

Typification of some names of rust fungi described by A. P. de Candolle

Uwe BRAUN

Abstract: Braun, U. 2022: Typification of some rust names described by A. P. de Candolle. *Schlechtendalia* **39**: 54–63.

A. P. de Candolle (1778–1841) described numerous species names of rust fungi of the genera *Aecidium*, *Puccinia* and *Uredo*. Original collections deposited in de Candolle's herbarium (G) under the names concerned were examined in order to clarify their typifications. Some types were classified as holotypes, according to Art. 9.1, Note 1. Other names are lectotypified or, when necessary, neotypes are designated. The nomenclature of the names involved was disentangled, including clarification of the correct current names, based on the currently valid Code (ICNafp). The new combination *Uromyces bifrons* is introduced.

Zusammenfassung: Braun, U. 2022: Typisierung einiger von A. P. de Candolle beschriebener Rostpilznamen. *Schlechtendalia* **39**: 54–63.

A. P. de Candolle (1778–1841) hat zahlreiche Artnamen von Rostpilzen der Gattungen *Aecidium*, *Puccinia* und *Uredo* beschrieben. In de Candolles Herbarium (G) unten den entsprechenden Namen deponiertes Originalmaterial wurde untersucht, um deren Typisierungen zu klären. Einige Typen konnten, sprechend Art. 9.1, Note 1, als Holotypen eingestuft werden. Andere Namen werden lectotypisiert oder es werden, wenn notwendig, Neotypen eingeführt. Die Nomenklatur der involvierten Namen wird klargestellt, einschließlich Klärung der gegenwärtig gültigen Namen, entsprechend dem heutigen Code (ICNafp). Die neue Kombination *Uromyces bifrons* wird eingeführt.

Key words: *Aecidium*, *Puccinia*, *Uredo*, herbarium G, typus, species.

Published online 29 Mar. 2022

Introduction

De Candolle (1805, 1815) described numerous rust fungi under the genus names *Aecidium*, *Puccinia* and *Uredo*. The typification of most of his rust names has not yet been clarified. In the course of nomenclatural studies on rust names, in connection with phylogenetic investigations, numerous specimens deposited under the names concerned in the herbarium of A. P. de Candolle at G have been examined. A few holotypes have been identified, and, in other cases, lecto- and neotypes are designated. The nomenclature of the rust names involved is treated in detail. Some additional names within the synonymy of the treated names are also lectotypified.

List of typified names

(1) *Aecidium bifrons* DC. [*α. aconiti-lycoctoni*], in Lamarck & de Candolle, *Fl. franç.*, Edn 3, **2**: 246, 1805.

Holotype: France, “fl. fr. 662”, on *Aconitum lycoctonum*, [M. Chaillet], ex herb. de Candolle (G00262469).

≡ *Nigredo bifrons* (DC.) Arthur, *N. Amer. Fl.* **7**(11): 760, 1926.

≡ *Uromyces bifrons* (DC.) U. Braun, **comb. nov.** (Basionym: *Aecidium bifrons* DC., in Lamarck & de Candolle, *Fl. franç.*, Edn 3, **2**: 246, 1805). MycoBank, MB833525.

≡ *Uromyces aconiti-lycoctoni* (DC.) G. Winter, *Rabenh. Krypt.-Fl.*, Edn 2, **1.1**: 153, [1884] 1881.

≡ *Uromycopsis aconiti-lycotoni* (DC.) Arthur, *Résult. Sci. Congr. Bot. Wien 1905*: 345, 1906.

= *Uredo lycoctoni* Kalchbr., *Mathem. Természettud. Közlem.* **3**: 306, 1865.

≡ *Aecidium lycoctoni* (Kalchbr.) Sacc. & D. Sacc., *Syll. fung.* **17**: 358, 1905.

≡ *Uromyces lycoctoni* (Kalchbr.) Trotter, *Fl. ital. crypt.*, *Fungi* **4**: 64, 1908.

= *Uromyces aconiti* Fuckel, *Jahrb. Nassauischen Vereins Naturk.* **23-24**: 61 [1869-1870] 1870.

Notes: De Candolle, in Lamarck & de Candolle (1805), described *Aecidium bifrons* with *α. aconiti-lycoctoni* and “*β. Aecidium ranunculi acris* Pers. 210?”, which refers to Persoon (1801) and not to the original description of *Aecidium ranunculi-acris* Pers. However, the name *Aecidium bifrons* is nevertheless legitimate and not superfluous since Persoon's name was only cited with question mark, i.e., this name was not included in the original description. Therefore, only “*α. aconiti-lycoctoni*” pertains to the protologue, with *Aconitum lycoctonum* as type host. There is only a single collection in de Candolle's herbarium which is in accordance with the protologue, so that this specimen can be

classified as holotype (according to Art. 9.1, Note 1). Different names have been applied to the common *Aconitum lycoctonum* rust, but *Aecidium bifrons* is the oldest valid name for this species.

(2) *Aecidium geranii* DC. [*β. Geranii rotundifolii*], in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 246, 1805.

Lectotype (designated here, MycoBank, MBT10006424): France, on *Geranium rotundifolium*, ex herb. de Candolle (G00262492).

≡ *Caecoma geraniatum* Link, in Willdenow, Sp. pl., Edn 4, 6(2): 57, 1825, nom. nov. [non *Caecoma geranii* (DC.) Schltld. 1824].

= *Uredo geranii* DC., in Lamarck & de Candolle, Syn. pl. Fl. Gall.: 47, 1806.

≡ *Caecoma geranii* (DC.) Schltld., Fl. berol. 2: 128, 1824.

≡ *Uromyces geranii* (DC.) Lév., Ann. Sci. Nat., Bot., Sér. 3, 8: 371, 1847, nom. inval. (Art. 35.2).

≡ ***Uromyces geranii*** (DC.) Fr., Summa veg. Scand., Sectio Post.: 514, 1849.

≡ *Coeomurus geranii* (DC.) Kuntze [as “*Caecomurus*”], Revis. gen. pl. 3(3): 450, 1898.

≡ *Nigredo geranii* (DC.) Arthur, N. Amer. Fl. 7(11): 765, 1926.

= *Trichobasis geranii* Berk., Outl. Brit. Fung.: 333, 1860.

