I-D SAXICOLOUS. Non-sorediate.
Apothecial margins some shade of white or grey, K-.

I-D-1. Apothecia superficially lecideoid

Thallus white, indistinct, minutely granulose. Apothecia numerous, dispersed to partly approximate, to ca. 0.5 mm, adpressed then substipitate, round; disc black to subolivaceous, epruinose (to pruinose?); margin concolorous with disk entire, sometimes also surrounded by thin ring of thallus. Excipulum containing large (to 25 um diam.) algal cells; cortex well developed, of thick-walled anticlinal hyphae, scarcely inspersed; hypothecium hyaline; hymenium 50-55 um; epihymenium sooty olive, covered by a hyaline amorphous layer; paraphyses when mature slightly capitate in N, distinctly capitate in K, 5 um thick, disitnctly septate in K, commonly simple; asci narrowly saccate, 10-12 um thick, wall strongly thickened above; spores ellipsoid, 10-12 x 4-5.5 um. Hymenium I+ blue; epihymenium N+ green. Medulla K-. On volcanic rock. Arctic. .....L. (Aspicilia?) discoensis

I-D-2. Thallus/apothecial margin whitish or grayish, K-.
Thallus conspicuous, continuous, verrucose or areolate.
Discs epruinose.

(if apothecia immersed, see Aspicilia)

1. Thallus thickly verrucose-papillate, dark grey to dark brown. .....L. sp.
1. Thallus smooth to areolate, not papillate-verucose. 2

2. Discs black. 3
2. Discs ± pale, or dark red or brown, not black. 5

3. Discs depressed, dense, often several per areole and irregular by pressure. Thallus white, areolate, effuse; areoles subcontiguous, thick, plane, 2-3 mm broad, separated by cracks, mostly concealed by the apothecia; upper cortex going round the edge to lower side, 50-70 um thick, translucid or often gray from granules (dissolving in N), the hyphae intricate, somewhat lax, ca. 5 um diam.; algal layer 100-150 um; algae 15-18(-20) um diam., yellow-green, mingled with gray granules; medulla 100-200 um, pale or sordid, the hyphae mainly perpendicular, thick-walled, 5-7 um thick. Apothecia often filling the areoles, 0.6-0.8 mm wide; disk epruinose; margin thick, ± smooth, irregular, prominent, often inflexed, often infested by a parasitic fungus. Pale part of apothecia 120 um thick, I+ blue down to the algae. Cortex thick, granular; exciple indistinct or at the base 5-8 um thick; hypothecium ca. 20 um thick; hymenium ca. 70 um high; epihymenium 8-12 um, yellow-brown, not granular; paraphyses contiguous, simple, 1.7 um thick, the tips slightly thickened, in K 3.5-5 um, still conglutinate; asci ca. 50 x 13 um; spores ellipsoid, 12-13 x 7 um. K-, C-, P-. On sandstone, montane, Utah. .....L. utahensis
3. Discs sessile to substipitate, not depressed. 4

4. Apothecia 0.4(-0.7) mm, broadly sessile; spores 8-11 x 4-5 um. Thallus irregularly flat, often only present as small sparse verrucules or tiny lobules attached to the apothecia, white, matt, K-, with cortex. Apothecia very variable, scattered, adnate; disk flat or slightly convex, black, matt, epruinose; margin thin, white or often bluish next to disc, entire, persistent; cortex very poorly developed; epihymenium bluish or bluish brown, N+ violet; hypothecium hyaline; hymenium I+ blue; paraphyses cohjerent, septate, simple or slightly branched, 1.5-2 um thick; spores ellipsoid. 2,7-dichlorolichexanthone (with 2,7-dichloro-3-O-methylnorlichexanthone present or absent), with or without pannarin. On calcareous silicate rocks in subalpine ranges, and Arctic (Greenland to Alaska). .....L. torrida
4. Apothecia 1.5-2 mm, sessile but elevated; spores 7-8 x 2.5-3 um. Apothecia numerous, round; disc black, epruinose, depressed convex to convex; margin white, entire, persistent. Thallus moderately thick, rimose-areolate, white, matt; areoles 0.3-0.4 mm wide. Excipulum scarcely corticate, containing algae; hypothecium hyaline; hymenium well delimited from hypothecium, I+ blue; epihymenium sooty green, inspersed, K-, N-; paraphyses strongly coherent, above slightly clavate, 1.5-2.5 um thick; asci narrow, ca. 10 um, numeous, but rarely fertile; spores ellipsoid to oblong. Medulla

I-, K-. On calcareous rock, Arctic. .....L. groenlandica

5. Discs dark red. Thallus very thin, warty, rough and heaped, dark greenish gray to ashy. Apothecia 0.3-0.8 mm, adnate, the disc flat to strongly convex, the margin thin, concolorous with thallus or olive green, becoming crenulate, sometimes disappearing. Spores 8-11 x 4-7 um. Northeastern, rare. Also on wood. .....L. willeyi

