

Leptogium (Ach.) S. Gray
(COLLEMATACEAE)

After Sierk (1964), and many others

Rev. 6/95

Thallus foliose to squamulose or dwarf fruticose or sometimes crustose; membranous, \pm gelatinous, blue-gray to brown or blackish; upper surface smooth to wrinkled or ridged, often glossy, rarely arachnoid; isidia often present. Lower surface smooth or white-tomentose (arachnoid or hairy), sometimes with scattered hapters or groups of white rhizines; upper and lower surfaces corticate; cortex distinct to indistinct, composed of a single row of isodiametric to shortly rectangular cells; inner part of thallus with loosely interwoven hyphae, or (in sect. Homodium) pseudoparenchymatous throughout; adhering to substrate or umbilicate.

Apothecia initially immersed, later adnate to shortly stipitate; laminal or sometimes marginal; disc round, concave to flat, red-brown; thalline margin usually becoming excluded; proper exciple raised, cupular, usually pseudoparenchymatous, colorless, \pm red-brown at edge; hypothecium hyaline to brown, of interwoven hyphae or pseudoparenchymatous; hymenium colorless, I+ blue; epihymenium colorless to reddish brown, K-, N-; paraphyses numerous, conglutinate, unbranched, apices \pm swollen; asci clavate, unitunicate, wall K/I+ blue; tholus I+ pale blue, K/I+ pale blue with a dark blue axial tube; spores (4-)8, ovoid to ellipsoid or fusiform, hyaline, usually submuriform to muriform, thin walled, without any distinct surface ornamentation or perispore.

Pycnidia \pm immersed in thallus or in warts, laminal or marginal, globose; wall colorless; conidiogenous cells slender, cylindric; fulcrum endobasidial, small celled; pycnospores bacilliform, simple, colorless. No substances. Photobiont Nostoc, distributed throughout the thallus, mostly arranged in distinct chains. On rock, bark or soil, usually in humid areas, often moist or periodically inundated or flushed, mostly basic to highly calcareous substrates.

Distinguished from Collema and Lempholemma by the presence of a cortex.

Some authors (e.g., Rogers) recognize section Mallotium as a separate genus.

The information given for species not mentioned by Sierk is often insufficient to determine in which section they belong in.

KEY TO SECTIONS

- 1. Cortex poorly developed; cells small and flattened, often indistinct. Thallus pseudoparenchymatous throughout.** Resembling Collema; crustose to foliose, olivaceous to blackish; without tomentum; commonly on soil or rocks.I. (sect. Collemodium)
- 1. Cortex well developed; cells distinct. Thallus proso- or para-plectenchymatous inside.**2
 - 2. Thallus with tomentum below.** Hyphae loose within.(if lobe margins and upper surface with tufts of white hairs and photobiont Scytonema, also see Leptochidium albociliatum, a very common species in the West)II. (sect. Mallotium)
 - 2. Thallus without tomentum below (but may have scattered tufts of hairs on underside).**3
- 3. Thallus paraplectenchymatous (appearing cellular) throughout.** Thallus crustose to minutely foliose or fruticose, gray to olivaceous blackish, without tomentum; on soil or rocks, sometimes treesIII (sect. Homodium)
- 3. Thallus not paraplectenchymatous throughout, but instead loose and prosoplectenchymatous in center.** Thallus foliose, lead gray to brownish, without tomentum.4
 - 4. Spores long, fusiform to acicular, without longitudinal septae.** Non-isidiate; apothecia common. On bark, FloridaIV. (sect. Leptogiopsis)
 - 4. Spores ellipsoid to fusiform, usually muriform. Isidiate or not; apothecia common to rare or absent.** On soil, moss, bark or rock, widespread and common.V. (sect. Leptogium)

I. Sect. Collemodium

1. Thallus appearing almost crustose, not distinctly lobed, minutely foliose, 1-2 mm broad, irregular or warty; numerous thalli forming a crust on the rock, dark brown to black. Cortical cells small, indistinct. Apothecia abundant, adnate to sessile. Spores 3-septate, 18-24 x 6-8 um. On rocks, Alaska, rare. Also see L. subtile, which has very tiny lobes.L. parculum Nyl.

1. Thallus not appearing crustose, instead distinctly lobed.2

2. Lobes erect to semi-erect, tufted. Thallus 1-2 cm broad, composed of numerous, clustered lobes, tan at base to dark brown above; lobes flattened, to 1.5 mm long, 0.5-1.0 mm across, narrow at base and broadening towards tips; apices digitate and greatly thickened; surface smooth and dull at base, becoming irregularly wrinkled and shiny at apex. Lobes 80-120 um thick at base, 150-200 um thick at tips. Apothecia unknown. On soil, western Colorado, rare.L. erectum Sierk

2. Lobes flat, spreading.3

3. Lobes mostly over 1.0 mm broad, not caniculate below. Thallus typically consists of rather ragged and scattered tufts with raised, convoluted and \pm cartilaginous lobes firmly attached to rocks. May be confused with Collema auriforme, which lacks a cellular cortex, does not remain tough when wet and is blackish olive-green in color. On hard limestone rocks, usually in damp situations, especially in seepage tracks, more rarely on siliceous rocks influenced by calcareous seepage. coastal California; Colorado, S. Dakota.L. plicatile (Ach.) Leighton

3. Lobes 0.5-1.0 mm broad, canaliculate below. Thallus attached to the substrate by tufts of white hairs. Thallus 1-3 cm broad, composed of numerous long, narrow, radiating lobes, olivaceous to black to occasionally grayish above, paler below; lobes 0.4-1.0 cm long, branching subdichotomously, thickened toward apices; upper and lower surfaces commonly wrinkled longitudinally. Lobes 200-500 um thick. Apothecia usually abundant and on often clustered on upper surface, immersed to sessile, 0.1-0.6 mm broad; disc brown to red-brown, concave to plane; thalline margin entire, concolorous with thallus to somewhat paler. Spores ellipsoid, 15-25 x 6-14 um, 3-5-septate transversely, 0-1-septate longitudinally. On calcareous rocks. Rare, southern Appalachians, Alabama to New Jersey.L. appalachense (Tuck.) Nyl.

ADD? (may not belong in this section; related to L. chloromelum according to Jorgensen, 1994):

Thallus very thick and gelatinous, reminiscent of a Collema, forming conspicuous tufts 1-5 cm wide, when moist pulpose, with markedly ridged and swollen, irregular, poorly developed, indistinct lobes, shrinking to an inconspicuous, irregular, flattened, often markedly ridged thallus when dry; upper surface dark green-black when wet, becoming gray-black when dry, strongly rugose and uneven; lower surface similar but pale olive, wrinkled-plicate, without tomentum; lobes partly fenestrate; ridges towards margin \pm isidiate; isidia cylindrical or flattened. Isidia granular (sometimes appearing like coarse-grained soredia), brownish, contrasting with the blue-gray thallus, often appearing \pm loosely scattered; mainly along the \pm swollen margins of the thallus, rarely spreading onto the ridges of the internal parts. Apothecia without paraplectenchyma directly below the subhymenium. Spores fusiform-acicular, muriform, 40-65 x 3-8 um. Corticolous or terricolous. On Rhamnus purshiana, British Columbia. L.

brebissonii Mont.

