

### IIIG. Usnea Subg. Usnea Sect. Barbatae

Rev. 1/94

Thallus often much branched and fibrillose, short and tufted or rather elongated and pendulous but usually not hairlike, at most indistinctly articulated; pseudocyphellae absent; branches markedly cylindrical, or if not then stiff; thallus usually  $\pm$  intense or pale to dark greenish, at most finally brownish in herbarium, and then surface  $\pm$  papillate; cortex often thin, or if thicker than densely and acutely papillate; cortex not scaly and falling off; color when fresh not reddish. Base rather distinct, rigid, and very often darkened. Surface usually papillate, tuberculate, or rugulose. Medulla white, often thick, lax to sublax, or if dense then often thin, and lax in the thinner branches. Axis relatively thin, I. Apothecia, if present, often with ciliate margins.

Except perhaps for a tendency for the thallus to have a "beardlike" (barbate) appearance due to the rich branching, this section is characterized mostly by the lack of any particularly distinctive features. Most of the more common species of Usnea subg. Usnea in N. America are in this section, and it is by far the most difficult section. If a specimen does not clearly key out under any of the earlier ones, try it here, and lots of luck. Many species from the earlier sections need to be crossreferenced in the keys below.

**IIIG1 Subg. Usnea Sect. Barbatae Subsect. Floridae**

**Apothecia always present and abundant; without soredia or isidia. Thallus short to moderately elongate, usually less than 10 cm long (sometimes to 15 cm) and 5 cm wide, mostly erect or stiff, always divergently branched, bushy. Branches usually papillate but sometimes smooth.**

The distinction between this group and the U. strigosa group (in sect. Ceratinae) seems to be dubious, the main distinction being that the strigosa group has a red to pink medulla or axis

Rev. Nov. 1993

**IIIG1a. Floridae:**

**Thallus rather elongate, ± pendulous.**

**1. Medulla dense or in part somewhat lax.** Thallus 1015 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 80130:200:500. .... U. concinna  
Stirt

**1. Medulla lax. .... 2**

**2. Thallus to 1530 cm long. Primary branches ashy sea green (dirty subglaucous graygreen), darkening, abundantly papillate, to 2 mm thick. Papillae elongate, cylindrical, concolorous or sordid. Medulla K. CMA 70100:270350:350390. 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, ± 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 sublax. On conifer bark. California. .... U. montana**

**2. Thallus 316 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, 13 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 6075:200225:300375. On trees. Southwestern (Arizona, New Mexico, California; Mexico). ..... **U. arizonica**

**IIIG1b. Floridae:**

**Thallus bushy, short, broad, at least as wide as long.**

**1. Medulla K+ red. .... 2**

**1. Medulla K (or almost). Thallus 58 cm long and wide. .... 5**

**2. Medulla lax, K reaction sometimes delayed or lacking.** Thallus 510 cm long. Branchlets often crowded, bristly. Thallus pale ashy green; primary branches often blackening. CMA 6075:200225:300375. .... (see U. arizonica, above)

**2. Medulla dense, K reaction immediate. .... 3**

**3. Axis very thick, 3 x medulla.** Thallus 46 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 subglaucescent, 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. retifera

**3. Axis and medulla equal or nearly so.** Without papillae. .... 4

**4. Thallus about 2.56 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, 13 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  $\mu$ 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. evansii

**4. 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 50100:250:250. Texas. .... U. erinacea

**5. Thallus mostly rather pale ashy green; very old herbarium specimens tan.** Thallus bushy to subpendent, generally rigid, remaining erect when moist, (2)48(15) cm long; primary branches 11.3 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 35 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 50100:150:450. Apothecia usually common, terminal or subterminal, 1.58(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. .... U. florida

**5. Thallus deep sea green (bluegray green), remaining dark in age;** primary branches ± dusky or nearly black, 1.32 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 12.5(3.5) µm, mostly sinuous or rounded in outline; cortex with welldeveloped zone of radiating lumina. CMA 75100:300370:375380. 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. tristis

ADD?:

Branches divergent, sprawling & becoming elongate, and apothecia very numerous, small to minute, on branchlets as well as on branches and on marginal fibrils of apothecia. .... U.

florida ssp. floridula Mot." (L. rigida group).

