

Catillaria Massal.
(LECANORALES: CATILLARIACEAE)

After Various Authors

Rev. 4/96

Thallus crustose, immersed, evanescent, rimose, warted, areolate, or granular, effuse (rarely with effigurate margins); whitish, grayish, greenish, brownish or blackish, poorly differentiated; upper cortex absent or rudimentary; lower cortex absent; attached by hyphal rhizoids. Soredia and isidia absent. Medulla I-.

Apothecia immersed to sessile, solitary or clustered, small (0.3-1.5 mm diam.); disk round, \pm concave to plane, to moderately or strongly convex, pale to dark, variously colored, matt or glossy, usually epruinose; thalline exciple absent; true exciple well developed in most species, usually evident and swollen at least when young, persistent or disappearing, of coherent (in K), branched, radiating hyphae; hypothecium pale or dark; margin and hypothecium without algae; hymenium colorless, (30-)40-60(-75) μ m; epihymenium colorless to black; paraphyses simple or sparingly branched (more branched towards tips), free, septate, the apices abruptly swollen (to 5-8 μ m), with a dark brown apical cap (Catillaria s. str.), or the apices swollen or not and either colorless or surrounded by a pigmented hood; asci clavate-cylindrical, unitunicate, rather thick-walled; tholus I+ blue; in K/I with a blue outer coat and uniformly blue apical dome (Catillaria-type) or with a K/I- conical apical cushion (Bacidia- or Biatora-types); spores 8(-16), 1-septate, thin-walled, hyaline, oblong-ellipsoid, ovoid or bean-shaped, with rounded or pointed ends.

Pycnidia usually immersed and inconspicuous; conidiogenous cells enteroblastic, arranged in chains with conidia borne terminally and laterally, or in a single layer and broadly ampulliform (fulcrum exobasidial according to Rogers); pycnosporangia colorless, simple, ellipsoid to bacilliform, (oblong to pyriform or curved, according to Rogers). Mostly no substances; some species with usnic acid or atranorin. Photobiont chlorococcoid (e.g., Trebouxia, Myrmecia, Dictyo chloropsis), mostly in small groups dispersed throughout thallus. On bark, rock, or soil. Best developed in the tropics (according to Galloway), but also well represented in temperate to boreal areas.

Catillaria s. str. is characterized by asci with uniformly K/I+ blue apical dome, the abruptly swollen paraphyses tips with a dark brown cap, non-halonate ascospores, and the conidiogenous cells in chains.

Coppins lists Kiliasia as a synonym, but Timdal synonymizes it under Toninia.

This genus in the broadest sense is characterized by lecideine to biatorine apothecia with small to moderate-sized, hyaline, 1-septate spores usually 8/ascus. It is still heterogeneous, and its relationships to other genera have not yet been fully clarified.

Key to Catillaria-like genera

1. Photobiont Trentepohlia.2

1. Photobiont chlorococcoid or micareoid. 6

2. Hypothecium and true receptacle pale. Apothecia \pm pale whitish to yellow. Ascus wall thin, even at the crown. Thallus crustose, coherent. Apothecia sessile. Ascus wall thin, even at the crown. Receptacle not carbonaceous. On bark or over bark-dwelling mosses in humid habitats. Dimerella

2. Hypothecium and/or true exciple dark, \pm carbonaceous. Apothecia \pm dark, mostly brown to black. 3

3. Paraphyses reticulate-bound (anastomosing). Asci bitunicate, thick-walled, not amyloid. Lateral receptacle lacking. Apothecia often of irregular outline, elongate and divided. (Arthonia)

3. Paraphyses simple or weakly forked. 4

4. Spores \pm brown when mature, often warty. Asci bitunicate. Apothecia rounded to elongated, if rounded then often with two-sided broken margin. On bark or rock. (Melaspilea)

4. Spores hyaline even when old. Asci unitunicate, comparatively thin-walled. 5

5. Spores relatively small. Thallus crustose, thin, uniform. Apothecia lecideine, sessile, usually black or dark brown, at least when young with flat disks and thick margin, later becoming convex and immarginate. Paraphyses simple or branched and anastomosing, with slightly clavate tips. Asci clavate to cylindric. Spores rather thick-walled, but without halo. Receptacle massive, not clearly notched-split, consisting of perithecium and radiating amphithecium. On bark or rock. Catinaria

5. Spores large. Tropical-subtropical. Megalospora

6. Hymenium and asci I-, K/I-. Asci thin to moderately thick-walled. 7

6. Hymenium and asci at least partly I+ blue or at least K/I+ blue. Apothecia not Gyalecta-like, not urceolate. 9

7. Apothecia without receptacle or with only a few paraphyses-like enveloped hyphae, rounded to lobed or elongated. Asci bitunicate, broad. Spore cells often unequal. (Arthonia)

7. Apothecia with a definite receptacle made up of usually radiating hyphae. Apothecia Gyalecta-like, concave to urceolate at least when young; discs pale rose, yellowish to brownish, rarely dull blackish, then however with usually light margin. Spore wall usually \pm swollen. 8

8. Paraphyses without septa visible even in I, crowded, mostly simple. Apothecia at least at first deeply concave-urceolate, whitish or yellowish pink, one per gray-greenish thallus. Ascus wall somewhat thickened at the apex. Very inconspicuous lichens on rapidly changing acid substrates on humid sites. Absconditella

8. Paraphyses with septa visible at least in I. Asci and hymenial gel not amyloid. Apothecia Gyalecta-like; usually small, disks flesh-colored to olive or blackish, concave

at least at first. Ascospores with a gelatinous outer wall (perispore), at least when young. Paraphyses simple, septa only visible in I. On various substrates, but almost always in moist to wet places. [If paraphyses branched and anastomosing and apothecia brown to blackish, see Gyalideopsis]. Gyalidea

