

Bacidia de Not.
(LECANORALES: BACIDEACEAE)

(After Ekman, 1996; and others)

Rev. November 3, 1997

Thallus crustose to \pm squamulose, microphylline or effuse, with or without a pale or dark marginal prothallus; attached by rhizoidal hyphae, uniform, heteromerous, ecorticate, smooth, cracked, warted, granular or soresiate, usually whitish, pale greenish or pale gray or fawn.

Apothecia sessile to somewhat immersed, variously colored (pale to black), mostly to 1(-1.3) mm diam.; disk round to \pm irregular, \pm flat to strongly convex, without "dotted" appearance in a wet condition; thalline exciple absent; true exciple always present, sometimes well developed, sometimes reflexed and excluded, composed of \pm coherent, radiating hyphae that often have swollen lumina at least in outer part but are usually not club-shaped, para- or prosoplectenchymatous [lumina narrowly cylindrical to almost globose]; hypothecium variously colored, pale to dark; hymenium I+ blue; paraphyses few to numerous, simple or rarely branched, apices often capitate; asci long-clavate to cylindrical, Bacidia-type, unitunicate, rather thick walled, I+ blue; apical dome K/I+ dark blue with a pale, \pm conical apical cushion or in a few species with a dark, tubular ring structure; wall pale, outer layer dark blue; spores 8(-16), hyaline, mostly with (3-5) or often more transverse septa at maturity, oblong, fusiform, bacilliform, acicular, or worm-like, both ends alike or one end pointed, one convex, curved, straight or helically interwoven; walls thin, septa often difficult to see, without a distinctive perispore (except in "B." sabuletorum group (see Mycobilimbia)).

Pycnidia immersed to sessile, variously shaped (\pm globose to urceolate) and colored; conidophores simple; fulcrum exobasidial; pycnosporangia formed apically, variously shaped, mostly bacilliform to acicular (ellipsoid, oblong or filiform according to Galloway), colorless, sometimes transversely septate. Thallus I-, usually without substances, except for a wide range of pigments in apothecia and pycnidia; some species with atranorin, rhizocarpic acid. Photobiont Trebouxia or other chlorococcoid; cells globose or broadly ellipsoid. On rock, bark, leaves, etc., usually not on very acidic substrates. Tropical to arctic-alpine.

The above description may need to be modified somewhat, to follow Ekman.

The keys to saxicolous and terricolous/muscicolous taxa are preliminary, and need work.

Key to taxa that can be confused with Bacidia and Bacidina

After Ekman (1996)

1. Photobiont Trentepohlia. 2
1. Photobiont a green member of the Chlorococcales. 5
 2. Apothecia pale yellowish to dark brown; disc concave with a distinctly raised margin. 3
 2. Apothecia black (although sometimes pruinose); disc plane to convex. 4
3. Most or all asci with more than 8 spores. Pachyphiale
3. Asci with 8 spores. Gyalecta
 4. Asci difficult to separate from ascogenous hyphae when squashed in K. Spores not fragmenting. Lecanactis
 4. Asci easily separated from ascogenous hyphae when squashed in K. Spores fragmenting in some species. 5
5. Thallus squamulose, or pustulate or minute fruticose, with grayish, bluish, brownish, or blackish apothecia. 6
5. Thallus crustose, or if squamulose then with pale pink apothecia. 10
 6. Squamules very small, almost granular, usually not exceeding 0.2 mm in width. Apothecia orange-brown. Not soresdiate. "Psorella" pertexta
 6. At least some squamules exceeding 0.5 mm in width. Apothecia brown to black. Some species soresdiate. 7
7. On soil, moss, or rock. Thallus often pustulate to squamulose or minute fruticose. Tholus with I+ deeper blue internal tube. Toninia
7. On bark or wood. Thallus squamulose 7
 8. Thallus of gray, placoid squamules that are appressed to a black, episubstratal, felty prothallus. Not soresdiate. On bark, Florida. "B." augustinii
 8. Prothallus indistinct or lacking. Often soresdiate. 9
9. Thallus with a para- or prosoplectenchymatous cortex, without epinecral layer. Apothecia grayish, bluish, or brownish to almost black, with algal cells below hypothecium. Waynea californica
9. Thallus with a stainable layer and an epinecral layer. Apothecia brown or black, without algal cells below hypothecium. Hypocenomyce
 10. Apothecia bright red, K+ blue. On bark or wood. (Ophioparma rubricosa)
 10. Apothecia differently pigmented, not K+ blue. Asci without pronounced swelling at the apex; A+b-layer of tholus not thickened terminally. 11
11. Asci polysporous, or 8-spored, clavate with a \pm pronounced swelling at the apex. A+b-layer of tholus thickened terminally. Ropalospora
11. Asci with 1-16 spores (usually 8), without pronounced swelling at the apex. A+b-layer of tholus not thickened terminally. 12
 12. Exciple absent or poorly developed, not forming a distinct margin; paraphyses and excipular hyphae similar, abundantly branched and anastomosed. Asci bound in gelatin. Photobiont usually "micareoid", less than 8 μ m diam., often in pairs, with fungal hyphae penetrating algal cells by intracellular haustoria. Apothecia round, becoming convex to subglobose. Asci unitunicate, I+ blue with I+ blue tholus, \pm clavate. Thallus mostly green. Thallus often goniocyst-like. Micarea

12. Exciple \pm well-developed, visible as a distinct margin at least in young apothecia, of densely arranged, often strongly conglutinate, \pm radiating hyphae. Paraphyses and excipular hyphae often not similar. Photobiont not "micareoid". Spores 8(-16) per ascus, under 100 μ m long, fusiform to acicular; walls < 2 μ m thick. 13
13. Asci 1-4-spored. Spores with walls c. 2 μ m thick. Megalospora
13. Asci with 8-16 spores. Spore wall thinner. 14
14. Thallus P+ yellow to orange, K+ vividly yellow (with thamnolic acid). Loxospora
14. Thallus often P- and K- to K+ faintly yellow (without thamnolic acid). Tholus with \pm conical, cylindrical, or lens-shaped axial body that is sometimes surrounded by a strongly amyloid zone. Proper exciple proso- or paraplectenchymatous. 15
15. Tholus without axial body but with a strongly amyloid, towards the tip slightly widened tubular structure. Proper exciple paraplectenchymatic or byssoid (but sometimes encrusted with crystals). 16
15. Tholus with \pm conical, cylindrical, or lens-shaped axial body that is sometimes surrounded by a strongly amyloid zone. Proper exciple proso- or paraplectenchymatic. 17
16. Proper exciple \pm byssoid, at least in outer part. Byssoloma
16. Proper exciple "normal", i.e., composed of hyphae with \pm gelatinized walls. Fellhanera
17. Tholus with a deeper I+ blue tube and a well developed ocular chamber; asci surrounded by a gelatinous, I+ blue sheath. Paraphyses not conglutinated, the apical cell distinctly swollen and covered by a \pm well-developed, gelatinous pigment cap. Epithecium green, brown, or gray, often N+ violet or K+ red or violet. On soil, rock, or lichens. (Toninia)
17. Tholus with an I- axial body, without a deeper I+ blue tube, with or without an ocular chamber. Substrate various, often on bark or wood. 18
18. Tholus with a \pm cylindrical axial body that reaches all through the d-layer. 19
18. Tholus with a \pm conical (or rarely lens-shaped) axial body that usually does not reach all through the d-layer, at least not in all asci. Apothecia at least at the start distinctly marginate, the exciple distinctly delimited. Spores usually straight, fusiform-ellipsoid to acicular, 3-many-septate. Paraphyses \pm simple, not netlike interwoven. Asci with a well-developed, I+ blue tholus. 22
19. Paraphyses abundantly branched, netlike interwoven, in much gelatin, some terminating in swollen apices that are provided with darkly pigmented caps. Apothecia often shiny, soon convex-immarginate; exciple indistinctly set off from the paraphyses. Spores \pm spirally twisted in ascus, \pm difficult to liberate, the septa often very indistinct. Scoliciosporum
19. Paraphyses moderately or not at all branched; apices sometimes pigmented but not with distinct caps. Apothecia matt. 20
20. Hypothecium brown. Spores with both ends pointed. "Bacidia" jacobii
20. Hypothecium colorless or yellowish. Spores with at least one blunt end. 21
21. Apothecia in transection, if at all, faintly and diffusely pigmented. At least some oil

- droplets present in hypothecium.** Not presently known from N. America. ("B." lutescens group)
- 21. Apothecia in transection usually at least partly distinctly pigmented (\pm greenish). Without oil droplets in hypothecium.** "Bacidia" beckhausii group
- 21. Spores 3-septate, bean-shaped. Upper part of hymenium green to blue-green.** Arthrosporum populorum
- 21. Without this combination of characters.** 22
- 23. Rim of proper exciple covered by a rather thick gelatinous layer that swells markedly (and finally almost dissolves) in K or a dilute hypochlorite solution. Spores with warted perispore in some species.** "Bacidia" sabuletorum group [see key under Mycobilimbia s. lato]
- 23. Rim without such gelatinous layer. Spores without warted epispore.** 24
- 24. Excipular hyphae of mature apothecia moderately branched, running closely parallel to each other; cell lumina narrowly cylindrical, evenly thick, not markedly widened near rim of proper exciple.** 25
- 24. Proper exciple different.** 26
- 25. Apothecia when very young almost globose, with a distinct core of young, immature asci and ascogenous hyphae surrounded by a distinctly delimited proper exciple.** Mycobilimbia s. str.
- 25. Apothecia when very young moderately convex. Immature asci and ascogenous hyphae dispersed in the sterile tissue, not forming a distinct core distinctly delimited from the proper exciple.** Biatora
- 26. Apothecia pale yellow to yolk-yellow, soon becoming convex. Spores 1-3-septate. Epithecium interspersed with crystals.** 27
- 26. Without this combination of characters.** 28
- 27. Apothecia pale yellow. Spores consistently 3-septate.** "B." pallens
- 27. Apothecia yolk yellow. Spores predominantly 1-septate, but occasionally up to 3-septate.** Cliostomum vitellinum
- 28. Spores with up to 5 septa. Epithecial pigmentation unevenly distributed; apothecial disc thus appearing "dotted" in a wet condition. Excipular hyphae club-shaped, i.e., narrowly cylindrical in interior part of proper exciple but gradually becoming thicker towards rim. Paraphyses thick, simple, conglutinated, sometimes sub-moniliform or with 1 or 2 terminal cells with dark-pigmented cap. Length of spores not exceeding 6 times the width.** Lecania naegelii and L. stigmatella
- 28. Spores often with more than 5 septa. Apothecia without "dotted" pigmentation in wet condition. Excipular hyphae usually not club-shaped; cell lumina narrowly cylindrical to almost globose. Paraphyses few to numerous, simple or rarely branched; apices often swollen.** 29
- 29. Thallus cortex with minute crystals. Thallus never dissolved into goniocysts. Apothecia usually strongly pigmented, not seldom in distinct layers. Proper exciple inside rim composed of thick-walled hyphae with narrowly cylindrical cell lumina. Axial body of asci $\leq 1/3$ of the entire width of the d-layer, vertically not reaching through this. Terminal cell of conidiophores 7-15 μ m long. Often containing atranorin, and rarely other substances.** Bacidia
- 29. Thallus cortex without crystals. Thallus often dissolved into goniocysts. Apothecia**

often weakly and diffusely pigmented. Proper exciple inside rim composed of rather thin-walled hyphae, most of which have cell lumina that are broadly ellipsoid, almost globose, or irregular. Axial body of asci > 1/3 the entire width of the d-layer, in some species vertically reaching all through this. Terminal cell of conidiophores 4-8 um long. Without lichen substances. Bacidina