5. Discs yellow to dark brown. 6

6. Thallus dark, sordid, thin. Discs not or only slightly pruinose (often bluish suffused according to Nylander), usually brown or red-brown, rather dark, sometimes livid or blackish, finally convex and immarginate. Apothecial margin white, narrow, subcrenulate, broken up, almost disappearing; apothecia extremely crowded, 0.2-1.0 mm diam.; paraphyses tthick, the tips clavate thickened, brownish; hymenium I+ blue; spores 9.8-11(-13) x (4-)5-7.2 um. Spermatia 16-24 long. Usually on wood, sometimes on rock walls. .....(L. umbrina)

6. Thallus whitish and thin to thick, or if dark then ± thick. 7

7. Discs pale yellow to dark brown. Apothecial margin cortex thick, especially at base. Apothecial margin thick, white (to blue-grey in dark apothecia), smooth, usually raised, persistent, even to wavy or crenulate. Discs pale pinkish brown, pale brown to yellow brown, olive brown or dark brown, sometimes lightly pruinose. Apothecia 0.1-0.7(-1.5) mm diam., abundant, generally compacted in the thallus center, sessile, broad at the base. Epihymenium brownish or ± colorless, N-; hymenium usually N+ purple-red. Paraphyses to 2 um, apices 1.5-3 um. Spores (7-)11(-16) x (3-)5-6 um, broadly ellipsoid. Pycnospores 20-35 x 1 um. Thallus to 1(-2) cm wide, in compact rosettes, convex, creamy white, brilliant white or rarely grayish white, slightly rough to granular, irregularly cracked-areolate; areoles swollen, sometimes almost lobe-like and notched at the margins. Thallus P-, K-, C-, KC-. On hard calcareous or ultramafic rocks, or mortar, in well-lit situations. A form with a very thin, inconspicuous thallus, found on the coast of Washington State, is tentatively included here. .....L. albescens

7. Discs brown to black. Thallus forming ± continuous, discrete patches, smooth and somewhat glossy to slightly roughened, rimose-areolate to ± verrucose, whitish to dull yellowish or gray to blue-gray; prothallus often conspicuous, white, dark blue or black. Apothecia 0.2-0.5(-0.7) mm diam., at first ± immersed, becoming sessile, not strongly constricted below; discs plane, black or sometimes pinkish brown; margin at first entire and concolorous with thallus, becoming brown to black, crenate, partly disappearing. Epihymenium yellowish or borwnish, K+ yellow, N-; hymenium 40-45 um, hyaline or greenish gray below and greenish to olivacoeous above; hypothecium gray; paraphyses 2-3 um, sparsely bracnhed, apcies to 3.5-4 um, swollen, bluish green to dark brown; asci broadly clavate, Lecanora-type; spores 9-15(-17) x 4-6 um, appearing 1-septate, often guttulate. Pycnidia often numerous, to 60 um diam., black; pycnospores 18-25 x 0.5-1 um, thread-like to arc-like, sigmoid or irregularly contorted. Thallus P-, K-, C-. On siliceous (and calcareous?) rocks, restricted to the seashore (mesic supralittoral). .....L. helicopsis (i.d. doubtful)

ADD:

Thallus granular-squamulose, pale to dark gray or brownish. On rocks in the supralittoral

zone of the seashore, Pacific NW. ..... Lecania? sp. 1 (Ryan--MS thesis)

"Lecidea" sp. 20 (Anderson)

Thallus gray, inconspicuous or absent. Apothecia numerous, often clustered and crowded; disk yellowish or olivaceous tan, weakly pruinose at least when young; margin white pruinose when young, well developed; spores 10-12(-14) x 5.5-7 um. Apothecia UV+ orange (unknown xanthones); margin K-. On calcareous rock, Michigan. ..... L. sp. 2 (Harris)

Thallus dull gray-brown, rimose-areolate, K-. Spores 9-10 x 4.5-5.5 um. On non-calcareous rock, Ontario. ..... L. sp. 2 (Brodo; this is from the first edition; he may have a name for the species now)

Thallus squamulose, whitish, the squamules flattened-globular, thick, 0.5-1 mm wide, pulverulent, fissured, K-, C-. Apothecia 1 per squamule, dull black then dark gray (dull brick-red when moist), eventually occupying greater part of squamule, level with thalline margin, to 0.75 mm, with thin gray proper margin. Spores 7-10 x 2-6 um. On granite, California. .....L. peltastictoides
(=??? Rhizoplaca glaucophana)

Ch: xanthones. ..... Lecanora contractula

Thallus whitish to grayish, K-.

