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Aspicilia uxoris, an epiphytic species from Algeria, Morocco and Spain

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Abstract: *Aspicilia uxoris* is proposed as a new combination for a species known from Algeria, Morocco and Spain. It grows on bark and lignum of *Cedrus atlantica*, *Juniperus* spp. and *Pinus halepensis* in the western Mediterranean Region. It is characterized by spore and conidia sizes, granular epihymenium on the surface of paraphyses and a typical apothecial structure and development. The ecology and distribution of the species and a comparison with other epiphytic taxa of the genus are discussed. Notes on the identity of *Aspicilia lignicola* are provided. Lectotypes for *Aspicilia cinerea* var. *vulgaris* f. *lignicola*, *Lecanora lignicola* and *Lecanora uxoris* are designated.

Key words: *Ascomycota*, *Aspicilia lignicola*, conifers, *Hymeneliaceae*, lectotypes, taxonomy

Introduction

During field work over the past few years for the Iberian Peninsula Lichen Flora project, several specimens of *Aspicilia* A. Massal. were collected from conifers (*Juniperus* L. spp.) in Central and SE Spain. The material was originally identified as *Aspicilia lignicola* ''(Anzi) Hue'' (Fos 1998; Fos & Barreno 1998; Martínez *et al*. 2001, 2002, 2003; Aragón *et al*. 2004, 2006), a rare epiphytic species previously reported from Algeria (Esnault 1985) and from a few localities in the Alps: Austria (Türk & Hafellner 1999; Hafellner & Türk 2001), France (Ozenda & Clauzade 1970, as *Lecanora lignicola* (Anzi) Zahlbr.; Clauzade & Roux 1985), Germany (Wirth 1987) and Italy (Hue 1910; Nimis 1993; Nimis & Martellos 2003). However, a critical investigation of the Algerian and Spanish material and a comparison with original material of *Aspicilia lignicola* have shown that it belongs to a different species. After an intensive search for an adequate name and for more material, the Algerian and Spanish species was found to be identical to *Lecanora* (*Zeora*) *uxoris* Werner, a species described from conifers in Morocco (Werner 1938, 1974; see also Egea 1996). The morphological characters of *L. uxoris*, mainly apothecia development, asci, paraphyses and spore type, reveal that it belongs in the genus *Aspicilia*, and consequently a new combination is proposed here. A description, complementary information on the distribution and ecology of the species, and a comparison with other epiphytic *Aspicilia* species taken from the bibliography are included. Notes on the identity of *Aspicilia lignicola* are given, and three lectotypes are also selected here.

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Material and Methods

The study was carried out using specimens from 29 collections deposited in BC, MA, MAF, O, PC, TO and the private herbarium of J. Esnault (hb. Esnault, Rennes). The species description is based on this material. The lichen specimens were examined and photographed using a Nikon SMZ 1500 stereomicroscope and a Nikon Eclipse 80i microscope fitted with bright field (BF) and differential interference contrast (DIC), both coupled to a Nikon DXM 1200F digital camera. To combine successive photographs at

different focal levels we used the free Public Domain software CombineZ5 by Alan Hadley (http://www.hadleyweb.pwp.blueyonder.co.uk). Hand-cut sections and squash preparations of the material were examined in water, Lugol's iodine solution or in lactophenol-cotton blue. Pre-treatment with 10% KOH solution (K) before applying Lugol's iodine solution (I) is indicated in the text as K/I. All measurements were made on specimens mounted in water. Extreme values have been placed between brackets where they represented no more than 10% of the measured character. For spore shape terminology and length:breadth (l:b) ratio method we followed Bas (1969: 321–322). Current mycological terminology is used and generally follows Kirk *et al.* (2001), and phytoclimatic terminology Rivas-Martínez (1987). The standard methods of thin-layer chromatography (TLC) (Culberson & Ammann 1979; Culberson *et al.* 1981; Culberson & Johnson 1982) were used for the identification of lichen substances. The distribution map was drawn using the freeware PanMap software (Diepenbroek, M., Grobe, H. & Sieger, R. PanMap 2000; http://www.pangaea.de/Software/PanMap).

Additional material used for comparison. Aspicilia contorta (Hoffm.) Kremp. **Spain:** *Navarra*: Amezcoa Baja, Zudaire, 640 m, orientación sur, *Pulmonario-Quercetum fagineae*, sobre *Quercus faginea*, en la base del tronco, 5 viii 1984, *B. Aguirre* (MAF).

Aspicilia crespiana V. J. Rico. **Spain:** *Madrid*: San Martín de Valdeiglesias, road from Cadalso de los Vidrios to Pelayos de la Presa, km 3, Corcobada, 740 m, overgrowing *Grimmia* sp., on horizontal sun-exposed granitic rocks, 30TUK843668, 1988, *V. J. Rico* 1249/1 *&* *M. A. Florido* (MAF—holotype, isotypes).

Megaspora verrucosa (Ach.) Hafellner & V. Wirth. **Spain:** *Aragón*, *Huesca*: Biescas, Valle de Tena, Ladera norte de Peña Telera, Ibón de Piedrafita, 1600–1700 m, 30TYN1316, 10 ix 1994, *A. Crespo et al.* (MAF).

The Species

Aspicilia uxoris (Werner) V. J. Rico, Aragón & Esnault comb. nov.

Lecanora (*Zeora*) *uxoris* Werner, *Bull. Soc. Sci. Nat. Maroc* **18**(2)**:** 130–131 (1938) (basionym); type: [Morocco: Ifrane: road from Azrou to Midelt,] Ad corticem *Juniperi thuriferae* cum *Parmelia jacquesii* prope lacum Si[di] Ali-ou-Mohand dictum in Atlante Medio ad alt. 2100 m, [33°05′N, 05°00′W,] 30 viii [19]34 (BC hb. Werner s.n.—lectotype, selected here; BC hb. Werner s.n.—isolectotype, thalli from the upper part of sheet).