ADD:

Thallus grayish, thick, clearly limited, rimose-areolate, the areolae to 1-2 mm broad, 0.5 mm thick, dirty white, becoming brownish in the herbarium, the surface rough. Apothecia broadly adnate, black (reddish black moist), becoming immarginate; exciple paraplectenchymatous, radiate, disappearing; hypothecium hyaline; epihymenium red-brown; hymenium 75 um, brownish; paraphyses 2.5-3 um, tips to 5 um; asci cylindrico-clavate; spores 8 per ascus, 2-4-celled, acicular (bacillar according to Thomson 1997), 22-24 x 3.5 um. Conidia curved, 16-18 x 3-6 um. Thallus K-, C-, P-; epihymenium K+ violet; hymenium I+ blue turning brown. On hard rocks on the seashore, Washington to Alaska. See Hedrick, 1935 (1936), plate 5 for photo. Herteliana alaskensis (Nyl.) S. Ekman

I. On Rock

I-A Spores bacilliform or acicular (L:W = ≥ 10)

1. Spores strongly curved and twisted, spirally arranged in the ascus. Tholus with a \pm cylindrical axial body that reaches all through the d-layer. Paraphyses abundantly branched, some terminating in swollen apices that are provided with darkly pigmented caps. Apothecia often shiny.[*Scoliciosporum* spp.]
1. Spores straight or slightly bent, not spirally arranged in the ascus (or if so then without the other characteristics given above). 2
 2. Spores 40-75 x 3-4 μ m, 7-14-celled.[*B. polychroa*]
 2. Spores mostly under 40 μ m long. 3
3. Spores 25-40 x 1 μ m, 6-9-celled. Thallus granulose, thick, dirty olive. Apothecia to 0.4 mm, plane, yellowish brown and darkening. On granite, Ohio. *Bacidina egenuloidea*
3. Spores 1.5 μ m or more wide, (2-)4-6(-8)-celled.4
 4. Hypothecium at least partly \pm dark or distinctly colored. Spores rod-shaped to acicular. 5
 4. Hypothecium hyaline or pale. 6
5. Spores 20-35 x 2-3 μ m, 4(-8)-celled; exciple colorless except at margin where it is dark brown or dark green; epithecium usually green, occasionally colorless; thallus well developed to nearly absent.. Michigan.*Bacidia* sp. #1 sensu Harris
5. Spores 1-2 μ m wide. (see *Bacidina egenula*, *arnoldiana*)
 6. Spores 2-4-celled, acicular, 22-24 x 3.5 μ m. Thallus grayish, thick, smooth, rimose. Apothecia black (reddish black moist). On hard rocks on the seashore, Washington to Alaska.*Herteliana alaskensis* (Nyl.) S. Ekman
 6. Spores 4-6(-8)-celled. 7
7. Growing on siliceous rocks on the seashore, in xeric-supralittoral in crevices and on underhangs. Pacific Northwest; East coast. *B. scopulicola* (Nyl.) A. L. Sm.
7. Growing inland. 8
 8. Growing at edge of streams or on water-dripped surfaces, more rarely lake margins. [*Bacidina inundata*]
 8. Growing on dry rocks. 9
9. Spores 30-60(-67) x 1-2(-2.5) μ m. Usually on bark. (*B. arceutina*)
9. Spores 30-53 x 2-2.5 μ m. On calcareous rocks in British Columbia. *Bacidia* sp. 2 (Noble)

I-B-1. On Rock;
Spores oblong or fusiform, $L:W \leq 9$
Hypothecium \pm dark brown

1. Spores (4-)6-celled; exciple pale. 2
1. Spores mostly 4-celled and mostly under 20 μm long and 4 μm wide; exciple pale or dark. 3
 2. Thallus pale gray or whitish, granular-pulverulent, granular-warted, scurfy-granular, or papillate, thin, often disappearing. Usually on moss or plant debris over calcareous rock, stonework or turf, rarely directly on rock, occasionally on shaded trunks of old trees. ["*Mycobilimbia*" *sabuletorum*]
 2. Thallus gray-blackish to brown-blackish, with \pm definite convex areoles. Apothecia black, 0.3-1.5 mm. Paraphyses free. Spores 18-50 x 5.5-7 μm , usually 7-celled, tail-like drawn out at the end. On non-calcareous rock. ["*Rhopalospora lugubris*"]
3. On bricks, mortar, or calcareous rock; hypothecium and exciple dark. Spores oblong-ellipsoid to dactyliiform. Hypothecium reddish-brown. Spores 10-20 x 2.4-4.5 μm , 4-celled. Apothecia 0.2-0.5 mm, \pm plane, usually black. Thallus thin, minutely granulose, greenish to ashy. Widely distributed. May be a synonym of *B. trachona*. "*B.*" *granosa* (Tuck.) Zahlbr.
3. On siliceous rock; exciple pale or dark. Spores fusiform. 4
 4. Spores 24-29 x 7-9 μm . Thallus areolate-verrucose, whitish. At high elevations. Apothecia 0.5-1 mm, black (brown-black wet), plane with elevated margin, then convex and immarginate. Spores usually 4-celled. Hypothecium and exciple dark. On siliceous rocks, subalpine, Washington. "*B.*" *nivalis* Follm. (Porpidiaceae?)
 4. Spores < 7 μm wide. 5
5. Thallus granulose or squamulose. 6
5. Thallus rimose to verrucose-uneven or lacking, surface minutely granular-warty, sometimes sorediate. Spores 11-19 x 3-5 μm "*B.*" *trachona*
 6. Thallus granulose; Apothecia to 0.7 mm. Spores 15-24 μm long. On sandstone, Midwestern U.S. 7
 6. Thallus of scattered to congregated or imbricated squamules, dirty light olive green. Apothecia 2-3.5 mm. On quartzose rock, S. California. "*B.*" *kingmanii* Hasse
7. Spores 3.5-6 μm wide, fusiform. Exciple pale. Thallus white to greenish gray to ashy, verrucose, or disappearing. Apothecia 0.2-0.7 mm diam., brownish yellow, dirty brown to black, soon convex or subglobose and immarginate. Hypothecium pale reddish brown. Usually on moss, but occasional on calcareous slate or old bones. ["*Mycobilimbia*" *microcarpa*]
7. Spores 3-4.5 μm wide, oblong-ellipsoid. Exciple black. Thallus greenish gray. Apothecia black, convex, the margin concolorous, soon disappearing. Hypothecium pale brown. *B. pammelii* (Fink) Zahlbr.

**I-B-2. On Rock;
Spores oblong or fusiform;
Hypothecium hyaline or pale.**

- 1. Spores under 20 μm long. 2**
- 1. Spores mostly over 20 μm long. 5**
 - 2. Spores 7-12 μm long, 2-3-celled.** Thallus yellowish ashy, thin, chinky. Apothecia to 0.2 mm, flat to convex, wax-colored. On granite, Massachusetts. "B." flavens (Willey) Zahlbr. (= Lecania sp., possibly L. erysibe)
 - 2. Spores over 12 μm long. 3**
- 3. Apothecia pale to yellowish and reddish. Spores 12-20 x 2-3.5 μm , 4-celled, On calcareous rock.** Spores fusiform-ellipsoid to dactyliiform. Thallus granulose to chinky and verrucose, greenish gray to whitish. Apothecia to 0.5 mm, plane to convex, New York. Lecania cuprea (syn. B. cupreorosella)
- 3. Apothecia black. Spores over 3.5 μm wide. On siliceous rock. 4**
 - 4. Spores 2-3-celled, 14-17 x 4-6 μm . Thallus white or endolithic.** Thallus granulose. Apothecia black, to 1.5 mm, plane or convex. Hypothecium pale yellowish or brownish. On siliceous rock, Saskatchewan. "B." saxicola Looman
 - 4. Spores 4-celled, 15.4-20 x 3.5-6 μm . Thallus black with a greenish or grayish cast, dark olive green when wet.** On igneous rocks on a dry hillside, California. "B." ioessa Herre
- 5. Spores 2-4-celled. Thallus brown, thin or scattered/grouped thallus.** Spores narrowly fusiform. 6
- 5. Spores 4-6(-8)-celled. 7**
 - 6. Thallus scant, dark gray-brown.** British Columbia. Bacidia sp. 1 (Noble).
 - 6. Thallus well-developed, light brown to pinkish-brown.** British Columbia. Bacidia sp. 3 (Noble)
- 7. Spores bacilliform, 35-40 x 1.5-2 μm .** Thallus thickish and squamulose or thin and granulose, pale yellow to whitish. Apothecia plane to convex, red. Usually on bark, but sometimes on sandstone. California. Ophioparma rubricosa (syn.: B. herrei)
- 7. Spores oblong-ellipsoid to fusiform, 16-25 x 4-5 μm .** Thallus thin, granulose, greenish gray; apothecia to 0.5 mm, concave to flat, pale flesh-colored, the exciple elevated. On sandstone. "B." ravenellii (Tuck.) Zahlbr.

II. On Soil, Moss, Herbaceous Stems, Leaves, etc.

1. Growing on leaves. Louisiana. Thallus irregular or circular, to 12 mm diam., continuous or in part dispersed, dark greenish gray to pale grayish white, smooth, farinose; prothallus absent. Apothecia constricted at base, 0.1-0.5 mm diam.; disc pale orange-yellow or salmon buff to pale reddish brown, epruinose, plane or subconvex; margins thin, often indistinct, smooth, concolorous with disc or paler. Hypothecium hyaline; hymenium 38-45(-50) μ m, I+ blue then sordid green. Spores normally 3-septate but sometimes 5-7-septate, \pm filiform, 20-40 x 1.5-2 μ m. [*Bacidina apiahica*]

1. Growing on soil or humus, moss, or herbaceous stems. 2

2. Thallus \pm sorediate or granular-isidiate, often at least partly yellow or greenish yellow, often sterile. 3

2. Thallus not yellow; usually fertile. 5

3. Thallus usually entirely rather bright yellow or green-yellow. Apothecia to 0.8 mm, black. Spores 30-100 x 2-5 μ m, 7-15-celled. Hymenium I-. Alpine.(see *Arthrorhaphis*)

3. Thallus not brightly colored. Spores shorter. 4

4. Thallus whitish or grayish, but with greenish yellow soralia. Apothecia to 0.8 mm, reddish to reddish brown or dark brown, long remaining plane, the margin paler.