Probably Belong in Aspicilia (at least sensu lato)

1. Paraphyses non-moniliform. 2
1. Paraphyses moniliform. 3

> **2. Spores (12-)13-17 x (5-)7-8.5 um. Thallus areolate-verrucose,** ± orbicular. Epihymenium olive-brown. Paraphyses non-moniliform. Hymenium 140-150 um. Arctic. .....Aspicilia novae-semliae
> **2. Spores (15-)17-20(-25) x (9-)10-12 um. Thallus rimose-areolate,** determinate, chalky white with bluish or grayish shade. Apothecia to 0.3 mm, immersed, black, plane, epruinose, the margin not very prominent. Hymenium 100-115(-150) um. Epihymenium dark olive; paraphyses branched, non-moniliform. On calcareous or non-calcareous rocks. .....L. (Aspicilia?) permutata

3. Hymenium 75-80(-85) um. Spores 12-13(-14) x 7.5-8.5 um. Thallus areolate, gray-white to bone white. Apothecia to 0.7 mm, immersed, concave to plane, black, epruinose, the margin rather thick, entire. Epihymenium gray-to green-brown; paraphyses distinctly moniliform towards tips. Hymenium I+ blue then yellow-brown. Eastern Arctic. .....L. (Aspicilia?) canadensis
3. Hymenium over 100 um. Spores over 14 um long and 10 um wide. 4

> **4. Spores (14-)18-24 x 10-14 um. Apothecia to 2 mm. Thallus gray-white or bluish,** rimose-areolate. Apothecia immersed, black, plane, epruinose. Hymenium 100-125 um. Epihymenium blackish; paraphyses moniliform. .....Aspicilia rolleana
> **4. Spores rare, 15-17 x 10-12 um. Apothecia to 0.5 mm. Thallus pale olive,** continuous, rimulose, becoming subareolate to subsquamulose at edge, thin. Apothecia dispersed, immersed, olive-gray to pale, concave, the margin thick, prominent. Paraphyses moniliform above; epihymenium olive to greenish, HCl+ bright green (therefore should definitely be Aspicilia!). Hymenium 110-135 um. On rock near stream, Tennessee. ..... Aspicilia olivaceopallida

Probably belong in Hymenelia or Ionaspis

Discs immersed, subconcave, ± pale red-brown to blackish, to 0.7 mm. Thallus rimose-areolate.

1. Spores 15-16 x 9-10 um, ellipsoid. Thallus glaucous-gray, thin, determinate, rimose-areolate. Apothecia innate, subconcave, 0.5-0.7 mm diam., rather pale red-brown. Epihymenium inspersed. Hymenial gelatin I+ red-brown. On rocks in bed of creek, W. Virginia. .....L. (?) deplanans

1. Spores 10-14 x 5-8 um, oblong-ellipsoid. Thallus glaucous to brownish, finely whitish pulverulent (faintly white pruinose), chinky to areolate, the areoles small and flat, rarely lobed toward the margins. Apothecia 0.25-0.7 mm diam., immersed to adnate, 1-2 per areole; disc slightly concave to plane, light to darker brown or blackish, persistently white-pruinose, the margin entire, becoming somewhat flexuous, concolorous with thallus or darkening. Hypothecium and hymenium hyaline. Paraphyses distinct, stout, enlarged and rarely branched toward the apices. Asci clavate. On calcareous rocks, Iowa. .....L. (?) iowensis

I-D-3. Thallus scant to disappearing.

1. Spores globular, 20 um diameter, 4-6 per ascus. Thallus diffuse, dirty whitish, indeterminate, or absent. Apothecia sessile, circular; disk plane, dusky brown; thalline margin regularly crenulate, the crenules globular, uniform in size, necklace-like surrounding the disk, this margin persistent and slightly elevated. Spores thin-walled. On decomposed granite, southern California. .....L. praecrenata
(if apothecia immersed, also see Aspicilia)

1. Spores ellipsoid, usually 8 per ascus. 2

2. Apothecial discs brown-black or black. 3

2. Apothecial discs ± pale. 4

3. Epihymenium sordid blue-green. Thallus indistinct or of a few white granules. Apothecia sessile, dispersed to contiguous, 0.4-0.8 mm diam., ca. 0.4 mm thick, strongly constricted at base; discs brown-black, subplane; margins coarsely crenulate when young, thin and slightly granulose when old, or "extenuated"; cortex thick (70-100 um throughout), inspersed with granules (insoluble in K and N); hyphae indistinct, apparently ± anticlinal, thick-walled; algal layer 70-100 um, continuous, uneven, going up into the margin; algae mostly ca. 17 um diam., yellow-green, rather thin-walled; exciple at center often up to 100 um thick, with intricate, thin hyphae, partly bluish green at central base, laterally only 10 um, at edge 35 um or more and bluish; hypothecium 15-25 um, indistinct, hyaline; hymenium 70 um, I+ dark blue; epihymenium 12-15 um, sordid blue-green, in K brown or green-brown; paraphyses conglutinate (even in K), ca. 2 um, the tips thickened, globose, 5-6 um; asci ca. 50 x 13-16 um, narrowly clavate; spores ellipsoid, 12-16 x 5.6-6.5 um. Apothecia K-, C-, P-. On dry, exposed sandstone, montane, Utah. .....L. flowersiana

