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Short Communications

Taxonomic and nomenclatural comments on the lichenicolous agaric *Arrhenia peltigerina*

Arrhenia peltigerina (Peck) Redhead, Lutzoni, Moncalvo & Vilgalys is a lichenicolous homobasidiomycete showing agaricoid-omphalinoid basidiomes with gilled hymenophores, smooth basidiospores and lacking cystidia. It grows on dead, necrotized thalli of species of the foliose lichen genus *Peltigera* Willd. Lichenicolous species within the homobasidiomycetes are unusual and scarcely known, but some new species have recently been reported (Diederich & Lawrey 2007). Current phylogenetic studies incorporate the genus *Arrhenia* Fr. into the family *Hygrophoraceae* within *Agaricales* and, it has been suggested that it is the ancestor of the lichenized genus *Dictyonema* C. Agardh ex Kunth, which shows stereoid-corticioid basidiomes with smooth hymenophore (Lawrey *et al*. 2009).

Species of another agaric genus *Gamundia* Raithelh. have also been suggested to be lichenicolous on *Peltigera* in northern Europe and North America (e.g. Bigelow 1985, sub *Stachyomphalina* H. E. Bigelow; Antonín & Noordeloos 2004), but no clear nutritional and ecological relationships have been established. *Gamundia striatula* (Khüner) Raithelh. was reported growing "… on or near …" *Peltigera* [Bigelow 1979: 42, as *Stachyomphalina striatula* (Kühner) Bigelow; Alstrup & Hawksworth 1990, as *Fayodia striatula* (Kühner) Singer]. *Gamundia leucophylla* (Fr.) H. E. Bigelow was not seen to grow on *Peltigera* in the field but "… On closer examination of the drier material, however, small pieces of ± moribund *Peltigera* cf. *leucophlebia* were found …" (Gulden 1987: 55, as *Fayodia arctica* Gulden; see also Santesson 1993: 150, comments on *Omphalina cupulatoides*). In spite of these ambiguous nutritional and ecological relationships, microscopic features of the species included in *Gamundia* include rough spores (Bigelow 1983) and conspicuous cheilo- and pleurocystidia. Therefore, they are quite different from *A. peltigerina*, which has smooth basidiospores and lacks cheilo-, caulo- and pleurocystidia.

Arrhenia peltigerina is an uncommon but widely distributed species in Europe and North America (*cf*. Garnier-Delcourt 2008). A taxonomic discussion and a detailed description of this species were carried out by Collin & Lauron (1994, sub *Omphalina peltigerina*). Moreover, *Omphalina cupulatoides* was also described from the United Kingdom growing on necrotized areas of a thallus of the foliose lichen *Peltigera polydactylon* (Orton 1977). This taxon has been successively synonymized to *A. peltigerina* by several authors (Collin & Lauron 1994; Vila 2002; Garnier-Delcourt 2008; Elborne 2008), but no type material was examined in any of these studies.

Examination of the type material of *Cantharellus peltigerae* Velen. revealed that it is conspecific with *A. peltigerina*. A more detailed discussion on the identity of *C. peltigerae* has recently been carried out by Hawksworth *et al*. (2009).

The type material of *Agaricus peltigerinus* Peck cited in the protologue (Peck 1878), is confusing since two collections from different localities, Oneida and North Greenbush (New York State) were cited; a problem that had already been noted by John Haines (1981, ex-curator of NYS) in an annotation included with the type. Bigelow (1985: 400) in the 'material examined' section cited as