II. Sect. Mallotium--With tomentum or hairs below.

(If thallus attached by tufts of white hairs, and cortex poorly developed, see L. apalachense; if lobe surfaces and margins with white hairs and isidia lacking, see Leptochidium albociliatum)

1. **Thallus isidiate.**2

1. **Thallus not isidiate, but occasionally with lobules.** 6

2. Hairs short, usually ca. 20 μ m long, the cells spherical. Thallus smooth, not swelling much when wet, 1-3(-6) cm across, flat to involute, spreading, loosely attached, lead gray to brownish. Lobes (1-)2-5(-8) mm wide, rather fragile, very irregular, orbicular to elongate-flabellate, sometimes with holes or tears or abraded patches; margins rarely entire, usually ragged, crisped, crenulate torn or incised, sometimes with whitish-gray patches of short hairs and isidia; isidia numerous on upper surface, dense in places, granular, terete, styliform, cylindrical or lobulate, simple to coralloid, then lobulate-phyllidiate, mainly marginal and there often densely clustered, to laminal especially bordering tears or cracks, simple or branched; lower surface paler than upper surface, minutely white-pubescent to tomentose, tomentum on lower side dense, of glistening short hairs with spherical cells (x 10 lens); lobes 50-90(-115) μ m thick. Apothecia not common, sessile on upper surface, 3-4 mm diam.; disc slightly convex, light brown to dark red-brown; thalline margin concolorous with thallus, with numerous isidiod outgrowths. Spores ellipsoid with pointed apices, 28-35 x 12-17 μ m, 3-7-septate transversely, 1-2-septate longitudinally. On bark (Thuja, Sorbus, Acer). Quebec to N. Carolina; Mexico?. L. laceroides (B. de Lesd.) P. M. Jorg.

2. Hairs long, usually at least ca. 100 μ m long (to 1 mm or more in L. hirsutum), the cells cylindrical. 3

3. Thallus distinctly wrinkled. Thallus bluish at least in central parts, not very densely wrinkled; spores 25-35 μ m long, acuminate. California to Texas, south to Mexico, north to South Dakota and NW Territories. Rather common. Records of L. furfuraceum from North America (British Columbia to California, east to S. Dakota, Colorado and Texas) are misidentifications, at least partly of this species. L. pseudofurfuraceum P. M. Jorgensen & Wallace

3. Thallus normally smooth to slightly rough.4

4. Thallus usually olivaceous-blackish; isidia usually granular. Tomentum hairs ca. 100 μ m long. Isidia abundant, black; thallus not pulvinate; upper side not wrinkled; lobes thick (150-300 μ m). Thallus to 6 cm broad, monophyllous to polyphyllous, the lobes rounded, to 10 mm broad; margins entire to irregularly cut or isidiate, sometimes curling under the upper surface. Tomentum dense. Apothecia rare. On bases of woody plants and on rocks. Arctic to temperate, south to Georgia in the east, to California in the west. Might be confused with Collema subflaccidum, but that species lacks hairs on lower surface and lacks a distinct cortex. L. saturninum (Dickson) Nyl.

4. Thallus bluish (lead color); isidia cylindrical-coralloid, solid. Tomentum hairs sometimes? to 1 mm or more long. 5

5. With minute hairs over the upper surface. Thallus 1-10 cm broad, monophyllous to

polyphyllous, lead gray to sometimes brownish; lobes orbicular, 4-10 mm broad, spreading with margins ascending, the margins entire to isidiate; isidia commonly abundant on upper surface, cylindrical to commonly branching, concolorous with thallus to somewhat darker; upper surface dull with rarely a few periclinal wrinkles near margin; white hairs common near margins; lower surface with dense tomentum; hairs becoming long (to 1 mm) and entangled, especially toward center; lobe tips also hairy; lobes (60-)125-200 μ m thick. Apothecia rare, sessile to short stipitate, 0.5-1.5 mm broad; disc concave to plane, dark red-brown to black; thalline margin entire, concolorous with thallus, with numerous white hairs. Very common in eastern N. America (Georgia to Quebec, west to Minnesota, Iowa, Missouri and SE Oklahoma); also found in Rocky Mountains (New Mexico and Colorado) and along west coast from Oregon to Alaska. Jorgensen treats this as a variety of L. burnettiae.L. hirsutum Sierk

5. Without hairs on upper surface. Thallus 2-4 cm across, foliose, loosely to firmly attached, bluish to gray blue when dry, dark olive green, translucent, generally non-glossy and slightly swollen when wet, deeply to shallowly lobate; lobes orbicular to sublinear, 10-15 mm wide at the periphery, usually separate, sometimes \pm confluent in the central part; margins entire to dentate isidiate, flat to ascending and revolute, thinner than the central part; upper surface dull, smooth to slightly rough, densely isidiate; isidia solid, simple, globular or cylindrical when young, later coralloid branched, 0.1-0.7 mm long, concolorous with thallus or darker; lower surface paler, densely tomentose; tomentum usually white, rarely pale brown, 0.2-1 mm long; hyphae of tomentum free to anastomosing, composed of 5-6 μ m long and 3.5-6 μ m thick cells. Apothecia not seen. On bark or moss on bark, rarely on soil or rock. In the key in Jorgensen, 1975, it is implied that ["true"?] L. burnettiae has hairs only 100 μ m long..... L. burnettiae Dodge (s. str., i. e., var. burnettiae)

6. Hairs short, usually c. 20 μ m long, the cells spherical.-
... 7

6. Hairs long, usually ca. 100 μ m long, the cells cylindrical; hairs mainly on lower surface. Spores usually submuriform, few-celled. 8

7. Thallus clearly wrinkled when dry, very thick (170-400 μ m) when wet. Apothecia with an euparaplectenchymatic tissue above the algal layer. Lobes digitate, rounded, \pm crisped (sometimes very much so), brown-gray to greenish. Apothecia to 5 mm diam.; disc orange-chestnut brown; margin with lobes similar to those of thallus, sometimes in several layers; spores broadly ovate with acute tips, 24-30 x 12-15 μ m, "1-2-septate transversely, 3-4-septate longitudinally" (according to Jorgensen; possibly backwards?). Tropical-subtropical.
L. digitatum (Massal.) Zahlbr.

7. Thallus smooth, not swelling much when wet. Apothecia with supporting tissue below the algal layer; margin with abundant folioles. Thallus to 10 cm diam., forming rounded tufts or rosettes of numerous, rounded or wavy lobes, often raised in center; lobes 3-5(-8) mm wide, much convoluted, overlapping, crisped, with \pm abundant folioles arising from margins and surface; upper surface blackish brown or blackish olive green; lower surface uniformly short gray tomentose, paler than upper surface. Apothecia fairly frequent. On mossy tree trunks and mossy rocks, in sheltered moist woodlands, often by lake-sides or in valley bottoms. Eastern U.S. L. burgessii (L.) Mont.

8. Thallus distinctly wrinkled, with round, often dense, deep and irregular wrinkles;

not swelling much when wet, browned-olivaceous. Apothecia often with a supporting tissue below the algal layer, connected to the cortex; spores fusiform, 30-40 x 6-10 μm . Thallus 2-3 cm broad, flat, spreading, lead gray to dull olivaceous, paler below; lobes somewhat elongate with rounded apices, 2-4 mm broad; margins entire to irregularly dissected, ascending slightly, often tightly turned under; tomentum on underside dense; lobes 100-300 μm thick. Apothecia abundant, sessile on upper surface, 0.4-1.0 mm across; disc plane to convex, light brown to red-brown; thalline margin entire to periclinally wrinkled, concolorous with thallus; spores fusiform, 30-40 x 6-7 μm , 3-4-septate transversely. Mountains of SE Arizona. L. rugosum Sierk

8. Thallus smooth to slightly rough, without wrinkles. 9

9. Apothecia absent. Thallus without black granules, olivaceous-blackish; lobes rather narrow, often crisped; growing in cushions (very pulvinate). Lobes thin (100-150 μm), translucent. Apothecia unknown. In low places in swales in lichen-rich tundras, arctic. L. arcticum P. M. Jorg.