Notes: De Candolle (1805) described *Aecidium geranii* with *α. Geranii pusilli* and *β. Geranii rotundifolii*. The syntypes are preserved in de Candolle’s herbarium (*α. Geranii pusilli*, G00262492). However, I prefer to designate de Candolle’s well-preserved material on *Geranium rotundifolium* as lectotype.

(3) *Puccinia laburni* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 224, 1805.

Neotype (designated here, MycoBank, MBT10006425): France, on *Laburnum anagyroides*, 1821, A. P. de Candolle, ex herb. de Candolle (G00262478).

≡ *Uredo laburni* (DC.) DC., Encycl. Méth. Bot. 8: 222, 1808.

≡ ***Uromyces laburni*** (DC.) G.H. Otth, Mitt. Naturf. Ges. Bern 531-552: 87, 1864.

Notes: Type material of *Puccinia laburni* collected before 1805 is not preserved. Therefore, a later collection deposited in de Candolle’s herbarium is designated as neotype.

(4) *Puccinia phyteumatum* DC. [as “*phyteumarum*”, *α. phyteumatis-spicati*], in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 225, 1805.

Lectotype (designated here, Mycobank, MBT10006426): France, on *Phyteuma spicatum*, “fl. fr. 602”, ex herb. de Candolle (G00262480).

≡ *Uredo phyteumatum* (DC.) DC., Encycl. Méth. Bot. 8: 222, 1808.

≡ *Caecoma phyteumatum* (DC.) Schltld. [as “*Caecoma phyteumatis*”], Linnaea 1: 611, 1826.

≡ ***Uromyces phyteumatum*** (DC.) Niessl, Verh. Nat. Ver. Brünn 3: 114, 1864.

≡ *Coeomurus phyteumatum* (DC.) Kuntze [as “*Caecomurus*”], Revis. gen. pl. 3(3): 450, 1898.

≡ *Telospora phyteumatum* (DC.) Arthur, Résult. Sci. Congr. Bot. Wien 1905: 346, 1906.

Notes: De Candolle (1805) based the name *Puccinia phyteumatum* on collections on two host species, viz., *α. phyteumatis-spicati* and *β. phyteumatis-orbiculare*. Hence, it is necessary to designate a lectotype for the species name. G00262480 is the only collection in de Candolle’s herbarium that coincides with the protologue of *α. phyteumatis-spicati*. Therefore, this specimen is designated as lectotype.

(5) *Puccinia phyteumatum* DC. *β. phyteumatis-orbiculare* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 225, 1805.

Holotype: France, on *Phyteuma orbiculare*, ex herb. de Candolle (G00262482).

Notes: The taxonomic rank of *α.* and *β.* was not indicated in the original description. The cited collection is the only specimen in de Candolle’s herbarium that is in agreement with the protologue. Therefore, it can be regarded as holotype for *β. phyteumatis-orbiculare* (Art. 9.1, Note 1).

(6) *Uredo bifrons* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 229, 1805.

Holotype: France, on *Rumex crispus* [patience crépue], ex herb. de Candolle (G00242484).

= *Uredo rumicis* Schumach., Enum. pl. 2: 231, 1803.

≡ ***Uromyces rumicis*** (Schumach.) G. Winter, Renabh. Krypt.-Fl., Edn 2, 1.1: 145, [1884] 1881.

Notes: The cited collection is the only specimen deposited in de Candolle's herbarium that is in agreement with the protologue. Therefore, it can be regarded as holotype (Art. 9.1, Note 1). The type material has been examined and turned out to be *Uromyces rumicis*.

(7) *Uredo caprearum* DC., [as '*capraearum*'], Fl. franç., Edn 3, 5/6: 80, 1815.

Lectotype (designated here, MycoBank, MBT10006427): "*Uredo farinosa*", on *Salix caprea*, 1806, without locality, date and collector (G00262487).

≡ *Caecoma caprearum* (DC.) Schltld., Fl. berol. 2: 124, 1824.

≡ *Erysibe caprearum* (DC.) Wallr., Fl. crypt. Germ. 2: 204, 1833.

≡ *Podosporium caprearum* (DC.) Lév. [as "*capraearum*"], Ann. Sci. Nat., Bot., Sér. 3, 8: 374, 1847.

≡ *Podocystis caprearum* (DC.) Fr. [as "*capraearum*"], Summa Veg. Scand., Sectio Post.: 512, 1849.

≡ *Lecythea caprearum* (DC.) Berk., Outl. Brit. Fung.: 334, 1860.

≡ *Melampsora caprearum* (DC.) Thüm., Mitt. Forstl. Versuchswesen Oesterr. 2(1): 34, 1879.

= *Uredo farinosa* Pers. [*α. salicis-capreae*], Syn. meth. fung. 1: 217, 1801, nom. sanct. **Lectotype** (designated here, MycoBank, MBT10006428): *Uredo* on *Salix caprea*, without locality, date and collector, herb. Persoon, no. 91026447 (L0114354).

≡ *Lecythea farinosa* (Pers.) Lév., Ann. Sci. Nat., Bot., Sér. 3, 8: 374, 1847, nom. inval. (Art. 35.2).

≡ **Melampsora farinosa** (Pers.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien 3.1(17–24): 360, 1887.

≡ *Melampsora salicis-capreae* (Pers.) G. Winter, Rabenh. Krypt.-Fl., Edn 2, 1.1: 239, [1884] 1881.

= *Sclerotium salicinum* Pers., in Mougeot & Nestler, Sirp. Crypt. Vog.-Rhen., Fasc. IV, no. 386, 1813, nom. nud.

≡ *Sclerotium salicinum* Pers. ex DC., Fl. franç., Edn 3, 5/6: 114, 1815. [Syntype: France, on *Salix caprea*, Mougeot & Nestler, Sirp. Crypt. Vog.-Rhen. 386 (F0170751F).]

≡ *Xyloma salicinum* (Pers. ex DC.) Duby, Bot. Gall. 2: 875, 1830, nom. illeg. (Art. 53.1), non Pers., 1794.

≡ *Melampsora salicina* (Pers. ex DC.) Lév., Ann. Sci. Nat., Bot., Ser. 3, 8: 375, 1847, nom. inval. (Art. 35.5).

≡ *Melampsora salicina* (Pers. ex DC.) Tul., Ann. Sci. Nat., Bot., Ser. 4, 2: 98, 1854.