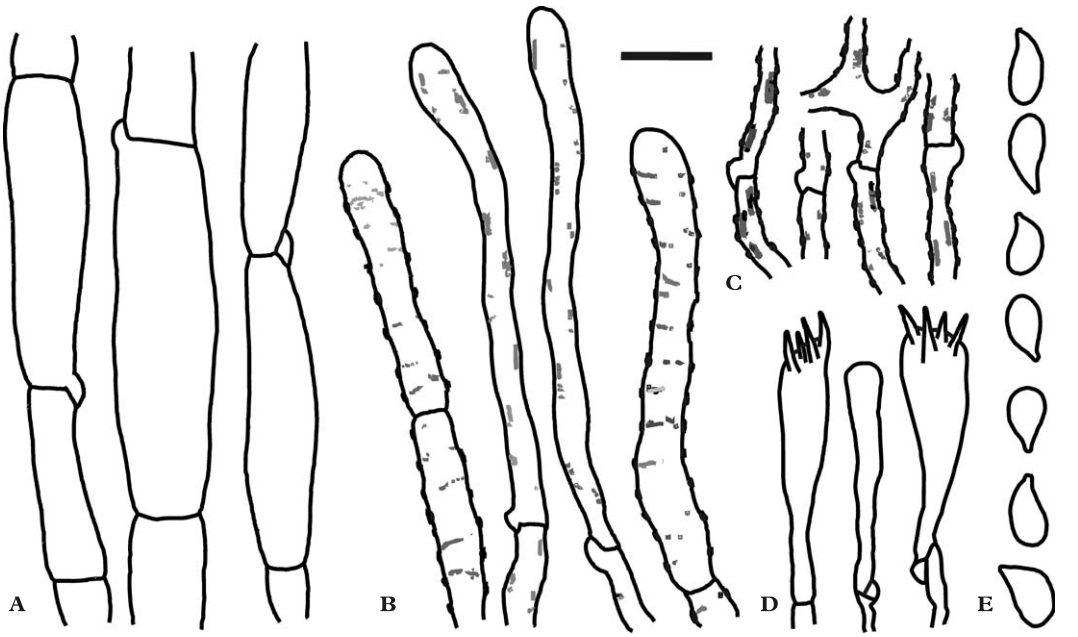

FIG. 1. *Agaricus peltigerinus* Peck (lectotype, NYS 2308). A, hyphae of the stipe; B, hyphae of the pileus; C, hyphae of the lamellar trama; D, basidia and basidiole; E, basidiospores. Scale = 10 μm.

"holotype" the Oneida specimen. This effectively lectotypified the name, but using an incorrect term that we have to correct here, according to Art. 9.8 of the ICBN (McNeill *et al*. 2006).

In this note we also illustrate and compare morphological features of the type material of *Agaricus peltigerinus* Peck and *Omphalina cupulatoides* P. D. Orton to solve the taxonomic and nomenclatural confusions above mentioned.

The type material of *Agaricus peltigerinus* Peck, *Cantharellus peltigerae* Velen. and *O. cupulatoides* and a number of other collections of *O. cupulatoides* have been examined. Additional fresh material of *A. peltigerina* collected by the authors in mountainous areas of central Spain has also been included in this study for comparison of its macro- and microscopic features.

Colours of the basidiomata were determined by reference to Munsell (1994). For basidiospore Q method (length:breath ratio), cf. Heinemann & Rammeloo (1985).

Arrhenia peltigerina (Peck) Redhead, Lutzoni, Moncalvo & Vilgalys

Mycotaxon **83:** 48 (2002).—*Agaricus peltigerinus* Peck, *Annual Rep. New York State Mus. Nat. Hist.* **30:** 38 (1878) [basionym, as "*Agaricus* (*Clitocybe*) *peltigerinus*"].—*Clitocybe peltigerina* (Peck) Sacc., *Syll. Fung.* **5:** 184 (1887).—*Clitocybe peltigerina* (Peck) Peck, *New York State Mus. Bull.* **157:** 87 (1912) [superfl. comb.].—*Omphalina peltigerina* (Peck) P. Collin, in P. Collin & A. Lauron, *Bull. Soc. Mycol. France* **110:** 11 (1994); type: USA, "New York State, Oneida, on *Peltigera* sp., *H. A. Warne*" (NYS 2308—lectotype!).

Omphalina cupulatoides P. D. Orton, *Kew Bull.* **31:** 712 (1977); type: United Kingdom, Scotland, "Perthshire, Rannoch, Dall, Sawmill Site, on *Peltigera* sp., 29 September 1971, *Orton* 4192" (E 157979—holotype!).

Cantharellus peltigerae Velen., *Věda Přírodní* **1:** 270 (1920); type: Czech Republic, Prague, Chuchle, on old thalli of *Peltigera* sp., April 1910, *O. Reisner* (PRC 336[a] [parte cum *Peltigera*]—lectotype!; *cf.* Hawskworth *et al.* 2009).

Selected descriptions and iconography: Orton (1977: 712 descr.; as *O. cupulatoides*); Bigelow (1985: 400 descr., Fig. 157 icon.); Collin & Lauron (1994: 12 descr., plate 280 icon.; as *Omphalina peltigerina*); Vila (2002: 211 descr., 212-213 icon., (fig. 1 and plate); as *O. peltigerina*); Garnier-Delcourt (2008: 5 descr., 4-5 icon. (figs 1 and 3)); Elborne (2008: 229 descr., 231 icon. (fig. 231a)).

(Figs 1–3)

Mycelium growing in moribund, necrotized thalli of *Peltigera* sp.