9. Apothecia common. Thallus 2-5 cm broad, spreading irregularly, lead gray to brownish; lobes very irregular with margins entire to lobulate and irregularly undulate; upper surface smooth to roughened, sometimes bearing fine hairs, not isidiate; lower surface paler, with short white or tan tomentum; lobes 80-200 μm thick. Apothecia sessile on upper surface, 1-3 mm broad; disc orange-brown to red-brown, concave; thalline margin microphylline, concolorous with thallus; spores ovoid to ellipsoid, 25-40 x 14-21 μm , 5-7-septate transversely, 1-3-septate longitudinally. On rock, SE Arizona (also known on bark in the tropics). L. inflexum Nyl.

III. Sect. Homodium

1. Thallus forming a broken areolate crust on soil, inconspicuous; areoles to 3 mm broad, ashy brown to black; surface smooth to commonly granulose. Apothecia common and immersed to adnate, to 1 mm broad; disc concave to flat, light brown to red-brown or black; thalline margin entire to granulose, concolorous with thallus, sometimes disappearing. Spores muriform, 18-33 x 7-14 μ m. Thallus 25-100 μ m thick, paraplectenchymatic throughout, often with one cortical cell-layer, individual cells 4-5 μ m diam. Apothecia with up to 100 μ m thick thalline margin; proper margin narrow, at most 10 μ m wide, subhymenium 304-0 μ m wide of compact, oriented hyphae; hymenium 100-150 μ m high, I+ blue, upper parts brownish; paraphyses simple, 10-2 μ m thick, slightly enlarged apically; asci narrowly clavate, 60-100 x 10-15 μ m, often with irregular spore formation, 4-6-8-spored; spores ellipsoid, muriform, 16-28 x 7-15 μ m. On soil (usually high in clay or calcium) or on soft limestone, temperate, New England to North Dakota and mountains of Colorado.L. byssinum (Hoffm.) Zwackh ex Nyl.

1. Thallus minutely foliose or fruticose.2

2. Thallus minutely fruticose; lobes subterete to terete.3

2. Thallus minutely foliose; lobes usually flattened. ...4

3. Thallus brown to (in shade) lead gray; lobes constricted at intervals, up to 100(-200) μ m diam. in center (30-70 μ m near tips). Thallus ca. 1(-3?) mm broad, composed of numerous irregularly branched terete lobes, at first with small, radiating, narrow, \pm branched, flat, adpressed lobes 0.3-1 mm long, which at their margins and tips develop long, cylindrical, isiaa-like extenisons to 0.6(-1) mm long, that become crowded to form dense clusters or cushions; at maturity the primary lobes are moslty obscured except sometimes at edge of cushions. Apothecia very rare; disc 0.2-0.4 mm broad; spores 20-25 x 10-11 μ m, 4-celled then muriform with 3-5 transverse septa and a total of up to 9 cells visible. On rough, basic bark of old trees, more rarely on basic rocks (including serpentine), old walls, and coastal turf. Maine, New Hampshire, Alberta, British Columbia, Washington.L. teretiusculum (Wallr.) Arnold

3. Thallus olivaceous to brownish; lobes irregularly contorted, 100-200 μ m thick. Thallus forming a crust; lobes terete to somewhat flattened, ca. 1.0 mm long, branching irregularly. Apothecia unknown. On soil over granite in pinyon-juniper community, western Colorado, apparently rare.L. contortum Sierk

4. On rocks in or beside water. Thallus 0.5-2 cm broad, microphylline, flat, spreading, tightly appressed with margins occasionally ascending, lead gray or greenish gray to blackish; lobes elongate, the apices rounded, 0.2-1.5 mm broad; margins entire to sometimes irregularly lobulate; surface smooth, shiny or dull; attached to substrate by numerous hairs on lower surface; lobes 45-150 μ m thick. Consisting of flexuose, up to 1.5 mm broad squamules, which may become crowded and imbricate; upper surface smooth and glossy, often emerald green; lower surface paler with occasional long-celled hairs. Apothecia not common, adnate on upper surface, 0.2-0.4(-1) mm broad; disc concave, brownish black; thalline margin entire, concolorous with or paler than disc and somewhat darker than thallus; spores ellipsoid to fusiform, 16-33 x 5-9 μ m, 1-5-spitate transversely, 0-1-sepatate longitudinally. Thallus 50-150 μ m thick, paraplectenchymatous

throughout, individual cells 5-10 um diam.; photobiont in short chains, individual cells 2-4 um diam. Apothecia with 50-100 um thick thalline margin; proper margin hardly visible; subhymenium 30-50 um thick, of densely interwoven hyphae; hymenium 100-150 um high, I+ blue, upper parts brownish; paraphyses simple, ca. 1 um thick, slightly enlarged apically; asci clavate, 90-130 x 10-12 um, 8-spored; spores ellipsoid, muriform, 20-35 x 6-10 um. On acidic rocks. California, Wyoming, northern Colorado.L. rivale Tuck.

4. On rocks, soil, or bark, not in water.5

5. Apothecia immersed to adnate; exciple lobulate. Lobes of thallus non-isidiate. Thallus to 1.5 cm broad, of numerous spreading to irrect lobes which are irregular, 0.1-0.8 mm broad, the margins entire to irregularly cut, light to dark brown. Apothecia common, to 0.5 mm broad; disc concave, brown to black. Spores muriform. On soil, Arctic (Bering Island; expected in Alaska). L. crenatum (Nyl.) Vainio

5. Apothecia sessile; exciple granular at times but not lobulate.
.....6

6. Lobes entire to irregularly lobulate, without coralloid outgrowths. Thallus to 2 cm broad, minutely foliose, of numerous spreading to commonly erect and often imbricate lobes; upper surface smooth, occasionally with minute lobules, lead-gray to brown; underside with tufts of hair; lobes \pm horizontal, often arranged in rosettes, 0.5-1.5(-2) mm diam., below a single or small group of apothecia; apices of lobes often dividing into short, flattened to terete extensions, to 0.3 mm long and 0.06-0.1 mm wide; center of thallus pseudoparenchymatous throughout. Apothecia 0.2-1.5 mm diam., usually abundant; discs concave to flat, brown, red-brown or dark chocolate brown; thalline exciple entire, concolorous with thallus or darker, mostly persistent, smooth to nodulose. Spores muriform, 21-35 x 7-14 um, muriform, with (3-)5(-7) transverse septa. On basic bark of old, usually fallen trees, old stumps, and plant debris on the ground, or soil, arctic, south to California, Colorado and W. Virginia; Washington state (Puget Sound). Goward, et al. distinguish L. minutissimum (Flörke) Fr. as having lobes short to elongate rather than distinctly elongate, mostly somewhat ascending and overlapping, rather than appressed to weakly ascending near tips, often averaging to more than 0.1 mm wide, and occurring over soil or bark rather than decaying wood or moss. L. subtile (Schrader) Torss.

