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Some new or interesting species of the genus *Usnea* (lichenised Ascomycetes) in the British Isles

PHILIPPE CLERC

ABSTRACT

CLERC, Ph. (1992). Some new or interesting species of the genus *Usnea* (lichenised Ascomycetes) in the British Isles. *Candollea* 47: 513-526. In English, English and French abstracts.

Two *Usnea*-species are described as new for the British Islands: *U. esperantiana* Clerc sp. nov., and *U. subscabrosa* Mot. The description of a previously badly understood species, *U. wasmuthii* Räs., is given. Chemical information as well as a key for all british *Usnea* are provided.

RÉSUMÉ

CLERC, Ph. (1992). Quelques espèces nouvelles ou intéressantes du genre *Usnea* (ascomycète lichénisé) des Iles britanniques. *Candollea* 47: 513-526. En anglais, résumés anglais et français.

La flore lichénique des Iles britanniques s'enrichit de deux nouvelles espèces: *Usnea esperantiana* Clerc, spec. nov. et *U. subscabrosa* Mot. Ces dernières, ainsi qu'*U. wasmuthii* Räs., une espèce méconnue, sont décrites en détail. Des informations sur la chimie, ainsi qu'une clé de détermination pour toutes les espèces britanniques du genre *Usnea* sont fournies.

Introduction

The british species of the lichen genus *Usnea* have already received many taxonomic treatments (CROMBIE, 1894; SMITH, 1918; WATSON, 1951; TALLIS, 1959; DUNCAN, 1970; HAWKSWORTH & al., 1980). However, many species are still badly known or ill-defined entities and need consequently a modern examination. During my work on a monograph of this genus in Europe, I collected much new informations on this genus in the British Isles. Two recent papers presented two species new for this country: *Usnea wirthii* Clerc (CLERC & DIEDERICH, 1991) and *U. madeirensis* Mot. (CLERC, 1991). The present article adds two more species to the british lichen flora, which contains now 19 species of *Usnea*, and gives a detailed description of a previously badly understood species: *Usnea wasmuthii* Räs. Furthermore, chemical information, and a key for all *Usnea* species in the British Isles are provided.

Material and methods

This account is based on specimens in BERN, BM, DUB, DUKE, G and GLAM as well as in the private herbaria of G. Degelius (Göteborg), Christian Printzen (Munich), C. Scheidegger (Birmensdorf), and M. Seaward (Bradford).

Unfortunately it was not possible for me to make field studies in the British Isles. However, with one exception (*U. chaetophora* Stirton), I have seen and collected all the species in the field elsewhere in Europe, on the Canary Islands, or in the southeastern United States. Literature records of *Usnea* species are unreliable, and all information on geographical distribution in this article are based on specimens examined by me. Most of the material referred to in this study was examined

by thin-layer chromatography (CULBERSON & AMMANN, 1979) with Solvant B modified (CULBERSON & JOHNSON, 1982). For the analysis of internal structures, see CLERC (1984a). In descriptions, when %C/%M/%A values are given, "n" refers to the number of specimens measured.

Chemistry

Table 1 lists the main lichen substances produced by *Usnea* in the British Isles and identified by TLC. Usnic acid is usually present in large amounts in the cortex of all species and is consequently not mentioned in Table 1. Consalazinic acid has not been distinguished from constictic acid, and no attempt was made to identify connorstictic acid. Depsidones are the main substances produced by the great majority of *Usnea* species. In the British Isles, only *U. florida* (L.) Wigg. em Clerc, *U. fulvoreagens* (Räs.) Räs., *U. subfloridana* Stirt. and *U. wasmuthii* Räs. produce depsides and/or a benzyl ester as well. *U. ceratina* Ach. is characterised by the presence of the β -orcinol paradesides diffractaic acid and barbatic acid. Fatty acids are very important in the taxonomy of this genus. So are bourgeanic acid and the murolic acid aggregate of diagnostic value by *U. esperantiana* Clerc and *U. hirta* (L.) Wigg. em Mot., respectively. Pigments have been found in three taxa: a periaxial yellow pigment in the medulla of *U. wirthii* Clerc (CLERC, 1984b; CLERC & DIEDERICH, 1991), a red pigment in the cortex of *U. rubicunda* Stirt. (JAMES, 1979) and a medullary pink pigment reacting CK+ yellow orange in *U. ceratina*.

Special part

1. *Usnea esperantiana* Clerc, spec. nov.

Thallus 2-5 cm altus, caespitosus, erectus. Rami principales teretes, saepe bis leviter tumidi et contracti, foveis paucis. Rami terminales comparato crassi, non nihil ramosi, typice torti et recurvati ubi sorediatissimi. Soralia non isidiata, plana vel leviter excavata, irregularia, saepe confluentia et apicem ramulorum terminalium fere tegentia. Apothecia desunt. Acidus salazinicus et acidus bourgeanicus, materiae principales.

Holotypus: Espagne, Iles Canaries, Tenerife, Tanque, Los Partidos de Franquis, petite colline à l'ouest d'un village abandonné. Flan NE de la colline. Sur les branches de *Pinus canariensis*. 1200 m. 8.09.1986. Leg. P. Clerc (G) (Fig. 1a); Chemistry: Usnic acid, salazinic acid and bourgeanic acid; %C/%M/%A: 4.5/32/27; **Isotypus** in G, BERN and TFM.

Description

Thallus shrubby, erect and compact, up to 5 cm long (Fig. 1), richly anisotomic to isotomic dichotomously branched (sometimes both patterns mixed), greyish yellow-green turning brownish in the herbarium; *trunk* short (1 mm), light brownish; *branches* terete or \pm irregularly shaped, \pm swollen, mostly slightly constricted at the base, \pm deformed by the presence of foveoles or depressions in the cortex; *apices* sparsely branched, thick, \pm distinctly twisted and recurved (Fig. 2a, b), depending on the density of soralia; *papillae* small, verrucous, \pm sparsely and unevenly distributed on the br.II and br.III; *fibrils* short (1-2 mm), spinulose, sparsely distributed, especially in the basal part of the thallus; *soralia* on the terminal branches, never isidiate, plane (Fig. 2c) to slightly excavate (Fig. 2d), irregularly outlined, often becoming confluent and then covering most of the apices (Fig. 2a); *cortex* shiny (Fig. 2e), usually thin [(3)-3.5-4.6%-5.7-(8), $n = 33$]; *medulla* dense (Fig. 2e), \pm large [(16)-25.8-30.5%-35.2-(37), $n = 33$]; *axis* (Fig. 2e) usually thin [(18)-21.8-29.8%-37.8-(56), $n = 33$]; *chemistry*: usnic acid, salazinic acid and bourgeanic acid as main substances, consalazinic acid and protocetraric acid as accessory substances.