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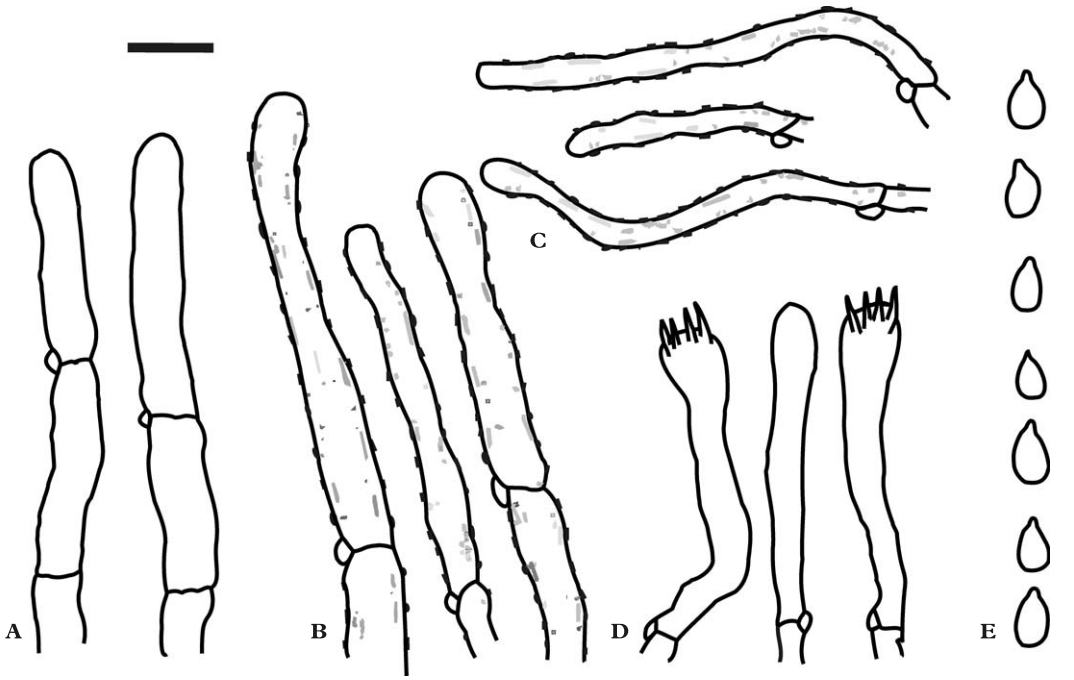

FIG. 2. *Omphalina cupulatoides* P. D. Orton (holotype, E 157979). A, hyphae of the stipe; B, hyphae of the pileus; C, terminal hyphae of the lamellar trama; D, basidia and basidiole; E, basidiospores. Scale = 10 μm.

Basidiomata omphalinoid, lamellated, 0·8–30 mm tall, mostly developed from the lower surface of the lichen thallus. *Pileus* thin, 5–20 mm wide, convex to nearly plane or umbilicate, with undulate and striate margin, glabrous to pubescent, brown to dark brown (7·5YR 2·5/3 to 5/6) or yellowish red (5YR 5/8 to 6/8), light brown to brown when dry (7·5YR 5/3, 6/3 to 6/4). *Lamellae* decurrent, distant, 8–12(–15) mm long, thick, forked near cap, somewhat veined, pinkish white to pink, ± concolorous with stipe, with darker edge. *Stipe* 8–20 × 0·8–3 mm, cylindrical with slightly thicker base, pinkish white to pink (5YR 8/2 to 8/3, 7·5YR 8/2 to 8/3), pruinose to pubescent, floccose at the base. *Flesh* concolorous, whitish when dry. *Smell* none. *Basidia* (25–)27–40 × 5–8(–9) μm, subclaviform, 4-spored, sterigmata 3–8 μm long. *Basidioles* 25–35 × 4–8 μm, subclaviform to claviform. *Basidiospores* 6–9(–10) × (3·5–)4–6(–6·5) μm (*n* = 150), Q = 1·33–*1·61*–1·89, ellipsoidal to elongate, with prominent apiculus, smooth, non-amyloid. *Pileipellis* a cutis of cylindrical hyphae with ascending free ends, (2·5–)3–10 μm wide, with intracellular and slightly extracellular encrusted pigment. *Stipitipellis* a cutis of cylindrical, slightly swollen hyphae, 6–14 μm wide. *Lamellar trama* irregular, with branched hyphae, (1·5–)2·5–6 μm wide, with slightly encrusted pigment. All tissues with clamp connections.