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. 1.54 um, mostly sinuous or rounded in outline. CMA 50100:200325:125200. Thallus bluegray 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. endochrysea Stirt.** (U. florida group or U. strigosa group)

**IIIG2. Subg. Usnea Sect. Barbatae Subsect. Comosae**

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Thallus sorediose, soredia isidiose or farinose; apothecia usually extremely rare. Thallus short to moderately elongate, often as wide or wider than long, with numerous branches and branchlets. Thicker branches plainly papillate; gray or ashy green. Medulla dense or lax.

This group is the sorediateisidiate, usually sterile, counterpart of Subsect. Floridae. Longer,  $\pm$  pendulous forms may be difficult to distinguish from young thalli of species in subsect. Dasypogae or other groups. Although some of the species have been well studied recently, others are still poorly known or poorly understood; this is generally a very difficult group (aren't they all, in this genus?!).

**1. Soredia always isidiose; soredia may become worn and appear farinose, especially in herbarium specimens.** Thallus compressed and divergently branched. .... IIIG2a. U. subfloridana/U. fragile complex.

**1. Soredia always farinose, without isidia, even when young.**  
..... 2

**2. Thallus short, 36(10) cm high and wide, less than twice as long as wide.** Mostly divergently branched. .... IIIG2b. U. lapponica/U. glabrescens complex.

**2. Thallus elongate, at least twice as long as wide, pendulous.**  
..... IIIG2c. U. silesiaca complex

IIIG2a. U. subfloridana/U. fragilescens Complex

Thallus ± short and tufted; Soredia isidiate, at least when young

1. Axis or medulla distinctly pigmented. .... 2

1. Axis and medulla white. .... 3

2. Axis or medulla pale yellow. Branching rather distinctly dichotomous. .... (see Sect. Glabratae: U. wirthii)

2. Axis or medulla pink or red. .... (see Sect. Ceratinae: U. mutabilis group)

3. Thallus soft and limp; branches ± foveolatescrobiculate or deformed, not terete; true papillae absent; base usually not distinctly blackened; isidia and fibrils often very dense, giving a shaggy appearance to the thallus. .... (see Sect. Foveatae: U. hirta; if isidia short and soralia ± distinct or becoming confluent, almost farinose, giving thallus surface a leprose appearance, also see U. variolosa in that section)

3. Thallus ± hard and rigid at least at the base, sometimes soft and limp in upper parts, but branches ± terete, not foveolate or scrobiculate, base often distinctly blackened papillae usually present and often numerous, and isidia and fibrils usually not very dense and shaggy. [Note: the choices below need to be strengthened by putting more parallel characters into **bold** and putting more shared features together, but I'm tired of working on this]. .... 4

4. Axis 500 um or more thick, much thicker (ca 5x) than cortex or medulla. .... 5

4. Axis thinner, equal to medulla or at most 23x thicker.

Thallus ± regularly branched, at least in basal part, fruticulose to subpendulous. Isidia [usually?] short and grouped on soralia. Medulla K+ or K. On trees, or if on rock (U. fragilescens v. fragilescens) then branches distinctly articulated and constricted. .... 6

5. Branching isotomic dichotomous near base. CMA

90140:70120:510650. Thallus bushy to pendant, 220 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, ± 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 35 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. [This species may belong under the U. diplotypus agg.; in other words this couplet may not be a good one] ..... U. madeirensis Mot. in C. Tavares

**5. 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, verrucose or cylindrical. Alecatorialic or barbatic acids also sometimes present; several reports, including ones on "U. herrei", state that norstictic acid is present (with or without salazinic or other acids). CMA 100:170:500. On rocks or trees. Northern US. U. diplotypus agg. .... 6

**6. With barbatic acid.** ..... U. substerilis (included under U. laricina by Ozenda & Clauzade)

**6. Without barbatic acid.** ..... U. diplotypus s. str.

**7. Medulla thicker than or + equal to axis.** ..... 8

**7. Medulla thinner than axis.** U. subfloridana  
agg. .... 10

**8. Thallus nearly white to pale olive or clear green.** Thallus 35(10) cm long, mostly subpendulous to ± erect, flaccid. Branching often distinctly sympodial. Main branches 1.52(3) mm diam., originating over the whole of the length with relatively few, thinner, side branches which often arise at ± 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 ± shiny, often ± 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 (24/0.5 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 ± norstictic, ± cryptostictic, ± constictic acids). CMA 6075: 195375:200350. Usually on trees. West coast. U. fragilescens. . . . . 9

**8. Thallus blackish green to olive or dusky, in herbarium turning brown.** CMA 5085:200396:150250. 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; isida long and thin, in soralia, eroding. Medulla lax, white, K+ yellow then red. Apothecia unknown.. . . . U. dalmatica Mot.

