

Usnea

papillae = small protuberances made mainly of cortex, low hemispherical lumps to more prominent protusions, often with a pore of pseudocyphella at the apex (Stevens 1999)

tubercles = larger protuberances, containing medulla

pseudocyphellae = surface features arising from a breakdown of the cortex exposing the medulla but not producing the specialized structures of soredia (Stevens 1999)

fibercles = \pm protuberant scars left on branches after fibrils have broken off (when young, the fibercles show a hole left by the central axis of the fibril).

branchlets = arising laterally from the branches, usually longer than the co-occurring fibrils, often branch once, containing an axis joined to the main axis of the branch (Stevens 1999)

fibrils = short, branch-like appendages, containing medulla and algae, with a central axis that is not attached to the central axis of the branches on which they occur; but terminates in the medullary tissue of the main branch (Stevens 1999); fibrils less than 3 mm long are described as spinulous

isidia = forming as outgrowths of the cortex, usually finger-like and contain both medulla and algae completely covered by cortex, often easily detached (Stevens 1999). There may be some disagreements among different authors regarding concepts of isidia-like structures

pseudoisidia = arising in soralia together with soredia and occasionally isidia, elongate outgrowths partly covered by cortex; sometimes occurring together with true isidia in pseudocyphellae (Stevens 1999).

isidiomorphs = 100-200 μ m long, thin, isidia-like structures, usually occurring in bundles

dense medulla = hyphae without space between them but still visible individually

compact medulla = individual hyphae not visible

Detailed descriptions

[U. aculeata Mot., nomen nudum]

U. affinis Mot.

U. alpina Mot. = U. scabrata s. lato acc. to Halonen et al. 1998

Thallus 10-40 cm long, more supple, elongated and narrowed, not sinuous, grayish green often slightly yellowish, not darkened and scarcely constricted at base. Medulla lax. Apothecia terminal on lateral branches. Thallus 10-40 cm long, CMA 50:500:340. Thallus compressed, rather supple, long and narrow, not very abundantly branched, pale ashy or ashy

straw color; lateral branchlets few, threadlike, curved, blunt. Branches not incurved, nor pleated. Tubercles lacking or sparsely intermixed, scabrous from many pointed papillae and spine-like soredia. Thallus from base to tips uniformly thickly cylindrical papillate and scabrous. Medulla lax. Apothecia 2-8 mm diam., at tips of lateral branches; thalline margin with fibrils. Northern US and Canada.

U. amabilis Mot.

Thallus pendulous, ca. 15 cm long, rather rigid, white, matt, smooth, appearing pruinose. Base almost indistinct, soon above base and along whole length rather frequently, usually dichotomously branched; branches arcuately curved, hanging and almost parallel, uniformly ca. 1 mm thick, somewhat attenuated towards hairlike tips, terete or slightly compressed near branching points; surface \pm continuous, smooth; papillae absent; fibrils absent or rare and poorly developed. Medulla rather dense, K+ yellow, not turning red. Apothecia rather rare, sessile, lateral on thicker branches, to 5 mm wide; margin cupuliform, smooth, sparsely ciliate; disc concave. CMA 50:130:280. Medulla K+ sulphur yellow (not red). Florida (but not mentioned by Harris, 1990).

U. amblyoclada (Muell. Arg.) Zahlbr.

THALLUS shrubby, compact, rarely subpendent, 2-10 cm long, grayish green; **branching** isotomic-dichotomous at least close to apices; **trunk** short, up to 3 mm long, distinctly paler than branches or of same color, with numerous and conspicuous annular cracks; **branches** usually \pm irregular, inconspicuously segmented, lateral branches not narrowed or slightly to distinctly narrowed at point of attachment; **segments** terete to distinctly ridged, cylindric to weakly sausage-shaped; **foveoles** absent or present; **transversal furrows** absent or present; **apices** short, thick, usually sparsely branched; **papillae** absent; **tubercles** absent; **fibercles** low, numerous, mostly sorediate; **fibrils** short (1-3 mm), often spinulose, mostly present in oldest part of thallus, breaking away early in youngest branches leaving conspicuous scars (fibercles); **soralia** punctiform, smaller than half the diameter of branches, densely disposed, (16-)29-40-51(-70) soralia/0.5 mm², slightly tuberculate, arising on fibercles; **isidiomorphs** on soralia or isolated on plain cortex (very young fibrils?), sometimes on ridges, frequently black pigmented at tips; **cortex** thin [(2.5-)4.5-6.5%-9(-13.5)], shiny, distinctly transversely and longitudinally cracked at the base of main branches, the edges of cracks slightly upturned; **medulla** moderately large [(8.5-)17.5-23%-28.5(-36.5)], compact to dense close to axis; **axis** thick [(19-)32-42%-50(-60)], often pale pink pigmented. **APOTHECIA** rare.

CHEMISTRY: 1) (common chemotype). usnic, norstictic, galbinic, and salazinic acids, sometimes with traces of protocetraric acid; 2) (rare chemotype). usnic, norstictic, and salazinic acids.

U. ammanii P. Clerc & Herrera-Campos

THALLUS shrubby, 1.5-3.0 cm long, grayish green; **branching** anisotomic-dichotomous; **trunk** short, not conspicuous, black pigmented in basal part; **branches** usually tapered, sometimes \pm irregular, with inconspicuous segmentation (3-5 segments/0.5 cm), lateral branches not narrowed at ramification point; **segments** terete to slightly ridged, cylindric to slightly sausage-like; **apices** short and thick with few ramifications; **foveoles** absent; **transversal furrows** present on whole thallus; **papillae** verrucous, irregularly distributed on main branches; **tubercles** absent; **fibercles** absent; **fibrils** short spinulose, 1-2(-3) mm long, irregularly

distributed on whole thallus; **soralia** superficial to slightly tuberculate, as large as the branches when mature, sometimes \pm encircling the end of branches, circular to transversely oblong, without margin, usually not confluent, arising on cortex *ab initio*; **isidiomorphs** small and sometimes black-tipped, mainly on young soralia, usually few on mature soralia; **cortex** \pm smooth and glossy, thin [(5-)5.5-7%-8.5(-9)]; **medulla** loose to dense, extruding between segments, especially at ramification points, moderately large [(17-)21-25%-29(-31)]; **axis** moderately thick [(26-)29.5-36.5-43.5(-52)].

APOTHECIA rare.

CHEMISTRY usnic and salazinic acids.

U. angulata = misidentifications, at least for British Columbia, acc. to Halonen et al. 1998. But does occur in Mexico (Herrera-Campos et al. 1998)

Axis solid. Thallus sharply angular, 5-sided in section. CMA 30-45:45-60:330-390. Branchlets about 10 mm long, growing perpendicularly from the ridges, smooth or with large irregular tubercles. Thallus non-annulate; surface becoming subareolate. Thallus dark green or dusky gray green turning brown in herbarium. Tubercles becoming sorediate and isidiate. Medulla K+ yellow then red, P+ yellowish (or K-?). Ch: norstictic acid (or usnic only?). Axis solid. Apothecia rare (at least in temperate N. America), sessile, lateral, terminal or subterminal on secondary branches, to 1.5 cm diam. Eastern US.

Thallus pendulous, 10-90(-160) cm long, rigid, glossy, sparsely to moderately branched with anisotomic and parallel branches; often with many points of attachment; trunk indistinct, sometimes up to 10 mm long, brownish, concolorous with or paler than branches; branches [(0.4-)0.50-0.7-0.9(-1.7)] mm thick, cylindric, tapering only close to apices, distinctly segmented; segments weakly to strongly alate, trapezoidal when optimally developed, edges of wings eroded and opening longitudinally exposing medulla; apices thin, with few ramifications; papillae absent to numerous especially on main branches, large, cylindric to truncate-conic; tubercles absent; fibrils numerous, 2-4(-6) mm, spinulose, in fish-bone arrangement; pseudocyphellae thin and elongate, inconspicuous, scattered; soralia arising on small and low elevations on the cortex of fibrils and small lateral branches, almost circular to longitudinally oblong, punctiform to wider than half of branch, slightly to distinctly tuberculate, with conspicuous cortical margin when mature; isidiomorphs on soralia, sparse and not conspicuous; cortex thin [(45-)6-8.5%-11(-15)], vitreous, sometimes producing schizidia, especially on the wings; medulla thin [(2-)8-14%-20(-28.5)], compact; axis thick [(31-)41-53%-65(-83)]; chemistry: usnic and norstictic acids. On bark. Mexico.

See Stevens 1999 for more info.

U. arizonica Mot.

Thallus 3-16 cm long (rarely more), pale greenish yellow to subolivaceous grayish green, sometimes turning reddish. Primary branches dusky to black, smooth to papillate. Thallus tufted, rather stiff, tufted to subpendulous, thick, rather soft; base short, rather thick, dark; above sparsely sympodially branched; branches indistinctly flexuose, ca. 1.5 mm thick at abase, irregularly attenuate towards tips, not rarely irregularly cracked and whitish, subterete but often slightly deformed and subfoveolate, irregularly papillate; papillae small or large, obtuse, concolorous, non farinose, sparse. Branchlets irregular, large and small intermixed, 1-3 cm long. Apothecia frequent, lateral then subterminal, to 10 mm wide; disk pale flesh color, thinly whitish pruinose; margin foveolate or slightly uneven, smooth to slightly papillate, ciliate; cilia irregular,

medium size to elongate, sometimes exceeding diameter of disc, flaccid and variously curved, thick, slightly inflated, obtusely acuminate. Medulla \pm lax, white, usually K+ red, often delayed, sometimes K-; P+ orange. Ch: salazinic acid. CMA 60-75:200-225:300-375. On trees. Southwestern (Arizona, New Mexico, California; Mexico).

U. arnoldii Mot. (lumped as a particularly robust form of "U. sorediifera" by Ozenda & Clauzade)

Medulla and axis thick relative to cortex (CMA 80:400:350). Thallus ca. 25 cm long. Medulla K+ yellow or red or K-; P+ yellow to orange (or P-?). Soralia abundant on branchlets, not deeply erose. Thallus distinctly pendulous, rather dilated, rigid, rather sordid ashy green, matt; base indistinct, narrowly darkened, rigid; rather frequently subsympodially branched almost from the base; branches slightly flexuose, to 2 mm thick near base, attenuate towards base. Papillae long, subcylindrical, concolorous. Fibrils \pm frequent, to 1 cm long, terete, at most subpapillose towards base, perpendicular but often curved, the apical part sorediose. Soralia farinose (rarely isidiate?), white, well delimited, becoming erose. Apothecia unknown. Pacific NW. Reported by Herre; not mentioned by Esslinger & Egan.

U. australis Fr.

Thallus with relatively few "cilia" (fibril-like structures); cilia not perpendicular. Thallus to about 4 cm long. Apothecia small; margin distinctly cupuliform. Thallus not basally constricted. Medulla lax, K-. CMA 100-200-300:150-200 μ m. California.

U. baileyi (Stirton) Zahlbr.

Medulla red. Thallus with fibrils, 4-18 cm long, sparingly to richly branched. Axis with very wide cavity, with white arachnoid hyphae; fibrils many, threadlike. Soredia isidiose, abundant on thinner branches. Sterile. CMA 80:80:1500. Medulla K+ yellow then orange or red (or K-?), P+ orange or red (or P-). Ch.: norstictic and traces of salazinic--chemotype of type specimens of U. baileyi and the synonymous taxa reported from N. America; other chemotypes are known from elsewhere).

[Following description is from Stevens 1999]:

Thallus erect to subpendulous, 5-15(-20) cm long, gray to greenish gray; branching subdichotomous to irregular; trunk usually black, rarely pale; branches terete or somewhat ridged, 1-1.5 mm wide; apices attenuate, straight or arcuate; fibrils sparse to dense on main branches, to 5 mm long; papillae-like projections are young isidia; isidia sparse to dense, solitary or clustered, cylindrical, easily dislodged, eroding to leave pseudocyphellae; pseudocyphellae punctiform, scattered; soredia absent. Cortex cracked, matt. Medulla dense, with yellow, pink, red-brown, marron or chocolate brown layer around axis. Axis 3/4 width of branch, hollow.

Apothecia rare, terminal on short lateral branches; disc flat; rim and lower surface bearing fibrils; spores 8-10 x 5-6 μ m.

Medulla K+ red but difficult to see because of the pigment. Usnic acid and eumitrin A, \pm eumitrin B, norstictic acid (major), \pm salazinic acid (minor/trace), connorstictic acid (trace), galbinic acid (trace), and hyposalazinic acid (trace); zeorin and secalonic acid A may also be present.

Common in open forest, on branches in moist canopies. Tropical and warm temperate.

U. californica Herre

Thallus uniformly whitish straw to almost white, often 30-50 cm long. Thallus thick, soft; branches coarse, to 2 mm diameter, often distinct to tips. Many blunt warty papillae on thinner branches. Soredia minute. Medulla K-. CMA 50-100:165-200:330-375. Thallus rather compressed, thick but rather soft, matt; base indistinct, the main trunk unbranched for some length; upwards rather sparsely repeatedly subdichotomously branched; axils commonly closed and branches subparallel; branches to ca. 2 mm thick, rather slightly attenuated above, slightly curved, terete to often compressed and subfoveolate; thicker branches commonly rather frequently articulate; surface with rather broad and deep cracks; thinner branches distinctly verruculose-papillate; thicker branches with thick, obtuse, concolorous verrucules, which become white farinose, sometimes elongated into rugulae. Lateral branches rare, similar to main branches, often hanging down, somewhat attenuate, variously curved, coarsely verruculose, obtusely acuminate. Soredia isidiose, short, minute, white, on verrucules. West Coast (at least California).

U. capillaris Mot.

Branches typically without papillae. Thallus about 30 cm long, very thin and totally filamentous, soft, grayish green, broadly darkening (almost black) on primary branches; branched from the base or almost unbranched; primary branches very thin, to almost 0.5 mm thick, indistinctly papillate, rather sparsely branched; secondary branches almost parallel, hairlike, uniformly 0.3-0.5 mm diam., usually epapillate, sometimes with irregularly dispersed, rather large, irregularly semiglobose, often sorediate tubercles and minute foveolate; tips hairlike. Soredia few, minute, on tubercles. Branchlets elongate, irregularly distributed, often long, flaccid, scarcely thinner than branches. Medulla lax, K+ red. CMA 35:100:300. West Coast.

U. catenulata Mot. = U. scabrata s. lato acc. to Halonen et al. 1998

Thallus distinctly "beard-like"; branches ± uniform or the middle distinctly thickest; not fusiform attenuate. Soredia spinelike; soralia minute. Thallus to over 30 cm long, rather dilated, sparsely subdichotomously and subsympodially branched; branches straight, to 1-2 mm diameter at base, somewhat irregularly attenuated towards tips, terete, occasionally articulate and constricted at the articulations; surface at most very indistinctly papillate, sometimes indistinctly and irregularly tuberculate; secondary branches and fibrils very rare, distinctly tuberculate and sorediate; surface uniformly pale straw color, matt. Base rather indistinct, rather rigid, notably roughened, darkened. Soredia minutely spinuliform, rather rare, from tubercles, pale. Apothecia lateral then subterminal, ca. 7 mm wide, rather effigurate; margin with few, thin, fibril-like cilia. Outer medulla dense, inner part lax. CMA 10:500:380. On bark. California. "Accepted" by Esslinger & Egan, but as "identification uncertain."