(Figs 1–4)

Thallus corticolous or lignicolous, on *Cedrus atlantica* (Endl.) Manetti, *Juniperus oxycedrus* L., *J. phoenicea* L., *J. thurifera* L. or *Pinus halepensis* Miller, crustose, episubstratal, irregular, continuous, areolate to rimose-areolate, rarely slightly squamulose, up to 15 cm wide, white to whitish grey, chalky or creamy, dull, sometimes with a whitish to greyish marginal prothallus. *Areoles* 0·6–3·5 mm wide, contiguous, irregular, angular to rounded, flat to convex, sometimes verrucose; surface smooth or commonly roughened, commonly pruinose. *Cortex* 15–65(–125) µm thick, paraplectenchymatous, totally or partially filled with coarse irregular to cubic granules partially dissolving in K and C (some of them are calcium oxalate crystals, refracting with polarized light), hyaline to grey because of granules and sometimes brownish in its upper part, sometimes indistinct because of granules; cells rounded to slightly elongated, cell lumina 2·5–12(–15) µm wide; epinecral layer up to 20 µm thick, consisting of dead mycobiont cell walls. *Photobiont* chlorococcoid, cells 7–15(–20) µm wide; arranged in a regular to rarely irregular layer (40–)60–80(–95) µm thick, commonly continuous. *Medulla* up to 310(–515) µm thick, paraplectenchymatous in upper part to ± loose, filled with coarse irregular to cubic granules partially dissolving in K and C (most of them are calcium oxalate crystals), hyaline to grey because of granules; cells leptodermatous to ± mesodermatous, hyphae often indistinct because of granules; hyphae clearly penetrate the first two rows of phorophyte cells.

Apothecia numerous, 1 to several per areole, up to 2·1 mm wide, simple or composite, sometimes regenerating, orbicular to slightly angular by pressure, or irregular and flexuose especially when composite, erumpent when young becoming sessile and adnate; cryptolecanorine or nearly urceolate at first, becoming lecanoroid or lecideoid when mature; margin pruinose and with an irregularly lacerated and raised thalline rim when young, remaining later distinct and ± prominent, either concolorous with the thallus (lecanoroid), brownish to black (lecideoid) or more commonly pruinose. *Disc* concave when young, plane to slightly convex when mature, brown to black or

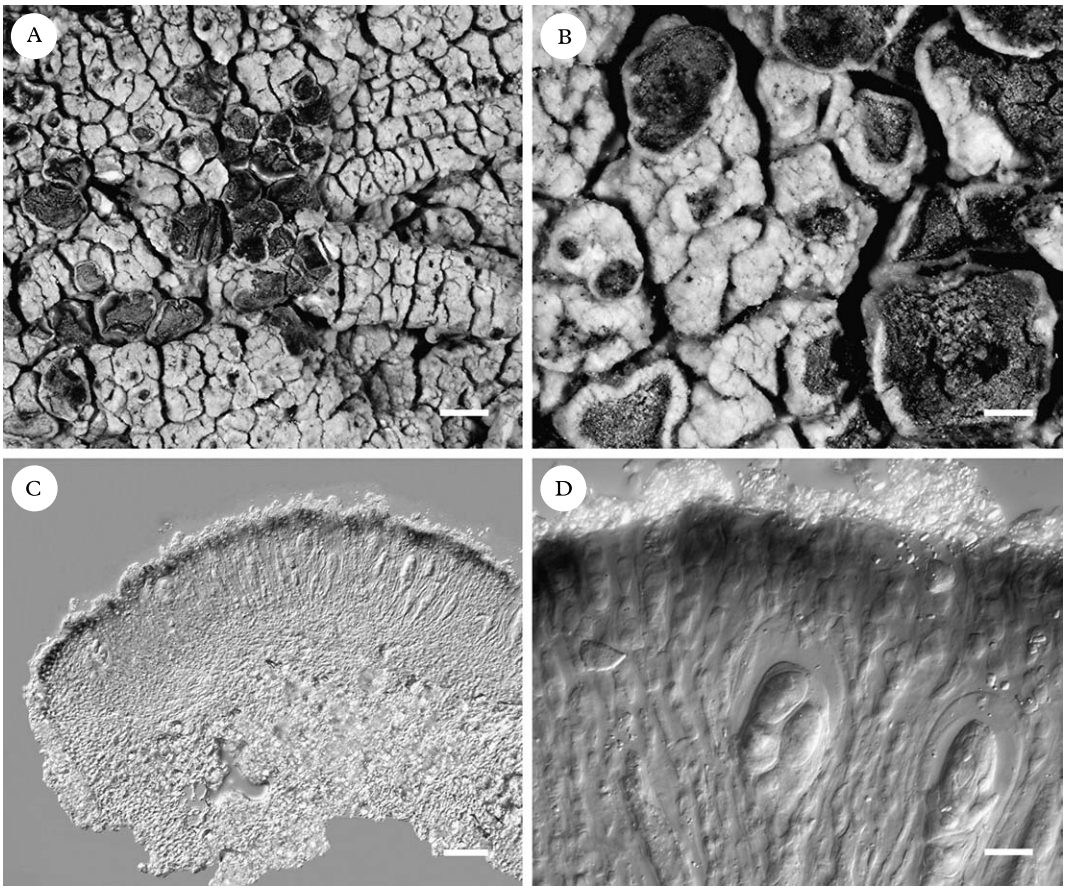

FIG. 1. *Aspicilia uxoris* (lectotype). A, general habit; B, detail of apothecia and areoles; C, section of young apothecia (DIC); D, detail of hymenium showing typical granules on the surface of paraphyses tips (DIC). Scales: A=1 mm; B=0·5 mm; C=50 μm; D=10 μm.

pruinose, surface slightly roughened, with button-like or linear pruinose protrusions of sterile tissue when composite, sometimes degenerated or eroded, most probably due to animals, and then at times regenerating. *Thalline exciple* distinct, well-developed and persistent in most mature lecanoroid apothecia, sometimes excluded, concolorous with thallus or commonly with whitish pruina, continuous with the thallus, up to 200 μm thick. *True exciple* up to 155 μm wide laterally, highly variable in development and thickness, reduced (with up to 5 cell rows in lecanoroid and some cryptolecanorine apothecia) to extended and ± flabellate (lecideoid), sometimes with greyish irregular granules; outer rim up to 25 μm wide, dark brown to brownish, ± paraplectenchymatous with *textura globularis*, cell lumina 3–8 μm wide; inner cells ± radiating with *textura prismatica*, brownish to commonly hyaline, cell lumina up to 12 μm long. *Hymenium* (80–)90–140(–160) μm tall, conglutinated, hyaline, subhymenium hyaline; epihymenium up to 40 μm tall, with dark brown to brownish or slightly olivaceous pigment, finely granular on the surface and rarely between paraphyses tips, granules mainly rectangular to irregular (smaller than those found in the cortex and medulla) partially dissolving in N, K and C (some of them are calcium oxalate crystals).