Paraphyses strongly coherent, unbranched. Spores 13-22 x 4-5 μ m, 4-celled. [*Mycobilimbia*: "*Biatora epixanthoides*"]

4. Thallus \pm yellow-green, granular-isidiate. Spores 4-6-celled; apothecia pink-brown to dark brown, to 1.2 mm diam. On or near the seashore. (see *B. scopulicola*)

5. Spores mostly under 3 μ m wide. 6

5. Spores mostly over 3 μ m wide. 7

6. Apothecia red-brown to dark brown; margin persistent. Spores 30-50(-60) x 1.5-3 μ m, (4-)6-8-celled, acicular. Growing on herbaceous stems, bryophytes or plant debris on calcareous turf or amongst limestone rocks, low to moderate elevations. *B. herbarum*

6. Apothecia whitish to pale pink, orangish or reddish, soon immarginate.

..... [*Bacidina phacodes*; N. American reports are misidentifications of *Bacidina californica*]

7. Spores (40-)55-70(-100) x (2-)3-4 μ m, 4-16-celled. Thallus \pm well delimited, continous to rimose or granulose, whitish or greenish gray. Apothecia to 1 mm, black, reddish- or purplish-black, blackish- or reddish-brown, distinctly paler wet, the margin dark, plane or slightly concave then very rapidly convex and immarginate. Epihymenium brown and K- or bluish black to deep blue-green and K+ violet; hypothecium hyaline except at edge of apothecium; paraphyses lax.(*B. laurocerasi*)

7. Spores mostly under 45 μ m long. 8

8. Spores acicular, 3-4 μ m wide. 9

8. Spores fusiform or oblong-ellipsoid, mostly over 4 μ m wide. 11

9. Spores oblong, with apices rounded (*Bilimbia*), 15-30 x 4-7.5 μ m. (*"Mycobilimbia" sabuletorum*)

9. Spores bacilliform to acicular (*Bacidia*). 10

10. Apothecia plane then convex, epruinose. Spores (4-)6-8(-15)-celled, 25-45 x 1.5-2.5(-3) μ m. On mosses or plant debris on calcareous rocks or walls, or on the ground in

- calcareous areas. Often confused in the field with "Mycobilimbia" sabuletorum, but easily separated by spore shape and wider and darker apothecia. Alaska to Greenland. B. bagliettoana (Massal. & De Not. in Massal.) Jatta
- 10. Apothecia concave to plane, densely pruinose. Spores 4-celled, 25-35 x 2-3 um**, the tips rounded. Apothecia concave to plane, densely pruinose, 0.5-0.7(-2) mm, the margin \pm thick. Hymenium 60-65 um. Hypothecium \pm dark. Thallus olive or gray, verruculose. B. illudens (Nyl.) Lyng
- 11. Spores 4-celled.** 12
- 11. Spores 4-6-celled.** 17
- 12. Apothecia pink-white to pale yellowish or orangish**, to 1.2 mm, flat with thick margin, then convex and immarginate; spores smooth, 15-18 x 5-5.5 um, 3(-5)-septate. Hypothecium hyaline. Epihymenium hyaline or pale. Thallus gray-white to bluish green, granular or partly sorediate. [Note: I find the literature relating to this species very confusing; the British book describes the species has having apothecia hemispherical then globose, and spores (0-)1(-3)-septate, which disagrees with the description given above [I'm not sure where I got it]]
..... ("Bacidia" sphaeroides (Dicks.) Zahlbr.) (= Mycobilimbia sp.)
- 12. Apothecia tan to brown or black.**13
- 13. Spores 21-27 x 6-7 um**, smooth, 4-celled; apothecia tan to brown. (Ramonia gyalectiformis, from southern California, also keys out here; it has reddish to blackish brown, cup-like apothecia with a false thalline margin)
.....(Mycobilimbia tetramera)
- 13. Spores mostly under 6 um wide.**14
- 14. Spores 14-20(-28) x (2-)2.5-3 um**, 3(-5)-septate, narrowly fusiform to \pm bacilliform. Apothecia 0.2-0.6 mm, plane, soon \pm convex, pale, pinkish brown, gray-brown, or dark, red-brown to blackish, at first with concolorous or pale to dark, thin margin, then immarginate. Thallus granular or verrucose, whitish, greenish white to pale buff; granules 40-200 um diam., discrete or more often coalescing to form a granular-warted crust. Photobiont cells 6-12(-16) x 6-12 um. Exciple hyaline except for upper outer edge and apex which may be brown and K+ purplish, mostly "cellular" with radiating ellipsoidal lumina 5-13 x 2.5-4.5(-7) um. Hymenium 40-50(-65) um, hyaline or upper part olive gray to pinkish brown, K- or K \pm purplish, N+ red. Hypothecium hyaline or pale straw, K+ yellowish. Paraphyses 1.5-2 um wide, tips to 5 um, swollen, often pigmented. Epihymenium violet-brown, K-. Pycnidia immersed, walls colorless; pycnosporos 31-55 x 1-1.5 um, mostly curved. On rocks (often calcareous), turf or clayey soil in nutrient-rich situations, even on bird-lime. Europe and North America. Lecania subfuscula (Nyl.) S. Ekman
- 14. Spores over 3 um wide.**15
- 15. Spores often over 18 um long, over 4 um wide**, 3-septate.16
- 15. Spores 13-18 x 4 um.** Michigan. B. sp. #2 sensu Harris
- 16. Thallus thick, granular to sublobulate, greenish gray to ashy.** Spores 12-24 x 4-6 um, 4-celled, finger-shaped. Apothecia to 0.7 mm, often clustered, convex to hemispherical, pale lead-colored to blackish brown or black, the margin soon disappearing. Hypothecium brown. Rocky Mountains of Colorado. (not mentioned in Esslinger's checklist). B. atryta
- 16. Thallus thin, white to greenish gray to ashy, verrucose, or absent.** Spores 16-30

x (3.5)5-6 um, 1-3-septate, fusiform with rounded tips. Apothecia to 0.7 mm, brownish yellow, dirty brown to black, epruinose, matt to somewhat shiny, constricted at base, soon convex or subglobose and immarginate. Exciple rather pale red-brown, columnar, extending under the apothecium. Hypothecium pale reddish brown to almost colorless. Hymenium brown, 60-70 um, I+ blue. Paraphyses coherent, gelatinous walled, septate. Epihymenium brown-red. On moss. Alaska to Greenland, south to Ohio.
["Mycobilimbia" microcarpa]

17. Spores 18-27 x 5-7 um; hypothecium ± brown.("Mycobilimbia" sabuletorum)

17. Spores 13-22 x 4-4.5 um, 4-6-celled, ellipsoid to fusiform; hypothecium hyaline. Thallus thin, granulose, greenish gray. Apothecia to 0.25 mm, concave, brownish red to blackish, the margin concolorous or darker. Massachusetts. "B." rubidofusca (Willey) Zahlbr. (= probably a Gyalidea species)

III-A. On Bark or Wood.

Upper Part of Hymenium Green, Blue-green, or Green-Gray,
N+ Red to Purple (Sometimes With a Precipitate of Blue Crystals).

After Ekman (1996)

1. Upper part of hymenium gray to gray-green, C+ violet. Louisiana to Georgia. B. reagens
1. Upper part of hymenium green to blue-green, C-. 2
 2. Proper exciple laterally with \pm evenly dispersed, minute crystals (mostly less than 1 μ m). British Columbia to central coast of California. B. absistens
 2. Proper exciple without crystals or with radiating clusters of \pm coarse crystals (mostly 1-7 μ m). 3
3. Hypothecium colorless or very pale yellowish-brownish. 4
3. Hypothecium orange to brown. 6
 4. Spores acicular. Apothecial margin finally excluded. S Oregon coast. B. friesiana
 4. Spores bacilliform or clavate. Apothecial margin usually persistent. 5
5. Young apothecia low and flat. Proper exciple mainly consisting of regularly radiating hyphae. Throughout much of temperate N. America (excluding SE coastal plain). B. circumspecta
5. Young apothecia barrel-shaped. Proper exciple below hypothecium forming a thick cushion of irregularly intertwined and richly branched hyphae. Saskatchewan. B. igniarii
 6. Hypothecium brown, downwards gradually merging into the dark brown-red to red-black proper exciple. Throughout temperate eastern N America, S to Florida, very common and variable. B. schweinitzii
 6. Hypothecium brown in a \pm distinct zone, in the lower part usually changing to colorless or yellowish (not gradually merging into a dark proper exciple). 7
7. Spores acicular, narrower than 2 μ m. At least lower part of proper exciple with \pm ellipsoid cell lumina. Hypothecium K- or K+ greenish brown. Great Lakes area; Louisiana. Bacidina egenula
7. Spores bacilliform, fusiform, clavate, or acicular, width always exceeding 1.5 μ m and usually also 2.0 μ m. Cell lumina in proper exciple (outermost cell layers excepted) cylindrical. Hypothecium K- or K+ purplish. 8
 8. Proper exciple, at least rim, dominated by a green to blue-green pigment (K-). Central to S California coast. B. insularis
 8. Proper exciple usually dominated by a brown, K+ purplish pigment. Some \pm pigment-deficient specimens dominated by a green to blue-green pigment, but then in low concentration and only in upper part of proper exciple. 9
9. Hypothecium colorless or pale orange to brown-orange, K-. Spores (average of 10) 1.7-3.2 μ m wide, never with more than 7 septa. Apothecial margin usually persistent. B. circumspecta

9. Hypothecium pale to dark (often reddish) brown, K+ purplish. Spores (average of 10) 2.1-5.1 um wide, with 3-13-septa. Apothecial margin finally excluded. Alaska to Arizona; Great Lakes area. B. subincompta

III-B-1. On Bark or Wood.

Upper Part of Hymenium Colorless to Yellow, Orange, Brown, or Dirty Purplish;
Reaction With N Various

(After Ekman, 1996)

1. Spores bacilliform or fusiform, straight or only slightly curved, not coiled in the ascus, length/width ratio (average of 10 or more spores) never exceeding 11 (often much less).
..... 2

1. Spores usually acicular, straight to curved or sigmoid, often coiled in the ascus when immature, length/width ratio exceeding 10, or if not and spores baciliform to clavate, then spores coiled in ascus and distinctly curved or sigmoid. Upper part of hymenium colorless to yellow or orange, not K+ pale green and N+ pure purple. Proper exciple with or without minute crystals. 5

2. Spores fusiform with blunt ends, width exceeding 5.5 μ m. British Columbia to Montana. B. auerswaldii

2. Spores bacilliform, width never exceeding 50 μ m. Southeastern. 3

3. Thallus often dissolved into goniocysts. Proper exciple at least in outer portion with wide, ellipsoid to globose cell lumina. Florida, Louisiana. Bacidina varia

3. Thallus never dissolved into goniocysts. Proper exciple of \pm cylindrical cell lumina. 4

4. Apothecia usually pink. Cell lumina wider in lower (old) part of proper than in upper (young) part. S Florida; Louisiana. B. medialis

4. Apothecia usually brown-orange to \pm purple-brown. Cell lumina in lower part of proper exciple narrower than or as wide as lumina in upper part. S Florida. B. hostheleoides

5. Upper part of hymenium dirty purplish, K+ pure green, N+ pure purple (often with a precipitate of blue crystals). Proper exciple interspersed with minute crystals (\sim 1 μ m). S British Columbia to central California, mostly coastal. B. absistens

5. Upper part of hymenium colorless to yellow, orange, or brown; reactions with K and N various but not K+ pure green and N+ pure purple. Proper exciple with or without minute crystals. 6

6. Hypothecium and/or proper exciple immediately below hypothecium dark (brown-orange, orange-brown, redi-brown, dark brown, or red-black). 7

6. Hypothecium and proper exciple below hypothecium pale (colorless, pale yellowish, orangish or brownish). 11

7. Hypothecium K+ green-brown. Thallus with c. 20-50 μ m wide goniocysts. Coastal British Columbia to Oregon; North Carolina. Bacidina arnoldiana

7. Hypothecium K-, K+ intensifying, or K+ purple-red. Thallus smooth or granules, granules then mostly exceeding 50 μ m. 8

8. At least young apothecia with abundant, \pm evenly dispersed minute crystals in the epithecium and rim of proper exciple (use polarizing filters!). S Florida. B. aggregatula