9. Apothecia without receptacle (excipulum). Hymenium at best surrounded by a few indefinite paraphyses-like hyphae. 10

9. Apothecia, at least when young, with receptacle. 12

10. Asci cylindrical or cylindrical-clavate; wall not noticeably thickened above. 11

10. Asci ellipsoid, subglobose or clavate with a large apical dome and usually distinct ocular chamber. Paraphyses richly branched and anastomosed. (Arthonia)

11. Apothecial tissues bound by a gel matrix; ascus apex with I+ blue outer layer and apical dome and unstained wall, with an apical cushion at times surrounded by a dark cylindrical "ring structure". Algae "micareoid", under 8 um diam. Micareia

11. Apothecial tissues lacking gel matrix; ascus apex I+ blue except for an apical pore. Asci in loose tufts, extremely thick-walled, with reduced hyphae-like paraphyses, or asci surrounded by a hyphal net. Inconspicuous species primarily on moss. (Veizdaea)

12. Spores halonate, large. Paraphyses clearly branched and anastomosing. Thallus bright greenish yellow, or gray to brown, areolate, often on a conspicuous black hypothallus. Hymenium amyloid. Almost always on rock. Rhizocarpon

12. Spores not halonate, or if so then small. 13

13. Ascospores 20-30 x 10-15 um. Asci Lecanora-type. Apothecia 0.4-1.3 mm diam., black, bare, plane to convex. Thallus greenish or yellowish gray to whitish, smooth to cracked or verruculose. Hymenium hyaline, ca. 150 um high; epihymenium greenish black to dark bluish green, or in part purplish or reddish brown; hypothecium dark purplish to reddish brown above, greenish to very dark bluish green below; exciple greenish black to very dark bluish green, paler within. On bark or wood. Megalaria (grossa)

13. Ascospores under 20 um long. Asci not Lecanora-type. 14

14. Asci Teloschistes-type. Apothecia or thallus often, but not always, with yellowish, orangish, or reddish, K+ red or purple pigments (anthraquinones). Spores often, but not always, becoming polarilocular. Apothecia with or without a thalline exciple. On all substrates except leaves. (Caloplaca)

14. Asci otherwise. Apothecia and thallus (usually?) without anthraquinones. Spores not becoming polarilocular. 15

15. Thalline exciple usually present at least when young. Spore walls not swollen. [These genera need to be incorporated with those lacking a thalline exciple, so that this couplet can be eliminated. 16

15. Thalline exciple absent. 19

- 16. On mosses and plant detritus.** Apothecia brown, with brown or grayish thallus, frequently entirely or partially K+ red. Arctic-alpine. (Bryonora)
- 16. On rock or soil.** 17
- 17. Fulcra endobasidial.** Thallus whitish to gray-green or brownish, often squamulose or radiately lobed, but sometimes purely crustose. Mediterranean-submediterranean, on mostly calcareous rocks or soil. (Solenopsora)
- 17. Fulcra exobasidial.** Thallus various. Distribution and ecology various. Asci with definite, amyloid tholus.18
- 18. Spores without distinct perispore.** (Lecania)
- 18. Spores with distinct perispore.** (Halecania)
- 19. Receptacle of apothecia made up of loosely tangled hyphae, extending laterally over thallus and there becoming thinner.** On evergreen leaves, needles, or thin twigs, in oceanic regions. (Byssoloma)
- 19. Receptacle made up of closely layered, ± radiating, often strongly cemented hyphae.** 20
- 20. On leaves (evergreen).** Asci with darker K/I+ blue tube in K/I+ blue apical dome, surrounded by an amyloid fuzzy coat. Thallus crustose, farinose to scurfy granular, sometimes irregularly shallow-verrucose, often rimose, ecorticate, whitish to gray-green or dull ochraceous. Photobiont chlorococcoid. Apothecia sessile, flat or later convex, sometimes thinly white-pruinose, whitish, beige or yellowish, colorless in sections. True exciple of ellipsoid to globose cells, becoming excluded. Hymenium I+ blue. Hypothecium colorless or dull orange-brown. Paraphyses numerous, mostly unbranched but often branched and widening above. Asci 8-spored, clavate. Spores 1-3-septate, ovoid, oblong-ovoid to fusiform, smooth, not or sometimes halonate. Pycnidia often numerous, ± immersed in thallus, whitish or brown-orange; ostiole often gaping; conidia 3-4 x 1.3-1.7 um, pyriform. No substances. Fellhanera
- 20. On other substrates.** 21
- 21. Thallus squamulose to pillar-form to small-shrubby ragged,** whitish, gray, gray-violet to blackish. On soil, over mosses, rarely directly on rock. Toninia
- 21. Thallus endolithic to epilithic or epiphloeic, smooth, areolate to weakly lobed at the margin.** 22
- 22. Thallus closely appressed skin-like, but clearly rosetted and effigurate, sometimes squamulose disintegrating,** gray-greenish. Apothecia biatorine to somewhat drawn out and almost lecanorine. Fulcra exobasidial. "Placodiella" (treated by some authors under Solenopsora, but that genus has endobasidial fulcra!)
- 22. Thallus endolithic to layered in the substrate, smooth, areolate, but not clearly effigurate.** 23
- 23. Apothecia whitish. Asci with a K/I+ blue tube in apical dome.** Pycnidia absent or inconspicuous, under 0.1 mm diam. On small twigs or siliceous rocks. Fellhanera

23. Apothecia black or deeply colored, or if whitish then asci or pycnidia otherwise. 24

24. Asci surrounded by a gelatinous, I+ blue sheath, with a well-developed, I+ blue tholus containing a deeper-staining tube and a well developed ocular chamber.