Variation

In *U. esperantiana* some features are highly variable depending on the habitat. In localities with optimal conditions (pine forests in Macaronesia) the thalli look like the holotype specimen

Table 1. — Main secondary metabolites in the genus *Usnea* (British Isles).

+, present in all specimens examined; ±, present in some specimens (chemoraces); o, accessory substances not important for taxonomy; (), present in small amount to faint traces; * present only in the soralia.

Bar, barbaric acid; 4OB, 4-O-demethylbarbaric acid; Dif, diffractaic acid; Squ, squamatic acid; Tha, thamnolic acid; Fum, fumarprotocetraric acid; Pro, protocetraric acid; Nor, norstictic acid; Sti, stictic acid; Cos, constictic acid; Crs, cryptostictic acid; Men, menegazziac acid; Sal, salazinic acid; Pso, psoromic acid; 2OP, 2-O-demethylpsoromic acid; Lob, lobaric acid; Ale, aleotorialic acid; Bou, bourgeanic acid; Mur, murolic acid aggr.

	Bar	4OB	Dif	Squ	Tha	Fum	Pro	Nor	Sti	Cos	Crs	Men	Sal	Pso	2OP	Lob	Ale	Bou	Mur
<i>U. articulata</i>	—	—	—	—	—	+	o	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. ceratina</i>	+	o	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. chaetophora</i> . . .	—	—	—	—	—	—	—	±	±	o	—	—	±	—	—	—	—	—	—
<i>U. cornuta</i>	—	—	—	—	—	—	o	—	—	o	—	—	+	—	—	—	—	+	—
<i>U. esperantiana</i> . . .	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
<i>U. filipendula</i>	—	—	—	—	—	—	—	(+)	—	—	—	—	+	—	—	—	—	—	—
<i>U. flammea</i>	—	—	—	—	—	—	—	(±)	—	—	—	—	—	—	—	±	—	—	—
<i>U. florida</i>	—	—	—	±	±	—	—	—	—	—	—	—	—	—	—	—	±	—	—
<i>U. fragilesceus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. fulvoviregens</i> . . .	—	—	±	—	—	—	o	±	±	—	—	—	—	—	—	—	—	—	—
<i>U. glabrata</i>	—	—	—	—	—	+	o	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. glabrescens</i>	—	—	—	—	—	—	—	±	±	—	—	—	—	—	o	—	—	—	—
<i>U. hirta</i>	—	—	—	—	—	—	—	±	—	—	—	—	—	—	—	—	—	—	+
<i>U. madeirensis</i>	—	—	—	—	—	—	o	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. rubicunda</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. subfloridana</i> . . .	—	—	—	±	±	—	—	+	±	—	—	—	+	—	—	—	±	—	—
<i>U. subscabrosa</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. wasmuthii</i>	±	o	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—
<i>U. wirthii</i>	—	—	—	—	—	—	—	±	—	—	—	—	—	+	o	—	—	—	—

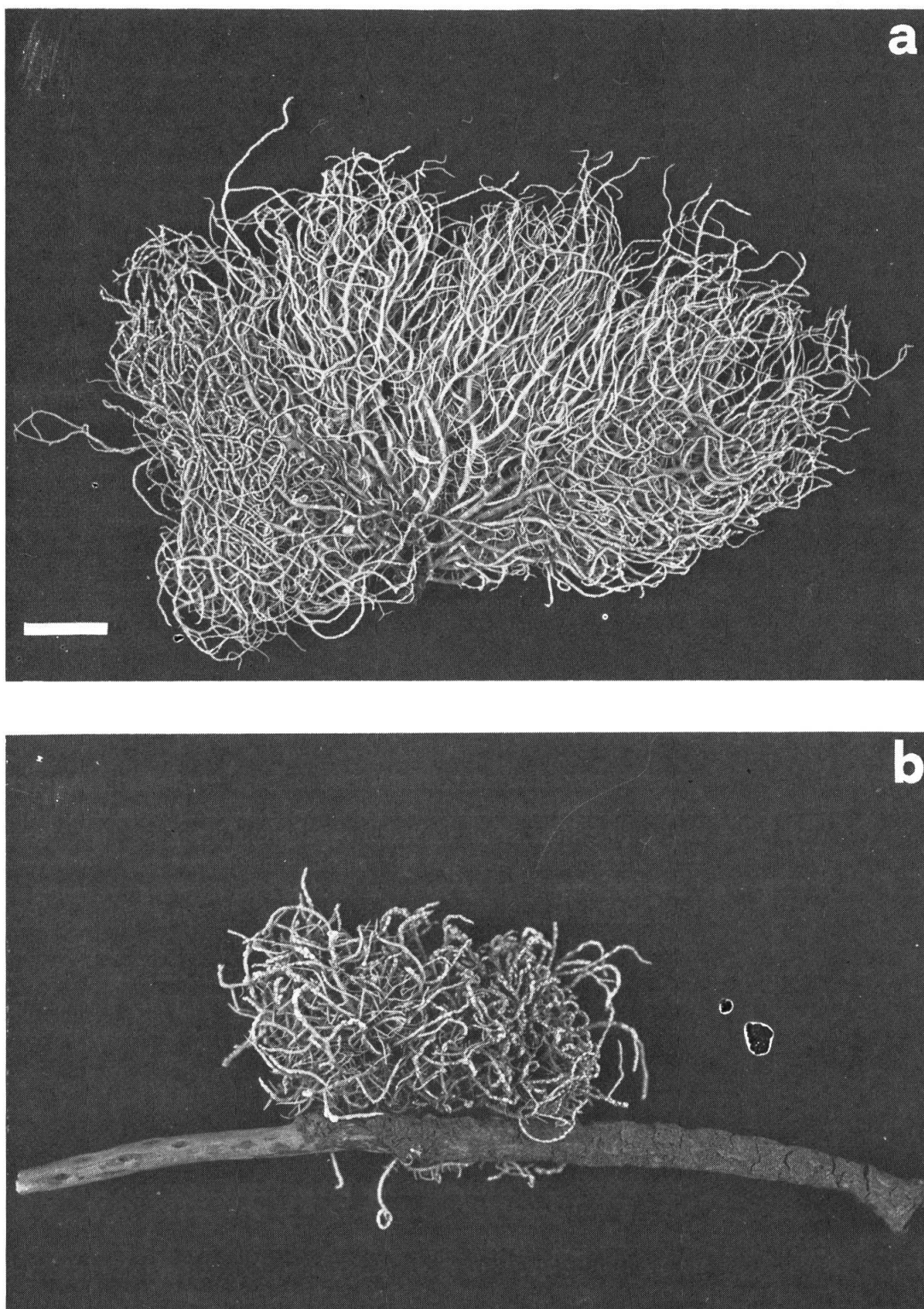


Fig. 1a. — *Usnea esperantiana*, E — Tenerifa, 9.1986, Clerc (G-Holotypus), showing optimally developed thallus. — Rule = 1 cm.