U. caucasica Vainio (--->? U. filipendula)

Papillae numerous and crowded, in general regularly distributed, small, short and blunt. Fibrils (branchlets) 5-10 mm long, incurved, very fine, threadlike, abundant and noticeable but not crowded, often divided or covered by spinules. Thalline margin of apothecia with very fine fibrils. Thallus surface smooth, almost polished; Color of thallus pale green. Flesh colored pseudocephalodia often present. Medulla compact. CMA 80:300:250. Medulla K-, KC-(according to Ozenda & Clauzade), or K+ yellow to red or K-, P+ yellow or P-. Western Canada. [Motyka's key seems to imply this is a sorediate species, but Ozenda &

Clauzade treat it as a non-soresiate, often fertile species).

U. cavernosa Tuck.

Branches slender, often threadlike. With few branchlets, esorediate, straw yellow to pale green, darkening in the herbarium, irregularly dichotomously branching, the branches to 1 mm diam., at least the thicker branches distinctively foveolate pitted, sometimes bluntly angled, more or less articulate fractured. CMA 30-50:180-200:240-275 um. Medulla lax. Apothecia rare or occasional, to 5 mm diam.; margin thin, with few short or long fibrils; disc plane to convex, bare or slightly pruinose. On trees. **Medulla K-, P- (usnic acid only).** Arctic-boreal to temperate, northeastern and north-central, with scattered populations southward in the west, to Mexico. (ssp. cavernosa) or **Medulla K+ red, P+ orange (salazinic acid).** Alaska. (ssp. sibirica (Räsänen) Mot.)

Thallus pendulous with parallel branches, up to 60 cm, isotomic dichotomously branched, flaccid, hanging loosely on branches and twigs, sometimes with several attachment points; trunk indistinct to short (1-2 mm long), paler than or concolorous to branches; branches thick [(0.3-)0.45-0.6-0.75(-0.85)] mm, cylindric to irregular, tapering very slowly, commonly conspicuously foveolate; segments terete, striate, or weakly ridged, cylindric; apices long, capillary, and sinuous; papillae absent; tubercles absent; fibrils absent to scarce and irregularly distributed, 1-3(5) mm long; pseudocyphellae fusiform to elongate-sinuous; soralia and isidiomorphs absent; cortex thin [(2.5)4-6%-8(-01.5)], shin and smooth, with thin transverse cracks; medulla [(10.5-)19-25%-31(-40.5)], dense; axis thick [(7.5-)27.538%-48.5(-62.5)], straight to typically sinuous; apothecia rare, small (1-3 mm diam.), subterminal; spores subglobose, (5)7-11 x 5-9 um; chemistry: usnic and salazinic acids. On bark. Alaska to Mexico; Arizona, New Mexico, Colorado.

U. ceratina Ach.

Thallus dark gray-green, mostly 15-30 cm long (but rarely to 80 cm), at first somewhat erect and tufted, then ± stiffly pendant, often long and straggling or scrawny, harsh. Base pale or ± blackened. Main branches often coarse, to 1.5 mm diam., of uniform thickness, only tapering at the apices, typically rather straight when well developed, or somewhat twisted, often ± angular; branching usually sparse, occasionally with numerous irregularly arranged lateral branches, with scattered or sometimes abundant single or clustered thin fibrils to 1 cm long, arising at right angles to branches. With conspicuous, large, irregularly scattered raised, ± hemispherical tubercles, their tips farinose, often bursting to form coarsely granular, ulcerose soralia, and occasionally, secondarily corticate isidia. Main branches also with smaller, low, translucent, paler papillae. Soredia always present, often isidiose. Axis white, but medulla pinkish. Medulla and axis very compact, pale to deep pink, rarely white. Cortex tough, vitreous. Medulla K- or K+ yellow, C+ yellow, CK+ orange. Ch: diffractaic and barbatic acids, ± several accessory substances. CMA 50-75:150-220:350-450. Apothecia rare, lateral on main branches; margins with few rays (fibrils). On trunks of acid-barked old hardwood trees, rarely on rock; usually in well-lit sites in old woodlands and parklands. ± Eastern US; Pacific NW; eastern and western Canada; California; throughout Mexico except for the most arid parts.

See Stevens 1999 for more info.

U. chaetophora Stirton

Thallus usually with numerous annular cracks (but annulations not distinctly

swollen), thickly barbate branched towards the base (but fibrils few or absent along main branches, irregularly distributed). Main branches rugulose to foveolate, with \pm evenly scattered, white, punctate or comma-like tubercles which may become ulcerose and produce isidia, and indistinctly short papillate, with numerous low papillae in patches occasionally present, occasionally elongating into isidia. bright pale green or dark green (darker in older parts). Main branches 0.3-0.8(-1.5) mm thick, curved and becoming parallel, \pm uniform from base to near tip, then abruptly attenuate; tips short, like flexuous hairs. Thicker branches matt, thin ones shiny; Soralia, when present, punctiform, distinctly tuberculate, inconspicuous, smaller than half the branch diameter; isidia sparse or absent towards the base of main branches. Apothecia subterminal, 6-10 mm wide, with abundant marginal cilia. Medulla moderately to very lax, K+ red, P+ orange, C- (salazinic acid); axis with dusky hyphae in the middle. CMA 50:280:350. On trees, California & Ontario (?); British Columbia Reported by Herre; not mentioned by Esslinger & Egan

U. ciliifera Mot.

Thallus with many cilia; cilia \pm perpendicular. Thallus to ca. 6 cm (or more?) long. Thallus suberect, firm, rigid. Base attenuate; dichotomously branched. Main branches distinctly inflated, to 2 mm thick in center, somewhat attenuated towards tips, to 0.3 mm thick below apothecia, \pm frequently branched, rarely articulate, not constricted, terete, smooth or very indistinctly verruculose papillate. Cilia fibril-like, articulate, to 3 cm long, subulate towards tips. Branch tips almost hairlike. Thallus pale yellowish in life, turning rosy-coppery to distinctly brown (not olive) in herbarium; surface sometimes appearing pruinose. CMA 100:300:300. Apothecia not rare, terminal, plane, ca. 4 mm diam.; margin smooth, with few but distinct, long, straight or slightly flexuous fibrils. Medulla white, somewhat lax.

U. cirrosa Mot.

1. Thallus relatively large (3-5 cm long), pale, pure green, in herbarium finally pale bronwsh. Medulla very lax. CMA 50-80:225-345:225-345. Thallus rather wide; base short, distinctly and abruptly attenuate, moderately dark; branching subsympodial; branches straight to slightly falcate, distinctly constricted at base, to 1.8 mm thick in center, somewhat attenuate towards tips, terete, rarely articulate. Papillae acute, concolorous. Fibrils rather frequent, minute, 1-3 mm long, straight, constricted at base, indistinctly attenuate towards obtuse or rather acute tips, slightly pale, appearing rather soft. Apothecia frequent, terminal, ca. 5 mm diam. or rarely larger; margin with numerous short fibrils. Mexico. U. cirrosa var. cirrosa

1. Thallus small (2-3 cm long), dark (in herbarium pure brown). Medulla moderately dense. CMA 50:200:150. Thallus suberect, shrubby, rigid. Rather densely branched above the base; branches almost straight, attenuate at base, ca. 1 mm thick in center, somewhat attenuate towards tips, terete, frequently verruculose-papillate; papillae short, obtruse, tuberculiform, concolorous; spinules frequent, 1-3 mm long, not or scarcely constricted at base, straight, attenuate, rather acutely acuminate, often sparsely tuberculate at base. Apothecia frequent, terminal, 2-3 mm wide; margin with rather frequent fibrils 2-3 mm long. Texas. U. cirrosa var. ramillosa Mot.

U. concinna Stirt.

Medulla dense or in part somewhat lax. Thallus 10-15 cm long, branches to 1.5 mm

thick, ashy green or paler, secondary branches give a gray effect, in herbarium ashy or reddish brown. Branches with irregular warts and papillae, partly pale and fungiform, partly large flattened growth. Branchlets many. Medulla K- or later reddish. Axis sometimes with sordid hyphae. CMA 80-130:200:500. Reported by Herre; not listed by Esslinger & Egan.

U. condensata Mot.

Soredia isidiate. Medulla K+ bright red. Branches often distinctly thickened. Thickly papillate. CMA 100:200:200 um.

U. confusa Asah.

Thallus yellow-gray or gray, caespitose, 1-3.4(-8) cm long, attached to substrate at a single point, usually branching near base to form several major axes, the main branches inflated and sparingly to much divided, with short lateral branches; sparsely to densely papillate. Apothecia small and lateral or unknown. Soralia verruculiform-tuberculate, soredia isidioid. Medulla white, thick but very lax, K+ red, P+ intense yellow (salazinic and consalazinic acid, or salazinic and alectorialic? acid and traces of unknowns, or salazinic and norstictic acids), or K+ yellow (stictic, constictic and possible trace of unknown); protocetraric acid strain has been reported from Japan. Axis narrow. Apothecia unknown. Very common on twigs of firs and various hardwoods in spruce-fir forests and less commonly in fire cherry communities. Southern Appalachians. Similar to U. glabrata but differing especially in that the soredia are not farinose and the soralia are not crateriform and eroded.

See Stevens 1999 for more info.

U. cornuta Koerber, s. lato

Tips and upper parts not black dotted. Soralia minute (60-200 um), punctiform, smaller than half of branch's diameter, numerous, often coalescing to form larger soralia-like patches, even to \pm tuberculate, with or without isidiomorphs when young. Thallus bushy, \pm erect and stiff when wet, 2-6(-10) cm. Trunk blackened at the base or not. Main branches terete, to 1.5 mm diam., inflated, with few to numerous, short, lateral branches clearly constricted and often annulated at the point of attachment, mostly curved, often widely divergent to 90° in terminal branches; branching anisotomic dichotomous, \pm isotomic towards apices, often appearing claw-like. very divergently branched at base; branches constricted basally, soon inflated to ca. 1.3 mm; indistinctly papillate, branchlets not numerous, tips very bluntly pointed. Surface \pm dark dull gray-green becoming \pm dark brown in herbarium; base usually concolorous or paler, rarely blackened; cortex often smooth and \pm shiny-glassy in lower parts of main branches, more rarely corrugate-areolate, sparsely to densely papillate above, without papillae on upper branches. Scattered or clustered isidia-like structures often present together with \pm roughened, whitish gray, erose, \pm erumpent soralia. CMA 35-40:200-300:200-300. Medulla very lax, K+ yellow to red, P+ yellow to orange-red (ch.: 1) salazinic, \pm constictic acids, \pm protocetraric; 2) psoromic acid; 3) norstictic, \pm stictic, menegazzic, constictic and \pm salazinic acids); 4) thamnolic and protocetraric acids; 5) fatty acids; 6) protocetraric, \pm psoromic acid. Usually on trees; sometimes on rocks. Mexico, coastal California; North Carolina.

See Stevens 1999 for more info.

U. cristatula Mot.

Thallus erect to pendulous, 3-70 cm long, isotomic to anisotomically dichotomous

ramified, branches divergent or parallel; trunk 2.5-13(-25) mm, concolorous with or paler than the branches, yellow to dark brown; branches [(0.6-)1-1.4-1.8(-2.1) mm thick, cylindric to irregular, slightly or conspicuously foveate and/or transversely furrowed; segments terete, striate to weakly or strongly ridged, cylindric, slightly swollen or trapezoidal; apices short and thick to long and fine; papillae absent to numerous, from indistinct to verrucose; tubercles always present, regularly abundant, conspicuous; fibrils numerous, spinulose (1-3(4)) mm thick and long (10 mm), irregularly distributed; pseudocyphellae punctiform, elliptic, on cortex or on top of tubercles; cortex [16-)8.5-11.5%-14.5(-16.5)], thick, shiny to vitreous, hard, smooth to very cracked; medulla [(12-)17-21.5%-26(-33)], thick, dense to compact, rarely loose, pink and/or yellow pigmented; axis [(21.5-)27-34%-41(-48.5)], thick, white, translucent, pink or yellow pigmented; apothecia terminal or subterminal, 1.5-5.0 mm diam.; chemistry: usnic, diffractaic, \pm barbatic, \pm squamtic acids, \pm unknown fatty acid (C: 3-4), \pm unknowns (C: 1-2, 5). Mexico.

U. dalmatica Mot.

Thallus blackish green to olive or dusky, in herbarium turning brown. CMA 50-85:200-396:150-250. Thallus shrubby to subpendulous, limp, ca. 10 cm long, thick; base rather indistinct, attenuate; from base rather rarely divergently branched; branches slightly flexuous, attenuated at the base and towards tips, to 1 mm thick, terete, rather distinctly articulate, constricted at the articulations, usually with the articulate joints white margined. Papillae rather rare, minute, semiglobose to shortly cylindrical, absent from upper parts. Tips elongate, slightly wavy, little branched. Fibrils infrequent, similar to branches, perpendicular, attenuate toward base, slightly flexuous, almost smooth. Soredia white, farinose, isidiose; isidia long and thin, in soralia, eroding. Medulla lax, white, K+ yellow then red. Apothecia unknown. Reported by Herre; not listed by Esslinger & Egan . I have collected material that seems to key out to this species.

U. dasaea Stirt.

THALLUS shrubby to subpendent, 2-15 cm long, grayish green; **branching** isotomic- or anisotomic-dichotomous; **trunk** short (1-3 mm), paler or of the same color as main branches, without conspicuous cracks; **branches** tapering or irregular; lateral branches often slightly to distinctly narrowed at attachment points; **segments** terete or slightly ridged, cylindric; **apices** mostly thin; **foveoles** absent or present; **transversal furrows** present; **papillae** absent; **tubercles** absent; **fibercles** present, mainly on main branches, verrucous, low; **fibrils** 1-2(-3) mm, usually conspicuous, spinulose, easily breaking away, usually densely disposed on some parts of the branches, especially close to basal part, rarely on whole length of branches, giving spinulose appearance to this part of thallus; **soralia** punctiform to slightly elliptic longitudinally (especially on terminal branches), raised, smaller than half diameter of main branches where they mainly arise from fibercles; typically enlarged on apices where they mainly arise on cortex *ab initio*, and appearing \pm fusiform; **isidiomorphs** occurring on soralia only, not blackened at tips; **cortex** thin [(2.5-)5-6.5%-8(-13)], glossy, not conspicuously cracked; **medulla** large [(13-)21-26.5%-32(-37.5)], compact to dense, periaxially pinkish pigmented; **axis** moderately thick [(14-)24-34%-44(-57)], often pinkish pigmented.

CHEMISTRY: usnic, salazinic, norstictic and galbinic acids, or norstictic and salazinic acids.

U. deformis Mot.

Soredia in minute soralia. CMA 60-75:340-350:150-250. Branches \pm deformed with wrinkles and sorediate tubercles. Thallus pendulous to prostrate, usually about 12 cm long, but Florida specimens only 4-6.5 cm; strongly flaccid; surface partly subnitid, partly matt; base slightly attenuate; along whole length infrequently subdichotomously branched; branches ca. 1 mm diam. along whole length, rather abruptly attenuate at bases and apices, strongly and irregularly curved, almost terete; surface smooth but uneven, or deformed by oblong rugae and sorediate tubercles and appearing scabrous. Fibrils very rare and irregularly distributed, ca. 2-3 mm long, constricted at base, pale. Soredia isidiose; isidia spinuliform, rather elongate, similar to fibrils. Medulla lax, K+ yellow then red. Apothecia unknown. California; southern US (but not mentioned by Harris, 1990); Mexico.