Thallus crustose to squamulose. On rock. Toninia s. lato ("Kiliasia")

24. Asci in K/I with a blue outer coat and uniformly blue apical dome (Catillaria-type), or with a K/I- conical apical cushion (Bacidia- or Biatora-types). Thallus usually crustose. Catillaria s. lato. 25

25. Thallus thin; apothecia to 0.5 mm diam., immarginate even when young; hyphae of exciple scarcely distinguished from the paraphyses; thallus K-, P-. 26

25. Thallus thick, verrucose-areolate; apothecia to 1.5 mm diam., immarginate only when old; thallus K- to K+ yellow or orange, P+ yellow then orange. Paraphyses frequently branched, anastomosed, the tips only slightly thickened. True exciple P+ yellow. Asci Biatora-type. On siliceous rock. Tylothallia

26. Pycnidia generally abundant and conspicuous, black. Asci Biatora-type.

Apothecia pale, or black but sometimes faintly pruinose, 0.4-1.1 mm diam.; disc concave to flat, rarely convex; true exciple well developed, persistent, \pm colorless but appearing straw colored through densely interspersed, minute granules; hyphae 1.7-2 μ m wide, branched and radiating. Epithecium straw-colored to dark brown, often minutely granular, the granules dissolving in k> Hymenium 35-50 μ m tall, I+ blue. Hypothecium colorless, I-. Paraphyses numerous, mostly simple, the apices not thickened, clavate or capitate, sometimes pigmented. Asci 8-spored, clavate-cylindrical. Spores smooth, mostly 1-septate, without a distinct perispore. Thallus crustose, whitish pale gray or straw-colored, effuse or bordered by a dark prothalline line, verruculose to granular or \pm sorediate, usually in part endophloedal or endolithic. Photobiont chlorococcoid.

Pycnidia stromatic; walls purplish brown, K+ grayish red or purple; conidiogenous cells cylindrical, enteroblastic; pycnospores under 5 μ m long, colorless, smooth, simple, ovoid to ovoid-cylindrical, acrogenous. Containing atranorin, usnic acid and fatty acids. On bark or wood, rarely rocks. Cliostomum

26. Pycnidia absent or inconspicuous, under 0.1 mm diam., whitish or if black then immersed. Asci Biatora-type or otherwise. 27

27. Asci Biatora-type. (if spores at least partly simple, see Biatora). Catillaria s. lato

27. Asci Catillaria-type, with uniformly K/I+ blue apical dome. Paraphyses tips abruptly swollen, with a dark brown cap. Conidiogenous cells in chains. 28

28. Spores without distinct perispore. Thalline exciple absent. Catillaria s. str.

28. Spores with distinct perispore. Thalline exciple present at least when young. (Halecania)

ADD:

Thallus usually densely shell-like squamulose, the squamules often roof-tile like, gray-greenish

to brown or whitish, concave to convex, usually broadly rounded, the anterior margin usually turned up, sometimes sorediate. Cortex with "ball" structures. Apothecia sessile, black or red-brown. Epihymenium blue-green to brown. Asci with strong amyloid tholus. On wood and bark (often charred). (Hypocenomyce)

..... Mycobilimbia

Apothecia soon convex and immarginate. Paraphyses layered in much gelatin, branched and anastomosed. Exciple poorly defined, made up of paraphyses-like hyphae. Asci with thick tholus. Spores often \pm screw-like twisted; septa often indefinite. Scoliciosporum

Asci with definite tholus or apical wall thickening. Dead spores becoming \pm brown and remaining in the asci, broadly ellipsoidal to bean-shaped. Epihymenium and marginal region of receptacle brown. Hypothecium often of conspicuously vertically ordered hyphae. Asci cylindric. Paraphyses with weakly clavate tips, easily freed. Pycnosporos \pm ellipsoid. On very hard, lime-free rocks, usually on steep surfaces or overhangs, predominantly in humid regions. Most species with simple spores. Photobiont chlorococcoid. Fuscidea

Spores mostly simple, but some becoming thinly 1-septate in some species. Photobiont chlorococcoid. Lecidea s. lato

Asci with K/I+ blue apical dome penetrated from below by a narrow, K/I- apical cushion surrounded by a narrow, deeply K/I+ blue zone, wall K/I= but surrounded by a K/I+ blue outer layer, ocular chamber poorly developed or not apparent. Paraphyses coherent even in K, 1.5-2 μ m wide, simple or sparingly branched, occasionally anastomosed, the apices \pm swollen (to 3 μ m wide) but sometimes clavate (to 5 μ m wide), not surmounted by a distinct apical "cap" or "hood". Apothecia pale to dark but never black. Thallus crustose, usually granular to granular-verrucose. Photobiont chlorococcoid. Biatora

I. On Rock

(Key to non-segregate taxa mostly after Kilius)

1. Algae Trentepohlia. (see Melaspilea, Catinaria, and Arthonia)

1. Algae chlorococcoid or micareoid. 2

2. Asci and hymenium I-, K/I-. (see Absconditella and Gyalidea)

2. Asci and hymenium at least partly I+ blue or K/I+ blue. 3

3. Spores halonate, large. Paraphyses clearly branched and anastomosing. Thallus bright greenish yellow, or gray to brown, areolate, often on a conspicuous black hypothallus. Hymenium amyloid. Almost always on rock. Rhizocarpon

3. Spores not halonate, or if so then small. 4

4. Apothecia without receptacle. (see Micarea; a few species of Arthonia may also key out here)

4. Apothecia at least when young with receptacle. 5

5. Spores frequently simple; septa often thin or indistinct. (see Micarea; a few spp. of Lecidea s. lato, Fuscidea, or Solenopsora may also key out here)

5. Spores entirely or almost entirely 1-septate. [if spores partly more than 1-septate, see Micarea, Bacidia, Scoliciosporum]. 6

6. Apothecia with thalline margin at least when young. (see Lecania, Halecania, and Solenopsora)

6. Apothecia without thalline margin. 7

7. Thallus squamulose to pillar-form to small-shrubby ragged, whitish, gray, gray-violet to blackish. On soil, over mosses, rarely directly on rock. Toninia

7. Thallus endolithic to epilithic or epiphloeic, smooth, areolate to weakly lobed at the margin. 8

8. Thallus closely appressed skin-like, but clearly rosetted and effigurate, sometimes squamulose disintegrating, gray-greenish. Apothecia biatorine to somewhat drawn out and almost lecanorine. Fulcra exobasidial. "Placodiella" (treated by some authors under Solenopsora, but that genus has endobasidial fulcra!)