3. Epihymenium brown-black. Thallus ± absent. Discs black, epruinose. Paraphyses tips much thickened. Apothecia aggregated, narrowly constricted at base, to 1 mm broad; margin thick, white, pruinose, persistent, entire; cortex of margin composed of perpendicular hyphae, 65 um thick, I-, K-; disk flat, black, epruinose; epihymenium olive-brown or dark brown, inspersed; hymenium 60-65 um, hyaline, I+ blue becoming red; paraphyses loosely coherent, simple or sparingly branched above, tips thickened to 5-6 um; spores ellipsoid, 10-13 x 4-5 um. Thallus K-, C-, P-, I-. On acid rocks. Arctic. .....L. congesta Lynge

4. Apothecia constricted, substipitate. Arctic. 5

4. Apothecia not constricted, not substipitate (?) Apothecial margin cortex gelatinous and conspicuous. Epithecium inspersed or granular. Often growing in maritime areas. 7

5. Disc red, red-brown, or blackening, flat. Thallus verruculose or areolate, thin to disappearing, bluish white or ashy, matt or shiny. Apothecia to 2 mm, substipitate, the margin thick, pale, entire, with thick cortex of palisade-like hyphae. Epihymenium reddish or brownish to violet reddish; hymenium 40-65 um; paraphyses coherent, slender, the apices slightly thickened; spores oblong to ellipsoid, 9-14 x 4-6 um. Thallus K-. Ch: 2,5-dichlornorlichexanthone. On rock or bone. Arctic. ..... (L. behringii)

5. Discs black or brown-black. 6

6. Thallus white, indistinct, minutely granulose. Apothecia 0.5 mm, adpressed then substipitate; disc black, naked to pruinose; margin entire, black. Spores 10-12 x 4-5.5 um. .....(L. discoensis)

6. Thallus white or ashy, ± dispersed, of small granules. Apothecia constricted, disc

black or brown-black; margin thin, entire or crenate, whitish or ashy. Spores 9-15 x 4-6 um. Thallus crustose, of ± dispersed small granules, whitish or ashy, K-. Apothecia to 1.2 mm diam., constricted at the base, dispersed or aggregated; margin thin, concolorous with thallus; disk flat or becoming convex; cortex thick, of irregular paraplectenchyma, not palisade-like; epihymenium red-red-brown or brown, N+ purple; hypothecium pale; hymenium 80 um, pale; paraphyses coherent, thin; tips clavate, upper part slightly branched and interconnected; spores ellipsoid. On calcareous rocks, Greenland and Alaska. .....L. nordenskjoeldii

7. Apothecial margins level with disk, sometimes almost disappearing.
.....8

7. Apothecial margins raised, persistent. Apothecia scattered.
.....9

8. Paraphyses richly branched. Apothecia dispersed, or usually clustered in small groups. Epihymenium colorless to pale brownish yellow, not granular. Hymenium 45-55(-65) um. Thallus not well delimited, of dispersed, rounded granules (ca. 0.25 mm), more aggregated with the larger granules somewhat lobed, whitish gray to gray or yellowish gray; prothallus indistinct. Apothecia 0.2-0.6(-0.8) mm diam., sessile, constricted below; thalline margin entire or irregularly crenulate to somewhat flexuose, persistent; discs pale brown to red-brown or yellow-gray, flat to slightly convex, sometimes weakly pruinose when young. Paraphyses 1.5-2.5 um, tips 2.5-3.5 um, not or slightly thickened and capitate, yellowish brown. Spores 8-11(-15) x 4.5-6.5(-7) um. Thallus P-, K-, C-, KC-, containing 2-5-dichlorlichexanthone. Medulla of apothecial margin lacking crystals. .....L. salina

8. Paraphyses simple. Apothecia usually dispersed. Epihymenium brown to olive-brown. Hymenium 60-65 um. Apothecia to 0.5 mm, disc plane, flesh colored to brownish or blackish, sometimes pruinose, margin white, thin, smooth or crenulate, often slightly powdery. Spores 7-14 x 4-6 um. Thallus usually lacking. Usually on bark. .....(L. hageni)

9. Apothecial margins thick, well developed, generally pruinose when young, then glossy brown, eroding, becoming white-sorediate (according to Galloway), persistent, entire to crenulate or contorted to flexuose. Discs not, or only slightly white pruinose (when young or on calcareous substrates). Thallus white to gray or blackish, of scattered granules, not readily seen, often immersed. Apothecia scattered or aggegated into dense groups, sessile, constricted below, to 0.2-1(-3) mm diam.; disc very variable in color, pinkish brown to olive brown, yellow-brown or dark brown, or pale yellowish or greenish gray. Epihymenium pale yellowish brown or brownish, densely inspersed with granules not dissolivng in K, N- or N+ paler. Hymenium 70-100 um; hypothecium someitmes brownish. Paraphyses 1.5-2 um, branched and frequently anastomosed, apices to 3.5 um, slightly swollen and brownish. Asci broadly clavate, short-stalked. Spores biseriate, broadly ellipsoid, (7-)8.5-10(-14) x (3-)4-7 um. Thallus P-, K-, C-, containing ß-sitosterol. On basic rocks, concrete and mortar, and seashore rocks; also on nutrient-enriched or dust-contaminated bark. Arctic to temperate. .....L. dispersa