9. Apothecia without crystals or with radiating clusters of crystals in the proper

- exciple. 10
10. Brown pigment in apothecia K+ intensifying. Eastern temperate N America, S to Florida. B. schweinitzii
10. Brown pigment in apothecia K+ purple-red. 11
11. Thallus smooth, wrinkled, or warted. Eastern temperate N America, S to Florida. B. polychroa
11. Thallus finely granular. Eastern temperate N America, S to Florida. B. diffracta
12. Apothecia (when fresh) pink, pale yellow, pale gray, or almost white (often darkening to near medium-orange in herbarium). 13
12. Apothecia at least partly brown-yellow or \pm orange to red-brown or black. 21
13. Epithecium and/or proper exciple with crystals. 14
13. Epithecium and proper exciple without crystals. 18
14. Proper exciple with coarse crystals (≤ 8 μ m diam.) in lower part and (usually) in upper part; rim usually with stronger pigmentation in lower part than in upper. Margin distinctly paler than disc, usually pinkish or pale brownish. S. Florida. B. campalea
14. Proper exciple either with clusters of coarse crystals or with \pm evenly dispersed minute crystals; rim with stronger pigmentation in upper part than in lower. At least upper part of margin (closest to hymenium) usually concolorous with disc or only slightly darker or paler. 15
15. Proper exciple along the rim with a distinct, 4-6 cell layers thick zone of enlarged cells. Eastern temperate N America, S to Florida. B. suffusa
15. Proper exciple along the rim without or with a 1-2 cell layers thick zone of enlarged cells. 16
16. At least margin of young apothecia with a thick white pruina. Margin persistent. S Florida. B. mutabilis
16. Apothecia with or without pruina. Margin finally excluded. 17
17. Width of apothecia seldom exceeding 0.3 mm. Spores (average of 10) to 1.7 μ m wide. Ocular chamber lacking. Southeastern coastal plain. Bacidina crystallifera
17. Width of apothecia usually exceeding 0.5 mm. Spores (average of 10) at least 2.0 μ m wide. Ocular chamber narrow and high. Great Lakes and northwards. B. rosella
18. Spores (average of 10 or more) 1.0-1.4 μ m wide. (see Bacidina chlorotricula [Great Lakes area], squamellosa [Florida] and sp. 1 [Florida, Louisiana])
18. Spores (average of 10 or more) 1.6-2.8 μ m wide. 19
19. Hymenium (average of 5 measurements in one apothecium) 75-88 μ m high. British Columbia to Oregon, coastal. B. salmonea
19. Hymenium (average of 5 measurements in one apothecium) 42-73 μ m high. 20
20. Most young apothecia with a thin thalline margin (visible at least in section), which is soon suppressed by the proper exciple. Axial body lens-shaped. Coastal, British Columbia to S California. Bacidina ramea
20. Apothecia without thalline margin. Axial body \pm conical. (see Bacidina californica [California], varia [Florida, Louisiana])

21. Disc of at least some young (not seldom all) apothecia brown-yellow or yellow-brown, without tinge of red. Rim of proper exciple K-, in upper part brown brown-yellow, yellow-brown, or almost pure brown, downwards usually gradually changing to pale yellow or colorless. 22
21. Disc at least partly orange to reddish brown or black. Rim of proper exciple at least in part \pm orange to pure brown or purple-brown (when \pm brown, then K+ green-brown or K+ purplish). 23
22. Thallus not dissolving into goniocysts. Proper exciple (the outermost cell layer excepted) of cells with \pm narrowly cylindrical lumina. Bicoastal, S to central California in the West, south to New York in the East. B. arceutina
22. Thallus partly dissolving into finely granular goniocysts. Proper exciple partly of cells with \pm ellipsoid lumina. Florida. Bacidina aenea
23. Thallus entirely consisting of rather large granules (average of 20 granules exceeding 70 μ m). 24
23. Thallus either not at all granular, or partly or entirely dissolving into finely granular goniocysts (average of 20 granules less than 60 μ m). 25
24. Apothecia in section \pm yellowish to pale orange throughout, K+ intensifying but never K+ purplish. Upper cortex with crystals. Great Lakes-northern Appalachians; Oregon to British Columbia. B. rubella
24. Apothecia in section with at least upper part of proper exciple and part of the hymenium \pm red-brown, K+ purplish. Cortex without crystals. N California. B. biatorina
25. Outermost 4-8 cell layers of proper exciple with enlarged cell lumina that are distinct from the inner, narrower ones, or cell lumina gradually but distinctly enlarging towards the rim (if in doubt due to obscuring pigments, use a diluted hypochlorite solution to bleach them). 26
25. Outermost 1-2 cell layers of proper exciple with enlarged cell lumina that are distinct from the inner, narrower ones, or entirely without enlarged cell lumina along rim. 27
26. Apothecia variously colored (but usually not brown-orange to red-brown). At least some apothecia with white pruina, particularly on the edge. Proper exciple with a distinct, 4-6 cell layers thick zone of cells with enlarged lumina along the rim. Eastern. B. suffusa
26. Apothecia brown-orange to red-brown, without pruina. Proper exciple with cell lumina gradually enlarging towards edge, or with a \pm distinct, 6-8 cell layers thick zone of cells with enlarged lumina along the rim. Extreme southern Texas. B. russeola
27. Orange to brown pigment of the apothecia K+ green-brown. California. Bacidina californica
27. Apothecial pigments K-, K+ intensifying, or K+ purplish. 28
28. Upper part of hymenium and at least upper part of proper exciple with a \pm distinct, dark brown, K+ purplish, continuous layer of pigment. 29
28. Upper part of hymenium diffusely and usually weakly pigmented, pale orange to \pm brown, never with a distinct and continuous layer of a brown, K+ purplish pigment. 33
29. Spores (average of 10) 16-27 μ m long, usually strongly curved or sigmoid. Scattered

localities in interior parts of temperate western N America. B. vermifera

29. Spores (average of 10) exceeding 35 μ m, straight or \pm curved to sigmoid. 30

30. Epithecial pigment forming \pm distinct gray-brown "caps" over the apices of the paraphyses (best seen by squashing strongly pigmented part of apothecium in K). N Oregon to S California coast, and SE coastal plain. B. heterochroa

30. Most of the epithecial pigment dissolved in the gelatinous matrix or as irregular granules between the apices of the paraphyses. 31

31. Spores strongly conglutinated, \pm helically twisted, often released in packages of 8.

Hymenial pigment concentrated in the gelatinous matrix surrounding the ascus apices.

Southeastern U.S. (including NW Florida). B. helicospora

31. Spores not conglutinated, although sometimes coiled prior to release. Hymenial pigment evenly distributed in upper part. Western and Great Lakes-northern Appalachian. 32

32. Thallus usually rather thick, gray-green, finely areolate. Margin of at least young apothecia paler than disc, usually \pm carmine red. Pacific NW.. B. laurocerasi subsp. idahoensis

32. Thallus usually thin, \pm gray, rarely areolate. Margin of apothecia \pm concolorous with disc, \pm brown to black. Great Lakes-northern Appalachian.

B. laurocerasi subsp. laurocerasi

33. At least some young apothecia with thick white pruina on the edge. Spores > 3 μ m wide. B. mutabilis

33. Apothecia without pruina. Spores < 3 μ m wide. 34

34. Hymenium (average of 5) at least 75 μ m high. Most spores at least 30 times longer than wide. Proper exciple (outermost 1-2 cell layers excepted) with narrowly cylindrical cell lumina only. B. salmonea

34. Hymenium (average of 5) 70 μ m or lower. Most spores less than 25 times as long as wide. Proper exciple even in inner part with at least some broadly cylindrical, irregular, or almost globose lumina. (see Bacidina egenuloidea [Ohio] ramea [Coastal, British Columbia to S California] assulata [Oklahoma] and varia)

ADD (not mentioned by Ekman, 1996, but retained in the N. American checklist by Esslinger & Egan).

Thallus \pm immersed or very thin, whitish, irregularly warted to almost granular. Photobiont cells 5-14 μ m. Apothecia to 0.8 mm, black, concave then plane, finally convex and immarginate. Exciple thin, brown-red or brown-purple, darker towards outer edge, K+ intensifying purple. Epihymenium reddish brown to purple brown (sometimes very dark), K+ intensifying purple. Hymenium (35-)50-60 μ m, \pm hyaline. Hypothecium hyaline or pale red-brown. Paraphyses 1-1.5 μ m, unbranched; upper 12-15 μ m pigmented and tips clavate to 5 μ m. Spores 20-30(-40) x 2-3(-4) μ m, short-acicular or worm-like, or narrowed at one end, 4-8-celled. Pycnidia 40-50 μ m diam., \pm immersed, black, the wall brown-purple in K; pycnospores 7-9 x 0.5-1 μ m, bacilliform or slightly curved. On various barks. B. hegetschweileii (Hepp) Vainio

IV. Apothecia absent (or immature)

After Coppins, 1992

Very Incomplete

1. **Pycnidia present.** 2
1. **Pycnidia absent.** 6
 2. **Pycnidia whitish or rosaceous.** 100-200 μm diam., \pm immersed, white or rosaceous; pycnospores (26-)30-47(-50) \times 1-1.5 μm , curved, thread-like. Thallus UV-, finely granular to rimose, white-gray to green-gray or dull yellowish green to fawn; granules (goniocytes) 20-40 μm diam. Photobiont cells 5-10(-12) μm diam. On shaded, damp calcareous rocks, or sometimes shaded bark. [also see B. egenula] (B. arnoldiana)
 2. **Pycnidia brown or blackish.** 3
3. **Conidia under 10 μm long, ellipsoid to bacilliform.** 4
3. **Conidia over 15 μm long, threadlike.** 5
 4. **Pycnidia 100-300 μm diam., sessile; conidia 3-5 \times 1-1.5 μm .** (B. trachona)
 4. **Pycnidia under 100 μm diam., immersed; conidia 5-9 \times 1.8-2.5 μm .** (B. incompta)
5. **On bark.** Pycnidia pale pink to red-brown; pycnospores 16-24 \times 0.5 μm , curved or sigmoid. With atranorin. On deciduous trees with nutrient-rich bark. (B. rubella)
5. **Usually on siliceous rocks on the seashore**, in xeric-supralittoral in crevices and on underhangs, rarely on soil or vegetable matter. Pycnidia reddish brown, \pm immersed; pycnospores 18-30 \times ca. 0.7 μm , strongly curved. Thallus granular-isidiate, pale olive-green to fawn brown (sometimes dark green in narrow crevices), rarely thin and rimose, mostly thick, warted and coarsely granular, with short, coralloid, isidium-like protuberances, or extreme morphs with soredia-like, \pm loose granules 40-80 μm . Photobiont cells 5-10 μm . Pacific Northwest. (B. scopulicola)
 6. **On maritime rocks; thallus thick, warty to coarsely granular; granules 40-80 μm diam.** (B. scopulicola)
 6. **On bark, or if on rocks, then thin or composed of fine granules under 40 μm diam.** 7
7. **Thallus granules 60-120 μm diam.,** the surface smooth, sometimes slightly glossy, never brownish (outer hyphae colorless). Thallus gray-green to yellow-green, thinly to richly isidioid-granular; granules 60-120 μm diam. Photobiont cells 5-17 μm diam. (B. rubella)
7. **Thallus granules 20-40 μm diam.;** outer hyphae not pigmented. (B. arnoldiana)

ADD: Similar to B. carneoglaucia, but apothecia unknown and differing in the effuse, irregular, often confluent patches of yellowish green, farinose soredia (soredia 10-30(-40) μm diam.), and slightly smaller (mostly 150-260 μm diam.), less frequent pycnidia. Containing coronaton, unidentified xanthone, and zeorin. On bases of Thuja plicata and Symphoricarpos albus, and on rock, in shaded situation on the shore of a lake, low elevation, Washington. Bacidia viridifarinosa Coppins & P. James

ADD:

Bacidia sp. (syn. Bacidia exemptilis Arnold, Oesterr. Bot. Z. 46: 286 (1896)) (= close to or identical to Bacidia (Mycobilimbia) tetramera

Newfoundland, on cracked, mossy bark.