U. dimorpha (Muell. Arg.) Mot.

Thallus with large (at first punctiform?) farinose soralia on numerous, large, very noticeable, crooked, deformed, coralloid branchlets (fibrils?). Thallus 12-15 cm long, pendent but comparatively thick. Deep dark green in Florida specimens, becoming dark olive to fuscous or dark red in herbarium, smooth and polished, shiny. Branches \pm pitted or deformed. Medulla lax, K+ dark red, P+ yellow (norstictic acid) and/or K-, P-? (galbinic acid aggregate according to Harris, 1990) CMA 40-60:200-300:90-120. On trees. Southeastern US.

U. diplotypus Vainio

Branching irregular, not distinctly dichotomous nor isotomic. Thallus erect in basal portion; upper part often prostrate. Isidia rather elongated, often isolated. Medulla K+ yellow then red, P+ orange, usually with salazinic acid as main substance. Not articulated. On rock or bark. Terminal branches with mostly anisotomic dichotomies, elongated, not tapered but of the same width throughout most of their length, twisted, some of them growing beyond the others, the whole giving a filamentous, contorted aspect to the tips of the thallus; secondary or tertiary branches not clearly constricted or fusiform; fibrils distributed on the whole thallus. Basal part of thallus jet black at least for 1 mm with few annulations. Papillae usually numerous, verrucous or cylindrical. Alectorialic or barbatic acids sometimes present; several reports, including ones on "U. herrei", state that norstictic acid is present (with or without salazinic or other acids). According to McCune & Goward, salazinic acid is present in both species. CMA 100:170:500. On trees, rarely on rocks. Northern US. **Soralia tuberculate (convex), becoming isidiate, generally not much expanded. Without barbatic acid (or with either it or alectorialic acid, plus fatty acids, according to McCune and Goward, 1995).** Terminal branches mostly anisotomic dichotomies, elongated, twisted, giving the branch tips a filamentous, contorted appearance (unlike U. subfloridana). Widespread, uncommon in northern Rockies, in moist, low elevation forest. British Columbia.

U. duriuscula Mot.

Axis \pm hollow, the branches centrally torn, with an irregular cavity. Thallus with blunt angles, nearly terete above. CMA 50:200:850. Branchlets about 30 mm long. Tubercles very blunt. Thallus very hard, strong. Surface areolate. Thallus 50 cm or more long, pendulous, ashy green; base slightly attenuate; soon above base and along whole length sparsely dichotomously and sympodially branched; branches often divergent; branches ca. 1.5 mm thick along most of the length, shortly attenuate towards tips, continuous, the lower part always obtusely angulate, distinctly areolate-cracked; areoles obtuse margined, the cracks scarcely deep;

upper part almost terete but often areolate and angularly cracked; with dispersed obtuse tubercles; lateral branches dense, ca. 3 cm long, flexuose or serpentine, thickened at base, somewhat attenuated towards tips, the thicker ones tuberculate. Soredia absent. Axial cavity with many dark hyphae. Apothecia unknown. Medulla K- or almost. [shouldn't this go into subg. Eumitra?]. On trees. Florida (but not mentioned by Harris, 1990); Mexico.

U. endochrysea Stirt.

Branches generally terete. "Papillae" usually distinctly elevated before white shows through the cortex, developing into delicate, fragile ramuli at irregular intervals on long branches emerging just above base of thallus; lateral branches short; apothecial cilia short, thin, often sparse; cortical cell lumina ca. 1.5-4 μ m, mostly sinuous or rounded in outline. CMA 50-100:200-325:125-200. Thallus blue-gray green, remaining gray green. Base of thallus not black (any darkening disappears with growth); "papillae" having predominantly sloping sides. Medulla or axis yellow? [implied by the name]. Eastern. (U. florida group or U. strigosa group)

U. erinacea Vainio

Thallus usually about 8 cm long, Thallus erect, very rigid, strong and firm, in herbarium sordid brown to almost reddish, matt. Main branches to ca. 2 mm thick, terete, slightly attenuate at base, sparsely dichotomously branched, usually irregular, warty; lateral branches short, divergent, thickened at bases, rather frequent. All branches terete but commonly rather irregular, without papillae but with verrucules, rarely articulate. Fibrils rather frequent from verrucules, rather short, cartilaginous, obtuse, straight, tuberculate. Apothecia frequent, terminal on all branches. CMA 50-100:250:250. Texas.

U. esperantiana Clerc

Thallus shrubby, or more rarely subpendent, to c. 8 cm long; branching mainly anisotomic-dichotomous; basal part pale, not constricted; main branches dividing from a short trunk, relatively thick, to c. 2 mm diam., \pm foveolate and swollen; branches often constricted at base; apices characteristically recurved, with plane to slightly excavate and \pm confluent soralia; isidia absent; papillae distinct, numerous; fibrils abundant; cortex glossy, usually thin; medulla lax to dense; central axis is normally thin, orangish. Usnic, salazinic, bourgeanic, and \pm constictic acids (K+ red, P+ yellow). British Columbia, rare.

U. evansii Mot.

Thallus about 2.5-6 cm long and wide. Thallus stiff, usually deep green (according to Tavares, bright yellowish gray green, turning olivaceous and brownish in herbarium) to nearly blackish green, but specimens from far south mostly pale green. Branches ca. 1 mm thick. Spinulose branchlets abundant, 1-3 mm long with much longer ones intermingled. Short, somewhat conical branches often crowded, sometimes interspersed with white-punctate areas of cortex resulting from clearly visible medullary spots preceding emergence of "papillae". Large branches often having pronounced ridges extending from bases of lateral branches. Lumina of corical cells extremely thin (not more than 1 μ m), often triangular in section. Back of apothecium smooth; cilia short and conical to inflated. Base of thallus not black (any darkening disappears with growth); "papillae" having predominantly sloping sides. Medulla K+ yellow then deep red orange or blood red. CMA 50(-60):(190-)245:125(-230). \pm Eastern US, and Calif.

U. extensa Vain.

Medulla and axis thinner relative to cortex (CMA 70:150:180). Thallus ca. 5-15(-20) cm long. Medulla K+ yellow then red-brown. Soralia all over upper part, immersed, crateriform. Base darkened for a rather great length. Papillae very numerous and crowded, farinose, not projecting. Without tubercles. Thallus supple. Apothecia unknown. Fibrils numerous. On bark. Saskatchewan. Reported by Herre; not mentioned by Esslinger & Egan.

U. faginea Mot.

Medulla lax to very lax. CMA 50:200:320. Thallus not very rigid. Apothecia mostly 0.4-0.7 cm across. Papillae frequent, conspicuous, on main branches thickened cuneiform at base, subcylindrical and acute, on thinner branches deformed and transformed into rugulae and then obtuse. Branchlets mostly few. Thallus usually dark glaucous green (pale green in one variety). Thallus to 30 cm long but often shorter, pendulous, firm, frequently dichotomously to subdichotomously branched from the base, towards tips sparsely branched; branches numerous, \pm parallel, typically distinctly flexuose, 0.8-1.5 mm thick, towards tips somewhat irregularly attenuated, continuous to subarticulate, terete to rather distinctly deformed and subfoveolate or at least uneven; tips rather elongate, slightly flexuose, obtuse. Apothecia almost always present, often numerous, sublateral to subterminal; margin with short and long, irregularly arranged, various flexuose fibrils; discs becoming pruinose. Medulla K-. Missouri. Reported by Herre; not mentioned by Esslinger & Egan.

U. fallax Mot.

Soredia in semiglobose soralia 1-2 mm in diameter, on lateral branches. CMA 50-60:400-600:250-300. Thallus to 15 cm long, subpendulous, rather soft, pale straw to dusky green, smooth, matt; base dilated, not darkened; from base to tips infrequently irregularly subsympodially and dichotomously branched; branches straight or slightly flexuose, slightly attenuate towards base and tips, 1-1.5 mm thick in center, rather indistinctly angular compressed, slightly rugulose and indistinctly foveolate; verrucles and soredia sparse. Soredia minutely isidiate, becoming abraded, yellowish white. Medulla lax, white, K+ yellow then red. Apothecia unknown. Florida (but not mentioned by Harris, 1990, nor by Esslinger & Egan)

U. fibrillosa Mot.

Branchlets (fibrils) none or very rare. Thallus about 25 cm long, thin, filamentous, grayish or rather pale greenish, often darkened on primary branches; branched from the base or almost unbranched; axils rather wide but branches soon convergent; all branches uniform, thinly hairlike, 0.4-0.5 mm thick, indistinctly undulate curved, subcontinuous; thicker branches with often sparse acute papillae, thinner branches irregularly but rather frequently tuberculate; tubercles rather deformed, comparatively large, almost always farinose; branch tips rather frequently branched. Soredia frequent on major part of thinner branches, from tubercles, isidiate, briefly spinuliform, almost white. Medulla rather lax, K+ slightly reddish. Apothecia unknown. Northern US and eastern Canada.

U. filipendula Stirton

Description mainly from James, et al., 1992: Primary branches minutely papillate, secondary ones slender, tuberculate, often much so; frequently isidiose soredia usually on upper branches towards the tips. Thallus pendulous, compressed, elongate, 20-30 cm long (to 75 cm on

Pacific coast), usually ashy to dusky green (but can also be very yellow according to Thomson), becoming yellow-brown to brown in herbarium; base sometimes blackened. Branches more or less compressed basally, often with few fibrils, more or less distinctly articulate. Main branches to 1 mm thick; secondary branches very long and hanging alongside the main branches, limp. Medulla lax to very lax, K+ yellow or red, P+ orange (or K-, P- in some varieties). Ch: Salazinic acid (or usnic only). CMA 60-75:120-180:250-400. Apothecia rare, usually absent. On trees (conifers and deciduous), common in the western coastal states, somewhat rarer eastward, but reported from numerous localities in the Great Lakes area and northeastern US; with scattered populations in southern Canada and in Alaska. (If primary branches blackening, = ssp. melanopoga Mot.).

Branches for the most part uniformly \pm clearly papillate, with long pointed papillae, mixed with blunt, farinose tubercles. Thallus pendulous; main branches (at least towards base) ca. 1.5 mm thick. 1

1. Thallus 20-30 mm long, not beardlike or strigose; lateral branchlets (fibrils) from none to many but not dense. Thallus bright clear green, in herbarium straw green. Medulla thinner than axis. isidiose soredia usually present; flesh colored pseudocephalodia often present; Medulla K+ bright red. Medulla lax to very lax, not wider than axis. CMA 50:200:350. Papillae present all over, rather long, pointed. Apothecia often present. West Coast. U. sublaxa Vainio (= U. filipendula)

1. Thallus to 15 cm long, much branched, "bearded" and almost strigose, with thin spinulose branchlets and dense but rather irregularly distributed fibrils. Thallus deep green. Medulla and axis equal in thickness. Medulla lax to very lax, K+ yellow then brick red. CMA 30:200:200. Base distinctly dilated, rather rigid and firm, \pm darkened; parts above base dilated, rather firm, \pm frequently branched; branches at first divergent, becoming subparallel; main branches attenuated towards base, fusiform, towards tips rather long and hairlike; terete; almost continuous; papillae rather frequent along whole length, minute but elongated, acute, concolorous, mixed with obtuse, deformed, soredia-bearing tubercles. Fibrils 2-10 mm long, very thin, perpendicular or obliquely hanging, often variously curved, acute at tips, appearing tuberculate and rugulose. Branch tips hairlike, distinctly flexuous, fibrilliform, branched to the tips. Soredia frequent on major part of the branches, isidiose, on tubercles, concolorous. Apothecia unknown. On bark. California. U. esthonica Räsänen (= U. filipendula)

Thallus distinctly "beard-like"; branches \pm uniform or the middle distinctly thickest; not fusiform attenuate. Thallus slender, pendulous, 20-30 cm long; branches 0.5-0.7 mm thick, abundantly papillate, without soredia, pale straw green. CMA 40:150:150. Medulla lax, K+ slowly red. Usually fertile in Europe, but apparently sterile in N. America. U. flagellata Mot. (= U. filipendula)

U. finkii Zahlbr.

Thallus to 15 cm long, pale ashy green, reddish tan in old herbarium specimens; fibrils almost always branched, rather distinctly papillate. Medulla K-. Thallus pendulous, hard and stiff, compressed; base scarcely distinct, soon branched above base; main branches mostly unbranched, straight or slightly flexuose, uniformly ca. 0.7 mm thick along most of their

length, terete, \pm continuous, almost smooth, almost without papillae, sometimes with minute verrucules. Branchlets (fibrils) very noticeable, 0.5-1 cm long, perpendicular, nearly always again branched; tips acute or obtuse. Soredia usually absent, but thallus appearing hoary when soredia are present. Medulla very dense; axis horny in texture. Flesh-colored pseudocephalodia present on fibrils. CMA 60:80:400. Apothecia unknown. Florida (but not mentioned by Harris, 1990).

U. firma Mot.

Thallus pendulous, to 55 cm long, isotomically to anisotomically branched, with branches mostly parallel; trunk conspicuously annulate, 2-12 mm long, usually orange-brown pigmented; branches [(0.6-)0.8-0.9-1.0(-1.1)] mm thick, distinctly annulated in basal parts, cylindric, tapering very slowly, segmented; segments terete and cylindric; apices thick; papillae absent; tubercles absent; fibrils long (5-)10-20(-30) mm, curved, few, and irregularly distributed to numerous, and in fish-bone arrangement; pseudocyphellae absent; soralia absent; isidiomorphs absent; cortex [(7-)8-10.5%-13(-13.5)], thick, mat; medulla [(11-)12-14.5-17(-19)], thick, compact; axis [(43.5-)46.5-50%-53.5(-55)], thick; apothecia lateral, (1.5-)2.5-12.5 mm diam., on small branches and fibrils; spores 7.5-10.5 x 4.5-7.5 μ m; chemistry: usnic and protocetraric acids. On bark, Mexico.

U. florida (L.) Weber ex Wigg.

Thallus mostly rather pale ashy green; very old herbarium specimens tan. Thallus bushy to subpendent, generally rigid, remaining erect when moist, (2-)4-8(-15) cm long; primary branches 1-1.3 mm thick, very divergent, few and strongly anisotomous, or very numerous and strongly isotomic; secondary branches mostly anisotomic dichotomous, not constricted; terminal branches not capillary. Fibrils usually numerous, divergent, mostly 3-5 mm long. Base black, at most weakly constricted. Papillae few and poorly developed towards base, abundant and distinct towards the tips, mostly verrucous, never cylindrical. Cortex very uneven. Medulla dense. CMA 50-100:150:450. Apothecia usually common, terminal or subterminal, 1.5-8(-13) mm diam.; margins fibrillose. Medulla K+ yellow or K-. Ch.: 1) thamnolic acid (+ hypothamnolic, diffractaic, bourgeanic and squamatic acids as accessories), 2) squamatic acid with accessory bourgeanic, 3) usnic acid only, or 4) hypothamnolic acid. Northern US.

See Stevens 1999 for more info.

U. fragilescens Hav. ex Lynge

Thallus nearly white to pale olive or clear green. Thallus 3-5(-10) cm long, mostly subpendulous to \pm erect, flaccid. Branching often distinctly sympodial. Main branches 1.5-2(-3) mm diam., originating over the whole of the length with relatively few, thinner, side branches which often arise at \pm right angles. Primary branches much elongate, distinct, often divided into long, somewhat inflated, segments, often constricted and annulate where they join the main stem, giving a characteristic overall combed appearance; fibrils few or absent; axils at an angle of 60-90°. Secondary or tertiary branches slender basally but distinctly inflated above (clearly constricted at the base or fusiform). Surface smooth and \pm shiny, often \pm pellucid when wet. Soredia on tips and branches in dotlike soralia, even, never excavate and never encircling the branches, widely spaced, rarely becoming confluent, large when mature, regular, rounded, isidiate only when young. Trunk (especially base) brownish to black; basal part with few (2-4/0.5 cm) and thin annulations, attenuated, brown to jet black, shiny (resembling broken glass),

smooth. Papillae usually numerous, evenly and densely distributed, low, broader than high, often inapparent. Axis rather thin. Medulla lax, K+ pale yellowish to red or K- (stictic, menegazziaic and \pm norstictic, \pm cryptostictic, \pm constictic acids). CMA 60-75: 195-375:200-350. Usually on trees. West coast.

