

III. On rock.
Thallus effuse to orbicular;
Sorediate, isidiate, or papillate

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

1. Medulla I-. 2

2. Medulla K+ red. Thallus grayish. 3

2. Medulla K+ yellow or K-. 7

3. Thallus papillate-tuberculate, without isidia or soralia (or with simple to branched isidia?--according to Ozenda & Clauzade, or with soredia?--according to Wetmore). Thallus \pm effigurate at margin, rather thick, somewhat tartareous, uneven, rimose-areolate, with warty-papillose or branched-granular areoles, dark or grayish ashy olive. Apothecia, when present, to 2 mm wide, always immersed; disc urceolate, finally flattish, black, epruinose; thalline margin granular, crenate. Asci inflated-clavate. "Hypothecium" hyaline. Paraphyses gelatinous, coherent. Spores often not developed, 8, ellipsoid, 16-22(-25) x 8-12(-15) μ m. Hymenium ca. 150 μ m, I+ pale blue then dirty wine red or yellowish. Epithecium brown to olive-brown. In f. *pseudoradiata*, the thallus is regularly orbicular, 1-2 cm wide, radiating and appearing lobed, somewhat violet-grayish. (If thallus effuse, see *A. cinerea*). Usually at higher elevations. Arctic (Greenland); S. Dakota and Wyoming; very common in California; Washington?; probably elsewhere. Not listed by Egan, but reported (probably incorrectly, since his material was sorediate) by Wetmore. Also reported (correctly?) by Ryan, 1985, with a "cf." and by Ryan & Nash, 1991, without a "cf.". Other frequently sterile, but not isidiate or sorediate, taxa in the *A. cinerea* group may also key out here. *A. mastrucata*

3. Thallus not papillate-tuberculate, 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, \pm dark gray, eventually becoming sorediose at the tips; soredia whitish or yellow-white. Thallus \pm dark gray. Spores to 10 μ m wide. Subhymenium 25-35 μ m. Thallus 0.3-0.5 mm thick, rimose-areolate or irregularly areolate, covering \pm large areas; areoles partly smooth, uneven, partly very minutely verruculose (x 20 lens). Apothecia sometimes present and occasionally numerous, 0.5-0.8 mm diam., depressed; disc concave, smooth; thalline margin thin, not always prominent. Upper cortex (15-)25-35(-50) μ m thick, the surface hardly darker;

epinecral layer sometimes present; cells 3-5(-6) μm diam. Algae 8-18 μm diam.; algal layer 50-70 μm thick, frequently interrupted or broken up. Medulla air-filled. Hymenium 100-120 μm , dirty yellowish. Exciple absent. Epithecium very dark olive. Paraphyses with 4-5 upper cells globose, 3.5-4 μm diam., coherent. Asci and spores rarely developed; spores 17-25 x 9-10 μm . Pycnospores straight, 7-10 x 1 μm . Thallus K+ rusty crystals (norstictic acid). On somewhat moist rocks. A. simoensis v. isidiata (typical strain)

5. Isidia developing on edges of areoles, few to abundant, minute and papillate or larger, flattened-coralloid, constricted variously along their length, becoming bent over, \pm hollow or opening along one side, white-gray to medium gray or often blackening; not becoming sorediose. Thallus \pm pale gray. Spores 11-13 μm wide. Subhymenium 35-60 μm .

Thallus rimose-areolate; areoles plane or occasionally somewhat convex, contiguous, usually with upper surface minutely cracked to give a scurfy appearance. Hypothallus absent or visible only at the margin, narrow, shiny, black. Apothecia common, scattered, immersed or sessile, becoming almost adnate, 1(-2) per areoles, 0.2-0.5(-1.0) mm diam.; isidia often reduced in the vicinity. Thalline margin thin to thick, smooth to occasionally papillate, \pm radially cracked, often circularly cracked around the base with age, sometimes becoming partially excluded to expose proper margin; proper margin black, thick, whit pruinose; disc concave then plane, or plane from start, round to often a little irregular, black, \pm light pruinose. Hymenium 80-130 μm ; epithecium green or sordid green; paraphyses branched and coherent especially towards apices. Spores 8, ellipsoid or ellipsoid-oblong, 17-23 x 11-13 μm . Thallus K \pm yellow, sometimes turning red with rusty crystals; P+ yellow to \pm orange. On sandstone and conglomerate, especially in the supralittoral zone, sometimes inland. British Columbia. [Aside from the chemical difference, this taxon differs from true A. leproscens in having isidia rather than granules or soredia, and in having a lower hymenium; however, the spores are very similar in dimensions]. A. leproscens sensu Noble

6. Soralia developing from break-up of verrucae, poorly delimited and becoming confluent, yellowish to whitish. Thallus rimose-areolate to rimose-granulate or verrucose, grey to green-gray, 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. Apothecia rare, small, urceolate. Spores 14 x 9.5 μm , ellipsoid. Epithecium sordid olive. Pycnidia unknown. Alpine or subalpine. California. A. simoensis v. simoensis

6. Soralia discrete, depressed (very low), not confluent, bluish white to greenish white. Thallus areolate to slightly verrucose. Soralia 0.5-1 mm diam. Thallus broadly expanded, to 10-20 or more cm across, dark gray with a bluish shade; areoles 0.5-1 mm across,

0.3-0.4 mm thick, irregular, slightly convex to uneven, separated by broad or narrow cracks and perpetually dividing into smaller parts; 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 20-35(-50) µm thick, hardly darker at the surface, Medulla granular, the granules dissolving in K but not in HCl. Apothecia unknown. Pycnospores 7-10 µm long, straight. Not listed by Egan; I'm not sure where I got the idea it might occur in N. America; it is treated by some authors (e.g., _____) as a synonym of A. simoensis v. simoensis. A. bahusiensis