**9. 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 var. fragilescens**

**9. 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, subtilly papillate. Thallus intense green; soredia and medulla K. . . . . U. fragilescens var. mollis**

**10. Thallus intense green, clouded sea green or dusky green.**

**Medulla rather dense.** Thallus regularly branched; branches paler, not inflated, to 1.5 mm thick, gradually tapering, deformed by tubercles or large, cylindrical "papillae". Base blackened. Soredia may become large, in semiglobose or capitate farinose soralia. Cortex soft, thin. Medulla K (according to Motyka) or K + red, P+ orange (salazinic acid). CMA 4060:150165:300345. On rocks and trees. Eastern US and Pacific NW. ....

U. subfusca v. subfusca

**10. Thallus pale green to ashy or straw green. .... 11**

**11. Thallus very pale, almost white (pale green to greenish white or almost straw color). Medulla lax.**

Thallus divergently branched, not compressed; not articulateconstricted. 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, ± 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 060:120140:220225. Thallus ca. 8 cm long, rather dilated, caespitose. Surface matt. Medulla white, K or almost. Apothecia unknown. West coast. [If medulla K+ yellow to red, see U. subfloridana ssp.

gorgonensis] ..... U. stuppea

**11. Thallus deeper or darker in color, ashy or straw green.** Pale fleshcolored pseudocephalodia (due to Abrothallus parmeliarum) often present. Thallus usually gray green to pale ashy straw color, 28(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 ± 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 spinelike. Surface pale to dark graygreen, 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 slightly tuberculate and raised, irregularly rounded; isidia often

abundant even when mature, but sometimes abraded. Terminal parts and fibrils smooth with scattered papillae and pseudocyphellae giving rise to ± tuberculate, irregularly rounded soralia with coarsely granular sores. Base constricted, jet black at least for 1 mm with few annulations and without small, longitudinal cracks. Medulla dense. CMA 60100:120200:300380. Usually on trees. Over much of N. America except high arctic. .... U. subfloridana ± **sensu stricto** (see key to variants below)

ADD:

**Thallus clouded sea green or dusky. CMA 4060:150165:300345.**  
..... U. subfusca v. halei Herre ined.

Key to variants of "U. comosa" (= U. subfloridana)

After Motyka;

Very Preliminary

1. Soredia and outer medulla K+ orange to red (norstictic or salazinic acids; according to Dey occasional thalli can have both). ..... 2
1. Soredia and medulla K or yellowish. .... 8
2. Chemistry known; I don't have info. on the morphology at present. .... 3
2. Chemistry unknown. .... 4
3. Medulla with norstictic acid. .... ssp. praertervisa (Asah.) ined.)
3. Medulla with salazinic acid. .... var. melanopoda (Asah.) Hawksw.
4. Thallus yellowish ochrewhite. (if medulla K, see U. stuppea). .... ssp. gorganensis
4. Thallus pure, + intense green. .... 5
5. Thallus coarsely papillate, rather tuberculate, rigid, glaucous green. .... ssp. glaucina
5. Thallus comparatively finely papillate; caespitose. .... 6
6. Thallus strongly and frequently branched, appearing "heaped". .... var. cumulata
6. Not as above. .... 7
7. Thallus rather short; upper part rather smooth. Thallus pure, intense green, unchanged in herbarium. Medulla lax or nearly so. Rather frequently branched and almost caespitose. Fibrils sparse. Thallus 37(10) cm long, rather rigid, black at base. Soredia rather broadly distributed on upper part of branches, on rather distinct tubercles, green. CMA 70:150:300. Soredia K+ yellow then red. Apothecia very rare, rather large, often deformed; margin with rather frequent long, often sorediose cilia. .... U. subfloridana ssp. similis Mot.
7. Thallus large, subpendulous, relatively coarsely papillate. .... var. scabriuscula
8. Chemistry known; I don't have info. on morphology at present. .... 9