1. Trunk thinner at its base. Thallus compressed, subsympodially and mostly sparsely branched over its whole length. Primary branches long, conspicuous, fusiform. Base attenuated. Mostly on rock. Distinctly articulated and constricted. U. fragilescens Hav. ex Lynge var. fragilescens

1. Trunk not thinner at its base, sometimes broadened. Thallus, at least at the base, divergently and subdichotomously branched (richly, especially towards base). Primary branches short, not distinctly fusiform. Base not attenuate. Mostly on trees. Branches distinctly inflated, subtly papillate. Thallus intense green; soredia and medulla K-. Usnic only, or traces of norstictic acid. U. fragilescens var. mollis (Vainio) Clerc

U. freyi Mot.

Medulla lax. Cortex half as thick as medulla (CMA 50:200:300). Thallus 10-20 cm long. Thallus dilated, thick and rather rigid, pale ashy green, matt. Base short, black, distinct; above base divergently branched; branches usually irregularly flexuous; primary branches rather distinctly constricted at base, soon attenuating but rather thick to the tips, terete; papillae minute, acute, rather long, cylindrical, concolorous, rather infrequent but \pm irregular, sparse on thinner branches; tubercles sorediate; surface rough with sorediose tubercles and rather long papillae; lateral branchlets (fibrils) minute, rather frequent and noticeable, slightly attenuated at base and towards tips, usually uncinatate or irregularly curved, the larger ones often branched again, always distinctly tuberculate and deformed. Soredia minutely spinulose, often on tubercles. Medulla K-. Apothecia absent or rare, sublateral, 5-8 mm diam., often irregular in outline; margins with elongate to very long, rather few, cilia; disc often pruinose. On bark of conifers. California.

U. fulvoreagens (Räsänen) Räsänen

Thallus \pm regularly branched, mostly isotomic-dichotomous, at least in part (examine branches midway out from holdfast). Stictic (major), cryptostictic, menegazziaic, norstictic, and \pm diffractaic acids. Fibrils numerous. Thallus 2-10 cm tall, erect, rarely subpendulous. Main branches to 1.5 mm diam. Laterals (fibrils) numerous, distributed over entire thallus, of \pm equal length, giving the main branches the appearance of a fish-bone. Papillae usually numerous. Branches cylindrical, not constricted or swollen. Terminal branches often twisted and contorted. Surface gray-green or yellow-gray. Soralia conspicuous, irregular, often crowded and coalescing, deeply excavate, reaching central axis, mostly bursting from low pustules (tubercle-like structures but much wider than high) and a tearing off of the adjacent cortex, broader than branch's diameter and irregular in shape; edges of ruptured cortex flexed outward, eventually the soralia often wrapping around the branches. Base jet black, with few inconspicuous annulations. Medulla K+ yellow-red, P+ yellow-orange, or K-, P-. On bark or wood, widespread and very common.

U. furfurosula (Zahlbr.) Mot.

Thallus large, to 20 cm long, pendulous, very soft and limp, pale clear green in life, dusky brown to nearly red in herbarium; pruinose chaffy with abundant spinules. Medulla K+

vivid red. CMA 100:400:400. Base short, indistinct. Soon above base and along whole length sparsely irregularly subsympodially branched, sometimes the lateral branches almost perpendicular but soon hanging and almost parallel; branches irregularly or subserpentinely curved, irregularly and distinctly articulate, constricted at base, mostly ca. 1.5 mm thick in center, terete, smooth or indistinctly papillate and spinulate. Fibrils very variable in size, irregularly distributed, constricted and often articulate at base, rather abruptly inflated above, acute, cartilaginous and often cracked. Soredia frequent on thinner and also thicker branches, isidiose, scattered or in indistinct soralia. Apothecia unknown. Southwestern US (Texas); Mexico.

U. glabrata (Ach.) Vainio

Soralia large when mature, finally efflorescent, excavate, extending to the full width of the branches and sometimes encircling them, the whole circumference being thus sorediate. Soredia farinose, without isidia even when young; Thallus usually 2-4 cm long, rarely 6-7 cm long and wide; nearly whitish green to whitish straw color; old specimens yellow to tan or finally red-brown; very smooth and shiny, without papillae, or rarely sparsely present towards the base. Secondary or tertiary branches clearly constricted or fusiform. Apothecia very small and very rare. Medulla very lax, K- or eventually + dark red, P+ orange-red (protocetraric acid) or P- (usnic acid only). CMA 35-75:210-375:190-225. On conifers, broad-leaved trees, and wood, known from a few scattered localities in Canada and northern US (including Idaho and Washington), possibly southward or in Alaska.

U. glabrescens (Nyl. ex Vainio) Vainio

Soralia even, plane or slightly concave, not excavate (except in psoromic acid strain of U. glabrescens), derived from pseudocyphellae which enlarge and not by sloughing of the adjacent cortex, distinctly rounded, widely spaced, rarely revealing the central axis. Fibrils absent on the apices. U. glabrescens s. lato. Forms of U. substerilis without isidia may also key out here.

1. Medulla lax to rather lax. Thallus short (to ca. 4-5 cm tall, but often less); branches smooth, thick to tips (not attenuate). Medulla usually K-, P-, KC- (?--possible type cited by Clerc, 1987 contains norstetic and salazinic acids; Bird states that the taxon contains barbatic and salazinic acids). CMA 50:200-250:200-300. Papillae sparse, not sharp pointed. Soralia punctiform, becoming efflorescent and capitate with age; isidia absent. Fibrils numerous and crowded. Thallus erect, cushion-forming, compactly caespitose, intricately branched, with long, slender ascending branches; branches \pm straight, ca. 1.5 mm thick, divergent; color intense or pale green, in herbarium unchanged or finally straw colored. Cortex rather soft. Probably an environmental modification. U. compacta (Räsänen) Mot. (= U. glabrescens according to Esslinger)

1. Medulla dense. Thallus 6-10 cm tall and wide; branch tips \pm slender and elongate, or thick. Medulla K+ or K-. Soralia deeply eroded, often small and sharply defined. U. glabrescens \pm s. str. 2

2. Main branches to 2 mm thick; lobe tips thick; color straw green or pale yellow (dark gray-green according to Tallis), unchanged in herbarium; young branches smooth; primary branches densely papillate; papillae rather coarse, short, almost tubercule-like, acute, concolorous, not farinose. Branching rather frequent, usually sympodial, divergent. CMA 70:(60-?)200:240(-350?). Medulla

white, K+ red, P- (K- according to some authors?). Thallus 6-10 cm tall, erect, short and broad, firm; base strong, to 2 mm thick, rigid and firm, slightly blackened, often annulate. Medulla dense. Soredia rather frequent on upper parts, farinose, from distinctly raised tubercles, small, indistinct, excavate when young, becoming eroded. Fibrils short, dense. Main branches slightly curved, thickened at base, attenuated above but rather thick, abruptly attenuated at tips, terete; long and "antenniform" (according to Dahl & Krog), or stout, flexuose, ascending, and gradually attenuated (according to Tallis). Fibrils infrequent, similar to branches but thinner. Apothecia unknown. Northern and Western. U. betulina (= U. glabrescens s. lato according to Dahl & Krog)

2. Main branches 1-1.5 mm thick; lobe tips elongated, hairlike, comiform; color yellowish white, straw green or pale to bright ashy green, becoming tan in herbarium. Main branches firm, elastic, often very richly branched and crowded towards the base, smooth, with evenly spaced, densely papillate, thinner branches; fibrils few or absent; blackened at the base; very smooth, shiny. Soralia frequent, minute, then becoming large and globose, conspicuous, pale or whitish, even to slightly tuberculate or regularly shaped and distinctly rounded, never larger than half branch diameter, discrete or occasionally forming paler eroded patches. Thallus 3-10(-15) cm tall, subpendulous, often \pm bushy below with several pendulous, little-branched, flexuose, extended main branches. Axis rather deformed. CMA 100-110:150-200:320-380. Northern US. 3

3. Medulla thin, K+ yellow/red. Ch.: norstictic acid, plus stictic or salazinic acids. Soralia not excavate. U. glabrescens (Nyl. ex Vainio) Vainio [ssp. glabrescens]

3. Medulla K-, P+ yellow. Ch.: psoromic acid. Soralia somewhat excavate. Branches slender, more intricately branched. [U. glabrescens ssp. glabrella Mot.?)

U. gonioides (Stirton) Mot.

Thallus pendulous, to 250 cm long, rigid, poorly to moderately branched, with anisotomic dichotomous and parallel branches; often with many points of attachment; trunk indistinct, sometimes up to 10 mm long, brownish, concolorous with or paler than branches, annulate; branches [(0.3-)0.5-0.8-1.1(-1.7) mm diam., cylindric, tapering only close to apices, sometimes areolated and cracked, rarely with erose cortex; segments \pm weakly to strongly ridged, slightly alate, cylindric to slightly trapezoidal; apices thin, with few ramifications; papillae absent, tubercles conspicuous, abundant, large, cylindric to truncate-conic, paler at top, often eroded, irregularly distributed on main and secondary branches; fibrils short (0.5-2.0 mm) and long (3-10 mm), mostly spinulose, in a fish-bone arrangement; pseudocyphellae linear, inconspicuous; soralia absent; cortex [(1.5-)5.5-8.5%-11.5(-15)], thick, shiny; medulla [(11.5-)4-9.3%-14.5(-26)], thin, compact; axis thick [(18.5-)49.5-64.5%-79.5(-94)], often fistulose at base of main branches; apothecia to 2 cm diam., lateral; spores 10.5-12.5 x 7 μ m; chemistry: 1, usnic and salazinic acids; 2, usnic and caperatic acids. On bark, Mexico.

U. graciosa Mot. = "Accepted" by Esslinger & Egan, but as "identification uncertain"; =? U. scabrata s. lato acc. to Halonen et al. 1998

U. halei P. Clerc

THALLUS shrubby to subpendent, 2-15 cm long, grayish to brownish green; **branching** isotomic-dichotomous at least in apical parts; **trunk** usually short (0-1 mm), branching at base, mostly with reddish brown pigment or of the same color as main branches, with conspicuous annular cracks; **branches** usually tapering, sometimes slightly irregular, lateral branches not or slightly to distinctly narrowed at ramification point; **segments** terete to slightly ridged, cylindric to slightly sausage-like, with slightly inturned ends; **apices** thin and loosely branched (except in compact forms); **foveolae** sometimes present; **transversal furrows** sometimes present; **papillae** low, verrucous, sparsely and unevenly distributed; **tubercles** present, verrucous, sparsely and unevenly distributed; **fibercles** absent; **fibrils** 2-4 mm, slender, sparsely and unevenly distributed close to basal part, absent in upper parts; **soralia** punctiform to large, slightly tuberculous, first smaller than half diameter of branches, but often soon enlarged, few to numerous (16-)18-36(-44), soralia/ 0.5² mm, arising on low tubercles in lower part of thallus, and on cortex *ab initio* on apices; **isidiomorphs** almost only on soralia, mostly visible on young soralia but sometimes densely covering mature, large, and capitate soralia, never single on plain cortex, rarely slightly blackened at tips; **cortex** thin to thick [(4-)5.5-7%-8.5(-13.5)], mat, distinctly transversely cracked at base of main branches; edges of cracks even or slightly inturned; **medulla** thick [(13.5-)23-28.5%-34(-37.5)], compact to dense, and rose pigmented periaxially; **axis** moderately thick [(14-)20-29%-38(-58)], almost always pink-pigmented.

CHEMISTRY: usnic, slazinic, norstictic, and \pm protocetraric acids.

U. hesperina Mot.

Sterile; with rather large isidiose soralia. Papillae low (very short), farinose, very few in v. *litorata* Mot. Nodules (tubercles?) small (short?), all sorediate, giving rise to isidiate soralia. Thallus pendulous, 10-30 cm tall, dichotomously and not very abundantly branched, the branches almost parallel. Medulla very dense and farinose. Medulla K⁺ and especially KC⁺ yellow then red-brown. Branches cylindrical, with distinct annulation close to the basal part, neither incurved, nor pleated, almost straight or a little sinuous, the terminal branches often very long. Papillae absent. Fibrils long and curved. Cortex matt. Soralia minute, pseudocyphella-like, sometimes enlarging and bearing isidiomorphs. Thallus greenish gray, browning slightly in herbarium. Branches about equal in thickness over most of their length. CMA 75-90:120-150:300. Containig protocetraric acid. Usually on trees; rarely on rocks. Eastern US (North Carolina); Mexico.

Thallus pendulous, to 55 cm long, isotomic to anisotomic dichotomously branched with branches mostly parallel; trunk conspicuously annulate, 2-12 mm long, usually orange-brown pigmented; branches [(0.5-)0.55-0.70-8.5(-1.12)] mm thick, segmented, tapering slowly, distinctly annulated in basal parts; segments terete and cylindric; apices thick; papillae absent; tubercles absent; fibrils long (5-)10-20(-30) cm long, curved, few, irregularly distributed to numerous, and in fish-bone pattern; pseudocyphellae absent; soralia punctiform, arising at surface of cortex often on small elevations and then slightly tuberculate, convex, sometimes confluent, often immature and resembling pseudocyphellae, rarely mature and enlarged; isidiomorphs very small, on young soralia and regenerative parts; cortex [(3.5-)9.5-11.5%-14.5(-20.5)], thin, mat; medulla [(6.5-)10.5-14.5%-18.5(-23)], thin, compact; axis [(27-)37-47.5%-58(-80)], thick; apothecia absent or rare, on small branches and fibrils, subterminal; chemistry: usnic and protocetraric acids. On trees, Mexico..

U. hirta (L.) F. H. Wigg.

Isidia very short, not spinule-like; soralia \pm distinct or becoming confluent, almost farinose, giving the thallus surface a leprose appearance. Thallus suberect to subpendulous, to 8 cm long, rather firm, densely caespitose, from the base rather frequently dichotomously branched, pure pale green when fresh, often sparsely black-spotted (parasite?), matt. Base short, firm, rigid, thick, often blackened. Branches almost parallel, to 1.8 mm thick, attenuate towards tips, the major part 0.5-0.8 mm thick, not rarely irregularly subarticulate; primary branches irregularly areolate to subfoveolate, smooth at base, \pm terete but often sculptured or acutely rugulose. Upper part of branches sorediate; tips obtuse. Fibrils few or absent. Frequently subtly "variolose" leprose, because of soredia; soredia frequent, subtly isidiose, dispersed on upper parts of branches on rugulae, concolorous. CMA 40:200:250. Medulla white, lax, K-. Apothecia unknown. On bark or wood of conifers. Arizona, New Mexico, Colorado, Wyoming, Montana; Maine, New Hampshire (in eastern N. America apparently intergrading with U. hirta). U. variolosa (= U. hirta according to Clerc, pers. comm.)

