KEY SAX3
Sorediate,
Saxicolous

1. Thallus bright greenyellow, yelloworange, or orangered to rusty. 2
1. Thallus not brightly yellow to red. 5

2. Thallus yelloworange to red or rusty. 3
2. Thallus greenyellow to yellow, K. ..... KEY 3A

3. Thallus K+ purple. ..... KEY 3B
3. Thallus K (?). 4

4. Thallus vivid orange, consisting of separated or contiguous rounded areolae on a black or partly reddish orange prothallus; soredia black or flecked with black, coarse, delimited in small, round areolae. ..... Lecidea atrofulva
4. Thallus at least partly rusty colored. ..... other Lecidea spp. and Porpidia spp.

5. Thallus completely sorediate, completely lacking a cortex. ..... KEY 8c
5. Thallus corticate in part, only partly sorediate. ..... KEY 8d

KEY 8c
Thallus completely sorediate or leprose;
Saxicolous

1. Thallus light yellowgreen to olivaceous, containing either usnic acid or xanthones. 2
1. Thallus whitish to light greenish to bluish gray, lacking usnic acid and xanthones. Lepraria spp. 3

2. Thallus pale greenish yellow, consisting of scattered to subcontinuous clumps of soredia. Contianing atranorin and xanthones. ..... Sterile crust no. 4 (Gowan, Bay of Fundy)
2. Thallus light to medium olive, thick, becoming areolate at the center; containing a xanthone (and usnic acid?). On maritime conglomerate. ..... Sterile crust no. 5 (Gowan, Bay of Fundy)

ADD:

Lecanora cf. thysanophora (Gowan, Bay of Fundy).

KEY 3d. SAXICOLOUS.
Thallus partly corticate, partly sorediate.
Soredia and medulla C+ red or pink
(gyrophoric + or lecanoric acids).

1. Cephalodia present. 2
1. Cephalodia absent. Thallus continuous, smooth to verrucose, light greenish gray. 4

2. Cephalodia deep red, tubercular, scattered among the areolae. Thallus scatteredareolate, light greenish gray. Soralia scattered, whitish. ..... Amygdalaria paneola
2. Not as above. 3

3. Thallus effuse, indeterminate, without any trace of marginal effiguration, thin (up to 0.2 mm thick); areoles contiguous or dispersed; ..... Placopsis effusa
3. Thallus effigurate, lobate, determinate. Soredia often present, scattered over the center and granulose; soralia rounded or radially elongate, eroded or plane, often irregularly confluent. Thallus forming rosettes which become confluent into large patches to 8 cm diam.; marginal lobes closely to ± loosely attached, contiguous, separated by cracks to 0.1 mm wide, to 2.5 mm long (or extending to center of thallus), 1.6 mm broad; apices uneven, rounded or crenulate, sometimes with a narrow, olivebrownish peripheral zone; thallus center becoming areolate; areoles irregularly angular, 0.62 mm across, ± swollen or plane; surface cream or ivory colored or glaucous, often olivebrownish tinged, smooth, matt, not pruinose; cephalodia single in center of small thalli, scattered in older thalli, discrete, 13(8) mm diam., orbicular, radiately folded and cracked, yellow brown or reddish brown, matt. Cortex Kor K+ yellowish, C+ rose; medulla K, C+ red, KC+ red, P+ red or P. Thallus containing gyrophoric acid. Pycnidia immersed in slight swellings, ostioles brownblack, 0.1 mm diam; pycnospores filiform, straight or curved, 1527 x 0.5 mm. Rather variable. On rocks (siliceous), occasionally on mosses or sandy soil, arctic to temperate, south to the White Mountains in the east and to California in the west; very common, at least in montane areas on the west side of the Cascades. ..... Placopsis gelida

4. Thallus thin, smooth to weakly rimoseareolate; soralia small, round, flat. Trapelia spp. 5
4. Thallus thick, verrucose or plicate and cracked, the cracks and wrinkles often oriented radially, giving the thallus a flowing appearance; soralia large, 0.53 mm diameter, often

convex. ..... Ochrolechia androgyna s. lato

5. Thallus conspicuous, forming small, ± delimited patches or an extensive crust to 15 cm across, white or pinktinged, matt; edge usually with discrete, ± effigurate, flat or ± convex areoles 0.20.4(0.6) mm diam., giving the thallus a placodioid appearance, towards center areoles coalesce, the thallus thenbecoming secondarily cracked. Soralia 0.20.3 mm diam., numerous, pale greenish or yellowish white, rarely ochraceous, usually developing from sides of areoles or cracks in thallus; soredia 2030 um diam., farinose. On hard siliceous rocks, minespoil heaps and walls. Apparently pollution tolerant (does well in the Bronx, New York City). Common in Michigan and New York, and probably elsewhere in eastern U.S. ..... Trapelia placodioides

5. Thallus inconspicuous, uneven, of ± scattered, often convex areoles or squamules, dark gray, olivaceous, pale green ± suffused ochraceous brown, pinkbrown to brownish; margin diffuse; soralia excavate to slightly convex, 0.20.4 mm diam. Apothecia often present. On siliceous rocks, stones, or more rarely plant debris. .....Trapelia obtegens

ADD:

Thallus and soralia P, C+ red. Thallus thickish, coherent, wartyfissured, irregularly breaking up into granular to almost isidiatesorediate surfaces. ..... (see Ochrolechia androgyna"v. saxosum")

1. On various crustose lichens (but this is not always recognizable in the herbarium) on exposed siliceous rocks. Medulla P+ yellow, K+ yellow to red, C, or P, K, C+ rose, with gyrophoric acid and varying proportions of norstictic acid; other reported substances are probably contaminants from host lichens. Areoles rough granuloseisidiatefurfuraceous to sorediate. Thallus rimoseareolate or irregularly areolate, to 0.8 mm thick, dark olivebrown to dark brown or blackish; areoles irregular in outline, flat to slightly convex, 0.40.5 mm across; surface minutely isidioid or granular, the granules (20)30(50) um diam. Hypothallus not visible. Photobiont cells 612 um diam. Nova Scotia. ..... "Rimularia" furvella

