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Sauteria 15, 2008 Contributions in Honour of Volkmar WIRTH 175-194

The non-sorediate and non-isidiate *Parmelina* species (lichenized ascomycetes, Parmeliaceae) in Switzerland - *Parmelina atricha* (NYL.) P. CLERC reinstated in the European lichen flora

Die soredien- und isidienlosen *Parmelina*-Arten (lichenisierte Ascomyceten, Parmeliaceae) in der Schweiz – Wiedereinführung von *Parmelina atricha* (NYL.) P CLERC in die europäische Flechtenflora

Philippe CLERC & Camille TRUONG

Key words: apothecia, maculae, rhizines, *Parmelina carporrhizans, Parmelina quercina.*

Schlagwörter: Apothecien, Maculae, Rhizinen, *Parmelina carporrhizans, Parmelina quercina.*

Summary: The separation of the corticolous species *Parmelina quercina* (WILLD.) HALE and *P. carporrhizans* (TAYL.) POELT & VEZDA is discussed. The presence of rhizines on the underside of the apothecia has been found to be a weak diagnostic character. *Parmelina quercina* has a non-maculated upper cortex and short rhizines, whereas *P. carporrhizans* has a maculated upper cortex and longer rhizines. *Parmelina atricha* (NYL.) P. CLERC, a species described from the Pyrenees, has been found to be distinct from *P. quercina. Parmelina atricha* is exclusively saxicolous, lacks maculae and has lobules and long rhizines. A key for the European species of the genus *Parmelina* is presented.

Zusammenfassung: Die Unterscheidung der epiphytischen Arten *Parmelina quercina* (WILLD.) HALE und *P. carporrhizans* (TAYL.) POELT & VEZDA wird diskutiert. Das Vorhandensein von Rhizinen an der Unterseite der Apothecien ist ein unzureichendes Unterscheidungsmerkmal. *Parmelina quercina* hat keine Maculae und kurze Rhizinen. *Parmelina carporrhizans* dagegen bildet Maculae und hat längere Rhizinen. *Parmelina atricha* (NYL.) P. CLERC, die aus den Pyrenäen beschrieben wurde, hat keine Maculae,

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kurze Lobulae und lange Rhizinen. Ein Schlüssel der europäischen Arten der Gattung *Parmelina* ist beigefügt.

Introduction

The genus *Parmelina* was introduced by HALE (1974) to accommodate grey coloured *Parmelia* species with marginal cilia, a black lower surface and an upper cortex with a palisade plectenchyma and a pored epicortex. Only four species of this genus were so far known to occur in Europe: two mainly asexually reproducing species: *Parmelina pastillifera* (HARM.) HALE and *P. tiliacea* (HOFFM.) HALE, and two sexually reproducing species: *P. carporrhizans* (TAYL.) POELT & VEZDA and *P. quercina* (WILLD.) HALE.

The separation of *P carporrhizans* and *P. quercina* has always been a matter of debate, one focusing mainly on the presence of rhizines on the lower side of the apothecia, which are used to justify the separation of both taxa: *Parmelina carporrhizans* with rhizines and *P. quercina* without rhizines (ANDERS 1928, HILLMANN 1936). FREY (1952, 1959) was the first to point out that all possible transition forms could be seen between the typical *P. carporrhizans* form with densely rhizinate exciples, and the typical *P. quercina* form without rhizines under the apothecia. CULBERSON (1961), studying the *Parmelia quercina* group in North America, stated that this character was quite variable and that both taxa could not be separated on this basis; an opinion that was shared later by HAWKSWORTH (1972) in his study of the lichens of the Slapton Ley Nature Reserve. Finally, DOBSON & HAWKSWORTH (1976) reported that "examination of European material named as *Parmelia quercina* in BM showed that almost all such specimens had at least some apothecia with rhizinose apothecial margins when these were critically studied" Then, and since the publication of HALE'S monograph (1976) stating that both species were conspecific, no new data has been contributed to the discussion. Thus, floras, checklists and phytosociological works accomodated the status of *P. carporrhizans* in various ways. For instance, SCHAUER (1965), POELT (1969), OZENDA & CLAUZADE (1970), CRESPO (1975), POELT & VEZDA (1977), NIMIS (1993), TÜRK & POELT (1993), KONDRATYUK et al. (1996), SUPPAN et al. (2000), HAFELLNER & TÜRK (2001) and MAYRHOFER et al. (2005) accepted this taxon as a good species, whereas WIRTH (1994, 1995a, 1995b), SCHOLZ (2000), LLIMONA & HLADUN (2001) and STOFER et al. (2007) considered it only as a variety of *P. quercina*. Finally, for JAMES et al. (1977), CLAUZADE & ROUX (1985), ROSE (1995), SEAWARD (1996), SCHEIDEGGER et al. (2002), CLERC (2004) and ROUX et al. (2006), *P. carporrhizans* was not considered worthy of separation and was treated as a synonym of *P. quercina*. Recently,

ARGÜELLO et al. (2007)[1] drew attention to the importance of maculation in separating both species.

([1] The paper of ARGÜELLO et al. (2007) was published after the submission of the present article.)

Material and Methods

Material was studied from the following herbaria: G, H and Z. Thin-layer chromatography (TLC) was applied using the standard technique of CULBERSON & AMMANN (1979) with the solvent B modified according to CULBERSON & JOHNSON (1982), and 6 specimens of each taxon were analysed.

Taxonomy

While investigating the genus *Parmelina* in Switzerland as a test group in the framework of the new "Digital Flora of the Swiss Lichens" project, it became evident that material named *P. quercina* was morphologically and ecologically heterogenous. Most of the specimens have few or numerous rhizines growing on the underside of some apothecia, but only some of them have a distinct maculate upper surface whereas in others maculae are absent. Furthermore, the presence of maculae seems to be strongly correlated with the morphology of the rhizines and, although loosely, with the stronger development of the rhizines under the apothecia. Specimens collected on rocks are never maculated; they have a different morphology than that of the corticolous specimens and are often infected by a lichenicolous fungus that does not occur on corticolous specimens. All these specimens have a C+ red reacting medulla.

