson ined. (called L. recessa Magn. in Anderson's dissertation)

1. Hymenium 50-80 μ m; epihymenium reddish- or yellowish-brown. Thallus 5-6 cm across, very thick (to 2 mm), rimose-areolate, bay brown to dark chestnut brown, shiny; areoles (0.4-)1.5-3(-4) mm wide, angular, plane to somewhat convex, very uneven, irregularly cracked-broken; margin black, \pm elevated, inrolled; hypothallus, when present, black. Apothecia rather sparse, solitary or often contiguous or confluent, 0.5-1.5 mm wide, immersed to adnate; disk pinkish-brown to dark reddish-brown or almost black (red-brown when wet), epruinose, at first plane and marginate, then soon convex and immarginate. Hypothecium hyaline; hyphae 2-3 μ m

diam., thick-walled, \pm vertical and densely compacted, mixed with thin-walled vesicular hyphae to 9 μ m diam. Exciple sometimes hyaline and intergrading with hypothecium, externally somewhat yellowish brown, within \pm olivaceous or yellowish due mostly to granules of norstictic acid; hyphae 2.5-5 μ m diam., often decidedly nodulose, with lumina of variable width, radially arranged, immersed in a gelatinous matrix or externally gelatinized, usually several times branched to somewhat netlike. Hymenium 50-80 μ m, hyaline, I+ blue then sordid red; epihymenium reddish to yellowish brown, K+ olive-brown, sometimes with hyaline gelatinous cover. Paraphyses strongly coherent, readily separating in K, 2-2.5 μ m diam., the tips capitate thickened to 5 μ m and often darkened. Spores poorly developed, ellipsoid to ovoid or oblong with rounded ends, (9-)10-13 x 5-6 μ m. Pycnospores \pm curved, ca. 30 x 1 μ m. Cortex K+ red (norstictic acid); medulla K-. New York. [Reported by Lowe; not in Egan?]L. arnoldii

III-E-5-a SAXICOLOUS.

Thallus areolate to almost squamulose, \pm dark brown to black.

Not parasitic on other lichens.

Medulla I-; thallus C-, K- or + yellow.

Needs further revision, with more emphasis on thallus and less on hypothecium and spores.

1. Hypothecium pale. Spores mostly over 7 μ m long and 3 μ m wide (but often lacking); thallus areolate-squamulose. 2

1. Hypothecium \pm dark. Thallus distinctly brown or blackish, \pm dark, well-developed. Epihymenium dark. Spores ellipsoid. 7

2. Spores (7-)9-11 x 3-3.5 μ m. (*L. fuscatoatra* sensu Magnusson)

2. Spores mostly over 10 μ m long and/or over 4 μ m wide, or (very frequently!) not developed. 3

3. Thallus thickish, \pm lobed at margin; areoles bullate, 2(-2.5) mm wide, 1.5 mm thick, yellow-brown to dark brown, shiny, without prothallus. Spores 10-19 x 4-7 μ m. (*Miriquidica garovaglii*)

3. Thallus thinner, not becoming lobed. 4

4. Hypothecium dirty brown to reddish brown. Hymenium 40-50 μ m high. (see *L. melaphanoides*)

4. Hypothecium hyaline. Hymenium 60 μ m or more high. 5

5. Apothecia to 0.6 mm diameter, immersed in thallus; disk flat; margin pale, disappearing. Thallus P-, K-, brownish black, chinky subareolate, thin, on black hypothallus. Spores 10-12 x 5-7 μ m. Hymenium 65 μ m; epihymenium brown; hypothecium hyaline. Colorado, Washington. *Miriquidica instrata*

5. Apothecia often over 0.5 mm diameter, adnate or sessile. 6

6. Spores 10-18 x 5-8 μ m. Apothecia to 1.5 mm diam. Thallus P+ yellow to red, K+ yellow. Exciple persistent, carbonaceous. Thallus forming small roundish "islands" on other lichens, gray. (*L. subplumbea*)

