

V. *Thallus effuse*.

V-A-1. On calcareous (HCl+) rock.

Thallus effuse, K+ red (at least after pre-treatment in HCl)

1. Thallus radiate, ashy brown. Medulla K+ red.(see A. fimbriata in Key IV-A)

1. Thallus not radiate, white or various shades of gray, but not brownish. 2

2. Thallus continuous to rimose. Spores 9-17 x 5.5-12.5 um (according to Esnault). Apothecia in wart-like elevations, 1-7 per areole, 0.3-2 mm diam., immersed, irregular; discs scarcely pruinose, and thalline margin thin, slightly projecting and flexuous. Hymenium 80-100 um; subhymenium 40-70 um; hypothecium 30-50 um; epithecium brown to greenish, N± green (never very bright). Paraphyses thick, coherent, little branched but anastomosing, scarcely moniliform. Spores 8/ascus, broadly ellipsoid, biseriate or monoseriate. Pycnospores 4.5-7 um. Thallus extensive, white, farinose, 0.5-2.5 mm thick, well delimited, the margins fringed to lobulate. Pycnospores immersed, punctiform, simple. Cortex 20-50 um, scarcely cellular, opaque from pruina; algal layer continuous, 40-80 um, extended under the apothecia. Thallus K+ red, with norstictic and connorstictic acid. On calcareous rocks, in fissures or north-facing surfaces. [Need to check Esnault again; some parts of this description are based on someone else's quite different concept.] [Note: an apparently rare strain of A. calcarea will also key out here; it has spores over 15 um wide, mostly 4 per ascus, and a continuous to rimose-areolate white thallus]. A. farinosa sensu Esnault v. reagens

2. Thallus areolate- verrucose. 3

3. Spores 12.7-18 x 10-10.4 um. Thallus chalk-white to blue-gray, rarely yellow-gray, continous, areolate-verrucose, with a dark gray prothallus; apothecia with ± prominent, smooth flexuous margin when mature. Medulla K-; cortex K+ red. Frequent, Alberta, Ontario, Yukon. "A. [cinerea] sp. 2" sensu Brodo

3. Spores mostly 20-26 x 12-14(-18) um. Thallus pale to dark yellowish to greenish or bluish gray, continuous to discontinuous, on a blackish hypothallus; areolate-verrucose, areoles 0.6-1 mm, having sloping sides, like volcanos; Apothecia 1 per areole, prominent, discs 0.3-0.6 mm, craterform, irregular; margins white pruinose, thin, prominent, generally radially striate (not Lecanora-type margins). Medulla densely granular. Thallus K+ red only after pre-treatment in HCl. Frequent, western. A. gibbosa

V-A-2. On non-calcareous (HCl-) rock.
Thallus effuse, K+ red (without pre-treatment with HCl)

1. Medulla I+ blue. Discs (under pruina) reddish or brownish to black. Epihymenium brown, N-. Paraphyses not moniliform. (*A. myrinii*, in which the medulla is I+ blue, also keys out here--see key to *Bellemerea*)
Bellemerea alpina

1. Medulla I-. Discs usually greenish black. Epihymenium usually greenish, N+ strong green. Paraphyses often moniliform. 2

2. Thallus dark, mostly brownish gray to olive-black. 3

2. Thallus ± pale, mostly whitish to pale grayish or tinged with other colors. 5

3. Thallus orbicular, delimited, ± distinctly radiate. 4

3. Thallus effuse, indeterminate, uniform almost to the margin. Spores (22-)25-27 x 16-18 µm. Thallus broadly expanded, dark to brownish gray, rimose-areolate, 0.2-0.3(-0.4) mm thick; areoles ca. 0.5 mm broad (though dividing through new cracks), angular with perpendicular edges, plane; hypothallus not distinct. Cortex and medulla ± opaque. Cortex (15-)25-30 µm, the exterior 4-5 µm brownish olive; epinecral layer 8-12 µm. Algae 6-12 µm; alga layer 35-70 µm, with rather even surface. Apothecia sparse, absent in large areas, in other parts scattered; immersed, solitary, discs 0.3-0.5 mm diam., depressed, plane or concave, black; thalline margin generally indistinct, scarcely prominent; proper margin absent. Exciple I+ blue. Hymenium (100-)120-150(-180) µm. Epihymenium dark olive. Paraphyses indistinctly septate, not moniliform, not or rarely branching, but anastomosing; apices scarcely thickened. Asci clavate. Spores 8. Pycnospores 15-20 µm. On siliceous rock. Alpine, Washington. *A. nordlandica*

4. Thallus papillate-tuberculate; apothecia usually absent. Alpine. Common, California to Washington; S. Dakota; Greenland. (*A. mastrucata*)

4. Thallus not papillate-tuberculate; apothecia often present at least in many of the species. [If thallus ± dark bluish gray, see *A. caesiocinerea*--an apparently rare strain; most authors consider that species to be always K-]. (see *A. fimbriata* and *A. subradicans* s. lato, in Key IV-A)

5. Thallus rimose-areolate. Spores mostly over 15 µm wide. 6

5. Thallus verrucose or verrucose-areolate, or if rimose-areolate then spores (sometimes poorly developed) under 15 µm wide. 7

6. Spermatia 24-32 µm long, straight, acicular. Spores 24-28 x 16-20 µm, ovoid. Hymenium ca. 180 µm. Apothecia 0.5-2 mm diam.