1. Directly on rock. Thallus C+ red (gyrophoric acid major), usually K, P. 2

2. Thallus thickish (0.10.4 mm), ± bullateareolate, light brown

to beige, or gray brown to dark brown, sterile with elongated papillae (isidialike outgrowths), or becoming sorediate; or richly fruiting and then mostly with few or no soralia. Thallus bullateareolate; areoles irregularly angular, 0.30.7 mm broad, mostly scattered on a black hypothallus (occasionally visible between areoles), seldom flat, mostly convex to nearly spherical; upper surface rough or smooth; papillae 0.150.25 mm broad, 0.5 mm high, the tips finally convex, mostly with somewhat paler outgrowths, slightly erose, occasionally breaking into whitish (or yellowish) soralia 0.20.5 mm wide, or the soralia replacing the papillae. Thallus K, P, with gyrophoric acid only. ..... Rimularia (Mosigia) gibbosa

2. Thallus thin (to 0.2 mm), crackedareolate to dispersed areolate, graybrown to dark brown or light brown, oroccasionally yellowish to pinkish brown (paler brownish when wet), without papillae or soralia, or papillatesorediate to finely isidiate. Areoles 0.20.7(1.2) mm wide, ± flat, swollen but not bullate, irregularly angular to at margin sublobulate; surface smooth to rough; black hypothallus present, visible at margin, not conspicuous between the areoles. Soralia 0.1 mm broad; isidia (0.05)0.1(0.15) mmbroad, to 0.2 mm high, cylindrical or spherical; prothallus dark brown to black. Medulla usually K, P, but rarely K+ red, P+ orange (norstictic). ..... Rimularia badioatra

1. Medulla and soredia C+ orange to red. Thallus deeply and regularly cracked, thick; areoles to 0.4 mm diam., contiguous to discrete, flat to mostly warty convex, pale grey to dark brown, often turning reddish in herbarium, delimited by black prothallus, rounded, tuberculate. Soralia 0.20.5 mm diam., at firts punctiform and rounded, pale greenish or ochre or creamcolored to greyyellowish, soon becoming brownish, and ± confluent, when old often craterform sunken. Soralia P+ yellow, KC+ red, UV+ faintly yellowish, with alectorialic acid. On ± vertical, shaded, siliceous rocks, often under overhangs. ..... Fuscidea praeruptarum

SAXICOLOUS.
Sorediate.
C+ red or pink.
Algae Trentepohlia.

1. Soralia with yellow or pinkish tinge, P, K, KC+ red, C+ red, UV+ glaucous or pale yellow. Containing Schizopeltic acid and satellites, or gyrophoric acid and trace of lecanoric acid, or both, unidentified xanthone. Thallus brownish or yellowish brown overall; soralia numerous, punctiform. On humid, often + vertical or overhanging, neutral or acid rock faces, especially in old woodlands; scarce on deciduous or conifer bark. Queen Charlotte Islands and Nova Scotia. Probably belongs in Lecanactis. ..... "Opegrapha" gyrocarpa Flot.
1. Not as above. Thallus usually C+ red (gyrophoric acid). Thallus sorediose, often sterile, thin to thickish, cracked or areolate. Cortex C+ red or pink (erythrin and lecanoric acid); roccellic acid absent. Medulla white, at least close to the substrate consisting of loose hyphae. Thallus less than 1 mm thick, nonlobate, not soft, tightly attached, usually whitegreen or creamy white, glabrous or only moderately pruinose, not strongly cretaceous, appearing well developed and "healthy". Individuals growing together in a mosaic pattern usually forming large uniform societies. Free prothallus thin, whitebrown to dark brown. Cortical hyphae anticlinally arranged. Thallus sorediate. 2

2. Medulla C+ pink or red. Thallus to 1 mm thick, areolaterimose, nonlobate, creamy white or whitegray. Medulla white. Cortex 3565 um thick. Unknown substance B present. Soralia slightly pruinose, often globose or capitate. On rock. ..... Dirina catalinaria f. sorediata
2. Meduula C. Thallus to 0.5 mm thick, whitegreen, seldom whiteyellow, smooth and pruinose, more or less areolate or even bullate. Medulla often dirty white. Cortex 1050 um thick. Unknown substance B absent. On rock. ..... Dirina paradoxa f. sorediata

SAXICOLOUS.
Sorediate.
Thallus K+ red.

1. Medulla I+ violet. Thallus K+ yellow then red (norstictic acid). ..... Bellemerea subsorediza
1. Medulla I. 2

Soralia pale yellow; norstictic acid present but stictic acid absent (medulla K+ red); thallus continuous only when young, becoming dispersed areolate on a well developed prothallus. Arcticalpine. .....cf. Porpidia sp.

Medulla K+ yellow becoming red, P+ yellow becoming yelloworange (norstictic acid), C, KC; saxicolous; disjunct between the Appalachian Mountains and the northwestern arctic coast; known only sterile. .....Pertusaria excludens

Thallus (medulla) K+ red. Thallus effuse, moderately thick, areolate; areoles ± convex, 0.20.5 mm wide, contiguous and angular to here and there subdiscrete and rounded; surface matt, gray to bluegray; soralia conspicuous, numerous, 0.40.5(0.8) mm across, becoming confluent; soredia white, granular. Hypothallus indistinct. Usually with apothecia but spores often not developed. Westcentral Canada. ..... Lecidea petsamoensis

3. Thallus papillatetuberculate, without isidia or soralia (or with simple to branched isidia?according to Ozenda & Clauzade, or with soredia?according to Wetmore). Thallus ± effigurate at margin, rather thick, somewhat tartareous, uneven, rimoseareolate, with wartypapillose or branchedgranular areoles, dark or grayish ashy olive. In f. pseudoradiata, the thallus is regularly orbicular, 12 cm wide, radiating and appearing lobed, somewhat violetgrayish. (If thallus effuse, see A. cinerea). Usually at higher elevations. Arctic (Greenland); S. Dakota and Wyoming; very common in California; Washington?; probably elsewhere. ..... Aspicilia mastrucata
3. Thallus not papillatetuberculate, but isidiate, sorediate, or both. 4

