Notes on the genus *Usnea* Adanson. II

Philippe CLERC

Conservatoire et Jardin botaniques de la Ville de Genève, Case postale 60, CH-1292 Chambésy/GE, Switzerland

**Abstract:** *Usnea confusa* Asahina is a new synonym for *U. cornuta* Körb. *Usnea cornuta* has now its geographical range extended to Asia and Oceania. *Usnea dasaea* Stirt. is new for Oceania. *Usnea entviolata* Motyka, differing from *U. ceratina* Ach. only in the development and the morphology of the soralia, is new for the continental United States, Mexico and Africa. *Usnea sanguinea* Swinscow & Krog is a new synonym of *U. erinacea* Vain. occurring in North and South America and in East Africa. *Usnea wirthii* P. Clerc is a synonym of *U. flavocardia* Råsänen. *Usnea pratervisa* (Asahina) P. Clerc, comb. nov., is now considered as a distinct species. It differs from *Usnea subfloridana* Stirt. in its chemistry and the type of soralia; it is new to North America. *Usnea shimadai* Asahina is confirmed to occur in Mexico. *Usnea schadenbergiana* Göpp. & Stein and *U. silesiaca* Motyka are the names that will have to be used in the future for *U. hesperina* Motyka and *U. madeirensis* Motyka respectively.

**Introduction**

Between 700 and 800 taxon names have been published in the genus *Usnea* (CLERC 1998). But we are still very far from having even a reliable approximation of the number of well defined species occurring worldwide in this genus. Several insufficiently understood taxa are known to exist both in the Northern and the Southern Hemispheres. After the first notes published six years ago (CLERC 1997), this paper is the result of the continuing process of visiting important herbaria and studying the original material of several taxa.

**Material and methods**

These notes are based on herbarium specimens deposited in the following herbaria: ASU, COIMBRA, DUKE, G, GZU, H, L, LBL, M, MEXU, MINN, PC, PR, S, SBBG, STR, TNS, TUR-V, US, UPS, VAB and W as well as on the private herbaria of K. Kalb, C. Printzen and M. R. D. Seaward. All material has been studied with thin-layer chromatography (CULBERSON & AMMANN 1979) with solvent B modified (CULBERSON & JOHNSON 1982). Anatomical measurements of the cortex (C), medulla (M) and central axis (A) were established according the method given in CLERC (1984).
Results

Usnea cornuta Körb.


Notes: The descriptions of Usnea confusa Asahina by STEVENS (1999) and OHMURA (2001) respectively for Australia and eastern Asia (India, Indonesia, Japan, Nepal and Taiwan) correspond well with the description of the European species Usnea cornuta Körb. Indeed the type specimen of U. confusa fits perfectly within the variation of U. cornuta as discussed by CLERC (1987a, b). STEVENS (1999) mentions the presence of galbinic acid in U. confusa; this chemotype should be checked against Usnea dasaea Stirt., see under this species in this paper.

Usnea jelskii Motyka (LBL – holotype!) described from Chile with salazinic and norstictic acids in the medulla is very similar to U. cornuta as well. However, more specimens of U. jelskii from South America should be studied before we recognize formally its presence on this continent.

This very characteristic species previously known only from Europe (MOTYKA 1936–1938; CLERC 1987a), the Macaronesian area (MOTYKA 1936–1938) and North America (MOTYKA 1936–1938; CLERC & HERRERA-CAMPOS 1997; HALONEN et al. 1998; HERRERA-CAMPOS et al. 2001), has now had its geographical range extended to Asia, Oceania and most probably South America.
Usnea cornuta ssp. brasiliensis (Zahlbr.) P. Clerc, comb. et stat. nov.