Fig. 1b. — *Usnea esperantiana*, E — Tenerifa, 8.9.1986, Clerc (G-Isotypus), showing smaller and compacter thallus as usually found in the old world. — Rule = 1 cm.

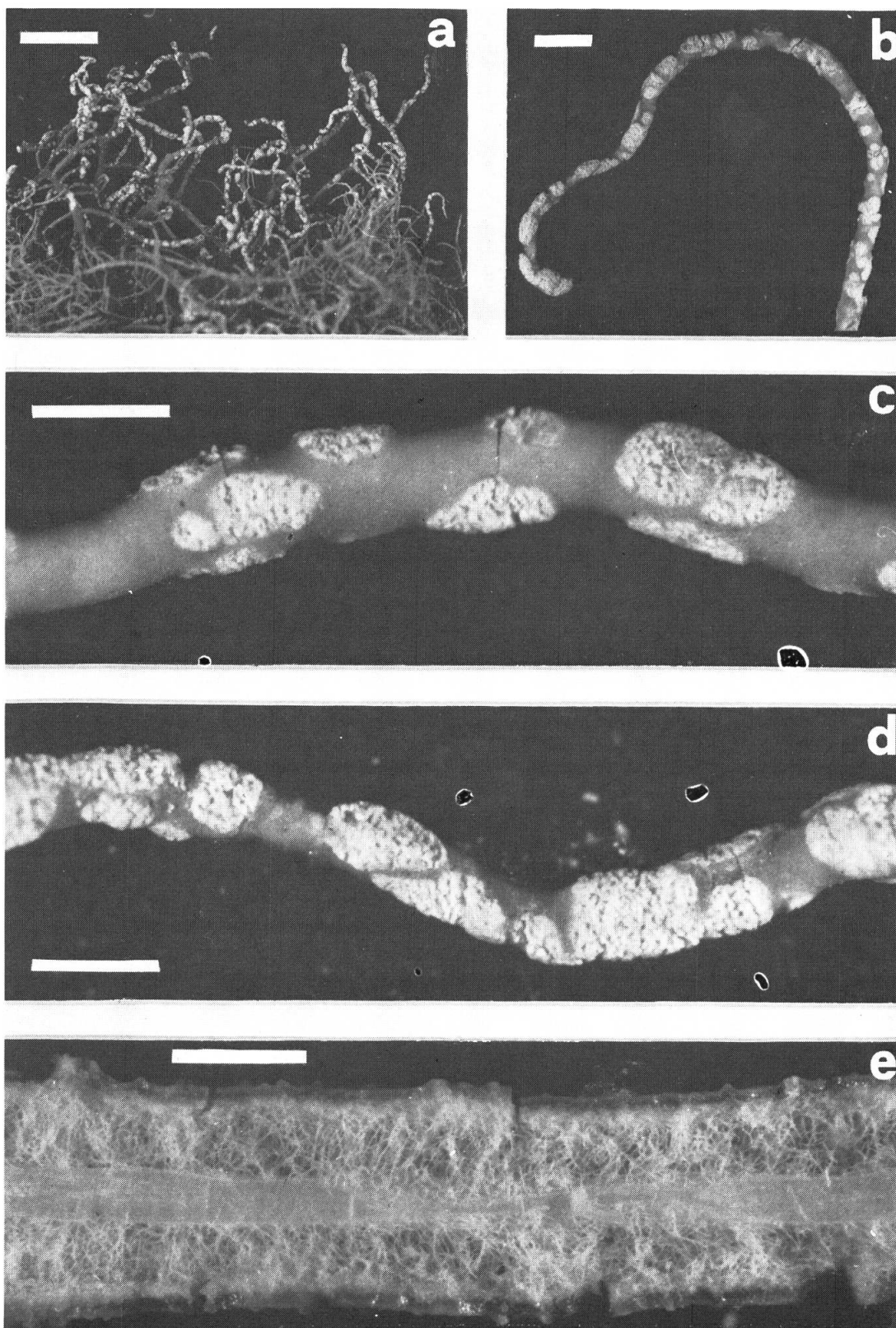


Fig. 2. — *Usnea esperantiana*, E — Tenerife, 6.9.1986, Clerc (G). **a**, apical part of a thallus with typically twisted, contorted and densely sorediated apices. — Rule = 0.5 cm. **b**, details of the apical part of one branch. — Rule = 1 mm. **c**, soralia plane, irregularly outlined. — Rule = 0.5 mm. **d**, soralia slightly excavate, becoming confluent and covering most of the branch. — Rule = 0.5 mm. **e**, cortex thin and shiny, medulla dense, large, axis thin. — Rule = 0.5 mm.

(Fig. 1a). In very exposed barren localities or at the limit of its distribution, thalli are much smaller and compacter (2-3 cm high) (Fig. 1b), fibrils are often numerous, giving a spinulose aspect to the thallus, soralia are very numerous, becoming confluent and covering the apices which are very twisted and contorted (Fig. 2a, b).

Taxonomic remarks

The distinctive features of this species are the light brownish trunk which is never black pigmented, the main branches irregularly shaped, \pm fusiforme and \pm constricted at the base, with small depressions at their surface, the superficial soralia without isidia and the constant presence of salazinic acid and bourgeanic acid. In the British Isles, this taxon has been confused with *U. fulvoreagens*, (see JAMES, 1978) which differs, however, by its black base, the soralia, which are fully excavate at maturity, a much thicker cortex (8-10%-12, $n = 99$) and the chemistry (norstictic acid, stictic acid group) (see Table 1). The other European sorediate and nonisidiate taxa which may be confounded with *U. esperantiana* are: *U. lapponica* Vain., with soralia fully excavate at maturity (see CLERC, 1987b, Fig. 11), branches not constricted at the base and salazinic acid or psoromic acid or caperatic acid in the medulla; *U. glabrata* (Ach.) Vain., with excavate soralia at maturity, no papillae and protocetraric acid in the medulla; *U. glabrescens* Vain., with a black-pigmented trunk, a much thicker cortex (8-10.5%-13, $n = 79$), distinctly rounded soralia, tapered branches which are not swollen or constricted at the base and salazinic with norstictic acid or stictic acid group in the medulla. *Usnea perplexans* Stirt., an asian taxon, is indeed very close to *U. esperantiana* in its habitus but lacks bourgeanic acid and has distinctly excavate soralia and tapered branches.