4. Isidiate; with or without soredia. 5
4. Not isidiate; with soredia. [Wetmore's "A. mastrucata" will also key out here, but I don't have enough information on it to put it into the key]. 6

5. Isidia scattered, short, ± dark gray, eventually becoming sorediose at the tips; soredia whitish or yellowwhite. Thallus ± dark gray. Thallus 0.30.5 mm thick, rimoseareolate or irregularly areolate, covering ± large areas; areoles partly smooth, uneven, partly very minutely verruculose (x 20 lens). Upper cortex (15)2535(50) um thick, the surface hardly darker; epinecral layer sometimes present; cells 35(6) um diam. Algae 818 um diam.; algal layer 5070 um thick, frequently interruptedor broken up. Medulla airfilled. Pycnospores straight, 710 x 1 um. Thallus K+ rusty crystals (norsticitic acid). On somewhat moist rocks. ..... Aspicilia simoensis v. isidiata (typical strain)

6. Soralia developing from breakup of verrucae, poorly delimited and becoming confluent, yellowish to whitish. Thallus rimoseareolate to rimosegranulate or verrucose, grey to greengray, thick. Verrucae immediately breaking up into soredia, covering the whole surface of the verruca and often forming large areas of confluent, soredia, giving the thallus a variegated color. Alpine or subalpine. California. ..... Aspicilia simoensis v. simoensis

6. Soralia discrete, depressed (very low), not confluent, bluish white to greenish white. Thallus areolate to slightly verrucose. Soralia 0.51 mm diam. Thallus broadly expanded, to 1020 or more cm across, dark gray with a bluish shade; areoles 0.51 mm across, 0.30.4 mm thick, irregular, slightly convex to uneven, separated by broad or narrow cracks and perpetually dividing into smaller prats; surface smooth, matt, for the most part sorediose; soralia round, subcrateriform, limited, efflorescent, often not occupying the whole surface of the areoles, not confluent. Hypothallus pale, indistinct. Cortex 2035(50) um thick, hardly darker at the surface, Medulla granular, the granules dissolving in K but not in HCl. Pycnospores 710 um long, straight. ..... Aspicilia bahusiensis

SAXICOLOUS.
Sorediate.
Thallus K+ yellow (to orangish), P+ yellow to red.

1. Thallus with thamnolic acid, P+ orange, K+ yellow. Thallus sorediate, pustulatesorediate, or isidioid. Prothallus absent. Usually on bark or wood. ..... Loxospora
1. Thallus with stictic acid, without thamnolic acid. 2

2. Thallus areolate to rugulose or verruculose, the marginal areolae often discrete and rounded, but becoming contiguous or imbricate toward the center; margins often weakly effigurate; soralia small, roundish, becoming confluent. Thallus K+ yellow (stictic acid). ..... Baeomyces rufus
2. Not as above. Soralia pale gray; stictic acid present with norstictic acid as a minor constituent (medulla K+ yellow or orange); thallus continuous. Rare in the eastern temperate zone. 3

3. Thallus thick (0.61.0 mm); soralia regular in shape, mostly not confluent. .....Porpidia albocaerulescens
3. Thallus thin (to 0.2 mm); soralia irregular in shape, often confluent. [At least in true P. soredizodes, soralia dark gray; thallus white with black, usually obvious hypothallus]. ..... Porpidia cf. soredizodes

SAXICOLOUS.
Sorediate.
Thallus or Soredia P+ yellow, orange, or red; K?.

Medulla and soredia C. Soralia P+ red. Soralia occasional, discrete, pale yellow brown to pale greenish, at most under favorable conditions becoming corticate and then darker; very irregularly distributed, rounded to oval or irregular in outline, 0.51.5(2) mm wide, convex. ..... Fuscidea cyathoides v. sorediata

SAXICOLOUS.
Sorediate.
Soredia and medulla C or C+ yellowish,
K or K+ yellowish, P.

1. Soredia KC+ violet. ..... Pertusaria amara
1. Soredia KC. 2

6. Soredia and medulla K+ yellow to orange. 7
6. Soredia and medulla K (confluentic acid present). 8

7. Thallus continuous, smooth rimoseareolate, light gray to whitish with scattered laminal soralia. ..... Porpidia cf. subsorediza

8. Cephalodia present. ..... Amygdalaria panaeola
8. Cephalodia absent. ..... Porpidia tuberculosa

ADD:

Thallus mostly gray, at most patchily orange. .....

4. Containing stictic or norstictic acid, or both (medulla K+ yellow to red). Eastern temperate or arcticalpine. ...5
4. Lacking stictic and norstictic acid. Eastern boreal. .....
.7

7. Medulla IKI; soralia irregular, forming along crackes in the thallus. Containing 2'Omethylsuperphyllinic acid. Thallus bluish grey or white. Apothecia rare. Spores 1825 x 7.510 um. Oceanic. .....Porpidia glaucophaea
7. Medulla IKI+ strong blueviolet, K. Soralia round, forming discrete patches, whitish or pale yellowgreen. Thallus grey or greygreen, or patchily oxidized reddish orange; continuous or patchy, rimoseareolate or verrucoseareolate on black hypothallus. Apothecia occasionally present, 0.42 mm, disc pruinose. Spores 1318 x 6.511 um. Ch: confluentic acid, and unknown(s). Oceanic or continental. .....Porpidia tuberculosa

