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STUDIES ON THE GENUS *HEBELOMA*  
WHAT IS *HEBELOMA VERSIPELLE* S. BRESADOLA?

Grilli E., 2017: *Studi sul genere Hebeloma. Cosa è Hebeloma versipelle* s. Bresadola?

### Abstract

*Agaricus versipellis*, an ambiguous Friesian species, has been the object of several conflicting interpretations in the course of time. After a brief account of the interpretations proposed by other authors, the study focuses on the one offered by BRESADOLA (1930), showing the results of the revision of an authentic Bresadolean collection. Such collection is, in all likelihood, the very material on which his interpretation was based. The study is illustrated with the reproductions of the original plates or line drawings of the interpretations discussed, as well as with camera lucida drawings of the main micro-anatomical features of the collection studied.

### Riassunto

*Agaricus versipellis*, una specie ambigua di Fries, è stata oggetto nel corso del tempo di varie interpretazioni contrastanti. Dopo un breve resoconto delle interpretazioni avanzate da altri autori, l'interesse dello studio si concentra sull'interpretazione proposta da BRESADOLA (1930), mostrando i risultati della revisione di una sua raccolta autentica. Tale raccolta è, con tutta probabilità, la stessa su cui la sua interpretazione è basata. Lo studio è illustrato da riproduzioni delle tavole o disegni al tratto originali delle interpretazioni discusse e da micrografie dei caratteri microscopici della raccolta studiata.

**Key Words:** *Hebeloma*, sect. *Hebeloma*, subsect. *Clepsydroidea*, *H. dunense*, *H. subtortum*, *H. vaccinum*.

### Introduction

*H. versipelle* (Fr.) Gillet is among the oldest *Hebeloma* epithets which have gradually disappeared from the studies devoted to this genus since the last decades of the past century. For most of such names, this fall into oblivion is a consequence of the insurmountable difficulties one runs into in interpreting the original descriptions with any degree of certainty. Evidence of this is the existence of conflicting interpretation, none of which has stood up to critical scrutiny.

Three such cases, i.e. *Hebeloma longicaudum* (Pers.) P. Kumm. and *H. claviceps* (Fr.) Quél., and *H. subtestaceum* (Batsch) Bres. & Sacc. were exhaustively discussed in GRILLI (2009) and GRILLI ET AL. (2015) respectively. That of *Hebeloma versipelle* is not much different and, quite understandably, the latter is listed among the excluded names in LEGON & HENRICI (2005) and, more recently, in the monograph devoted to the European species of *Hebeloma* (BEKER ET AL., 2016). After surmising that this name might be applicable to either *Hebeloma mesophaeum* (Pers.) Quél. or *H. dunense* L. Corb & R. Heim, the latter authors conclude that it is impossible to arrive at an unambiguous interpretation of the Friesian name.

FRIES (1838), crediting the species with a fibrillose veil on the stipe, had included *Agaricus versipellis* among his *Indusiata*. Therefore, despite the interpretative difficulties of the protologue, in the past there was an almost general agreement in characterizing *Hebeloma versipelle* as a member of sect. *Hebeloma* and most authors interpreted it as a fungus with ellipsoid spores

and lageniform cheilocystidia. The following list, which has no pretence to exhaustiveness, includes only authors providing data on microscopy: REA, 1922; KONRAD & MAUBLANC, 1924; ROMAGNESI, 1965; MALENÇON & BERTAULT, 1970; BOHUS, 1972, 1978; HORA *ET AL.*, 1974; BON & CHEVASSUT, 1974; MOSER, 1983; BON, 2002.

The focus of interest of the present paper is on Bresadola's interpretation of *Hebeloma versipelle*, and reports on the results of the study of an authentic Bresadolean collection conducted in 1999 and updated in 2017. It provides a modern description of its main micro-anatomical features, camera lucida drawing of the same and a discussion of its morphological sectional placement and likely identification. However, even if an in-depth review of the various interpretations proposed by other authors is outside the scope of the present paper, the description and discussion of the Bresadolean collection is preceded by a brief account of *Hebeloma versipelle* s. RICKEN (1915) and a cursory glance at the two interpretations (KONRAD & MAUBLANC'S, 1924 and ROMAGNESI'S, 1965) that gained some currency in the literature at the close of the past century.

## Material and methods

Spore and cheilocystidium characters were estimated following VESTERHOLT (2005), BEKER *ET AL.* (2016). Average spore values were determined by measuring at least 50 spores. Given its diagnostic value, the average width of the apex (A) of cheilocystidia was assessed based on at least 100 cheilocystidia from an unsquashed mount of lamellar section, unselectively measuring all apices properly in focus within a field. The average measures of the other cheilocystidium features (L, M and B), were obtained by measuring an excess of 30 entire cheilocystidia from a squashed mount. They were chosen to provide an acceptably accurate picture of the relative percentages of cheilocystidium types observed, L, A, M and B being the initial letters of *length*, *apex width*, *median width* (narrowest median point) and *basal width* (width of base or, if present, basal swelling), respectively. Spore measures do not include the apiculum and, if it is the case, the expanding myxosporium. The number of spores and cheilocystidia measured and the number of specimens per collection is specified in parenthesis. For the cheilocystidia the first number refers to the apex measures, the second to those of the other features (L, M and B). The presentation of quantitative data of spores and cheilocystidia follows GRILLI *ET AL.* (2016). It has the form (a) b c d (e), in which the values between parentheses are the smallest and the highest values recorded (but excluding clearly anomalous measures), b and d the 5% and 95% percentiles and c the average. In the description have also been introduced the spore codes (BEKER *ET AL.*, 2016) and the data regarding cheilocystidium ratios A/M, A/B and B/M, introduced in BEKER *ET AL.* (2010). Since clamp connections are common in all *Hebeloma* species, their presence is taken for granted. The systematic framework of reference is that offered in BEKER *ET AL.* (2016).