6. Lobes irregularly divided, with coralloid outgrowths and margins and surface, appearing isidiate. Thallus small (to 2 mm broad), but coalescing, appearing almost crustose. Lobes divided, to 0.2 mm broad, flattened to nearly terete, appearing as clustered coralloid growths; surface smooth, often with granular outgrowths, lead gray or brownish to black. Apothecia common, adnate to sessile, to 0.8 mm broad; thalline margin entire to lobulate. Spores usually muriform, 17-37 x 9-14 um. Usually on sandy soil but also on sandstone or occasionally other rocks, and on tree barks, often among mosses. Arctic to temperate, widely distributed, to the southwestern and central states, and southeast to Florida.L. tenuissimum (Dickson) Körber

ADD?:

L. schraderi

IV. Sect. Leptogiopsis

Lobes numerous, narrow, radiating, irregularly anastomosing, elongate; upper and lower surfaces wrinkled, the heaviest wrinkles running the length of the lobes; paler below. Apothecia common, sessile on the margins and tips.

1. Spores acicular, 50-85 x 3-5 um, 7-11-septate transversely. Lobes lead gray to greenish gray. Thallus 3-6 cm broad; lobes 1-2 mm broad, thickened along margins and at tips; lobes 200-500 um thick. Apothecia 1-2.5 um broad; disc concave, orange-brown to red-brown; thalline margin concolorous with thallus, periclinally wrinkled. On bark. Florida and Mexico. L. adpressum Nyl.

1. Spores fusiform, 25-40 x 6-7 um, 3-5-septate transversely. Lobes lead gray to usually brownish. Thallus 4-9 cm broad; lobes 0.5-2.5 mm broad, greatly thickened here and there along the margins at tips so that central part of thallus appears as an aggregation of thickened lobules; lobes 150-300 um thick. Apothecia 0.5-1.2 mm across; disc concave to plane or convex, pale to dark brown; thalline margin entire, concolorous with thallus. In oak and other trees. Florida. L. fusisporum (Tuck.) Dodge

V-A. Sect. Leptogium (and other isidiate)

1. Thallus distinctly wrinkled. (If thallus fruticose, see L. schraderi).2

1. Thallus smooth, not distinctly wrinkled.7

2. Isidia mostly marginal and associated only with apothecia. Wrinkles irregularly arranged. Isidia not granular. Thallus 2-6 cm broad, flat, spreading, the margins ascending, lead gray to brownish, paler below; lobes orbicular, 1.5-5.0 mm broad; margins entire to cut, undulate; both surfaces distinctly and irregularly wrinkled; lobes 45-220 µm thick. Apothecia common but rarely fully developed, marginal, 0.1-1.0 mm broad; disc concave to plane, brown to red-brown; thalline margin concolorous with thallus to cream-colored, bearing numerous cylindrical to lobulate outgrowths; spores ellipsoid with pointed tips, 15-26 x 9-12 µm, 3-5-septate transversely, 1-septate longitudinally. On hardwood trees. Florida to Texas, Alabama. L. marginellum (Swartz) S. Gray

2. Isidia on the surface of the thallus as well as associated with apothecia.
.....3

3. Thallus of radiating, irregularly anastomosing lobes, usually brownish. Lobes numerous, (2-)3-4 mm broad; margins and tips thickened; surface wrinkled, the heaviest wrinkles running the length of the lobes. Isidia becoming granular, generally more abundant at the margins, giving thallus a crested appearance, or very dense throughout; lobes 150-800 µm thick. Thallus 2-6 cm broad, lead gray to greenish or brownish black. Apothecia not common, sessile on margins, 0.5-1.0 mm across; disc concave to plane, light brown to red-brown; thalline margin granular isidiate, concolorous with thallus; spores ellipsoid with pointed apices, 20-35 x 9-12 µm, 3-5-septate transversely, 0-1-septate longitudinally. On bark of deciduous trees, New England to Florida, W through Texas to California and Mexico, and to Wisconsin. L. millegranum Sierk

3. Thallus of distinct lobes, usually lead gray.4

4. Thallus very thick. Northern or western. 5

4. Thallus usually less than 200 µm thick. Southeastern. Isidia not granular. Lobes distinct; margins not thickened. 6

5. Thallus 2-5 cm broad, 200-500 µm thick, flat, spreading to semi-erect, lead gray to brownish, paler below; lobes orbicular to somewhat elongate with rounded apices, 3-10 mm broad; margins ascending, entire to isidiate; isidia scattered on upper surface, sometimes very dense, granular to cylindrical to lobulate, concolorous with thallus; surfaces wrinkled, more heavily so below, the heaviest wrinkles running the length of the lobes; attached by scattered tufts of hairs. Apothecia unknown. Usually on rock, occasionally on trees. Rather common in mountains of southwestern U.S. (Arizona to Colorado), north to S. Dakota and Wisconsin. L. arsenei Sierk

5. Thallus very thick and gelatinous, reminiscent of a Collema, forming conspicuous tufts 1-5 cm wide, when moist pulpose, with markedly ridged and swollen, indistinct lobes, shrinking to an irregular, flattened, often markedly ridged thallus when dry; upper surface dark green-black when wet, becoming gray-black when dry, strongly rugose and uneven;

lower surface similar but paler, without tomentum; lobes partly fenestrate; ridges towards margin \pm isidiate; isidia cylindrical or flattened. On Rhamnus purshiana. British Columbia. L. brebissonii Mont.

6. Isidia usually simple, scattered on the surface; wrinkles irregularly arranged, not acutely raised. Thallus 1-8 cm broad, composed of numerous spreading to erect lobes, lead gray to occasionally brownish, paler below; lobes orbicular, 2-10 mm broad; margins entire to occasionally cut to commonly isidiate; isidia abundant on upper surface and margin, commonly cylindrical to clavate, occasionally squamuliform; surfaces distinctly and irregularly wrinkled; attached by scattered tufts of hairs. On bark, usually of deciduous trees, rarely on bark. Florida. L. austroamericanum (Malme)

Dodge

6. Isidia much branched, concentrated along the ridges; wrinkles longitudinal, acutely raised. Thallus 2-10 cm broad, flat, spreading with margins ascending, lead gray to brownish, paler below; lobes orbicular to commonly elongate, 3-12 mm broad, the margins entire to commonly isidiate; isidia present on upper surface, especially on wrinkles, cylindrical, simple to much branched and coralloid, concolorous with thallus to slightly darker; wrinkles running length of thallus; lobes 50-160 μ m thick. Apothecia rare, marginal to submarginal, 0.5-2.15 mm broad; disc concave, orange-brown to red-brown; thalline margin isidiate, concolorous with thallus to cream-colored; spores ellipsoid, 23-35 x 9-14 μ m, 3-7-septate transversely, 1-septate longitudinally. On trees and rocks. Florida. L. isidiosellum (Riddle) Sierk

7. Isidia squamuliform, never cylindrical. Thallus 1-3 cm broad, composed of numerous spreading to erect and tufted lobes, lead gray, paler below; lobes orbicular, 3-6 mm broad; margins entire or irregularly cut to lobulate; isidia on surface and margins, concolorous with thallus; surface roughened but not wrinkled; lobes 45-120 μ m thick. Apothecia rare, sessile to short stipitate, 0.5-1.0 mm across; disc concave, brown to red-brown; thalloid escape entire to occasionally isidiate, concolorous with thallus or tan; spores ellipsoid to subfusiform, 20-25 x 7-9 μ m, 3-5-septate transversely, 1-septate longitudinally. Usually on rocks, occasionally on trees, Arizona to western Texas, Colorado. L. denticulatum Tuck.