8. Thallus endolithic to layered in the substrate, smooth, areolate, but not clearly effigurate. 9

9. Asci surrounded by a gelatinous, I+ blue sheath, with a well-developed, I+ blue tholus containing a deeper-staining tube and a well developed ocular chamber. Thallus crustose to squamulose. Toninia s. lato (including "Kiliasia")

9. Asci in K/I with a blue outer coat and uniformly blue apical dome (Catillaria-type), or with a K/I- conical apical cushion (Bacidia- or Biatora-types). Thallus usually crustose. Catillaria s. lato. 10

10. Thallus thick, verrucose-areolate; apothecia to 1.5 mm diam., immarginate only when old; thallus K- to K+ yellow or orange, P+ yellow then orange. Paraphyses frequently branched, anastomosed, the tips only slightly thickened. True exciple P+ yellow. Ascus type? Tylothallia

10. Thallus thin; apothecia to 0.5 mm diam., immarginate even when young; hyphae of exciple scarcely distinguished from the paraphyses; thallus K-, P-. 11

11. Pycnidia generally abundant and conspicuous, black. Asci Biatora-type. Apothecia pale, if blackish then pruinose, 0.4-1.1 mm diam. Thallus whitish, effuse, verruculose to granular or \pm soresiate, usually in part endophloedal or endolithic. Pycnidial walls K+ grayish red; pycnosporos under 5 μ m long. Cliostomum

11. Pycnidia absent or inconspicuous, under 0.1 mm diam., whitish or if black then immersed. Asci Biatora-type or otherwise. 12

12. Apothecia whitish. Asci with K/I+ blue tube in the apical dome. On siliceous rocks. Fellhanera

12. Apothecia black or deeply colored, or if whitish then asci otherwise. 13

13. Apothecial discs wax-colored. Thallus thin, chinky, yellowish ashy. Apothecia 0.1-0.2 mm across, adnate; disk flat to convex; exciple thin, soon disappearing; hypothecium hyaline; spores ellipsoid to oblong-ellipsoid, 7-12 x 2-3 um, rarely 2-septate. On granitic rocks, Massachusetts. C. flavens

13. Apothecial discs black, brown or red. 14

14. Paraphyses coherent. 15

14. Paraphyses free; tips pigmented. 17

15. Thallus thick, effuse, of small but thick and coarse squamules, these numerous and close together, concave, rugose, undulating, often crenate and lobulate, or sometimes closely appressed, few in number, or nearly disappearing, occasionally becoming warty and crumbling, ashy white to gray, paler at margin, K-, C-; hypothallus indistinct or absent. Apothecia 0.5-0.1.25 mm diam., sessile; disk flat to strongly convex, dull dark brown to black, or commonly ± whitish pruinose; exciple dull black or paler than disc, rather stout, soon disappearing; epithecium brown; hypothecium hyaline or faintly colored; hymenium hyaline, I+ blue; paraphyses coherent, not septate; tips slightly thickened, light brown; asci elongate-clavate, about as high as paraphyses; spores oblong, 14-22 x 3-5 um. On rocks along the coast. California. C. franciscana

15. Thallus areolate or verruculose-granulose to almost squamulose, but not of concave squamules. 16

16. Apothecia whitish pruinose. Hymenium 65-80 um. Paraphyses not free even under strong pressure. Epilithic thallus well developed, areolate, the pseudocortex deeply rimose, making the areoles appear to be covered by small crystals, beige to yellowish; apothecia 0.4-1.0 mm diam., black (even when wet); spores 10.5-12.8-15 x 3.5-4.0-6 um. On calcium-high limestone. C. sculpturata

16. Apothecia epruinose. Hymenium 50 um. Thallus crustose (approaching squamulose), verruculose, of thick cracked-areolate to turgid, swollen granules which become nearly lobate, matt, off-white to pale fuscous or gray. Apothecia few to abundant, scattered, adnate, not constricted, 0.4-0.5 mm wide; proper margin at first thick, shiny, prominent, soon excluded; disc plane becoming convex, matt, roughened, black; hypothecium black; epithecium bluish black; hymenium hyaline with top suffused with bright blue or blackish tints; paraphyses simple, stout, septate, with a globose end cell, strongly coherent. Spores 8 per ascus, hyaline, fusiform to ovoid, (0-)1(-2)-septate, (12-)15-19 x 4-5 um. Thallus K-, C-, KC-, P-. Primarily on sandstone in the supralittoral zone of the seashore. British Columbia. Close to C. chalybeia but different in thallus form and color, black hypothecium, and larger spores. Also similar to Toninia spp. Possibly a parasite on Lecania sp. Possibly the same taxon occurs on serpentine rock on the seashore in Washington. C. sp. (Noble, 1982)

17. Paraphyses with pigment distinctly confined within the cell wall; pigment in exciple, epihymenium and hypothecium K-, N+ violet. 18

17. Paraphyses with pigment diffusing outward from the cell wall, K+ and N+ purple-violet. Exciple carbonaceous black, with concolorous hypothecium; apothecia 0.3-0.5(-1.5) um diam., black (even when wet), somewhat shiny; hymenium dirty dark green, I+ red (rarely

preceded by blue color); spores (9-)9.6-11.9(-13.5) x (3.5-)4.4(-5.5) um. On limestone. C. tristis