≡ *Melampsora salicina* (Pers. ex DC.) Rabenh., Klotzschii Herb. Viv. Mycol., Ed. Nov., Cent. V: no. 494, 1857, isonym (Art. 6, Note 2).

= *Xyloma frustulatum* Fr., Observ. mycol. 2: 358, 1818.

= *Epitea fenestrata* Bonord., Abh. Naturf. Ges. Halle 5: 203, 1860 [also, in Rabenh., Fungi Eur. Exs. (Klotzschii Herb. Viv. Mycol. Continuatio, Ed. Nova, Ser. Sec.), Cent. 2: no. 189, 1860; Bot. Zeitung 18: 175, 1860; Flora 43: 749, 1860]. **Lectotype** (designated here, MycoBank, MBT10006429): Germany, Guestphalia, on *Salix caprea*, Bonorden, Rabenh., Fungi Eur. Exs. 189 (HAL, s.n.).

= *Entyloma salicis* P. Karst., Meddn Soc. Fauna Flora Fenn. 14: 103, 1887 [type host: *Salix caprea*].

= *Melampsora laricis-caprearum* Kleb., Forstl.-Naturw. Zeitschr. 6: 469, 1897.

Notes: The nomenclature of this species is complex and in need of some explanations. (1) *Melampsora farinosa*, with the sanctioned name *Uredo farinosa* as basionym, is the valid name for the species, which is usually referred to as *Melampsora caprearum* and *M. laricis-caprearum*, respectively. Jørstad (1958: 7) examined the original collections of *U. farinosa* in Persoon's herbarium. "No. 91026447" is a collection on *Salix caprea*, which contains uredinia and telia. Jørstad (l.c.) confirmed its identity as *Melampsora caprearum* (*M. laricis-caprearum*). This specimen is designated as lectotype.

(2) The designated lectotype material of *Uredo caprearum* from de Candolle's herbarium has been re-examined and confirmed as *M. farinosa* (uredinia hypophyllous, 1–2.5 mm diam., orange, paraphyses numerous, capitate, capitulae 15–25 µm diam., wall up to 5 µm thick at the apex, urediniospores 13–22 µm diam., loosely verruculose, distance between verrucae 1–3 µm). The name *Melampsora caprearum* (DC.) Thüm. (Thümen 1879), based on *Uredo caprearum* DC., is sometimes cited as new species name ascribed to de Thümen. Thümen (l.c.) cited this name as "*Melampsora caprearum* Thüm. nov. sp.", i.e., this name could be interpreted as new name introduce for the teleo- and holomorph, respectively (according to Art. F.8.1). He cited several synonyms for the uredinal stage ("stylospores"), including *Uredo farinosa* and *U. caprearum*, as synonyms. However, he also cited the valid name *Sclerotium salicinum* Pers. ex DC. and several other names as synonyms for the teleomorph, which would render the name *Melampsora caprearum* illegitimate (Art. 52.1). Therefore, this name can only be considered a valid new combination, based on *Uredo caprearum*, as done in

Index fungorum, which is possible since all requirements for a valid publication of a new combination are given. Thümen (1879a) cited other names in this publication as “nov. sp.” as well, such as *Melampsora vitellinae*, although he did not describe the teleomorph, indicating a misuse of “nov. sp.” in this work, which is in favour of interpreting such names as combinations. The original description of *M. caprearum* (without synonyms) was later copied and published in “Hedwigia 18: 77, 1879” with reference to Thümen (1879a). Hence, the name *M. caprearum* published in Hedwigia is an isonym of the validly published name *M. caprearum* published by Thümen (1879a).

Braun & Bensch (2019) cited *Epitea fenestrata* Bonord. (type host = *Salix caprea*), based on uredinia, as synonym of “*Melampsora ribesii-epitea*”, which was probably not correct. *M. ribesii-epitea* may also occur on *Salix caprea* (Klenke & Scholler 2015), but *M. farinosa* is the most common *Melampsora* on this host. The urediniospores of the two species are rather similar, and a differentiation between them without telia is difficult. Therefore, it was necessary to clarify this name by epitypification with a genetically proven epitype, which will be made in a later phylogenetic publication.

(8) *Uredo longicapsula* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 233, 1805.

Holotype: “*Aecidium pynolae* Gmel.?” on *Populus nigra*, 6 Oct. 1791, Chaillet, ex herb. de Candolle (G00262494).

≡ *Lecythea longicapsula* (DC.) Lév., Ann. Sci. Nat., Bot., Sér. 3, 8: 374, 1847, nom. inval (Art. 35.2).

≡ *Epitea longicapsula* (DC.) Rabenh., Klotzschii Herb. Viv. Mycol., Edn Nov, Ser. Sec., Cent. 4: no. 384, 1857.

= *Sclerotium populneum* Pers., Observ. mycol. 2: 25, [1799] 1800.

Type: on *Populus nigra*. [Possible type: J.F. de Chaillet [910.264-607] (L0117545)].

≡ *Melampsora populnea* (Pers.) Lév. [as “*populina*”], Ann. Sci. Nat., Bot., Sér. 3, 8: 375, 1847, nom. inval. (Art. 35.2).

≡ *Melampsora populnea* (Pers.) P. Karst., Bidr. Känn. Finl. Nat. Folk 31: 53, 1878.

[*Melampsora tremulae* Tul., Ann. Sci. Nat., Bot., Sér. 4, 2: 95, 1854, nom. illeg. (Art. 52.1).]

= *Uredo populina* Pers. [α], Syn. meth. fung. 1: 219, 1801, nom. sanct. **Lectotype** (designated here, MycoBank, MBT10006430): on *Populus basamifera*, herb. Persoon [910.264-112], “prope Parisios” (L00119108).

≡ *Melampsora populina* (Pers.) Tul., Ann. Sci. Nat., Bot., Ser. 4, 2: 95, 1854.

[*Uredo cylindrica* F. Strauss, Ann. Wetter. Gesellsch. Ges. Naturk. 2: 92, 1811, nom. illeg. (Art. 52.1).]

[*Caeoma cylindricum* Schltdl., Fl. berol. 2: 119, 1824, nom. illeg. (Art. 52.1).]

[*Caeoma cylindricum* (F. Strauss) Link, in Willdenow, Sp. pl., Edn 4, 6(2): 39, 1825, nom. illeg. (Art. 53.1), non *Caeoma cylindricum* Schltdl., 1824.]

