

NOTES ON HYGROPHORACEAE – VII
On the taxonomy and nomenclature of some species of *Hygrophorus*

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Taxonomy and nomenclature of some West European species of *Hygrophorus* are discussed. The current use of *Hygrophorus cossus* (Sow.) Fr. as correct name of *H. chrysaspis* Métrod is rejected. Instead the name *H. discoxanthus* (Fr.) Rea is reintroduced. *Hygrophorus barbatulus* Becker is synonymized with *H. penarius* Fr. *Hygrophorus melizeus* (Fr.: Fr.) Fr. is considered as an earlier name of *H. karstenii* Sacc. & Cub. and a neotype from Sweden is indicated and briefly described. *Hygrophorus leucophaeus* (Scop.) Fr. is rejected as a nomen dubium, the valid name of this species in its current concept being *H. unicolor* Gröger. *Hygrophorus quercetorum* P.D. Orton is reduced to a variety of *H. eburneus*. The new combination *Hygrophorus eburneus* var. *quercetorum* is proposed.

In the framework of the 'Flora agaricina neerlandica' (see Bas, 1983) a revision was made of the genus *Hygrophorus* in the Netherlands and adjacent regions (Arnolds, in prep.). Some taxonomic and nomenclatural problems met during this work are discussed in this paper. Most discussions concern the group of whitish species around *H. eburneus*. In spite of recent revisions of this group by Neuhoﬀ (1962) and Bresinsky (1965) some name changes appear to be necessary. These alterations are partly due to modification in the rules of botanical nomenclature adopted at the Sydney congress (Voss & al., 1983), partly because of incorrect interpretations of Friesian names neglecting the original species concepts.

The typification of names sanctioned by Fries is ruled in Art. 7.17 of the Code, but unfortunately more than one interpretation is possible. In my opinion the type must be selected from the older descriptions mentioned by Fries in his protologue if such references are given. Some other authors still prefer to regard Fries' sanctioning descriptions in *Systema* and *Elenchus* as the relevant protologues and therefore as type descriptions. They neglect the fact that under the present Code many pre-Friesian names were already validly published before they were sanctioned by Fries.

These two approaches often lead to conflicting interpretations of fungus names. For instance it is demonstrated in this paper that the type species of *Hygrophorus*, *Agaricus eburneus* Bull.: Fr., is differently interpreted by Bulliard and Fries: the concept by Bulliard agrees with current use, but *Agaricus eburneus* sensu Fr. is identical with *Hygrophorus piceae* Kühner.

The nomenclatural and taxonomic notes are arranged in alphabetical order of the epitheta.

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TAXONOMIC AND NOMENCLATURAL NOTES

barbatulus

Hygrophorus barbatulus Becker is a synonym of *H. penarius* Fr. See there.

carpini

Hygrophorus carpini Gröger was described by its author (1980: 162) side by side with *H. unicolor* Gröger as part of the species complex formerly known as *H. leucophaeus* (Scop.: Fr.) Fr. That name was rejected by Gröger (l.c.) as a nomen confusum. I share that opinion, although on partly different grounds (see *leucophaeus*).

According to Gröger (l.c.), *H. unicolor* is a species with a dry stipe, dull orange colour all over the basidiocarps and associated with *Fagus*, whereas *H. carpini* has a weakly viscid stipe, a whitish pileus with orange-brown centre and is associated with *Carpinus*. In the Netherlands and adjacent parts of Belgium and Germany I know only one species, occurring under *Fagus* and answering the description of *H. unicolor*, but some collections are close to *H. carpini* having a whitish pileus with flesh-brown centre; others have a greasy (although not really viscid) stipe, in microscopic section with fascicles of ascending, loosely interwoven, slightly gelatinized hyphae. Among the plates quoted by Gröger (l.c.) for *H. carpini* some agree very well with collections made in beech forests in the Netherlands, e.g. the painting by Konrad & Maublanc (1937: 370).

On the other hand Gröger (priv. comm.) suggested that *H. carpini* may very well be identical with *H. lindtneri* Moser, originally described (Moser, 1967: 3) as associated with *Corylus*. The only morphological differences with *H. carpini* are slightly larger basidiocarps and somewhat larger spores.