8. Chemistry unknown. .... 11
9. Medulla K+ yellow, P+ yellow to orange, with thamnolic acid (+  
hypothamnolic acid and sometimes squamatic acid). Thallus pale  
ashy or pale green, 510 cm long and wide. .... ssp.  
subfloridana Asah.
9. Medulla K, P+ or P. .... 10
10. Medulla K, P+ red, UV (protocetraric  
acid). .... unnamed taxon
10. Medulla K, P, UV+ white (squamatic acid). Rare in Europe,  
common in N. America). .... (unnamed subspecies)
11. Thallus dark green or sordid olive green; rarely over 5 cm  
long. .... U. subfloridana ssp. sordidula Mot.
11. Thallus pale ashy or pale greenish. .... spp. "eucomosa"

**IIIG2b. U. lapponica/U. glabrescens Complex**

**Thallus + short and tufted; isidia absent even when young.**

(Also see U. glabrata)

Note: the descriptions of U. glabrescens and U. lapponica given below are combinations of the descriptions of several "species" synonymized under them by Egan, and keyed out quite differently by Herre; they need to be reworked somewhat. There seems to be a lot of confusion in the literature over several of the names in this group, and this is still a preliminary attempt to sort it out.

**1. Axis thinner than medulla (CMA 3045:180:150). 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 24 cm high. Branches 0.51 mm thick, larger ones often pitted. Soralia dotlike then large and globose, to 2 mm. Medulla dense, K. .... U. scholanderi

**1. Axis usually as thick as or thicker than medulla (CMA 50110:130300:240380). Usually on trees, borealtemperate areas, Northern and western.** Soralia minute and sharply limited or becoming large & globose. .... 2

**2. Axis slightly orange. Medulla K+ yellow then red, P+ yellow (salazinic acid).** Thallus ± erect, 58(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 bsent. On trees. .... U. perplexans Stirt. (sometimes spelled "perplectans")

**2. Axis white. Medulla K+ or K, P+ or P. .... 3**

**3. 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 dotlike convex or globular soralia on upper part of thallus; soralia at first punctiform and borne on tubercles, not becoming excavate until very tardily. Medulla ± lax, K. CMA 80:120:280. Western US. .... U. laricina (>? U. lapponica)

**3. Branches not noticeably flexuous.** Branch tips short, often

indistinct. Secondary or tertiary branches not clearly  
constricted or  
fusiform. .... 4

**4. Soralia excavate when mature, ± broadly eroded, often becoming confluent and then revealing the central axis of the small branches. Fibrils usually present on the apices.** Thallus 310 cm long, densely branched, erect or ± prostrate. Thallus ± ashy straw color or straw green becoming dusky straw in herbarium, or ± dark green; Canadian specimens may be much paler, even whitish to straw colored. Primary branches divergent or appressed and ascending, 11.8 mm thick, often sigmoid curved; with minute papillae; branchlets many, conspicuous. Branch tips short. Medulla lax. Axis slightly misshapen. CMA 5080:130300:180400. Western and Northern. U. lapponica s. lato (also incl. U. brouardii Mot ined.; also see U. kujalae) ..... 5

**4. 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.** ..... 7

**5. Thallus ± regularly branched, mostly isotomicdichotomous,** 210 cm tall, erect, rarely subpendulous. Main branches to 1.5 mm diam. Laterals (fibrils) numerous, distributed over entire thallus, of ± equal length, giving the main branches the appearance of a fishbone. Papillae usually numerous. Branches cylindrical, not constricted or swollen. Terminal branches often twisted and contorted. Surface graygreen or yellowgray. Soralia conspicuous, irregular, often crowded and coalescing, deeply excavate, reaching central axis, mostly bursting from low pustules (tuberclelike structures but much wider than high) and a tearing off of the adjacent cortex, broader than branch's diameter and irregular in shape. Base jet black, with few inconspicuous annulations. Medulla K+ yellowred, P+ yelloworange. On trees. .... 6

**5. 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, ± abruptly attenuate towards tips, irregularly flexuose, usually continuous, ± 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 flexuose. Soredia farinose; soralia punctiform or finally subcapitate, K+ red. CMA 60:150:300 um. Medulla loose, K+ yellow then slowly and rather vaguely red. Apothecia unknown. On trees. .... U. monstrosa

**6. Stictic (major), norstictic, and + diffractaic acids. .... U. fulvovireagens (Rsnen) Rsnen**

**6. Salazinic acid, or usnic acid only. .... U. lapponica s. str.**

**7. Medulla lax to rather lax. Thallus short (to ca. 45 cm tall, but often less); branches smooth, thick to tips (not attenuate).**