= *Sphaeria populi* Sowerby, Col. fig. Engl. Fung. Mushr. 3(no. 25): tab. 374, fig. 2, 1802, nom. inval. (Art. 38.1a).

≡ *Peripherostoma populi* Gray [as “(Sowerby) Gray”], Nat. Arr. Brit. Pl. 1: 515, 1821. **Lectotype** (designated here, MycoBank, MBT10006431): Sowerby, Col. fig. Engl. Fung. Mushr. 3(no. 25): tab. 374, fig. 2, 1802.

≡ *Phoma populi* (Sowerby) Fr., Syst. mycol. 2(2): 547, 1823.

≡ *Melampsora populi* (Gray) M. Morelet [as “(Sowerby) M. Morelet”], Cryptog. Mycol. 6(2): 107, 1985, nom. illeg. (Art. 53.1), non *M. populi* Mont., in Castagne 1851.

= *Uredo ovata* F. Strauss, Ann. Wetter. Gesellsch. Ges. Naturk. 2: 92, 1811. **Neotype** (designated here, MycoBank, MBT10006432): Germany, Baden-Württemberg, Karlsruhe, Daxlanden, Rappenwört, Bad, on *Populus nigra*, 2009, M. Scholler (KR-M-0023902).

= *Uredo populi* H. Mart., Prodr. Fl. Mosq., Edn 2: 231, 1817. **Neotype** (designated here, Mycobank, MBT10006433): Russian Empire, Chernigovskaya Guberniya (Chernigov Governorate), Ostra [now Ukraine, Chernivtsi Oblast, Kitsman Raion, Ostra], on *Populus nigra*, as “*Melampsora laricis-populina*”, 25 Jul. 1908, G. Newodovski, Griby Ross. Herb. 37 (LE 56347).

≡ *Caeoma populi* (H. Mart.) Schltdl., Fl. berol. 2: 123, 1824.

≡ *Erysibe populi* (H. Mart.) Wallr., Fl. crypt. Germ. 2: 203, 1833.

= *Xyloma populinum* Duby, Bot. gall. 2: 875, 1830, nom. illeg. (Art. 53.1), non *X. populinum* Pers, 1801.

≡ *Melampsora populi* Mont., Suppl. Cat. Pl. Mars.: 80, 1851.

- = *Epitea oblonga* Bonord., Abh. Naturf. Ges. Halle **5**: 204, 1860 [also, in Rabenh., Fungi Eur. Exs. (Klotzschii Herb. Viv. Mycol. Continuatio, Ed. Nova, Ser. Sec.), Cent. 2: no. 190, 1860; Bot. Zeitung **18**: 175, 1860; Flora **43**: 749, 1860]. **Lectotype** (designated here, MycoBank, MBT10006435): Germany, Guestphalia, on *Populus* sp., Bonorden, Rabenh., Fungi Eur. Exs. 190 (HAL, s.n.).
- = *Uredo laricis* Westend., Bull. Acad. R. Sci. Belg., Cl. Sci., Sér. 2, **11**(6): 650, 1861.
- ≡ *Caecoma laricis* (Westend.) R. Hartig, Wichtige Krankheiten der Waldbäume. Beiträge zur Mykologie und Phytopathologie für Botaniker und Forstmänner: 93, 1874.
- ≡ *Melampsora laricis* (Westend.) R. Hartig, Bot. Centralbl. **23**: 362, 1885, and Allg. Forst-Jagdzeitung **61**: 326, 1885.
- ≡ *Melampsora tremulae* f. *laricis* (Westend.) R. Hartig, Lehrb. Baumkrankh.: 143, 1889.
- = *Melampsora balsamiferae* Thüm., Mycoth. Univ., Cent. 19: no. 1832, 1881. **Lectotype** (designated here, MycoBank, MBT10006436): Germany, Bavaria, Bayreuth, May 1876, on *Populus balsamifera*, Thüm., Mycoth. Univ. 1832 (HAL, s.n.). Isolectotypes: Thüm., Mycoth. Univ. 1832 (e.g., B, ILL77500, NEB40826, PUR044184).
- = *Melampsora laricis-populina* Kleb., Z. Pflanzenkrankh. **12**: 25 (and 43), 1902.

Notes: Type material of *Uredo longicapsula* has been re-examined and turned out to be *Melampsora populina*, as already pointed out by Tulasne (1854). The urediniospores are broad ellipsoid-ovoid to oblong, 30–45 × 14–20 µm, wall often thickened in the middle, distance between verrucae 1.5–3 µm, bold towards the apex, paraphyses clavate-capitate, capitulae 15–25 µm diam. There is a single collection under the name *U. longicapsula* in de Candolle's herbarium that corresponds to the protologue, including a reference to "*Aecidium pynolae* Gmel.?" This collection can be regarded as holotype (see Art. 9.1, Note 1). Tulasne (1854) also introduced the new (superfluous) name *Melampsora tremulae* (*Sclerotium populneum* Pers. was cited as synonym). Tulasne (l.c.) cited *S. populneum* Pers. (Persoon 1801: 125), in which *Populus tremula* was cited as host. However, Persoon (1801) cited Persoon (1800) as original reference in which *S. populneum* was described on *Populus nigra*. In addition, Tulasne (l.c.) referred to *Uredo ovata* F. Strauss in connection with the uredinial stage of *M. tremulae*, which is a species described on *Populus nigra* and *P. tremula*.

The nomenclature of the rust fungus commonly referred to as *Melampsora laricis-populina* is complicated and has been notoriously confused since the 19th century. Numerous old names are involved. The nomenclature of this species can only be disentangled on the basis of clarifications of the typifications of the names involved. The sanctioned name *Uredo populina* is the oldest valid name with priority for this rust species. This name must be ascribed to Persoon [Persoon (1801) cited "*Lycoperdon populinum* Ehrh., Pl. Crypt. Lin., Dec. 22, no. 220, nom. nud., and Jacquin (1787 [1786]: t. 9, f. 2, 3). However, Pl. 9 in the latter work exhibits a higher plant, but the name *L. populinum* is not listed in this work and it is also not included in the index]. Léveillé (1847: 375) cited the name "*Sclerotium populinum*" (probably in error for *Sclerotium populneum*) under *Melampsora*, but he failed to introduce the combination "*M. populneum*" (or "*M. populinum*"). The combination *M. populinum* was later validly introduced by Tulasne (1854: 95). He cited "*Melampsora populinum* Lév." and listed *Uredo populina* Pers. as synonym, which fulfils the conditions for a valid combination. Type collections of *Uredo populina* preserved in Persoon's herbarium were examined and listed by Jørstad (1958: 8). Collection "910.264-112" (on *Populus balsamifera*), containing uredinia and telia, and was identified as *M. laricis-populina*. This collection is designated as lectotype.