Detailed Descriptions

Bold = a true Bacidia according to Ekman

Unless noted otherwise, descriptions at this stage are based mainly on sources other than Ekman, and need to incorporate information from his monograph.

B. absistens (Nyl.) Arnold

Thallus whitish-gray or gray, thin, granular warted. Algae 5-12(-14) μm . Apothecia 0.3-0.8(-1) mm diam., flat, black; true exciple persistent, dark greenish, K+ intensifying green at upper/outer edge, internally pale reddish brown (K \pm purplish) and with abundant, minute, colorless, granular inclusions (less than 1 μm diam.) dissolving in K; epithecium blue-violet or purple-brown (rarely green), K+ green, N+ purple-violet with blue crystals; hymenium 65-90 μm , hyaline; hypothecium colorless or pale yellow-brown. Paraphyses 1-1.5 μm wide, simple, or forked above; apices often pigmented and swollen to 4 μm . Spores 45-80 x 2-3(-4) μm , 7-16-septate, acicular. On \pm acid bark of deciduous trees, mainly in old woodlands.

B. aggregatula Malme

Description condensed from Ekman

Thallus determinate, very thin to rather thick, usually continuous, without cracks or \pm cracked, wrinkled, pale gray, pale yellow-gray, \pm green-gray or gray-green. Prothallus bordering the individual, narrow, black where it meets other lichens, otherwise pale gray or lacking.

Apothecia (0.5-)0.7-0.8-1.1(-1.7) mm diam., plane then convex, epruinose or with very thin pale pruina on disc and margin. Disc very variable even within same specimen, pink to red-brown; margin raised, soon level, later excluded. Proper exciple in interior brown to red-black, in rim with a layer of evenly dispersed, minute crystals. Hypothecium colorless to red-black, pigmentation merging into the proper exciple. Upper part of hymenium pale orange, with layer of minute crystals. Spores acicular, 37-66 x 2.1-3.3 μm , with 3-9 septa.

On bark.

B. arceutina (Ach.) Arnold

Spores 30-60(-67) x 1-2(-2.5) μm . thinly 3- to 7-septate, acicular. Apothecia 0.2-0.6(-0.8) mm, pale-, medium-, red- or dark-brown, plane then mostly moderately convex, the margin often darker, raised at first, finally excluded. Exciple hyaline inside, usually brown at edge; hyphae ca. 1 μm , radiating, bound in a gel matrix that swells in K, but usually with a single row of swollen, rounded lumina (to 6 μm wide) at outer edge; epihymenium yellow-brown, dirty brown to olive-green or dark brown, K-, N-; hypothecium hyaline; subhymenium yellowish to brownish, K \pm intensifying yellow. Hymenium 45-65 μm , hyaline. Paraphyses 1-1.5 μm wide, simple or a few irregularly forked above; tips slightly widening to 2.5(-4) μm , hyaline. Thallus \pm uneven, flat-warty, \pm immersed or thin, whitish, pale green-gray or gray, \pm smooth or rimose, sometimes minutely granular-warted. On trunks and branches of trees and shrubs with a \pm basic or nutrient-rich bark, more rarely on sheltered, often slightly calcareous rocks or mosses on them

B. auerswaldii (Hepp ex Stizenb.) Mig.

Description condensed from Ekman.

Thallus indeterminate, thin, of discrete or contiguous, \pm globose or irregular, often

slightly inflated granules, pale gray, pale yellowish gray, pale green to green, or \pm gray-green to brown-green. Granules 36-145 μm diam., without crystals in the cortex. Prothallus sometimes present between discrete granules, very thin, endophloeodal, pale gray.

Apothecia (0.3-)0.4-0.5-0.6(-1.1) mm diam., plane or becoming moderately convex, normally purple-brown to black, but often \pm pigment-deficient, epruinose; margin distinct, raised then level, persistent. Proper exciple laterally orange to black-brown. Hypothecium (almost) colorless. Upper part of hymenium orange to black-brown. Spores fusiform with blunt ends, 19-33 x 5.6-7.8 μm , 3-9-septate.

On bark.

B. bagliettoana (Massal. & De Not. in Massal.) Jatta

Spores (4-)6-8(-15)-celled, 25-45 x 1.5-2.5(-3) μm , acicular or \pm bacilliform. Apothecia usually distinctly constricted below, black, plane and marginate then convex and immarginate, 0.3-1(-1.4) mm. Exciple red-brown in upper and outer parts, pale red-brown within but becoming \pm colorless below, hyphae radiating, ca. 3-5 μm wide (in K), with thick, gelatinous walls and lumina to less than 1.5 μm . Epihymenium bluish- to green-black, olive green, or dirty green, K-, N+ violet with blue granules; hymenium 40-55 μm ; hypothecium red-brown and K+ intensifying red in upper 25-35 μm , pale reddish to colorless below. Paraphyses 1.5-2 μm wide, simple or a few forked above, tips to 4(-5) μm . Thallus whitish gray to gray or green-white, \pm granular-warted, K-, C-, P-. Photobiont cells 7-15 μm diam. On mosses or plant debris on calcareous rocks or walls, or on the ground in calcareous areas. Often confused in the field with "Mycobilimbia" sabuletorum, but easily separated by spore shape and wider and darker apothecia. Alaska to Greenland.

B. biatorina (Koerber) Vainio

Description condensed from Ekman.

Thallus indeterminate, thin to rather thick, of discrete or contiguous, globose or irregular, often slightly flattened granules, gray-green. Granules 48-121 μm diam, without crystals in the cortex. Prothallus lacking.

Apothecia (0.4-)0.6(-0.9) mm diam., remaining plane, epruinose, orange-brown to dark red-brown; margin distinct, raised then level, persistent. Proper exciple laterally orange-brown to dark red-brown. Hypothecium (almost) colorless. Upper part of hymenium brown-orange to red-brown, the latter pigment K+ purplish. Spores acicular, 42-57 x 2.1-2.9 μm , 3-15-septate.

On bark.

B. campalea (Tuck.) S. Ekman & Kalb

Description condensed from Ekman.

Thallus determinate, \pm thin, continuous, \pm cracked, wrinkled, or sometimes partly discontinuous and of discrete or contiguous, convex areoles, pale bluish gray. Prothallus sometimes bordering the thallus, narrow and black, sometimes also between discrete areoles, thin, pale gray.

Apothecia (0.5-)0.6-0.7(-0.9) mm diam., plane or moderately convex, usually slightly pruinose on disc and margin, later epruinose, pink to brown or almost black; margin paler, raised, soon level, persistent; proper exciple colorless to brown-orange or dark brown, in lower part with large clusters of crystals and in upper part with evenly dispersed, minute crystals, with cell lumina gradually enlarging towards the edge, or along edge with a 6-8 cell layers thick zone of

enlarged cell lumina. Hypothecium brown-orange to brown. Upper part of hymenium orange-brown to red-brown. Spores acicular, 41-71 x 2.5-3.7 μm , 3-11-septate.

On bark..

B. circumspecta (Nyl. ex Vaino) Malme

Spores (18-)20-30(-38) x (1.5-)2-3 μm , \pm bacilliform; epihymenium greenish; exciple tinted reddish or purplish brown, lacking colorless granules. Apothecia 0.2-0.7(-1) mm diam., plane, brownish to usually black. Exciple with upper part and outer edge dark purplish brown, K+ intensifying purple, becoming pale to hyaline below. Epithecium blue-green, K-, N+ purple-violet, often with blue crystals. Hymenium 45-55 μm tall, hyaline or pale green above; hypothecium colorless or pale straw; paraphyses 1-1.5 μm wide, simple or forked above, the tips often swollen to 4 μm . Thallus whitish or pale green-gray, thin, irregularly warted but without distinct granules. Photobiont cells 7-14(-16) μm diam. Pycnidia rare, 100-160 μm , sessile, \pm globose, black, the wall with purple-brown and green pigments; pycnospores 7-9 x 1.5-2 μm , 0(-1)-septate, oblong. On Ulmus and Thuja.

B. diffracta S. Ekman

Description condensed from Ekman.

Thallus indeterminate, thin to rather thick, continuous or \pm discontinuous, finely granular, pale gray, pale greenish gray, yellowish gray, greenish gray, grayish green, or gray. Granules 36-97 μm diam. Prothallus lacking or present between discrete granules, endosubstratal, white to pale gray.

Apothecia 0.5-0.9(-1.1) mm diam., \pm plane then convex, brown-orange to red-brown or dark purplish brown, at least some with thin to thick white pruina on edge and/or disc; margin concolorous with disc, level or raised, then level, finally excluded. Proper exciple \pm brown-orange or orange-brown. Hypothecium darker than proper exciple. Upper part of hymenium colorless to orange-brown. Most pigmented parts K+ purple-red. Spores acicular, 32-69 x 1.9-41 μm , 3-11-septate.

On bark.

B. friesiana (Hepp) Koerber

Thallus whitish to pale gray-green, partly immersed, mostly thin and minutely granular-warted. Algae 6-14 μm . Apothecia 0.2-0.6(-0.8) mm diam., flat to convex, blue-gray, gray-brown or black, but sometimes \pm pale when deeply shaded; true exciple at first \pm apparent, \pm colorless within, outer edge (especially above) and upper parts usually dark brown, K+ purplish or in part or wholly dark greenish and K+ intensifying green, hyphae with swollen cells to 6 μm wide towards outer edge; epithecium pale gray-green to dark blue-green, K-, N+ red or violet (often with blue granules); hymenium 60-65 μm , colorless or pale greenish; hypothecium colorless or yellowish brown to brown in upper part (subhymenium). paraphyses 1-1.5 μm wide, simple, or a few forked above, apices often swollen to 5 μm . Spores 30-50(-65) x 3 μm , 3-7(-8)-septate, acicular. On nutrient-rich bark of trees and shrubs. Rather variable.

B. gramineum (Vainio) Zahlbr.

On grass and humus, Siberia. See Thomson 1997 for description.

B. helicospora S. Ekman

Description condensed from Ekman.

Thallus indeterminate or determinate, thin, usually continuous, smooth, wrinkled, or rarely warted, without cracks or \pm cracked, rarely discontinuous, of \pm discrete, thin areoles, light gray to greenish or yellowish gray. Prothallus sometimes present as a thin, black line along edge of thallus.

Apothecia (0.4-)0.4-0.7(-1.0) mm diam., plane or slightly convex, epruinose, pruple-brown to black; margin concolorous with disc or darker, distinct, raised, soon level, persistent. Proper exciple red-brown to black in the rim, otherwise colorless to orange-brown. Upper part of hymenium \pm brown, pigment accumulated around upper part of asci. Spores acicular, helical and tightly coliled, 33-81 x 2.1-3.7 μ m, 7-19-septate.

On bark.