6. Spores 9-11 x 6-8 μ m, or 6-8 μ m diameter. (see *L. rugosa*)

7. Thallus black. Hypothecium violet, K+ blue-green. Hymenium 130-160 μ m high. Spores 5-8 x 3.5-4 μ m. Thallus to 2 cm across, black, shiny, rather thin, angular areolate; areoles flat (to slightly concave near margin of thallus), 0.5-0.7 mm across; hypothallus not evident. Apothecia dispersed, few, to 2 mm broad, adnate, black (unchanged wet), epruinose, shiny, plane and thinly marginate, soon convex and immarginate. Excipulum in lower part \pm violet or blackish. Hypothecium and lower part of hymenium violaceous. Hymenium with blotches of blue-green or blue-green black in upper part, I+ blue then dirty red. Violet pigments K+ distinctly bluegreen. Paraphyses strongly coherent, septate, sometes branched, slightly clavate above. Spores 5-8 x 3.5-4 μ m. On acidic rocks. Arctic (Alaska and Greenland). *L.*

picea

7. Thallus brown. Hypothecium \pm brown-black. Hymenium under 100 μ m high. 8

8. Spores 8-12 x 3-4 μ m. Thallus determinate, of approximate, brown squamules, slightly concave to undulate and becoming convex, round-angular or lobulate, K-, C-; hypothallus indistinct. Apothecia subinnate or appressed; disk dull black, flat to convex, round-angular or sinuate, the proper margin slightly paler than disc, thin, persistent, entire or crenulate and sinuate, subcarbonaceous. Epithecium continuous, bluish black or brown black. Hymenium hyaline, 90-92 μ m, I+ blue; asci clavate; paraphyses strict, coherent, not all clavate at the blunt, bluish tips. Spores oblong-ellipsoid. Hypothecium brown, as dark as the epithecium and thicker than the hymenium. Apothecial tissues K-, N-. On granite. California. Differs from Nylander's material (at least as studied by Magnusson) in having a squamulose thallus, higher hymenium, and perhaps epruinose disks, among other features. L. fuscatoatra sensu Hasse

8. Spores over 4 μ m wide. 9

9. Thallus of uneven verruculose areoles or verrucules. Epithymenium bluish or bluish brown. Spores biserial, 9-14 x 5-6 μ m, oblong-ellipsoid, sometimes partly 1-septate. Thallus thin or thick, brownish or olivaceous, with indistinct hypothallus, K-. Apothecia dispersed or aggregated, to 0.4 mm, disc flat with thin margin, becoming convex and immarginate. Exciple radiate, of thick-walled cells, brown or rosy red at edge, paler inside. Hypothecium dirty brown to reddish brown, sometimes mottled. Hymenium 50 μ m, hyaline, the upper part bluish. Paraphyses conglutinate but in K lax, 1.5 μ m thick, gelatinous, unbranched, septate, the tips thickened. Asci clavate. Arctic (Alaska to Greenland). L. melaphanoides

9. Thallus distinctly areolate or squamulose, not verruculose. 10

10. Areoles \pm strongly convex; edges not pale. 11

10. Areoles \pm flat or concave. Epithymenium \pm green. Apothecia over 0.4 mm diam. Hymenium ca. 50 μ m high. 15

11. Hymenium 100 μ m high. (Schaereria fuscocinerea)

11. Hymenium under 70 μ m high. 12

12. Hymenium 30-40 μ m high. Thallus Acarospora-like in habit, of convex to subglobose, \pm squamulose warts (0.5-)1-2(-3) mm wide, rather loosely attached to the rock, constricted below, red-brown to dark brown, often shiny; surface uneven; prothallus absent. Apothecia 0.3-0.5(-1) mm, sessile, \pm flat to somewhat convex, black; exciple black, becoming excluded, of dark brown radiating hyphae expanded to 6-8 μ m at the surface; epithecium dark brown, K-; hypothecium dark brown, massively developed and sometimes \pm stalked. Paraphyses sparsely branched and anastomosed, apical cells with dark brown caps, to 6 μ m wide. Asci Catillaria-type. Spores (5-)7-10(-12) x 4-5(-6) μ m, ellipsoid, \pm attenuated at the ends. Pycnospores 12-17 x 0.5 μ m, threadlike and arcuate. Thallus and medulla P-, K-, C-, KC- (no substances). On exposed siliceous rocks. L. fuliginosa