On the base of these observations I regard *H. carpini* as a synonym of *H. lindtneri*, whereas the limits with *H. unicolor* have to be critically studied. For the moment I assign all collections from the Netherlands to *H. unicolor*.

cossus

Agaricus cossus Sow. was listed by Fries in Systema (1821) as an unnamed form of *Agaricus eburneus* under the heading 'b. disco flavescente, stipite longo'. The name was not sanctioned by Fries and consequently the type description is that of *Agaricus cossus* by Sowerby (1799: pl. 121) in any case. That description only says that 'the pileus is covered with a gluten, which constantly gives a strong goatlike odour, exactly resembling the wounded larvae of *Phoel. Cossus*'. His plate shows a slender, white agaric with a habit and size resembling most representatives of the *eburneus*-group. No indication of the habitat or host tree is given.

This name was interpreted by Neuhoff (1962) and Bresinsky (1965) as an earlier valid name for *H. chrysaspis* Métrod, a species associated with *Fagus* and well-characterized by the yellowish discoloration of older basidiocarps and especially by the browning of the lamellae. This interpretation was mainly based on the description of *H. cossus* in the *Hygrophorus* part of Fries' Monographia (1851: 4/124), which may very well be identical with *H. chrysaspis* indeed. The earlier description by Fries in Epicrisis (1838: 321)

is less clear and the indication of the habitat 'in pinetis' excludes in my opinion synonymy with *H. chrysaspis*. However, this description too is not relevant from a nomenclatural point of view.

In my opinion Sowerby's description of *Agaricus cossus* (l.c.) may concern several species of the *eburneus*-complex, especially *H. eburneus* itself. Not a single phrase points to the striking characters of *H. chrysaspis*, mentioned above. Moreover, Sowerby (1797: pl. 71) described as a different species *Agaricus nitens*, which perfectly agrees with *H. chrysaspis* (see *nitens*).

Neuhoff (1962: 67) discussed the taxonomic significance of the 'cossus-smell' and concluded that it cannot be used as a single character since such a smell may be noticed in *H. chrysaspis*, *H. hedrychii* and in *H. eburneus*. I agree with this point of view.

Orton (1984a: 584) claims to know a fungus from the collecting area of Sowerby that has a strong *cossus*-smell and a pileus discolouring slightly cream with age, quite distinct from *H. chrysaspis*. In my opinion it is not at all sure that *H. cossus* sensu Orton is really different from *H. eburneus*, but Orton's observations support the view that it is impossible to synonymize *H. cossus* and *H. chrysaspis*.

In my opinion an earlier alternative name for *H. chrysaspis* is *H. discoxanthus* (Fr.) Rea. See the discussion on that epithet.

discoxanthus

Agaricus discoxanthus was described by Fries (1815: 15) as an agaric with a whitish, viscid pileus, c. 40–50 mm broad, turning yellowish at the centre ('pileo . . . viscoso albido, disco flavescente'); broadly adnate to decurrent, white lamellae turning brown ('lamellae albido-fuscescentes'); the stipe c. 5 cm long, white, white squamulose. In *Systema* (1821: 33) this name was listed under *Agaricus eburneus*, as (forma) 'b. disco flavescente, stipite longo', together with *Agaricus nitens* With., (actually *A. nitens* Schaeff.) *A. cossus* Sow. and *A. elongatus* Schum. In *Epicrisis* (1838: 321) and later publications *Agaricus discoxanthus* was listed by Fries as a synonym of *Hygrophorus cossus*. The characteristic browning of the lamellae was omitted, however, from the description of that species (see discussion on the epithet *cossus*).

It is perfectly clear that *Agaricus discoxanthus* Fr. is identical with the species associated with *Fagus*, unambiguously described by Métrod (1938: 153) as *Hygrophorus chrysaspis*. The epithet *discoxanthus* was recombined in *Hygrophorus* by Rea (in Smith & Rea, 1908: 45), who gave also a good description: ' . . . edge (of lamellae) turning reddish when bruised at first and then finally reddish brown'.

See also discussion on the epithets *cossus* and *nitens*.

eburneus

Agaricus eburneus Bull.: Fr. was at first the only white species included by Fries (1821: 33) in the tribus *Limacium*. From the habitat indication ('in silvis frondosis et acerosis, frequens') and the synonyms listed by Fries it is clear that he used a very broad species concept at that time, including *H. eburneus* sensu stricto, *H. piceae* Kühner and as 'b. disco flavescente ' *H. cossus* (Sow.: Fr.) Fr., *H. discoxanthus* (Fr.) Rea and

probably *H. hedrychii* (Velen.) Kult. In 1838(:33) *Hygrophorus eburneus* was described by Fries as a common species with a pleasant smell growing in forests, but no associated tree was mentioned.