2. Soralia dark brown to ± lilacwhite, pale when abraded, P, K, KC, C, UV, rarely UV+ deep blue. Containing confluentic, 2'Omethylmicrophyllinic and 2'Omethylperlatolic acids. Thallus thin to rather thick, smooth, even, or finely cracked,

superficial, dark chocolate brown with ± distinct lilac tinge, often delimited by black prothalline line; soralia punctiform, rarely confluent, (0.2)0.51(1.5) mm diam., Pycnospores 56 x 0.5 um, straight. On steep, deeply shaded, overhanging, siliceous rocks in humid situations, rarely on shaded, smooth, deciduous bark. Nova Scotia. ..... (Enterographa zonata)

3. Thallus bullate areolate, eroding into granular soredia at least in part; cephalodia large, hemispherical, pink, containing Gloeocapsa; medulla K, P, usually C+ red, but rarely C. .....Amygdalaria panaeola

6. Thallus K+ yellow. Thallus indistinctly rimoseareolate, with soralia, patchy? ("maculatim dissolutus"), the patches ± linearly arranged and radiating toward periphery of thallus, thin. Medulla I+ blue. On shaded rock, Smoky Mts. .....Lecidea degelii

SAXICOLOUS.
Sorediate.
Thallus lobate, C, K or K+ yellow, P.

Thallus to 6 cm diam., often smaller and coalescing, ± crustose at the center with radiating, closely contiguous, apparently pleated, convex marginal lobes, glaucousgraywhite, sometimes becoming darker, more verruculose and ± cracked and areolate towards the center; lobes 0.51 mm wide, wider at margins, matt, densely whitepruinose, sorediate. Soralia scattered, coalescing to form erose patches, mainly laminal; soredia white or concolorous, granular, ± farinose. Thallus P, K± yellow, KC, UV+ dull orange or UV, containing atranorin, chloratranorin, diploicin and a xanthone. On calcareous (or siliceous?) rocks and walls in mainly dry, often ± sheltered, nutrientenriched habitats, also on bird perch rocks in the xeric supralittoral. Southwestern. ..... Diploicia canescens

Sorediate, pustulate, or isidiatepustulate; soredia coarsegranular or finefarinose, sometimes at tips of isidia. 6

6. Soralia developed at tips of thick erect isidial growths, craterform. Hypothecium lensshaped. ..... Dirinaria confusa v. saxicola
6. Soralia developed on thallus surface (not elevated on isidia), globose capitate or forming craterform verrucae. Upper cortex C. Lower side with well developed cortex. Thallus generally coriaceaous. Medulla white (to yellowish, but not red). With divaricatic acid. Soralia globose capitate, soredia finefarinose. Hypothecium more than 120 um thick at center. 8

8. Lobes to 0.5 mm wide, discrete, adglutinated to substrate, tips bluish; thallus soft, fragile, nonplicate. On rock. ..... Dirinaria frostii
8. Lobes 0.51(2) mm wide; thallus coriaceous. Discs black. Divaricatic acid. Lobes subdichotomously, dichotomously or irregularly divided, confluent form the peripheral region of thallus, often convex; tips generally flabellate; thallus generally longitunally rugoseplicate.
Substrate? ..... Dirinaria applanata

1. Thallus P, K+ yellow or K, without thamnolic acid. Thallus with fine soredia. Prothallus often present. 3

3. Thallus soft, leprose or farinose, often widespreading, composed of fine soredia, whitish to pinkish gray, K+ yellow, P+ pale yellowish; with atranorin, porphyrilic acid and zeorin, usually delimited by a white, cottony prothallus. (if thallus pale yellowgreen or yellow=gray, with usnic acid, = var. ochroleucum). Pycnidia sometimes pressent, immersed but upper part scarlet (K+ magenta); conidia 1220 x 0.50.7 um, curvedfiliform. On rock (acid or slightly calcareous), on relatively dry, vertical surfaces, rarely on bark. ..... Haematomma ochroleucum var. porphyrium

3. Thallus at least in younger parts, with delimited soralia; margins usually esorediate; thallus, medulla and soralia P, K, KC, UV+ white (perlatolic acid); prothallus smooth, bluegray. Thallus pale gray and rather scabrid, with scattered areoles on a smooth bluegray prothallus; soralia numerous, efflorescent, discrete, 0.21 mm diam., or often confluent, whitish to bluish gray; soredia 3080(100) um diam.; external hyphae often bluegray, N+ red. Usuall on bark, rarely on shaded acid rocks (vertical surfaces). ..... (Mycoblastus caesium)

4a. Thallus tan at margin, becoming dark gray in center; soredia dark gray. On noncalcareous rock, Michigan. ..... Caloplaca sp. 4 (Harris)

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

1. Thallus lobed or radiatingplicate at margin. Thallus sometimes K+ red (norstictic acid). Spores and spermatia various. .....

2. Lobes very distinct, elongated, very narrow (mostly to ca. 0.5 mm or less), graybrown; soredia or isidioid granules often present. Thallus with pseudoparenchymatous true cortex. .....(Hyperphyscia)

5. Medulla with at least one spot test positive; thallus variously colored. 6
5. Medulla with all chemical tests negative (or spot tests uncertain); thallus always gray (?). Producing no lichen substances; restricted to the (eastern) arctic. ..... Pertusaria pruinifera

6. Medulla K or K+ yellowish then redbrown or violet, without norstictic acid, KC+ or KC. 7

7. Medulla KC. Thallus margin characteristically zoned; medulla K, C, P+ orangered, contains fumarprotocetraric and succinprotocetraric acids; Widespread throughout eastern temperate North America. .....Pertusaria multipunctoides
7. Medulla KC+ rose or violet. Medulla K or K+ yellow becoming redbrown, P or P+ yellow becoming orangered (± protocetraric acid), C, but always KC+ instantly roseviolet fading to wine red (picrolichenic acid), UV; widespread throughout eastern and western temperate North America. ..... (Pertusaria amara)

Thallus and soredia C. Rare, western Canada. ..... ("Ochrolechia sorediosa" morph of O. szatalansis)

Lepraria s. lato (including Leproloma)