B. hegetschweileii (Hepp) Vainio

Thallus \pm immersed or very thin, whitish, irregularly warted to almost granular. Photobiont cells 5-14 μ m. Apothecia to 0.8 mm, black, concave then plane, finally convex and immarginate. Exciple thin, brown-red or brown-purple, darker towards outer edge, K+ intensifying purple. Epihymenium reddish brown to purple brown (sometimes very dark), K+ intensifying purple. Hymenium (35-)50-60 μ m, \pm hyaline. Hypothecium hyaline or pale red-brown. Paraphyses 1-1.5 μ m, unbranched; upper 12-15 μ m pigmented and tips clavate to 5 μ m. Spores 20-30(-40) x 2-3(-4) μ m, short-acicular or worm-like, or narrowed at one end, 4-8-celled. Pycnidia 40-50 μ m diam., \pm immersed, black, the wall brown-purple in K; pycnosporos 7-9 x 0.5-1 μ m, bacilliform or slightly curved. On various barks.

B. herbarum (Stizenb.) Arnold

Spores 30-50(-60) x 1.5-3 μ m, (4-)6-8-celled, acicular. Growing on herbaceous stems, bryophytes or plant debris on calcareous turf or amongst limestone rocks, low to moderate elevations. Apothecia to 0.3-0.8 mm diam., distinctly constricted at base, red-brown, reddish or dark brown, often variously colored, plane or finally slightly convex; margin persistent. Exciple \pm colorless or straw, but often orange- or red-brown at outer edge, composed of radiating, thin hyphae but with 1-2 rows of swollen lumina (to 6 μ m wide) at outer edge; Hymenium 45-60 μ m, hyaline or very pale orange-brown above, Epihymenium pale to brownish. Subhymenium pale orange brown and K-; hypothecium pale orange-brown, straw or \pm colorless. Paraphyses 1-1.5 μ m wide, simple, tips to 3(-4.5) μ m, becoming clavate. Thallus whitish, thin and varnish-like, or thicker and minutely granular-warted. Photobiont cells 7-14 μ m. North Dakota; Northwest Territories.

B. heterochroa (Muell. Arg.) Zahlbr.

Description condensed from Ekman.

Thallus indeterminate or determinate, very thin to rather thick, usually continuous, usually wrinkled but sometimes smooth or warted, without cracks, \pm cracked, or areolate, rarely discontinuous, of \pm discrete, thin areoles, light gray, gray, yellow-gray, green-gray, or blue-gray, rarely gray-green or grayish yellow. Prothallus often present as a thin, black line bordering thallus.

Apothecia 0.5-0.8(-1.1) mm diam., plane or moderately convex, rarely becoming markedly convex, epruinose or rarely thinly pruinose on the edge of a few young apothecia,

usually mainly purple-brown to black but often mottled with various pink, orange, brown, or violet hues; margin distinct, raised, soon level, persistent or rarely excluded. Proper exciple brown or red-brown in the rim, otherwise colorless to orange-brown. Hypothecium colorless or pale yellow. Upper part of hymenium \pm brown, pigment forming distinct caps over apices of paraphyses. Spores acicular, 32-73 x 2.5-4.3 μ m, 3-15-septate.

On bark.

B. hostheleoides (Nyl.) Zahlbr.

Description condensed from Ekman

Thallus indeterminate, thin to thick, mainly continuous, \pm cracked and wrinkled, or granular to subsquamulose, partly discontinuous, of discrete to contiguous granules, pale gray to pale green-gray. Granules 31-80 μ m wide.

Apothecia (0.5-)0.6(-0.8) mm diam., at first plane, later convex, epruinose, brown-orange; margin concolorous with disc, then level, finally excluded. Proper exciple very pale orange; lumina in lower part narrower than or as wide as lumina in upper part. Hypothecium very pale orange. Upper part of hymenium very pale orange. Spores bacilliform, fusiform, or almost clavate, (almost) straight, 16-25 x 2.9-5.0 μ m, 3-5-septate.

On bark.

B. igniarii (Nyl.) Oksner

Description condensed from Ekman.

Thallus indeterminate, rather thin, discontinuous, of discrete or contiguous, convex, sometimes subsquamulose areoles, light brown-gray. Hypothallus not visible.

Apothecia (0.2-)0.3(-0.4) mm diam., \pm plane, remaining so or becoming slightly convex, high and barrel-shaped when young, later becoming inversely cone-shaped, 1.7 times as wide as high; disc pure black; margin distinct, raised then level, persistent. Proper exciple with green and brown pigmentation, strongly developed below hypothecium, greater part consisting of intricately intertwined hyphae. Hypothecium pale. Upper part of hymenium blue-green. Spores bacilliform to clavate, 12-19 x 2.5-2.9 μ m, 3-septate.

On bark.

B. illudens (Nyl.) Lynge

Thallus white to ashy green, verrucose, scattered to thicker or lacking. Apothecia 0.5-0.7 mm or larger, appressed, the base constricted, flat, black, at first urceolate, becoming flat; margin thick to becoming thinner but persistent, very blue pruinose; exciple reddish brown to violet tinged, and continuing into the hypothecium, which is also dark red-brown; epihymenium blue, turning violet with N; hymenium 65-70 μ m, hyaline with the upper part blue, I+ blue turning wine-red; paraphyses easily separable, slender, tips thickened to 4 μ m; spores 8, bacillar, straight or slightly curved, (3-)5-9-septate, 23-24 x 2.5-3 μ m. On bryophytes and humus; also reported from bark. Arctic (NW Territories).

B. incompta (Borrer ex Hook.) Anzi [European species; reports from N. America not confirmed].

B. indigens (Vainio) Zahlbr.

On bones and sandy soil, Siberia. See Thomson 1997 for description.

B. insularis Zahlbr.

Description condensed from Ekman.

Thallus indeterminate or determinate, thin to rather thick, usually continuous, warted to subsquamulose or sometimes almost granular, \pm cracked, rarely discontinuous, of \pm discrete, convex and warted areoles, light gray, green-gray, brown-gray, or

Apothecia (0.4)0.5-1.0(-1.7) mm diam., plane or slightly convex, black, often white pruinose on edge when \pm young; margin distinct, raised then level, persistent. Proper exciple laterally blue-green with only some brown pigmentation, otherwise colorless to blue-green. Hypothecium \pm brownish and sometimes also partly blue-green. Upper part of hymenium blue-green. Paraphyses 0.8-1.2 μ m wide in mid-hymenium. Spores fusiform to acicular, 26077 x 3.1-5.3 μ m, 3-15-septate.

On bark.

B. laurocerasi (Delise ex Duby) Zahlbr.

Spores up to 16-18-celled at maturity, (34-)55-70(-90) x (1.7-)2.5-3.4(-4) μ m, filiform, acicular. Apothecia usually numerous but not aggregated, 0.1-1(-2.5) mm diam., round to irregular, sessile to subpedicellate; disc plane or concave at first, later convex, initially yellow brown or pinkish brown (in shade), later brown-black, brownish red or black (with lavender shades), not pruinose, matt; margins entire, \pm flexuose, disappearing with age; epithecium granular, pale gray-brown (K-) to red-brown, dark (\pm purplish) brown (K+ intensifying purple) or sometimes blackish green or black, 5-13 μ m thick; hymenium hyaline or pale brownish, 65-90(-100) μ m; paraphyses dense, thin (1-1.5 μ m), simple or branched above; tips clavate, often swollen to 5 μ m and with a dark red-brown to black pigment, K+ purplish. Exciple purplish brown, K+ intensifying purple at outer edge, internally pale red-brown but often darker and sometimes with a purple tinge in the upper part. Hypothecium massive, hyaline or pale straw above, in lower part often pale yellow-brown to red-brown towards the exciple, 200-350 μ m thick. Thallus usually thin, smooth, rimose, or becoming wrinkled-tuberculate, granular-verrucose or glebose, continuous, or in scattered colonies or \pm squamulose, in patches 2-5(-10) cm diam, yellowish gray, brownish gray, pale greenish white, pale gray, or olivaceous, shining in part; photobiont cells 5-12(-14) μ m diam. Pycnidia immersed, the walls colorless; pycnidia 13-17 x 1 μ m, curved. No lichen substances. On conifers, rarely yellow birch and aspen, on \pm basic or nutrient-rich bark, usually in open situations.

subsp. laurocerasi

subsp. idahoensis (H. Magn.) S. Ekman

Thallus olive-brown to gray, granulose-scabrid. Apothecia to 0.8 mm, brown-black, plane to slightly convex, the margin dark brown, becoming crowded back. Excipulum thick, K+ yellow. Hypothecium hyaline, 80-100 μ m. Epihymenium bluish, K+ violet. Spores 60-85 x 3-3.5 μ m, ca. 11-celled, at least one end attenuate. On Amelanchier, Idaho. .

B. medialis (Tuck. ex Nyl.) de Lesd.

Thallus effuse, very thin, minutely rimulose-granulose, furfuraceous, green-gray, gray or yellowish gray, K-; prothallus concolorous or paler; algae globose, 4-6(-9) μ m. Apothecia often \pm crowded, 0.2-0.6(-0.9) mm diam., often lobed or glomerulose, adnate, base not or only slightly

constricted; disc yellow-brown to red-brown or paler, first plane, then \pm convex, matt; margin concolorous or slightly paler, thin, scarcely prominent, soon almost excluded; excipulum hyaline, marginal part composed of radiating hyphae, strongly conglutinate, rather thick-walled; lumina ca. 10 x 4 μ m; hymenium 50-60 μ m, hyaline, I+ blue then reddish; epihymenium pale, K-; subhymenium hyaline; paraphyses strongly coherent, tips not thickened; asci clavate, apical wall thickened; spores polystichous, rod shaped or fusiform-bacilliform, (1-)3-5-septate, (16-)22-32 x 2.4-3.2(-3.5) μ m, tips \pm obtuse. On bark.

B. mutabilis Malme

Thallus effuse, thin, uneven to minutely verruculose and rimulose, white or gray, matt, K-; prothallus concolorous; algae globose, ca. 5-7 μ m diam.

Apothecia sparse, sessile or adnate-sessile, well constricted at base, 0.4-1 mm diam.; disc first concave, then plane or becoming convex, dirty reddish flesh color to red-black, matt, at first often pruinose; margin often paler, at first thick and very prominent, white-pruinose or granulose, then thinner, then almost excluded. Excipulum towards margin reddish or red, K-; marginal part of irregularly radiating hyphae, strongly conglutinate, thick-walled, towards the tips septate, the apical cells subglobose. Hymenium 60-75 μ m, hyaline, I+ blue then reddish or dirty discolored; epihymenium violet-brown, K-; subhymenium hyaline or yellowish; paraphyses strongly coherent, slender, towards the tips usually not thickened; asci clavate, ca. 11 μ m, apical wall thickened. Spores polystichous, straight, bacilliform or clavate-bacilliform, 35-45(-50) x 2.5-3.5(-4) μ m, mostly 5-9-septate, one end obtuse, the other attenuate.

On bark.

B. polychroa (Th. Fr.) Koerber

Apothecia (0.3-)0.5-1(1.5) mm diam., plane to sometimes convex, pale to dark reddish yellow to reddish brown. Epihymenium brownish; hypothecium and exciple yellow or reddish yellow K+ rose-red or mauve in upper parts, \pm hyaline below. Exciple lumina 1.5-3.5 μ m wide but 5(-6) μ m at outer edge. Hymenium 70-100 μ m, hyaline or upper part yellowish (K \pm mauve). Paraphyses 1-1.5 μ m, simple; tips to 2 μ m wide, tips scarcely swollen. Thallus whitish or pale green-gray, thin and smooth or thickish and irregularly warted; photobiont cells 5-10 μ m. Spores (3-)7-14-septate, acicular, (30-)50-55(-70) x 2-4(-4.5) μ m. Pycnidia immersed reddish; pycnospores 8-12 x 0.5 μ m, curved. With atranorin. On deciduous trees.