Isidia long, very abundant, especially on upper part, giving characteristic shaggy spinulose appearance; distinct soralia not present. Thallus 1-4(-8) cm long, almost as wide, shrubby or tufted, limp, very flaccid when wet. Main branches to 1 mm diam. All branches constricted and articulate basally (?--secondary or tertiary branches not clearly constricted or fusiform according to Clerc, 1987); primary and secondary branches typically obtusely angular and deformed, with rather indistinct foveoles or depressions in the surface. Fibrils few or absent. Surface grey-green, yellow-green or blackish gray. Without true papillae. Basal part not darkened. Medulla white, moderately to very lax, K-, P- (murolic acid) or rarely K+ yellow then red, P+ orange (norstictic and murolic acids). CMA 60:250-300:250-300. Apothecia rare. On coniferous and deciduous trees, wood, and rarely rocks. Boreal to temperate, south to northeastern U.S. and Great Lakes area, and to Arizona and Mexico.

Thallus 3 cm or longer, loosely branched, with thickly ciliate soredia in broad apical region. U. hirta ssp. hirta

Thallus under 3 cm long, densely branched; lacking cilia; soredia in narrow subapical zone. U. hirta ssp. minutissima (Mer.) Mot.

U. horrida Mot.

Thallus bluntly angular, flattened, deformed, to 3 mm thick, with many spine-like branchlets. Thallus 6-10 cm long. Apothecia abundant, terminal, ca. 7 mm diam.; margin densely spinulose; spinules short, dactyliform, similar to fibrils; disc carneous brown, becoming pruinose. Medulla K-. CMA 100:700:300. Thallus compressed shrubby to subpendulous or prostrate; in herbarium greenish brown to reddish brown; matt; frequently and irregularly branched; branches slightly flexuose, thinner towards base, ca. 3 mm thick in middle, thinly scabrid and verruculose-areolate, appearing partly densely papillate but typically without papillae; lateral branches perpendicular, rather short, constricted at base and swollen in middle, the thicker ones areolate-verruculose, the thinner ones less so, all complanate and deformed, almost angulate-rugulose, with short spinuliform structures. Texas; Mexico. Not mentioned by Esslinger & Egan

U. lapponica Vainio

Soralia excavate when mature, \pm broadly eroded, often becoming confluent and then revealing the central axis of the small branches. Fibrils usually present on the apices.

Salazinic acid (\pm barbatic, psoromic, or caperatic acids), or usnic acid only. On shrubs and trees, lowland to subalpine, very common in the central to northern Rocky Mountains (the most common Usnea there; mainly the usnic-only strain), also in outlying mountains east of the Continental Divide. [Need to find a more complete description of this species to see how it differs from U. monstrosa--check Clerc, 1987, and descriptions of U. sorediifera sensu Mot.].

Description after Halonen, et al. 1998:

Thallus shrubby, more rarely subpendant, normally with \pm deformed, swollen, and foveolate branches; branching mainly anisotomic-dichotomous but an isotomic pattern is also common near the basal parts; base pale to distinctly blackened; thallus typically with deeply excavate soralia when mature, soralia often reaching the central axis, never with isidia (sometimes with spinules), soralia borne mainly on a plane cortex, especially near apices and on tubercles, soredia farinose, cortex around soralia often torn; papillae low to cylindric and usually numerous; fibrils often abundant and present also near apices; cortex usually thin (4-11%), medulla lax to dense, very variable in thickness, but usually \pm thick (12-30%); central axis \pm thick (27-60%). Usnic acid alone (K-, P-), or usnic and salazinic acids (K+ yellow or orange, P+ yellow or orange), or sometimes with salazinic, barbatic, and 4-O-demethylbarbatic acids, or occasionally with usnic, psoromic and 2'O-demethylpsoromic acid (K-, P+ yellow). Terpenoids commonly present. Protocetraric acid rarely present (in traces), accessory. Most frequent on conifers, especially Picea and Pseudotsuga, but also common on deciduous trees and shrubs. In open to somewhat sheltered localities at lower to upper forested elevations. Circumpolar and continental. Montane or boreal areas, including British Columbia..

U. laricina Vainio ex Räsänen (--->? U. lapponica)

Branches and tips flexuous. Thallus to 5(-7) cm long and wide, intricate, pale green to clear deep green (unchanged in herbarium), slender, ca. 1 mm thick. Soredia finely granulose, in dot-like convex or globular soralia on upper part of thallus; soralia at first punctiform and borne on tubercles, not becoming excavate until very tardily. Medulla \pm lax, K-. CMA 80:120:280. Western US.

U. leucosticta Vainio

Papillae absent but sparse irregular tubercles present. Soralia in wide capitate, eroded soralia more than 1 mm in diameter, distributed over whole surface. Thallus about 20 cm long, pendulous, flaccid, very soft; sparsely branched; branching dichotomous below, subsympodial above; main branches flexuous, irregularly thickened, terete but \pm deformed and slightly pitted, ca. 1.2 mm thick, often annulate; surface green or pale yellow green, turning pale straw color in herbarium; articulate, with the medulla well shown at the joints; branchlets (fibrils) absent or almost. Cortex paperlike but rather firm. Medulla very lax, K+ deep red. CMA ca. 50:200:100. Apothecia unknown. Alaska to Washington.

U. longissima Ach.

Thallus pendulous, very elongate, up to several meters, consisting of one or few simple or scarcely branched main strands ca. 0.5-0.8 mm thick, terete or indistinctly flattened, scarcely attenuate towards tips, usually straight, usually not attached at base; surface gray green to paler or whitish straw. Fibrils many, at right angles, corticate, only a little thinner than main strand, simple or sometimes branching, sometimes tuberculate basally. Apothecia very rare. Soredia

none or only abnormal when present. Medulla usually K-, C-, P-, but K+ or P+ strains are also known. 1) usnic only. 2) barbatic and barbatolic? acids (var. vulgata and var. robustior). 3) barbatic acid, barbatolic? acid, squamatic acid. 4) diffractaic acid--most common chemotype? (ssp. ambigua), 5) evernic acid and unknown (ssp. jesoensis), 6) squamatic acid and unknown, 7) fumarprotocetraric acid and unknown (ssp. persensibilis), 8) salazinic acid (ssp. sensibilis). On trees. Mostly northern US and Canada, Alaska to Newfoundland, south to northern California in the west. .

U. madeirensis Mot. in C. Tavares

Branching isotomic dichotomous near base. CMA 90-140:70-120:510-650. Thallus bushy to pendant, 2-20 cm long, very rigid; Branches generally divergent, dichotomous, isotomic near the base, anisotomic towards the tips; color grayish yellow to grayish green, turning olive brown in herbarium, \pm extensively blackened and with numerous annular cracks, both near the base and upwards; trunk well developed; primary branches cylindrical, short, ca. 1 mm diam., generally with numerous conspicuous annular cracks; secondary and tertiary branches cylindrical, not constricted at the base, tapering slightly towards tips; tips moderately or little-branched. Papillae generally very distinct, verrucose or sometimes cylindrical-conical, here and there over entire thallus. Fibrils 3-5 mm long, over whole thallus. Soralia present especially near the tips, slightly tuberculate then enlarged and finally wider than the branches, roundish to ellipsoid or irregular, without distinct margins, usually plane to slightly concave, mostly discrete; isidia present at least when young. Medulla dense. Medulla K+ yellow then red. Ch.: salazinic acid, sometimes also with protocetraric acid, constictic acid, unknown substances, or rarely atranorin. On bark. California to Oregon; North Carolina.

U. malmei Mot.

Thallus pendulous with parallel branches up to 75 cm, anisotomic dichotomously branched, rigid; trunk 1-5(-7) mm, annulate, paler than main branch to brownish; branches [(0.7-)0.700-0.9(-0.95)] mm thick, cylindric, tapering very slowly, with numerous transverse cracks (3-7 cracks/0.5 cm), distinctly paler margins (regenerating cortex), and short longitudinal cracks connected to the transverse ones; segments terete and cylindric; apices slender with few ramifications; papillae indistinct to verrucose, irregularly distributed; tubercles absent; fibrils sparse, on main and secondary branches, long, 3-15(-20) mm; pseudocypbellae abundant and conspicuous, somewhat irregularly distributed in patches, irregularly shaped, punctiform, fusiform to elongate; soralia punctiform, slightly tuberculate, plane to convex, \pm circular, without margin, sometimes confluent; arising on cortex or at edge of annular cracks; isidiomorphs on mature soralia sparse; cortex thick [(6.5-)8-13%-18(-18)], vitreous; medulla compact, hardly distinct [(8.5-)9-14.5%-20(-24.5)]; axis thick [(32.5)-35-45%-55(-60)]; apothecia absent; chemistry: usnic acid, unknowns UP1 and UP2; terpenes, \pm stictic acid group. On bark, Mexico.

U. merrillii Mot. (listed by Asahina under U. cribosa)

Medulla K+ red, P+ orange (salazinic acid). Thallus dark olive to rather pure green, turning fuscous olive in herbarium, \pm shiny or polished. Almost no fibrils. CMA 50:80:200. Thallus ca. 15 cm long, pendulous, rather rigid; main branches uniform, flexuous, to 1 mm thick, arching, subdichotomously to subsympodially branched, the branches divergent; abruptly attenuate, terete; surface continuous, \pm smooth. Medulla dense. Surface rather regularly and abundantly papillate; ecorticate tubercles also present. Soredia absent. Apothecia unknown. On

trees. Mostly northeastern US (New England to S. Carolina); New Mexico.

Thallus decumbent to pendulous, with parallel branches up to 50 cm, isotomic dichotomously branched, flexible, hanging loosely on branches and twigs or with several attachment points; trunk indistinct to long (up to 7 mm), sometimes annulate, concolorous with or paler than the branches, sometimes blackish; branches thin [(0.35-)0.45-0.56-0.67(-0.85)] mm, cylindric, all of them almost of same diameter, tapering very slowly, distinctly sinuous, densely segmented and annulately cracked (up to 12 cracks/0.5 cm), with areas of regeneration of cortex in between segments as irregular beads; segments terete and cylindric; apices long, capillary, sinuous, anisotomic dichotomous; papillae absent to scattered, indistinct; tubercles absent; fibrils long (5-12 mm), irregularly distributed; pseudocyphellae irregularly fusiform; soralia arising on cortex or on eroded papillae, punctiform, slightly tuberculate, convex, circular to irregular, rarely confluent; isidiomorphs on soralia, inconspicuous, sparse; cortex thin [(6-)10-13%-16(-21)], mat to slightly shiny; medulla thin [(7.5-)14-18%-22(-28.5)], compact; axis thick [(25-)32-38.5%-45(-53)]; apothecia rare; chemistry: usnic and salazinic acids, \pm unknown yellow C: 5-6. On trees, Mexico.

U. mexicana Vainio

Fertile, with minute apothecia; esorediose. Axis with sordid yellow or dark hyphae in central part. CMA 40-100:60-120:250-650. Thallus to 60 cm long, pendulous, compressed, rather rigid, subglaucous ashy green, appearing subvitreous. Main branches at first unbranched; above rarely subdichotomously branched; axils narrow. Branches uniform, slightly flexuose, ca. 1 mm thick along their length, somewhat attenuated towards tips, smooth, rather rarely and irregular annulate and cracked. Branchlets rather irregularly distributed, 1-3 cm long, thickened at base, often slightly flexuose, elongated and hairlike towards tips, terete, sometimes slightly papillate. Apothecia apparently not frequent, subterminal, on lateral branches, ca. 2 mm diam.; margin smooth, with few or no fibrils; disc dirty whitish pruinose, almost plane. Medulla K-. Southern US (and Mexico).

Thallus pendulous, up to 80 cm, stiff, barely ramified, anisotomic dichotomously ramified with parallel branches, often with multiple attachment points; trunk indistinct to long (2.5-3.0 cm), concolorous with branches, brownish to black; branches [(0.5-)0.6-0.8-1.0(-1.1)] mm thick, cylindric, only narrowing towards apices, distinctly segmented, with eroded edges; segments terete, slightly ridged to weakly alate, smooth to conspicuously cracked and areolated, with eroded cortex in some places, cylindric; papillae indistinct to conic, irregularly distributed on thallus, from scattered to abundant; tubercles low and \pm subhemispheric, scattered to abundant, irregularly distributed; fibrils abundant, long, 5-15(-20) mm, usually in fish-bone pattern; pseudocyphellae long and narrow on thin branches, inconspicuous; soralia arising on eroded tubercles or papillae, usually slightly tuberculate, punctiform; isidiomorphs on cracks and erose parts; cortex thin [(2-)3-6.5%-10(-15)], mat to shiny; medulla [(12-)16-20%-24.5(-26)], thin, compact; axis [(30-)36-48%-59.5(-71.5)] thick, ochraceous brown, fistulose in thickest branches, brittle; apothecia mostly absent or rare, lateral, 3 mm diam.; chemistry: 1. Usnic, diffractaic, \pm salazinic, \pm constictic acids; 2. Usnic, salazinic, \pm protocetraric (accessory) acids; 3. Usnic and protocetraric (main) acids. On bark, Mexico.

U. michauxii I. Tavares

Base of thallus not black (any darkening disappears with growth); "papillae" having predominantly sloping sides. Small red spots [cortex? parasite?] scattered over branches and

ramuli; cortex subnitid; "papillae" on stipes of apothecia elongate, sharply raised, frequently inflated just above base; cortical cell lumina 1-1.5 μ m wide. CMA 50-60:175-250:100-125. Thallus clear bluish gray green, turning yellowish. Medulla white.

U. mirabilis Mot.

Branchlet tips blunt, thick, coralloid, finger-like. Axis with dark hyphae. Thallus to at least 13 cm long; surface shiny. CMA 120:200:560. Thallus pendulous; surface frequently white maculate towards tips. Primary branches ca. 1.5 mm thick, often dichotomously branched above base; secondary branches frequent; branches slightly curved, thinner towards base, thickened to 1.8 mm upwards; extreme tips almost semiglobose, ca. 1 mm thick; branches almost terete, foveolate, appearing continuous but not rarely annulate, rather densely rimose-areolate. Apices sorediate; soralia maculiform, white, slightly raised, farinose, well developed. Medulla K+ intense yellow, I+ indistinctly bluish. Mostly southeastern US (Pennsylvania to Florida); southern California; Mexico

U. monstrosa Vainio

Thallus usually irregularly branched. Medulla K+ yellow or finally reddish, P+ orange (salazinic and protocetraric acids, unknown fatty acid). Thallus ca. 6 cm long, irregularly shrubby or caespitose, glaucescent rather dark green, matt; base rather indistinct, narrowly blackened. Branched almost from the base and densely to the summit; branches ca. 1 mm thick, rather indistinctly attenuate at base, \pm abruptly attenuate towards tips, irregularly flexuous, usually continuous, \pm terete but usually irregularly compressed, foveolate, inflated, smooth, or rarely with short, obtuse tubercles. Fibrils few and very irregularly distributed, short, thin, obtuse, variously curved. Branch tips shortly dichotomously branched and flexuous. Soredia farinose; soralia punctiform or finally subcapitate, K+ red. CMA 60:150:300. Medulla loose, K+ yellow then slowly and rather vaguely red. Apothecia unknown. On trees. [This species may not belong here--the description of the soralia doesn't seem to fit, and the species apparently lacks papillae; check Clerc, 1987 again].