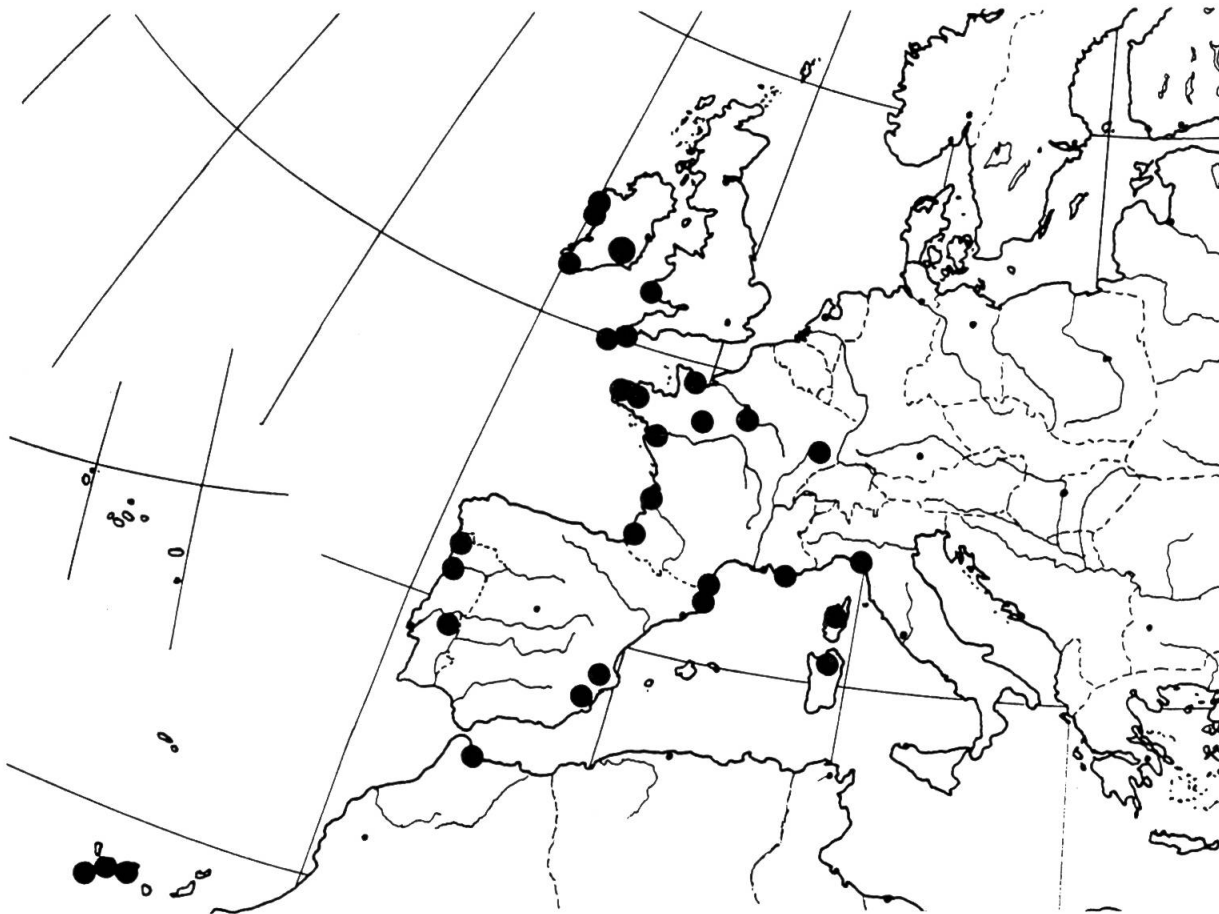


Fig. 3. — Known world distribution of *Usnea esperantiana*.

Distribution and habitat

Like *U. wirthii* in Europe (CLERC & DIEDERICH, 1991), *U. esperantiana* has a distinct South European-Atlantic type of distribution (Die südliche “südatlantische” Gruppe, DEGELIUS, 1935) (Fig. 3). Other lichens belonging to this group in Europe are for instance *Usnea subscabrosa* (see underneath), *U. articulata* Hoffm. (CLERC, unpublished), *Sticta dufourii* Del., *Teloschistes flavicans* (Swartz) Norman, *Heterodermia leucomelos* (L.) Poelt and *Pseudocyphellaria aurata* (Ach.) Vainio (DEGELIUS, 1935). In the western Canary Islands (Tenerifa, La Gomera, El Hierro) *U. esperantiana* is very frequent and optimally developed in the cloud zone between 650 and 1300 m where it can be mostly found in disturbed areas like degradation series of the laurel forest, mainly on *Erica* and *Myrica* (Fayal Brezal) as well as in *Pinus canariensis* forests or *Pinus radiata* plantations but never in pure stands of laurel forest. On the continent, field studies and herbarium labels show that this corticolous species occurs on all kinds of trees or bushes available throughout its distribution range: *Acer*, *Alnus*, *Betula*, *Cistus monspeliensis*, *Calluna vulgaris*, *Crataegus*, *Erica*, *Ficus carica*, *Fagus*, *Fraxinus*, *Larix*, *Olea europaea*, *Punica granatum*, *Pinus*, *Prunus malus*, *Quercus* and *Ulmus*, mostly very close to the sea level.

Etymology

This new species is dedicated to my friend Claude Roux (Marseille) in recognition of his outstanding work in the systematics of lichenized ascomycetes and named after Esperanto, an international language by now used by all European lichenologists since the publication of “Likenoj de okcidenta europo” (CLAUZADE & ROUX, 1985).

Collections examined (British Isles only)

England: East Cornwall: In small wood near Penzance, 6.10.1959, *B. M. Sturdy* (BM); **West Cornwall:** Isles of Scilly, Tresco, 13.4.1968, *P. W. James* (BM); **Ireland:** **West Galway:** Connemara, Ballinahinch Lake, near Castle, 2.3.1965, *P. W. James* (BM); Connemara, Bertraghboy Bay, Knockboy, Lough Bola, ad corticem arborum (*Betula* et *Larix*), 7.8.1966, *P. W. James* (A. Vezda: Lichenes selecti Exsiccati Nr. 572) (BM, G); **South Kerry:** Killarney, 1864 (DUB); Caherdaniel, 5 miles SE of Waterville, 1977, *A. M. Burnet* (BM); **Kilkenny:** Cullintra, on turkey oak, 3.1969, *M. R. D. Seaward* (DUB); **West Mayo:** South of Moher Lough, 5 miles south of Westport, on *Crataegus*, 1966, *P. W. James* (BM); **Wales:** **Pembroke** (V.C.45): Walwyn's Castle, branch of ash, 4.1958, *T. D. V. Swinscow* (BM); Walwyn's Castle, on branches of *Fraxinus* overhanging stream, 6.4.1958, *P. W. James* (BM); Oriulton Estate, SW of Pembroke, bole of *Alnus glutinosa* at edge of Lake, 30.7.1972, *A. R. Perry* (G).