B. reagens Malme

Thallus effuse, thin, minutely granulose, gray, K-; prothallus indistinct; algae globose, 6-8 μ m.

Apothecia dispersed, sessile, well constricted at base, 0.5-0.8(-1) mm diam.; disc plane then slightly convex, black, matt; margin slightly paler, brown, then concolorous, shiny, thick, not very prominent, becoming thinner. Excipulum hyaline; marginal part of radiating hyphae, strongly conglutinate, very thick-walled, rather frequently septate. Hymenium 55-65 μ m, hyaline, I+ blue; epihymenium slightly blue-black to brown, K+ rose-violet; paraphyses simple, strongly coherent, ca. 1 mm thick, tips slightly clavate, apical wall thickened; subhymenium hyaline. Spores polystichous, straight, subfiliform, 35-45(-50) x 1.5-2 μ m, usually 5-septate. On bark.

B. rosella (Pers.) De Not.

Description condensed from Ekman.

Thallus indeterminate, thin, usually continuous, warted, slightly cracked or without cracks, or sometimes partly discontinuous, of discrete, warted areoles, light gray. Prothallus lacking or present between discrete areoles, light gray.

Apothecia (0.4-)0.5(-0.6) mm diam., plane then markedly convex, epruinose (but with a granular inspersed epithecium), \pm pink; margin concolorous with or slightly paler than disc, distinct, slightly raised, soon level, finally excluded. Proper exciple colorless, with evenly dispersed, minute crystals. Hypothecium (almost) colorless. Hymenium colorless. Spores acicular, 36-62 x 1.6-2.5 μ m, 3-11-septate.

On bark.

B. rubella (Hoffm.) A. Massal.

Apothecia, when present, (0.4-)0.7-1(-1.3) mm diam., usually constricted below, pale to bright or dark yellow-brown, orange-brown to red-brown, plane, sometimes to convex; exciple raised, sometimes white pruinose. Thallus gray-green to yellow-green, thinly to richly isidioid-granular; granules 60-120 μ m diam. Photobiont cells 5-17 μ m diam. Exciple hyaline but upper part pale yellow-orange to yellow-straw, sometimes (pruinose morphs) with radiating streaks of minute crystals; hyphae with lumina 1-2 μ m wide or to 5 μ m wide towards outer edge. Hymenium 70-105 μ m, hyaline or faintly orange-red or yellowish in upper part. Hypothecium hyaline, or upper part pale yellowish- or orange-straw, $K\pm$ yellow intensifying. Paraphyses 1-1.5 μ m thick, simple or forked above, the tips often slightly swollen to 2.5 μ m. Spores up to 10-celled, (35-)40-50(-75) x 2-3(-4) μ m, acicular. Pycnidia pale pink to red-brown; pycnospores 16024 x 0.5 μ m, curved or sigmoid. With atranorin. Epihymenium K-. On deciduous trees with nutrient-rich bark.

B. russeola (Kremp.) Zahlbr.

Thallus effuse, thin, uneven or rugulose, white or gray, matt, K-; algae globose, 4-6 μ m.

Apothecia often rather crowded, adnate to adnate-sessile, slightly constricted at base, 0.5-1.2 mm diam.; disc first plane, then usually soon becoming convex, rarely remaining subplane, pale or deep chestnut brown, matt; margin concolorous or slightly darker, thin, often soon excluded. Excipulum towards margin reddish, K-; marginal part of radiating hyphae, strongly conglomerate, thick-walled, rather few-septate. Hymenium 80-90 μ m, hyaline, I+ blue; epihymenium fulvescent, $K\pm$ distinct rose-violet; paraphyses coherent, slender, simple, apices not thickened. Spores polystichous, acicular to clavate-acicular, mostly 45-55 x 2-3 μ m, 7-11-septate, one end obtuse, the other acute.

On bark.

B. salmonea S. Ekman

Description condensed from Ekman.

Thallus indeterminate, thin, either discontinuous, of discrete or contiguous, convex, sometimes almost granular areoles, or continuous, \pm cracked, wrinkled to warted, pale green-gray. Prothallus often present between discrete areoles and sometimes also bordering thallus, very thin, endophloeodal, pale gray.

Apothecia (0.3-)0.4-0.5(-0.7) mm diam., plane then markedly convex, epruinose, \pm pinkish or pale orange; margin concolorous with disc, raised, soon level, finally excluded. Proper exciple colorless, pale yellowish or pale brown-orange, without crystals, along edge with a 1(-2)

cell layers thick zone of enlarged cell lumina. Hypothecium yellowish or pale brown orange. Upper part of hymenium colorless or very pale brown-orange, without crystals. Spores acicular, 41-82 x 1.2-2.1 μm , 3-15-septa.

Conidia only slightly curved.

On bark.

B. schweinitzii (Fr. ex E. Michener) A. Schneider

Apothecia 0.6-1.75 mm, reddish black to black, distinctly marginate at least when young. Thallus granular, occasionally appearing coralloid, or less commonly smooth; epihymenium green; hypothecium and inner part of exciple red-brown, redder in K; outer part of exciple paler; spores (4-)8(-12)-celled, (37-)50-60(-65) x 3-4 μm . Epihymenium dark bluish green to blackish, K-. Thallus usually rather dingy, light greenish or olivaceous gray, usually effuse and partly immersed, smooth or verruculose to granulose or sorediate. No lichen substances. On deciduous and coniferous trees.

B. scopulicola (Nyl.) A. L. Sm.

Growing on siliceous rocks on the seashore, in xeric-supralittoral in crevices and on underhangs, rarely on soil or vegetable matter. Spores (21-)29-45(-51) x 1.7-3 μm , 4-8-celled, acicular. Pycnidia reddish brown, \pm immersed; pycnospores 18-30 x ca. 0.7 μm , strongly curved. Thallus granular-isidiate, pale olive-green to fawn brown (sometimes dark green in narrow crevices), rarely thin and rimose, mostly thick, warted and coarsely granular, with short, coralloid, isidium-like protuberances, or extreme morphs with soredia-like, \pm loose granules 40-80 μm . Photobiont cells 5-10 μm . Often sterile. Apothecia 0.4-1.3 mm diam., flat, soon convex, pale to dark brown, often with pinkish tinge, rarely black, often irregularly shaped or tuberculate; exciple at first thick, usually darker than disk. Exciple orange-brown (K-) in inner part, outer and sometimes lower parts colorless, of radiating, thick, densely gelatinized hyphae with narrow (to 2 μm) lumina, but lumina near outer edge often to 5(-7) μm . Hymenium 45-60 μm , hyaline or lower part pale red-orange; hypothecium hyaline; subhymenium usually pale red-orange. Paraphyses 1-1.5 μm wide, simple, often forked above; tips sometimes slightly swollen to 2(-4) μm . Pacific Northwest; East coast.

B. siberiensis (Willey) Zahlbr.

Thallus very thin, disappearing except under the apothecia, yellowish white. Apothecia yellowish, to 0.3 mm, convex, soon immarginate; exciple pale, radiate, outer part paraplectenchymatous with the cells \pm in rows; hypothecium hyaline to pale yellowish; epihymenium hyaline; hymenium hyaline, 36-50 μm ; paraphyses slender, 2 μm , gelatinous, loosely coherent, easily separating in K, tips slightly thickened; asci clavate; spores 8, biseriate, hyaline, 3-septate, 14-22 x 3.5-5 μm . Hymenium I+ blue, lower part slightly violaceous blue; all parts K-. On old weathered bone and on moss and humus. Alaska.

B. subincompta (Nyl.) Arnold

Spores bacilliform, 20-36(-40) x 2.3-3.5(-4) μm , 3- to 7-septate. Epihymenium pale to dark green, K-, N+ purple-violet. Apothecia flat, later convex. Thallus of whitish, scattered to confluent granules, not forming a thick granular crust, the granules 40-100 μm diam. Photobiont cells 7-14 μm diam. Apothecia 0.3-0.6(-0.9) mm diam., sometimes tuberculate and to 1.2 mm diam., black or rarely pale (albino morph). Exciple weakly developed, dark red-brown

within, outer edge \pm colorless; hymenium 50-65 μ m; hypothecium dark red-brown, K \pm purplish in upper part, pale red-brown below. Paraphyses 1-1.5 μ m, simple or rarely forked above; tips only slightly wider, to 3 μ m. On bark of deciduous trees. Alaska, NW Territories.

B. suffusa (Fr.) A. Schneider

Description condensed from Ekman.

Thallus indeterminate, usually \pm thick but sometimes thin, continuous, without cracks, or \pm rimose to areolate, smooth to wrinkled, warted, tuberculate, or sometimes subsquamulose, \pm yellow-gray, green-gray, pale gray, or gray. Prothallus lacking.

Apothecia (0.5-)0.6-1.2(-1.5) mm diam., \pm plane, then convex, with thin to thick white pruina on edge and/or disc of at least some \pm young apothecia, \pm yellow-brown, \pm orange-brown, \pm purplish, or black, sometimes mottled; margin concolorous with disc or sometimes slightly darker, \pm thin, level or slightly raised when young, persistent or finally excluded. Proper exciple laterally pale yellow to black-brown (along edge with a 4-6 cell layers thick, distinct zone of enlarged cell lumina), without minute and evenly dispersed crystals (but often with clusters of \pm large crystals). Hypothecium \pm yellowish, K+ intensifying. Upper part of hymenium pale yellow to black-brown. Spores 38-91 x 2.5-4.3 μ m, 3-17-septate.

On bark.

B. vermifera (Nyl.) Th. Fr.

Description condensed from Ekman.

Thallus indeterminate, \pm thin, either continuous, warted, \pm rimose to areolate, or discontinuous, of discrete or contiguous, convex, warted, sometimes subsquamulose, often poorly delimited areoles, white to pale gray, gray, or brown-gray. Prothallus lacking or present between discrete areoles, thin, white to pale gray, endosubstratal.

Apothecia (0.2-)0.3-0.4(-0.5) mm diam., \pm plane or becoming moderately or rarely markedly convex, epuriose, (almost) black; margin concolorous with disc, glossy or matt, distinct, raised, soon level, persistent or only rarely excluded. Proper exciple laterally red-brown to black-brown (rim darkest). Hypothecium pale. Upper part of hymenium dark red-brown to black-brown, much of the pigment confined to the wall of the paraphyses tips. Spores bacilliform to clavate, strongly curved or sigmoid, 14-31 x 2.1-3.1 μ m.

On bark.

B. xylophila Malme

On rotting wood, Siberia. See Thomson 1997 for description.

Excluded

"B." floridana (Tuck.) Zahlbr. (syn. Biatora floridana Tuck., Syn. N. Amer. Lich. 2: 39 (1888) = Fellhanera floridana

Florida, on tree trunks

B. suballinita (Nyl.) Zahlbr. = Micarea ternaria (Printzen 1995)

Excluded (But Not Yet Transferred to Other Genera)

"B." arthoniza (= Lecidella stigmataea) (Arthonia intexta?)

S. California (reported by Hasse; not in Egan's list, nor Esslinger's!). B. milliaria (Fr.) Koerber f. lignaria (= Micareia lignaria?)