U. mutabilis Stirton

With few if any fibrils. Medulla brick red to whitish rose, K-, P- (fatty acids of the murolic group). Thallus usually densely tufted, to almost subpendulous, to 15 cm long, with several major axes; main branches ca. 1.2 mm thick, usually much branched; lateral branches to 4 cm long; surface dusky green, the smaller branches paler to ashy gray green. Moderately papillate and isidiate-spinulate, the papillae becoming sorediate. Soralia minute, with isidiomorphs. Base pale. Lateral branches not narrowed at attachment points. Papillae absent. Axis reddish; medulla with wine red pigment. Apothecia very rare, to 4 mm broad; disk tan, pruinose; margins with fibrils. CMA 60-100:200:320. On trees, rarely on rocks, lowland areas, \pm Eastern US (Arkansas; Florida; etc.), very frequent; also common in California (at least the Channel Islands). [See Clerc (1994) for more details]

U. nashii P. Clerc & M. Herrera-Campos

THALLUS shrubby, rigid, 2-12 cm long, yellowish green; branching anisotomic-dichotomous; **trunk** short (1-3 mm), variously pigmented but never jet black, sometimes barely developed, often rugose to \pm decorticated; **branches** usually tapering, conspicuous with few ramifications, distinctly segmented (especially the main branches) with conspicuous everted

medulla between segments, lateral branches sometimes slightly narrowed at ramification point; **segments** terete to slightly ridged, cylindric to slightly sausage-like; **apices** thick and short with few ramifications, axils near 90°; **foveoles** absent; **transversal furrows** sometimes present; **papillae** minute, hardly distinct; **tubercles** absent; **fibercles** large (7-10 x 10-20 µm), conspicuous and numerous on whole thallus; **fibrils** of mature length rather rare and only present near basal part, short (1-3 mm), ± slender; short (0.5 m) isidiomorph-like fibrils produced (sometimes in bundles) on top of fibercles; **isidiomorphs** absent; **cortex** ± glossy, distinctly longitudinally and transversely cracked, with conspicuous everted medullary tissues emerging from cracks, moderately thick [(4.5-)5.5-7.5%-8.5(-11)]; **medulla** dense, moderately thick [(22-)26-30%-34(-37)]; **axis** sometimes fistulose, ± thin [(15-)18-24%-30(-41)].

CHEMISTRY: usnic and protocetraric acids.

U. nidulans Mot.

Thallus shrubby or more rarely subpendant; branching mainly anisotomic-dichotomous; base pale to strongly blackened; branches usually sparse to scattered, axils mostly c. 90°; branches segmented by annular cracks, which often have thin, white medullary rings, segments are sometimes slightly swollen, although the ramification points are not constricted; depressions and foveoles only occasionally sparsely present; fibrils inflated, ± spinulose, often fasciculate in bundles of two to four; soralia tuberculate, bearing isidia or fibrils when young; papillae low and verrucous, nearly indistinct to absent; cortex relatively thin (6-12%), distinctly glossy and translucent; medulla lax to dense. Usnic, norstictic, ± salazinic, ± protocetraric (trace) acids, and ± stictic acid group (K+ yellow to red, P+ orange), or usnic, psoromic, and ± 2'-O-demethylpsoromic acids (K-, P+ yellow). On conifers and deciduous trees, in humid, hypermaritime forests at lower elevations. British Columbia, Oregon.

U. occidentalis Mot.

Thallus ca. 8 cm long, matt, almost pure green when fresh, in herbarium often deep brown, tufted, very hard and cartilaginous; primary branches to 2.5 mm thick, secondary ones to 1.5 mm thick; not much attenuated, very blunt; tips almost finger-like; branchlets seldom present, very short, thick. Soredia abundant, farinose. Medulla rather lax. CMA 90-100:250-330:330-450. Medulla P-. Pacific Northwest; also reported from Florida (but not mentioned by Harris, 1990).

U. pachyclada Mot.

Medulla in outer part roseate, the rest white. Thallus about 30 cm long, pendulous, rather sparsely and irregularly branched, subarticulate; main branches somewhat attenuated towards tips, often irregularly subsympodially branched; secondary branches curved, irregularly hanging, rather sparsely branched; surface pale olive green, matt to almost shiny, with large tubercles and pits (foveolate and lacunose); subarticulate, strongly and irregularly cracked; Medulla dense. Primary branches to 3 mm thick, coarse, almost stick-like. Fibrils usually absent. Isidiose soredia occasionally developed from tubercles. CMA 50:400-700:500. Inner medulla and axis white. Eastern US (e.g., Maine).

U. papillata Mot.

Thallus pendulous with parallel branches up to 15 cm, anisotomic dichotomously branched, rigid; trunk indistinct, 1 mm long, paler than main branch; branches 0.7-0.9 mm thick,

cylindric, tapering very slowly, annulated, with numerous transverse cracks with exposed axis; segments terete and cylindric; apices slender with few ramifications; papillae verrucose, numerous, regularly distributed, often whitish at top; tubercles absent; fibrils abundant, 3-15(-20) mm long; pseudocyphellae rare, inconspicuous, fusiform; cortex thick (12%), vitreous; medulla compact, hardly distinct (20%); axis thick (36%); apothecia up to 11 mm diam.; spores 7-9 x 5.5-6.0 um; chemistry: usnic acid, UPI and UPII. On bark, Mexico.

U. pennsylvanica Mot.

Cortex partly green (brownish in herb.), partly dark lurid reddish (commonly red of medulla seen only in sections); axis without dark hyphae. Thallus to 6-8 cm long. CMA 50-150:150-225:250-450. Thallus shrubby and erect, to subpendulous, rigid; base short, rather thick; repeatedly dichotomously branched; branches 1.3-1.5 mm thick, flexuose; surface rather rarely transversely cracked, the thicker branches slightly rimose-areolate; thicker branches verrucose-papillate; papillae long and almost cylindrical, or short and \pm semiglobose, wart-like, concolorous. Fibrils absent or few and poorly developed. Soredia white, farinose becoming isidiate; soralia on upper parts of branches on slightly raised, spinule-like warts. Pale "pseudocephalodia" present. Medulla dense, I+ blue; inner part K+ yellow to red, outer part K-. Eastern US (Connecticut to Florida, west to Iowa)

U. perplectata Mot.

Thallus without fibrils or only some short ones on bases of branches; thallus to 20 cm long, branches about 1.3 mm thick, with large blunt farinose warts (isidiate-sorediate or sorediate); ashen dusky green. Cavity wide, moderately filled with cobwebby hyphae. CMA 90-105:90-120:525-550. Medulla pink, K- (diffractaic acid).

Thallus clear green, smooth; branches often inflated. Medulla K+ yellow then deep red (unknowns). Cavity indistinct, \pm filled with dark hyphae. Medulla pinkish next to cavity. Fibrils few. Thallus 7-20 cm long, abundantly sorediose. CMA 100:180:560. U. subcavata Mot. (= U. perplectata)

U. prostrata Vainio ex Räsänen [included under U. foveata by Dahl & Krog; accepted by Ozenda & Clauzade; = U. barbata according to Esslinger & Egan; misidentifications for North America?]; = U. scabrata s. lato acc. to Halonen et al 1998

Medulla K+ yellow then red. Apothecia rare. Thallus pale olive or deep glaucous green, becoming yellowish brown in herbarium; smooth and shiny, or sometimes wrinkled or with barely perceptible papillae or small tubercles, the latter becoming transformed into isidiate soralia; branches flexuous, ca. 1-1.8 mm thick, remaining the same width along almost their entire length, then strongly attenuate at the tips; branchlets none or very few, threadlike. Medulla lax. CMA 50:300:300. Thallus rather rigid. Apothecia 5-10 mm diam., not terminal; margin with fibrils. West Coast.

U. retifera Mot.

Axis very thick, 3 x medulla. Thallus 4-6 cm long and wide, firm and stiff, strong; sparsely branched; primary branches to 1 mm thick, often dichotomously branched, not exactly terete, irregularly papillated; papillae concolorous, minute, rather long, almost cylindrical; surface, uniformly dusky olive green to subglaucous, matt. Fibrils few or absent, thin. Apothecia frequent, terminal, to 1.5 cm wide, plane; margin densely reticulate on the back, the

ridges often with branched fibrils; discs thinly pruinose. Medulla K+ yellow then rose red. California; southern US.

U. rigida (Ach.) Röhl

Medulla dense. CMA 50-75:120-200:300-450. Thallus very rigid. Apothecia 0.5-1.5 cm across, abundant, on side branches or branchlets, often several on one branchlet. Thallus open sprawling; branches 0.7-1 mm thick. Thallus rather intense and dark pure green, in herbarium turning olive brown; thinner branches paler and often sordid. Thallus ca. 15 cm long, pendulous, rather compressed, relatively little branched, commonly with several distinct main branches. Base slightly attenuate. Branching almost sympodial; branches curved and dependent but distinctly close together. Secondary branches thickened, ca. 1.2 mm diam., regularly fusiform attenuate, terete; surface the whole length regularly papillate; papillae small, short but rather acute, concolorous. Soredia absent. Fibrils rather infrequent and regularly distributed, 0.5-1.5 cm long, perpendicular, often curved, attenuate, smooth or at most slightly papillate. Apothecia frequent, sublateral; margins with numerous fibrils; discs often pruinose. Medulla K-. North Carolina. Reported by Herre; not mentioned by Esslinger & Egan.

U. roseola Vainio

Description below from Stevens 1999:

Thallus shrubby, erect to subpendulous, 6-10(-12) cm long, olive green-gray; branching subdichotomous, irregular; trunk pale, yellowish, transversely furrowed; branches terete, 0.5-1 mm wide; apices forked, tapered; branchlets sparse; fibrils sparse; papillae small; isidia arising from small raised pseudocyphellae, numerous; pseudocyphellae few to absent on primary branches, numerous on secondary branches and branchlets, often mound-like with isidial eruption; soredia present, sometimes erupting from soralia-like structures. Cortex thick, shiny. Medulla very compact, strawberry pink throughout or in patches. Axis ½ width of branch, hyaline.

Medulla K-. Usnic acid, diffractaic acid (major), barbatic acid (trace), and faint traces of other substances, plus secalonin acid and an unknown pigment.

On trees in sheltered, damp habitats. Tropical-subtropical.

U. rubicunda Stirton (incl. U. subpurida Stirt.)

Cortex pure red or rose (sometimes seen only in section), especially close to the basal part of the thallus, not lurid or brownish; sometimes yellowish green but with pure red spots. Branchlet tips ± pointed, thin. Trunk pale. Soralia with numerous isidiomorphs. Thallus to about 15 cm long, shrubby to subpendant, isidiate or isidiate-sorediate. CMA 75-180:120-280:200-500. Axis solid, white, with no dark hyphae. Medulla very dense, white, K+ yellow, P+ yellow (stictic acid aggregate [stictic, ± constictic, ± norstictic], or, in "U. rubescens", salazinic, norstictic, and ± contictic acids; I+ indistinctly blue. Morphologically extremely variable. On bark, rarely on rock. ± eastern U.S. (Minnesota; North Carolina; Tennessee); Mexico (Baja California).

[The following description is from Stevens 1999]:

Thallus shrubby to straggly, erect to subpendulous, 6-15(-30) cm long, mottled green and red to shades of red only; branching subdichotomous to irregular; base black; trunk cracked, pale to red; branches terete, 0.5-1 mm wide; branchlets numerous; fibrils dense, rarely sparse, 3-5 mm

long, with or without pseudocyphellae; papillae, if present, usually on primary and/or secondary branches only, numerous, small; isidia arising directly from cortex or erupting from pseudocyphellae, sparse to dense, short; pseudocyphellae small, flat or punctiform and raised, becoming large with eruption of isidia; soredia absent. Cortex thick, glassy. Medulla dense. Axis 1/2-3/4 width of branch, hyaline.

Apothecia uncommon, terminal on small lateral branches, to 4 mm wide; disc flat; fibrils sparse on rim; lower surface with fibrils, with or without isidia; spores 8-10 x 5-6 μ m.

Medulla K+ yellow, with stictic acid (major) present in the typical variety.

On bark in moist areas.

U. sanctaeritae Clerc & Herrera-Campos

Similar to U. merrillii except: soralia absent; apothecia 1-5 mm diam., lateral to serial; spores 9-12 x 5-7 μ m; cortex [(8-)10-13%-16(-17)]; medulla [(12-)14-17%-20(-22.5)]; axis [(30-)33-39%-46(-53)]; chemistry: usnic and salazinic acids, \pm unknown yellow C: 5-6. On bark, Mexico.

U. scabiosa Mot. = U. scabrata s. lato acc. to Halonen et al. 1998

Medulla K-. Thallus pale glaucous green. Branches under 1 mm diam. Entire length of branches rugose, scabiose. Soredia present but inconspicuous. Fibrils or short isidia numerous; soredia sparse. Medulla K-, P-(no substances). Thallus 10-20(-30) cm long, pendulous; color pale emerald green, to bright or almost glaucous green. Papillae indistinct, numerous, sharp-pointed, fine, on main branches. Soredia forming excrescences on wrinkles; isidia present on soredia near tips of branches. Fibrils absent (according to Motyka), or numerous but short and isidia-like (according to Hale). Infrequently sympodially branched, with acute axils; main branches rugulose-foveolate, uniformly ca. 1 mm thick, flaccid, flexuous; surface continuous, rugose, the wrinkles thin and rather acute; secondary branches becoming almost cracked-sorediate near tips. Medulla rather lax. CMA 40:200:260. Apothecia infrequent, ca. 0.5 mm diam., distinctly lateral, often convoluted; margin with short and long cilia; disc flesh color, with pale pruina. Vermont; British Columbia; southwest US; Mexico.

U. scabrata Mot.

Thallus pendulous, to 55 cm long, with mixed branching pattern and parallel branches; trunk from 1 to 30 mm long, concolorous with branches or black pigmented near attachment point; branches cylindric to irregular; deformed by foveolae, papillae or tubercles; with segments of various lengths, annular cracks conspicuous, exposing axis, or with regenerating cortex; segments terete to striate, irregular and slightly swollen or sausage-like in longitudinal section; apices long, \pm sinuous, often isotomic dichotomously branched at the ends, or running parallel and densely packed; papillae numerous, indistinct to verrucose, often eroded and turning into soralia, sometimes confluent and forming striations; tubercles sparse to abundant, often eroded; fibrils short (0.5-5.0 mm), often appearing as small (0.5 mm) sp[in]ules, few to numerous, irregularly disposed along branch; pseudocyphellae absent; soralia punctiform, irregularly shaped, slightly raised, arising on top of eroded papillae or tubercles; isidiomorphs present on young soralia, not conspicuous; cortex thin [(50)6-9%-13(-19)], mat to slightly shiny; medulla [(21-)25-30.5%-36(-41.5)], thick, loose to dense; axis thin [(12-)20-29.5%-39(049)]; apothecia infrequent, subterminal, 1-12 mm diam.; spores globose to subglobose, or elliptic, 5.5-9 x 4-7 μ m; chemistry: usnic acid and salazinic acid. On trees, Mexico.

Medulla K+ red, or if K- then thallus pale straw green (U. scabrata ssp. nylanderiana) or branches 1-2 mm thick ("U. maxima") Branches numerous, parallel to each other. Main branches with few secondary branches and few or no fibrils. Surface of main branches wrinkled tuberculate or deformed; wrinkles raised; papillae often present (according to McCune & Goward, 1995). Thallus to 30-50 cm long, often very bulky, but narrow; not constricted at base, which reaches 2 mm diam. Isidiate soralia sometimes not very abundant, developed on the nodules (tubercles). Apothecia usually rare, 2-5 mm wide. Surface distinctly wrinkled; papillate or not. Medulla lax. CMA 40:200:200-250. Widespread, boreal and montane, in mesic montane forests, especially stream bottoms, northern Rocky Mountains, and California. 1

1. Branches up to 2 mm thick. Color slightly bluish green. Medulla K-. Thallus up to 40 cm long. Branches few, coarse and strong; papillate and wrinkled in a farinose network; almost no fibrils. Medulla lax. Axis pale, with sordid hyphae interwoven. CMA 100:300:400. California. Reported by Herre; not mentioned by Esslinger & Egan. U. maxima (lumped by Ozenda & Clauzade under U. scabrata s. lato))

1. Branches of medium thickness, 0.5-1(1.8) mm thick. Color pale clear yellowish green or straw green, in herbarium dusky straw color. Medulla K+ red or K-. Branch tips attenuate, thin. 2

2. Medulla K+ yellow then deep red or red-brown; thallus rather compressed. Thallus rather rigid; surface pleated, very abundantly papillate and tuberculate; branches \pm angular in section. Apothecia 3-5 mm, not terminal; margin with fibrils. Northern U.S.? U. scabrata Mot. ssp. scabrata

2. Medulla K- (no substances); thallus less compressed. On Picea and Pinus, or sometimes on Betula or other deciduous trees (e.g., on oaks in California). Western Canada, [southwest to California?]. Not mentioned by Esslinger & Egan. U. scabrata ssp. nylanderiana Mot.