In Europe most authors regard *H. eburneus* as a purely white fungus, associated with *Fagus*. However, Neuhoff (1962: 64) has argued that the only widespread white species of this group in Sweden is in fact *H. piceae* Kühner, associated with *Picea*. In fact Lundell & Nannfeldt (1939) had drawn the same conclusion by distribution of a collection from *Picea* forest as exsiccates of *H. eburneus* (in fact *H. piceae* Kühner). I agree with these authors that such an interpretation of *Agaricus eburneus* is necessary if that name is typified by the sanctioning description by Fries (1821), which would be a most unfortunate name change.

However, in my opinion *Agaricus eburneus* Bull.: Fr. is to be typified by the oldest plate by Bulliard quoted by Fries, viz. plate 118, published in 1782 or 1783 and accompanied by the Latin name *Agaricus eburneus* and a short description. This plate represents an entirely white, very glutinous agaric without particular smell. I am aware of the fact that the diagnosis is too short for being sure that Bulliard's species is *H. eburneus* in the current sense (and for instance not *H. quercetorum*), but nothing in plate and text pleads against such an interpretation, which in my opinion is sufficient reason for continuing the use of the name in that sense. In the collection areas of Bulliard *H. eburneus* is a common species. The later description by Bulliard & Ventenat (1809: 524) has no nomenclatural importance, but probably concerns the same species.

fagi

Hygrophorus fagi Becker & Bon is discussed under *H. penarius*.

hedrychii

Hygrophorus hedrychii (Velen.) Kult is in my opinion the correct name for the species in the *eburneus* group with pinkish centre of the pileus, pinkish lamellae and growing in association with *Betula*. The epithets *melizeus* and *cossus* must be rejected for this species.

karstenii

Hygrophorus karstenii Sacc. & Cub. is a taxonomic synonym of *Hygrophorus melizeus* (Fr.: Fr.) Fr. See discussion on *melizeus*.

leucophaeus

Hygrophorus leucophaeus (Scop.) Fr. is usually interpreted as a rather slender species with a slimy, pale brown pileus and a dry stipe without veil, mostly associated with *Fagus*, e.g. by Konrad & Maublanc (1937: pl. 370), J. Lange (1940: pl. 163 G), Kühner & Romagnesi (1953: 57) and Moser (1978: 78). Gröger (1980: 157) has convincingly demonstrated that the descriptions of *H. leucophaeus* by Fries (e.g. 1838: 323; 1874: 408) differ strongly from that concept. However, according to the present nomenclatural rules the concept by Fries is not important in nomenclatural respect since the name is not sanctioned and a direct reference (with note of exclamation) is given to *Agaricus leucophaeus* Scop., which is the validly published basionym. In the type description Scopoli

(1772: 423) characterized *A. leucophaeus* as an agaric with a pale yellow, filamentose, humid pileus, c. 100 mm wide; subdecurrent, pale lamellae and a short stipe. No indication of the habitat was given. In my opinion it is impossible to use this name for one of the present species of *Hygrophorus* and it is even not clear, whether it belongs to a species of *Hygrophorus* or not. I reject it as a nomen dubium. One thing is certain: it has nothing to do with *H. leucophaeus* sensu auct., so that the rejection of that name by Gröger (l.c.) is still justified. The correct name is *H. unicolor* Gröger. See also *H. carpini*.

lindtneri

Hygrophorus lindtneri Moser is an older valid name for *H. carpini* Gröger. See there.

melizeus

Hygrophorus melizeus (Fr.: Fr.) Fr. has been interpreted by various authors in different ways, e.g. sensu Ricken (1910: 16, = *H. discoxanthus* (Fr.) Rea), sensu Favre 1960 (= *H. spodoleucus* Mos.), sensu Neuhoff 1962 (= *H. hedrychii* (Velen.) Kult.), sensu Arnolds 1974 (= *H. eburneus* var. *quercetorum* (P. D. Orton) Arnolds). This confusion is mainly caused by distinct changes in the species circumscription applied by Fries himself. The concept of Neuhoff has been accepted by most European authors, e.g. by Bresinsky (1965:13) and Moser (1967: 1).