Nomenclature

When looking at the protologue of *Parmelia carporrhizans* (TAYLOR 1847), we discovered that TAYLOR indeed observed and described the maculae ["thallo...minutissime albido-reticulato"] and that they have been by all accounts "forgotten" by the lichenologists in the recent times. Thus, *Parmelina carporrhizans* corresponds to the corticolous specimens with a maculate upper surface and often, but not always, with a strong development of rhizines under the apothecia. *Parmelina quercina* corresponds to the corticolous specimens with an upper surface that is not maculate, with or without rhizines under the apothecia. In his monograph, HALE (1976) mentions three synonyms for *P. quercina*: *Parmelia atricha* NYL., *P. budapestinensis* GYELN., and *P. yalungana* ZAHLBR. Of these three species, only *Parmelina atricha* is saxicolous and corresponds morphologically well with the saxicolous specimens of "*P. quercina*"

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Description of the species

All the species described here have a C+ red medulla, a thallus without soralia, isidia and pseudocyphellae, and usually numerous apothecia with red-brown discs and a ± thick thalline excipulum.

Parmelina quercina (WILLD.) HALE, Phytologia **28**: 483. 1974.

Lichen quercinus WILLD., Fl. Berol. Prodr.: 353. 1787.

Type: Germany, Baden, Südlicher Schwarzwald, Fahrstrasse zwischen dem Jugendheim, c. 1050 m, 14 July 1926, J. Hillmann [B 60 0033509, neotype (see ARGÜELLO et al. 2007)].

Parmelia quercina (WILLD.) VAIN., Term. Füz. **22**: 279. 1899.

Thallus: foliose, 2-6 (-10) cm diam., tightly adnate, rosette forming, often wrinkled to almost cerebriform at the centre; lobes (fig. 3): 2-4 mm wide, usually short, dichotomously or irregularly branched, contiguous and rapidly becoming imbricate at the centre, often pruinose close to the periphery, lobe tips ± rotund, not or very slightly crenate, slightly down-turned, with black cilia, 0.08-0.2 mm long, on lobe margins (sometimes sparse and difficult to see); upper surface: light mineral grey to blue-grey, smooth, often ± shiny, without maculae (fig. 7); medulla: white; lower surface: black and mat, brownish towards the lobes end, with short (0.5-1mm), rather thick (fig. 11), sparse to numerous, unbranched, black and mat rhizines. Ascomata: common, few to numerous, in average 2-4 mm diam. (up to 6 mm diam.), with red-brown discs and thick margins, lower side smooth and grey to blackish with few to numerous rhizines usually close to the point of attachment; ascospores: 8 per ascus, colourless, 1-celled, short-ellipsoid, 8-11 x 5-6.5 µm. Pycnidia: usually numerous; conidia: 5-7 x 1 µm, bacilliform, straight.

Spot tests: Cortex K+ yellow (atranorin), medulla K-, KC+ red, C+ red, P-, UV- (lecanoric acid).

Tlc: atranorin (major), lecanoric acid (major), gyrophoric acid (minor).

Illustrations: BRODO et al. (2001: 486), DOBSON (2005: 306).

Diagnostic characters: this taxon is characterized by the mineral greyish, often ± pruinose and tightly adnate thallus, the absence of maculae on the upper cortex (fig. 7), the ± broad, rotund lobes (fig. 3) with short cilia at their margins and the black and mat undersurface with ± short and thick rhizines (fig. 11).

Variability: some thalli can be quite small, with narrow lobes (1-2 mm wide) and few small apothecia (most probably juvenile thalli). The pruinosity of the thallus is variable, from faint to distinctly present most of the time. Local irregularities in the pruinosity of the upper surface of the thallus, which some-

times look like maculae, might explain the affirmation of some authors that maculae are present in *Parmelina quercina*. Cilia at the margins may be well developed and conspicuous or nearly absent and very difficult to find (look at the axils at 50x magnification!). The presence of rhizines growing on the underside of the apothecia is very variable, from absent to moderate; rhizines are rarely conspicuous and usually not visible from above.

Taxonomic notes: Young, not well developed thalli may be confused with immature and non-sorediate thalli of *Hypotrachyna revoluta* (FLÖRKE) HALE or *H. afrorevoluta* (KROG & SWINSCOW) KROG & SWINSCOW (both species have a C+ red medulla!). For differences with *P. carporrhizans* and *P. atricha*, see under these species and in table 1.

Ecology: *Parmelina quercina* seems to be exclusively corticolous in Switzerland, growing mainly on *Alnus incana*, *Quercus* spp. and *Fagus sylvatica*. Other phorophytes are *Castanea sativa*, *Tilia* spp., *Acer pseudoplatanus*, *Fraxinus excelsior*, *Malus silvestris*, *Populus* spp., *Prunus* spp., *Salix* spp., and *Sorbus aria*. It grows between (400) 800 and 1400 (1630) m, on scrubs or isolated trees, on road sides, in parks, in pastures or in forest's skirts.

Distribution: In Europe, the main distribution range of *Parmelina quercina* is the southern part of the continent with extensions to central Europe, going north as far as Denmark (NIMIS 1993). In Switzerland, this species has been found in all natural regions but seems to be more frequent in the Alps and the western part of the Plateau (fig. 1).

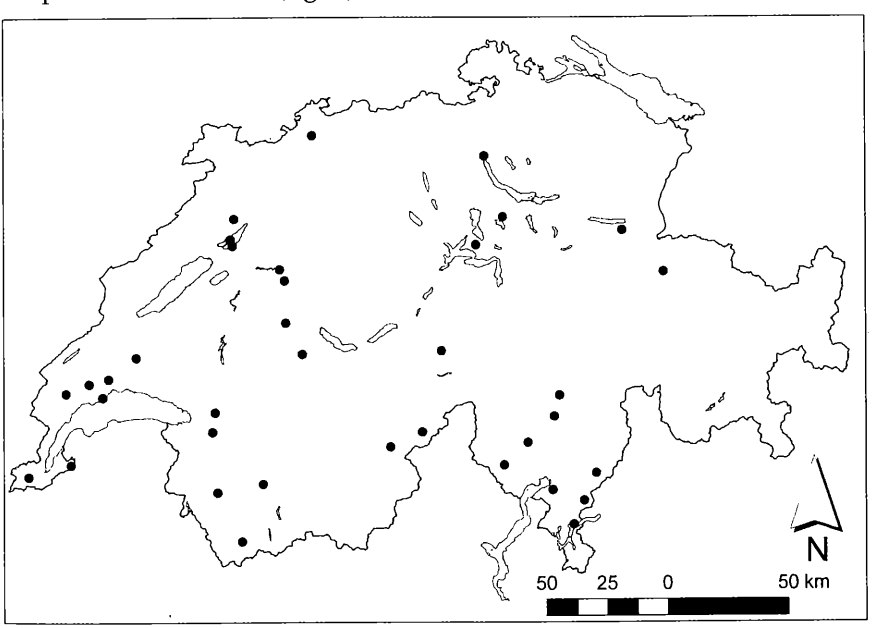

Fig. 1: Known distribution of *Parmelina quercina* in Switzerland.