Notes: There is a tendency for the protocetraric acid chemotype to have segments that are more “sausage-like” with a thinner cortex and larger medulla than in the other chemotypes (HERRERA-CAMPOS et al. 2001). However, this separation is not complete yet and lots of intermediates still occur (Usnea brasiliensis morphotypes without protocetraric acid or typical U. cornuta with protocetraric acid). For this reason I propose to recognize these two taxa at the subspecific level. U. cornuta ssp. brasiliensis is known from North and South America (MOTYKA 1936–1938; HERRERA-CAMPOS et al. 2001), from the Macaronesian area (CLERC, unpublished) and from Eastern Asia (Japan and Taiwan) (OHMURA 2001).

Specimens studied: U.S.A. California: Santa Barbara Co., North side of the Santa Ynez Mountains along Refugio Road, 10 km north of Capitan, 34° 34' N, 120° 05' W, ca. 270 m alt., on tree, 15 July 1980, L. Ross 74 (ASU); Santa Barbara Co., Channel Islands Nat. Park, Santa Catalina Island, Haypress Reservoir, 1/10 of mile towards Avalon, 390 m alt., formation arbustive (chapparal) en bordure de chaque côté de la route, sur les branches de Quercus pacifica, 18 Aug. 1999, P. Clerc & C. Bratt s. n. (G).

Usnea dasaea Stirt.


Synonyms: see CLERC & HERRERA-CAMPOS (1997).

Notes: This species differs from U. cornuta mainly by the densely arranged spinulose fibrils on the branches and the presence of galbinic acid. CLERC & HERRERA-CAMPOS (1997) mentioned that U. dasaea is distributed worldwide and that Australasia was the only continent from which they had not seen specimens. This gap is now filled since in GZU a specimen collected in Queensland, Australia was found. Usnea dasaea is thus new for Oceania. This definitely confirms that Usnea dasaea was erroneously lumped with U. cornuta (syn. U. confusa Asahina) by STEVENS (1999).


Usnea entoviolata Motyka


Notes: Usnea entoviolata was so far known from only two specimens collected in Hawaii. It was placed in the section Glabratae by MOTYKA (1936–1938). When I discovered the type material in W, I was then very surprised to see that this species is morphologically, anatomically and chemically closely related to Usnea ceratina Ach. (section Elongatae). I had been searching for years for a
name for these forms of *U. ceratina* with large soralia. *Usnea entoviola*ata differs from *U. ceratina* only in the development and the morphology of the soralia. In *U. ceratina* (Figs 1–3), the soralia are born on the top of well-developed tubercules (Fig. 1). They eventually enlarge to an average diameter of half the bearing branch, being distinctly stipitate (Fig. 2). Sometimes the soralia appear as large as the bearing branch but then they are convex (Fig. 3), and still visibly ± stipitate, never becoming excavate, usually with many isidiomorphs. In *U. entoviola*ata (Figs 4–6), the well developed tubercules so typical for *U. ceratina* are generally absent and the soralia develop on the cortex *ab initio* or on low elevations of the cortex (Fig. 4). The soralia then enlarge (Fig. 5), are even to slightly stipitate, eventually becoming as large as or larger than the bearing branch and excavate (Fig. 6), with few or no isidiomorphs.

![Image](image-url)

Figs 1–6. 1. *Usnea ceratina*, Frey 19474 (G) – Tubercules and young soralia. 2. *Usnea ceratina*, Frey 19474 (G) – Mature stipitate soralia. 3. *Usnea ceratina*, Frey 19474 (G) – Convex soralia with isidiomorphs. 4. *Usnea entoviola*ata, P. Clerc 89/787 (G) – Pseudocyphellae on small elevations of the cortex. 5. *Usnea entoviola*ata, P. Clerc 89/787 (G) – Young soralia. 6. *Usnea entoviola*ata, holotype (W) – Mature large and ± excavate soralia. Figs 1–6: bar = 0.5 mm.

I was not able to make enough field observations to be absolutely sure that these two forms are really separate species without transition forms (CLERC 1998). However, the fact that I was not able to find large and excavate soralia on European specimens convinced me that we are dealing with something more than a phenotypic modification. Further field observations as well as molecular studies will be necessary to answer this question in an appropriate manner.

