

VI. Axils/cups closed;

Without cups; often (but not always) tipped with apothecia

Helopodium

Partly after Culberson, 1969

1. Primary squamules very small (1.52 mm long and wide), poorly developed, unlobed or short lobate, persistent, appressed. Podetia simple to sparingly branched, short, 0.51-1.0(1.5) cm long, slender (11.3 mm thick), twisted, pale brownish, generally with 13 branches in the apical parts; branches corymbosely arranged; axils closed; cortex of small dispersed areoles covering twisted, cartilaginous ribs, or lacking over extensive areas; podetial wall indistinctly fissured; surface subcontinuously to areolate corticate; apothecia conspicuous, always much exceeding the width of the podetia, fleshcolor to pale brown, occasionally darkened; thallus K⁺ greenish yellow becoming dingy brown, P⁺ redorange; containing fumarprotocetraric and protocetraric acids and two fatty acids, soemtimes with accessory atranorin. Common on soil or tree bases in mature forests. Throughout eastern U.S. (south to Fla.), and California. C. peziziformis (With.)

Laundon

1. Primary squamules mediumsized to large; podetia, when present, obconical or stout and straight, cortex usually continuous or subcontinuous, rarely of dispersed areoles; apothecia scarcely or not at all exceeding the thickness of the podetia, brown to brownblack; thallus K⁺ or2

2. Primary squamules long and linear (0.51 x 1015 mm), corticate both above and below; apothecia sessile or subsessile at the tips of the primary squamules; K⁺ yellow; containing atranorin and protolichesterinic acid.

Eastern. (Gymnoderma lineare)

2. Primary squamules shorter, linear or not, ecorticate below; apothecia usually on distinct podetia (but sometimes absent, or on the primary squamules); thallus K⁺ or3

3. Thallus (squamules, and podetia if present) K (without atranorin; without norstictic and norstictic acids).

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3. Thallus (squamules, and podetia if present) K⁺ yellow (atranorin and/or stictic acid) or red (norstictic acid + stictic acid and/or atranorin). 7

4. Apothecia on tips and margins of the primary squamules, without distinct podetia; thallus P+ red; containing fumarprotocetraric acid. Primary squamules persistent, small, rounded, reflexed when dry, showing the chalky underside; upper side glaucescent. Apothecia brown. Pycnidia on primary squamules. On soil. Northeastern (Massachusetts and New Jersey).C. nanodes

4. Apothecia on distinct podetia. With fumarprotocetraric or psoromic acid.5

5. P+ golden yellow; containing psoromic acid. [If K+ yellow, see C. dahliana].6

5. P+ red, containing fumarprotocetraric acid. Apothecia very common, rarely exceeding the podetium in width, dark brown; podetia usually present (but sometimes few or absent), stout, simple, or very little branched (towards upper parts), evenly corticate, not twisted and torn, rarely squamulose, greenish mineral gray, 12 cm tall, sparsely squamulate. Primary squamules well developed, often forming extensive patches, medium sized. On soil or rocks, never on rotting wood, along roadbanks or in open woods; widely distributed in eastern, temperate N. America but rarely common.C. sobolescens

6. Podetia never squamulose, short and stout, to 2 cm tall and 4 mm broad below apothecia, rarely branched, cylindrical or clubshaped, cupless; cortex continuous or becoming chinky areolate or with fissures, the regions between areoles becoming translucent, conspicuously fissured when old. Apothecia occasionally exceeding the podetium in width, to 4 mm broad, brown. Primary squamules persistent, 24 mm long, irregularly incised or incised-crenate, rounded, appressed or ascending; upper side wrinkled, olivegreen or brownish; underside white. On soil in old fields and sometimes on rocks, never on rotting wood; widely distributed in the East (Labrador S to Wisconsin and Virginia), but rarely common.C. brevis

6. Podetia verruculose to phyllidioid to squamulose. Podetia and squamules K; lacking atranorin; podetia scarcely sorediate. Basal squamules large, 26 mm long, 4.5-10 mm wide, sparsely lacinate; upper side matt to somewhat glossy, verruculose to chckered. Podetia 13 cm tall, 23 mm thick greenish brown, unbranched or with few short branches in the apical parts; tips bluntish; podetial wall becoming laterally fissured; cortex thick; surface esorediate, phyllidioid to squamulose; squamules thick, 23 mm diam., regularly centrally attached (peltate).

Apothecia brown, confluent or conglomerate or fissured lobate, sometimes with squamules among the discs. Thallus P+ yellow; containing psoromic and psoromic acids and two unknowns. KC. On soils high in humus and on soil over rocks. Arcticalpine to borealtemperate (Alaska to Greenland, south to British Columbia and Alberta in the west and to New York in the east. C. macrophylla (Schaerer) Stenham.