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Exsiccatae seen: HEPP, Flechten Eur. 855, as *Imbricaria quercifolia* α. *tiliacea* (G); KERNER VON MARILAUN, Fl. Exs. Austro-Hung. 1542, as *Parmelia tiliacea* (B, G); KÖFARAGÓ-GYELNIK, Lichenoth. 135 (B, G); MIGULA, Krypt. Germ., Austr. Helv. Exs. [Flechten] 64, as *Imbricaria tiliacea* (G); POELT, Lich. Alp. 7 (G, Z); VĚZDA, Lich. Bohemoslov. Exs. 201 (G).

Specimens studied (Selected specimens from Switzerland only): Basel-Land: Pfeffingen, 400 m, Kirschbaum, 28.04.1919, FREY 2609 (G).
Bern: Gurten, 850 m, Bergahorn, 10.08.1934, FREY 7996 (G). Guttannen, 1060 m, 13.10.1919, FREY 2622 (G). Orvin, 1082 m, *Sorbus aria*, 25.05.1998, FREI 22468 (G).
Genève: Bois de Jussy, bois mort de *Quercus*, 496 m, 15.05.1967, PAGE 868 (G).
Graubünden: Val Lumnezia, 1250 m, 09.1978, AMMANN 17093 (G).
Schwyz: Rigi-Klösterli, 1400 m, Bergahorn, 13.10.1961, FREY 24371 (G).
St. Gallen: Tannenboden, 1400 m, *Fagus sylvatica*, 5.09.1962, FREY 25488 (G).
Solothurn: Balm, 820 m, *Malus silvestris*, 14.10.1996, KELLER 4541 (G).
Ticino: Gresso, 1080 m, *Quercus petraea*, 25.09.1996, KELLER 18948 (G).
Valais: Brig-Glis, 820 m, *Alnus incana*, 22.07.1997, FREI 7450 (G). Fully, 1077 m, *Quercus petraea*, 13.10.1998, KELLER 15013 (G).
Vaud: Longirod, 900 m, *Fagus sylvatica*, 30.10.1991, CLERC s. n. (G). Yens, 685 m, *Fagus sylvatica*, 21.04.1997, FREI 20240 (G). Saint-Saphorin-sur-Morges, 530 m, Laubbäume, 28.08.1998, KELLER 11462 (G).
Zug: Oberägeri, 1000 m, Bergahorn, 5.08.1956, FREY 18895 (G).

Parmelina carporrhizans (TAYLOR) POELT & VEZDA, Bibliotheca Lich. **9**: 183. 1977.

Parmelia carporrhizans TAYLOR in HOOKER, London J. Bot. **6**: 163. 1847.
Type: [Spain] Canary Islands, Lemann [FH-Tayl, holotype, G (!) isotype].

Parmelia quercina var. *carporrhizans* (TAYLOR) V. WIRTH, Stuttgarter Beitr. Naturk., A, 517: 62. 1994.

Thallus: foliose, 3-7 (-10) cm diam., tightly to ± loosely adnate, rosette forming, never cerebriform at center, but often with small juvenile apothecia or small regeneration's lobules giving the thallus a wrinkled appearance; lobes (fig. 4): 2-4 mm wide, dichotomously or irregularly branched, usually long and deeply incised, contiguous, usually not becoming rapidly imbricate, lobe tips ± rotund, distinctly crenate, slightly down-turned, usually not pruinose, with black cilia, 0.08-0.2 mm long on lobes margin (difficult to distinguish from young rhizines); upper surface: light mineral grey to blue-grey, smooth, often ± shiny, with punctiform to effigurate maculae (at 25-50x magnification!) (figs. 8 & 9); medulla: white; lower surface: black and shiny, brownish towards the lobe ends, with long (0.8-1.4 mm), rather thin, numerous and densely disposed, un-

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branched, black and shiny rhizines (figs. 10 & 11), that often develop horizontally and give the margins a ciliated aspect. Ascomata: common (rarely absent), few to numerous, in average 3-5 (up to 12 mm), with red-brown discs and thick margins (rarely with rhizines growing from the inside part of the excipulum), lower side smooth and grey to blackish, with few to numerous rhizines usually close to the point of attachment; ascospores: 8 per ascus, colorless, 1-celled, short-ellipsoid, 8-11 x 5-7 µm. Pycnidia: usually numerous; conidia: 5-7 x 1 µm, bacilliform, straight.

Spot tests: Cortex K+ yellow (atranorin), medulla K-, KC+ red, C+ red, P-, UV- (lecanoric acid).

Tlc: atranorin (major), lecanoric acid (major), gyrophoric acid (minor).

Illustrations: British Lichen Society (1997, as *Parmelia quercina)*

Diagnostic characters: *Parmelina carporrhizans* is characterized by the mineral greyish, rarely pruinose and loosely adnate thallus with punctiform to effigurate maculae on the upper surface (figs. 8 & 9), the deeply incised and ± contiguous, rarely overlapping lobes, the ± crenate lobe tips (fig. 4) with short cilia at their margins, and the black and shiny undersurface with ± long and thin, black, shiny and densely disposed rhizines (figs. 10 & 11).

Variability: the maculature varies from conspicuous (easily seen at 10x magnification, fig. 9) to weak and difficult to observe (visible only at 25-50x magnification, fig. 8). The presence of rhizines growing horizontally at the margins of the thallus also varies from numerous and conspicuous to almost absent. The rhizines growing on the underside of the apothecia are on average numerous and conspicuous, but they can sometimes be nearly absent or very inconspicuous.

Taxonomic notes: *Parmelina carporrhizans* differs from *P. quercina* mainly by the presence of maculae on the upper surface, the thallus that is loosely adnate on the substrate and the longer and thinner rhizines (table 1). NASH & ELIX (2002), in their description of *Parmelina quercina* occuring in the Sonoran Desert, indicate that the upper surface is "usually strongly white maculate peripherally" These indications suggest the presence of *P. carporrhizans* in the Sonoran Desert area, something that would be expected giving the known distribution area of this species in Europe (see below).