Medulla usually K, P, KC (?possible type cited by Clerc, 1987 contains norstictic 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, cushionforming, compactly caespitose, intricately branched, with long, slender ascending branches; branches ± 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"

**7. Medulla dense. Thallus 610 cm tall and wide; branch tips + slender and elongate, or thick. Medulla K+ or K. Soralia deeply eroded, often small and sharply defined. U. glabrescens + s. str. .... 8**

**8. Main branches to 2 mm thick; lobe tips thick; color straw green or pale yellow (dark graygreen according to Tallis), unchanged in herbarium; young branches smooth; primary branches densely papillate; papillae rather coarse, short, almost tuberclelike, 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 610 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 "atenniform" (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)

**8. Main branches 11.5 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 310(15) cm tall, subpendulous, often ± bushy below with several pendulous, littlebranched, flexuose, extended main branches. Axis rather deformed. CMA 100110:150200:320380. Northern US. .... 9

**9. Medulla thin, K+ yellow/red. Ch.: norstictic acid, plus stictic or salazinic acids. Soralia not excavate.** .... U. glabrescens [ssp. glabrescens]

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

ADD:

Thallus short, 35 cm tall, erect, fruticulose, milky strawcolor to whitish green. Apothecia rare, terminal, 23 mm wide, whitish strawcolor, fibrillose, plane. Soredia sparsely present, non isidiate. Main branches smooth, without "nerves" and verruculae. Medulla lax, K. On bark. British Columbia. Similar to "U. sorediifera" [(Arnold) Lynge = U. glabrata, but sens. Mot. = U. lapponica] but whitish and sparsely sorediate. .... U. kujalae Ras.

**IIIG2c. U. silesiaca complex**

**Thallus ± long and pendulous; soredia without isidia**

Need cross references to subsect. Dasypogae, etc.

**1. Soralia mostly on thicker branches, rare on branchlets. Axis 4x as thick as medulla (CMA 7590:7590:330375). 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. .... U. silesiaca Mot.

**1. Soralia common on lateral branches and tips. Axis at most slightly thicker than medulla. Medulla lax. .... 2**

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

**2. Medulla and axis thinner relative to cortex (CMA 70:150:180).**

**Thallus ca. 515(20) cm long.** Medulla K+ yellow then redbrown. 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. .... U. *extensa* Vain.

IIIG3 Subg. Usnea Sect. Barbatae Subsect. Tortuosae

**Thallus elongated, pendulous, nonsorediate,  
tuberculate bluntly papillate; not rugose;  
Apothecia usually numerous**

Thallus large, pendulous, much longer than wide, strong; soredia none or so few as to be practically invisible; branches with tubercles or large blunt papillae; branchlets none to few and irregular; color pale olive to deep green, unchanged in herbarium, only becoming dark brown after a very long time.

This subsection seems to differ from the other pendulous ones (Scabratae and Dasypogae) mainly by the numerous apothecia and usual lack of soredia; although some members of those other groups lack soredia or occasionally have apothecia, they are usually not richly fertile, and they are often rugose and/or finely papillate. Nevertheless there should be some crossreferencing.

Rev. Nov. 1993

**1. 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 subsympoidally 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 sticklike. Fibrils usually absent. Isidiose soredia occasionally developed from tubercles. CMA 50:400700:500. Medulla and axis white. Eastern US (e.g., Maine). ..... U. pachyclada

**1. Medulla all white.** Thallus usually 1530 cm long. Without soredia. .... 2

**2. 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. 11.8 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 510 mm diam., not terminal; margin with fibrils. West

Coast. .... U. prostrata  
[included under U. foveata by Dahl & Krog; accepted by Ozenda & Clauzade]

**2. Medulla K. Apothecia very frequent;** margin with fibrils. Thallus 1030 cm tall, rather rigid; base often blackened but not clearly constricted. Thallus covered by generally numerous and crowded blunt papillae. Branches ±parallel, not incurved. U. rigida s. lato. .... 3

**3. Medulla lax to very lax. CMA 50:200:320. Thallus not very rigid. Apothecia mostly 0.40.7 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, ±parallel, typically distinctly flexuose, 0.81.5 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. .... U. faginea  
Mot.

**3. Medulla dense. CMA 5075:120200:300450. Thallus very rigid. Apothecia 0.51.5 cm across, abundant, on side branches or branchlets, often several on one branchlet.** Thallus open sprawling; branches 0.71 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, 0.51.5 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. .... U. rigida (Ach.) Rhl s. str.