Thallus rimose-areolate, thick, whitish to light gray; areoles angular, plane or slightly concave, smoothish. Apothecia immersed; disk at first flat, sometimes finally slightly convex, dull black, the large ones moderately "umbilicated" (umbonate?) and sometimes with thin grayish pruina; thalline margin persistent. Paraphyses lax, coherent at tips, septate. "Hypothecium" ca. 45 μ m. Asci ventricose. On granite, southern California. A. cinerea sensu Hasse non (L.) Koerber

6. Spermatia 6-9(-12) μ m long. Spores 13-34 x 15-25 μ m. Hymenium 45-50 μ m high (according to ?; 80-180 μ m according to Esnault!). Apothecia 0.16-0.33 mm diam. (according to ?; 0.3-1.5 mm according to Esnault). Thallus continuous, rimose-areolate, well delimited, light grayish yellow brown, pale gray to almost white; areoles plane or convex, smooth or granulose, 0.4-1.2 mm diam. Cortex variable, 20-60 μ m thick, \pm cellular; algal layer regular or (in more verrucose thalli) irregular. Pycnidia immersed or projecting, with elongated ostiole. Apothecia 1-6 per areole, sunken to plane, irregular, epruinose to ("A. ammotropha") very pruinose. Subhymenium 30-70 μ m; hypothecium not visible; epithecium greenish, N+ green (sometimes very weak). Paraphyses branched, anastomosed, and \pm moniliform. Spores (5-)6-8/ascus, ellipsoid, biseriate. Thallus K+ red, with norstictic and connorstictic acid. Very polymorphous. On siliceous rock. Rare, Black Hills. A. intermutans

7. Thallus rimose-areolate, the areoles contiguous (but separated by deep, sometimes wide, cracks). 8

7. Thallus verrucose or verrucose-areolate, the verrucae contiguous or dispersed. 10

8. Edges of areoles often becoming papillate to flattened-coralloid isidiate. Surface of areoles minutely cracked, giving a scurfy appearance. Apothecia common, adnate to sessile, 0.8-1.6 mm diam.; disc black, lightly white pruinose. Hymenium 80-130 μ m; epithecium green or sordid green. Spores 17-23 x 11-13 μ m. On sandstone. British Columbia. (A. leproscens sensu Noble)

8. Thallus without papillae or isidia. 9

9. Hymenium 160-170 μ m tall; Paraphyses moniliform. Epithecium 30-35 μ m, sordid olive greenish. Spores (12-)15-22(-25) x (6-)10-13 μ m. Thallus dull gray to gray-brown, whitish gray, yellowish gray, yellowish white, grayish yellow or olive gray, at times rust-colored or greenish, smooth or rough, forming continuous patches 1-2 cm or more across, rimose-areolate to areolate, or \pm verrucose-areolate to papillate in nutrient-rich environments; areoles plane to convex, angular, 1-2 mm wide, separated by deep gaping cracks, superficially gray-pruinose or frosted; prothallus, if visible, sometimes dark gray, delimiting. Apothecia to 0.4-1.2(-2) mm diam, round or irregular; discs 0.33-1 mm diam., black, matt, epruinose, innate and

concave to flat, later sometimes becoming sessile; thalline margin thin or thick, slightly prominent, concolorous with thallus, persistent. Hypothecium 55-65 μm , colorless. Asci (6-)8-spored; spores oblong- to broadly-ellipsoid. Paraphyses conglutinate, discrete and branched in upper part, 1-1.4 μm thick, to 2 μm thick at tips, **moniliform**. Cortex and medulla K+ red, P+ orange, C-, with norstictic acid. Pycnospores 11-16(-25?) \times 1 μm . On exposed siliceous rocks. Common from Nova Scotia to BC in boreal (or arctic) regions; California (Herre's rather skimpy description of material from the Santa Cruz Peninsula, fits here); probably elsewhere in the west.A. cinerea \pm s. str.