7. Isidia cylindrical, rarely squamuliform. 8

8. Apothecia abundant. Lobes relatively dark, olivaceous to brownish (to lead gray), usually less than 3 mm broad, usually olivaceous. Thallus 2-3 cm broad, composed of numerous squamuliform lobes; lobes spreading to ascending, 1-4 mm broad; margins entire to irregular to densely isidiate; isidia abundant on upper surface, cylindrical and commonly much branched, concolorous with thallus; surface smooth; attached by scattered tufts of hairs; lobes 55-125 μ m thick. Apothecia sessile, 0.2-1.2 mm across; disc concave to convex, brown to red-brown; thalline margin entire to densely isidiate, concolorous with thallus or tan; spores ellipsoid, the apices sometimes pointed, 13-20 x 5-8 μ m, 2-3-septate transversely, 0-1-septate longitudinally. On limestone, more rarely on bark. Rare, New England to southern Minnesota, S to Tennessee, Alabama, and Oklahoma. L. dactylinum Tuck.

8. Apothecia rare. Lobes pale and bluish gray, or brownish, usually more than 3 mm broad. 9

9. Upper surface pale, bluish (lead) gray. On trees (rare over mossy rock); restricted to humid localities. Lobes usually more than 3 mm broad; surface not wrinkled. Apothecia rare. Thallus to 10 cm diam., flat, forming irregularly spreading patches or small tufts; lobes \pm overlapping, rather thin, orbicular, 2-4 mm broad; margins entire, wavy, \pm ascending, to dentate-isidiate; upper surface smooth to occasionally slightly roughened, not wrinkled or plicate, isidiate; lower surface loosely attached by scattered tufts of hairs, or closely attached centrally and with margins and apices \pm free and ascending. Lobes 35-100 μ m thick. Isidia abundant, laminal and sometimes also marginal, granular-furfuraceous, cylindrical or flattened (clavate to lobulate), often branching, concolorous with thallus; folioles occasionally present. Lower surface concolorous with upper surface or paler to \pm grayish-fawn, smooth. Apothecia not common, sessile to short stipitate, 0.5-2.0 mm broad; disc slightly concave to plane or convex, light brown to red-brown; margin entire to isidiate, light gray to cream-colored; spores ellipsoid, sometimes pointed at tips, 18-23 x 6-10 μ m, 3-septate transversely, 0-1-septate longitudinally. Very common on mossy trees and rocks or directly on rock when particularly near water, temperate to subtropical. Minnesota to Florida and Texas; Alaska to British Columbia and Colorado.L. cyanescens (Rabenh.) Körber

9. Upper surface partly brownish. Over (mossy rock); widespread in rather arid localities. Thallus small to medium sized, foliose, distinctly thin, averaging to less than 0.1 mm thick when moist; upper surface dark greenish brown, smooth to finely striate, often shiny towards the margins; lobes averaging to 2-3 mm wide, always dorsiventral, rounded with dentate margins. Isidia laminal, clavate to dactyliiform, terete throughout, shiny. Thallus 100-125 μ m thick; upper and lower cortex dark colored, paraplectenchymatous, 15-20 μ m wide, consisting of rectangular cells; inner part consisting of unoriented closely interwoven hyphae with aggregates of emerald green Nostoc (?) cells; individual photobion cells 8-10 μ m diam. Lower surface similar, but paler, with tufts of anchoring hyphae. Apothecia unknown. Over soil and (mossy) rock, in rather arid intermontane localities at lower elevations; often associated with Leptochidium albociliatum. Frequent, British Columbia to Oregon. L. subaridum Jorg. & Goward

V-B Sect. Leptogium (and other non-isidiate, non-tomentose)

(also see sect. Leptogiopsis, with spores acicular or fusiform)

1. Thallus crustose, not distinctly lobed.2

1. Thallus foliose or minutely fruticose.3

2. Cortex poorly developed; cells indistinct. Arctic.(L. parculum)

2. Cortex well developed; cells distinct.(L. byssinum)

3. Thallus minutely fruticose; lobes subterete to terete, or flattened but very narrow. (Also see L. lichenoides and L. subtile).4

3. Thallus foliose; lobes usually flattened, but sometimes minutely divided.

..... 7

(cross-references to other sections are needed in the choices below)

4. Terminal lobes distinctly constricted at intervals, up to 100 µm thick. Over bark in humid climates. Thallus lead gray to brown. Lobes terete to subterete.(L. teretiusculum)

4. Terminal lobes often somewhat contorted, but never distinctly constricted at intervals, over 100 µm thick. 5

5. Lobes subterete to terete. Thallus olivaceous; lobes irregularly contorted, 100-200 µm thick.(L. contortum)

5. Lobes mostly distinctly flattened. 6

6. Lobe tips in part strongly wrinkled. Thallus minute to medium-sized, heavily wrinkled and pleated, essentially fruticose, to 3-5 mm tall, forming small, upright tufts or more effuse, to 4 cm broad, dichotomously or more irregularly branched, almost cauliflowerlike, fastened to the ground by a small tuft of rhizoidal hyphae; lobes closely packed, to (0.1-)0.3-0.6(-1.5) mm wide, cylindrical or more often somewhat compressed, ascending to erect, often divided towards base. In the course of time the branches of a fruticose thallus may become separated through the death of the older, basal parts, and eventually the branches may form individual thalli. In moist condition the thallus branches are plump and swollen with rounded tips of a dark green color, the tips average to 0.4 mm thick. The basal parts are of a pale yellowish color, owing to the scarcity of living cells of the photobiont in the shaded parts of the thallus. When dry the branches are shrivelled and collapsed, and somewhat angular with a minutely wrinkled-areolate surface, dark olive brown. Cortex consisting of a single layer of cells. Apothecia occasional, cup-shaped, developing near the tips of branches, becoming lateral; disc to 1.5 mm diam. Spores 23-33 x 10-15 µm, hyaline, muriform with 3-5 transverse septa. Pycnidia rare, visible on wet thalli as yellowish brown spots on the sides of the otherwise bright green, young branches; ostiole minute; pycnosporos bacilliform, 4-5 x 1.5 µm. On mosses or soil in calcareous habitats, and on rocks and walls of limestone, in somewhat arid habitats. Utah; California; semiarid southern interior of British Columbia, rare.

Resembling a Collema when moist, but I'm not sure which section it belongs under. L. schraderi (Ach.) Nyl.