Melampsora populi (Gray) M. Morelet is a homonym (nom. illeg., Art. 53.1) of *M. populi* Montagne (in Castagne 1851), a name validly published with reference to *Xyloma populinum* Duby (1830: 875), non Pers. 1801. The latter name included a reference to *Sclerotium populneum* (as "*populinum*"), described on *Populus nigra*, which is a synonym of *Melampsora populina*.

Sphaeria populi Sowerby is an invalid name (nom. nud., Art. 38.1). A description or diagnosis is lacking and the original illustration is not accompanied by an analysis (Art. 38.7). This name was later validated as *Peripherostoma populi* Gray [as "(Sowerby) Gray", with description]. However, the exact name of the host species was not given in Sowerby's original publication, and it cannot be properly identified on the basis of the original illustration. Gray (1821) did also only cite "*Populus*" as host. Therefore, the common interpretation of *Melampsora populi* as synonym of *Melampsora laricis-populina*, as done, for instance, in Index fungorum, required the clarification of the typification of *Peripherostoma populi*. This name is lectotypified by the original illustration. However, this lectotype requires an epitype, including ex-epitype sequence that fixes the application of this name as currently done, i.e., as synonym of *M. populina*. This will be done in a later phylogenetic publication.

Strauss (1811) introduced the name *Uredo ovata* for rusts on *Populus nigra* and *P. tremula*. The identity of this name can also only be clarified and determined by typification. The herbarium of F. Strauss is preserved at herbarium M, but according to a recent information of D. Triebel, curator of the mycological herbarium in M, authentic material for this name is not preserved. Therefore, we propose a neotype, viz., a collection on *Populus nigra*, the first mentioned host, and follow the assumption in Sydow & Sydow (1915) that *U. ovata* belongs to *M. laricis-populina* (now *M. populina*).

The synonymy of *Epitea oblonga* was discussed in Braun & Bensch (2019: 13). The lectotype material of *Melampsora balsamiferae* perfectly coincides with *M. populina* (uredinia hypophyllous, telia epiphyllous, paraphyses to 70 µm long, clavate to capitate, terminal capitulate 12–24 µm diam., wall at the apex 3–10 µm thick, urediniospores 30–38 × 15–20(–23) µm, wall 2–3 µm wide, sometimes wider in the middle, verruculose, distance between verrucae 1.5–3 µm, less verruculose at the apex or bold or almost so).

The identity of *Uredo populi* H. Mart., described from Russia on *Populus nigra* and *P. tremula*, can only be clarified by neotypification as well. The description is very meagre, and two *Melampsora* species were undoubtedly involved in the original description. We prefer to use Russian neotype material on *Populus nigra*, the host cited first in the protologue, belonging to *M. populina*, the most common species on this host.

The type material of *Uredo laricis* is not preserved at BR in herb. Westendorp. There is a single specimen deposited under the name *Caecoma laricis* (= *Uredo laricis*) [Belgium, on *Larix decidua*, s.d., G.-D. Westendorp, s.n. (BR5020105858318)], which cannot be considered the holotype. *Melampsora laricis* and *M. tremulae* f. *laricis* were introduced as combinations based on *Uredo laricis* [by reference to *Caecoma laricis*] (Hartig, in Anonymous 1885, Hartig 1889), and applied to a *Melampsora* host-alternating with *Populus tremula*. However, Hartig in Anonymous (1885) only obtained uredinia, i.e., telia were not observed and not described, so that the name *Melampsora laricis* cannot be ascribed to Hartig as new teleomorph-typified species name, according to Art. F.8.1. The holotype of *Uredo laricis* is not preserved and caeomata on *Larix decidua* are associated with several *Melampsora* species, and the morphological differentiation between them is not possible with certainty. Therefore, the clarification of the identity of *Uredo laricis* and its homotypic synonyms requires the neotypification with genetically proven material. I prefer to follow Hartig's (l.c.) interpretation that this name is ascribable to *M. tremulae* (now *M. populina*). However, to fix this interpretation, it is necessary to neotypify *Uredo laricis* with phylogenetically proven (sequenced) material. This will be made in a later phylogenetic publication.

Klebahn (1902: 43) reported results of his inoculation experiments, but the morphology of *Melampsora laricis-populina* was not described. However, the name *M. laricis-populina* was first introduced on page 25, where Klebahn discussed differences to *M. allii-populina*, which constituted a diagnosis and valid publication of the name *M. laricis-populina*.

(9) *Uredo petasitis* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 236, 1805.

Lectotype (designated here, MycoBank, MBT10006437): France, “fl. fr. 635”, on *Petasites hybridus* (= *Tussilago petasites*), ex herb. de Candolle (G00262465).

≡ *Coleosporium petasitis* (DC.) Lév., in d’Orbigny, Dict. Univ. Hist. Nat. 12: 786, [1848] 1849, nom. inval. (Art. 35.5).

≡ *Coleosporium petasitis* (DC.) Berk. [as “Lév.”], Outline of British fungology: 333, 1860.

= *Peridermium boudieri* E. Fisch., Bull. Soc. Bot. Fr. 41: CLXXI, 1895, nom. nud. (Art. 38.1 a).

= *Peridermium dietelii* G.H. Wagner [as “dieteli”], Z. Pflanzenkrankh. 6: 10, 1896.

Notes: Berkeley (1860) cited “*Coleosporium petasitis* Lév.” which is a reference to Lévillé, in d’Orbigny (1849: 786). Lévillé (l.c.) cited *Uredo petasitis* DC. under *Coleosporium*, but did not introduce the combination *C. petasitis* (Art. 35.5). Therefore, Berkeley's (1860) citation can be considered a new combination based on *Uredo petasitis*, validated by indirect reference (Art. 38.14, 41.3) to de Candolle's name.