**IIIG4. Subg. Usnea Sect. Barbatae Subsect. Pendulinae**

Thallus  $\pm$  long, usually pendulous; sorediate, the soredia not on tips of branches, or if so then soredia isidiate; surface rarely distinctly papillate, not rugose, in life yellowish green, in the herbarium brownish or straw yellow. Apothecia rare, or if common then papillae fine.

No species of this subsection known from N. America.

**IIIG5 Subg. Usnea Sect. Barbatae Subsect. Scabratae**

**Thallus elongate, pendulous. Fibrils few or absent. Thallus surface scabrous, with  $\pm$  distinct wrinkles.**

Papillae or tubercles distinct. Thallus usually much branched. Apothecia present or not. Cortex some shade of green, sometimes yellowishbrownish in herb. Medulla white, lax.

This subsection differs from subsection Dasypogae mainly in lacking fibrils and in having a roughened, often wrinkled surface.

Rev. Nov. 1993

**IIIG5a**

**Sorediate (sometimes inconspicuously so);  
color pale yellowish green to bluish green when fresh;  
surface not strongly pleated.**

**1. 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 1020(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 isidialike (according to Hale). Infrequently sympodially branched, with acute axils; main branches rugulosefoveolate, 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. scabiosa

**1. Medulla K+ red, or if K then thallus pale straw green (U. scabrata ssp. nylanderiana) or branches 12 mm thick ("U. maxima")**

Branches numerous, parallel to each other. Fibrils few or none. Surface wrinkled tuberculate or deformed. Thallus to 30 cm or more 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 rare, 25 mm wide. Surface distinctly wrinkled; papillate or not.

Medulla lax. CMA

40:200:200250. .... 2

**2. 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. .... U. maxima (lumped by Ozenda & Clauzade under U. scabrata s. lato)

**2. Branches of medium thickness, 0.51(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. .... 3**

**3. Medulla K+ yellow then deep red or redbrown; thallus rather compressed.** Thallus rather rigid; surface pleated, very abundantly papillate and tuberculate; branches ± angular in section. Apothecia 35 mm, not terminal; margin with fibrils. Northern U.S.? .... U. scabrata Mot. ssp. scabrata

**3. Medulla K (no substances); thallus less compressed.** On Picea and Pinus, or sometimes on Betula or other deciduous trees. Western Canada, southwest to California. .... U. scabrata ssp. nylanderiana Mot.

**IIIG5b. Scabratae:**

**Not Sorediate; Color brownish green or olivegreen.**

**1. 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, foveolatescrobiculate, 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 1530 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 (accepted by Ozenda & Clauzade, but lumped under U. scabrata by Egan)**

**1. 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. .... U. sylvatica**

IIIG6. Subg. Usnea Sect. Barbatae Subsect. Dasypogae

Rev. 1/94

Thallus elongate (to 2050 cm long), pendulous, with many branches, branchlets, and fibrils. Almost never wrinkled. Branches nearly always rather thin (mostly under 1 mm diam.), terete; at least the primary branches usually papillate; color pale to dusky green, unchanged in herbarium; fibrils present or absent. Soredia isidiose except in one species. Apothecia, if present, usually terminal.

This group should probably be called subsect. Barbatae, since it contains the implied type of the section.

**IIIG6a. "U. filipendula Group" s. lato**  
**Sorediate or Isidiate, usually sterile.**

Mostly after Ozenda & Clauzade

**1. Soredia farinose, without isidia. Thallus supple, flaccid.**  
..... 2

**1. Soredia isidiate (isidia sometimes sparse). Thallus ± rigid,**  
uniformly covered with papillae or nodules (tubercles), some of  
the latter giving rise to isidiate  
soralia. .... 3

**2. 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 ± 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.  
leucosticta

**2. Papillae present, very numerous and crowded; tubercles**  
**absent.** Thallus 520 cm long. Medulla K+ yellow then reddish.  
Darkened at base for a rather large distance. .... (see  
Barbatae Subsect. Comosae: U. extensa; also see U. silesiaca in  
that subsection)

**3. Thallus distinctly "beardlike"; 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 12 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, fibrillike cilia. Outer medulla dense, inner part lax.