12. Hymenium 50-70 μ m high. Exciple and hypothecium (often) confluent. 13

13. Epihymenium blue-black. Thallus becoming squamulose.(see L. protabacina)

13. Epihymenium brown. 14

14. Thallus of verrucae less than 1 mm diameter. Rimularia impavida

14. Thallus squamulose; squamules to 1.3 mm diameter, bullate, round to angular, scattered to crowded, flat-lying, dirty sand brown to green-brown, shiny, strongly folded/cracked (?--"verfaltet" in German); K-, P+ yellow (K+ red, with norstictic acid according to Wetmore). Thallus to 4 cm across. Cortex plechtencymatous, with brown zone in upper part, otherwise colorless; epinecral layer present. Algal layer loose, well delimited above and below. Medullary hyphae 4 µm diam., thin-walled. Lower cortex absent. Apothecia 0.8-1.2 mm diameter, sessile on surface of areoles, 1 per areole; **disc dark red-brown**, plane; margin paler brown, swollen, persistent; hymenium hyaline, 65 µm, I+ blue; epihymenium 12-15 µm or more, medium brown; hypothecium weak brown; excipulum plectenchymatous, colorless inside, brown at edge. Paraphyses parallel, straight, ca. 3.5 µm thick, thin-walled, little branched and anastomosed; some cells with knot-like lateral growths; apical cells to 5 µm thick, frequently somewhat curved or asymmetrical, the entire apical cell or only the upper part medium brown. Apothecial tissues K-, C-, KC-, P-. Asci broadly clavate, 40-45 x 13-15 µm, thin-walled, with distinctly developed amyloid tholus. Spores oblong-ellipsoid, 10-12 x 5.5-6 µm, with smooth outer surface, without halo. Maine, Colorado, S. Dakota.L. lyngei

15. Apothecia rare, 0.7-1 mm or more diam., 0.2 mm thick, occurring between the areoles, with discs black, level with areole surface, then becoming prominent, convex and subimmarginate, sometimes breaking into several parts; margin indistinct or thin. Areoles strongly adherent, ± scattered, 0.5-0.8(-1) mm wide, 0.2-0.3 mm thick, discrete or rarely a few approaching, round or usually irregular, also sublobate, scattered on the surface of the stone, dark red-brown to blackish brown, smooth, matt, concave to plane, with thin, prominent white margins, often irregular, sometimes sublobate; lower side not distinctly dark; hypothallus indistinct. Upper cortex 25-35 µm thick, colorless, the exterior 5-9 µm dark brown; cells distinct, the lumina 1.7-3 µm across, moderately thin-walled; epinecral layer 10-25 µm; algae 5-10 µm in a continuous layer, 60-100 µm thick with very even upper surface; medulla colorless, transparent without enclosed air, or at least upper part grayish from granules, consisting of distinct, smooth or granular, long-celled, 3-4.5 µm thick, thin-walled hyphae, laxly arranged, or dense especially towards the base. Hypothecium blackish brown, 100-150 µm thick (35 µm in "L. washingtonensis"), at the sides separated from the dark part of the excipulum by pale tissue. Excipulum 65-100 µm thick (35 µm in "L. washingtonensis"), thinner in the very margin, blackish brown (K+ green) in exterior half, pale inside. Subhymenium 35 µm, pale. Hymenium 45-55 µm, colorless or upper part pale blue-green; epihymenium 15-20 µm, blackish green; paraphyses ± conglutinate, 1.7-2 µm thick, somewhat coherent even in K; tips slightly thicker, dark olive. Asci ca. 35 x 13 µm, broadly clavate. Spores (often not developed) ellipsoid, 9-10 x 5 µm. On volcanic rock, montaine. Washington.L. cascadenis