18. Exciple carbonaceous black, at least in a broad marginal region; hypothecium pale to dark brown or red-brown. Thallus thin, continuous to rimose or minutely areolate-verrucose, the areoles 0.1-0.4 mm diam., beige to more usually dark olivaceous to blackish gray, ashy black, dark gray-brown or brownish black, (or sometimes sooty white according to Thomson), matt or slightly glossy, to disappearing, effuse or delimited, sometimes with black hypothallus and mosaic forming. Apothecia (0.15-)0.2-0.5(-1) mm diam., scattered or a few clustered, broadly adnate; disc black (rarely dark brown), bare, dull, slightly scabrid, flat or becoming convex; proper margin thin, slightly raised, greenish black, usually concolorous with disk but sometimes paler, usually persistent; exciple dark reddish brown; epithecium dark brown to green-black; hypothecium dark brown, K-; hymenium 40-60(-70) um, upper part very dark, lower part pale blue-green, center hyaline, I+ blue becoming wine red; green pigment in epithecium, hymenium and exciple K- (or green intensifying), N+ purple-red; paraphyses 1.5-2 um wide, simple or rarely forked, lax; apices capitate to 6 um wide, with dark brown cap; asci clavate, Catillaria-type; spores 8, biseriate, hyaline, oblong-ovoid to oblong-ellipsoid, (7-)9-12(-15) x 2.5-4 um. Pycnidia 50-100 um diam., the wall dark green, the outer cells with dark brown caps; conidia 1.8-3.5 x 0.5-0.8 um. No substances in TLC. On wide range of acidic, or more usually, slightly basic or nutrient-enriched rocks, especially on marine and lake shores, rare on highly calcareous substrates; occasionally on dust-impregnated timberwork and tree trunks. Alaska to Greenland, south to Maine, Ohio, Indiana, Wisconsin, S. Dakota, Saskatchewan, and British Columbia; possibly also to California. Very variable, especially in thallus appearance. C. chalybeia

18. Exciple with (mostly thin) pale- to dark brown colored marginal region (from the pigmented apical cells of the hyphae), never carbonaceous black. 19

19. Apothecia black. Thallus effuse, thin and rimose, beige to green-gray or gray-brown. Photobiont cells 8-12 um, ellipsoid, ovoid or \pm oblong. Apothecia black; true exciple dark brown at outer edge (ends of hyphae with dark brown caps), \pm colorless within; hypothecium colorless. Spores mostly 10-16 x 4.5-6 um. Pycnidia absent. No substances. On nutrient-enriched (e.g., by birds) rocks. C. subviridis

19. Apothecia red to dark brown to (rarely) blackish, 0.2-0.4(-0.6) mm diam. On limestone. 20

20. Hypothecium hyaline (at most in old apothecia slightly yellowish), 50-130 um high; apothecia frequently slightly immersed; asci 35-45 x 10-15 um; Thallus cryptothalline to small-squamulose areolate, usually effuse, \pm immersed to thin and rimose, whitish, beige or pale brown, sometimes dark brown or olivaceous due to invasive cyanobacteria. Photobiont Dictyochloropsis; cells 7-15 um diam. Apothecia 0.15-0.4 mm diam., numerous, scattered or in small groups, often partly immersed in thallus or substratum, reddish to dark brown, rarely black (then brownish when wet), flat to convex; true exciple sometimes paler than disc, pale to dark brown at outer edge (many hyphae with brown apical caps), pale brown to colorless within; epithecium pale to dark

brown, K-, N-; hymenium 35-50(-70) μ m, hyaline; hypothecium colorless or pale straw; paraphyses and asci as in C. chalybeia; spores 7-10(-12) x (2-)2.5-3.5(-4) μ m, oblong or oblong-ellipsoid. Pycnidia 50-70 μ m diam., the wall brown, the outer cells with dark caps; conidia 2-3.5 x 0.7-1.3 μ m. No substances. On limestones and other highly calcareous substrates (e.g., mortar) and eutrophic silicates. Ohio, California. C. lenticularis

20. Hypothecium pale brown, otherwise similar to the above. Usually on bark. [C. nigroclavata]

ADD:

Saxicolous species of Micarea with frequently 1-septate spores:

Thallus indeterminate, purplish black to dark brown, of scattered to confluent, convex areoles or squamules 0.8-4.5 mm diam., imbricate, lobed and crenulate, rugulose, K-, C-. Photobiont cells 4-7 um diam. Apothecia sessile, 0.2-0.6 mm diam., or tuberculate to 1 mm; disc flat, dark brown to black, finely papillate, becoming markedly convex; margin pale brown, reflexed, at first thick, but becoming partly or wholly obsolete; hymenium 35-38 um thick (68 according to Herre), pale purplish gray, paling downward, I+ blue; epihymenium brown, K-, N- paraphyses numerous, branched (1-)1.5-2 um wide, subcoherent, the tips to 2.5 um, clavate; hypothecium colorless; asci 33-35 x 10-14 um; spores ellipsoid, (0-)1-septate, 8-12 x 4-5 um (to 7 um according to Herre). Pycnidia frequent, immersed, (a) 80-200 um, the macroconidia 7-10 x 5-6 um, helicoid; (b) 40-100 um diam., the microconidia 4.5-6 x 0.5-1 um, bacilliform. No substances. On ± exposed hard siliceous rocks. [Reported from California by Herre; not mentioned by Egan].
Micarea subnigrata (syn.: C. subnigrata)

Micarea lithinella

Micarea tuberculata

Usually on soil or organic substrates, rarely on shaded sandstone. Micarea prasina

Usually on wood, more rarely on shaded sandstone. Micarea denigrata

Usually on wood, rarely on rock. Micarea elachista

("Kiliasia"):

Excipulum of the "athallina type" (hyphae weakly branched, the end cells much thickened and completely pigmented); hypothecium 60-85 μm ; spores 10.5-11.6-13.5 x 3.5-5.1-7 μm . Epilithic thallus usually absent. Apothecia 0.3-0.5 mm diam., slightly shiny. Toninia ("Kiliasia") athallina