CMA 10:500:380. On bark. California. .... U. catenulata

**3. Thallus not so distinctly beardlike; branches [usually?] distinctly thickest above the base, visibly attenuate, or all thickly tuberculate. .... 4**

**4. Thallus usually with numerous annular cracks (but annulations not distinctly swollen), fibrils few or absent along main branches, irregularly distributed; branches ± terete but main ones rugulose to foveolate.** Soralia usually absent; when present, punctiform, distinctly tuberculate, inconspicuous, smaller than half the branch diameter; isidia sparse or absent towards the base of main branches. Medulla K+ red. Motyka treats this species as a nonsorediate, often fertile species. .... (see U. chaetophora Stirton)

**4. Thallus at most weakly annulate; fibrils absent or numerous; branches terete or ± angular. .... 5**

**5. Fibrils absent or few. Branches terete or angular and pleated. .... 6**

**5. Fibrils usually numerous [but...]. Branches ± terete; surface of thallus at most slightly pleated. .... 7**

**6. Branches ± angular in section; surface pleated.** Branches mostly uniformly plainly papillate, mixed with tubercles here and there, or all tuberculate. Branchlets usually none. Thallus to 50 cm long; tubercles without cortex, sorediose. Medulla dense, K+ reddish; axis with sordid hyphae interwoven. CMA 40:150:250. Northern. .... (see Barbatae Subsect. Scabratae: U. scabrata; also see U. maxima)

**6. Branches terete; surface not pleated.** Thallus to 50 cm long, compressed, ± clear pure green, usually without fibrils; branches ca. 1.2 mm thick, continuous (not annulate), terete, infrequently branched; isidiose 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. .... U. subscabrata

**7. Medulla K.** [Some of these taxa may be primarily chemical variants of U. filipendula s. lato]. .... 8

**7. Medulla K+ yellow then reddish.** Branches straight or slightly curved, ca. 1 mm thick for most of their length, never incurved, nor pleated; terminal branches often very long. Thallus grayish green, slightly browner in herbarium. .... 11

8. True papillae almost completely absent; tubercles present.  
Thallus 1040 cm long. .... (see Ceratinae: U. ceratina)

8. True papillae abundant; small tubercles also  
present. .... 9

9. Thallus 515(20) cm long, rigid and scarcely elongated, rather  
little branched, graygreen, darkened but not constricted at base.  
Medulla dense or lax. Apothecia not terminal. ....  
10

9. Thallus 1040 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 1040 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 spinelike  
soredia. Thallus from base to tips uniformly thickly cylindrical  
papillate and scabrous. Medulla lax. Apothecia 28 mm diam., at  
tips of lateral branches; thalline margin with fibrils. Northern  
US and Canada. .... U. alpina

10. Medulla compact. Cortex twice as thick as medulla (CMA  
200:100:320). Thallus pale greengray to yellowgray, not blackened  
at the base (blackened but not constricted according to Ozenda &  
Clauzade), smooth and shining, sometimes with inconspicuous  
annulations, erect to subpendent (410 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.  
Soralia numerous, very small, punctiform, superficial, smaller  
than half width of branches, with fragile isidia when young.  
Lateral branches not constricted at point of attachment. Cortex  
81% of diam.. Medulla compact. Medulla and axis white.  
Medulla K, C, P+ redorange. Ch.: protocetraric acid. Apothecia  
45 mm diam., not terminal; margin with fibrils. On bark. Florida.  
..... (see Setulosae: U. subscabrosa)

10. Medulla lax. Cortex half as thick as medulla (CMA  
50:200:300). Thallus 1020 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 uncinata 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, 58 mm diam., often irregular in outline; margins with elongate to very long, rather few, cilia; disc often pruinose. On bark of conifers. California. .... U. freyi

**11. Medulla very dense and farinose. Thallus 1030 cm tall, dichotomously and not very abundantly branched, Papillae farinose,** low (very short), very few in v. liturata Mot. Nodules (tubercles?) small (short?), all sorediate, giving rise to isidiate soralia. Sterile; with rather large isidiose soralia. Branches almost parallel. Medulla K+ dingy yellow or K, K, C, KC+ faint pink, P+ orange, with protocetraric acid and traces of an unknown. Common on hardwoods, especially oak and birch, rarely on firs or rocks in deciduous forests. Eastern U.S., including southern Appalachians. .... (see **Ceratinae: U. hesperina**)

**11. Medulla loose. Thallus very long (20100 um) and narrow, rather abundantly divided dichotomously and polytomously. Papillae not farinose. .... U. filipendula s. lato** (see separate key below)

## **U. filipendula s. lato**

This group is a horrible mess, and most recent authors just lump everything together under U. subpendula.