(10) *Uredo pinguis* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 235, 1805.

Lectotype (designated here, MycoBank, MBT10006438): France, “fl. fr. 631”, on *Rosa gallica* (= *R. austriaca*), ex herb. de Candolle (G00566472).

= *Puccinia mucronata* Pers., Neues Mag. Bot. 1: 118, 1794, nom. sanct. (Persoon 1801: 230).

≡ *Phragmidium mucronatum* (Pers.) Schltdl., Fl. berol. 2: 156, 1824.

Notes: The name *Uredo pinguis* is in need of lectotypification. It was introduced with reference to two different hosts, viz., α . *Rosae austriacae* and β . *Rosae alpinae*. De Candolle's original material on *Rosa austriaca*, deposited at G, is designated as lectotype.

(11) *Uredo punctata* DC. [α . *euphorbiae-helioscopiae*], in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 236, 1805.

Lectotype (designated here, MycoBank, MBT10006439): France, “*Aecidium; Lycoperdon epiphyllum* Lin.”, on *Euphorbia helioscopia*, ex herb. de Candolle (G00262467).

≡ *Diplodia punctata* (DC.) Lév., in Orbigny, Dict. Univ. Hist. Nat. 12: 779, 1849.

= *Uredo helioscopiae* Pers., Neues Mag. Bot. 1: 93, 1794.

≡ *Caecoma helioscopiae* (Pers.) Schltdl. [as “(DC.) Schltdl.”], Fl. berol. 2: 125, 1824.

≡ *Erysibe helioscopiae* (Pers.) Wallr., Fl. crypt. Germ. 2: 205, 1833.

≡ *Melampsora helioscopiae* (Pers.) G. Winter, Rabenh. Krypt.-Fl., Edn 2, 1.1: 240, [1884] 1881.

≡ *Uredo euphorbiae-helioscopiae* Pers., Syn. meth. fung. 1: 215, 1801, nom. sanct. **Neotype** (designated here, MycoBank, MBT10006440): “*Uredo euphorbiae* var.”, on *Euphorbia helioscopia*, J. J. A. Mougeot, ex herb. Persoon 910.264-560 (L 0114215).

≡ *Melampsora euphorbiae-helioscopiae* (Pers.) Nannf., in Lundell & Nannf., Fungi Exsiccati Suecici: no. 1211, 1943.

[*Uredo euphorbiae* Rebent., Prodr. fl. neomarch.: 354, 1804, nom. illeg. (Art. 52.1)]

[*Lecythea euphorbiae* (Rebent.) Lév., Ann. Sci. Nat., Bot., Sér. 3, 8: 374, 1847, nom. inval. (Art. 35.2).]

Notes: The status of the name *Uredo punctata* requires clarification by lectotypification. De Candolle (1805) introduced this name with three different hosts (α . *Euphorbiae-helioscopiae*, β . *Euphorbiae-pusillae* and γ . *Euphorbiae-pelidis*). A collection of α . *Euphorbiae-helioscopiae* on *Euphorbia helioscopia* from de Candolle's herbarium is designated as lectotype.

The taxonomy and circumscription of *Melampsora* spp. on *Euphorbia* spp. have been variously treated. The *Melampsora* on *Euphorbia helioscopia* is biologically confined to this host, i.e., in inoculation experiments, it could not be transferred to *Euphorbia peplus* and other *Euphorbia* species that pertain to *M. euphorbiae* (Ficinus & C. Schub.) Castagne (Sydow & Sydow 1915), and this rust is also phylogenetically different from *M. euphorbiae* (see Maier et al. 2003), which has been taken into account in the present synonymy of *M. euphorbiae-helioscopiae*.

According to the current Code (Art. F.3.7), *Melampsora euphorbiae-helioscopiae* is the correct name for this fungus, since *Uredo euphorbiae-helioscopiae* being a sanctioned name, treated as if conserved against earlier homonyms and competing synonyms [Persoon (1801) cited “Disp. meth. fung. p. 13” (Persoon 1797: 13) in the protologue, which is a reference to the name *Uredo helioscopiae* in the latter work, based on the original publication of this name in Persoon (1794), so that *U. helioscopiae* has to be considered a homotypic synonym of *U. euphorbiae-helioscopiae*]. Nannfeldt's combination in Fungi Exs. Suec. was effectively published (see Art. 30.8, Ex. 12). Jørstad (1958: 6) examined specimens deposited in Persoon's herbarium under *Uredo euphorbiae/helioscopiae/euphorbiae-helioscopiae* and emphasized that suitable type material is not preserved. Therefore, a neotype is designated, based on a collection examined by Jørstad (l.c.) and confirmed as “*Melampsora euphorbiae* (syn. *M. helioscopiae*)”. The neotype only contains uredinia.

De Candolle, in Lamarck & de Candolle (1805), cited *Uredo helioscopiae* with reference to Persoon (1801), who introduced *Uredo euphorbiae-helioscopiae* with reference to *Uredo helioscopiae* in Persoon (1798). Hence, de Candolle (l.c.) indirectly referred to *U. helioscopiae* Pers. and did not intend to introduce a new species with the same name. Hence, all combinations based on “*U. helioscopiae* DC.”, such as *Caecoma helioscopiae* refer to *U. helioscopiae* Pers. as basionym. *Uredo euphorbiae* Rebent. is an illegitimate (superfluous) name, since the original description encompassed *Uredo euphorbiae-helioscopiae* [a reference to Persoon (1801: 215) was given].

(11) *Uredo salicis* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, 2: 230, 1805.

[Type: on *Salix* sp. (“*Uredo du saule*”), C. Berger, without any further details.] **Lectotype** (designated here, Mycobank, MBT10006441): France, on *Salix triandra*, without locality, date and collector, ex herb. de Candolle (G00262500).

= *Hypodermium* (subgen. *Uredo*) *mixtum* Link [as “*Ur. mixta*”], Mag. Gesell. Naturf. Freunde, Berlin 7: 28, 1816 [type host: *Salix triandra*].