I. Thallus P+ yellow, orange, or red

1. Thallus coarsely granular, with few if any projecting hyphae, pale gray, on sunny (to shaded), mossy, acid rocks or stony ground, usually on horizontal to gently sloping surfaces. 2
1. Thallus powdery; in shade, often on steep or overhanging surfaces (protected from sun and precipitation). 3

2. Thallus C+ reddish orange or C, KC+ reddish orange, P+ yellow, K+ yellow or K, containing alectorialic acid, ± atranorin. Thallus granular, firm, delimited, somewhat effigurate and growing in irregular rosettes, but without distinct lobes; granules convexglobular, ca. 0.10.2 mm diam., usually without projecting hyphae, ± separated in center but clustered at the margins; bluish to whitish gray; medulla grayish white, rarely exposed. On moss cushions or acidic rock, and on stony ground, in open, sunny locations, Arctic/alpine. (If containing porphyrilic acid and fatty acids, see Leproloma cacuminum; various other whitish or grayish sterile granular lichens are also common, but are apparently not named at present). ..... L. neglecta (Nyl.) Lettau
2. Thallus P+ orange red, K± yellow, KC± yellow. With fumarprotocetraric acid, usually + atranorin (and zeorin?not mentioned by Laundon). Thallus a mass of convex granules 0.050.2 mm diam., usually without projecting hyphae (i.e., not appearing powdery), pale gray, delimited, the granules often lighter and clustered towards the margin, sometime giving a zonate appearance, with alternating zones of dark and light greenish or bluish gray, firm (or soft?), not clearly lobed but often growing in irregular rosettes; medulla grayish white, rarely exposed. On moss cushions, lichens and cyanobacteria, or directly on rock, often on gently sloping and somewhat sunny habitats. Northeastern, and elsewhere. Resembles L. neglecta but differs chemically. ..... L. caesioalba (B. de Lesd.) Laundon (syn. L. zonata)

5. Thallus P+ yellow, KC, with porphyrilic acid and fatty acids. Thallus crustoseleprose, forming a thick, nonareolate crust of powdery to nonpowdery spherical granules to 0.4 mm diam., yellowish white to gray; surface not corticate, or eroded to leave a leprose membrane, the margin absent, diffuse, undelimited

to delimited, without lobes; medulla white; underside with a weft of loosely entangled hyphae forming the early development of a hypothallus, whitish gray. On especially acid, mossy rocks, also acid bark, soil, and other lichens.
Temperatearctic. ..... Leproloma cacuminum (Massal.) Laundon
5. Thallus P+ orange or red. 6
6. Thallus P+ redbrown, K+ yellow. Granules connected by cottony membrane, whitish. On soil, moss or rock, arctic/alpine. Not treated by Laundon,
1992. .....L. arctica
6. Thallus P+ orange or orange red. 7

7. Thallus with pannaric acid or its derivatives. 8
7. Thalllus without pannaric acid or its derivatives, often K+ yellow (atranorin). 9

8. Thallus P+ reddish orange, K, C, containing pannaric acid 6methyl ester, ± pannaric acid, rarely atranorin. Thallus forming irregular rosettes and obscurely lobed, or irregularly delimited small crusts, powdery, whitish to pale yellowish or greenish gray; surface not corticate, a mass of powdery, convex granules, which are sometimes eroded to leave a leprose margin; medulla white, exposed in places on most specimens; underside a weft of loosely entangled hyphae forming the early development of a hypothallus, whitish grya to brownish. On stone and bark, in shaded situations, espcially on nutrientrich Fraxinus and Ulmus in sheltere parks and woodlands, on bare surfaces, and bryophytes, also commonly on soil. Resembling a poorly developed morph of Leproloma membranaceum, but lobes indistinct and differing chemically. ..... Leproloma vouaxii
8. With pannaric and roccellic acids, P+ reddish orange, K+ yellow (atranorin) or K, C. Thallus soft, well delimited, forming irregular rosettes, usually rather distinctly lobed at the margin, forming small, shelflike membranous outgrowths, yellowish white; apices of lobes rounded, ± flat; surface not corticate, of numerous powdery convex granules, the margin either flat or raised, 117 mm wide, older lobes often disintegrate to poweery convex granules to 0.5 mm diame, especially at the center of the thallus, or eroded to leave a leprose membrane; medulla whitish; underside a continuous, welldeveloped weft of branched hyphae forming a hypothallus, whitish gray to brownish. Young specimens with rounded powdery squamules with a rolled edge at the margin, recalling Normandina. Apothecia very rare, to 2 mm diam., the sorediate thalline exciple 0.5 mm thick. Usually on shaded, steep, mossy, acidic rock faces or walls, on the surface

and over mosses, occasionally on mosses on shaded tree trunks, especially Quercus. .....Leproloma membranaceum

9. Thallus KC+ reddish orange, K+ yellow or K, P+ orange, with protocetraric and alectorialic acids. Thallus of a mass of powdery spherical granules to 0.2 mm diam., with projecting hyphae, when well developed forming a thick powdery crust, bright whitish gray with a greenish or yellowish tinge, diffuse, without marginal lobes; medulla white. On bricks, mortar and mosses of brick walls in slight shade, rock crevices and tree trunks. ..... L. eburnea Laundon9. Thallus KC, without alectorialic acid, K± yellow, P+ orange. With protocetraric or fumarprotocetraric acid, stictic acid, or thamnolic acid. 10

10. Thallus granular (rarely powdery), often zonate, with alternating zones of dark and light greenish or bluish gray. Soft or firm, usually not clearly lobed. Directly on rock, often on gently sloping and somewhat sunny habitats. K± yellow, with fumarprotocetraric acid, + or atranorin. Northeastern (and elsewhere?). ..... (see L. caesioalba)
10. Thallus powdery, not zonate. 11