Here again a different interpretation is in order. The first description, here chosen as lectotype, was published in *Observationes* (1818: 201). Important diagnostic characters of *Agaricus melizeus* are a smooth, white pileus, c. 51 mm broad; distant, decurrent, yellow lamellae ('. . . lamellis luteis decurrentibus . . .'); a solid white stipe, c. 6–8 mm thick, a very weak smell ('Odor valde debilis, sed non distinctus') and the occurrence in *Picea* forests ('In silvis muscosis abiegnis'). This description deviates in several respects from *H. hedrychii*: the latter species has pinkish colours on the glutinous pileus and especially on the lamellae, usually a strong smell and it grows near *Betula*.

The description from 1818 was almost copied in *Systema* (1821: 83), where *Agaricus melizeus* was placed in tribus *Clitocybe*. In 1838 (:321) the description of *Hygrophorus melizeus* was changed to fit a species with straw-yellow basidiocarps, a viscid pileus, and growing in deciduous forests near Uppsala. A direct reference is given to the description in *Systema* (with the addition 'pileo exsiccato'), so that *Agaricus melizeus* Fr.: Fr. is undoubtedly the basionym of *Hygrophorus melizeus* Fr. Apparently Fries regarded his former descriptions as to refer to a deviating form, since the last sentence in the 1838 description reads: 'Variat pileo albo, lam. luteis'.

In *Monographia* (1851: 4(124)) and *Hymenomycetes europaei* (1874: 406) Fries' concept of *H. melizeus* was even more strongly altered, the species now having a viscid pileus, leather-coloured lamellae, a pleasant smell ('Odor gratus') and a habitat in deciduous forests. I agree with Neuhoff (1962) that this fungus is probably identical with *H. hedrychii*, but this is not relevant from a nomenclatural point of view.

Returning to *Agaricus melizeus* Fr. (1818), the question remains which species Fries had in mind in his original diagnosis. In my opinion it is quite obvious that this description relates to *H. karstenii* Sacc. & Cub. (= *H. vaticanus* Heim & Becker), which is a

species from coniferous forests with a white pileus and yellow lamellae. Moreover it occurs in the surroundings of Femsjö (pers. comm. M. Moser, Innsbrück) and it is hardly possible that Fries should have overlooked such a striking agaric.

Hygrophorus melizeus sensu Favre (= *H. spodoleucus* Moser) is a related species from *Picea* forests, but characterized by the cream-coloured, soon greyish pileus and the greyish brown, rarely ochraceous lamellae (see Moser, 1967: 1).

It is unfortunate, but in my opinion inevitable, that name changes are necessary for two well-known species. In order to promote stability of names in the future I propose as *neotype* of *H. melizeus* the collection made by Belin on 15 Sept. 1951 near Uppsala, distributed under the name *H. karstenii* as Fungi exsiccati suecici 2320, edited by S. Lundell & J. A. Nannfeldt. Notes on the neotype (UPS):

Pileus in dried basidiocarps 23–60 mm wide, applanate, rather fleshy, dull ochraceous. Lamellae decurrent, distant, characteristically olivaceous grey to bluish black. Stipe 58–68 × 4–10 mm, subcylindrical. Spores 7.5–9.5 × (4.5–)5–6 μm, Q = 1.4–1.7, ellipsoid to obovoid, sometimes subamygdaliform. Basidia 42–74 × 7.5–11 μm, 4-spored. Cystidia absent. Hymenophoral trama bilateral, made up of short elements, 35–85 × 6–11 μm. Pileipellis an ixotrichodermium, c. 100–120 μm thick, made up of ascending and erect, rather crowded hyphae, 2–5 μm wide, with cylindrical, rounded ends. Stipitepellis a compact ixotrichodermium, 45–70 μm thick, made up of repent to erect hyphae, 3–7 μm wide, with many free ends. Warts at the apex of the stipe up to 120 μm high, made up of compact erect hyphae with subcylindrical terminal elements, 32–53 × 4–5.5 μm, in places with clods of yellowish pigment (excretions) at the apices.

nitens

Agaricus nitens Schaeff. (1774: 60, pl. 238) is a species from the *eburneus* group of uncertain identity. Sowerby (1797: pl. 71) described under this name a white species, the pileus turning reddish brown at last, obviously *Hygrophorus discoxanthus* (= *H. chryspis*, *H. cossus* sensu Neuhoff). Although this name is older than *Agaricus discoxanthus* Fr. (1818) it is not available since it is an illegitimate homonym of the sanctioned name *Agaricus nitens* Batsch (1789): Fr. given to a quite different fungus with blackish brown pileus (see also Gams & Kuyper, 1984: 628).

penarius

The first valid description of *Hygrophorus penarius* Fr. is usually assigned to Epicrisis (Fries, 1838: 321), e.g. by Dennis & al. (1960: 75) and Hesler & Smith (1963: 378). However, valid publication was earlier effectuated by Fries in 1836 (: 45) in a more obscure booklet, entitled 'Anteckningar öfver de in Sverige växande ätliga svampar'.