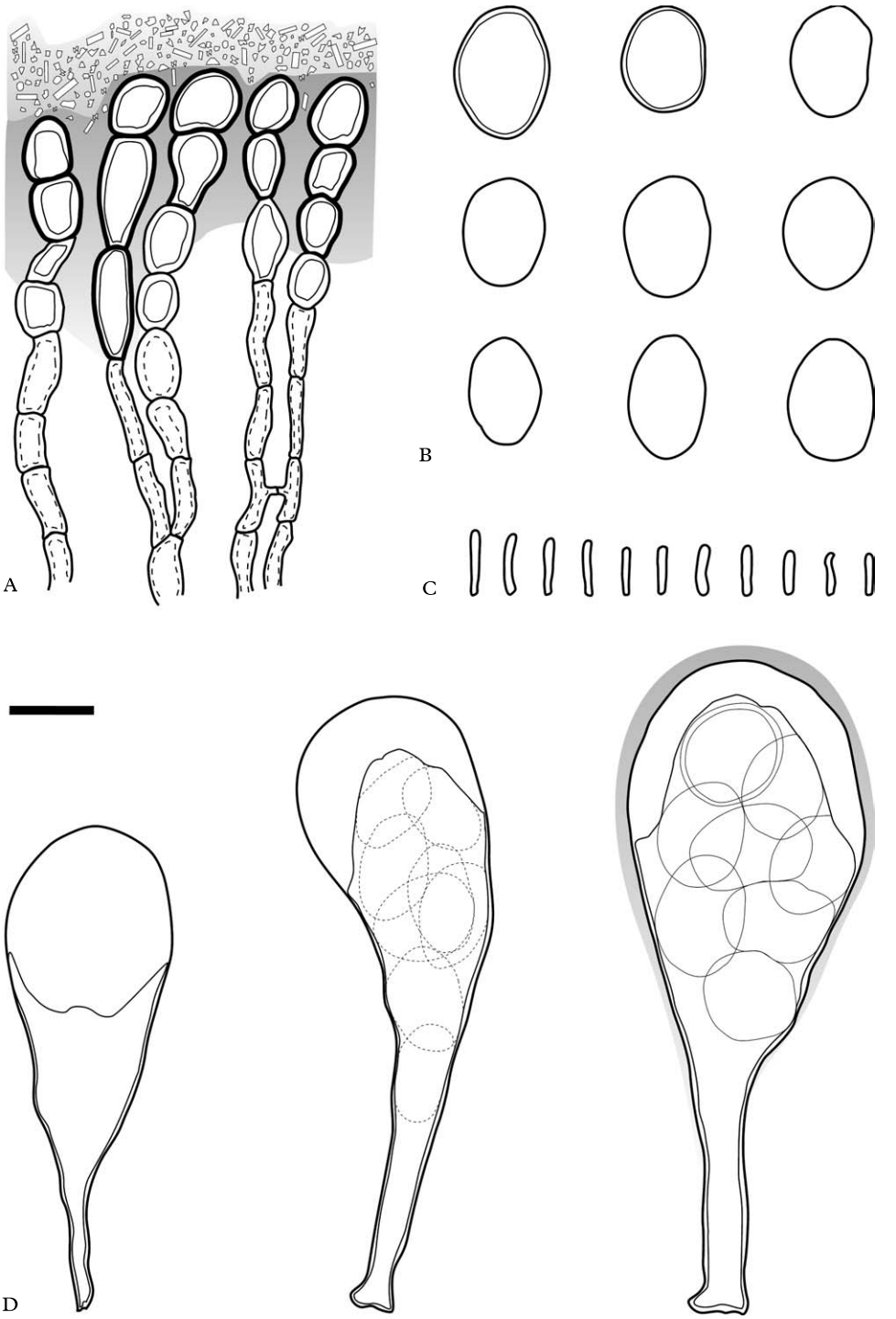

FIG. 2. *Aspicilia uxoris* (lectotype). A, paraphyses with fine granules on the surface; B, ascospores; C, conidia; D, asci, the right one after treatment with I. Scale=10 μm.

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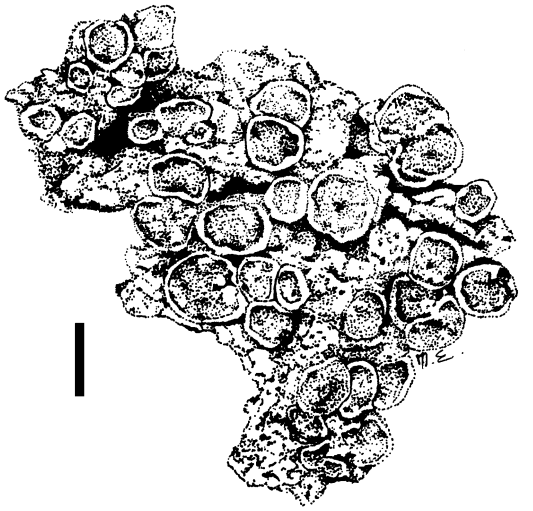

FIG. 3. *Aspicilia uxoris*, detail of habit. (*J. Esnault* 2036, hb Esnault). Scale=1 mm.

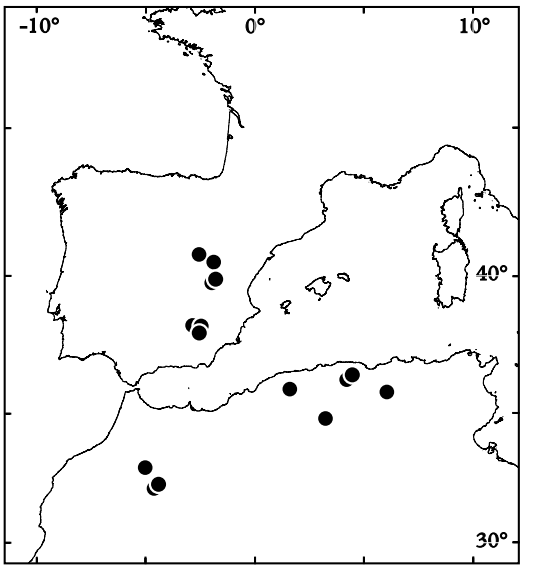

FIG. 4. Known distribution of *Aspicilia uxoris*.

Paraphyses simple to rarely branched and anastomosed, moniliform, with 1–7 rounded cells at the tips, brown pigmented apices, apical cells 3–9 µm wide. *Hypothecium* hyaline, 20–110(–125) µm tall, commonly without algal layer underneath. *Asci* clavate, mature when 70–100(–120) × 19–30 (–36) µm, 8-spored; apical apparatus thick, K/I −, with a fuzzy amyloidal coat. *Ascospores* hyaline, unicellular, thin-walled, (10–) 12–17 × 7–12 µm (n=310), l:b ratio of (1·15–)1·2–*1·64*–2(–2·28), (broadly ellipsoid–) ellipsoid to elongate (–cylindrical).