2. *Usnea subscabrosa* Nyl. ex Mot.

Lich. Gen. *Usnea* Stud. Monogr., Pars Syst. 2: 313 (1937). **Holotype:** Portugal, 1877 Newton (H!); %C/%M/%A: 14/13.5/45; chemistry: usnic acid and protocetraric acid.

Motyka is the first to have published a valid description of this taxon cited “Nyl. in herb” in his monograph (MOTYKA, 1936).

Description

Thallus erect, subpendant to pendent, up to 25 cm long, rigid, mainly isotomic dichotomously branched (especially towards the apices); *trunk* usually very distinct, up to 6 mm long, paler than the br. I and slightly orange yellow pigmented at the base or dark brown with some reddish hue; *branches* terete, tapered, very rarely slightly constricted at their base; *apices* thin, not curved, axils nearly 60° sparsely ramified; *papillae* verrucous, scarcely and irregularly distributed on the whole thallus (apices excepted), sometimes absent; *fibrils* absent or sporadic over the whole thallus, rarely numerous; *soralia* isidiate, minute, not excavate (Fig. 4a, b), numerous, mainly on small branches and the apices; *cortex* thick [(7)-11-14%-17-(22), *n* = 48], typically and conspicuously shiny like broken glass; *medulla* thin [(4.5)-7.5-10.5%-13.5-(16), *n* = 48], compact; *axis* thick [(38)-41-50%-59-(73), *n* = 48]; *chemistry*: Usnic acid, protocetraric acid; chemorace with thamnolic acid not found so far in the British Isles.

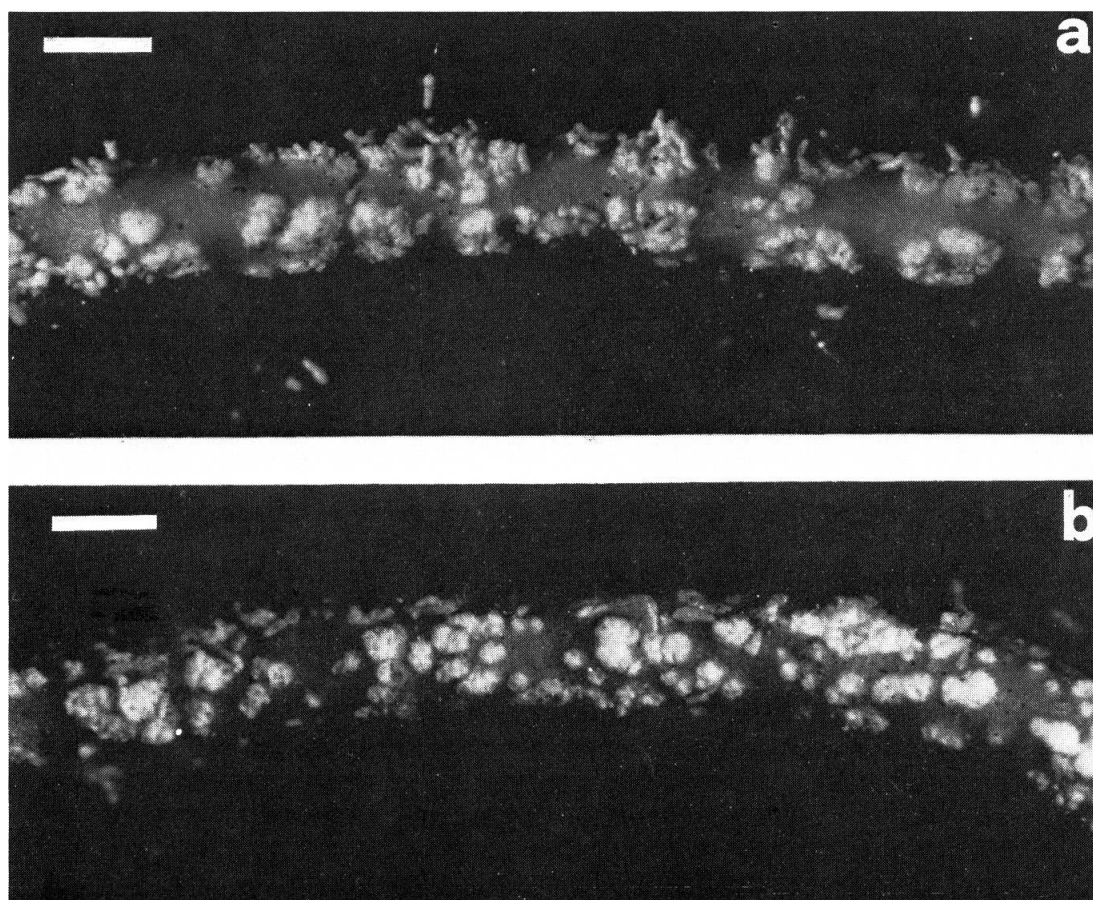


Fig. 4a. — *Usnea subscabrosa*, U.S.A. — NC, Haywood CO., 4420A, Dey (DUKE). **a**, soralia isidiate, minute, plain and crowded. — Rule = 0.5 mm. **b**, branch with non-isidiate soralia. — Rule = 0.5 mm.

Variation

This species, like *U. glabrescens* Vain. or *U. madeirensis*, may have an erect shrubby habit or a pendulous habit with all the transitions (CLERC, 1991). As in the two other species, the pendulous habit seems to be correlated with optimal environmental conditions. The density of ramification and fibrils are two very variable features as well.

Taxonomic remarks

The thick and distinctly shiny cortex, the soralia type and the chemistry make this taxon very distinct among the European and North American *Usnea* species. *U. ceratina* Ach., which is morphologically very close to *U. subscabrosa*, has a pink pigment in the medulla, tuberculate soralia and a CK+ orange medulla (barbatic and diffractaic acids). *U. subfloridana* Stirt. has a black-pigmented basal part, a thinner (8-10%-12, $n = 199$) cortex which is not shiny, and thamnolic or squamatic acids in the medulla. *U. madeirensis* has a dull cortex, a different type of soralia and salazinic acid in the medulla (CLERC, 1991). Both specimens collected in Great Britain had first been identified as *U. flammea*. This last taxon has a different kind of soralia (see CLERC, 1987a), distinct annulation in the basal part of the thallus, a dull cortex and nortstictic, stictic, \pm lobaric acids in the medulla.