9. Apothecial margins thin, crenulate, not pruinose, well developed, persistent, white, regularly deeply crenate with 5-8 segments, rarely non-crenulate. Discs rather variable in color, reddish brown to yellowish or brownish black, heavily gray or blue-white pruinose. Epihymenium brownish or blue, inspersed with fine granules, N- or N+ faintly pink; hymenium

55-70 um, yellow-brown above; paraphyses ca. 2 um, sparsely branched, apices capitate, the terminal cell brownish and swollen to ca. 3 um wide. Spores 6-10(-15.5) x (4-)4.5-6 um. Pycnospores 11-15 x 0.5 um. Thallus usually immersed and inconspicuous, more rarely areolate, pale gray, smooth to finely granular. Apothecia to 0.2-0.6(-0.9) mm diam., constricted at base, slightly raised, often in small groups and then becoming anuglar by compression. Thallus P-, K-, C-. On hard, calcareous rocks, and mortar. .....L. crenulata

ADD:

Thallus continuous, irregularly cracked-areolate, gray to brownish gray or bluish gray, surface densely granular to warted or papillate, papillae rounded to flattened or branched; prothallus often prominent, fimbriate, with alternating white and greenish to black zones. Apothecia to 1 mm diam., often aggregated, constricted at the base, scarcely exceeding the level of the papillae; thalline exciple crenulate to strongly crenate, sometimes papillate, persistent; discs dull red0brown, flat or slihgtly convex; epitheicum yellowish brown, not granular; hymenium 45-70 um. Paraphyses 2-3 um wide, mainly simple, some sparsely branched; apices 3.5-5 um wide, pale yellowish brown, markedly swollen, capitate. Asci 35-45 x 12-15 um, clavate. Spores (7-)9-13(-15) x (4-)5-7 um, ellipsoid. Thallus P0, K-, C-. no substances. On seashore rocks, Queen Charlotte Islands, British Columbia; Alaska. ..... L. poliophaea (Wahlenb.) Ach. s. [lato] (L. sp. 1 of Noble, 1982)

II-E. SAXICOLOUS. Non-sorediate.
Thallus and apothecial margins whitish or grayish, K+ red
Apothecia ± immersed.

1. Spores narrow, oblong, 17-22 x 7-8.5 um. Paraphyses non-moniliform. Thallus gray-white, rimose-areolate. Apothecia immersed, black, plane, to 0.6 mm, the margin dark, thin to indistinct. Epihymenium blue-green or olive-green. On granitic rock, Maine. .....L. (Aspicilia?) monticola

1. Spores (mostly?) broadly ellipsoid to globose. 2

2. Epihymenium greenish, HCl+ (or N+) stronger green. Paraphyses moniliform. Spores broadly ellipsoid. Oregon. .....Lecanora (Aspicilia?) sipeana)

2. Epihymenium brown, N-. Paraphyses not moniliform. .....Bellemerea
(including Lecanora applegatei)

I-F Thallus whitish, K+ yellow,
but not belonging to L. subfusca or L. rupicola groups
(Discs not strongly pruinose;
amphithecium without K-insoluble crystals)

1. Hypothecium and hymenium (excluding upper part) hyaline, K-. Apothecia appearing lecideoid. Thallus whitish, epruinose, to 2-3 mm thick, soft, irregular, papillate-verrucose to coarsely plicate or becoming ascending subsquamulose, often cariose (split), P+ yellow-orange, K+ yellow, C-, I-. Upper cortex inspersed with minute granules; medullar hyphae 2-2.5 um, rather loosely arranged. Apothecia numerous, partly contiguous but scarcely crowded, to 1.5 mm diam., sessile from the beginning, constricted at the base, then often becoming stalked, strongly elevated in the apices of columnar to podetiaform or squamuliform thalline excrescences; discs pure black, epruinose, plane becoming convex to semiglobose, margin concolorous with disk, at first thick, then becoming excluded. Excipulum in lower part not delimited; algae rather numerous in margin; cortex ca. 50 um thick, the hyphae thin, thin-walled, indistinct, variously oriented, but in exterior part of upper margin more radiating; excipulum hyaline; hymenium 50-55 um, I+ blue then dirty wine red; epihymenium emerald green, not granular; paraphyses thin, septate, simple to rarely furcate, the tips slightly thickened; asci numerous, narrowly pyriform; spores often absent, ellipsoid to oblong, 7-8 um long. Pycnidia not found. On calcareous rock, arctic. .....L. cladonioides

1. Hypothecium and hymenium dark, K+ violet. Apothecia clearly lecanorine.
.....Tephromela atra and T. nashii

ADD?:

Apothecial margin with well developed, gelatinous cortex, K+ yellow (atranorin). On bone, Long Island, New York. ..... L. cf. varia (Brodo)