11. Thallus K, P+ orangered, with protocetraric or fumarprotocetraric acid, and rangiformic or roccellic acids as uncommon accessories. Thallus froming an uneven noncortciate membrane on which occur powdery convex granules to 0.4 mm diam., with projecting hyphae, when well developed producing an extensive, thickish, powdery, folded crust, delimited, with the margins almost lobelike; color white to pale gray, sometimes with a bluish gray tinge. On bare rock and over mosses and lichens on shaded limestone, often dominant, also on siliceous coastal rocks. ..... L. nivalis Laundon
11. Thallus K+ yellow, P+ orange, with stictic or thamnolic acid. 12

12. Thallus with atranorin, stictic ± constictic acid, and zeorin. Thallus of a mass of powdery convex granules of variable shape and size, to 0.5 mm diam., with projecting hyphae which sometimes form a weft on the surface, or the granules becoming eroded to leave a leprose membrane; usually forming a thick powdery crust, bright greenish gray to whitish gray, the latter color especially when eroded; usually diffuse, without marginal lobes but in eroded specimens the medulla often develops into

delimited sublobes; medulla white. On shaded bark and on shaded acidic and calcareous rock, directly on the surface and especially over mosses; also on shaded earth. ..... L. lobificans Nyl. (L. sp. of Brodo, Long Island, also keys out here)

12. Thallus with thamnolic acid, often dull green. ..... L. umbricola Tonsb.

ADD:

Thallus KC+ red, with fumarpotocetraric acid and zeorin, + or alectorialic acid, + or atranorin, soft and powdery or firm and granular, zonate. Directly on rock, in shaded to somewhat sunny habitats, northeastern. ..... L. zonata sensu ? (lumped by Laundon under L. caesioalba)

II. Thallus P (at most P+ pale yellowish)

1. Thallus bright greenish yellow or orangish yellow. .....
(see Chrysothrix if K, Leproplaca if K+ purple)
1. Thallus not bright yellow, at most pale yellow. 2

2. Thallus coarsely granular, often zonate, K± yellow, C. With either rangiformic or roccellic acids, ± atranorin [If containing porphyrilic acid, see Leproloma cacuminum]. Often growing on rather sunny, mossy, acidic rocks. ..... (see L. caesioalba)
2. Thallus finely granular or powdery soft or firm, not zonate growing in shade. 3

3. Thallus C+ red, K, P, KC+ yellow; thick, pale green with white prothallus, fine, soft. On dry overhangs, Western Washington. .....L. sp.
3. Thallus C. 4

4. Thallus ± yellow, KC+ yellow (usnic acid). 5. Without pannaric acid. K+ yellow (atranorin), KC+ yellow (usnic acid). Friable in consistency. With fatty acids (roccellic, hydroxyrocellic) and pulveracic acid. Not treated by Laundon, 1992. .....L. farinosa
4. Thallus ± white, gray, green, bluish, or creamy, without usnic acid. 5

5. Thallus poorly delimited, not lobed. 6
5. Thallus well delimited, ± lobed. 8

6 With porphyrlic acid and fatty acids, K+ yellow (atranorin), without triterpenes. ..... (see Leproloma cacuminum)
6. Without porphyrilic acid and fatty acids, with triterpenes, with or without atranorin. 7

7 Thallus UV+ white, with divaricatic acid, zeorin, K± yellow (atranorin). Thallus leprose, a mass of powdery spherical granules to 0.1 mm diam., with projecting hyphae, when well developed forming a thick (sometimes loosely attached?), frequently areolate, powdery crust, dull greenish gray, usually with a bluish tinge, diffuse, without marginal lobes; medulla ± undifferentiated. On acid, shaded bark, and on acid, shaded walls and rocks, especially on bare surfaces but also over mosses. .....L. incana
7. Thallus UV, with unidentified triterpene, K. Thallus leprose,

of a mass of powdery irregular granules, to 0.1 mm diam., but often much smaller, with numerous projecting hyphae which tend to form a weft over the surface, when well developed forming a thick powdery crust, verdigris green, but becoming dull greenish gray in herbarium; forming ± irregularly orbicular patches in the early stages, without marginal lobes. On rock and over mosses in limestone caves and clefts, and on limestonecliffs shaded by trees, confined to damp, heavily shaded habitats, in deeper shade than Leproplaca chrysodeta with which it often grows. ..... L. lesdainii (Hue) R. C. Harris

8. Thallus K+ yellow (atranorin); with roccellic and lepraric acids. Thallus pale green to fairly vivid green, rather thick; granules ± fine, piled on top of each other. Algae Trentepohlia. Not treated by Laundon, 1992. .....L. latebrarum
8. Thallus K, without atranorin. 9

9. Thallus UV+ white, with divaricatic acid. Thallus thick, soft. On shaded calcareous substrates. .....L. crassissima (Hue) Lettau
9. Thallus UV (?), obscurely lobed, powdery, whitish to pale yellowish or greenish gray, containing pannaric acid 6methyl ester, ± pannaric acid, rarely atranorin. ..... (see Leproloma vouaxii)

1. On various crustose lichens (but this is not always recognizable in the herbarium) on exposed siliceous rocks. Medulla P+ yellow, K+ yellow to red, C, or P, K, C+ rose, with gyrophoric acid and varying proportions of norstictic acid; other reported substances are probably contaminants from host lichens. Areoles rough granuloseisidiatefurfuraceous to sorediate. Thallus rimoseareolate or irregularly areolate, to 0.8 mm thick, dark olivebrown to dark brown or blackish; areoles irregular in outline, flat to slightly convex, 0.40.5 mm across; surface minutely isidioid or granular, the granules (20)30(50) um diam. Hypothallus not visible. Photobiont cells 612 um diam. Nova Scotia. ..... "Rimularia" furvella

1. **Thallus C+ orange or red.** Sorediate to scurfyblastidiate. Hypothecium yellowbrown to redbrown. 2
1. Thallus C (may actually be C+ orangeAnderson's C may not have been working). Thallus verrucose, uneven, grayish. Soralia pale greenish, to 1 mm diam., composed of a roundish, irregularly convex mass of soredia; verrucae to ca. 0.25 mm diam. Thallus and soredia K+ yellow, P+ weak yellow. Black hypothallus not evident. On streamside rock wall in subalpine, Colorado. (Roger told me this is Lecidella scabra, but I that species is supposed to be C+ orange)
..... Lecidella sp. ("Lecidea sp. 13" of Anderson)

2. Thallus thin, granular. Apothecia sessile. Soralia distinct. On siliceous or slightly basic rocks, occasionally on dry and often dustimpregnated wood. ..... Lecidella scabra
2. Thallus thick, composed of blastidia. Apothecia ± immersed. Not sorediate. On noncalcareous maritime rocks, rarely on decorticated wood or decaying vegetation. .....
Lecidella prasinula [auct. non (Wedd.) Hertel?]