Distribution and habitat

U. subscabrosa displays a Southwestern European — Macaronesian — Northeastern American disjunction (Fig. 5). The same kind of distribution is displayed by *U. hesperina* Mot. (CLERC, unpublished). It is a both corticolous and saxicolous species. In the British Isles, it has been found

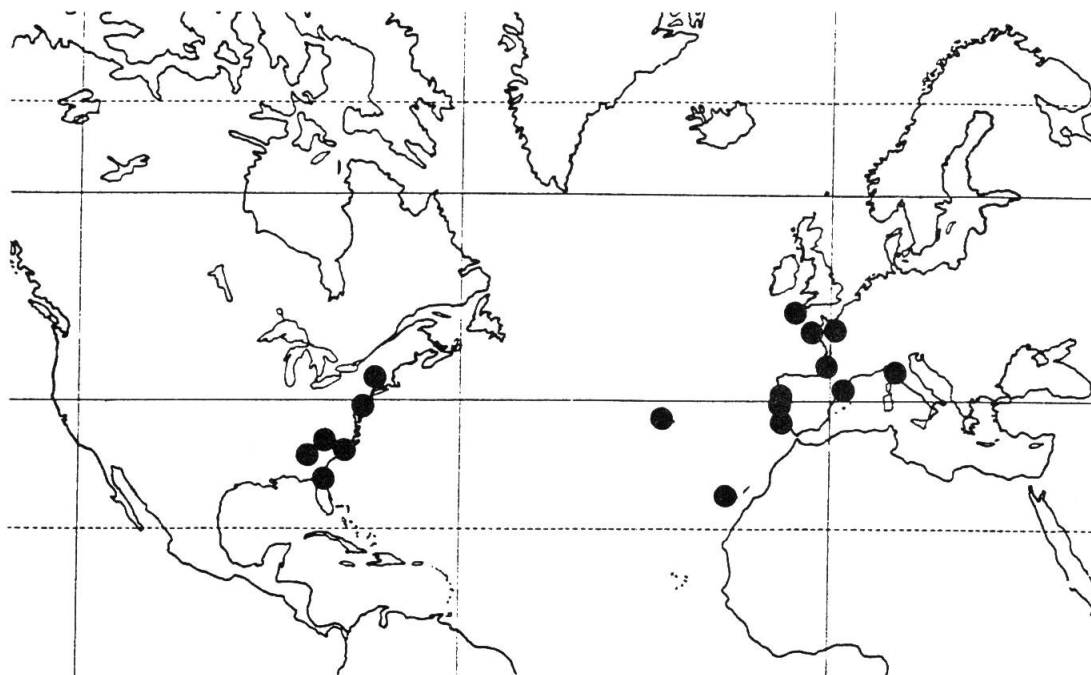


Fig. 5. — Known world distribution of *Usnea subscabrosa*.

only in the Scilly Isles, where it grows on granite outcrops close to the sea or on *Calluna*-bushes (PRINTZEN, 1990).

Collections examined (British Isles only)

England: West Cornwall: Isles of Scilly, St. Mary's, Loaded Camel, north side, on vertical granite outcrop ca 2 m above HWM, N, 11.3.1989, C. Printzen (Printzen, G); Isles of Scilly, Annet, 2.8.1872, W. Curnow (BM).

3. *Usnea wasmuthii* Räs.

Flecht. Estlands I., Suom. Tidenknd. Taim. 34(4):17-19 (1931). **Holotype:** USSR. Esthonia, Tallinna, Kakumäem in *Picea*. 13.7.1908. Wasmuth (H!); %C/%M/%A: 13.5/14.5/44 (thallus A), 9.5/11.5/58 (thallus B); chemistry: usnic acid and barbatic acid.

Description

Thallus erect to subpendant, up to 11 cm long, rigid, richly branched with mainly anisotomic dichotomous ramifications except at the apices, which are \pm isotomic dichotomous; *trunk* 0.5 to 6 mm long, usually very distinct, jet-black pigmented, with small longitudinal cracks; *main branches* terete, tapered, divergent; *smaller branches* with few ramifications, often running \pm parallel to each other, sometimes with slightly swollen segments; *apices* thin, not curved, with few ramifications; *papillae* verrucous, irregularly distributed on the whole thallus (apices excepted); *fibrils* (3-5 mm) irregularly distributed on the whole thallus; *soralia* conspicuous, more than half the diameter of the largest branches bearing them, plane to slightly excavate, never reaching the axis, oblong cylindrical (only when mature) (see CLERC, 1987b, Fig. 1D) to irregularly rounded, isidiate when young, isidia mostly absent from mature soralia; *apothecia* rarely present, *cortex* mat [(6-)8.1-10.5%-12.9(-18.5), $n = 93$]; *medulla* dense to compact [(4-)9.6-13.9%-18.2(-27.5), $n = 93$]; *axis* moderately thick [(33-)43.5-51.2%-58.9(-71), $n = 93$]; *chemistry*: usnic acid, \pm atranorin in the cortex; barbatic acid (as main substance), \pm 4-O-demethylbarbatic acid, \pm salazinic acid (as main substance), \pm consalazinic acid, \pm protocetraric acid or only salazinc acid as main substance in the medulla.

Variation

The development of soralia is environmentally dependant and only in optimally developed thalli may several typical oblong cylindrical-shaped soralia be observed. They are otherwise rare or even absent, replaced by less typical irregularly rounded soralia. The characteristically small longitudinal cracks on the trunk may sometimes be absent or difficult to observe, probably due to external factors, for example grazing by insects or molluscs or when the trunk is overgrown by other lichens or mosses. Furthermore, these cracks may be absent in juvenile thalli.