*Usnea ceratina* is locally abundant but infrequent across its whole range in Eurasia, North America and Oceania. *Usnea entoviola*ata seems to have a more scattered distribution (Fig. 7) in North America, the West Indien, Africa and Ha-
waiti. It has so far not been seen in Europe. Both species have been collected side by side on the same tree in North Carolina. *Usnea entoviolata* is new for the continental United States, for Mexico, and for Africa.


Fig. 7. Known distribution of *Usnea entoviolata* Motyka.
**Usnea erinacea Vain.**


**Notes:** *Usnea erinacea* is a corticolous species characterised by a erect-shrubby thallus, with lateral branches not narrowed at attachment points, terete and cylindric segments, numerous and short fibrils giving a spinulose aspect to the branches, usually numerous often eroded tubercles (young fibrils?) and fibrules (papillae are absent), a thick (8–12%) and shiny cortex with red pigment, a thin and compact medulla, a thick central axis, fessulose in the thickest branches, numerous subterminal to terminal apothecia and norstictic and salazinic acids in the medulla.

The red pigment present in the cortex of the holotype specimen of *Usnea erinacea* is faint and difficult to detect. When describing this species, VAINIO (1926) failed to see this pigment and the same happened to MOTYKA (1936–1938) ten years later. As a consequence, *U. erinacea* has been considered, to date, as a member of the *U. strigosa* agg. (MOTYKA 1936–1938). However the presence of the red pigment in the cortex makes this species a close relative of *U. rubicunda* Stirt., a sorediate species from which it differs mainly by the reproductive strategy. Without being aware of the presence of the red pigment in the cortex of *U. erinacea*, SWINSCOW & KROG (1979) described *U. sanguinea* from East Africa. *Usnea sanguinea* fits well within the range of variation of *U. erinacea* and is thus synonymized with the latter species.

*Usnea erinacea* occurs in North and South America (MOTYKA 1936–1938) (although the South American specimens remain to be checked) and in East Africa. It is new to Madagascar.

**Specimens studied:** MADAGASCAR. Cercle Mtn, Fort Dauphin, 1901, [collected by indigenous people] I7208 (PR). – MEXICO. Sinaloa: Sierra Madre Occidental, 1 km S of Barranca Lierre near route 40, 2 km W of Durango border, 23° 28' N, 105° 50' W, ca. 2300 m alt., mixed pine oak forest, on *Quercus*, 27 May 1992, T. H. Nash III 31081 (ASU).

**Usnea flavocardia** Räsänen


Notes: CLERC (1997) reported *U. wirthii* as new for South America, based on two specimens collected in Chile and Peru. TAVARES et al. (1998), in their paper on the same species, mentioned the existence of two other taxa with a yellow pigmentation in the medulla around the axis and described as *Usnea grandisca* from Peru by MOTYKA (1936–1938) and *U. flavocardia* in Chile by RÄSÄNEN (1936). *Usnea grandisca* is a synonym of *U. cristata* Motyka, a taxon with apothecia, closely related to *U. ceratina* Ach., but not to *U. wirthii*. On the other hand, the type specimen of *U. flavocardia* falls well within the variation of *Usnea wirthii*. The medulla close to the central axis is indeed yellow and the spotted red pigmentation, so characteristic for American specimens of *Usnea wirthii*, can be distinctly seen especially on the terminal branches. The thallus is parasitized by a lichenicolous fungus and this could explain the densely divided branch apices as well as the somewhat strange development of the soralia (CLERC 1998). The morphological characters mentioned by TAVARES et al. (1998) to separate *U. flavocardia* from *U. wirthii* are very variable and cannot be used to define taxa in the genus *Usnea*. The type specimen of *U. flavocardia* contains salazinonic, norstictic and galbinic acid, extending thus the so far known chemical variation of this taxon. An other specimen collected in Chile (H) and identified as *U. flavocardia* by Räsanen contains only a fatty acid.

*Usnea praetervisa* (Asahina) P. Clerc, comb. et stat. nov.