15. Apothecia under 0.7 mm diam. (except in "L. fumosa")..... 16

16. Apothecia 0.1-0.15 mm diam., \pm dense to dispersed, immersed, \pm immarginate, or at first with thin margin; disc black, epruinose to thinly pruinose, plane. Hypothecium \pm pale brown to brown below, sometimes hyaline above. Exciple blue-green to olive brown; epihymenium blue-brown to blue-green-black. Paraphyses strongly coherent, moderately thick, slightly gelatinized. Spores ellipsoid, (6-)8-9(-10.5) x 5(-7) μ m. Hymenium 40-45 μ m. Thallus thin, usually rimose-areolate; areoles to 0.3 mm, angular, contiguous or rarely partly dispersed, fuscous brown to subtestaceous or rarely almost grayish, slightly concave to plane, the margins often bluish gray; on conspicuous black hypothallus. On granite. (L. extenuata)

16. Apothecia 0.3-0.7 mm diam. Apothecia adnate to sessile. 17

17. Areoles 0.1-0.4 mm wide. Apothecia 0.3-0.6 mm diam., long immersed, finally emerging and becoming adnate and in part freed by the thallus breaking away, the disk at first plane, becoming moderately convex, dark reddish brown to brown-black, shiny, epruinose; at first immarginate but at maturity thinly marginate, the margin olivaceous, paler than disk. Thallus moderately thin, grayish black or often stained reddish; areoles plane, on thin, black, usually delimiting, hypothallus. Hypothecium dark reddish brown, K-; exciple often poorly developed and very thin, arising from the external portion of the hypothecium, indistinctly pseudoparenchymatous, olivaceous-black or greenish-black along the side of the hymenium, pale below, the hyphae 2-3 μ m diam., with wide lumina and numerous inconspicuous septa. Hymenium 55-65 μ m, I+ blue then the upper 40 μ m reddish brown and the lower part sordid olivaceous blue; epihymenium moderately olive green; paraphyses embedded in abundant gelatin, coherent, ca. 2 μ m diam., sometimes slightly enlarged above to 2.5 μ m. Asci narrowly clavate. Spores 8, oblong to ellipsoid, 8-12 x 4-6 μ m. Algal cells 5-11 μ m. New York. L. humilis

17. Areoles 0.5-0.75 mm wide. Apothecia 1-1.25 mm diameter, sessile. Thallus areolate-squamulose; areoles flat or concave, shiny, brown to nearly black; margin distinct, often paler, becoming intricately flexed; on distinct black hypothallus. Apothecia few, smooth, flat then convex, black, sometimes lightly pruinose; margin thin, black or grayish-black, entire then flexuous or lobate or crowded back. Hymenium ca. 70 μ m; epihymenium brown to blue-black; hypothecium dark brown. Spores 11-16 x 5-7.5 μ m. California. L. fumosa sensu Hasse and Herre (true L. fumosa = L. fuscoatra, but this California species is something else)

ADD:

Thallus of discrete or imbricate, mostly rounded squamules, often with ascending margins, with or without hypothallus. Paraphyses tips only slightly thickened. Asci surrounded by amyloid gelatin. Hypothecium mostly hyaline. Apothecia plane, marginate, black, the exciple lecideine. Squamules pale olive-brown above, epruinose, with green-black margins, with blue-green rhizoids below. On rock. Psorula rufonigra

III-E-5-b SAXICOLOUS.

Thallus areolate to almost squamulose, \pm pale brown.

Not parasitic on other lichens.

Medulla I-; thallus C-, K- or + yellow.

Needs further revision, with more emphasis on thallus and less on hypothecium and spores.

1. Hypothecium pale. Spores mostly over 7 μ m long and 3 μ m wide (but often lacking); thallus areolate-squamulose. 2

1. Hypothecium \pm dark. Thallus pale. Discs pruinose. Epihymenium blue-green. Hymenium 60 μ m. Medulla often K+ yellow. 5

2. Spores (7-)9-11 x 3-3.5 μ m. Thallus thin, brown grey "mushroom-like leprose" or \pm absent on blackish indistinct hypothallus. California. (L. fuscatoatra sensu Magnusson)

2. Spores mostly over 10 μ m long and/or over 4 μ m wide, or (very frequently!) not developed. 3

3. Thallus thickish, \pm lobed at margin; areoles bullate, 2(-2.5) mm wide, 1.5 mm thick, yellow-brown to dark brown, shiny, without prothallus. Spores 10-19 x 4-7 μ m. (Miriquidica garovaglii)