Fries (l.c.) noticed 'Hittills funnen S. Sveriges bokskogar' and mentioned the preference for *Fagus* forests also in later publications. It is therefore difficult to understand why Becker (1954: 91) regarded *H. penarius* as a characteristic species of *Quercus* forests and described *H. barbatulus* as a closely related species, associated with *Fagus* on acid soils. These concepts have been followed by e.g. Bon (1977: 28) and Michael-Hennig-Kreisel (1979: 29 226). In 1974 Becker & Bon (in Bon) added a third species to this complex, viz.

H. fagi, described from *Fagus* forests on calcareous soils. Moser (1978: 76) contributed to the confusion by mentioning *H. barbatulus* from *Quercus* forests on acid soils and *H. penarius* from deciduous forest (on chalk).

From N. W. Europe (Belgium, W. Germany) I know only one species, associated with *Fagus* and mostly (but not exclusively) growing on calcareous soils. This fungus has a pileus (35–)45–90 mm broad, a short compact stipe attenuated to the base, 28–60 × (7–)9–20 mm, and spores 6–8(–8.5) × 4.5–5.5 μm . For a complete description I refer to Arnolds (1986). Not a single discrepancy exists with various descriptions of *H. penarius* by Fries (1836: 45; 1838: 32) and consequently I do not hesitate to use that name. *Hygrophorus barbatulus* Becker is regarded as a synonym.

Hygrophorus fagi Becker & Bon may be a species in its own right, characterized by a much longer stipe, pale pinkish centre of the pileus and larger spores (7–10 × 4.5–5.5 μm). I do not know this fungus. It is not clear whether *H. penarius* sensu M. Bon (1977: 28, = *H. barbatulus* sensu Moser, 1978?), associated with *Quercus*, represents a different taxon.

quercetorum

Hygrophorus quercorum was described by Orton (1984a: 585) as a species close to *H. eburneus* but differing in (i) its association with *Quercus*, (ii) its often more robust habit and (iii) its entire basidiocarp becoming pale cream or ivory with age. For nomenclatural reasons this name was later changed into *H. quercetorum* (Orton, 1984b: 56).

In the Netherlands three collections have been made that agree with Orton's description. They will be fully described in a later publication (Arnolds, 1986). In my opinion the morphological differences with *H. eburneus* are so subtle that this taxon does not deserve the rank of species and one must be extremely careful with emphasizing ecological characters since this may lead to circular reasoning (see e.g. discussion under *penarius*). Therefore I propose the new combination: *Hygrophorus eburneus* var. *quercetorum* (P. D. Orton) Arnolds, *comb. nov.* (Basionym: *Hygrophorus quercetorum* P. D. Orton in Doc. mycol. 14 (56): 56. 1984).

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REFERENCES

- ARNOLDS, E. (1974). *Hygrophorus* subgenus *Hygrophorus* (de 'Slijmkoppen') in Nederland. In *Coolia* 17, suppl.: 46 pp.
 — (1985). Notes on *Hygrophorus*-IV. New species and new combinations in *Hygrophoraceae*. In *Persoonia* 12: 475–478.
 — (1986). *Hygrophoraceae*. In *Flora agaricina neerlandica*. Vol. 2 (in prep.).