6. Lobe tips not wrinkled. (L. tenuissimum aggregate)

7. Spores acicular or fusiform. 8

7. Spores \pm ellipsoid, with rounded ends. 9

8. Spores acicular, 50-85 x 3-5 μ m, 7-11-septate transversely. Lobes lead gray to greenish gray. On bark. Florida and Mexico. (L. adpressum)

8. Spores fusiform, 25-40 x 6-7 μ m, 3-5-septate transversely. Lobes lead gray to usually brownish. On oak and other trees. Florida. (L. fusisporum)

9. Thallus of radiating and irregularly anastomosing lobes. 10

9. Thallus of distinct lobes, not anastomosing. [This is often a rather difficult choice to make].
..... 14

10. Thallus distinctly and irregularly wrinkled but flattened; lobes orbicular.

Thallus 1-4 cm broad, monophyllous to polyphyllous, flat, spreading, lead gray, paler below; lobes orbicular, 2-10 mm broad; margins entire, often curling under; lobes 300-500 μ m thick. Apothecia usually abundant, adnate to sessile, 0.5-2 mm broad; disc concave to plane, brown to dark red-brown; margin raised, periclinally wrinkled; spores ellipsoid, often pointed at apices, 23-35 x 12-16 μ m, 3-7-septate transversely, 0-2-septate longitudinally. On bark of deciduous trees, Florida. L. sessile Vainio

10. Thallus irregularly raised; lobes elongate. 11

11. Cortical cells 3-5 μ m in diameter. Lobes elongate and hollow near the apothecia; apothecia at the apices of the lobes. Thallus spreading with ascending margins, 2-6 cm broad, lead gray to brownish olivaceous; lobes 1-8 mm broad with rounded apices; margins entire, sometimes undulate; surface heavily wrinkled longitudinally, the heaviest wrinkles running the length of the lobes; lobes 100-300 μ m thick. Apothecia common and often abundant, 0.8-3.0 mm across; disc concave to plane or convex, light brown to red-brown; thalline margin concolorous with thallus, entire to periclinally wrinkled; spores ellipsoid to subfusiform, 23-35 x 9-12 μ m, 3-5-septate transversely, 1-septate longitudinally. On bark, Florida, S. Carolina, Louisiana. L. stipitatum Vainio

11. Cortical cells 4-13 μ m in diameter. Lobes elongate or short, solid; if fertile, the apothecia on the surface of the lobes. 12

12. Thallus with warty thickenings, appearing as aggregated granules, usually bluish, heavily wrinkled longitudinally. Thallus 3-8 cm broad, composed of numerous narrow, radiating and irregularly anastomosing lobes, lead gray to brownish, paler below; lobes elongate, 0.5-2.0 mm broad, becoming thickened at warty, especially at apices; upper and lower surface distinctly wrinkled where not thickened, the wrinkles running the length of the lobes. Florida. L. floridanum Sierk

12. Thallus thickened but not warty, generally appearing gray or gray-green.
..... 13

13. Thallus greenish gray to brownish; thalloid exciple not lobulate. Thallus 2-7 cm broad, lead gray to greenish, paler below, composed of numerous radiating and anastomosing lobes; lobes elongate, 1-4 mm broad, the margins and apices thickened, entire; surface wrinkled, the heaviest wrinkles running the length of the lobes; lobes 125-500 μ m thick. Apothecia common, sessile on margins, 0.5-2.5 mm broad; disc concave to plane, red-brown; thalline margin verrucose to periclinally wrinkled; spores ellipsoid with pointed apices, 20-30 x 9-12 μ m, 3-5-septate transversely, 0-1-septate longitudinally. Usually on deciduous trees, especially oak, rarely on rock. Massachusetts to Florida, west to Texas and Mexico. L. chloromelum (Ach.) Nyl.

13. Thallus lead gray; thalloid exciple lobulate. Thallus (2-)5-7 cm broad, subpulvinate to spreading, composed of elongate and irregularly anastomosing lobes, lead gray; lobes narrowly oblong, 1-2 mm broad (4-5 mm according to Galloway & Jorgensen 1995); margins undulating, entire to lobulate, often thickened; upper surface deeply wrinkled, with numerous prominent wrinkles or outgrowths, the heaviest wrinkles running the length of the lobes; lower surface paler, also wrinkled, with distinct anchoring holdfasts, lobes to (150-)300(-500) μ m thick when wet. Apothecia usually abundant, sessile at apices of lobes (subpedicellate and submarginal according to Galloway & Jorgensen 1995), 1-5 mm broad; disc concave to plane, brown to red-brown to blackish; thalline margin thick, entire to lobulate (lobules distinct, undulating, rugose); proper exciple distinctly euparaplectenchymatous; spores ellipsoid to subfusiform, (20-)23-25(-30) x 9-13 μ m, muriform, (3-)5-septate transversely, 1-septate longitudinally. On bark of deciduous trees and cedar, N. Carolina to Florida, W to Texas. L. phyllocarpum (Pers.) Mont.

14. Thallus surface (especially lower surface) distinctly wrinkled.15

14. Thallus surface smooth, not distinctly wrinkled. 22

15. Thallus usually over 150 μ m thick. (If lobes narrow, proportionally elongate, \pm erect and bearing distinctly swollen tips, on soil in arid localities, see L. schraderi).16

15. Thallus usually less than 150 μ m thick.18

16. Thallus lead gray; lobes distinct, not anastomosing, broad, commonly 5-10 mm wide, the margins entire, ascending or upturned. Thallus 2-8 cm broad, flat, spreading; lobes orbicular; surface heavily and irregularly wrinkled; lobes 125-300 μ m thick. Apothecia always present and conspicuous, sessile, 0.5-2.0 mm broad; disc concave to convex, light brown to dark red-brown; exciple concolorous with thallus or usually pale-colored, conspicuous even in mature apothecia, entire; spores ellipsoid, 16-26 x 10-13 μ m, 3-5-septate transversely, 0-1-septate longitudinally. On bark. Ontario and Maine to Florida, west to Texas, Oklahoma, and Minnesota. L. corticola (Taylor) Tuck.

16. Thallus gray to mostly brown or black.17

17. Tufts of hairs developed from lower surface. Thallus 1-7 cm broad, flat, spreading; margins ascending, lead gray to brown to blackish, paler below; lobes orbicular to elongate, 1-6 mm broad; margins entire to irregularly cut to lobulate; surface of thallus distinctly and irregularly wrinkled; lobes (150-)250-500 μ m thick. Apothecia common and often abundant, adnate to sessile, 0.2-0.5 mm across; disc concave to plane, brown; thalline margin entire,

concolorous with thallus; spores ellipsoid to subfusiform, 35-48 x 9-16 um, 7-9-septate transversely, 1-2-septate longitudinally. On soil or rock. California to Texas; Washington. L. platynum (Tuck.) Herre

17. Irregular tubercular outgrowths developed from lower surface. Thallus 2-4 cm broad, flat, spreading, lead gray to brownish or olivaceous; lobes orbicular, 3-5 mm broad; margins entire, sometimes turning under; upper surface distinctly wrinkled; lower surface more strongly so, paler; thallus 200-500 um thick. Apothecia common, sessile, 1-2 mm broad; disc concave to plane, brown to red-brown; exciple entire, concolorous with thallus or tan; spores ellipsoid to fusiform, 23-35 x 7-10 um, 3-5-septate transversely, 1-septate longitudinally. On trees and rocks. Arizona and Mexico. L. hypotrachynum Müll. Arg.