Pycnidia common, immersed, indistinct to rarely open when old, unilocular to multilocular, occurring singly or in clusters; ostiole hyaline to brownish or black; wall hyaline, cells with ± *textura angularis*. *Conidia* 5–8 × 0·75–1·25 µm, bacilliform, straight.

Chemistry and spot tests. No lichen substances detected by TLC; cortex and medulla K−, C−, KC− and I−; epihymenium pigment HNO_3+ light emerald green (especially near the edge).

Distribution and ecology. According to our data, *Aspicilia uxoris* has a limited distribution and is currently known from the mountainous calcareous areas of Algeria, Morocco and Spain (Fig. 4). This epiphytic lichen grows on the acid bark and wood of *Cedrus atlantica*, *Juniperus oxycedrus*, *J. phoenicea*, *J. thurifera* and *Pinus halepensis*, at altitudes ranging from 900 to 2100 m a.s.l. It has been collected in dry to per-humid, temperate to extremely cold sites (Barbero *et al.* 1981), from the mesomediterranean to the upper oromediterranean belts of the western Mediterranean Region.

The current distributional range of this lichen recalls that of *Juniperus thurifera* and partially of *Cedrus atlantica*, two conifers respectively from the western Mediterranean and North-West African Mediterranean Region (Castroviejo *et al.* 1986; Vidakovik 1991; Farjon 2005) which could represent its preferred phorophytes. The lichens growing on *Cedrus* and *Juniperus* spp. from Morocco and Spain have been studied by several authors (e.g.: Werner 1970; Crespo & Vězda 1985; Burgaz *et al.* 2002; Aragón *et al.* 2004, 2006). Some epiphytic lichens growing on those phorophytes, such as *Buellia cedricola* Werner (Burgaz & Sarrión 1995; Martínez *et al.* 2001), have a similar known distribution in Europe and North Africa to *Aspicilia uxoris* and could represent part of

an old floristic and ecologically threatened contingent (Barreno 1991; Martínez *et al.* 2003). *Buellia cedricola* is also known from semi-open coniferous forests in western North America (Nordin 2000).

The material from Morocco was collected on wood of *Cedrus atlantica* and on bark of *Juniperus oxycedrus* and *J. thurifera*, growing with *Caloplaca cerina* (Ehrh. ex Hedw.) Th. Fr., *Physconia grisea* (Lam.) Poelt and *Xanthoria parietina* (L.) Th. Fr. (Werner 1938, 1974). The Moroccan cedar and juniper forests are mainly distributed in the cold to very cold supramediterranean to oromediterranean belts, in subhumid to perhumid situations, of the Moyen and Haut Atlas (Barbero *et al.* 1981; Benabid 1982; Benabid & Fennane 1994).

In Algeria, *Aspicilia uxoris* was collected on the bark and occasionally on stumps of *Cedrus atlantica*, and one specimen on the bark of *Pinus halepensis* growing with *Megaspora verrucosa* (incl.: *M. verrucosa* var. *mutabilis* (Ach.) Nimis & Cl. Roux) (Esnault 1985, as *A. lignicola*). The Algerian cedar forests are also mostly distributed in the cold to very cold supramediterranean to oromediterranean belts, in humid to per-humid situations, of the Tellien and Saharien Atlas (Yahi *et al.* 1999; Meddour 2002). The *Pinus halepensis* forests of the eastern Saharien Atlas, where *Aspicilia uxoris* was collected, are found in the cool to temperate and sub-humid to dry mesomediterranean belt (Quezel 1986).

In Spain, material of *Aspicilia uxoris* from Cuenca, Guadalajara and Teruel provinces (*cf.* Martínez *et al.* 2001, 2002, 2003, as *A. lignicola*) came from the bark and wood of old *Juniperus thurifera* trees, usually growing with *Anaptychia ciliaris* (L.) Körb., *Diplotomma alboatrum* (Hoffm.) Flot., *Lecanora paramerae* I. Martínez, Aragón & Lumbsch, *Megaspora verrucosa*, *Pertusaria albescens* (Huds.) M. Choisy & Werner and *P. paramerae* A. Crespo & Vězda. *Aspicilia uxoris* is locally common in the Guadalajara province, forming populations of 20 or more specimens per tree. The typical vegetation of these cold supramediterranean continental areas of Central-East Spain (called parameras) consists of open forests on limestones, mostly dominated by *J. thurifera*. The material from the Jaén province (Aragón *et al.* 2006, as *A. lignicola*) grew in the mesomediterranean belt on the bark of *Juniperus phoenicea* and *J. oxycedrus*. It is frequently found together with *Buellia griseovirens* (Turner & Borrer ex Sm.) Almb., *Caloplaca herbidella* (Hue) H. Magn., *Fuscopannaria olivacea* (P. M. Jørg.) P. M. Jørg. and *Megaspora verrucosa* (*cf.* Aragón *et al.* 2004, sub *A. lignicola*). These last juniper species occur under the canopy of holm-oaks, on limestone slopes in deep valleys and steep ravines. The record from Cáceres province in Spain (Fos 1998; Fos & Barreno 1998, as *A. lignicola*) refers to a *Lecanora* sp., since the specimen has *Lecanora*-type asci (Purvis *et al.* 1992) and the ascospores are smaller (9–10 × 5–6 μm) than those of *A. uxoris*.

Remarks. *Aspicilia uxoris* is well characterized by its epiphytic habit, spore and conidia sizes, commonly granular cortex and medulla, finely granular epihymenium mainly on the surface of the paraphyses and typical apothecial structure and development. The pruinose cover of the thallus and apothecia is very variable, especially in the pruinose and chalky specimens growing on *Cedrus atlantica* and *Juniperus thurifera*, the optimal phorophytes of this lichen. A similar pattern of variation occurs with apothecia development; thalli with a very high proportion of composite apothecia being more frequent on optimal phorophytes than those with simple ones. Frequently, the HNO_3-reaction in the epihymenium is clearly visible only in the contact area of the hymenium and the exciple.