Taxonomic remarks

Usnea wasmuthii has been considered as the barbatic acid and salazinic acid chemoraces of *U. subfloridana* (HAWKSWORTH, 1972; JAMES, 1978). Beside the different chemistry, the latter species has much smaller soralia, which are always richly soresiate (even when mature) and lack the small longitudinal cracks on the trunk. However, badly developed specimens are often very difficult to tell apart morphologically. It is here important to mention that a specimen has been found that has the morphology of *U. wasmuthii* (soralia type and longitudinal cracks at the base) and the chemistry of *U. subfloridana*. Such a thallus might be considered as an "hybrid" (BRODO, 1978) between these two species and has already been found to occur in *Usnea* (CLERC, 1984a). *U. madeirensis* has a much thinner medulla (CLERC, 1991), a different type of soralia, numerous annular cracks without small longitudinal cracks in the basal part of the thallus and never produces

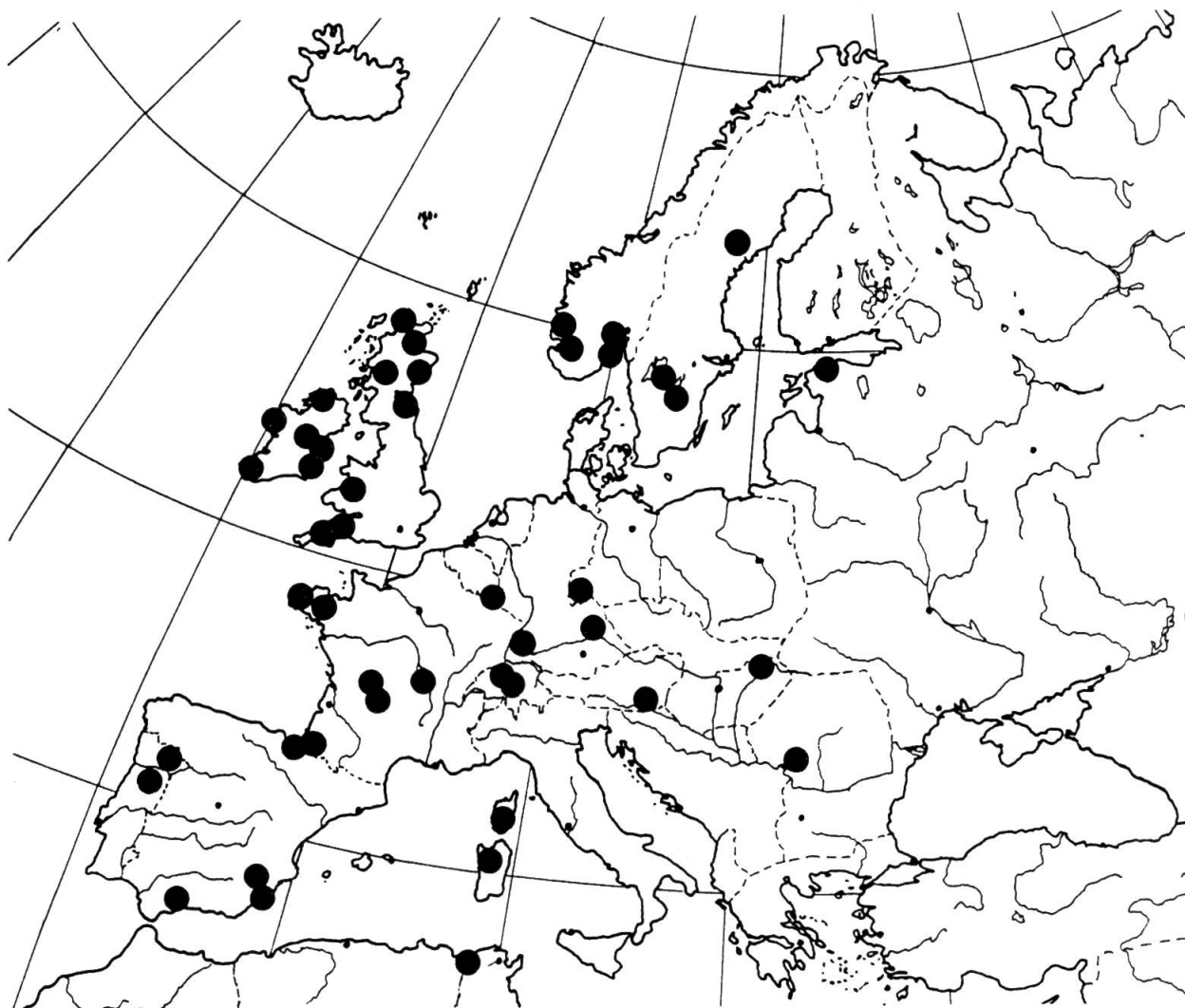


Fig. 6. — Known european distribution of *Usnea wasmuthii*.

barbatic acid. *U. glabrescens* has a different kind of soralia (see CLERC, 1987b, Fig. 1H), and a different chemistry (see Table 1).

Distribution and habitat

U. wasmuthii is an Eurasian corticolous taxon. In Europe its distribution (Fig. 6) is very much like that of *U. florida* (CLERC, 1984a), that has a suboceanic distribution. In the British Isles, it occurs mainly on *Alnus*, *Betula*, *Crataegus*, *Quercus* and *Salix*.

Collections examined (British Isles only)

England: West Cornwall: SW Penzance, N Burnewhall, on *Salix cinerea*, 23.9.1982, *P. Diederich* (hb. Diederich); **North Devon:** Belstone Cleave, near Okehampton, on branches of *Quercus*, 11.4.1959, *F. H. Brightman* (BM); **Somerset:** W Monkton, 9.1939, *W. Watson* (BM); **Ireland: Donegal:** Gartan Outdoor Center, on E-shore of Lough Gartan, on branches of apple trees in garden, ca. 90 m, 20.7.1991, *H. Sipmann* (B); **South Kerry:** S. shore Lough Currane, 10.1977, *A. M. Burnet* (hb. Seaward, G); Kilgarvan, 20.10.1977, *A. M. Burnet* (hb. Seaward, G); Killarney, Torc cascade, on *Larix*, 4.8.1933, *G. Degelius* (hb. Degelius); **Longford:** Carrigglas Manor, 10.1981, *A. M. Burnet* (hb. Seaward); **West Mayo:** South of Moher Lough, 5 miles south of Westport, on *Crataegus*, 1966, *P. W. James* (BM); **Meath:** Near Trim, 1926, *Z. Duffy* (DUB); **Wicklow:** Powerscourt, on oak trees, 9.1925, *M. C. Knowles* (DUB); **Scotland: Angus:** near Glamis, *S. Stevenson* (GLAM); **Argyll:** Dalmally, 16.7.1881 (BM); **East Inverness:** Aviemore, Loch an Eilein, on deciduous twigs, 8.1961, *D. Brown* (DUKE); **Moray:** near Forres, *J. Keith* (GLAM); **Roxburgh:** Rulietownhead near Bonchester Bridge, 4.1961, *U. Duncan* (BM); **Sutherland:** by Loch Assynt, birch, 6.1958, *T. D. V. Swinscow* (BM); Dunrobin Glen, Golspie, 10.6.1971, *W. Heath* (hb. Seaward); **Wales: Merionethshire:** on *Quercus*, 7.1924 (BM); **Pembroke:** 4.1958, *P. W. James* (BM).