7. Thallus K+ yellow (often rather indistinct without pre-treatment 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, ochraceous-gray, with scattered, verrucae; lobes undulating, extending even far towards the center. Cortex 15(-20) µm thick; cortical cells 2-3 µm thick. Algae 6-8 µm diam. Cortex K+ yellow, stronger after pre-treatment in HCl. Apothecia unknown. Pycnospores 20-25 µm. On siliceous rock. Arctic. A. 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 0.25-0.35 mm diam., plane, abruptly 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 yellow-gray; hyphae 5-6 µm thick, leptodermatous, constrictedly septate. Cortex rather weakly K+ yellow, but K+ intense golden yellow after pre-treatment with HCl. Apothecia unknown. On dry siliceous rock. Boreal-arctic (Greenland; NW Territories). A. sorediza

10. Thallus with isidia, becoming sorediose. Similar to the K+ red strain, but has the hymenium 85-100 µm high, subhymenium 50-60 µm, and spores 12-15 x 8-10 µm. [If soredia lacking, see A. leproscens sensu Noble]. K+ yellow strain of A. simoensis v. isidiata ("f. inferior")

10. Thallus without isidia, verrucose-papillate, broadly expanded, thick, scarcely rimose, dark gray-black to brown-black, limited by black, radiate hypothallus; verrucae subdiscrete to contiguous, epruinose. Apothecia sometimes present and numerous, dispersed, to 1 mm diam., 1 per verruca, immersed then elevated and basally constricted, substipitate; disc black, epruinose; margin entire, thick, persistent. Subhymenium hyaline, 45-50 μ m. Hymenium 125 μ m. Epithecium olive-brown, strongly inspersed. Paraphyses scarcely thickened towards tips, constricted septate, usually simple. Asci pyriform. Ascospores unknown. Pycnidia rare; pycnospores 15-23 μ m long. On siliceous rock. Arctic (Greenland, and elsewhere). Other non-isidiate, non-sorediate, K+ yellow species will probably also key out here. The report by Ryan & Nash, 1990, of a stictic acid strain of A. mastrucata from California, may be based on A. mastoidea instead. Both taxa are very similar; aside from the chemical difference, A. mastrucata has a more olivaceous and somewhat effigurate thallus, and larger, and persistently immersed apothecia. A. mastoidea

11. Thallus C+ red. (see "Mosigia gibosa")

11. Thallus C-. 11

12. Thallus \pm effuse (sometimes delimited, but not at all radiate), \pm papillate or isidiate, becoming sorediate. 13

12. Thallus \pm orbicular, weakly to strongly radiate, not papillate or isidiate; distinctly to indistinctly sorediate. 14

13. Thallus (at least towards center) of easily detached flattened-glebulose (subsquamulose) to \pm papillate granules, at times later becoming \pm granular-sorediate, pale to dark bluish gray, rimose-areolate, smooth to scurfy or scabrid-tartareous; prothallus sometimes evident, conspicuous, dark green-gray, delimiting. Apothecia usually infrequent, 0.5-0.7(-1) mm, at first urceolate, later emergent, black; (pseudo-?)thalline margin crenulate, often granular, mostly paler than thallus. Spores (17.0-28.5)22.5 x 17(16-20) μ m, (4-)8/ascus, subglobose to ellipsoid. Hymenium 130-165 μ m. Asci small. Paraphyses moderately thick (1.5-2.5 μ m). Pycnospores unknown. Thallus P-, K-, containing aspicilin. Usually on nutrient-enriched 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. A. leproscens s. str.

13. Thallus partly with narrow, verruciform isidia soon dissolving into grayish white soredia. Areoles \pm verruciform, dark bluish gray, with irregularly scattered, 0.5-1.5 mm across, low heaps of densely clustered isidia. Apothecia rare, generally immature. Pycnidia numerous, at least

partly composite, up to 250 μ m broad; pycnospores 7-8 μ m long. On siliceous rocks. "Probably an accidental form, found only once" [in Norway] according to Magnusson; not definitely known from N. America.A. caesiocinerea v. isidiata

13. Thallus pale ochraceous, \pm orbicular but not distinctly radiate; soralia distinct. Cortical cells 5-6 μ m thick. (see A. solediza)

13. Thallus dark gray, distinctly radiate; soralia \pm indistinct. Cortical cells 2-3 μ m thick. Thallus soft, orbicular, 1.5 cm diam., towards center effuse, areolate, towards margin narrowly radiate; areoles 0.35-0.55 mm wide, separated by deep and somewhat wide cracks, subcolumnar, rounded to subangular, distinctly and densely sorediate. Marginal strings of areoles branched, often \pm discrete, convex, narrow, 0.15-0.3 mm wide, apiculate, often longitudinally striate and here and there nodulose, under 0.15 mm thick. Surface deep gray or (when cortex destroyed) partly gray-white. Cortex variable, to 25 μ m thick, the outer part dark gray; hyphae strongly leptodermatous, 5 μ m thick, constricted septate. Medulla somewhat granular, the granules dissolving in HCl. Algae bright orange in K after HCl; cortex unchanged. Apothecia and pycnidia unknown. On basalt, Greenland. [If not pre-treated with HCl, the typical strain will also key out here; it differs in having a larger, ochraceous-gray thallus, with the lobes undulating and extending even far towards the center, and the verrucae only indistinctly sorediate]. A. mashinginensis K- strain ("A. bennettii")