The initial cryptolecanorine and erumpent ascomatal structure, the ascus type with a thick, non-amyloid apical apparatus, the moniliform paraphyses, the HNO_3+ light emerald green epihymenium, the thin-walled ascospores and the conidium morphology, indicate that the species belongs in *Aspicilia* subgen. *Aspicilia* (Clauzade & Roux 1984; Esnault 1985; Hafellner 1991; Purvis *et al.* 1992). The apothecia

of *A. uxoris* are similar in morphology and development to those described in *A. crespiana* (Rico 1999), a species of the *A. calcarea* (L.) Mudd. complex, and this could indicate a close relationship of *A. uxoris* to acidophilous taxa of that complex. In both species, the young apothecia are typically cryptolecanorine, ± immersed with reduced true exciple and ± raised margin, appearing as nearly urceolate at maturity, whether lecanoroid or lecideoid, almost all of them with a prominent margin. *Aspicilia crespiana* is clearly separated from *A. uxoris* by its muscicolous, squamulose thallus with fungal rhizomorphs, longer conidia and by the absence of granules and crystals in its epihymenium (Sanders & Rico 1992; Rico 1999; Sanders 1999). In addition, the main difference between these species lies in the number of spores per ascus, which is up to 6 in *A. crespiana* (as in all species of the *A. calcarea* complex; *cf.* Clauzade & Roux 1984) but always 8 in *A. uxoris*. Further detailed analyses are needed to clarify their presumed relationship.

There are some morphs of *Aspicilia contorta* [e.g. *Aspicilia lundensis* (Fr.) Zahlbr., considered a synonym of *A. contorta*, *cf.* Clauzade & Roux 1985, Wirth 1995], another member of the *A. calcarea* complex, which rarely grow on lignum. This species has up to 6-spored asci and larger ascospores than *A. uxoris* (*cf.* Ekman & Fröberg 1988; Wirth 1995; Rico 1999).

Aspicilia is a difficult genus containing many confusing species with many unresolved taxonomic and nomenclatural problems, and requires a thorough revision (Purvis *et al.* 1992). Only a few species have been described as epiphytic (corticolous and/or lignicolous). Most of the names of the epiphytic species are poorly known and dubious and await critical revision; some of them probably refer to lignicolous morphs of normally saxicolous species (Nimis 1993). The following dubious taxa are quite different from *Aspicilia uxoris*, as judged from their principal distinguishing characters taken from the literature. *Aspicilia xyloxena* (H. Magn.) R. Sant. *ad int.* (*cf.* Santesson 1993; Randlane & Saag 2004) has a dark indistinctly areolate thallus crust and immersed apothecia with a poorly developed true exciple, growing on unidentified weathered wood (Magnusson 1939, as *Lecanora xyloxena* H. Magn.). *Aspicilia trunciseda* (H. Magn.) R. Sant. *ad int.* (Santesson 1993) has a bluish grey rimose thallus, small irregular apothecia and non-moniliform paraphyses, growing on wood in a dusty situation (Magnusson 1939, as *Lecanora trunciseda* H. Magn.).

The monotypic genus *Megaspora* (Clauzade & Cl. Roux) Hafellner & V. Wirth is related to *Aspicilia* (Ivanova & Hafellner 2002). *Megaspora verrucosa* clearly differs from *Aspicilia uxoris* by its very large and thick-walled spores (35–50 × 25–39 µm), immersed apothecia in thalline verrucae and habitat, primarily growing on mosses and plant debris (Purvis *et al.* 1992; Wirth 1995).

Additional specimens examined. **Algeria:** *Batna*: col de Telmet, 1750 m, ècorce de cèdre, 1985, *J. Esnault* 2036 *& J. C. Masse* [hb. Esnault, MAF, sub *Aspicilia lignicola* (Anzi) Hue]. *Bouira*: Djurdjura National Park, Tikdja, mountée du Lac Goulmin aprés le col, 1800 m, cèdre, *J. Esnault* 1837 (hb. Esnault, sub *A. lignicola*). *Djelfa*: Monts des Ouled Naïl, forêt de Djelfa, sur pin d'halep, 1982, *J. Esnault* 1054 (hb. Esnault, sub *A. lignicola*). *Tissemsilt*: Théniet El Had, Ouarsenis, ècorce de cèdre, *J. Esnault* 1560 (hb. Esnault, sub *A. lignicola*). *Tizi Ouzou*: Djurdjura National Park, Ras Tigounatine, versant nord, 1750 m, souche de cèdre, 1985, *J. Esnault* 1055 (hb. Esnault, sub *A. lignicola*).—**Morocco:** *Khenifra*: Midelt, Grand-Atlas Oriental, massif de l'Ayachi: Cédraie près du cirque de Jafar, 17–1800 m, sur bois de Cèdre (n° 60) avec *Xanthoria parietina* (L.) Th. Fr. v. *aureola* (Ach.) Th. Fr. f. *congranulata* (Cromb.) B. de Lesd., 20 vii 1938, *R. G. Werner* (BC-hb. Werner, sub *Lecanora uxoris* Werner); *ibid.*: près piste d'entrée du cirque, 2000 m, sur *Juniperus oxycedrus* (n° 221), 20 vii 1938, *R. G. Werner* (BC-hb. Werner, sub *L. uxoris*).—**Spain:** *Andalucía, Jaén*: Villacarrillo, Sierra de Las Villas, Lancha de la Escalera, 30SWH0814, 1450 m, sobre *Juniperus phoenicea*, 1998, *G. Aragón* 1062/98 *& I. Martínez* (MAF, sub *A. lignicola*); La Iruela, Sierra de Segura, río Borosa, cerrada de Elías, 30SWH1405, 1000 m, sobre *J. oxycedrus*, 1995, *G. Aragón* 712/95 *& I. Martínez* (MAF, sub *A. lignicola*); Santiago-Pontones, Sierra de Segura, río Aguamulas, cerca del Cortijo del Mulón, 30SWH1810, 950 m, sobre *J. oxycedrus*, 1995, *G. Aragón* 237-3/95, 240/95 *& I. Martínez* (MAF, sub *A. lignicola*); *ibid.*: 1995, *G. Aragón* 572/95 & *I. Martínez* (MAF, sub *A. lignicola*). *Aragón*, *Teruel*: Noguera, Sierra del Tremedal, barranco de las Fuentes, 30TXK1676, 1480 m, sabinar, sobre *Juniperus thurifera*, 1998, *G. Aragón & I. Martínez* 3918 (MA, sub *A. lignicola*). *Castilla-La Mancha*, *Cuenca*: Campillos-Sierra, Serranía

de Cuenca: Valdeliebres, 1320 m, 30TXK1337, sobre *J. thurifera* L., sabinar-encinar, 1998, *G. Aragón & I. Martínez* 2745 (MAF, sub *A. lignicola*); *ibid.*: Majada de la Ceja, 30TWK9045, 1400 m, sabinar, sobre *J. thurifera*, 1998, *G. Aragón & I. Martínez* 3214 (MA, MAF, sub *A. lignicola*). *Castilla-La Mancha*, *Guadalajara*: Zaorejas, carretera de Villanueva de Alcorón a Zaorejas, cruce a Huertapelayo, 40°43′58·57″N 2°12′35·92″W, 1278 m, sabinar en calizas, sobre *J. thurifera*, 2006, *V. J. Rico* 3622 & *J. Pizarro* (MAF).