Medulla rather dense, K+ slowly but distinctly red [or K-, with no substances, according to ?--see Culberson's chem. book]. Thallus brownish green, dirty greenish or dark greenish; surface strongly pleated, foveolate-scrobiculate, excavated with depressions and covered with extremely abundant and crowded, sharp-pointed cylindrical papillae and broad obtuse tubercles intergrading with wrinkles. Fibrils few or absent. Thallus 15-30 cm long, flaccid (according to Motyka) or rather rigid (according to Ozenda & Clauzade), darkening or even blackening at base; base not noticeably constricted. Frequently branched, subdichotomously, divergently to subparallelly, slightly flexuous. Main branches under 1 mm diam.; terminal branches rather strongly narrowed. Base indistinct. Apical parts hairlike, frequently branched. Not annulate. Secondary branches becoming almost cracked-sorediate towards tips. Apothecia rather rare, 0.5 cm diam., lateral; margin with few short fibrils. CMA 40:200:200. British Columbia. U. rugulosa Vainio (accepted by Ozenda & Clauzade, but Esslinger & Egan lump it under U. scabrata)

U. scholanderi Llano

Axis thinner than medulla (CMA 30-45:180:150). On rocks, in the Arctic. Thallus

pale straw color to yellowish green in life, becoming yellowish tan in herbarium, short, compact, bushy or tufted, intricately branched, mostly 2-4 cm high. Branches 0.5-1 mm thick, larger ones often pitted. Soralia dot-like then large and globose, to 2 mm. Medulla dense, K-.

U. silesiaca Mot.

Soralia mostly on thicker branches, rare on branchlets. Axis 4x as thick as medulla (CMA 75-90:75-90:330-375). Medulla dense. Thallus to 15 cm long, ashy green. Medulla K+ red. Thallus pendulous, to 15 cm long, rather wide, hard and rigid, firm, rather fragile, ashy green, darker on thicker branches, thinner on paler ones, matt. Base usually distinct, thick, [not?] darkened; from base frequently and repeatedly branched often subsympodially; branches usually divergent, distinctly flexuose, to 1.2(-1.8) mm thick, rather abruptly attenuate near tips, usually continuous, frequently papillate; papillae thin, large but acute, often dark. Fibrils frequent but turning into the thinner branches, poorly developed towards tips, perpendicular, mostly concolorous, to ca. 1 cm long, fragile,. Soralia on thicker branches, rarely on fibrils, slightly elevated, indistinctly delimited, pale yellowish, farinose. Medulla white, K+ red. Cortex rigid and fragile. Apothecia unknown. On bark. Reported by Herre; not mentioned by Esslinger & Egan.

U. silvatica Mot.

Medulla lax, K-. Thallus dark, olive green; surface almost smooth and partly vernicose (appearing varnished), but frequently tuberculate along entire length; tubercles rather uniform, sometimes developing into rugae; papillae absent, or rather frequent on basal part. Soredia absent. Thallus ca. 15 cm long, pendulous, rather frequently branched, rather compressed, nitid or almost matt. Basal part short, rather rigid, thick, with narrow dark zone. Secondary branches numerous, less frequently branched, almost parallel, terete, slightly flexuous, ca. 0.7 mm thick, somewhat attenuated towards tips; surface continuous. Fibrils usually absent. Apothecia not uncommon, ca. 0.5 cm diam., sublateral or becoming terminal; margin almost smooth or slightly uneven, with infrequent obtuse fibrils of variable length. CMA 50:150:220. Reported by Herre

U. strigosa (Ach.)_Eaton

Thallus mostly 5-10 cm long, or sometimes larger; tufted. Tuberculate or moderately papillate. Branches ashy to dusky green, with many stiff erect bristly fibrils. Branches and "cilia" (fibrils?) well developed, resistant to damage. CMA 50:300:450. Base of thallus not black (any darkening disappears with growth); "papillae" having predominantly sloping sides. Medulla deep rose red to white, K- or K+ red, P- or P+ yellow. Ch: Four strains (check Tavares--may partially correspond to different subspecies): 1) usnic alone; 2) norstictic & galbinic acids; 3) psoromic acid; 4) fumarprotocetraric acid. On trees. ± Eastern US.

1. "Papillae" wide, often remaining undeveloped so that ramuli are few; lateral branchlets tend to be long and closely spaced in groups interspersed with unextended "papillae;" younger branchlets subnitid; cortical lumina ca. 1-2(-3) mm wide; CMA 200-225:350:200-300; thallus dark olive in age. U. strigosa ssp. rubiginea (Michaux) I. Tav.

1. "Papillae" medium in width, typically extending more or less regularly into ramuli; thallus cortex tends to be rough (rimose). 2

2. Ramuli typically regularly interspersed with short, lateral branchlets (fibrils); cortical

lumina small (ca. 1-2 μ m wide); CMA 85-100:200-325:175-400; thallus clear gray-green turning yellowish. U. strigosa ssp. major (Michaux) I. Tav.

2. Ramuli less regularly arranged, but not closely grouped; cortical lumina large (ca. 2-5 μ m wide); CMA 75:175:250; thallus persistently gray-green. U. strigosa spp. strigosa

U. stuppea (Räsänen) Mot. = U. substerilis acc. to Halonen et al. 1998

Thallus very pale, almost white (pale green to greenish white or almost straw color).
Medulla lax. Thallus divergently branched, not compressed; not articulate-constricted. On bark. Base short, constricted, narrowly darkened, rather thick and rigid; above base subdichotomously or indistinctly subsympodially branched; primary branches few, to 2 mm diam., terete, inflated, thickest basally, irregular above and abruptly attenuate. Minute papillae very abundant, subcylindrical, acute, concolorous, rarer on thinner branches. Branchlets (fibrils) rather numerous, elongate, thin and almost hairlike, \pm uniform in thickness or attenuate towards tips, often slightly flexuose, ascending, smooth, the thicker ones sparsely branched. Branch tips sparsely branched. Soredia numerous on upper part, soralia first elevated then erose, shortly idisiate, white. CMA 0-60:120-140:220-225. Thallus ca. 8 cm long, rather dilated, caespitose. Surface matt. Medulla white, K- or almost. Apothecia unknown. West coast.

U. subcomosa Vain.

With \pm dense covering of fibrils. Medulla dense, K+ yellow or red. Fibrils short, spinelike. Thallus pale whitish green to dark glaucous green, partly reddish maculate; matt. Thallus ca. 10 cm long, suberect to subpendulous, thick, firm; base ca. 1.3 mm thick, irregularly attenuate along the whole length; above the base densely subdichotomously branched; branches rather short, variously irregularly curved, \pm terete, not rarely partly irregularly but indistinctly deformed; surface continuous and often almost smooth. Isidiate soralia rather frequent, capitate, convex. Medulla I \pm violet or rosy. Southeastern US; Calif. Perhaps belongs closer to U. subfloridana according to Thomson. Not mentioned by Esslinger & Egan.

U. subelegans (Vain.) Mot.

Thallus pendulous or subpendulous, soft, limp, to 10 cm (rarely to 25 cm) long; branches thick, up to 2 mm thick; usually with very many spinules. Color in herbarium brown. Base slightly attenuate, pale. Infrequently subsympodially branched; branches ca. 2 mm diam along whole length, usually articulate and constricted at base, terete; spinules ca. 2 mm long, fragile; surface smooth, but poorly developed spinules resembling papillae. Medulla arachnoid, K+ deep red. CMA 60-90:250-400:250-400. Apothecia frequent, commonly terminal on tips of lateral branches, 5-8(-15) mm diam.; margin smooth or becoming reticulately rugose, smooth and shiny, with spinules or rather rare, short, spinuliform, fibrils; disc plane, pale carneous. Southern US (but not mentioned by Harris, 1990, nor by Esslinger & Egan).

U. subfloridana Stirt.

Soralia slightly tuberculate and raised; isidia often abundant even when mature, but sometimes abraded or absent; base with few annulations and without small, longitudinal cracks. Medulla P-, K-, UV+ (squamic acid) or P+ yellow-orange (instantly), K+ yellow, UV- (thamnolic acid \pm alectorialic acid), or rarely P+ orange, K+ red, UV- (norstictic acid). Pale flesh-colored pseudocephalodia (due to Abrothallus parmeliarum) often present. Thallus usually gray green to pale ashy straw color, 2-8(-20) cm long & wide. Branches attenuate, to 1

mm thick (or 2 mm in one var.); secondary or tertiary branches not clearly constricted or fusiform; terminal branches with mostly isotomic dichotomies, tapered, not twisted, all ending \pm at the same height; tips virgate (long and slender) or comiform (I'm not sure what this means), but not filamentous or contorted; fibrils distributed on the whole thallus, but not dense and spine-like. Surface pale to dark gray-green, papillate but not tuberculate; papillae usually numerous especially towards base, verrucous (wartlike), never cylindrical. Soredia always present, often in a wide belt on upper and inner branches, but often lost or becoming farinose; always farinose in one variety; soralia irregularly rounded. Terminal parts and fibrils smooth with scattered papillae and pseudocyphellae giving rise to \pm tuberculate, irregularly rounded soralia with coarsely granular soredia. Base constricted, jet black at least for 1 mm. Medulla dense. CMA 60-100:120-200:300-380. Usually on trees. Reported to occur over much of N. America except high arctic, but the name is widely misapplied.

U. subfusca Stirton

Apothecia common. On trees. Eastern.

U. subhirta Mot.

Medulla K- or \pm yellow to slightly reddish. Thallus to 5-7 cm long, tufted or bushy, soft; branches constricted and jointed basally, inflated above, to 2 mm thick. Surface in herbarium orangish brown, shiny, on thicker branches intense brown, on thinner branches paler. Base short, distinctly and rather abruptly attenuate; from base almost to summit subsympodially to subdichotomously branched; branches straight to slightly curved; primary and secondary branches similar, ca. 2 mm thick in middle, terete to slightly foveolate, often smooth to very indistinctly tuberculate; tubercles minute and low but rather dense, somewhat farinose. Fibrils absent or few and poorly developed. Soredia commonly present but often replaced by isidia; isidia rather large, long, pale, becoming eroded. Medulla lax to very lax, I+ blue. CMA 70:300:220. Apothecia unknown. California; Mexico.

U. subplicata (Vain.) Mot.

Thallus 18-24 cm long, pale straw or nearly yellow; fibrils almost always simple, almost non-papillate. Medulla K+ yellow then reddish. Soredia leprose but isidioid. Thallus pendulous, rather stiff and rigid. Base thick, \pm unbranched for some distance, or soon dichotomously and repeatedly sparsely branched; branches soon subparallel, almost straight, ca. 1.5 mm thick at base, gradually and regularly attenuated towards tips, terete, commonly distinctly annular cracked; thinner branches continuous. Papillae absent. Fibrils rather rare but regularly distributed, flexuose, simple, attenuated and hairlike towards tips, slightly tuberculate in upper part, the thicker ones indistinctly annulate. Branch tips slender, flexuose, often branched. Soredia rare, on upper parts of fibrils, farinose, apparently not isidiate, white. Cortex very hard, horny in texture. Medulla dense. CMA 50-75:50-75:300-375. \pm Southeastern US. Not mentioned by Esslinger & Egan

U. subscabrata

Branches terete; surface not pleated. Thallus to 50 cm long, compressed, \pm clear pure green, usually without fibrils; branches ca. 1.2 mm thick, continuous (not annulate), terete, infrequently branched; isidioid soralia almost all over; tubercles abundant, distinct, irregularly semiglobose, sorediate; papillae absent or very minute and sparse. Soredia over whole plant,

frequently on tubercles; isidia long, spinule like. Base indistinct. CMA 40:150:250. Cortex unequally thickened. Medulla thin in primary branches, thicker in secondary ones, compact (dense), K+ reddish. Apothecia unknown. Reported by Herre; not mentioned by Esslinger & Egan.

U. subscabrosa Nyl. ex Mot.

Thallus pale green-gray to yellow-gray, not blackened at the base (blackened but not constricted according to Ozenda & Clauzade), smooth and shining, sometimes with inconspicuous annulations, erect to subpendent (4-10 cm) or scrambling (to 25 cm), rigid, rather little branched (almost dichotomously), forming loose, rather irregular tufts; main branches rather stout, hard, to 1 mm diam., richly branched especially towards the ends; lateral branches finer, not constricted at the base. Trunk pale, often with a reddish hue. Shrubby to pendulous. Soralia numerous, very small, punctiform, superficial, smaller than half width of branches, with or without fragile isidia when young. Lateral branches not constricted at point of attachment. Cortex 8-15% of diam., vitreous. Medulla compact. Medulla and axis white. Medulla K-, C-, P+ red-orange. Ch.: protocetraric acid. Apothecia 4-5 mm diam., not terminal; margin with fibrils. On bark, rarely on rock. Eastern U.S. (Florida; North Carolina); Mexico.

Thallus erect to pendulous, up to 22 cm long, anisotomic or isotomic dichotomously ramified with branches divergent or parallel; trunk annulate, 9-11 mm long, red-brown pigmented at base, rarely partially black; branches [(0.4-)0.7-0.9-1.1(-1.3)] mm diam., tapered, segmented; segments terete and cylindric; tubercles present; fibrils absent to numerous, mostly spinulose, short (3-5 mm) or long (5-10(-12)) mm, irregularly distributed; pseudocyphellae ellipsoid or linear, inconspicuous; soralia punctiform to half width of branch bearing them, arising from cortex and/or tops of papillae or tubercles, plane, convex or capitate, rarely slightly concave; circular, irregular, transversely or longitudinally oblong, totally confluent or remaining individual sometimes with numerous isidiomorphs; isidiomorphs absent to abundant, on young and mature soralia, seldom on cortex; apothecia absent; cortex [(9-)11.5-15%-18.5(-24.5)], thick, vitreous, and smooth, occasionally with longitudinal cracks; seldom red-spotted; medulla [(4.5-)7-9.5%-12(-15)] thick, compact, rarely dense; axis [(21.5-)33-40.5%-48(-5)] thick; chemistry: usnic and protocetraric acids, \pm fumarprotocetraric, \pm barbatic acid, \pm unknown fatty acid (C: 5-6). On bark, Mexico.

U. substerilis Mot.

Soralia initially tuberculate but becoming concave. Medulla with barbatic acid (accessory according to McCune and Goward, 1995). Widespread, occasional in northern Rockies, in Pinus ponderosa savanna to boreal forest and perhaps to subalpine forest, both sides of Continental divide.