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 yellowbrown 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 6075:120180:250400. 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.).

Description from Ozenda & Clauzade (1970), who lumped the following taxa (including U. filipendula s. str. I'm not sure where it goes in the key below; they didn't mention U. esthonica but Egan suggests it may also belong here) under "U. dasypoga" (= U. filipendula s. lato):

Medulla loose. Thallus very long (20-100 um) and narrow, rather abundantly divided dichotomously and polytomously. Papillae not farinose. Papillae little elongated, almost cylindrical, rather sparse. Nodules (tubercles) vaguely hemispherical, often very abundant, especially on the terminal branches, not all sorediate; isidiate soralia localized on the larger nodules. Apothecia 2-8 mm diam., almost terminal at the end; thalline margin with fibrils.

**1. Thallus hairlike; branches to 0.7 mm diam. .... 2**

**1. Thallus not hairlike; branches (at least main ones) usually thicker. .... 3**

**2. 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 foveolae; 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. capillaris

**2. Thicker branches with pointed papillae.** 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, broadly spinuliform, almost white. Branchlets none or very rare. Medulla rather lax, K+ slightly reddish. Apothecia unknown. Northern US and eastern Canada. .... U. fibrillosa

**4. Primary branches minutely papillate; secondary branches distinctly tuberculate, often very much so.** Thallus to 30 cm long; isidiose soredia nearly always on upper parts of branches. CMA 60:150:250+. Medulla thin, very lax, K+ yellow then reddish, the reaction usually slow or delayed. .... U. dasypoga s. str.

**4. Branches for the most part uniformly + clearly papillate, with long pointed papillae, mixed with blunt, farinose tubercles.** Thallus pendulous; main branches (at least towards base) ca. 1.5 mm thick; ..... 5

**5. 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

**5. 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, ± darkened; parts above base dilated, rather firm, ± 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 210 µm long, very thin, perpendicular or obliquely hanging, often variously curved, acute at tips, appearing tuberculate and rugulose. Branch tips hairlike, distinctly flexuose, fibrilliform, branched to the tips. Soredia frequent on major part of the branches, isidiose, on tubercles, concolorous. Apothecia unknown. On bark. California. .... U. esthonica (>? U. filipendula)

**IIIG6b. Not soresiate or Isidiate.**

(If fertile, also see suspect. Tortuosae and some members of suspect. Scabratae)

**1. Thallus threadlike, branches not over 0.7 mm thick, mostly 0.30.5 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 3050:120200:180300. On trees. Eastern

US. .... U. trichodea

**1. Thallus coarser, the branches more than 1 mm thick, or if slender and hairlike, then densely papillate or tuberculate; annulate or not; fibrils present or not.** ..... 2

**2. Thallus usually with numerous annular cracks (but annulations not distinctly swollen), thickly barbulate branched towards the base (but fibrils few or absent along main branches, irregularly distributed). Main branches rugulose to foveolate, with + evenly scattered, white, punctate or commalike 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 0.30.8(1.5) mm thick, curved and becoming parallel, + 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, 610 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 (?). .... U. chaetophora**

**2. Thallus + continuous, not annulate.** ..... 3

**3. Thallus distinctly "beardlike"; branches + uniform or the middle distinctly thickest; not fusiform attenuate.** Thallus slender, pendulous, 2030 cm long; branches 0.50.7 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 (= U. filipendula according to Egan)

**3. Thallus not so distinctly beardlike; branches usually thickest above the base.** Thallus 1040 cm long, supple and sinuous ("serpentine"), long and narrow, yellowish green; branches less than 1.5 mm diam. Apothecia (according to Ozenda & Clauzade) usually common, 25 mm diam., clearly lateral or almost terminal. Thallus rather abundantly branched, darkened at base. .... 4

**3. Papillae rather variable, for the most part pointed, very unevenly distributed, ± 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, ± flexuous. Medulla K+ and especially KC+ yellow then redbrown. .... U. intermedia

**3. Papillae numerous and crowded, in general regularly distributed, small, short and blunt. Fibrils (branchlets) 510 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 nonsorediate, often fertile species). .... U. caucasica (>? U. filipendula)