Notes on *Aspicilia lignicola*

In *Aspicilia*, the epithet *lignicola* has been introduced twice by Anzi to designate lignicolous morphs of two different siliceous species collected on worked timber in the Alps. Anthropogenic wood, a commonly nutrient-rich environment, is a suitable habitat for colonization of lichens, and among them by normally saxicolous species (Svensson *et al.* 2005; Brightman & Seaward 1977). That is the case of *A. caesiocinerea* and *A. cinerea*, two polymorphic, normally silicicolous species, with wide ecological amplitude (Räsänen 1939; Purvis *et al.* 1992; Nimis 1993; Wirth 1995).

Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold

New synonyms: *Aspicilia lignicola* Anzi ex Hue, *Nouv. Arch. Mus. Hist. Nat.*, *Sér.* 5, **2**(1)**:** 49 (1910).—*Aspicilia gibbosa* var. *lignicola* Anzi, *Anzi*, *Lich. Rar. Langob. Exs.* nº 306 (1863) (*cf.* Saire 1969: 111) [*nomen*, without diagnosis, figure or reference].—*Lecanora lignicola* (Anzi ex Hue) Zahlbr., *Cat. lich. univ.* **5**(3)**:** 328 (1928).—*Urceolaria lignicola* (Anzi ex Hue) Motyka, *Porosti* (*Lichenes*) **2**. *Rodzina Lecanoraceae. Pinacisca*, *Lecidorina*, *Urceolaria*, *Semilecanora*, *Paraplacodium*, *Koerberiella*, *Pseudoplacodium*, *Tephromela* (*Lublin*): 280 (1996); type: N. *Aspicilia gibbosa* (Ach.) f. *lignicola*, [Italy: Lombardia, Sondrio,] ad tegulas ex coniferis in Valle di Dentro (Bòrmio)./Dedit *Anzi* 1862. (PC 74231 (HG 8204)—lectotype, selected here).

Aspicilia lignicola Anzi ex Hue is a validly published name (Hue 1910), and is based on a specimen probably sent to Nylander by Anzi in 1862 (PC 74231) and selected here as lectotype. In 1863 Anzi (*cf.* Saire 1969) had introduced the epithet in his *Anzi*, *Lich. Rar. Langob. Exs.* nº 306 (as *Aspicilia gibbosa* (Ach.) var. *lignicola*), but without diagnosis, figure or reference. Later authors based their opinion, description, combination or simple reference to the taxon on Hue's description and on different specimens of Anzi's exsiccata nº 306, particularly the one deposited in O (revised by A. H. Magnusson and J. Motyka; *cf.* Magnusson 1939). But in all cases the apparent intention was to use Anzi's epithet validated by Hue.

All the material studied of *Aspicilia lignicola*, and probably all specimens of Anzi's exsiccata number, are very similar in general habit, basic features and in the way of preparation, which indicates that they were prepared simultaneously and belong to a single collection, made from one locality at one time. Some specimens (including the lectotype) were probably sent to different authors prior to the distribution of the exsiccata fascicle, which supports the variations in label data (see label data of lectotype and additional specimens). Therefore, we believe that most specimens, if not all, must be considered as authentic material.

The specimens studied of *Aspicilia lignicola*, and also the extensive descriptions by Hue (1910) and Magnusson (1939; *cf.* also 1944) differ from *A. uxoris*, mainly by the absence of granules in the greenish to brown epihymenium, by their larger ascospores (19–26 × 11–15 μm) and conidia (11–19 × 0·5–1 μm), and by the brownish to grey epruinose thalli and crater-like, plane to slightly concave almost epruinose apothecia. These characters plus its K− thalli, reveal a close relationship of *A. lignicola* with *A. caesiocinerea* s.l. (Magnusson 1939; Clauzade & Roux 1985; Purvis *et al.* 1992; Wirth 1995), which is occasionally found on wood (Magnusson 1939). Consequently, we propose *A. lignicola* as a synonym of *A. caesiocinerea* in its current concept.

Unfortunately, we have not been able to check the records of *Aspicilia lignicola* "(Anzi) Hue" from Austria (Türk & Hafellner 1999; Hafellner & Türk 2001), France [Ozenda & Clauzade 1970, as *Lecanora lignicola* (Anzi) Zahlbr.; Clauzade & Roux 1985] and Germany (Wirth 1987).

Additional authentic specimens examined. [**Italy:** *Lombardia*, *Sondrio*:] Ad tegulas ex coniferis in prov. Sondriensi (valle di dentro). [*Anzi*, *Lich. Rar. Langob. Exs.* nº 306] (O, PC, TO, sub *Aspicilia gibbosa* Ach. var.

lignicola); Ad tegulas laricinas in prov. Sondriensi (Valle di Dentro) *Anzi* [Anzi's handwritten label] (PC hb Eggerth ex hb Krempelhuber, as *Aspicilia gibbosa* (Ach.) f. *lignicola* Anzi).

A. cinerea (L.) Körb.

New synonyms: *Aspicilia cinerea* α. [var.] *vulgaris* ⋆ [f.] *lignicola* Anzi, *Cat. lich. Sondr.*: 60 (1860).—*Aspicilia gibbosa* γ. [var.] *lignicola* (Anzi) Bagl. & Carestia, *Atti. Soc. Crittog. Ital.* **2:** 224 (1880).—*Lecanora gibbosa* f. *lignicola* (Anzi) Zahlbr., *Cat. lich. univ.* **5**(2)**:** 314 (1928); type: [Italy: Lombardia, Sondrio:] Ad tegulas ex coniferis in montibus Bormiensibus (Val Furva) [*Anzi*, *Lich. Rar. Langob. Exs.* 130] (TO s.n.—lectotype, selected here, the sample with five wood portions, as *Aspicilia cinerea* f. *lignicola* Anzi; O s.n., TO s.n.—isolectotypes).