3. Thallus thinner, not becoming lobed. 4

4. Hypothecium dirty brown to reddish brown. Hymenium 40-50 μ m high. (see L. melaphanoides and L. lyngei)

4. Hypothecium hyaline. Hymenium 60 μ m or more high. Apothecia often over 0.5 mm diameter, adnate or sessile. Spores broadly ellipsoid, 9-11 x 6-8 μ m, or subglobose, 6-8 μ m diameter. Apothecia to 1 mm diameter, adnate, epruinose; margin elevated, shiny, becoming strongly flexuous. Thallus squamulose; squamules at first minute, dispersed, convex, then enlarging to ca. 1.5 mm wide and forming a moderately thick, somewhat loosely attached, diffract crust, with the surface cerebriform, grayish brown, shining, black on underside; hypothallus absent. Hymenium 65-80 μ m, I+ blue then greenish black; epihymenium greenish black. Asci sometimes I+ reddish brown in lower half. Paraphyses gelatinous, coherent but rather easily separable in K, 1.5-2 μ m diam. Exciple distinct from the hypothecium and greenish black in upper part, intergrading with it and brownish black below, pale purplish brown in lowest part, K-. Hypothecium with hyphae ca. 2.5 μ m diam., moderately thick-walled, irregularly arranged, immersed in a gelatinous matrix. Algal cells 8-20 μ m diam. New York. Externally similar to L. cinereorufa. L. rugosa

5. Disc dark red-brown, plane; margin paler brown, persistent; hymenium 65 μ m; hypothecium weak brown; excipulum brown at edge. Spores 10-12 x 5.5-6 μ m. Thallus squamulose; squamules to 1.3 mm diameter, bullate, round to angular, scattered to crowded, dirty sand brown to green-brown, shiny, strongly folded/cracked (?--"verfaltet" in German); K-, P+ yellow. Apothecia 0.8-1.2 mm diameter, sessile; Maine, Colorado, S. Dakota. L. lyngei

5. Disc black. 6

6. Thallus thickish, ± squamulose. Apothecia to 1 mm or more diam., sessile between the areoles at least when young. Discs often pruinose. 7

6. Thallus thin, rimose-areolate or areolate. Apothecia to 0.2-0.7 mm diam., immersed. 8

7. Areoles to 1(-3) mm broad, ± rounded. Thallus K-. Exciple ± violet. Spores 9-12 x 3.5-4 um, oblong-ellipsoid. Thallus to several cm across, to 0.4-0.5(-1.0) mm thick, areolate to squamulose-areolate, whitish gray to tan or pale brownish; areoles dispersed to contiguous, roundish to slightly angular, plane to convex, often slightly shiny, smooth to uneven, often irregularly ridged and cracked or subtuberculate (epinecral layer); on black hypothallus. Apothecia to 1(-1.6) mm diam., to 0.75 mm thick, sparsely to densely dispersed to 3-4 contiguous, roundish to irregular or lobate, sessile between the areoles, moderately to strongly constricted at base; disc ± plane, black, smooth, matt, usually pruinose; margin distinct, ± thick and prominent, usually persistent, often infolded, epruinose. Excipulum not always well differentiated into ectal and medullary regions, violet brown, darker externally, usually blue-green in a thin line above externally, to 80 um thick laterally, to 130 um along the flank; ectal part of parallel-radiate hyphae 2.5-4 um thick, thin-walled, slightly carbonaceous, the hyphae obscured by pigmentation; medullary part, when developed, of loosely interwoven, pale brownish, leptodermatous to mesodermatous hyphae 2-4 um thick. Tissues K- or exciple K+ slightly more intense violet brown, C-, P-. Hypothecium often ± continuous with excipulum, brownish or slightly reddish brown, sometimes extensively developed, the upper 20-40 um ± colorless, I+ blue, below with a tail reaching or nearly reaching the hypothallus or substrate, of predominantly vertical hyphae 2-3 um thick. Hymenium 60-65 um, colorless, I+ blue to blue-green, the asci yellowish; epihymenium brown to olive or blue-green; paraphyses subdiscrete to discrete, coherent, mostly simple, some branching and anastomosing, 1.5-2 um thick, the apical cells ± clavate, to 3.5 um. Asci clavate. Thallus without lichen substances, but pannarin present in the apothecial pruina (v. leucothallina); stictic and ?hypostictic (v. discrepans); pannarin in thallus and apothecial pruina (v. kujalae). On siliceous boulders in forested subalpine areas. Widespread, northern Rockies (Alberta to Colorado) to Cascades (Oregon and Washington) and possibly Sierras (California). L. leucothallina