- ≡ *Caeoma mixtum* (Link) Schldtl., Fl. berol. **2**: 124, 1824.
- ≡ *Uredo mixta* (Link) Duby, Bot. Gall. **2**: 895, 1830.
- ≡ *Erysibe mixta* (Link) Wallr., Fl. crypt. Germ. **2**: 204, 1833.
- ≡ *Lecythea mixta* (Link) Lév., Ann. Sci. Nat., Bot., Sér. 3, **8**: 374, 1847, nom. inval. (Art. 35.2).
- ≡ *Epitea mixta* (Link) Fr., Summa veg. Scand., Sectio Post.: 512, 1849.
- ≡ *Melampsora mixta* (Link) Thüm., Mitt. Forstl. Versuchswesen Oesterr. **2**(1): 42, 1879.
- = *Melampsora amygdalinae* Kleb., in Pringsheim, Jahrb. Wiss. Bot. **34**: 352, 1900 [type host: *Salix triandra*].

Notes: The identity of *Uredo salicis* remained quite unclear to this day. The identity of this name can only be pointed out in connection with a clarification of its typification. In the original description, de Candolle (in de Lamarck & Candolle 1805) cited a single specimen on *Salix*, collected by C. Berger. However, de Candolle (l.c.) mentioned C. Berger and names of other collectors or senders in the protologues of several other names of rust fungi, but the names concerned are often not to be found on the labels of authentic collections in de Candolle's herbarium that were recently re-examined. The collection on *Salix triandra*, deposited in de Candolle's herbarium under the name *Uredo salicis* is, although without any other data on the label, the only specimen that can be taken into consideration as original material. It is unclear if de Candolle obtained a single specimen that he used for the description of *U. salicis*. Therefore, I do not consider this sample, according to Art. 9.1, Note 1, as holotype, but prefer to designate it as lectotype. The collection on *Salix triandra* from de Candolle's herbarium, which is designated as lectotype of *Uredo salicis*, has been examined and identified as *Melampsora*, so far usually referred to as *M. amygdalinae* [uredinial paraphyses capitate, capitate apex 12–22 µm wide, uredospores oblong ellipsoid-ovoid, 18–32 × 12–18 µm, with loosely arranged warts, distance between warts 1.5–3 µm, apically with fewer or without any verrucae (“bold”)].

Hypodermium (subgen. *Uredo*) *mixtum* is another synonym. Link (1816) introduced this name and cited *Uredo salicis* as synonym with question mark. Schlechtendal (1824) introduced the new combination *Caeoma mixtum* and cited *Uredo salicis* as genuine synonym (without question mark). Last but not least, Thümen (1879a) introduced the combination *Melampsora mixta* and classified *Salix triandra* as principal host [this name was introduced as “*Melampsora mixta* nov. spec.” but it fulfils the necessary conditions for a new combination; the basionym was cited as synonym and the teleomorph was not described, so that Art. F.8.1 cannot be applied].

The name *Uredo salicis* takes priority over *Hypodermium* (subgen. *Uredo*) *mixtum* and *Melampsora amygdalinae*. To maintain the established name *Melampsora amygdalinae*, a proposal to preserve this name is needed.

(12) *Uredo vitellinae* DC., in Lamarck & de Candolle, Fl. franç., Edn 3, **2**: 231, 1805.

Lectotype (designated here, MycoBank, MBT10006442): on *Salix alba* var. *vitellina* (≡ *S. vitellina*), Girod-Chantrons (1802: plate 22, figs. 55, 55’).

- ≡ *Erysibe vitellinae* (DC.) Wallr., Fl. crypt. Germ. **2**: 204, 1833.
- ≡ *Epitea vitellinae* (DC.) Fr. Summa veg. Scand.: 512, 1849.
- ≡ *Melampsora vitellinae* (DC.) Thüm., Mitt. Forstl. Versuchswesen Oesterr. **2**(1): 43, 1879.
- ≡ *Melampsora vitellinae* (DC.) Thüm. [as “Thüm.”], Hedwigia **18**(5): 79, 1879, isonym. (Art. 6, Note 2).

[*Caeoma saliceti* Schldtl., Fl. berol. **2**: 124, 1824, nom. illeg. (Art. 52.1).

- ≡ *Uredo saliceti* (Schldtl.) J. Becker, Fl. Frankfurt, Zweite Abth.: 252, 1828.
- ≡ *Lecythea saliceti* (Schldtl.) Berk., Outl. Brit. Fung.: 334, 1860.]
- = *Uredo orbicularis* Mart., Fl. crypt. erlang.: 318, 1817 [type host: *Salix alba*].
- = *Melampsora salicis-albae* Kleb., Jahrb. Wissen. Bot. **35**: 679, 1901, nom. inval. (Art. 36.1).
- = *Melampsora allii-salicis-albae* Kleb. [as “nom. nov.”], Z. Pflanzenkrankh. **12**: 19, 1902.

Notes: De Candolle (in Lamarck & de Candolle 1805) introduced the name *Uredo vitellinae* for an uredinial stage on “saule osier” (*Salix vitellina* ≡ *S. alba* var. *vitellina*). De Candolle (l.c.) based this name on an illustration published by Girod-Chantrons (1802), who described and discussed a rust (rouille) on *Salix vitellina* (Girod-Chantrons 1802: 131). Girod-Chantrons (1802: Pl. 22, fig. 55) might refer to a leaf of *Salix alba* var. *vitellina*, and Fig. 55’ can be interpreted as uredinia and urediniospores of a *Melampsora*. They are not globose, but rather ellipsoid-oblong, which is in agreement with those of *Melampsora* on *Salix alba*, usually referred to as *M. salicis-albae*, which is, however, an invalid name, published as “ad int.” (Art. 36.1). Additional specimens were not cited, so

that only the original illustration can be used for lectotypification. However, the identity of *U. vitellinae* can only be pointed out by clarification of its typification. The lectotype (Girod-Chantrons 1802: Pl. 22, fig. 55) is not sufficient for a proper identification of this name. Therefore, the lectotype must be supplemented by an epitype. This will later be accomplished in another publication with corresponding, sequenced material.