Anzi (1860: 60) validly described *Aspicilia cinerea* α. [var.] *vulgaris* ⋆ [f.] *lignicola* Anzi, but unfortunately, Anzi's original collections were scattered in different herbaria (D. Isocrono and M. Tretiach *in litt.*; Piervittori & Pistarino 1990; Tretiach & Dallai 1990), and only material of his exsiccatae have been located and examined. One year later (in 1861, *cf.* Saire 1969) the *Anzi*, *Lich. Rar. Langob. Exs.* n° 130 (as *Aspicilia cinerea* f. *lignicola* Anzi) was distributed, including in the printed label a reference to the original valid description (Anzi 1860: 60) and one of the localities cited in the protologue. Consequently, we selected here as lectotype the sample with five wood portions preserved in TO.

The studies of three collections of this exsiccatum number reveals that it is conspecific with the variable species *Aspicilia cinerea* in its current concept (*cf.* Magnusson 1939; Clauzade & Roux 1985; Purvis *et al.* 1992; Wirth 1995), a normally siliceous species occasionally found on wood (Hafellner & Türk 2001), and simply represents a morph found on worked timber. The specimens have a K+ red (crystals) rimose thallus, cortex and epihymenium with only a few granules, immersed and concave mature apothecia, spores of 14–20 × 7–12 µm and conidia of 16–21 × 0·5–1 µm, characters that clearly separate them from *A. uxoris*.

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References

Anzi, M. (1860) *Catalogus Lichenum quos in Provincia Sondriensi Collegit et Ordinavit et in Ordinem Systematicum Digessit Presbyter M. Anzi*. Novo Como: Carolus Franchi.

Aragón, G., Sarrión, F. J. & Martínez, I. (2004) Epiphytic lichens on *Juniperus oxycedrus* L. in the Iberian Peninsula. *Nova Hedwigia* **78:** 45–56.

Aragón, G., Rico, V. J. & Belinchón, R. (2006) Lichen diversity from Cazorla, Segura and Las Villas Biosphere Reserve (SE Spain). *Nova Hedwigia* **82:** 31–50.

Barbero, M., Quézel. P. & Rivas-Martínez, S. (1981) Contribution a l'étude des groupements forestiers et préforestiers du Maroc. *Phytocoenologia* **9:** 311–412.

Barreno, E. (1991) Phytogeography of terricolous lichens in the Iberian Peninsula and the Canary Islands. *Botanika Chronika* **10:** 199–210.

Bas, C. (1969) Morphology and subdivision of *Amanita* and a monograph of its section *Lepidella*. *Persoonia* **5:** 285–579.

Benabid, A. (1982) Bref aperçu sur la zonation altitudinale de la vegetation climacique du Maroc. *Ecologia Mediterranea* **8:** 301–315.

Benabid, A. & Fennane, M. (1994) Conaissances sur la végétation du Maroc: Phytogeographie, Phytosociologie et séries de vegetation. *Lazaroa* **14:** 21–97.

Brightman, F. H. & Seaward, M. R. D. (1977) Lichens of man-made substrates. In *Lichen Ecology* (M. R. D. Seaward, ed.): 253–293. London: Academic Press.

Burgaz, A. R. & Sarrión, F. J. (1995) *Buellia cedricola* new to Europe. *Lichenologist* **27:** 305–308.

Burgaz, A. R., Aharchi, Y. & Enabili, A. (2002) Epiphytic lichens of *Cedrus atlantica* in the Rif mountains (N Morocco). *Nova Hedwigia* **74:** 429–437.

Castroviejo, S., Laínz, M., López González, G., Montserrat, P., Muñoz Garmendia, F., Paiva, J. & Villar, L. (eds) (1986) *Flora iberica. Plantas Vasculares de la Península Ibérica e Islas Baleares. Vol. I* (*Lycopodiaceae-Papaveraceae*). Madrid: Real Jardín Botánico-C. S. I. C.

Clauzade, G. & Roux, C. (1984) Les genres *Aspicilia* Massal. et *Bellemerea* Hafellner et Roux. *Bulletin de*

la Société Botanique du Centre-Ouest, Nouvelle série **15:** 127–141.

Clauzade, G. & Roux, C. (1985) Likenoj de Okcidenta Europo, Illustrita determinlibro. *Bulletin de la Société Botanique du Centre-Ouest, Nouvelle série—Numéro Spécial* 7 **1985:** 1–893.

Crespo, A. & Vězda, A. (1985). *Pertusaria paramerae* sp. nov., un liquen epífito de los sabinares españoles. *Anales del Jardín Botánico de Madrid* **41:** 251–255.

Culberson, C. F. & Ammann, K. (1979) Standardmethode zur Dünnschichtchromatographie von Flechtensubstanzen. *Herzogia* **5:** 1–24.

Culberson, C. F., Culberson, W. L. & Johnson, A. (1981) A standardized TLC analysis of β-orcinol depsidones. *Bryologist* **84:** 16–29.

Culberson, C. F. & Johnson, A. (1982) Substitution of methyl *tert*.-butyl ether for diethyl ether in the standardized thin-layer chromatographic method for lichen products. *Journal of Chromatography* **238:** 483–487.

Egea, J. M. (1996) Catalogue of lichenized and lichenicolous fungi of Morocco. *Bocconea* **6:** 19–114.

Ekman, S. & Fröberg, L. (1988) Taxonomical problems in *Aspicilia contorta* and *A. hoffmannii*—an effect of hybridization? *International Journal of Mycology and Lichenology* **3:** 215–225.

Esnault, J. (1985) Le genre *Aspicilia* Mass. (Lichens) en Algérie: étude des caractères taxonomiques et de leur variabilité. Unpublished Thése, Universite de Rennes I.

Farjon, A. (2005) *A Monograph of Cupressaceae and Sciadopitys*. Kew: Royal Botanic Gardens.

Fos, S. (1998) Líquenes epífitos de los alcornocales ibéricos. Correlaciones bioclimáticas, anatómicas y densimétricas con el corcho de reproducción. *Guineana* **4:** 1–507.

Fos, S. & Barreno, E. (1998) Fragmenta chorologica occidentalia, lichenes, 6434–6537. *Anales del Jardín Botánico de Madrid* **56:** 130–137.

Hafellner, J. (1991) Die Gattung *Aspicilia*, ihre Ableitungen nebst Bemerkungen über cryptolecanorine Ascocarpsorganisation bei andere Genera der *Lecanorales* (Ascomycetes lichenisati). *Acta Botanica Malacitana* **16:** 133–140.

Hafellner, J. & Türk, R. (2001) Die lichenisierte Pilze Österreichs—eine Checkliste der bisher nachgewiesenen Arten mit Verbreitungsangaben. *Stapfia* **76:** 3–167.

Hue, A. M. (1910) Lichenes morphologice et anatomice disposuit (continuatio). *Nouvelles Archives du Muséum d'Histoire Naturelle de Paris, ser.* 5, **2:** 1–120.