"Biatora" carneoalbida (Gilbert, et al., 1988; Coppins, 1989) (Bacidia sphaeroides auct.) = probably Mycobilimbia sp. (see Printzen 1995)

"B." augustini (Tuck.) Zahlbr. (possibly = Sporacestra sp.)

Spores 30-40 x 1.5-2 um, acicular, becoming 4-celled. Thallus greenish gray to brownish, of placoid squamules, (imbricated or expanded, stellate?), adpressed to a black hypothallus consisting of a web of hyphae that are purple-brown under the microscope. Apothecia to 1 mm, slightly concave to flat (or convex?), orange-brown (pale lead-colored to dark reddish?), margin red-brown to black, thick (soon disappearing?). Proper exciple orange-brown to red-brown along rim, internally colorless to pale yellow, without crystals or oil droplets, consistin of hyphae with lumina that are \pm ellipsoid (3.0-3.5 um wide), often protruding from the lower part (anchorage hyphae?) Hypothecium pale yellow (to hyaline?). Hymenium hyaline to pale yellow, c. 50 um high. Paraphyses sparsely branched in upper part, apical cell sometimes swollen to 3 um, the wall of which is not thick and gelatinized. Spores filiform, distinctly 1-3-septate, 25-30 x c. 1.2 um. On bark. Florida.

"B." granosa (Tuck.) Zahlbr. (close to "B." coprodes but differing in pycnidial characters)

Thallus thin, minutely granulose, greenish to ashy. Apothecia 0.2-0.5 mm, \pm plane, usually black. Proper exciple dark, built up of hyphae with cell lumina wide relative to the length, lacking constrictions at the septa, abundantly furcate, non-anastomosed, with rather thick cell walls. Hypothecium reddish brown. Paraphyses rather conglutinated. Spores oblong-ellipsoid to dactyliiform, 10-20 x 2.4-4.5 um, 4-celled. On bricks, mortar, or calcareous rock. Widely distributed.

"B." ioessa Herre (type not studied, but diagnosis suggests that it does not belong in either Bacidia or Bacidina).

Spores 4-celled, 15.4-20 x 3.5-6 um. Thallus black with a greenish or grayish cast, dark olive green when wet, K-, C-. Spores fusiform to dactyliiform or sickle-shaped. Thallus effuse, thin, of scattered, minute to small, thick, rounded or subglobose, sometimes sub-plicate or diffomr granules or crumb-like squamules, which are occasionally aggregate; on a thick, prominent, often scurfy hypothallus; Apothecia numerous, small, sessile, black; disk flat then convex; margin narrow, entire, sometimes paler, finally excluded. Epihymenium blackish, K+ purplish or rosy violet, the color suffusing the hymenium; hymenium I+ blue; paraphyses free, thread-like, rather lax, with subglobose tips which are violaceous dusky to blackish; hypothecium colorless to pale brownish; asci subcylindrical to clavate, 35-45 x 10-15 um; On igneous rocks on a dry hillside, California.

"B." jacobi (Tuck.) Hasse (incertae sedis)

Thallus rather thick, wrinkled to warted (or scurfy or powdery?), effuse, forming small

patches, white to ashy gray, K+ yellow, C-; hypothallus apparently pale.

Apothecia 1-several per thallus patch, appressed, 0.25-0.6 mm; disc flat to slightly convex, black; margin concolorous, level with disc, thin and often at least finally disappearing. Proper exciple mostly colorless, but the interior gradually merging into the pigmentation of the hypothecium, with crystals in the rim and as radiating clusters in the interior. Hypothecium blackish brown, K-. Epithecium interspersed with crystals, fuliginous brown; hymenium (48-56-?)75 µm, hyaline except for brown spots in the epithecium, I+ light blue; paraphyses subcoherent, indistinct, unbranched or sparsely branched in upper part, with abruptly thickened, black capitate tips to c. 4 µm, some apical cells with a distinctly delimited, brown (K-) hood; asci clavate to inflated-clavate, 36-48 x 14-16 µm, the apices I+ dark blue to violet, with a pointed, conical ocular chamber and a rather narrow axial body that reaches all through the d-layer. Spores (3-?)5(-7?)septate, (20-)30(-38) x (2-)2.5(-3.5 µm), acicular with both ends pointed (fusiform, one end long-attenuate, the other short-acuminate?); slightly curved. On bark of Malvastrum. California.

"B." kingmanii Hasse

Thallus of scattered to congregated or imbricated squamules, dirty light olive green.

Apothecia 2-3.5 mm, sessile or substipitate, dull black, often with a faint grayish bloom, plane to convex; margin persistent, turgid, gray pruinose, generally strongly crenate-sinuous. Proper exciple of densely packed, thin-walled hyphae. Epithymenium subcontinuous, bluish black. Hymenium colorless, ca. 85-90 µm high, I+ dark blue. Paraphyses richly branched, coarse, scarcely thickened above, with light brown tips. Hypothecium dark brown, thicker than hymenium. Asci narrowly clavate, not reaching the epithymenium; tholus similar to that of Bacidia but lacking a discernable c-layer. Spores indistinctly 4-5-celled, 14-20 x 3.5-4 µm, often slightly curved. Thallus poorly developed; squamules ca. 0.5 mm wide, flat or conchiform; hypothallus indistinct. On quartzose rock, S. California.

"B." pallens (Kullhem) Zahlbr. (= with close affinities to Cliostomum)

Thallus thin, white, verrucose or smooth, to dispersed, K+ yellow. Apothecia 0.2-0.3 mm, carneous to white, pruinose or bare, becoming convex, dense, margin thinning; exciple pale;. Proper exciple "paraplectenchymatic", composed of hyphae with ellipsoid, globose, or irregular cell lumina, interspersed with crystals. Hypothecium pale, straw-yellow. Hymenium 40-45 µm, I+ persistently blue; epithymenium straw-colored, interspersed with crystals; paraphyses simple, 1.5 µm, tips slightly thicker. Spores oblong or elongate-oblong, the tips rounded, 9-18 x 2-3 µm, usually 4-celled. Conidia bacilliform to narrowly elliptical to narrowly drop-shaped. Thallus K+ pale yellow, C+ yellow. Usnic acid present in the apothecia. On various woody plants. Northwest Territories.

"B." ravenellii (Tuck.) Zahlbr. (incertae sedis; not close to Bacidia or Bacidina)

Thallus thin, granulose, greenish gray; apothecia to 0.5 mm, concave to flat, pale flesh-colored, the exciple elevated. Spores oblong-ellipsoid to fusiform, 16-25 x 4-5 µm. On sandstone. Florida.

"B." rubidofusca (Willey) Zahlbr. (= probably a Gyalidea species)

Thallus thin, granulose, greenish gray. Apothecia to 0.25 mm, concave, brownish red to blackish, the margin concolorous or darker. Hypothecium hyaline. Spores 13-22 x 4-4.5 µm, 4-

6-celled, ellipsoid to fusiform. On naked earth. Massachusetts.

"B." saxicola Looman (incertae sedis, not closely related to Bacidia or Bacidina)

Thallus granulose, white or endolithic. Apothecia black, to 1.5 mm, plane or convex. Hypothecium pale yellowish or brownish. Hymenium with oil droplets. Paraphyses very wide, richly branched. Ascus with tholus almost entirely non-amyloid, but with a faint, central structure comprised of a small cone just above the spore mass with a long, pointed extension at its apex. Spores 2-3-celled, 14-17 x 4-6 μ m. On siliceous rock, Saskatchewan. "B." saxicola Looman

"B." trachona

1. Hypothecium (entirely) and exciple (at least within) dark red-brown, K+ purplish. Spores (1-)4-celled, 11-19 x 3-4.5 μ m. Apothecia often absent, sessile, 0.2-0.8 mm, plane then convex, dark brown or black; margin persistent. Thallus thin, rimose, surface minutely granular-warty, whitish, greenish gray or fawn, rarely thicker and minutely leprose-granular. Photobiont cells 5-12 μ m. Hymenium 40-50 μ m, pale reddish brown below, pale green above. Epihymenium dark green, K-, N+ red. Paraphyses 1-1.5 μ m wide, contorted and often branched or anastomosing, the tips to 2 μ m, at most slightly swollen. Pycnidia 100-300 μ m, \pm sessile, black; wall dark brown, K+ purplish; pycnosporos short-baciliform, often biguttulate, 3-5 x 1-1.5 μ m. On deeply shaded, hard igneous rocks, rarely on exposed large roots, in underhangs and caves. Arctic; South Dakota; Appalachian-Great Lakes area. "B." trachona (Ach.) Lettau

1. Thallus verrucose uneven to subareolate or lacking, esorediate or partly soresediate, glaucescent or ashy, whitish glaucescent or blackish. Apothecia to 0.8 mm, at first plane and marginate, soon convex and immarginate; exciple dark outside, violet within, radiate; epithecium and upper part of hymenium greenish or bluish; hypothecium dark in lower part, red-violet to pale in upper part; hymenium 50-55 μ m, I+ blue then wine red; upper part bluish or greenish, lower part hyaline or red-violet; paraphyses coherent, septate, 1.5 μ m, the tips capitate, 4-5 μ m; asci cylindrico-clavate, 50-52 μ m; spores uniseriate or biseriate, fusiform, 3-septate, 11-19 x 3-5 μ m. On calcareous rocks, Alaska (misidentified). "B." trachona (syn. B. coprodes)

Incertae Sedis (Types Not Studied)

B. brouardii (de Lesd.) Zahlbr.

Thallus indistinct. Apothecia black, epruinose, shiny, dispersed to aggregated, to 1 mm, sessile with thin, entire, concolorous margin, then convex and immarginate, on short white stipe. Excipulum violaceous; epihymenium blue; hymenium and hypothecium hyaline; paraphyses narrow, free, branched; asci inflated-clavate; hymenium 45 μ m, I+ blue; spores not known. On siliceous rocks, New Mexico.

"Bacidia beckhausii Group"

Proper exciple rather poorly developed; excipular hyphae not resembling paraphyses. Tholus with a blunt and indistinct ocular chamber or no ocular chamber at all; axial body narrow, reaching all through the d-layer, with sides that are parallel or upwards slightly convergent, surrounded by a rather distinct zone that is more heavily amyloid than the rest of the tholus; spores bacilliform to fusiform and usually 3-septate.

B. beckhausii Koerber

Thallus whitish or pale gray, \pm immersed, or thin and varnish-like or slightly warted. Photobiont cells 8-14 μ m. Apothecia blue-black or gray-black, pale gray in shade, often thinly white pruinose, or with bluish "bloom" when wet, at first \pm flat, soon convex, to 0.6(-1.5) mm. Exciple thin, colorless or partly pale greenish, K+ violet; hyphae 1.5-2 μ m wide, more distinct in K but not separating. Epihymenium usually with minute granules dissolving in K. Hypothecium hyaline or pale. Hymenium 35-50(-75) μ m; upper part (and often vertical streaks) dull greenish, K+ violet, N+ red. Paraphyses 1-1.5 μ m wide, simple or sparingly branched; tips not, or only slightly widening to 2 μ m. Spores 16-32 x 1.5-3 μ m, (2-)4(-8)-celled, bacilliform or slightly curved. Pycnidia 50-100 μ m, immersed, black, the wall olive, K+ violet; pycnospores 3-3.5 x 1-1.5 μ m, oblong-ellipsoid. On bark or rarely wood, on deciduous trees; rarely also on bone. Alaska; NW Territories.

B. verecundula (Th. Fr.) H. Magn.

On bark. Report from N America is based on a misidentification. See Thomson 1997 for description.

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