In de Candolle's herbarium, there several specimens, collected after 1805, which are deposited under *Uredo vitellinae* and a single undated uredinial sample (without locality and collector) on *Salix viminalis* (G00261342), which is morphologically identical to *Melampsora epitea* Thüm. (uredinia about 0.5 mm diam. or somewhat larger, paraphyses capitate, capitulae 20–30 µm diam., urediniospores globose, 16–24 µm diam., regularly verrucose, distance between verrucae 1.5–3 µm). Thümen (1879a) introduced the new combination *Melampsora vitellinae*, described “stylospores” (urediniospores), and assigned collections on *Salix fragilis*, *S. lucida*, *S. pentandra*, and *S. vitellina* to this name, but emphasized that *S. vitellina* being the main host. Telia and teliospores were not described. Therefore, the name *M. vitellinae*, although described as “nov. spec.”, can only be considered a new combination based on *Uredo vitellinae*, which was cited as synonym, as also interpreted in Index fungorum and MycoBank. In Thümen (1879b), all descriptions of species from Thümen (1879a) were repeated with reference to the latter publication, but without citing any synonyms, which constitutes an indirect reference to *Uredo vitellinae* (Art. 43.1). Sydow & Sydow (1915) cited *Uredo vitellinae* as synonym of *Melampsora laricis-pentandrae*, but only with question mark.

Caecoma saliceti (Schlechtendal 1824) is an illegitimate (superfluous) name, according to Art. 52.1, since *Uredo vitellinae* was cited as synonym.

Literature

- Anonymous 1885: Originalberichte gelehrter Gesellschaften. Botanischer Verein in München. IV. ordentliche Sitzung Mittwoch den 11. Februar 1885. Botanisches Centralblatt **23**: 361–363.
- Berkeley, M. J. 1860: Outlines of British Fungology; containing characters of above a thousand species of fungi, and a complete list of all that have been described as natives of the British Isles. London.
- Braun, U. & Bensch, K. 2019: Annotated list of taxonomic novelties published in “Fungi Europaei Exsiccati, Klotzschii Herbarium Vivum Mycologicum Continuato, Editio Nova, Series Secunda” Cent. 1 to 26 issued by G. L. Rabenhorst between 1859 and 1881 (first part – Cent. 1 to 10). Schlechtendalia **36**: 1–60.
- Candolle, A. P. de 1815: Flore Française **5-6**: 1–662. Paris.
- Castagne, L. 1851: Catalogue des Plantes qui Croissent Naturellement aux Environs de Marseille. Supplément. Aix.
- D'Orbigny, M. C. [1848] 1849: Dictionnaire Universel d'Histoire Naturelle. Tome Treizième. Paris.
- Duby, J. É. 1830: Aug. Pyrami de Candolle. Botanicon Gallicum, seu Synopsis Plantarum in Flora Gallica Descriptarum. Ed. 2, 2.
- Girod-Chantrons, J. 1802: Recherches chimiques et microscopiques sur les conferves, bisses, tremelles, etc. Paris.
- Gray, S.F. 1821: A Natural Arrangement of British Plants. Vol. 1. London.
- Hartig, R. 1889: Lehrbuch der Baumkrankheiten. Zweite verbesserte und vermehrte Auflage. Berlin.
- Jacquín, N. J. [1786] 1787: Collectanea ad botanicam, chemiam, et historiam naturalem spectantia: cum figures. Vol. 1. Vindobonae.
- Jørstad, I. 1958: The genera *Aecidium*, *Uredo* and *Puccinia* of Persoon. Blumea **9**(1): 1–20.
- Klebahn, H. 1902: Kulturversuche mit Rostpilzen. X. Zeitschrift für Pflanzenkrankheiten **12**: 17–44, 132–151.
- Klenke, F. & Scholler, M. 2015: Pflanzenparasitische Kleinpilze Bestimmungsbuch für Brand-, Rost-, Mehltau-, Flagellatenpilze und Wucherlingsverwandte in Deutschland, Österreich, der Schweiz und Südtirol. Heidelberg.
- Lamarck, J. B. de & De Candolle, A. P. 1805: Flore française **2**: 1–600. Paris.
- Léveillé, J. H. 1847: Sur la disposition methodique des Urédinées. Annales des Sciences Naturelles, Botanique, Série 3, **8**: 369–376.
- Link, J. H. F. 1816: Observationes in ordines plantarum naturales. Dissertatio secunda. Magazin für die neuesten Entdeckungen in der gesammten Naturkunde, Gesellschaft Naturforschender Freunde zu Berlin **7**: 25–45.
- Maier, W., Begerow, D., Weiß, M., & Oberwinkler, F. 2003: Phylogeny of the rust fungi: an approach using nuclear large subunit ribosomal DNA sequences. Canadian Journal of Botany **81**: 12–23.
- Persoon, C. H. 1794: Neuer Versuch einer systematischen Eintheilung der Schwämme. Neues Magazin für die Botanik in ihrem ganzen Umfange **1**: 63–128.
- Persoon, C. H. 1797: Tentamen Dispositionis Methodicae Fungorum in Classes, Ordines, Genera et Familias cum Supplemento Adjecto. Leipzig.
- Persoon, C. H. [1799] 1800: Observationes Mycologicae, **2**. Leipzig.

- Persoon, C. H. 1801: *Synopsis methodica fungorum*. Göttingen.
- Schlechtendal, D. F. L. von 1824: *Flora Berlinensis, Pars secunda: Cryptogamia*. Berlin.
- Strauss, F. 1811: Über die Persoonschen Pilzgattungen *Stilbospora*, *Uredo* und *Puccinia*. *Annalen der Wetterauischen Gesellschaft für die Gesammte Naturkunde* **2**(2): 79–114.
- Sydow, P. & Sydow, H. 1915: *Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* **3**(2): 1–726. Leipzig.
- Thümen, v. F. 1879a: *Melampsora salicina*, der Weidenrost. Eine monographische Studie. *Mitteilungen aus dem Forstlichen Versuchswesen Österreichs* **2**(1): 25–46.
- Thümen, v. F. 1879b: *Melampsora salicina*, der Weidenrost. (S. A. aus den „Mittheilungen aus d. forstl. Versuchswesen Oesterreichs“. Bd. II, Heft 1). *Hedwigia* **18**(5): 76–79.
- Tulasne, E. L. R. 1854: Second mémoire sur les urédinées et les ustilaginées. *Annales des Sciences Naturelles Botanique, Série 4*, **2**: 77–196.

Address of the author

Uwe Braun, Martin-Luther-Universität, Institut für Biologie, Bereich Geobotanik und Botanischer Garten, Neuwerk 21, 06099 Halle (Saale), Germany.
(E-mail: uwe.braun@botanik.uni-halle.de)