Thallus sorediate.

1. Medulla and soredia C+ orange to red. Thallus deeply and regularly cracked, thick; areoles to 0.4 mm diam., contiguous to discrete, flat to mostly warty convex, pale grey to dark brown, often turning reddish in herbarium, delimited by black prothallus, rounded, tuberculate. Soralia 0.20.5 mm diam., at firts punctiform and rounded, pale greenish or ochre or creamcolored to greyyellowish, soon becoming brownish, and ± confluent, when old often craterform sunken. Soralia P+ yellow, KC+ red, UV+ faintly yellowish, with alectorialic acid. On ± vertical, shaded, siliceous rocks, often under overhangs. ..... Fuscidea praeruptarum

1. Medulla and soredia C. 2

2. Soralia P+ red. Soralia occasional, discrete, pale yellow brown to pale greenish, at most under favorable conditions becoming corticate and then darker; very irregularly distributed, rounded to oval or irregular in outline, 0.51.5(2) mm wide, convex. ..... Fuscidea cyathoides v. sorediata

2. Thallus and soralia P. Thallus areolate or wartyareolate, whitish to grey or brownish gray; areoles 0.10.5 mm diam., usually contiguous, discrete, rounded and unvevenconvex or tuberculate. Soralia 0.20.7 mm diam., at first whitish, soon becoming brownish and confluent, uneven, sometimes convex. Prothallus dark brown, thin, ± visible between areoles and delimiting the thallus. Medulla and soralia UV+ white, with divaricatic and ± nordivaricaric acids. On hard, often ± vertical, siliceous rocks. ..... Fuscidea recensa

1. Thallus sorediate. Thallus gray, white, or yellowish, I. 2

2. Thallus yellowish. C, with ± confluent soralia, pale yellowish, uneven or smooth. On steep siliceous rocks. ..... Lecidea orosthea
2. Thallus gray or graywhite. 3

3. Thallus or at least exciple C+ red (gyrophoric acid). 4
3. Thallus and exciple C. .....

4. ..... Trapelia placodioides and T. obtegens
4. ..... Rimularia gibbosa and R. badioatra

5. Thallus K or + yellow. 6

6. Thallus K, poorly developed, membranaceous or verrucose, dirty gray, with inconspicuous indistinct whitepunctate soralia. New York. .....Lecidea sorediifera
6. Thallus K+ yellow. Thallus indistinctly rimoseareolate, with soralia, patchy? ("maculatim dissolutus"), the patches ± linearly arranged and radiating toward periphery of thallus, thin. Medulla I+ blue. On shaded rock, Smoky Mts. .....Lecidea degelii

1. Thallus yellow or greenish yellow. 2
1. Thallus gray, white, or brown. 4

2. Thallus thick, ± lobed at margin, greenish yellow, C+ orange (xanthones); Coast of S. California. ..... Lecanora xanthosora
Thallus thin or thick, C (no xanthones). Mostly inland. 3

3. Thallus greenish yellow, yellow green or sometimes blackish green; effuse, thickish, of crowded or scattered verrucose or coarse subsquamulose granules, or forming a ± continuous, areolate crust; areoles strongly warted and convex; prothallus when visible blackish. Soralia arising on the upper surface of the areoles, 0.20.5 mm diam., but often coalescing to form an almost continuous sorediate crust; soredia dull yellow to citrine yellow, usually paler but sometimes concolorous with thallus. Thallus and soredia P or occasionaly P+ yellow or orange, K, C(Ch: epanorin, rhizocarpic acid, zeorin). On ironrich siliceous rocks in shaded overhangs and dry crevices. .....Lecanora epanora
3. Thallus strongly yellow, lobate; lobes mostly very short, definitely lifted from substrate, high convex, crowded, each soon breaking up into a wide, deeply hollowed out thalluscolored soralium; old lobes finally almost hollow; K+ redbrownish. Very loosely attached to noncalcareous, overhanging rocks. Arcticalpine. ..... (Lecanora reagens)

4. Thallus brown. .....(Miriquidica intrudens)
4. Thallus gray or white, K+ yellow (atranorin). 5

5. Thallus greywhite, of contiguous, convex to subglobose verrucae. Chem.: sometimes Lgr1 and Lgr2 or fatty acids. Washington, Ontario. .....L. umbrosa
5. Soralia punctiform. Chem.: zeorin. Arizona. .....L. sp. 10 sensu Brodo (1984)

Thallus (usually) with isidioid soralia towards center, brown or graybrown; lobes very narrow (under 0.5 mm wide), thin (ca. 100200 um), plane and closely appressed, appearing cellular throughout inside; hyphae thinwalled (walls thinner than lumina). Apothecia unknown. Spermatia bacilliform, 57 um long. Chem.: no substances, or traces of unknown substances. On dry, steep or overhanging silicates at low to moderate elevations. [Note: various Hyperphyscia spp. (Physciaceae) will also key out here; they generally have a prosoplectenchymatous medulla and some lack soredia, but some are extremely difficult to separate from true L. demissa] . . . . . INCERTAE SEDIS: "Lecanora" demissa