Thallus of minutely scattered to ± contiguous irregular areioles, areoles flat to somewhat warted with age, creamy, whitish gray or green-gray, paler towards the margins; prothallus, when evident, white. Apothecia 0.1-0.2(-0.5) mm diam., dispersed, immersed to sessile, the base slightly constricted, inconspicuous; thalline exciple poorly developed, irregularly crenulate, often excluded; discs white to pale green, pinkish brown or pale brown, becoming strongly convex, not or slightly pruinose; epithecium ± colorless, interspersed with coarse granules; hymenium 25-40 um tall. Paraphyses 1.5-2 mm wide, simple or sparsely branched, apices to 5 um wide, not swollen or expanded. Asci 30 x 10 um, broadly clavate, Bacidia-type. Spores 7-10(-15) x (1.5-)2-3 um, rarely appearing 1-3-septate, fusiform-ellipsoid, apices pointed, often curved. Pycnidia frequent, immersed; conidiogenous cells sessile; conidia 4-5.5 x 1-1.5 um, narrowly ellipsoid to bacilliform. Thallus P+ red, K+ yellow, C- (atranorin, chloratranoirn, stictic and ± norstictic acids, unidentfied compounds). On seashore rocks, Queen Charlotte Islands, British Columbia. ..... L. tenera (Nyl.) Crombie

I-G. Apothecia appearing lecideoid.
(These species need to be cross-referenced in Lecidea keys)

1. Thallus dark red-brown or brown-black. On siliceous rocks (sandstone, quartzose rocks), mostly coastal, California. .....L. scotopholis
1. Thallus whitish, grayish, or yellowish. 2

2. Thallus or apothecia distinctly yellowish. 3
2. Thallus whitish or grayish; apothecia ± black. 4

3. Disks black. Thallus well developed. On hard, calcareous or base-rich rocks. ..... L. marginata
3. Disks yellowish or brownish. Thallus often poorly developed or absent. On siliceous rocks, alpine. ..... L. polytropa

4. Thallus K+ yellow, to 2-3 mm thick, soft, irregular, papillate-verrucose to coarsely plicate or becoming ascending subsquamulose, often cariose (split). On calcareous rock, arctic. .....L. marginata (syn. L. cladonioides)
4. Thallus K-, indistinct, minutely granulose. On volcanic rock.
Arctic. .....L. (Aspicilia?) discoensis

Descriptions

L. albescens (Hoffm.) Branth & Rostr. (L. dispersa group)

THALLUS usually distinctly epilithic, to 1-8 cm wide, usually growing in rounded, convex, often indistinctly effigurated (with tiny marginal lobes all around), compact rosettes or cushions, which are sometimes confluent; irregularly cracked-areolate; **areoles** (0.2-)0.43-0.61-0.84(-1.5) mm across, separated by narrow fissures, swollen, sometimes almost lobe-like and notched at the margins; **surface** chalky white or pale pinkish, creamy white, brilliant white or rarely grayish white, slightly rough to granular, **cortex** present.

APOTHECIA (0.1-)0.21-0.36-0.53(-1.0) mm diam., abundant, generally compacted in the thallus center, usually crowded to confluent, immersed (to sessile but broad at the base?). **Discs** pale pinkish brown, pale gray, pale brown to yellow brown, olive brown or dark brown, epruinose. **Margin** white (to blue-grey in dark apothecia according to ?; never bluish according to Poelt et al. 1995), smooth, immersed (to raised and thick?), persistent, even to wavy or crenulate; cortex thick, especially at base. **Hymenium** usually N+ purple-red. **Epihymenium** brownish or ± colorless, K-, N-, with insoluble crystals; **Paraphyses** 1- 2 um thick, apices (1.5-)2.5-3(-4) um. **Spores** (7-)11(-16) x (3-)5-6 um, broadly ellipsoid.

PYCNIDIA Pycnospores 20-35 x 1 um.

CHEMISTRY Thallus P- (or P+ orange?), K-, C-, KC- (?). Usually with 2,7-dichlornorlichexanthone (with 2,7-dichloro-3-O-methylnorlichexanthone present or absent), with or without pannarin.

ECOLOGY AND DISTRIBUTION: On hard calcareous or mortar, in well-lit situations in hilly-mountainous districts, or? on ultramafic rocks on the seashore (Pacific NW).

NOTES: Often strongly damaged. Specimens with thin thalli, elevated and sometimes rather large, apothecia with thick rims, and containing other substances, may be better included in L. flotowiana.

L. crenulata Hook. (L. dispersa group)

THALLUS usually immersed and inconspicuous, more rarely areolate, pale gray, smooth to finely granular.