7. Areoles (1-)2-4 mm broad, angular. Thallus K+ yellow. Exciple ± blue-green. Spores 12-14 x 6-6.56 um, ellipsoid. Thallus pale brown-yellow, squamulose; squamules ± plane or finally concave, to at least 0.5 mm thick, thinly white marginate. Upper cortex 50-65 um thick, mostly opaque, the surface ± dark sordid yellow; epinecral layer to 14 um. Algae 5-8 um, the layer ca. 100 um thick; medulla blackish gray with numerous coarse granules, slowly dissolving in K; hyphae 2-3 um thick, lax, perpendicularly ± intricate, long-celled, moderately thick-walled. Apothecia numerous, sometimes grouped, 1-1.5(-3) mm, ca. 0.2 mm deep, innate between the areoles when young, finally slightly prominent; disc ± plane, black, thinly pruinose, margin indistinct. Exciple laterally 30-35 um thick, blackish bluegreen, 125 um downwards from the surface ± indistinct and disappearing. Hypothecium ± lens-shaped with indistinct limits, 50-100 um thick, very dark brown, K-. Subhymenium 20-25 um, ± pale brownish. Hymenium 65 um, pale to colorless, I+ pale greenish blue; epihymenium 14-18 um, blackish blue-green, K+ dirty olive, the surface rough. Paraphyses indistinct, 2-3 um thick, simple, very firmly coherent, in K distinct but apices coherent, only slightly swollen. Asci 45-50 x 12-14 um, rarely fully developed. On nutrient-enriched vertical face of probably volcanic rock. Mexico. L.

tenayucae

8. Apothecia 0.1-0.2 mm, \pm dense, immersed, \pm immarginate, epruinose to thinly pruinose, plane. Hypothecium \pm pale brown. Exciple blue-green to olive brown; epihymenium blue-brown to blue-green-black. Spores 8-9 x 5 μ m. Hymenium 40-45 μ m. Thallus thin, rimose-areolate; areoles to 0.3 mm, brown to grayish, the margins often bluish gray; on conspicuous black hypothallus.L. extenuata

8. Apothecia 0.3-0.7 mm diam., immersed in thallus. Thallus thin, areolate, pale reddish; areoles to 0.4 mm diameter, \pm contiguous, \pm plane, the margins often narrowly ashy subpruinose, on conspicuous black hypothallus. Epihymenium blue-green to (diseased?) partly brownish. Hypothecium brown. Spores 10-12 x 5-6 μ m.L. kemioensis

III-G SAXICOLOUS.

Thallus continuous or granular, brown to black.

Not parasitic.

Medulla I-.

1. Thallus smooth, continuous, not areolate or rimose, indeterminate, dark brownish gray, smooth, matt, K-, C-. Apothecia numerous, immersed, 0.6-0.8(-1) mm; disc plane, black, densely bluish-gray pruinose; margin thin, black, persistent, K+ yellow. Exciple dark brown at edge, K+ reddish brown with violet shade, N+ orange-brown, I+ dark blue, 60-100 µm thick; hypothecium blackish brown, lens-shaped, 85-100(-250) µm thick at center, distinctly limited towards the exciple. Subhymenium 40-50 µm, mostly hyaline. Hymenium 90-100 µm, I+ dark blue; epihymenium 15-20 µm, olive brown or sordid brown-yellow, granular. Paraphyses dense, ca. 1.5 µm thick, unbranched, distinct in water, apices in K coherent, 4-5 µm thick, in N more orange brown. Asci ca. 85 x 17 µm, clavate. Spores 17-24 x 8.5-10.5 µm, internally granular, the free ones often conglutinate. Pycnospores 7-9 µm. On non-calcareous rocks. Appalachians (Virginia to S. Carolina). Belongs to the "macrocarpa group" according to Magnusson.L. (Porpidia?) hebescent