Since they are both maculate, *Parmelina pastillifera* and *P. tiliacea* could be more closely related to *P. carporrhizans* than to *P. quercina*. Specimens of *P. pastillifera* and *P. tiliacea* with few isidia might be confused with *P. carporrhizans* [see *P. tiliacea*: Massalongo, Lich. Ital. Exs. 327, as *P. quercifolia* var. *saxicola* (G)]. For differences with *P. atricha*, see under this species and table 1.

Ecology: *Parmelina carporrhizans* seems to be exclusively corticolous in Switzerland, growing mainly on *Acer pseudoplatanus*. Other phorophytes are: *Fraxinus excelsior, Juglans regia, Castanea sativa, Larix decidua, Populus italica, Fagus*

silvatica, *Quercus pubescens* and *Sorbus aria*. It grows between (340) 700 and 1200 (1340) m, mainly on isolated trees in pastures, on road sides or in forest's skirts.

Distribution: SCHAUER (1965) mapped the distribution of *P. carporrhizans* north of the Alps. Although some confusions with *P. quercina* probably occurred, we agree with his conclusions stating that *P. carporrhizans* has a mediterranean-atlantic distribution, with occurrences in western Central Europe. It doesn't extend, however, as far north as *P. quercina*. Its occurrence in other parts of the world needs confirmation in the light of the new concepts presented here (see under taxonomic notes). In Switzerland, this species is rare in the Jura mountains (northern part of Switzerland) and has a more pronounced southern distribution than *P. quercina* (fig. 2).

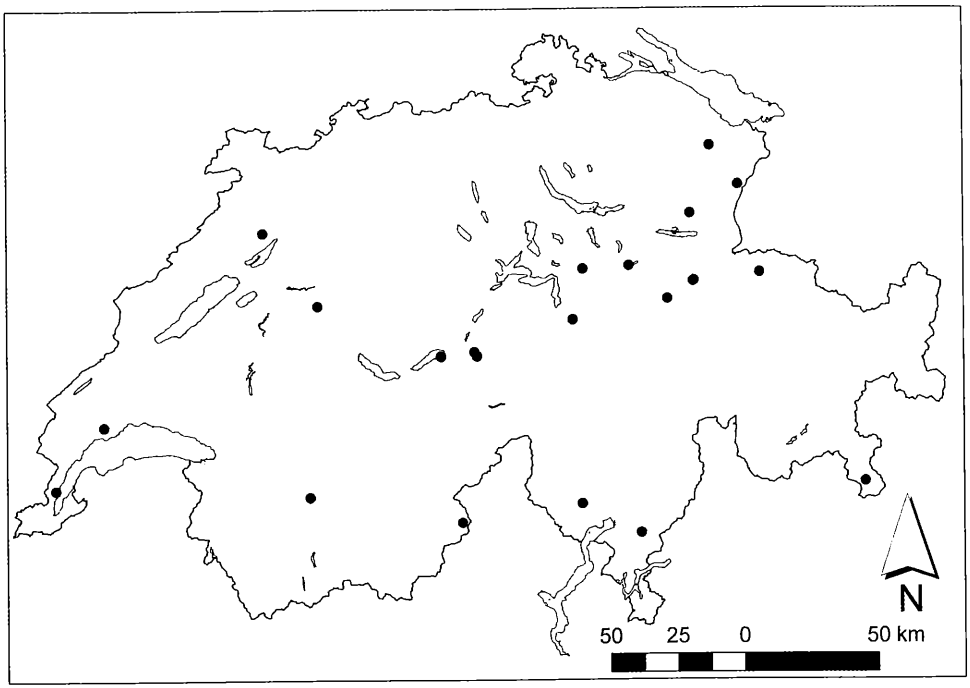

Fig. 2: Known distribution of *Parmelina carporrhizans* in Switzerland.

Exsiccatae seen: Erbar. Crittogam. Ital. 465, as *P. tiliacea* (B, G); HARMAND, Lich. Gall. Rar. Exs. 36 (B, G); MASSALONGO, Lich. Ital. Exs. 326, as *P. quercifolia* var. *tiliacea* (G); PASSAUER, Crypt. Exs. 4134 (B, G); POELT, Lich. Alp. 8 (G, Z); Société Française, Exsicc. CH. DUFFOUR. 2925, as *P. tiliacea* (G); TAVARES, Lich. Lusit. Sel. Exs. 217 (G); VĚZDA, Lich. Sel. Exs. 268 (G); WARTMANN & SCHENK, Schweiz. Krypt. 57, as *P. quercifolia* α. *tiliacea* b. *furfuracea* (G).

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Specimens studied (Selected specimens from Switzerland only): Bern: Brienz, 890 m, *Acer*, 25.04.1982, CLERC s. n. (G). Orvin, 1082 m, *Sorbus aria*, 25.05.1998, FREI 22468 (G).
Glarus: Elm, 1225 m, *Acer pseudoplatanus*, 21.05.1997, ROTH 7863 (G).
Genève: Versoix, 1919, MERESCHKOWSKY s. n. (G).
Graubünden: Puschlav, 1000 m, Lärche, 8.08.1958, FREY 22138 (G).
St. Gallen: Rheintal, 1050 m, Laubbäume, 1964, FREY 26190 (G). Weistannental, 1330 m, *Acer pseudoplatanus*, 13.06.1992, CLERC s. n. (G).
Schwyz: Ibergeregg, 1080 m, *Fraxinus excelsior*, 4.08.1956, FREY 18873 (G).
Ticino: Valle Maggia, 340 m, *Juglans regia*, BISANG 4893 (G). Isone, *Castanea*, 07.1833, SCHAERER s. n. (G).
Uri: Schattdorf, 1180 m, *Acer pseudoplatanus*, 11.10.1995, GRONER 4504 (G).
Valais: St. Léonard, 940 m, *Quercus pubescens*, 9.04.1968, AMMANN s. n. (G). Zwischberger Tal ob Gondo, 1200 m, *Fagus silvatica*, 26.09.1961, ERB s. n. (G).
Vaud: Bex, 809 m, *Juglans regia*, 30.10.1991, CLERC s. n. (G).