Description after Halonen et al. 1998

Thallus shrubby or more rarely subpendent; branches normally \pm deformed, swollen, and foveolate; branching mainly anisotomic-dichotomous, but an isotomic pattern is also common; base pale to distinctly blackened; soralia borne mainly on tubercles and low pustules; mature soralia are slightly tuberculate to slightly excavate, but remain superficial and are normally irregular in shape and often bear isidia at least when young; soredia usually \pm granulose; papillae low to cylindric, usually numerous; fibrils often abundant and present even near the apices; cortex is \pm thin, medulla lax to dense and variable in thickness, but usually thick; central axis

also \pm thick. Most common chemotype contains usnic and salazinic acids (K+ yellow or orange, P+ yellow or orange). The chemotype with usnic, salzinic, barbatic and \pm 4-O-demethylbarbatic acids is also common. A few specimens have only usnic acid, or usnic, barbatic and 4-O-demethylbarbatic acids (K-, P-). Most frequent on conifers, especially *Picea* and *Pseudotsuga*, but also common on deciduous trees and shrubs. Probably circumpolar from boreal to southern temperate regions. In open inland forests and steppe margins at lower to upper forested elevations.

U. transitoria Mot.

Thallus pendulous, up to 250 cm long, rigid, poorly to moderately branched, with anisotomic, dichotomous and parallel branches; often with many points of attachment; trunk indistinct, sometimes up to 10 mm long, brownish, concolorous with or paler than branches, annulate; branches [(0.4-)0.5-0.7-0.9(-1.5) mm thick, cylindric, tapering only close to apices, with small to extensive areas where cortex is erose; segments weakly to strongly ridged, cylindrical to slightly trapezoidal; apices thin, with few ramifications; papillae absent; tubercles conspicuous, abundant, largely cylindric to truncate-conic, paler on top, often eroded, irregularly distributed on main and secondary branches; fibrils short (0.5-2.0) mm and long (3-10 mm), mostly spinulose, in fish-bone arrangement; pseudocyphellae linear, inconspicuous; soralia arising on cortex or tubercles and/or ridges; punctiform, circular to irregularly shaped, often becoming confluent and thus looking like large convex to capitate soralia, without definite margin; isidiomorphs on both young and mature soralia, conspicuous; cortex [(2.5-)4-8%-12(-20)], thick, shiny; medulla [(2.5-)6-11%-16(-29.5)], thin, compact; axis thick [(27.5-)49-62%-75(-88)], often fistulose at base of main branches; apothecia to 6 mm diam.; spores 6-8 x 10-12 μ m; chemistry: 1, usnic and salazinic acids; 2, usnic and caperatic acids. On bark, Mexico.

U. trichinella Mot.

Thallus about 15 cm long, pendulous, hair-like, greenish straw-colored, very smooth. Apothecia only 2-4 mm. CMA 60:170:100. Surface smooth. Base short, indistinct, with narrow dark zone. Primary branches ca. 0.5-0.7 mm diam., often slightly obuse annulate and foveolate, usually short, soon repeatedly dichotomously branched; secondary branches terete, ca 0.4-0.5 mm diam., somewhat attenuate towards tips, rarely articulate. Soredia absent or few and poorly developed, farinose, developing from tubercles, on subapical parts of branches. Fibrils usually absent. Medulla K \pm brown, I-. Apothecia not rare, lateral then terminal, 2-4 mm diam., plane; margin with few, short fibrils. Southeastern US (but not mentioned by Harris, 1990); Mexico. Not mentioned by Esslinger & Egan

U. trichodea Ach.

Thallus threadlike, branches not over 0.7 mm thick, mostly 0.3-0.5 mm; without papillae or fibrils. Branches strongly annulate, always broken into rings. Medulla K- or K+ yellow (or reddish next to axis), P+ orange or P-. Ch: salazinic acid or unknowns; or (according to Harris, 1990) diffractaic acid and/or constictic acid. Thallus very long, pendent; very smooth, soft, clear green; fibrils none. Branches not constricted basally. Apothecia common. Soredia and isidia absent. Axis sometimes with dark yellow hyphae interspersed, appearing brownish. CMA 30-50:120-200:180-300. On trees. Eastern US.; British Columbia

U. tristis Mot.

Thallus deep sea green (blue-gray green), remaining dark in age; primary branches ± dusky or nearly black, 1.3-2 mm thick. Thallus very stiff and strong. Axis irregular, medulla lax. "Papillae" small to large and deformed, usually distinctly elevated before white shows through the cortex; thin cortex tends to sink between "papillae" into depressions having ridged margins (rugae); ramuli and cilia inflated, short, sparse, often deformed. Cortical lumina 1-2.5(-3.5) µm, mostly sinuous or rounded in outline; cortex with well-developed zone of radiating lumina. CMA 75-100:300-370:375-380. Base of thallus not black (any darkening disappears with growth); "papillae" having predominantly sloping sides. Medulla white or red, K+ yellow then red (norstictic acid).

U. vainoi Mot.

Soralia almost globose, farinose, without isidia, conspicuous, often 1-1.5 mm diameter (possibly abnormal in origin according to Harris, 1990). Thallus to 17 cm long and 10 cm wide, with many branches and branchlets. CMA 100:100:800-1000. Cortex, medulla, and axis very hard. Cavity with lax sordid yellow hyphae. Medulla K- or + slightly reddish (ch.: diffractaic acid). Thallus olivaceous ashy green, often appearing pruinose. Base short, ca. 2 mm diam. Primary branches ca. 2 mm thick, attenuated above, becoming hairlike towards tips, straight or slightly flexuous, terete, almost smooth or indistinctly subverruculose, subpapillate or uneven; verruclues obtuse, pale at tips. Fibrils not rare on basal parts of branches, ca. 0.5-1 cm long, divergent, flexuose, cuneiform thickened at base, attenuated towards tips, verruculose, absent from upper parts. Branch tips rather elongated, thick but hairlike, branched, subtuberculate. Soredia very noticeable, not rare, often on thicker branches, farinose, in semiglobose soralia, yellowish white. Medulla, brown or almost reddish, surrounding cavity. Apothecia unknown. S. Carolina to Florida.

U. vitrea P. Clerc & M. A. Herrera-Campos

Thallus erect to pendulous, to 30 cm long, anisotomically or isotomically dichotomous ramified with divergent or parallel branches; trunk annulate, 9-11 mm long, red-brown pigmented at base, seldom black; branches [(0.6-)0.6-0.9-1.2(-1.6) mm diam., tapered, segmented; segments terete and cylindric; apices fine, short or long, divergent; papillae absent to abundant, verrucose or cylindric; tubercles present; fibrils absent to numerous, mostly spinulose, short (3-5 mm), also long (5-10(-12)) mm, irregularly distributed; pseudocyphellae ellipsoid or linear, inconspicuous; apothecia subterminal, 2-7 mm diam.; spores 8-12 x 5-8 µm, colorless, elliptic; cortex thick [(9.5-)13-18%-24(-27)], vitreous, occasionally with longitudinal cracks, sometimes with red spots; medulla thin [(11-)12.0-14%-15.5(-16.0)], compact, rarely dense; axis thick [(24.5)26-33.5%-45(-50)]; chemistry: usnic and protocetraric acids, ± fumarprotocetraric, ± hypoprotocetraric, ± barbatic acids, ± unknown fatty acid C: 5-6. On bark, Mexico.

U. wasmuthii Räsänen = misidentification (of U. lapponica) for North America

Soralia slightly excavate, ulcer-like, longitudinally stretched (at least when mature), isidiate only when young; basal blackened part of thallus with faint, transverse and longitudinal cracking (x50) forming a fine rimose areolation. Soralia P-, becoming yellowish after one minute (salazinic acid diffusing from inner medulla); medulla K+ yellow-orange or red (salazinic and barbatic acids). On deciduous trees.

U. wirthii Clerc

Axis and inner medulla yellow. Papillae numerous on the main branches. Thallus 1-4(-6) cm long, soft, pliant, \pm erect, shrubby; base pale; color pale green, turning yellowish brown to dark brown in herbarium; branching \pm dichotomous; branches tapered or often somewhat constricted at the base and then slightly fusiform, distinctly segmented by annular, white-bordered cracks and showing conspicuous gaps between the segments especially at the branching points; fibrils sparse; pseudocyphellae numerous on eroded papillae, later becoming sorediate; soralia numerous, especially in the upper part, slightly excavate; isidia absent or rare. Trunk pale. Cortex red-spotted. CMA 40-90:130-250:300-330. Medulla \pm dense to lax. Cortex fragile. Apothecia unknown. Medulla and axis K+ yellow-orange, C+ yellow-orange, KC++ orange, CK-, P+ slightly yellowish (psoromic acid, \pm unknown fatty acid and two unknowns) or norstictic acid. On bark, in chaparral and woodlands, rarely on rock. California to British Columbia; common west of Cascades.

U. xanthopoga Nyl.

[Description below is from Stevens 1999]:

Thallus shrubby, erect, rarely straggly, to 8 cm long, pale green to yellowish green; branching \pm dichotomous; trunk with annular cracks, usually black; branches terete, to 1.5 mm wide, \pm slightly inflated, rarely faveolate, articulate, with or without cracks bordered by white rings; primary and secondary branches usually much thicker than tertiary branches; apices tapered or blunt; short branchlets often arise from primary and secondary branches; fibrils sparse or absent; papillae, when present, dense on primary and secondary branches; isidia in pseudocyphellae only, dense, small; pseudocyphellae sparse or absent on primary and secondary branches, common on terminal branches, not in bands, punctiform, round, flat or concave, not raised, usually large on branchlets; soredia absent. Cortex thick, shiny to matt, sometimes waxy. Medulla dense. Axis 1/4-1/2 width of branch, hyaline.

Apothecia not seen.

Medulla K-. Usnic acid and various medullary substances: 1) fumarprotocetraric acid (major), protocetraric acid (minor), \pm lobaric acid (minor), traces of other substances; 2) protocetraric acid; 3) usnic acid only.

On bark, in moist areas.

U. sp.

Soralia rather long, thin, isidiose, not forming large capitate soralia. Thallus 7-15 cm long, with relatively thin branches and branchlets. Medulla very dense. CMA 40:60:900. (This taxon is treated by Swinscow & Krog as a synonym of U. baileyi, but it differs in having a dense, pale medulla, and a different outer color).

II. Usnea Subgenus Neuropogon

Axis solid;

Thallus conspicuously variegated and banded with black; On rock

After Imshaug (1957) and Thomson (1984)

Rev. 12/93

Thallus attached by a holdfast, branching with or without lateral fibrils; branches terete to anular, smooth or minutely scabrid, verruculose, plicate or foveolate, yellow with more or less variegation with black banding; cortex with yellowish granules and pachydermatous hyphae; medulla lax (in arctic species); central axis 1/5 to 1/3 of the diameter of the branches (in northern hemisphere species), hard and horny in texture; sorediate in northern hemisphere species, the soredia yellow to blackish, borne in rounded soralia on the branches. Apothecia lacking in northern hemisphere species. On rock.

Thallus to 2-3(-4) cm tall, erect to subdecumbent, narrowly attached to the substrate by basal holdfast, rather sparsely branched, caespitose. Basal branches 0.7-0.85 mm thick at widest part but tapering to 0.3-0.4 mm in diam. at point of attachment. Main branches terete, 0.5-1.3 mm diam., sulphur yellow but occasionally blackening above, smooth or scabrid, matt or subnitid, not foveolate nor verrucose, rarely faintly scrobiculate, often fracturing to expose the central strand; upper parts somewhat soft; ultimate branches terete, 0.1-0.25 mm diam., tapering to a point, smooth, nitid, black-banded; tips almost entirely black. Soralia 0.2-0.5 mm across, abundant on ultimate branches, punctiform; soredia yellowish, occasionally blackening, mealy granulose. Medulla white, usually lax; axis white, well defined, usually rather thin, 1/4-1/3(-1/2) the diameter of the branch. Apothecia and pycnidia absent. Thallus (in N. American material) K-, P-. On rhyolite rocks, arctic, coastal to high elevations, Greenland and northern Canada; alpine, Washington state. U. sphacelata

Usnea: Additional Species from North America

U. caespitosa Mot.

Apical and subapical parts and their soralia all black dotted. Thallus densely tufted, to 3-4 cm tall, firm, pale yellowish olive, above the base yellowish brown and sordid; subapical part smooth, subnitid; branches common from the base, almost parallel, frequently sympodially and subdichotomously branched; secondary branches obliquely ascending and almost parallel, often unbranched; all branches rather abruptly attenuate at base, ca. 1.3 mm thick in center, towards tips subulate, straight or slightly curved. Base often articulate and constricted; branches terete, not rarely foveolate, compressed and variously uneven; thicker branches subtly verruculose-papillate; papillae minute, acute, semiglobose, concolorous. Fibrils absent or few and poorly developed. Branch tips subulate, often dichotomously few-branched, densely sorediate. Soredia frequent on upper parts of branches, farinose. Medulla very lax, K+ yellow, later red. CMA 50-60:225-300:200. Apothecia unknown. On rock. Southwestern US. Not mentioned by Esslinger & Egan, nor by Clerc & Herrera-Campos.

[U. aculeata Mot. nom. nud.]

[U. affinis Mot. nom. nud.]

Mexico [not reported for U.S. and Canada?--check Herre] U. concinna Stirton

U. distincta = U. glabrescens according to Egan

U. flagellata = U. filipendula according to Egan

U. rugulosa = U. scabrata according to Egan

U. variegata

3 additional unnamed species from Florida reported by Harris (1990)

Excluded from North America

U. intermedia (Massal.) Jatta

Papillae rather variable, for the most part pointed, very unevenly distributed, \pm absent from certain parts, sometimes the surface almost bare, with only rare obtuse papillae. Fibrils especially abundant on parts of branches with few papillae. Thalline margin of apothecia without fibrils, Thalline margin of apothecia with or without papillae. Color of thallus bright green. Branches thick, \pm flexuous. Medulla K+ and especially KC+ yellow then red-brown. Misidentifications for North America.

U. montana Mot.

Thallus to 15-30 cm long. Primary branches ashy sea green (dirty subglaucous gray-green), darkening, abundantly papillate, to 2 mm thick. Papillae elongate, cylindrical, concolorous or sordid. Medulla K-. CMA 70-100:270-350:350-390. Thallus pendulous, thick and firm, dilated; base often attenuate, simple for some length, above frequently subsympodially branched; branches divergent, flexuose, ca. 1.5 mm thick, somewhat attenuate below, thicker towards tips, often articulate, constricted at the cracks, terete or slightly deformed, along whole length rather frequently papillate. Fibrils rather rare, \pm regularly distributed, rather long and firm, tuberculate. Branch tips rather thin, sparsely papillate. Soredia absent. Apothecia frequent, lateral, soon terminal, to 1(-1.5) cm diam.; margin almost smooth or sparsely papillate, with rather numerous short to long obtuse fibrils; disc often deformed, sordid flesh color, glaucous pruinose. Medulla las to sublas. On conifer bark. California. Misidentifications for North America.

U. perplexans Stirt. (sometimes spelled "perplectans")

Axis slightly orange. Medulla K+ yellow then red, P+ yellow (salazinic acid). Thallus \pm erect, 5-8(-10) cm tall, greenish gray to pale yellowish brown; base black. Branching sympodial; main branches to 2 mm diam., tapering; laterals dense, flexuose, simple to branched, giving a dense bushy appearance to thallus. Cortex annularly and irregularly cracked at intervals; surface sparsely and very minutely papillate; papillae prominent in older branches. Young part of branches sorediate; soralia minute, round to elongate, excavate with granular soredia. Pseudocyphellae and isidia absent. On trees. An Asian taxon, not present in North America.