18. Lobes becoming tubular inrolled, with corniculate (subtubular, antler-like) tips. Thallus to 7 cm broad, of tufted, mainly erect lobes, the lobes elongate, 5-20 mm long, 0.5-6.0 mm broad; wrinkles running the length of the lobes; surface often shiny at the apices, lead-gray to brown; underside with tufts of hairs at times. Apothecia, when present, adnate to sessile, to 0.6 mm broad; thalline margin entire, concolorous with thallus or cream colored, often wrinkled. Spores muriform, 30-56 x 10-20 um. On soil or moss, sometimes over rock, rarely on bark. Alaska to California. L. corniculatum (Hoffm.) Minks

18. Lobes not becoming inrolled; without corniculate tips. 19

19. Margins mostly entire (to irregularly cut or lobulate). 20

19. Margins divided. 21

20. Over soil or mossy rock; apothecia scattered, not sunken; spores 8 per ascus; widespread. Thallus to 5 cm broad, of erect to semi-erect lobes forming a cushion-like growth, the lobes orbicular, to 4 mm broad. Upper surface roughened to distinctly wrinkled, matt (or shiny especially near margins), lead gray to dark brown. Apothecia common, adnate to sessile, occasionally on both sides of erect lobes; thalline margin entire, thick, sometimes concentrically wrinkled. Spores muriform, 25-35 x 12-14 um. On soil and among mosses, on bark and on rocks on \pm basic to highly calcareous substrates. Temperate, with disjuncts in Alaska and Iceland. Very polymorphic and much confused with L. lichenoides, particularly when the lobes are small and very richly divided; the marginal outgrowths or extensions are always flattened, never cylindrical as in L. lichenoides, and the lower surface of the lobes is usually less markedly ridged. L. gelatinosum (With.) Laundon (synonym: L. sinuatum)

20. Over bark or among mosses over bark; apothecia crowded, somewhat sunken; spores 4 per ascus; coastal. Thallus small to medium-sized, foliose; lobes averaging to more than 1.5 mm wide, always dorsiventral, broadly rounded, 0.5-1.0 cm wide; without isidia and lobules; underside without tomentum. Upper surface distinctly wrinkled when dry (but wrinkles rather weak according to Goward, et al., 1994); lower surface similar to upper, always blue-gray; lobe margins even to weakly lobulate. Cortex cellular, with 1-2 rows of rectangular cells; upper to 50 um thick; lower to 40 um. Inner part of loose unoriented hyphae with Nostoc in beaded, string-like chains, the individual photobiont cells 4-5 um. Thallus swelling considerably when wet, to 400 um thick. Apothecia very numerous, tiny, 0.2-0.5 mm diam.; disc brown, convex, with distinct paler thalline

margin. Thalline margin to 80 µm wide, proper margin rarely visible. Subhymenium of densely compacted hyphae, yellowish brown, 40-60 µm wide; hymenium 120-150 µm, I+ blue; paraphyses simple, conglutinated in a gelatinous matrix, ca. 2 µm wide, somewhat enlarged apically with brownish external pigmentation; asci narrowly cylindrical, 100-125 x 10-15 µm, always 4-spored; spores ellipsoid, muriform, 25-40 x 12-15 µm, uniseriate. Over bark of deciduous trees or among mosses over bark, coastal, in sheltered forests at low elevations, restricted to damp habitats in moist river valleys or other regions subject to much fog and heavy precipitation, British Columbia to Oregon. L. polycarpum Jorg. & Goward

21. Thallus usually lead gray (to brown), matt; margins finely lobulate to fringed, the divisions sometimes resembling isidia; raised wrinkles on the surface of the thallus, the heaviest ones running the length of the lobes. Lobes narrow, rarely exceeding 3 mm in width. Apothecia frequent, sessile, to 0.7 mm broad; discs brown to red-brown; thalline margin with numerous lobulate to coralloid outgrowths. Thallus to 6 cm broad, of numerous erect to semi-erect lobes sometimes forming distinct cushions, the lobes orbicular to elongate. On soil and among mosses, commonly over rocks and in calcareous situations, or at the base of old trees, in rather damp areas. Over much of North America except the southeastern and Gulf coasts, the Central Plains, and the Great Basin. L. lichenoides (L.) Zahlbr.

21. Thallus usually greenish to olivaceous or brown (to lead gray), often shiny near the apices; margins divided but rarely finely fringed; wrinkles, when present, not raised. Thallus 2-10 cm broad, composed of numerous, usually erect lobes; lobes elongate to somewhat orbicular, 0.5-3.0 mm broad, 2-5 mm long; margins entire to lobulate to lacerate to granular, often wavy; surface smooth to distinctly wrinkled, occasionally bearing a few granules, attached by scattered tufts of hairs; lobes 70-170(-200) µm thick. Apothecia common, sessile, 0.1-1.0 mm diam.; disc concave to plane or convex, brown to dark red-brown; thalline margin entire to sometimes granulate to lobulate, concolorous with thallus to pale brown; spores ellipsoid, sometimes pointed at ends, 25-45 x 12-15 µm, 3-7-septate transversely, 1-2-septate longitudinally. Usually on mossy rocks, occasionally on soil, rarely on trees. Mostly western, Alaska to California, east to S. Dakota and western Ontario. L. californicum Tuck.

22. Thallus foveolate (pitted); not wrinkled. Thallus 1-7 cm broad, flat, spreading, rather tightly appressed, lead gray, paler below; lobes orbicular, 3-5 mm broad; margins entire; surface roughened; lobes 65-105 µm thick. Apothecia usually abundant, sessile to short stipitate, 0.3-1.3 mm broad; disc plane to convex, pale brown to red-brown; exciple entire, concolorous with thallus; spores fusiform, 20-35 x 5-9 µm, 3-5-septate transversely, 0-1-septate longitudinally. On bark. Florida, Louisiana. L. microstictum Vainio

22. Thallus not foveolate. 23

23. Thallus brown. (L. californicum)

23. Thallus lead gray to greenish or olivaceous. 24

24. Lobes less than 2.0 mm broad. 25

25. Lobes more than 2.0 mm broad; surface smooth, not wrinkled or pitted. 26

25. Spores 15-20 x 6-7 um. Thallus 0.4-5.0 cm broad, flat, spreading, lead gray to brownish; lobes orbicular to elongate with rounded apices, 0.5-2.0 mm broad, rather closely adnate but with margins ascending, entire or crenate to occasionally lobulate; surface matt to shiny, not wrinkled; attached by scattered tufts of hairs; lobes 60-130 um thick. Apothecia common, sessile; disc concave to convex, light brown to red-brown; margin entire, concolorous with thallus to tan; spores 4/ascus, ellipsoid to subfusiform, 3-septate transversely, 0-1-septate longitudinally. On bark, periodically inundated along margins of ponds. Ontario; formerly also found in Vermont and Illinois L. rivulare (Ach.) Mont. (syn. L. crenatellum)

25. Spores 21-35 x 7-14 um. Apices of lobes often dividing into short, flattened to terete extensions, to 0.3 mm long and 0.06-0.1 mm wide; center of thallus pseudoparenchymatous throughout. On basic bark of old, usually fallen trees, old stumps, and plant debris on the ground, or soil, arctic, south to California, Colorado and W. Virginia; Washington state (Puget Sound). (L. subtile)

26. Lobes usually less than 3.0 mm broad, dark greenish gray or olivaceous, or gray-brown (to lead gray). Thallus 0.5-4.0 cm broad, composed of numerous flattened to semi-erect and often imbricate lobes; lower surface paler; lobes orbicular to elongate with rounded apices, 2-3 mm wide; margins entire to irregularly cut to lobulate, ascending; surface smooth, dull to shiny; attached by scattered tufts of hairs; lobes 45-115 um thick. Apothecia usually abundant, adnate to sessile, 0.2-2.0 mm broad; disc concave to convex, light brown to red-brown; exciple entire to minutely lobulate, concolorous with thallus; spores ellipsoid to subfusiform, 12-23 x 5-9 um, 3-septate transversely, 0-1-septate longitudinally. Usually on soil, often among mosses, sometimes on twigs. Florida to New England, west to Illinois in the north and to Arizona in the south. L. juniperinum Tuck.