Notes. The lectotype of *Agaricus peltigerinus* Peck is old and has deteriorated. There are only a few sparse basidiomata fragments (stipe and pileus), a segment of stipe attached to a portion of *Peltigera* thallus, and indeterminate portions. Several different microscopic observations of these pieces of lectotype revealed some of the most distinctive micromorphological features known from fresher specimens of *A. peltigerinus* (Table 1, Fig. 1).

Omphalina cupulatoides (Orton 1977) was described as growing on a thallus of *Peltigera polydactylon*. However, some confusion and

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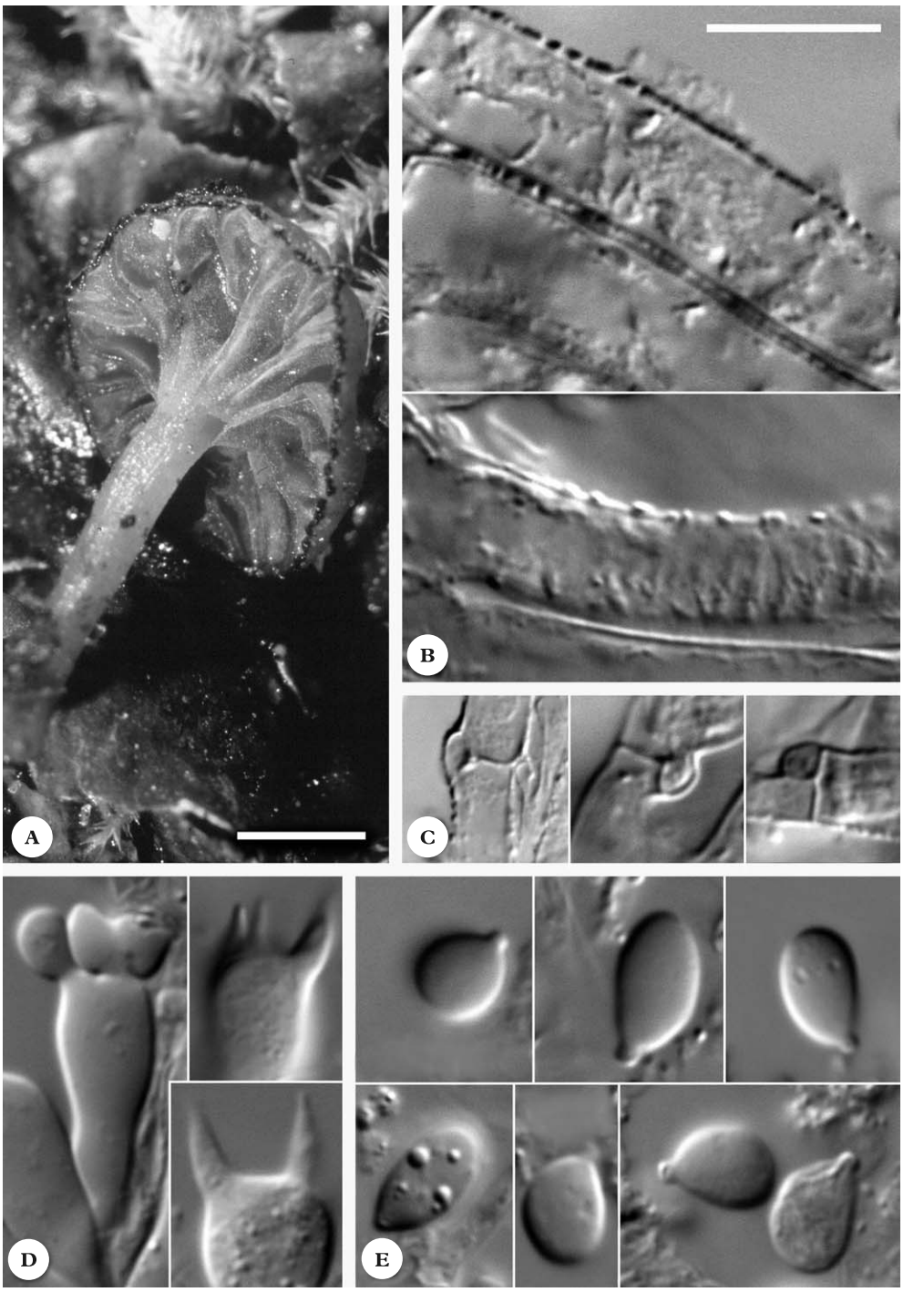

FIG. 3. *Arrhenia peltigerina* (AH 32777). A, fruit body on *Peltigera* thallus; B, hyphae of the pileus (DIC); C, clamps (DIC); D, basidia (DIC); E, basidiospores (DIC). Scales: A = 2 mm; B–E = 10 μm.