Excipulum of the "philippea type" (hyphae strongly branched and anastomosing, the end cells little thickened and only partly pigmented); hypothecium 70-160 μm , pale to strong violet brown; spores 11-13.1-16 x 4-5.3-6.5 μm . Epilithic thallus well developed. Apothecia 0.2-0.8 mm diam., matt. Toninia ("Kiliasia") philippea

II. On Soil, Moss, Vegetable Matter, or Leaves

1. On leaves. 2

1. On soil, moss, or vegetable matter. 3

2. Receptacle of apothecia made up of loosely tangled hyphae, extending laterally over thallus and there becoming thinner. On evergreen leaves, needles, or thin twigs, in oceanic regions. (*Byssoloma*)

2. Receptacle made up of closely layered, \pm radiating, often strongly cemented hyphae. Apothecia whitish. Asci with K/I+ blue tube in apical dome. Pycnidia inconspicuous, under 0.1 mm diam. (*Fellhanera*)

3. Algae *Trentepohlia*. Apothecia \pm pale whitish to yellow. Ascus wall thin, even at the crown. Over bark-dwelling mosses in humid habitats. [some *Arthonia* spp. on soil may possibly also key out here]. (*Dimerella*)

3. Algae chlorococcoid or micareoid. 4

4. Asci and hymenium I-, K/I-. (see *Absconditella* and *Gyalidea*)

4. Asci and hymenium at least partly I+ blue or K/I+ blue. 5

5. Spores at least partly more than 1-septate. (see *Bacidia*, *Biatora*, *Mycobilimbia*, *Toninia*, *Micarea*, and *Scoliosporum*)

5. Spores not more than 1-septate. 6

6. Spores at least partly simple. (see *Biatora*, *Mycobilimbia*, *Micarea*, *Scoliosporum*, and *Lecidea* s. lato; some species of *Solenopsora* may also key out here)

6. Spores entirely or almost entirely 1-septate. 7

7. Apothecia without definite receptacle. (see *Vezdaea* and *Micarea*)

7. Apothecia with definite receptacle, or with a thalline margin. 8

8. Apothecia with thalline margin at least when young. (see *Solenopsora*, *Lecania*, and *Bryonora*)

8. Apothecia without thalline margin. 9

9. Thallus squamulose to pillar-form to small-shrubby ragged, whitish, gray, gray-violet to blackish. On soil or mosses. (*Toninia*; some species of *Solenopsora* may also key out here)

9. Thallus endolithic to epilithic or epiphloeic, smooth, areolate to weakly lobed at the margin. Asci in K/I with a blue outer coat and uniformly blue apical dome (*Catillaria*-type), or with a K/I- conical apical cushion (*Bacidia*- or *Biatora*-types). *Catillaria* s. lato. 10

10. Spores fusiform. Thallus crustose, varnish-like, clay-colored, submembranaceous to minutely granulose-verruculose. Hypothecium indistinct, dark brownish red, HCl+ pale violet. Apothecia to 1.5 mm diam., flat and thick marginate, becoming very convex and immarginate, in age recurved; disk minutely roughened, black, concolorous with margin. Apothecia numerous. Exciple dark brownish red, radiate; outer part palisade-plectenchymatous and thick; epithecium pale; hymenium 50 um, pale bluish, I+ reddish or blackish; paraphyses conglomerate but easily separating in K or HCl, slender, unbranched or rarely branched; tips not much thickened; asci saccate; spores 8, irregularly arranged, hyaline, 1-septate, the center scarcely constricted, 12-17 x 5-6 um. On mosses and humus. Arctic (Alaska to Greenland). C. muscicola

10. Spores ellipsoid. Thallus thin, composed of large, coarse, crenate, yellowish to reddish yellow granules. Hypothecium hyaline. Apothecia 0.1-0.2 mm diam., sessile; disk convex, yellowish flesh colored; exciple absent or soon disappearing; spores 14-18 x 3.5-5.5 um. On soil, Massachusetts and Illinois. C. terrena (= Vezdaea sp.)

ADD:

Thallus thin, varnish-like or white. Apothecia black, shining, to 1 mm broad, at first flat and marginate, becoming convex and immarginate; exciple brownish or greenish, outer part radiate, hyaline or pale brownish; hypothecium pale, brownish, 75 um; epihymenium greenish blue; hymenium 75 um, upper part blue, lower part hyaline; paraphyses simple, coherent, 1-2 um, only slightly thickened at tip, their upper part blue, then dark brown to tip; asci clavate; spores simple or 1-septate, 16-26 x 7-10 um. On moss and humus. Alaska. C. jemtlandica

C. dufourei [Not in Egan, nor the supplements]

Terricolous/muscicolous species of Micarea with frequently 1-septate spores:

Micarea denigrata

Micarea prasina

Micarea incrassata

Micarea turfosa

III. On Bark or Wood

After various authors

1. Thallus usually densely shell-like squamulose, the squamules often roof-tile like, gray-greenish to brown or whitish, concave to convex, usually broadly rounded, the anterior margin usually turned up, sometimes sorediate. Cortex with "ball" structures. Apothecia sessile, black or red-brown. Epihymenium blue-green to brown. Asci with strong amyloid tholus. On wood and bark (often charred). (Hypocenomyce)

1. Thallus crustose. 2

2. Thallus sorediate. Epitecium dark green, K+ green intensifying, N+ red, sometimes with additional, violet, K+ green patches. Spores 10-16(-19) x 4.5-65 µm, broadly to fusiform-ellipsoid, the walls rather thick; perispore absent. On mossy trunks (rarely branches) in old, especially moist woodlands, occasionally on mossy rocks or soil (especially near the coast), and on old Calluna. Megalaria pulverea