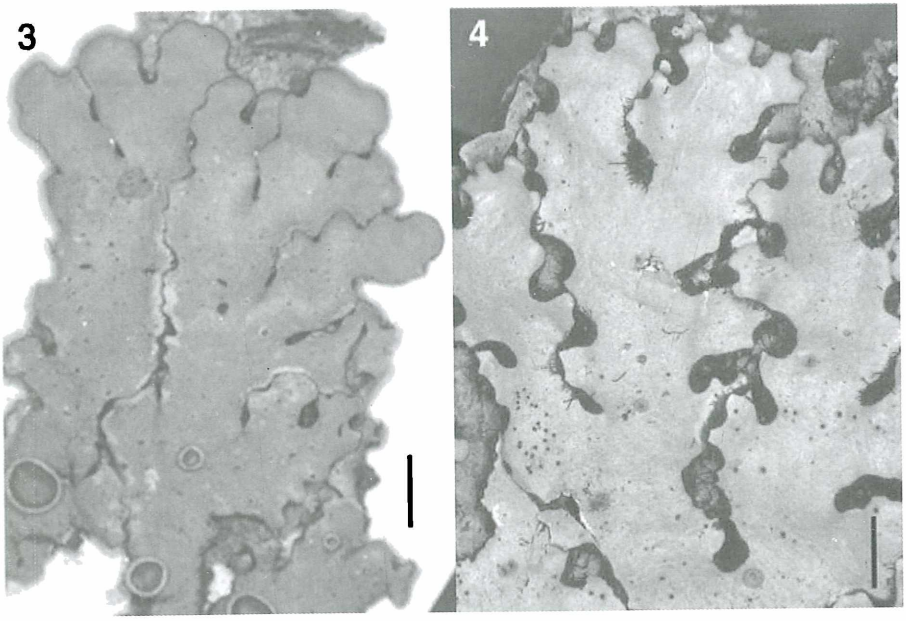

Fig. 3 (left): Terminal lobes of *Parmelina quercina* (G00064038, G), scale 2mm.
Fig. 4 (right): Terminal lobes of *Parmelina carporrhizans* (G00064039, G), scale 2mm.

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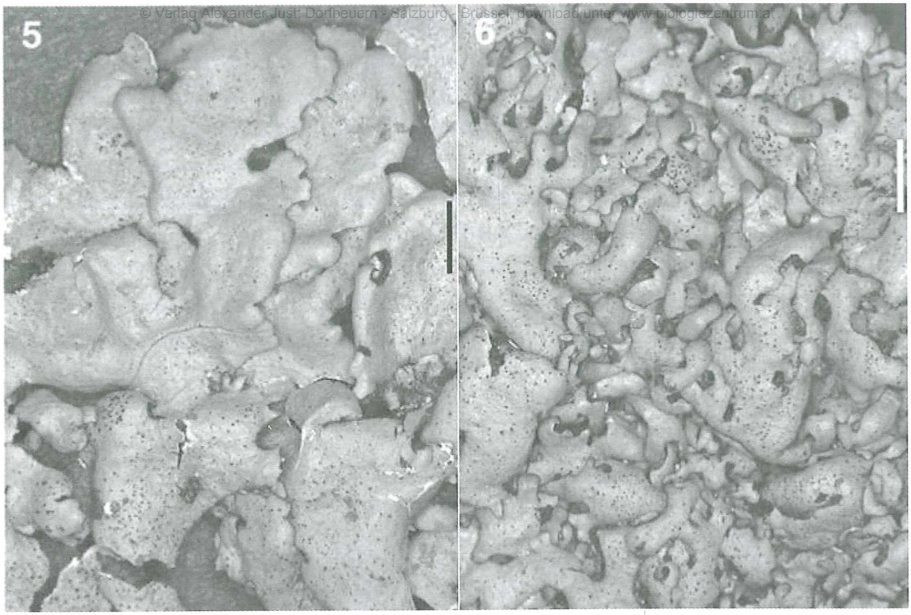

Fig. 5 (left): Terminal lobes of *Parmelina atricha* (G00064037, G), scale 2 mm.
Fig. 6 (right): Secondary lobes of *Parmelina atricha* (G00064037, G), scale 2mm.

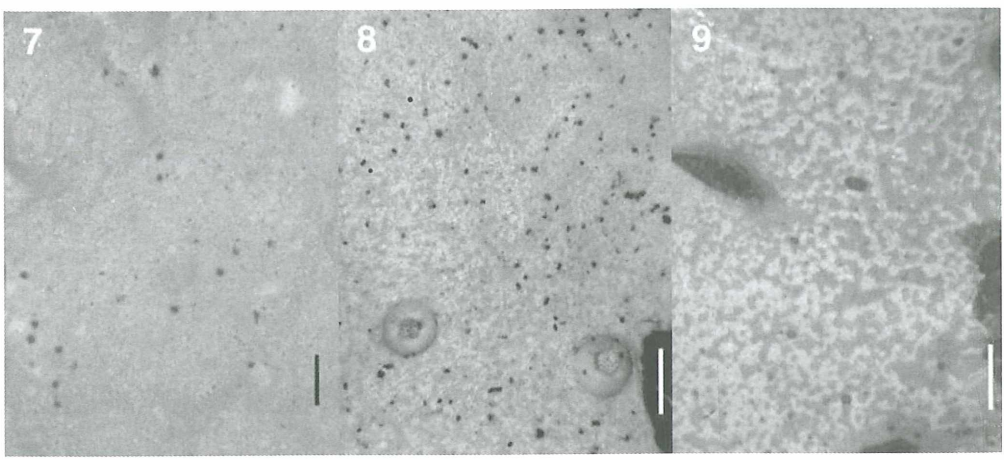

Fig. 7 (left): Upper cortex without maculae of *Parmelina quercina* (G00064057, G), scale 0.5 mm.
Fig. 8 (middle): Upper cortex with maculae of *Parmelina carporrhizans* (G00064024, G), scale 0.5 mm.
Fig. 9 (right): Upper cortex with distinct maculae of *Parmelina carporrhizans* (G00064058, G), scale 0.5 mm.

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Fig. 10: Rhizines of *Parmelina carporrhizans* (G00064035, G), scale 1 mm.

Parmelina atricha (NYL.) P. Clerc comb. nov.