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TABLE 1. Arrhenia peltigerina. *Microscopic features of* Agaricus peltigerinus *(lectotype) and* Omphalina cupulatoides *(holotype).*

	Basidiospores	Basidia	Sterigmata	Basidioles	Hyphae		
					pileipellis	stipitipellis	lamellar trama
Agaricus peltigerinus Peck (lectotype NYS 2308)	6–8·5(–9) × (3·5–)4·5–6 µm; Q = 1·33–1·89, Q mean value = 1·52; ellipsoidal to elongate; 30 spores measured	27–38 × 5–8 µm; tetrasporic; clamped	3–5 µm long	25–30 × 4–5 µm; clamped	3–7 µm wide; clamped; with encrusting pigment	6–14 µm wide; clamped	2·5–4 µm wide; clamped; irregular; with encrusting pigment
Omphalina cupulatoides P. D. Orton (holotype E 157979)	6–8(–9) × 4–6 µm; Q = 1·4–1·8, Q mean value = 1·61; ellipsoidal to elongate; 43 spores measured	33–40 × 7–8 µm; tetrasporic; clamped	4–6 µm long	30–35 × 6–8 µm; clamped	4–8 µm wide; clamped; with encrusting pigment	6·5–10 µm wide; clamped	3–4·5 µm wide; clamped; irregular; with encrusting pigment

discussion was raised on the identity of this agaric species, mainly concerning spore shape (*cf.* Collin & Lauron 1994) and colour of basidiomata (*cf.* Bon 1997). It has been considered as a synonym of *A. peltigerina* (Collin & Lauron 1994; Vila 2002; Garnier-Delcourt 2008; Elborne 2008; Smith *et al.* 2009) or as a separate species (Santesson 1993; Bon 1997). After examination of the holotype and additional herbarium material deposited in E, we conclude that *O. cupulatoides* is conspecific with *A. peltigerina* since no relevant differences were observed in size and shape of spores and basidiomata colour (Table 1, Fig. 2). Thus, we agree with the previous taxonomic treatment carried out by several authors (Collin & Lauron 1994; Vila 2002; Garnier-Delcourt 2008; Elborne 2008).

For a comparative study, modern material collected by the authors in Spain (AH 32777) has also been used in this work. Macro- and micromorphological features of basidiomata of the Spanish material are illustrated in Fig. 3. Micromorphological features (Fig. 3 B–E) can be compared with those observed in the *Agaricus peltigerinus* lectotype (Fig. 1) and in the *Omphalina cupulatoides* holotype (Fig. 2).

In most herbarium specimens studied, the *Peltigera* thalli are in too poor a state of preservation for an accurate identification.

Additional specimens examined. **Spain:** *Madrid*: Canencia, Puerto de Canencia, en el abedular, talud rezumante, sobre *Peltigera* cf. *membranacea*, 19 ix 2003, *V. J. Rico, J. M. Barrasa & F. Esteve-Raventós* (AH 32777).—**Great Britain:** *England*: **V. C. 11**, South Hampshire: New Forest, Woodford Bottom, 1987, *P. D. Orton* 5832 (E, as *O. cupulatoides*). *Scotland:* **V. C. 85**, Fifeshire, Devilla Forest, alongside track on E side of Forestry nursery, on *Peltigera lactucifolia*, 200 ft, 14 vii 1985, *B. J. Coppins s. n.* (E, as *O. cupulatoides*); **V. C. 86**, Stirlingshire: Doune Ponds, Doune, on *Peltigera lactucifolia*, 1990, *R. Watling* 22554 (E, as *O. cupulatoides*); **V. C. 88** Mid Perthshire: Rannoch: Dall, 1971, *P. D. Orton* 4193 (E, as *Omphalina cupulatoides*); *ibid.*: Blackwood, 1965, *P. D. Orton* 1403 and 2829 (E, two specimens as *O. cupulatoides*).

We thank the curators of the NYS and E herbaria for sending us the type material of *Agaricus peltigerinus* and *Omphalina cupulatoides* respectively, F. Esteve-Raventós (Alcalá de Henares) for bibliographic advice and D. L. Hawksworth (Madrid) and J. Kokourková (Praha) for

encouraging us to study the Velenovský's type material of *Cantharellus peltigerae*. Three anonymous referees are also thanked for improvements to the manuscript. We acknowledge support from the Spanish Ministerio de Educación y Ciencia (Flora Liquenológica Ibérica project, CGL2007-66734-C03-01) and from BSCH-UCM (GR58/08-910773).

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