Notes: ASAHINA (1956) described this rare taxon as a pure chemical variant of *U. subfloridana* Stirt. (*U. comosa*) occurring in Japan and China. Since that time it has been found in Europe and North America (FOS & CLERC 2000). OHMURA (2001) on the basis of the asiatic material further treated this taxon as a chemotype of *U. subfloridana*. However, detailed morphological and anatomical studies have shown that this chemotype is different from *U. subfloridana* and deserves a specific status. The way soralia develop is very different in these two species. In *U. subfloridana* most of the soralia form on thin and terminal branches that develop *ab initio* on the cortex and not on top of eroded papillae as OHMURA (2001) suggested. The edge of the soralia is slightly reflexed (50×1) producing a cortical rim that delimits well the soralia. Most of the time the soralia then enlarge, become ± circular, shortly stipitate, slightly convex at the top and usually remain separate. In *U. praetervisa* the formation of soralia and thus their morphology seems to be very different. This species first produces short fibrils on very young and thin branches. These fibrils can be considered as diaspores and most of them are shed when they are very young, leaving a small fibercle looking like pseudocyphellae. The edges of these fibercles are not reflexed, lack a cortical rim and are of irregular shape. The fibercles often coalesce with each other, thus they look like large unstipitate diffuse and even soralia. Secondarily, isidiomorphs and soredia may develop inside the fibercles. The same type of development can be seen in *Usnea cornuta* Körb. Furthermore the diameter of the fibercles/soralia is smaller and the density of fibercles/soralia is on average higher in *U. praetervisa* than in *U. sub-
floridana. Anatomically U. subfloridana has a tendency to have a thicker cortex and a thinner central axis than U. praetervisa (Table 1). However, due to the small number of specimens of U. praetervisa analysed these differences can be only interpreted as tendencies. The correlation of these morphological and anatomical characters with the production of norstictic acid in the medulla prompts us to consider U. praetervisa as being a distinct species. Norstictic acid is biosynthetically distant from thamnolic and squamatic acids which are produced in U. subfloridana. Usnea praetervisa is new for North America. The known world distribution of U. praetervisa is shown in Fig. 8.

Table 1. Width of cortex, medulla and central axis given in percentage (%) of the whole width of the branch in Usnea subfloridana and U. praetervisa.

<table>
<thead>
<tr>
<th></th>
<th>cortex</th>
<th>medulla</th>
<th>central axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usnea subfloridana</td>
<td>(5–)8–10–12(–16)</td>
<td>(4–)11–16–21(–28)</td>
<td>(27–)38–47–56(–74)</td>
</tr>
<tr>
<td>Usnea praetervisa</td>
<td>(5–)6–8–10(–11)</td>
<td>(12–)13–16–19(–22)</td>
<td>(41–)45–51–57(–62)</td>
</tr>
</tbody>
</table>

Fig. 8. Known distribution of *Usnea praetervisa* (Asahina) P. Clerc.

**Usnea schadenbergiana** Göpp. & Stein


**Notes:** Since my attempt (CLERC 1999) to conserve *Usnea hesperina* against *U. schadenbergiana* failed (P. M. Jørgensen, pers. comm.) we shall now utilize the rarely used and mostly overlooked binomial *Usnea schadenbergiana* for this species, one of the most distinctive and best known taxa in this genus (see CLERC 1997; CLERC & HERRERA-CAMPOS 1997; HALONEN et al. 1998; HERRERA-CAMPOS et al. 1998 for the diagnostic characters).
Usnea shimadai Asahina


Notes: This species is closely related to Usnea amblyoclada (Müll. Arg.) Zahlbr. (see CLERC & HERRERA-CAMPOS 1997) from which it seems to differ only by the reproductive strategy. Usnea amblyoclada has soralia with isidiomorphs whereas U. shimadai has terminal to subterminal apothecia and no soralia. In Mexico there are specimens with diffractive acid instead of galbinic, norstictic and salazinic acids, and a slightly different morphology (thallus more rigid and central axis thicker). They are provisionally placed here under U. shimadai waiting for more material and detailed study.