Parmelia atricha NYL., Bull. Soc. Linn. Normandie **6**: 271. 1872.

Type: [France], Pyrénées orientales, ad saxa granitica mox supra La Preste, alt. 1190 m, 12.07.1872, W. Nylander N° 16 [H (!), holotype].

Parmelia quercina var. *convoluta* (SCHAER.) ZAHLBR., Cat. Lich. Univ. **6**: 191. 1929.

Parmelia quercina f. *saxicola* (KÖRB.) ZAHLBR., Cat. Lich. Univ. **6**: 191. 1929.

Thallus: foliose, 3-10 cm diam., loosely adnate, ± rosette forming, the central areas or sometimes the entire thallus becoming ± panniform, covered by numerous overlapping and narrow lobes; lobes: of two types: a) lobes at the periphery of the thallus, 2-3 mm wide, dichotomously or irregularly branched (fig. 5), usually long and deeply incised, contiguous, rapidly overlapping, flat to slightly concave, lobe tips ± rotund and crenate, not pruinose, with black cilia; b) secundary lobes in the central areas of the thallus narrower, 1-2 mm wide, irregularly or dichotomously branched (fig. 6), not pruinose, flat to distinctly convex, lobe-tips rotund, usually numerous and densely overlapping; upper sur-

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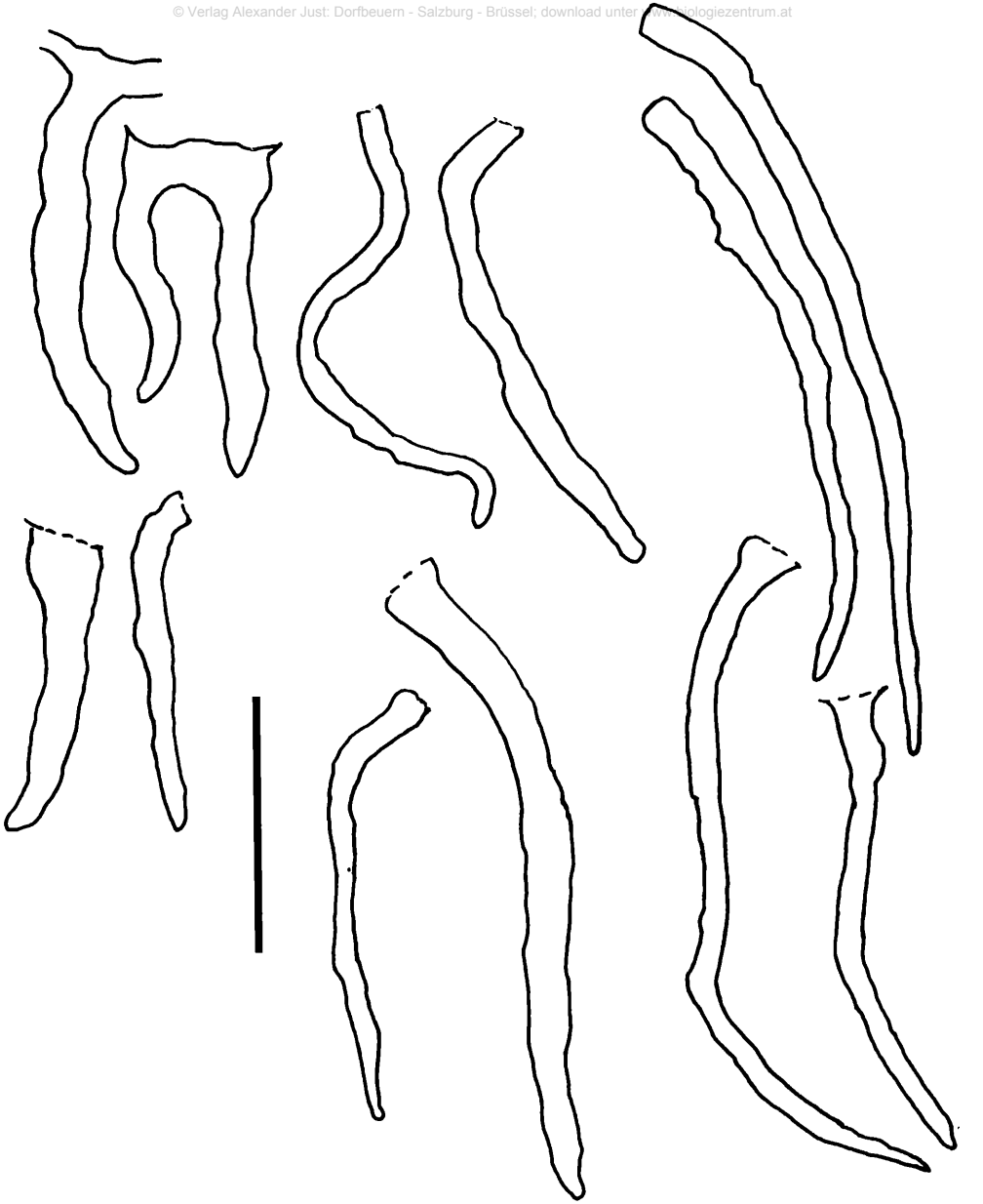

Fig. 11: Rhizine morphology - left row: *Parmelina quercina* (G00064032, G); central row: *Parmelina carporrhizans* (G00064023, G); right row: *Parmelina atricha* (G00064034,G), scale 0.5 mm.

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face: light mineral grey to yellowish-grey (in herbarium specimens), smooth, often ± shiny, without maculae; medulla: white; lower surface: black and shiny, brownish towards the lobe ends, with long (0.8-2 mm), thin, numerous and densely disposed, unbranched (fig. 11), black, shiny rhizines; Ascomata: common (rarely absent), few to numerous, on average 2-3 mm diam. (up to 5 mm diam.), with red-brown discs and thick margins, sometimes becoming almost convex and ± margin free, lower side distinctly roughly wrinkled, black around the point of attachment with none to few rhizines; ascospores: 8 per ascus, colourless, 1-celled, short-ellipsoid, 8-11 x 5-7 µm. Pycnidia: usually numerous; conidia: 5-7 x 1 µm, bacilliform, straight.

Spot tests: Cortex K+ yellow (atranorin), medulla K-, KC+ red, C+ red, P-, UV- (lecanoric acid).

Tlc: atranorin (major), lecanoric acid (major), gyrophoric acid (minor).