2. Thallus not sorediate. 3

3. Ascospores 20-30 x 10-15 µm. Asci Lecanora-type. (Megalaria grossa)

3. Ascospores smaller. Asci otherwise. 4

4. Algae Trentepohlia. (see Arthonia, Melaspilea, Catinaria, and Dimerella)

4. Algae chlorococcoid or micareoid. 5

5. Hymenium and asci I-, K/I-. Asci thin to moderately thick-walled. (see Arthonia, Absconditella, and Gyalidea)

5. Hymenium and asci at least partly I+ blue or at least K/I+ blue. Apothecia not Gyalecta-like, not urceolate. 6

6. Apothecia without receptacle (excipulum). Hymenium at best surrounded by a few indefinite paraphyses-like hyphae. (see Micarea; some Arthonia spp. may also key out here)

6. Apothecia, at least when young, with receptacle. 7

7. Thalline exciple usually present at least when young. Spore walls not swollen. (see Lecania)

7. Thalline exciple absent. 8

8. Receptacle of apothecia made up of loosely tangled hyphae, extending laterally over thallus and there becoming thinner. On thin twigs of evergreens, in oceanic regions. (Byssoloma)

8. Receptacle made up of closely layered, ± radiating, often strongly cemented hyphae. 9

9. Spores frequently simple, or with only very thin or indistinct septa. (see Biatorea, Mycobilimbia, Micarea, Scolicosporum, and Lecidea s. lato)

9. Spores mostly septate. 10

10. Spores at least partly more than 1-septate. (see Biatora, Bacidia,
Mycobilimbia, Micarea, and Scoliciosporum)

10. Spores at most 1-septate. 11

11. Pycnidia generally abundant and conspicuous, black. Asci Biatora-type. Apothecia pale, if blackish then pruinose, 0.4-1.1 mm diam. Thallus whitish, effuse, verruculose to granular or \pm sorediate, usually in part endophloedal or endolithic. Pycnidial walls K+ grayish red; pycnosporos under 5 μ m long. Cliostomum

11. Pycnidia absent or inconspicuous, under 0.1 mm diam., whitish or if black then immersed. Asci Biatora-type or otherwise. Asci in K/I with a blue outer coat and uniformly blue apical dome (Catillaria-type), or with a K/I- conical apical cushion (Bacidia- or Biatora-types). Thallus usually crustose. Catillaria s. lato. 12

12. Apothecia whitish. Asci with K/I+ blue tube in apical dome. On twigs.
Fellhanera

12. Apothecia black or deeply colored, or if whitish then asci otherwise. 13

13. Exciple and hypothecium bright blue or green. Spores (12-)15-18(-19) x 5-6(-7) μ m. Thallus K \pm sordid yellow, C-, KC-, P-. On bark of various coniferous and hardwood trees or shrubs. Southern British Columbia, Washington to California. Megalaria columbiana

13. Hypothecium not blue or green. 14

14. Apothecia \pm strongly convex and immarginate from the first. Apothecia 0.1-0.3 mm diam., pale yellow or lead-colored. Spores oblong-ellipsoid. Thallus thin, scurfy or minutely granulose, pale greenish to ashy. Apothecia adnate, often clustered and confluent; disk strongly convex; exciple absent or soon disappearing; hypothecium hyaline; spores rarely non-septate, 8-14 x 2.5-4.5 μ m. On trees, Massachusetts. [If spores partly simple and partly 3-septate, see "Catillaria" sphaeroides]. C. micrococca

14. Apothecia at least at first flat and marginate. 15

15. Spores mostly over 4 μ m wide. 16

15. Spores under 4 μ m wide. 17

16a. Hypothecium at least partly K+ red or pruple-red. Epithecium usually green or blue-green, K+ pure green, N+ purple-red. Megalaria laureri and M. brodoana

16a. Hypothecium K-. 16b

16b. Hypothecium hyaline. Growing in the Smoky Mountains. Epithecium green or blue-green, K+ pure green, N+ purple-red. Megalaria albocincta

16b. Hypothecium pale brown. Growing in California, or in Florida and Alabama. 16c

16c. Apothecial margin yellowish green, yellowish brown or brown, or finally blackening. Hypothecium pale brown, K-; spores fusiform or ellipsoid and slightly curved, (12-)16-20(-24) x 4-6 μ m. Apothecia 0.5-1(-1.8) mm diam., sessile; disc flat to convex, black, shiny; exciple thin, becoming irregular and finally disappearing; hymenium 50-60 μ m. Thallus moderately thick, rough, wrinkled, minutely granulose, greenish gray to yellowish, ashy, gray-white, or gray-brown. On trees. California. C. endochroma

16c. Apothecial margin black. Exciple violet in section, K+ purple; hypothecium pale brown, K-. Apothecia 0.5-1.0(-1.5) mm diam., black, flat to strongly convex; exciple thin, soon disappearing; hymenium 50-70(-90) μ m; spores ellipsoid to fusiform or "boat-shaped", sometimes obliquely curved on ends, (12-)13-20(-22) x 4-6 μ m. Thallus grayish brown to whitish, minutely granular to rimose, areolate, or finally verrucose; hypothallus black, thin, fibrillose, bordering the thallus. Hypothecium distinct, not merged with exciple. On trees, Florida and Alabama. C. leptocheila

17. Hypothecium (at least in upper part) pale to dark brown. 18

17. Hypothecium hyaline. Bacidia globulosa

18. Paraphyses free to very weakly coherent. Thallus thin and often immersed, pale to dark gray or gray-brown. Apothecia to 0.3-0.5 mm diam., dark brown to black, flat with thin margin, finally convex and immarginate. Hymenium 30-40 μ m; spores 8-12 x

(2-)2.5-3.5(-4) μm . Hypothecium pale to dark brown at least in upper part. Paraphyses above distinctly clavate thickened with dark brown cap. Pycnidia unknown. On deciduous trees. C. nigroclavata