9. Hymenium 85-100 μm . Paraphyses non-moniliform. Epithymenium \pm intense blue-green or olive-green. Spores (often poorly developed) **(14-)17-22 \times 7-8.5 μm .** Thallus deeply cracked, ashy white, rimose-areolate. Hypothallus indistinct. Paraphyses cylindrical. Thallus broadly expanded, ashy white, moderately thick; areoles flattish to convex, 0.6-1 mm across, 0.5-1.2 mm thick, irregular in shape, generally rounded-angular, the perpendicular sides separated by \pm broad (0.1-0.5 mm), deep cracks; surface smooth, matt. [Fertile?] verrucae often 0.9-1.1 mm high, ca. 1 mm broad at surface, \pm podicellate, with about 0.3 mm thick margin; "foot" 0.7 mm thick. Cortex 40-50 μm , dark gray. Algae 10-15 μm diam.; algal layer 50-100 μm , dense, continuous. Medulla dense, but with air-filled spaces. Apothecia frequent but sparse, immersed, solitary or 2-3 confluent; disc often irregular in shape, level with thallus or slightly sunken, 0.3-0.6 mm diam., black, plane; proper margin thin, dark, or indistinct. "Hypothecium" 50-80 μm . Paraphyses conglutinate, \pm branched, scarcely thickened to 2.5-3 μm at tips, indistinctly septate, or constrictedly septate but scarcely moniliform. Asci often degenerate. Spores oblong, 8/ascus. Cortex K+ red. Medulla also K+ red? On granitic rock, Maine.A. monticola (Degel.) ined.

10. Thallus discontinuous, on a conspicuous black prothallus. Spores 15-18 \times 9.5-9.9 μm . Thallus verrucose-areolate, chalky white to blue-gray or rarely yellow-gray, Apothecia 0.25-0.75 mm, several per areole.A. cf. lecideoides

10. Thallus \pm continuous (or often dispersed in A. sipeana, but then without visible hypothallus). Spores (when well developed) often over 18 μm long, and (in A. cinerea) over 10 μm wide. 11

11. Areoles or verrucae 1-2 mm wide, gray-white or often tinged yellowish, greenish, brownish, or rusty. Apothecia (usually?) not becoming constricted and substipitate; margin concolorous with thallus. Hymenium 160-170 μm tall. "Hypothecium" 55-65 μm . Paraphyses 2 μm wide at tips. Pycnospores 11-16(-25?) \times 1 μm (forms of A. cinerea \pm s. str. from nutrient-enriched sites)

11. Verrucae (at least the sterile ones) 0.4-0.7(-1) mm diam., ashy white (medium gray with slightly scabrid-pruinose appearance,

according to Noble). Apothecia ("at length") becoming constricted and substipitate. Hymenium 120-135 μ m tall (to 150 μ m according to Noble). "Hypothecium" 30-45 μ m. Paraphyses 3-3.5 μ m wide at tips. Apothecia Pycnospores ("not free", possibly immature) 5-7 μ m long. Spores rarely fully developed, 22-25 x 12-14.5 μ m (20-23 x 10-11 μ m according to Noble), broadly ellipsoid. Epihymenium greenish, HCl+ (or N+) stronger green. Paraphyses \pm distinct, 1.7 μ m thick, with indistinct septa, somewhat branched towards apices and there moniliform, the apical cell globose, 3-3.5 μ m, the next 2-3 cells subglobose or broadly ellipsoid. Asci clavate. Thallus effuse, probably extensive, verrucose; sterile verrucae 0.3-0.4 mm thick, irregular in shape, usually separated, rarely 2-3 contiguous. Fertile verrucae \pm scattered, at length \pm prominent and 0.5-9.8 mm high with narrower, partly foot-like base. Hypothallus apparently absent. Apothecia 1 per areole, dispersed (clustered according to Noble), immersed then "verrucam expleantia" (initially sessile becoming adnate on sides or tops of verrucae according to Noble); disc finally 0.7-1 mm diam., often with rough surface, black, plane (initially concave according to Noble); thalline margin obtuse, slightly prominent, often darkened; proper margin sometimes \pm distinct, dark; thalline margin (according to Noble) thick, raised, \pm smooth or occasionally slightly irregular, initially white pruinose but quickly epruinose and concolorous with thallus, persistent. Cortex (25-)30-45 μ m thick, the lower portion partly granular, the outer 12-15(-20) μ m transparent with distinct 3-4.5 μ m diam cells. Algae 7-12 μ m diam.; algal layer 50-100 μ m. Medulla \pm transparent or with patches of air and granules. Epithecium pale (yellowish) olive (black fading sordid green immediately below according to Noble), HCl+ sordid green. On siliceous rocks, apparently in moist sites, Oregon; on non-calcareous sandstone, rare, British Columbia ("cf.", but Noble's description differs only in minor ways).A. sipeana (Magn.) ined.

A. cinerea senu lato

This is an extremely variable species, even in the relatively strict sense, and the name has been used as a convenient trashbag for almost any K+ red Aspicilia. I don't have enough information to make a viable key for the "A. cf. cinerea" material reported in the literature.