Diagnostic characters: *Parmelina atricha* is morphologically very distinct and is characterized by a mineral greyish, non pruinose, ± loosely adnate thallus without maculae on the upper cortex, the presence, at least in the central areas, of narrow, ± convex and overlapping secondary lobes (lobules) giving a panniform aspect to the thallus (fig. 6), and the black undersurface with thin and long (fig. 11), densely disposed rhizines. Furthermore, *Parmelina atricha* is a strictly saxicolous species.

Variability: Rhizines under the apothecia are absent or present, but never as frequent as in *P. carporrhizans*. In some specimens the narrow, ± convex and overlapping secondary lobes, although distinctly present, are scattered and are not well developed, thus the habit is dominated by the broad lobes at the periphery and is *P carporrhizans/quercina*-like (fig. 5). At the other extreme of the variation, there are specimens that are distinctly panniform, that is almost completely covered by the secondary lobes, with only a few ± distinct broad lobes at the periphery (fig. 6). Many specimens are situated in between these two extremes. Frey (in litt. 1959) was aware of this variation and questioned whether part of this variation observed in the different specimens could be due to the bias of the collectors themselves by looking especially for one or the other type of variation when collecting.

Taxonomic notes: *Parmelina atricha* resembles *Parmelia omphalodes* subsp. *pinnatifida* (KUROK.) SKULT (Syn.: *P. omphalodes* var. *panniformis* ACH.) but the latter taxon has pseudocyphellae on the upper surface of the much narrower secondary lobes (often smaller than 1 mm) and the medulla is C-, K+ yellow turning red, P+ orange (salazinic acid). *Parmelina atricha* could be of course interpreted as a saxicolous phenotype of either *P. quercina* or *P. carporrhizans*. The absence of maculation eliminates the possible connection with the second species and the differences in the lower surface and the rhizines make a close connection with *P. quercina* very unlikely. Moreover almost all studied specimens of

P. atricha hosted a lichenicolous fungi (fig. 12) that was never present on *P. carporrhizans* and *P. quercina* specimens, supporting the specific status of *P. atricha*.

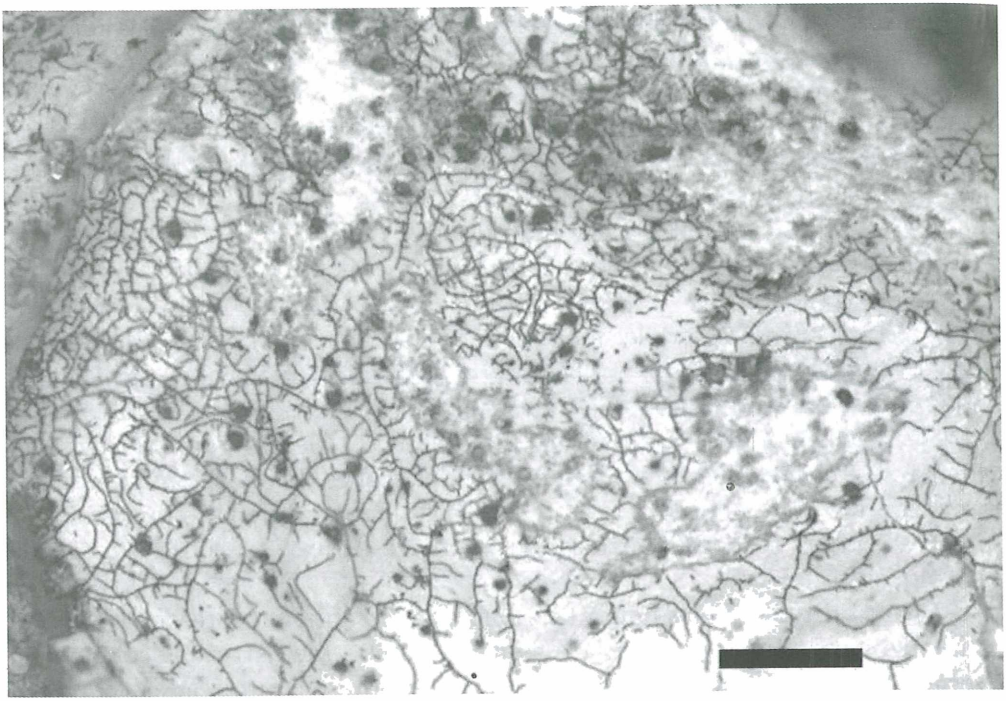

Fig. 12: Lichenicolous fungi on the upper cortex of *Parmelina atricha* (G00064048, G), scale: 0.5 mm.

Distribution: *Parmelina atricha* is so far known from the eastern of Pyrenees, southern France, northern Italy and southern Switzerland and it seems to have a submediterranean-mediterranean distribution. In Switzerland, this species has a distinct southern distribution and is found only in the cantons of Valais and Graubünden (fig. 13).

Ecology: *Parmelina atricha* is an exclusively saxicolous species, growing on siliceous rocks in ± exposed and dry areas, mainly between (500) 1100 and 1500 (1740) m.

Exsiccatae seen: ANZI, Lich. Rar. Langob. Exs. 26, as *Imbricaria tiliacea* f. *saxicola* (G); Erbar. Crittogam. Ital. 466, as *Parmelia sinuosa* (B, G, Z); RABENHORST, Lich. Europ. Exs. 501, as *Parmelia sinuosa* β. *hypothrix* (B, G, Z).

Specimens studied (Selected specimens from Switzerland only): Valais: Bourg-St.Pierre, 1680 m, Felsen, 08.1943, FREY 12169 (G). Ob Fully, 1250 m, Blöcke in der Weide, 19.03.1915, FREY 1884 (G). Les Follatères, 500 m, Gneiss, 8.03.1980, CLERC 206 (G); Plex, 1250 m, blocs permiens, 1915, GAMS s. n. (G).

Graubünden: Zernez, Felsen, 1500 m, 11.04.1932, FREY 3226 (G). Puschlav, La Motta, 1150 m, Gneissblöcke, 11.08.1958, FREY 20960 (G).