26. Lobes usually more than 3.0 mm broad (1-5 mm), dark blue-gray to bluish when dry (dark lead-gray or slate-gray when wet). Thallus submonophyllous to much lobed, 2-10 cm broad; lobes rather thin and papery, orbicular to somewhat elongate with rounded apices 1-5 mm broad; margins commonly entire to sublobulate; upper surface smooth to occasionally somewhat roughened but never wrinkled-plicate; lower surface concolorous with upper surface, loosely attached by scattered tufts of hairs; lobes 50-100(-150) um thick. Apothecia common, often abundant, scattered, sessile to short stipitate, laminal, 0.2-0.5 mm broad; discs concave to plane or subconvex, light brown to dark red-brown, matt; exciple entire with occasionally a few small microphylline growths, concolorous with thallus or cream-colored; proper exciple rarely seen; spores ellipsoid to subfusiform, apices pointed, 14-26 x 6-9 um, submuriform, 3-6-septate transversely, (0-)1(-2)-septate longitudinally. On bark (rarely rock), Florida to Texas, and to southern Ontario, rare N of the Gulf Coast region. L. azureum (Swartz) Mont.

ADD:

L. imbricatum P. M. Jorg. (Jorgensen, 1994)

Thallus composed of flat to \pm erect, usually imbricate squamules forming a dense crust or cushion up to 3 cm diam.; individual squamules (0.1-)0.2-0.5(-1.0) mm wide; upper surface smooth, blue-gray to usually dark brownish, particularly apically; margins indented to incised; lower surface usually blue-gray with occasional, irregular tufts of long-celled hairs. Apothecia rare, laminal, sessile, to 1 mm diam.; thalline margin distinct, paler than the concave, brown disc.

Thallus 45-80 μ m thick, paraplectenchymatous throughout, individual cells 5-10 μ m diam. Photobiont Nostoc in short chains, individual cells 4-5 μ m diam. Apothecia with 30-60 μ m thick thalline margin; proper margin narrow, at most 10 μ m, subparaplectenchymatous; subhymenium to 30 μ m wide, of compact unoriented hyphae; hymenium 100-150 μ m high, I+ blue, upper parts brownish; paraphyses simple, 1-2 μ m thick, slightly enlarged apically; asci clavate, 90-120 x 12-15 μ m, 8-spored; spores ellipsoid, muriform, 20-35 x 7-15 μ m.

On calcareous soil or sand, often amongst mosses in open, short vegetation, arctic-alpine. Closely related to L. tenuissimum.

L. intermedium (Arnold) Arnold (L. minutissimum auct.)

Thallus composed of numerous spreading to more rarely imbricate squamules, up to 3 cm broad; lobes shallowly incised up to 1 mm wide; upper surface indistinctly wrinkled, blue-gray to usually brown; lower surface similar to upper, but paler with irregular tufts of long-celled hairs. Apothecia common, laminal, sessile, to 1.5 mm diam.; thalline margin distinct, paler than the concave, brown disc.

Thallus 50-100 μ m thick; upper and lower cortex of a single layer of irregularly isodiametric cells, 5-10 μ m diam.; medulla of densely interwoven hyphae. Photobiont Nostoc in short chains, individual cells 4-5 μ m diam. Apothecia with 40-60 μ m thick thalline margin; proper margin narrow, subparaplectenchymatous; subhymenium to 40 μ m wide, of compact unoriented hyphae; hymenium 100-180 μ m high, I+ blue, upper parts brownish; paraphyses simple, 1-2 mm thick, slightly enlarged apically. Asci clavate, 90-150 x 12-20 μ m, 8-spored; spores ellipsoid, muriform, 20-35 x 8-12 μ m.

Usually on somewhat calcareous soil amongst short vegetation, occasionally on mossy tree trunks, lowland to subalpine.

Resembling a diminutive form of L. gelatinosum.

Excluded

Thallus distinctly wrinkled, usually browned, not swelling much when wet; wrinkles on upper side periclinal near the margins; isidia cylindrical to clavate, fallen in at the tips; tomentum white; apothecia under 1 mm diam.; spores 20-25 μ m long with \pm rounded ends. Thallus 3-8 cm broad, flat, spreading, monophyllous to polyphyllous, lead gray to commonly brown; lobes orbicular, 3-7 mm broad, the margins entire to irregularly cut to isidiate, commonly turning under. Isidia scattered on upper surface, simple to branched, concolorous with surface or darker, sometimes shiny. Lower surface paler, wrinkled, the heaviest wrinkles running the length of the lobes, covered with tomentum except near margins. Lobes 90-200 μ m. Thick. Apothecia rare, sessile, 0.5-0.8 mm broad; disc slightly concave to plane or convex, light brown to red-brown; thalline margin entire to isidiate, concolorous with thallus. Spores ellipsoid, 23-26 x 7-9 μ m, 3-

septate transversely, 1-septate longitudinally. Usually on bark, especially oak; sometimes on rocks. L. furfuraceum (Harm.) Sierk

Descriptions

L. pseudofuraceum P. M. Jorg. & Wallace

Thallus spreading, closely attached to the substrate, individual lobes to 1 cm diam.; upper surface wrinkled, shiny, brownish at least marginally, centrally usually bluish gray, with clustered, cylindrical, brownish isidia, often apically collapsed.

Apothecia very rare, to 1 mm diam., with brownish, flat discs and brown exciple. Spores 26-29 [according to description; 25-35 um according to key] x 8-10 um, acuminate.

Apparently quite common in the oak forests at 1500-2500 m in Mexico and adjacent U.S.A., north to South Dakota; with an isolated occurrence in the Northwest Territories on Salix at c. 500 m.

Literature

- Awasthi, D. D. and P. Akhtar. 1977. The genus Leptogium (subg. Mallotium) in India. Norw. J. Bot. 24: 59-71.
- Christiansen, M. S., K. Ramkaer, F. Rose & U. Sochting. 1979. Additions to the Danish lichen flora. Bot. Tidsskr. 74: 89-115.
- Coppins, B. J. and O. W. Purvis. 1992. Leptogium. In: Purvis, et al., Lichen Flora of Great Britain and Ireland.
- Galloway, D. 1985. Flora of New Zealand Lichens.
- Galloway, D. and P. M. Jorgensen. 1995. The lichen genus Leptogium (Collemataceae) in southern Chile, South America. Flechten Follmann 227-247.
- Goward, T., B. McCune and D. Meidinger. 1994. The Lichens of British Columbia: Illustrated Keys. Part 1 - Foliose and Squamulose Species. Ministry of Forests Research Program, Victoria.
- Jorgensen, P. M. 1973. Über einige Leptogium-Arten vom Mallotium-type. Herzogia 2: 453-468.
- Jorgensen, P. M. 1994. Further notes on European taxa of the lichen genus Leptogium with emphasis on the small species. Lichenologist 26: 1-30.
- Jorgensen, P. M. & T. Goward. 1994. Two new Leptogium species from western North America. Acta Bot. Fenn. 150: 75-78.
- Jorgensen, P. M. and P. W. James. 1983. Studies on some Leptogium species of western Europe. Lichenologist 15: 109-125.
- Moore, B. J. 1968. The macrolichen flora of Florida. The Bryologist 71: 161-265.
- Rogers, 19 . Genera of Australian Lichens.
- Sierk, H. A. 1964. The genus Leptogium in North America north of Mexico. The Bryologist 67: 245-317.
- Thomson, J. W. 1984. American Arctic Lichens I. The Macrolichens. Columbia University Press, New York.