7. Podetia absent or very rare; apothecia rare, if present, occurring on primary squamules. Containing atranorin, plus psoromic or fumarprotocetraric acid. [If containing atranorin only, or atranorin plus norstictic acid, see C. symphycarpa] **87. Podetia [usually?] common (except in C. symphycarpa); apothecia [usually?] common, usually on tips of podetia.** Primary squamules not usually reflexed when dry (except frequently in C. podocarpoides). 9

8. P+ yellow (psoromic acid). Podetia very rare (usually absent), 0.8-1.2 cm tall, 12 mm diam., cylindrical, simple or with 23 divisions, broadening upwards, esorediate, often ± squamulose towards the base; cortex uneven, with verrucae separated by blackish lines. Apothecia unknown. Pycnidia on primary squamules. Containing psoromic acid complex; perhaps only a chemical strain of C. symphycarpa. On exposed calcareous rocks. C. dahliana

8. P+ red; containing fumarprotocetraric acid. Podetia absent; apothecia rare, sessile or shortstipitate on the primary squamules; primary squamules large (ca. 1 cm long), linear, reflexed when dry and showing chalky white underside; upper surface greenish mineral gray; On sandy soil in open woods or along roadsides. Eastern (Great Lakes, Appalachian, and Ozarks regions). C. apodocarpa

9. Podetia soon ± strongly torn and fissured (or, in C. symphycarpa, podetia absent). Containing atranorin. Pycnidia on primary squamules. 10

9. Podetia entire or subentire, [usually?] present. With or without atranorin. 11

10. Primary squamules large (23 mm long) and abundant (dominant), scattered to contiguous, usually ± appressed and horizontally spreading at periphery and erect toward center of thallus; margins recurved when dry. Podetia usually absent or if present, few, very small (to 1 cm tall), with irregular cups

[according to Purvis, et al., 1984], mostly as wide as or wider than podetial stalk, or without cups [according to Thomson, 1984]. Apothecia rare. Thallus usually K+ yellow then red, KC, P+ orangered (norstictic), or rarely (according to Thomson, 1968) K+ yellow, P (atranorin only). Podetia soon becoming ± fissured. With atranorin. Podetia similar to those of C. cariosa, to 1 cm tall, branched toward top and somewhat broadening upwards; cortex soon verrucose areolate and fissured, bluish green to olive green. Apothecia dark brown, much larger than tips of podetia. On mineral soil, usually calciferous. Arctic to temperate, Alaska to southern Canada, Kansas, Colorado, and Michigan. C. symphycarpa

10. Primary squamules small to middlesized, 17 mm long and 12 mm broad, rarely larger, usually not recurved when dry. Podetia [usually?] present, often over 1 cm tall, without cups. Apothecia usually common. Thallus usually K+ yellow, P, with atranorin only, but rarely (e.g., in SE Canada see Gowan & Brodo, 1988) P+ red (fumarprotocetraric acid) or (British material) K+ red, P+ orange (norstictic acid). Podetia laterally markedly torn and fissured, oftensquamulose, often branched. Primary squamules irregularly divided, crenate, incised or rounded, flat or concave, confluent or sometimes caespitose; upper side white or bluish green or olive green; underside white or darkening toward the base; esorediate; sometimes reflexed when dry; persistent. Podetia 726 mm tall, to 2 mm diam., cylindrical, cupless, somewhat branched toward top; decorticate parts exposing the inner medullary layer which also becomes fissured and torn, the whole appearance suggesting halfdead podetia, this resemblance heightened by the pale white to bluish green or olivegreen color. Apothecia dark brown and quite large. On soils, especially those rich in humus, arctic to temperate. Widely distributed in northern N. America (Alaska to Iceland) and south throughout Canada, to the Great Lakes states, central Rocky Mountains, and northern California. [Note: a strange, apparently undescribed species, occuring very rarely, in Washington State, may key out here; it has very slender podetia with a verrucose surface, and the overall appearance of a cluster of podetia is almost netlike]. C. cariosa

11. Usually without atranorin, containing norstictic and connorstictic acids, homoheveadride, and unknown; without stictic acid. Primary squamules linear, large; podetia rarely if ever squamulose, broader at top. Podetia (and lower surface of primary squamules) K+ yellow, quickly turning red, P+ yellow to orange; Podetia rarely squamulose, simple, or sparingly branched towards tips. Primary squamules persistent, well developed,

forming extensive mats, strapshaped, to 5(10) mm long, 13 mm wide, laciniate, forming tufts; apices rounded; underside white to buff; upper side olivegreen to brown. Podetia often not developed, when present ca. 1(1.5) cm tall, 1.5 mm thick, olive greenish to brown, with a few branches in the apical parts. Apothecia common, brown, 1.2-1.5 mm across. Podetial wall indistinctly fissured; surface subcontinuously corticate, verruculose. On soil in abandoned fields, open woods, and along roadsides. Rocky Mountains east to southern New England and south to Florida and Louisiana but absent from most of the coastal plain; very abundant and common throughout most of its range. C. polycarpoides Nyl. (syn.: C. subcariosa auct. non Nyl.)

11. With atranorin plus accessory norstictic and/or stictic acid. Podetia never squamulose (?can be squamulose according to Thomson), simple, or usually well branched into two or more divisions as the podetia broaden upwards, sometimes the branches forming ± distinct corymbose clusters; cortex continuous or divided into minute areoles or low verrucules separated by paler lines, esorediate. Primary squamules persistent, simple or sparingly branched or even divided into lobes which in turn are divided; rounded at apices, from small to as large as 810 x 35 mm; upper side green or olivegreen; underside white. Podetia 5-15 mm tall, to 2 mm diam., cylindrical. Especially on sandy soil in ± exposed places, also on steep roadside banks, in fields, and in open woods; also on old shingled roofs near the coast. Southeastern coastal plain, to Louisiana and Florida, and from Saskatchewan, Nebraska, Colorado, and Kansas C. polycarpia Merr. (syn.: C. subcariosa Nyl. non auct.)