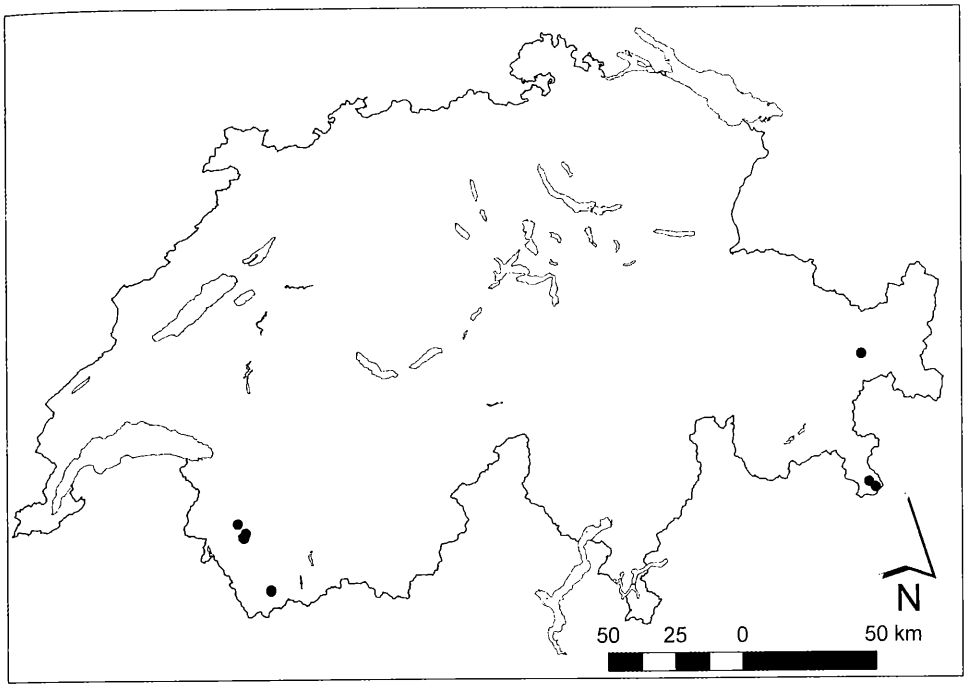

Fig. 13: Known distribution of *Parmelina atricha* in Switzerland.

Discussion

To the best of our knowledge a detailed discussion of the taxonomic value of the maculae in the Parmeliaceae is still lacking. ELIX & HALE (1987) stressed the presence of effigurate maculae on the upper surface of the cortex of the lobes in the genus *Canomaculina*. They mentioned the presence of maculae in some species of *Parmelina* s. str., but without any further discussion. The presence of maculae seems to be an important character and in many species is often of diagnostic value. For instance, in Europe, *Hypotrachyna taylorensis* (MITCH.) HALE is readily identified among closely related species due to its distinctly maculate upper surface. Furthermore, *Usnea merrillii* MOTYKA and *U. trichodea* ACH. are well defined by small maculae on thin branches (OHMURA 2001, CLERC unpublished). Among the European *Parmelina* species, *P. carporrhizans*, *P. pastillifera* and *P. tiliacea* have an upper cortex that is distinctly spotted by maculae. Unlike the statements of ELIX & HALE (1987) and ARGÜELLO et al. (2007) that maculae are present in *Parmelina quercina* s.str., we did not observe such structures on the upper cortex of this species. In *Parmelina carporrhizans* the presence of maculae is

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highly correlated with other subtle differences like the morphology of the rhizines, the degree of thallus adnation and the morphology of the lobes. Among the exclusively sexually reproducing European species of *Parmelina*, we thus consider the presence of maculae as a diagnostic character that can be used to identify *P. carporrhizans*. If the presence or absence of maculae for distinguishing species in this group has been underestimated, in contrast, the taxonomic value of the presence of rhizines on the underside of the apothecia has been overestimated. This lead to confusion in the distinction between *P. carporrhizans* and *P. quercina*. This is somewhat surprising because of its evident morphological and ecological characteristics that *Parmelina atricha* has not been widely recognized by modern lichenologists until now. It is probably because the circumscriptions of *P. carporrhizans* and *P. quercina* are clearer that the difference between these two species and *P. atricha* are more apparent.

	P. quercina	***P. carporrhizans***	***P. atricha***
Maculae	absent	present	absent
Thallus	tightly adnate	loosely adnate	loosely adnate
Rhizines	short and thick	± long and thin	long and thin
Narrow overlapping lobes in older parts of the thallus	absent	absent	present
Ecology	corticolous	corticolous	saxicolous

Table 1: Characters differenciating *Parmelina atricha*, *P. carporrhizans* and *P. quercina*.

Key to the species of the genus *Parmelina* in Europe

1 Thallus with isidia, with or without apothecia 2
Thallus without isidia, usually with numerous apothecia 3

2 Isidia ± cylindrical, grey to grey-brown, ± concolorous to thallus, sometimes blackish apically, leaving very distinct scars when falling ..... ***P. tiliacea***
Isidia not cylindrical but button-like with an even or slightly concave apical part, black or brownish black, leaving indistinct scars when falling ..... ***P. pastillifera***

3 Upper surface of thallus maculate; corticolous ..... ***P. carporrhizans***
Upper surface of thallus not maculate; corticolous or saxicolous 4

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4 Central areas of thallus with narrow (1-2 mm), ± convex and overlapping lobules; rhizines shiny, thin and long; thallus ± loosely adnate; saxicolous .... ***P. atricha***

Central areas of thallus without such lobules; rhizines mat, ± thick and short; thallus tightly adnate; corticolous ..... ***P. quercina***

Acknowledgements

We thank Michelle PRICE (CJB) for checking the English, Dagmar TRIEBEL for valuable information on lichenicolous fungi, Reinhard BERNDT for the loan of material from Z, Roland SKYTÉN (H) for the loan of the type of *Parmelia atricha*, Michael DIETRICH (Kriens), Claude ROUX (Mirabeau) and Harrie SIPMANN (Berlin) for comments on an early version of the manuscript.

This paper is dedicated to Volkmar Wirth for his tremendous contribution to the knowledge of the European lichen flora.

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Zeitschrift/Journal: Sauteria-Schriftenreihe f. systematische Botanik, Floristik u. Geobotanik

Jahr/Year: 2008

Band/Volume: 15

Autor(en)/Author(s): Clerc Philippe, Truong Camille

Artikel/Article: Die Soredien- und isidienlosen Parmelina-Arten (lichenisierte Ascomyceten, Parmeliaceae) in der Schweiz - Wiedereinführung von Parmelina atricha (NYL.) P. CLERC in die europäische Flechtenflora 175-194