18. Paraphyses coherent. Thallus thin, indistinct, composed of continuous or scattered, small, round, greenish gray to ashy granules. Apothecia 0.2-0.45 mm diam., adnate to sessile; disc flat to convex, pale lead colored to black; exciple concolorous with disk, soon disappearing (brown and persistent according to Thomson 1997), pale within, radiate; hypothecium brown to brownish black; hymenium 60-65 μm , hyaline, I+ blue; paraphyses coherent (free according to Thomson 1997), tips with darkened caps; asci clavate; spores oblong-ellipsoid, 6-12 x 2.5-4 μm . On trees, Massachusetts and California; subarctic. C. glauconigrans (position unclear; possibly close to Micarea)

ADD:

Hypothecium hyaline. Thallus effuse, whitish, thin, smooth to powdery, \pm rimose. Photobiont cells 7-14(-18) μ m diam. Apothecia to 0.4 mm diam., at first flattish, soon convex to subglobose, usually gray-brown or gray- to greenish black, rarely pale in shade morphs; exciple indistinct from above, colorless except upper edge which is often concolorous with the epithecium, the hyphae coherent in K, lumina ellipsoid, 2-4 μ m wide; epithecium mostly slate-gray to dark olive-green, K+ green intensifying, N+ red; hymenium 30-40 μ m, hyaline; Paraphyses 1.2-2 μ m wide, simple or forked above, apical 1-2 cells often grey- or green-walled and swollen to 6 μ m wide. Asci Bacidia-type or Biatora-type. Spores 7-12(-16) x 2-2.5 μ m, simple to 1-septate, oblong-fusiform or bacilliform. Pycnidia inconspicuous, partly immersed, 40-100 μ m diam., black, the wall dark green; conidiogenous cells in a single layer, short-ampulliform; conidia of two types (a) bacilliform or \pm curved, 3.5-5(-6) x 0.5-0.7 μ m (commoner), or (b) ellipsoid, 2-2.8 x 1-1.5 μ m, the two types not in the same pycnidium. On rough bark. [Fink reports in from old wood, New Hampshire and California]. Often difficult to distinguish in the field from Bacidia beckhausii, with which it often grows. (Bacidia globulosa--Coppins treats this as a Catillaria; according to Printzen it is probably close to "Lecidea" albohyalina and "Lecidea" meiocarpa)

Apothecia 0.4-0.8(-1.1) mm diam., pale to dull orange-pink, or sometimes (especially when old) pale reddish brown. Spores fusiform-ellipsoid. Spores (0-)1(-3)-septate. Thallus gray-green, finely to mealy granular; granules 25-70 μ m diam. Apothecia at first hemispherical, later becoming \pm globose, in section without pigmentation. Spores (9.5-)11-17 x 3.5-5 μ m. On sheltered, mature deciduous tree trunks (especially Fraxinus and Quercus), often around their bases, in old woodlands, more rarely on mossy rocks in wooded ravines or sheltered gullies. ("Catillaria" sphaeroides (A. Massal.) Schuler) [= Mycobilimbia sp.]

Corticolous/lignicolous species of Micarea with frequently 1-septate spores:

Micarea prasina

Micarea melanobola

Micarea denigrata

Micarea globulosella

Micarea micrococca

Micarea elachista

ADD:

Thallus white, thin, minutely granular. Apothecia sordid pale brown then black, small, plane, marginate, pale inside, young margin pale; hypothecium hyaline; hymenium I+ wine red. paraphyses scarcely discrete; spores 8, fusiform-ellipsoid to ovoid, 1-septate, 9-11 x 4-5 μ m. Lichenicolous on Peltigera. C. heeri (Hepp) H. Olivier

Catillaria erysiboides (Nyl.) Th. Fr. (Syn. Arthonia carneorufa)

Spores 1-septate, the cells equal, 8-10 x 4-5 μ m, ovoid-ellipsoid. Hymenium I+ blue. Thallus very thin, white, smooth, effuse. Apothecia reddish flesh-colored, round, convex, 0.1-0.3 mm across, adante; tinged yellowish brown within. On wood, Washington.

C. cupressi Zahlbr., Ann. Mycol. 33: 42 (1935) (systematic position unclear)

Thallus densely isidiate; apothecia large, black, persistently marginate. Sanford, Florida, on Cupressus

Toninia philippea

C. jemtlandica Th. Fr. & Almqu.

Thallus thin, varnish-like or white. Apothecia black, shining, to 1 mm broad, at first flat and marginate, becoming convex and immarginate; exciple brownish or greenish, outer part radiate, hyaline or pale brownish; hypothecium pale, brownish, 75 μ m; epihymenium greenish blue; hymenium 75 μ m, upper part blue, lower part haline; paraphyses simple, coherent, 1-2 μ m, only slightly thickened at tip, their upper part blue, then dark brown to tip; asci clavate; spores simple or 1-septate, 16-26 x 7-10 μ m. On moss and humus. Alaska.

C. nigroclavata (Nyl.) Schuler (syn.: Bacidia declinis)

See Kilias

C. subnegans (Nyl.) Boistel

On soil, moss, or humus. Apothecia black. Paraphyses coherent, scarcely branched. Thallus not pulveraceous, K-, P-. Hypothecium red-brown. Apothecia adnate, 0.4-0.6 mm diam., soon convex and immarginate; disk black, bare, scabrid; exciple radiate, pale exteriorly, red-brown interiorly. Epithecium blackish green. Hymenium 30 μ m, I+ blue turning violet. Paraphyses 1.5 μ m, tips thick and black.. Spores ovoid to oblong, 10-16 x 4-6 μ m. Thallus white or pale gray or brownish-ashy, granular or verruculose. Alaska.

C. superflua (Mull. Arg.) Zahlbr. = Megalaria sp., possibly M. grossa

Toninia athallina

Toninia lutosa

Toninia scalpturata

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