1. Thallus without isidia or soredia, or if soralia present then thallus distinctly yellowish (Lecanora subg. Placodium sect. Endochloris Poelt), very thick and inflatedsquamulose (Lecanora cavicola) or otherwise different (various taxa not known from North America); lobes broader and thicker; thallus not appearing cellular inside; hyphae thick or thinwalled. Apothecia often present. Spermatia filiform to bacilliform. Chem.: usnic acid present or not. Mostly on exposed rocks, sometimes on soil, mosses, or rarely wood, low to high elevations. 2

Lecanora cavicola

1. Thallus dwarf fruticose (rarely poorly developed and appearing somewhat crustose, but not marginally lobed) ..... Lecanora phryganitis

1. Thallus crustose, marginally lobed. Thallus forming rather thin, more or less flat rosettes, usually grayish yellow or greenish yellow (more strongly yellow in herbarium); hypothallus thin or absent; medulla and lower hypothecium of more or less randomly oriented hyphae; cortex Pd+ yellow; thallus without LPN1 and 2. Thallus usually with pustules or soredialike granules, grayish yellow to slightly brownish (often much paler at margin); Baja California (Norte) to southern California .... Lecanora xanthosora

Sorediate, Isidiate, or Papillate

1. Medulla I+ blue, K+ red. Thallus with discrete soralia. Alpine. ..... (Bellemerea subsorediza)
1. Medulla I. 2

2. Medulla K+ red. Thallus grayish. 3
2. Medulla K+ yellow or K. 7

7. Thallus K+ yellow (often rather indistinct without pretreatment with HCl, due to poor development of cortex; presumably containing stictic acid, but the reaction may at least partly be due to release of algal pigments instead).
..... 8
7. Thallus K, without stictic acid.
..... 11

8. Thallus ± orbicular, ochraceous. 9
8. Thallus effuse, ± dark gray. 10

9. Thallus distinctly radiate, very indistinctly sorediate. Thallus thin, ochraceousgray, with scattered, verrucae; lobes undulating, extending even far towards the center. Cortex 15(20) um thick; cortical cells 23 um thick. Algae 68 um diam. Cortex K+ yellow, stronger after pretreatment in HCl. Pycnospores 2025 um. On siliceous rock. Arctic. .....
Aspicilia mashinginensis (typical strain)
9. Thallus radiating only along a very narrow (to 1.5 mm broad) marginal zone; soralia very distinct. Thallus to 2 cm diam., sometimes confluent, areolate; central areoles 0.250.35 mm diam., plane, abuptly limited, ± discrete, becoming sorediate; marginal lobes thin, subplane, contiguous, not apiculate, indistinctly terminate. Soralia often darkened, with a stellate appearance (probably due to parasitic Torula). Thallus (hypothallus?) between the areoles concolorous with them. Medulla strongly granular, the granules soluble in HCl. Cortex better developed on lobes than on areoles, the outer part dark yellowgray; hyphae 56 um thick, leptodermatous, constrictedly septate. Cortex rather weakly K+ yellow, but K+ intense golden yellow after pretreatment with HCl. On dry siliceous rock. Borealarctic (Greenland; NW Territories). .....Aspicilia sorediza

10. Thallus with isidia, becoming sorediose. [If soredia lacking, see A. leproscescens sensu Noble]. ..... K+ yellow strain of Aspicilia simoensis v. isidiata ("f. inferior")

11. Thallus C. 11

12. Thallus ± effuse (sometimes delimited, but not at all radiate), ± papillate or isidiate, becoming sorediate..... 13
12. Thallus ± orbicular, weakly to strongly radiate, not papillate or isidiate; distinctly to indistinctly sorediate. 14

13. Thallus (at least towards center) of easily detached flattenedglebulose (subsquamulose) to ± papillate granules, at times later becoming ± granularsorediate, pale to dark bluish gray, rimoseareolate, smooth to scurfy or scabridtartareous; prothallus sometimes evident, conspicuous, dark greengray, delimiting. Thallus P, K, containing aspicilin. Pycnidia unknown. Usually on nutrientenriched siliceous rocks on or near the seashore. The report of this species from N. America (British Columbia) is based on K+ yellow to red, isidiate material that is probably a separate taxon. .....Aspicilia leproscescens s. str.
13. Thallus partly with narrow, verruciform isidia soon dissolving into grayish white soredia. Areoles ± verruciform, dark bluish gray, with irregularly scattered, 0.51.5 mm across, low heaps of densely clustered isidia. Pycnidia numerous, at least partly composite, up to 250 um broad; pycnospores 78 um long. On siliceous rocks. "Probably an accidental form, found only once" [in Norway] according to Magnusson; not definitely known from N. America. .....Aspicilia caesiocinerea v. isidiata

14. Thallus pale ochraceous, ± orbicular but not distinctly radiate; soralia distinct. Cortical cells 56 um thick. ..... (see Aspicilia sorediza)
14. Thallus dark gray, distinctly radiate; soralia ± indistinct. Cortical cells 23 um thick. Thallus soft, orbicular, 1.5 cm diam., towards center effuse, areoleate, towards margin narrowly radiate; areoles 0.350.55 mm wide, separated by deep and somewhat wide cracks, subcolumnar, rounded to subangular, distinctly and densely sorediate. Marginal strings of areoles branched, often ± discrete, convex, narrow, 0.150.3 mm wide, apiculate, often longitudinally striate and here and there nodulose, under 0.15 mm thick. Surface deep gray or (when cortex destroyed) partly graywhite. Cortex variable, to 25 um thick, the outer part dark gray; hyphae strongly leptodermatous, 5 um thick, constircted septate. Medulla somewhat granular, the granules dissolving in

HCl. Algae bright orange in K after HCl; cortex unchanged. Pycnidia unknown. On basalt, Greenland. [If not pretreated with HCl, the typical strain will also key out here; it differs in having a larger, ochraceousgray thallus, with the lobes undulating and extending even far towards the center, and the verrucae only indistinctly sorediate]. ..... Aspicilia mashinginensis K strain ("A. bennettii")