APOTHECIA (0.1-)0.22-0.25-0.28(-0.4) mm diam. (to 0.9 mm according to ?), constricted at base, slightly raised, ± circular and never crowded (often in small groups and then becoming anuglar by compression according to ?); usually containing lots of algae **margins** usually thin (0.05 mm thick), distinctly crenulate (irregularly strongly notched, with at least some of the indentations reaching the disc)), not pruinose, well developed, persistent, white, regularly deeply crenate with 5-8 segments, rarely non-crenulate; commonly with a lot of epinecral material, especially in the area of the parathecium, that finally can hang down as sort of lobulles, giving the tim a ± opaque aspect from above, and leaving the rim appearing almost zeorine. **Discs** pale brownish to black (rather variable in color, reddish brown to yellowish or brownish black, according to ?), often heavily gray or blue-white pruinose. **Hymenium** 55-70 um, yellow-brown above; **Epihymenium** brownish or blue, inspersed with fine granules, N- or N+ faintly pink, without crystals; **paraphyses** ca. 1-2 um wide, sparsely branched, apices capitate, the terminal cell brownish and swollen to ca. 2.5-4 um wide. **Spores** 6-10(-15.5) x (4-)4.5-6 um, broadly ellipsoid to somewhat elongate.

PYCNIDIA Pycnospores 11-15 x 0.5 um.

CHEMISTRY: Thallus P-, K-, C-, KC-. No substances

ECOLOGY AND DISTRIBUTION: On hard, calcareous rocks (usually pure limestone, but also on dolomite and calcareous slate), and mortar, usually on steep to overhanging surfaces, from hills to the snow zones.

NOTES: Some specimens have larger apothecia with a thicker rim and a brown to dark brown and often less pruinose, approaching L. xanthostoma or L. flotowiana

L. dispersa (Pers.) Sommerf. (L. dispersa group)

THALLUS white to gray or blackish, of scattered granules, not readily seen, often immersed.

APOTHECIA scattered or aggegated into dense groups and slightly crowded, sessile, constricted below, (0.2-(0.41-0.52-0.7(-1.1) mm diam. (to 3 mm according to ?); thin, **disc** very variable in color, light brown to brown-gray, pinkish brown to olive brown, yellow-brown or dark brown, or pale yellowish or greenish gray, not, or only slightly white pruinose (when young or on calcareous substrates). **Margins** 0.05-0.1 mm thick, well developed, usually only slightly prominent, shallow, often notched on the sides, generally pruinose when young, then glossy brown, eroding, becoming white-sorediate (according to Galloway), persistent, entire to slightly crenulate or contorted to flexuose. **Hypothecium** sometimes brownish. **Hymenium** 70-100 um; **Epihymenium** pale yellowish brown or brownish, densely inspersed with granules (not dissolivng in K or N), N- or N+ paler. **Paraphyses** 1-2 um wide, branched and frequently anastomosed, apices to 2.5-4 um, slightly swollen and brownish. **Asci** broadly clavate, short-stalked. **Spores** biseriate, broadly ellipsoid, (7-)8.5-10(-14) x (3-)4-7 um.

CHEMISTRY: Thallus P-, K-, C-, containing 2,7-dichlorlichexanthone (with 2,7-dichloro-3-O-methylnorlichexanthone present or absent), with or without pannarin). Also containing ß-sitosterol.

ECOLOGY AND DISTRIBUTION: On basic rocks, concrete and mortar, and seashore rocks; also on nutrient-enriched or dust-contaminated bark. Preferring walls, stone surfaces, on flat or perpendicular surfaces. At ± low elevations. Arctic to temperate.

NOTES:

L. flotowiana Spreng. (L. dispersa group)

THALLUS endolithic.

APOTHECIA (0.2-)0.46-0.72-1.49(-3.0) mm diam., crowded and usually incised and very irregular in outline; **discs** light to dark brown, dirty gray green to blackish, epruinose or slightly pruinose when very young, rarely remaining pruinose very long; **margin** 0.05-0.15 mm thick, mostly distinctly prominent, usually whitish, whitish-gray, or sometimes weakly yellowish at the beginning (at higher altitudes tinted bluish near the disc or entirely bluish), epruinose or pruinose, smooth, not or slightly crenulated; **epihymenium** K-, N- (pigment dissolving in K and N), without crystals, or with brownish granules (insoluble in N) in brown discs; **paraphyses** 1-2 um wide, tips 2.5-4 um; **spores**

CHEMISTRY: Apothecial margin K- or K+ yellowish, KC- or KC+ yellow. Very variable: substances 1 (vinetorin); 2 (5-6AB,6C, UV+ white to ice-blue after charring, probably 7-chlor-3-O-methylnorlichexanthone) + substances 3 (4-5A,3-4B,3C, dark orange in daylight after heating) and 7 (7A,6-7BC); substances 2 and 3 + substance 8 (probably 2,7-dichlorlichexanthone); substances 4 (5A,6BC, violet in daylight after heating) and 5 (6AC); substances 4, 7, and 9 (3-4A,5B,4-5C); substance 8; substances 8 and 10 (6A,8B,6C, violet in daylight after charring); or without lichen substances.