Usnea shimadai cannot be considered as new for North America since ASAHINA (1970) wrote: “The author possesses a Mexican specimen collected by Dr E. Matuda in monte Ovando, Chiapas (Jan. 3, 1928), which is almost identical with the type specimen of Usnea shimadai, containing also the same chemical ingredients”. There is probably an older name for this taxon but I was so far unable to find it.

Specimens studied: Norstictic acid chemotype: MEXICO. Durango: Cerro Blanco, on rocks, M. Herrera-Campos 1546 (MEXU). Sinaloa: Sierra Madre Occidental, along highway 40 between Mazatlán and Durango forest station, 1 mile west of Durango line, 23° 28’ N, 105° 50’ W, pine-oak forest, on Pinus, ca. 1830 m alt., 19 March 1975, T. H. Nash III 10155i (ASU). Sonora: 3 mi W of Yecora on shady, rocky embankment, pine-oak forest, 28° 21’ N, 108° 59’ W, on rhyolite, 1680 m alt., 30 May 1975, T. H. Nash III 10917 (ASU).

Diffractive acid chemotype: MEXICO. Baja California Sur: Lower foothills NE of the Sierra Laguna along road to intersection to Thermopilas; 23° 42’ 15” N, 109° 59’ 9” W, thorn forest-Acacia, Lysiloma, Jatropha; on Acacia, 5 Jan. 1998, T. H. Nash III 39712 (ASU); Sierra de la Laguna. Along the path to Santiago, E side of the mountain pass, close to a meadow, 23° 30’ N, 110° 00’ W, ca. 1800 m alt., on trunks and branches, 15 Feb. 1993, R. Moberg 10290 (UPS). Chihuahua: southwestern Chihuahua, between Quirire and Basigochic and drainagings of Río Batopilas and Río Cobre in forest of Quercus omissa, Pinus engelmannii and Picea chihuahuana, Almus sp.; rocky slope above stream, 2150 m alt., 31 July 1977, W. A. Weber & R. Bye s. n.; Weber, Lich. Exs. n° 575 as U. strigosa (ASU); Copper Canyon, near Diversidero, Ponderosa pine, Douglas fir and Oak forest, 2500 m alt., on wood, 8 March 1978, R. Rosentretre 1013 (ASU); Sierra Madre Occidental, near continental divide along secondary road, 25 km from Cascada de Baseseachic, 28° 08’ N, 107° 55’30” W, pine-oak-Douglas fir forest, ca. 2570 m alt., 23 May 1992, H. Kashiwadani 37119 (TNS).

Usnea silesiaca Motyka


Notes: Since my attempt (CLERC 1999) to conserve Usnea madeirensis against U. silesiaca failed (P. M. Jørgensen, pers. comm.) we shall now utilize the little
used and mostly misunderstood binomial *Usnea silesiaca* for this very polymorphic species (see Clerc 1991; James et al. 1992; Halonen et al. 1998 for the diagnostic characters).

This refusal by the Committee of nomenclature of the proposition to avoid two disadvantageous nomenclatural change is a small but distinct backward movement in the attempts made by several sytematists to proceed towards a stabilisation of the nomenclature. Refusal of such propositions leads to the promotion of inaccuracies and confusions in nomenclature that the very code itself is designed to prevent. It will further contribute to reinforce among the users of the products of systematics their poor consideration for this science.

Acknowledgements

I am very grateful to H. Mayrhofer and U. Passauer and their staffs for the facilities they granted to me in GZU and W, respectively. I am much indebted to the curators and owners of the herbaria listed in the chapter ‘Material and methods’. I thank Hélène Geser (CJB Geneva) for technical assistance with TLC. I also thank Nicolas Wyler (CJB Geneva) for providing the maps and Michelle Price (CJB Geneva) for correcting the English.

References