- BAS, C. (1983). Notulae ad Floram agaricinam neerlandicam. In *Persoonia* 12: 29–30.
- BATSCH, A. J. G. C. (1783–1789). *Elenchus Fungorum*. Halle und Salle.
- BECKER, G. (1954). Un nouvel *Hygrophore*: *Hygrophorus (Limacium) barbatulus*. In *Schweiz. Z. Pilzk.* 32: 91–92.
- BON, M. (1974). *Hygrophores du Centre-Est de la France étudiés du salon du Museum 1971*. In *Bull. mens. Soc. Linn. Lyon* 43: 333–343.
- (1977) Clé analytique des *Hygrophoraceae* (suite). In *Doc. mycol.* 7 (27–28): 25–53.
- BRESINSKY, A. (1965). Abgrenzung einiger Arten der Sekt. *Hygrophorus* Gattung *Hygrophorus* (Agaricales) und ihr Vorkommen in Schweden. In *Z. Pilzk.* 31: 1–6.
- BULLIARD, P. (1780–1798). *Herbier de la France*. 13 Vols. Paris.
- BULLIARD, P. & VENTENAT, E. P. (1809–1812). *Histoire des champignons de la France* 2: 369–700. Paris.
- DENNIS, R. W. G., ORTON, P. D. & HORA, F. B. (1960). New checklist of British agarics and boleti. In *Trans. Br. mycol. Soc.* 43, Suppl.: 1–224.
- FAVRE, J. (1960). Catalogue descriptif des champignons supérieurs de la zone subalpine du Parc National Suisse. In *Ergebn. wiss. Unters. Schweiz. Nat. Parks* 6 (N.F.) 42: 321–610. Liestal.
- FRIES, E. M. (1815). *Observationes mycologicae* 1. Havniae.
- (1818). *Observationes mycologicae* 2. Havniae.
- (1821). *Systema mycologicum* 1. Lundae.
- (1836). Anteckningar öfver de in Sverige växande ältiga svampar. Upsaliae.
- (1838). *Epicrisis Systemis mycologici*. Upsaliae.
- (1851). (*Monogr. Hymenomyc. Sueciae* 2) *Cortinariii et Hygrophori Sueciae*. Upsaliae.
- (1867–1884). *Icones selectae Hymenomycetum*. Vol. 1, 2. Stockholm.
- (1874). *Hymenomycetes europaei*. Upsaliae.
- GAMS, W. & KUYPER, Th. W. (1984). Problems involved in the sanction of fungal names. In *Mycotaxon* 20: 619–631.
- GRÖGER, F. (1980). Was ist *Hygrophorus leucophaeus* Scop. ex Fr.? In *Z. Mykologie* 46: 157–164.
- HESLER, L. R. & SMITH, A. H. (1963). North American species of *Hygrophorus*. Knoxville.
- KONRAD, P. & MAUBLANC, A. (1924–1937). *Icones selectae Fungorum*. Vol. 1–5. Paris.
- KÜHNER, R. & ROMAGNESI, H. (1953). *Flore analytique des champignons supérieurs*. Paris.
- LANGE, J. E. (1935–1940). *Flora agaricina danica*. Vol. 1–5. Copenhagen.
- LUNDELL, S. & NANNFELDT, J. A. (1939). *Fungi exsiccati suecici* 15–16.
- MÉTROD, G. (1938). Description de quelques agarics peu communs. In *Revue Mycol.* 3: 148–156.
- MICHAEL-HENNIG-KREISEL. (1979). *Handbuch für Pilzfreunde*. Vol. 3. Jena.
- MOSER, M. (1967). Beitrag zur Kenntnis verschiedener *Hygrophoreen*. In *Z. Pilzk.* 33: 1–23.
- (1978). *Kleine Kryptogamenflora*. Band II b/2: Die Röhrlinge und Blätterpilze. 4. Aufl. Stuttgart-New York.
- NEUHOFF, W. (1962). Verworrene weisse Schnecklinge um *Hygrophorus eburneus*. In *Westfäl. Pilzbr.* 3: 59–64.
- ORTON, P. D. (1984a). Notes on British agarics VIII. In *Notes R. bot. Gdn Edinb.* 41: 565–624.
- (1984b). Noms nouveaux. In *Doc. mycol.* 14(56): 56.
- RICKEN, A. (1910–1915). *Die Blätterpilze (Agaricaceae)*. Leipzig.
- SCHAEFFER, J. C. (1762–1800). *Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur*. Ed. 1, Vol. 1, 2, pl. 1–200; Ed. 2, Vol. 3, 4, pl. 201–330. Ratisbonae.
- SCOPOLI, J. A. (1772). *Flora carniolica*, Ed. 2. Vindobonae.
- SMITH, A. L. & REA, C. (1908). New and rare British fungi. In *Trans. Br. mycol. Soc.* 3: 34–46.
- SOWERBY, J. (1796–1815). *Coloured figures of English fungi or mushrooms*. Vol. 1–3, Suppl. London.
- VOSS, E. G. & AL. (1983). *International code of botanical nomenclature*. *Regnum vegetabile* Vol. 111. Utrecht/Antwerpen; The Hague/Boston.