Thallus areolate; areoles completely cracked-separate, contiguous, distinct, angular, straight-edged, moderately thick, \pm flat, smooth, almost shiny, brownish gray to white, whiter around apothecia and slightly whiter around edge of some areoles. Hypothallus absent. Apothecia persistently immersed, 1(-3) per areole, 0.3-0.5 mm diam.; proper margin absent; thalline margin initially only slightly discernable from remainder of areole but becoming slightly raised, moderately thick, and lighter gray than rest of thallus, persistent. Disc concave to almost plane, black, epruinose. Hypothecium hyaline; epithecium sordid golden (-green) brown, N+ green; hymenium hyaline below, pale green above, 120 μ m high; paraphyses slender becoming slightly branched above, the very top cells moniliform (3 or more globose cells in a row). Spores 8, globose-ellipsoid, 20-23 x 12-16 μ m ["30-23" in the original]. Medulla K+ red. On non-calcareous sandstone, rare. British Columbia. A. cinerea sensu Noble.

Medulla and cortex both K+ red. Thallus medium gray. Spores 21-24 x 10.4-12.5 μ m, 8 per ascus. Thallus rough, continuous, verrucose; apothecia 0.5-1.0 mm diam., with margin becoming thick, almost flexuous. Rare, northwestern Canada. A. [cinerea] sp. 1 sensu Brodo

Medulla K-? (check Brodo's manuscript again); cortex K+ red. Thallus areolate-verrucose. Hypothallus dark gray. Spores 12.7-18 x 10-10.4 μ m. Thallus continuous, chalky white to blue-gray or rarely yellow-gray. Apothecia with \pm prominent, smooth flexuous margin when mature. Pycnospores 16-25 μ m long (?--need to check Brodo's key again). Frequent, Alberta, Ontario, Yukon. "A. [cinerea] sp. 2" sensu Brodo

V-A-3. On rock.

**Thallus effuse, containing norstictic or salazinic acid,
but K+ red only after pre-treatment in HCl.**

1. Thallus effuse, ± yellowish or blue-gray. Spores mostly 20-26 x 12-14(-18) µm. Thallus pale to dark yellowish to greenish or bluish gray, continuous to discontinuous, on a blackish hypothallus; areolate-verrucose, areoles 0.6-1 mm, having sloping sides, like volcanos; Apothecia 1 per areole, prominent, discs 0.3-0.6 mm, craterform, irregular; margins white pruinose, thin, prominent, generally radially striate (not *Lecanora*-type margins). Medulla densely granular. Thallus K+ only after pre-treatment in HCl. Frequent, western. This name has been almost indiscriminately applied to almost any grayish, ± verrucose, effuse, apparently K- *Aspicilia* on siliceous rocks, and I do not understand it at present except by its cryptic K+ red reaction.*A. gibbosa*

1. Thallus orbicular, olive black, blackish gray or black, or sometimes mingled with whitish gray; lobes ± indistinct; spores (13-)17-25 x (7-)10-15 µm. Apothecia 0.2-0.7 mm. Hymenium (85-)100-120(-150) µm. Hypothallus ± distinct or not, black. (The smaller spores were reported by Magnusson under "*Lecanora subradiascens*", the larger ones were reported by Nylander under that name, and by various authors under "*Lecanora stygioplaca*"). Apothecia sparse to very dense in thallus center, solitary or 2-3 ± confluent; margin ± obtuse, pale or black, shining, prominent; disc concave, black, impressed, becoming irregular and uneven. Pycnosporos 14-25 µm long. Thallus shiny to matt; central part verrucose-areolate or areolate; areoles convex or flat, 0.5-1 mm diam., 0.4-0.6 mm thick, very irregular in shape, towards the center with deep cracks, the sides perpendicular; marginal part not radiate or only indistinctly so; lobes 1-2 mm long, 0.3-0.4 mm broad, widened towards the margin. Cortex 25-30(-40) µm thick, transparent, the upper part dark. Epithecium dark olive brown or dark green, N+ green; "hypothecium" 35-50 µm, pale; Paraphyses ± distinct, the upper 5-6 cells globose and moniliform, 3-4 µm diam., or not moniliform, sparsely branched and anastomosing, the cells elongate and constricted between. Spores 8/ascus. Thallus containing salazinic acid and/or norstictic acid; medulla K+ yellow; small parts of thicker thalli K+ yellow with few to numerous rusty crystals, at least after pre-treatment with HCl. On granitic rocks. Alaska and NW Territories. Apparently a quite variable species; the descriptions of its two synonyms (*Lecanora subradiascens* and *L. stygioplaca*) differ considerably from each other, and I have not yet seen the description of *A. subradians* itself). *A. subradians* s. lato

ADD:

Spores 28-34 x 10-15 um.A. sp. (Weber & Shushan)