ECOLOGY AND DISTRIBUTION: On calcareous rock, mortar and bricks. From valleys up to high-alpine levels, especially on manured flat to inclined surfaces. Not yet reported for North America, but I have tentatively identified some of my North American (?) collections as this species.

NOTES: This species corresponds to "L. dispersa type 2" in Fröberg (1989). It is not homogeneous.

L. perpruinosa Fröberg (L. dispersa group)

THALLUS endolithic or epilithic and areolated; **areoles** (0.2-)0.30-0.32-0.34(-0.5) mm across, gray or dark gray.

APOTHECIA (0.2-)0.40-0.45-0.50(-0.8) mm diam., usually crowded in loose groups, circular to angular, thickish, broadly sessile; **disc** dark violet to black, usually distinctly and ± uniformly pruinose; **margin** 0.05-0.1 mm wide, gray, distinctly and ± uniformly pruinose, not crenulated, slightly prominent; **epihymenium** K-, N+ pink, without crystals; **paraphyses** often submonilliform, 1.5-2.5 um thick, the tips 3.5-5 um thick, with a brownish cap; **spores**

CHEMISTRY: No substances.

DISTRIBUTION AND ECOLOGY: On calcareous rock (limestone), mostly in subalpine-alpine areas, often forming communities with other species of the group. Not yet reported for North America, but I have tentatively identified material from Ontario as belonging to this species

NOTES:

Species Not Yet Known From North America

L. aghardiana Ach. (L. dispersa group)

THALLUS endolithic, altering the rock structure.

APOTHECIA sunken into the rock at least at the base, often umbonate, mostly pruinose, with few algae.

CHEMISTRY: no substances.

ECOLOGY AND DISTRIBUTION:

1. Apothecia remaining sunken or later ± prominent, often very distinctly umbonate. Thallus often bluish. Chiefly in submediterranean regions, rarely extending to subalpine levels. Variable. ..... subsp. aghardiana

1. Apothecia finally distinctly prominent. Umbo distinct, or only noticeable in sections. Thallus not especially colored, but the altered stone structure now and then causing a yellowish tint. (subsp. sapaudica Clauzade & Roux). 2

2. Apothecia small, mostly c. 0.2-0.5 mm diam., usually rather crowded, the umbo often visible only in section. Apothecia pruinose whan young, later mostly epruinose and ± black. At alpine to high alpine elevations. ..... v. lecidella (Poelt) Leuckert & Poelt

2. Apothecia to 1 mm diam., usually scattered, remaining pruinose, the sides often white. From valleys to high alpine elevations. ..... v. sapaudica

L. eurycarpa Poelt, Leuckert & Roux (L. dispersa group s. lato)

THALLUS ± endolithic, at most weakly developed,

APOTHECIA 1-2(-3.5) mm diam., thick; **margin** fairly thin, brownish to gray-brownish, often darkly tinted; with few algae, paraplectenchymatous (especially the amphithecium), with attachment hyphae growing out here and there; **disc** medium brown, flat to strongly convex; **hyppothecium** subparaplectenchymatous, cupulate; **spores** rather narrowly ellipsoid, c. 10-16 x 4.5-6 um.

CHEMISTRY: usnic and rangiformic acid.

ECOLOGY AND DISTRIBUTION: On iron- and weakly limestone-containing silicates, on strongly inclined surfaces, in the alpine levels of the central Alps; very scattered.

L. turbinata Poelt & Leuckert

THALLUS ± endolithic

APOTHECIA sessile, usually containing lots of algae, often distinctly stalked, mostly bundled together, irregular in outline, the rim irregularly notched, the disc brown and epruinose; **spores** narrowly ellipsoid, often somewhat bent, c. 13 x 4 um.

CHEMISTRY: No substances.

ECOLOGY AND DISTRIBUTION: High alpine. Alps.

L. xanthostoma Roux & Fröberg (L. dispersa group)

THALLUS endolithic.

APOTHECIA (0.2-)0.42-0.53-0.74(-1.0) mm diam., dispersed to crowded, circular, or when crowded irregular in shape but never incised, sessile; usually containing lots of algae; **discs** yellow-gray or olive-brown, matt, epruinose (to pruinose); **margin** 0.1-0.2 mm thick, smooth to finely notched, without a thick epinecral layer, not appearing very opaque from above, usuallly distinctly yellowish to yellow or olive-white, never bluish; base of apothecia sometimes bearing tiny lobules in well-developed specimens; **epihymenium** K-, N- (pigment dissolving in K and N), without crystals; **spores** broadly ellipsoid to somewhat elongate.

CHEMISTRY: Apothecial margin K+ strongly yellow to light orange, KC+ yellow to orange (rarely K-, KC-). Substances 1 (vinetorin) and 6 (probably aotearon).

ECOLOGY AND DISTRIBUTION: On flat or sloping surfaces of calcareous rocks (limestone, marl-limestone) and similar siliceous rocks containing low quantities of lime. France, Sweden.

NOTES: This species corresponds to "L. dispersa type 1" in Fröberg (1989).