Key of the *Usnea* species in the British Isles

Notice to the key: Young, necrotic or abnormally developed specimens with badly developed characters cannot be identified without the help of TLC and Table 1.

1. Thallus with a red pigment in the cortex, sometimes present only in the older parts of the thallus ***U. rubicunda***
- 1a. Thallus without such a pigment 2
2. Thallus with a yellow pigment in the inner medulla and axis ***U. wirthii***
- 2a. Thallus without such a pigment 3
3. Medulla CK+ yellow orange, pink pigment present in the medulla (sometimes very faint and not visible) ***U. ceratina***
- 3a. Medulla CK-, pink pigment never present 4
4. Medulla and/or soralia Pd+ red orange and K- 5
- 4a. Medulla and/or soralia not Pd+ red orange and K- 7
5. Thallus flaccid, pendulous, branches running parallel, with swollen segments, cortex thin (5-7%), mat ***U. articulata***
- 5a. Thallus rigid, erect to subpendulous (if pendulous then the cortex thick (8-15%) and shiny) with divergent branching 6
6. Soralia conspicuous, larger than half the diameter of the largest branches bearing them, excavate without isidia, main branches constricted at their base, cortex thin (5-8%) ***U. glabrata***

- 6a. Soralia punctiform, smaller than half the diameter of the largest branches bearing them, not excavate, with isidia when young, main branches not constricted, cortex thick (8-15%) and conspicuously shiny **U. subscabrosa**
7. Thallus pendulous with main branches running \pm parallel 8
- 7a. Thallus erect or subpendulous with main branches diverging 10
8. Mature soralia conspicuous, larger than half the diameter of the largest branches bearing them and not isidiated when mature, either norstictic acid or psoromic acid always present
U. glabrescens
- 8a. Soralia absent or when present, punctiform, smaller than half the diameter of the largest branches bearing them and mostly isidiated when mature, norstictic acid or psoromic acid never present 9
9. Fibrils sparse, very irregularly distributed, soralia when present mostly tuberculate
U. chaetophora
- 9a. Fibrils numerous, regularly distributed along the entire length of main branches (fishbone-like pattern), soralia when present not tuberculate **U. filipendula** s.l.
10. Thallus without soralia, apothecia usually numerous **U. florida**
- 10a. Thallus with soralia, apothecia absent or infrequent 11
11. Mature soralia punctiform, smaller than half the diameter of the largest branches bearing them, numerous, isidiate (at least when young) 12
- 11a. Mature soralia conspicuous, larger than half the diameter of the largest branches bearing them, not so numerous, isidiate or not 15
12. Main branches \pm angular, ridged, basal part never blackened, papillae absent ***U. hirta**
- 12a. Main branches circular, not ridged, basal part blackened or not, papillae present ... 13
13. Main branches constricted at their base and/or segments \pm swollen, ramification anisotomic-dichotomous, basal part blackened or not ****U. cornuta**
- 13a. Main branches never constricted, segments cylindrical, never swollen, ramification isotomic dichotomous, basal part always jet black, at least on the lowest mm 14
14. Thamnic acid and/or squamatic acid, soralia densely isidiated, basal part without longitudinal cracks **U. subfloridana**
- 14a. Norstictic acid or psoromic acid, soralia sparsely isidiated, basal part with small but distinct longitudinal cracks (at 50 \times magnification) **U. glabrescens**
15. Basal part whitish or concolorous with the main branches or rarely brownish black, never jet black (when the basal part is covered with mosses or other lichens, it may become black) 16
- 15a. Basal part distinctly jet black, at least on the lowest mm 17
16. Soralia with isidia, terminal branches not twisted or contorted, medulla K+ yellow orange **U. flammea**
- 16a. Soralia without isidia, terminal branches often twisted and contorted, medulla K+ red
U. esperantiana
17. Main branches constricted at their base or fusiform **U. fragilesceus**
- 17a. Main branches neither constricted nor fusiform 18
18. Soralia isidiate (at least when young) 19
- 18a. Soralia not isidiate 22

19. Thamnolic acid and/or squamatic acid present, mature soralia richly isidiated
U. subfloridana
- 19a. Thamnolic acid and squamatic acid absent, mature soralia not or poorly isidiated . . 20
20. Norstictic acid or psoromic acid present, soralia of \pm regular shape, rounded when mature, basal part with longitudinal cracks (at 50 \times magnification) . . *****U. glabrescens**
- 20a. Norstictic acid and psoromic acid absent, soralia irregularly shaped, not distinctly rounded, basal part with or without longitudinal cracks 21
21. Basal part with small but distinct longitudinal cracks (at 50 \times magnification) and few annular cracks (2-5/5 mm), mature soralia usually longitudinally stretched, barbatic acid present or absent **U. wasmuthii**
- 21a. Basal part without longitudinal cracks, with numerous annular cracks (6-9/5 mm), mature soralia not distinctly longitudinally stretched, barbatic acid absent **U. madeirensis**
22. Soralia deeply excavate, irregularly shaped, basal part without longitudinal cracks, fibrils numerous on the whole thallus, psoromic acid never present . . . ******U. fulvoreagens**
- 22a. Most of the soralia not excavate, plane to slightly tuberculate, regular and distinctly rounded, basal part with small but distinct longitudinal cracks (at 50 \times magnification), fibrils scarcely present close to the basal part of the thallus, psoromic acid sometimes present **U. glabrescens**
- * Syn. nov.: *U. foveata* Vain. in: Meddeland. Soc. Fauna Fl. Fenn. 48:172, 1924. **Holotypus:** Fennia, Isthmus karelicus, Sakkola: Kylmäoja, in *Betula*, 1917, V. Räsänen (H!).
- ** Syn.: *U. inflata* (Del.) Mot. see CLERC (1987a)
- *** In CLERC (1987b) *U. glabrescens* is said to be never isidiated. This is not true as thalli with very young soralia may have isidia. Such thalli are very difficult to tell apart from *U. subfloridana* without TLC examination.
- **** *Usnea fulvoreagens* (Räs.) Räs. has been considered to be a synonym for *U. lapponica* Vain. However, both taxa are very distinct and should not be confounded. *Usnea fulvoreagens* has a distinct isotomic dichotomous branching pattern, a much thinner medulla (13-22%), a distinct chemistry (see Table 1) and a suboceanic distribution pattern. *Usnea lapponica* has a distinct sympodial branching pattern, a wider medulla (21-30%), a different chemistry (salazinic acid or psoromic acid or caperatic acid) and a continental distribution (*Usnea lapponica* has not been found so far in the British Isles).

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