1. Thallus granular to rugulose, granular-powdery or ± absent. 2

2. Hypothecium brown-black. Thallus to 3-5 cm across but continuous only in small patches, 0.1-0.5 mm thick, granulose to rugulose, effuse, thin, brown-black, without visible hypothallus. Algae 8-12 µm. Apothecia frequent, dispersed, sessile to adpressed, 0.2-0.4 mm diam., at first plane with hardly visible, not prominent margin, becoming very convex and immarginate (resembling the perithecial warts of Staurothele), partly shiny, 0.15-0.25 mm thick. Exciple brown-black, confluent with hypothecium, 50-85 µm thick, blackish brown, or exciple in young apothecia 35 µm, ± pale brown-red. Hymenium 50 µm high, hyaline or pale sordid brownish, I+ dark blue; epihymenium 3-5 µm, greenish brown. Paraphyses firmly contiguous, indistinct, in K 1 µm thick, ± branched but not anastomosing, the apices in much gelatin, not thickened. Asci narrowly clavate, 8-spored. Spores ellipsoid, 5-7 x 3-3.5 µm. On moist siliceous rock. New York.L. nearingii

2. Hypothecium ± pale, not brown-black. 3

3. Hypothecium gray-brownish. Apothecia scarce, solitary in the unevennesses of the stone, ca. 1-1.5 mm, very constricted and ± stipitated at base; disc plane or ± convex, smooth, black but grayish rose-colored pruinose; margin thin, prominent or disappearing. Excipulum in the very margin 35(-50) µm thick, pale gray brown, below 55-70 µm, separated from the hypothecium by a ± hyaline 35 µm thick layer above. Hypothecium ± lens-shaped, 150 µm thick in center, at the sides 35-50 µm, rather pale, gray brown from cloudy material, in thicker sections darker, ± brownish with indistinct limits. Thallus thin, brown grey, somewhat "mushroom-like leprose" on blackish indistinct hypothallus, or ± absent. Hymenium 60-65 µm, I+ dark blue; epihymenium 8-10 µm, gray brownish violet, uneven. Subhymenium 50-60 µm. Apothecial tissues K+ slightly dirty violet. Paraphyses ca. 1.7 µm thick, coherent even in K, the ends unevenly thickened with lumps. Spores ± cylindric, not easily escaping, 9-10 x 3-3.5 µm. California. L. fuscatoatra sensu Magnusson (= true L. fuscatoatra sensu Nyl.?--but not if the only published description is that of "Nyl. in Hasse")

3. Hypothecium hyaline to olive or green. Spores 4-7 x 2-3 um. Thallus of tiny dispersed granules or verruules, grey-brown to yellow-brown or olive-green to greenish brown. Hymenium 60 um high. Exciple dark brown, or green black above. L. atomaria

III-H. Thallus \pm green.

1. Paraphyses free. Asci with I+ blue tholus. Lecidella viridans

1. Paraphyses coherent, very indistinct. Asci not as above. Hypothecium pale greenish black to pale olive or hyaline, granular appearing, the hyphae 4-5 μ m diam., with narrow lumina, vertically arranged for the most part, fragmenting under pressure, not at all conglutinate. Spores (4-)5-7 x 2-2.5(-3) μ m, ellipsoid. Thallus of tiny dispersed granules or verruules, grey-brown to yellow-brown or dark olive-green to greenish brown; verrucules to 0.7 mm wide, I-, K-. Apothecia 0.2-0.45(-0.6) mm diam., adnate; disk at first depressed (concave), then sometimes becoming plane, black, epruinose; margin elevated. Hymenium 40-60 μ m high, pale; epihymenium intensely greenish black or olivaceous black, granules dissolving in K. Paraphyses 1.5-2.5 μ m diam. Exciple distinct from hypothecium, dark brown (violaceous according to Th. Fries), or somewhat greenish black above, the hyphae 2-4 μ m diam. and enlarged to 4-5 μ m at apices, with narrow lumina, \pm conglutinate. New York. Externally similar to Micarea erratica. L. atomaria