Ivanova, N. V. & Hafellner, J. (2002) Searching for the correct placement of *Megaspora* by use of ITS1, 5.8S and IS2 rDNA sequence data. *Bibliotheca Lichenologica* **82:** 113–122.

Kirk, P. M., Cannon, P. F., David, J. C. & Stalpers, J. A. (2001) *Ainsworth & Bisby's Dictionary of the Fungi*. 9th edn. Wallingford: CAB International.

Magnusson, A. H. (1939) Studies in species of *Lecanora*, mainly the *Aspicilia gibbosa* group. *Kunglinga Svenska Vetenskapsakademiens Handlingar, Tredge Serien(III)* **17:** 1–182.

Magnusson, A. H. (1944) Key to the Hue's *Aspicilia*. *Revue Bryologique et Lichénologique* **13:** 149–159.

Martínez, I., Aragón, G. & Burgaz, A. R. (2001) Propuesta de áreas de conservación en el Sistema Ibérico Central (España) utilizando la diversidad liquénica. *Botanica Complutensis* **25:** 129–140.

Martínez, I., Aragón, G. & Burgaz, A. R. (2002) Epiphytic lichens and lichenicolous fungi from the Serranía de Cuenca mountains (Sistema Ibérico, Spain). *Herzogia* **15:** 37–49.

Martínez, I., Aragón, G., Sarrión, F. J., Escudero, A., Burgaz, A. R. & Coppins, B. J. (2003). Threatened lichens in the central Spain. *Cryptogamie, Mycologie* **24:** 73–97.

Meddour, R. (2002) Bioclimats, étages et séries de végétation de l'Atlas Blidéen. *Phytocoenologia* **32:** 101–128.

Nimis, P. L. (1993) *The Lichens of Italy. An Annotated Catalogue*. Torino: Museo Regionale di Szience Naturali, Monografie XII.

Nimis, P. L. & Martellos, S. (2003) *A Second Checklist of the Lichens of Italy with a Thesaurus of Synonyms*. Saint Pierre: Museo Regionale di Scienze Naturali, Monografie 4.

Nordin, A. (2000) Taxonomy and phylogeny of *Buellia* species with pluriseptate spores (Lecanorales, Ascomycotina). *Symbolae Botanicae Upsalienses* **33**(1)**:** 3–117.

Ozenda, P. & Clauzade, G. (1970) *Les Lichens*. Étude biologique et flore illustrée. Paris: Masson et Cie.

Piervittori, R. & Pistarino, A. (1990) Le collezioni lichenologiche del Museum Botanicum Horti Taurinensis (TO). *Notiziario della Società Lichenologica Italiana* **3:** 67–70.

Purvis, O. W., Coppins, B. J., Hawksworth, D. L., James, P. W. & Moore, D. M. (eds) (1992) *The Lichen Flora of Great Britain and Ireland*. London: Natural History Museum Publications.

Quezel, P. (1986) Les pins du groupe "Halepensis". Ecologie, Végétation, Ecophysiologie. *Options Mediterraneenes, Série Etudes* **86:** 11–23.

Räsänen, V. (1939) Die Flechtenflora der nördlichen Küstengegend am Laatokka-See. *Annales botanici societatis zoologicae-botanicae fennicae Vanamo* **12:** 1–240.

Randlane, T. & Saag, A. (eds) (2004). *Eesti Pisisamblikud*. Tartu: Ülikooli Kirjastus.

Rico, V. J. (1999) *Aspicilia crespiana*, a new lichen species from southern Europe. *Lichenologist* **31:** 129–139.

Rivas-Martínez, S. (1987) *Mapa de las series de vegetación de España 1: 400 000 y memoria*. Madrid: ICONA, Série Técnica.

Saire, G. (1969) Cryptogamae Exsiccatae—An Annotated Bibliography of Published Exsiccatae of Algae, Lichenes, Hepaticae, and Musci. Introduction, I. General Cryptogams, II. Algae, III. Lichenes. *Memoirs of The New York Botanical Garden* **19:** 1–174.

Sanders, W. B. (1999) Thallus organization and development in the fruticose lichen *Aspicilia californica*, with comparisons to other taxa. *Lichenologist* **31:** 149–162.

Sanders, W. B. & Rico, V. J. (1992) Lichenizing rhizomorphs and thallus development in the squamulose lichen *Aspicilia crespiana* Rico ined. *Botanica Acta* **105:** 449–456.

Santesson, R. (1993) *The Lichens and Lichenicolous Fungi of Sweden and Norway*. Lund: SBT.

Svensson, M., Johansson, P. & Thor, G. (2005) Lichens of wooden barns and *Pinus sylvestris* snags in Dalarna, Sweden. *Annales Botanici Fennici* **42:** 351–363.

Tretiach, M. & Dallai, D. (1990) Le collezioni lichenologiche dell'Università de Modena (MOD). *Notiziario della Società Lichenologica Italiana* **3:** 51–56.

Türk, R. & Hafellner, J. (1999) Rote Liste gefärhdeter Flechten (Lichenes) Österreichs. 2. Fassung. In *Rote Liste gefährdeter Pflanzen Österreichs. 2. Auflage. Grüne Reihe des Bundesministeriums für Umwelt, Jugend und Familie 10* (H. Niklfeld, ed.): 187–228. Graz: Austria Medien Service.

Vidakovik, M. (1991) *Conifers: Morphology and Variation* (Revised and expanded edition translated from Croatian by M. Soljan). Zagreb: Graficki zavod Hrvatske.

Werner, R. G. (1938) Contribution à la flore cryptogamique du Maroc. Fascicule XVII (Algae, Lichens et Fungi). *Bulletin de la Société des Sciences Naturelles du Maroc* **18:** 126–135.

Werner, R. G. (1970) La flore lichénique des chênes a liège et des cédres. *Bulletin de la Société Mycologique de France* **86:** 813–830.

Werner, R. G. (1974) Misión scientifique dans le Grand-Atlas marocain oriental. *Bulletin Académie et Société Lorraines des Sciences* **13:** 55–70.

Wirth, V. (1987) *Die Flechten Baden-Württembergs, Verbreitungsatlas*. Stuttgart: Ulmer.

Wirth, V. (1995) *Flechtenflora. 2. Auflage*. Stuttgart: Ulmer.

Yahi, N., Mediouni, K. & Géhu, J.-M. (1999) Syntaxonomie des groupements a cèdre *Cedrus atlantica* Manetti d'Algerie. *Documents Phytosociologiques, Nouvelle Série*, **19:** 417–431.

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