## TAXONOMY

*Hebeloma versipelle* (Fr.) Gillet, *Hymen.*: 524, (1876)

Basionym: *Agaricus versipellis* Fr., *Epicr. Syst. Mycol.*: 179 (1838) ["1836-1838"].

Type: Not designated.

Homotypic synonyms: *Inocybe versipellis* (Fr.) P. Karst., *Bidr. Kanned. Finl. Natur. Folk* 32: 470 (1879); as "*versipellis*". – *Hebelomatis versipelle* (Fr.) Locq., *Fl. Mycol.* 3: 146 (1979) ["1977"]; nom. inval. (Art. 41.5). – *Hyllophila versipellis* (Fr.) Quél., *Ench Fung.* 99 (1886).

Original diagnosis: A. *versipellis*, pileo carnosio convexo plano glutine tenaci viscoso discoideo, versus ambitum adglutinato-sericeo, dein glabro, stipite fistuloso tenaci albosericeo apiceque

pruinoso, lamellae rotundatis confertis latis (3-5 lin.), ex albo-carneo argillaceis. *A. lubricus* Aman. *A. thelephor.* Secr. n. 576. Clus. pern. g. XII. Sp. 1! Sterb. t. 20. B. Locis graminosis, ad vias, praecox, subcaesp. Ex aetate et jove mire mutatur. Sericeo e velo fibrilloso evanido stipes fibrillosi-striatus, intus fuscens. Pileus tenuis, subpunctatus\*, regularis, crustallinus: demum repandus, siccus, alutaceus, opacus. Odor debilis, non ingratus.

(\* The adjective “punctatus” is ambiguous; it either describes a surface with marks the size and appearance of dots, spots or small depressions or studded with points (squamules). Qualifying the surface of a *Hebeloma* species, in all likelihood the meaning of the adjective “subpunctatus” should be “slightly dotted”).

English translation: *Agaricus versipellis*, pileus fleshy, plano-convex, viscid due to a tenacious glue, orbicular, sticky and shiny towards margin, then glabrous, stipe fistulose, tough, white-sericeous with pruinose apex, lamellae adnexed, crowded, broad, (7–11 mm), white-incarnate then argillaceous. *Agaricus lubricus* Aman., *A. thelephorus* Secr. n. 576. Clus. pern. g. XII. Sp. 1! Sterb. t. 20. B. Grassy places, along roads, precocious, subcaespitose. Surprisingly changing with age and weather conditions. Stipe silky from a fibrillose, evanescent veil, fibrillose-striate, turning brown inside. Pileus thin, slightly dotted, regular, bread crust-coloured, then irregularly wavy, dry, pale yellowish-brown, opaque. Odour weak, not unpleasant.

***Hebeloma versipelle*** s. Ricken, *Blätterpilze Deutschl.*: 118, n. 378, Taf. 33, Fig. 3

RICKEN (1915) includes his “Bläßblättriger Fälbling” (*Hebeloma versipelle*) among the species with veil rarely evident (“Velum selten ausgeprägt”). Accordingly, even if in the description he cites the presence of a veil on the stipe, there is no trace of veil in the figures depicted in the accompanying plate (see Fig. 1). Overall, Ricken’s description and plate are even less interpretable than Fries’ diagnosis. Nonetheless, his interpretation was generally thought to represent *Hebeloma porphyrosporum* Maire, as *H. sarcophyllum* Peck (e.g. ROMAGNESI, 1965; BRUCHET, 1970), perhaps laying too much emphasis on the “weißfleischrot” tinge of the lamellae. Such a tinge (“ex albo-carneo”) is, in fact, already present in Fries’ diagnosis. Apart from other considerations, it is now known that Maire’s species, which is frequent and widespread in the Mediterranean area, is rather rare in Northern Europe (Beker *ET AL.*, 2016); therefore, it is very unlikely that Ricken’s fungus, and with yet stronger reason Fries’, may represent this species. Unfortunately, Ricken, who provides sufficient information on spores (amygdaliform in shape, measuring 12-13 × 7 µm), reports no data about cheilocystidia; therefore, given also the absence of herbarium material (STAPLEU & COWAN, 1976-1985), any other identification is destined to remain mere speculation.

***Hebeloma versipelle*** s. Konrad & Maublanc, *Icon. select. fung.*: Pl. 78, I

REA (1922) was the first to assign relatively large (8-12 × 6-7 µm), ellipsoid spores to *Hebeloma versipelle*. However, later authors (e.g. BOHUS, 1972, 1978; HORA *ET AL.*, 1974; BON & CHEVASSUT, 1974), quite understandably, referred this sense, or gave priority, to KONRAD & MAUBLANC (1924), because the latter authors accompanied the description with a good plate of the species, illustrating also spores and cheilocystidia (see fig. 2), and separating a var. *mesophaeum* on account of the smaller spores (8-10 × 5-6 µm). In any case, perhaps due to lingering interpretative doubts, BON & CHEVASSUT (1974) informally proposed to name *H. versipelle* s. Konrad & Maublanc *Hebeloma caespitosum* ad int., and few years later BON (1978)\* published it formally as *H. subcaespitosum* Bon, the following year providing also a plate of the new species (BON, 1979).

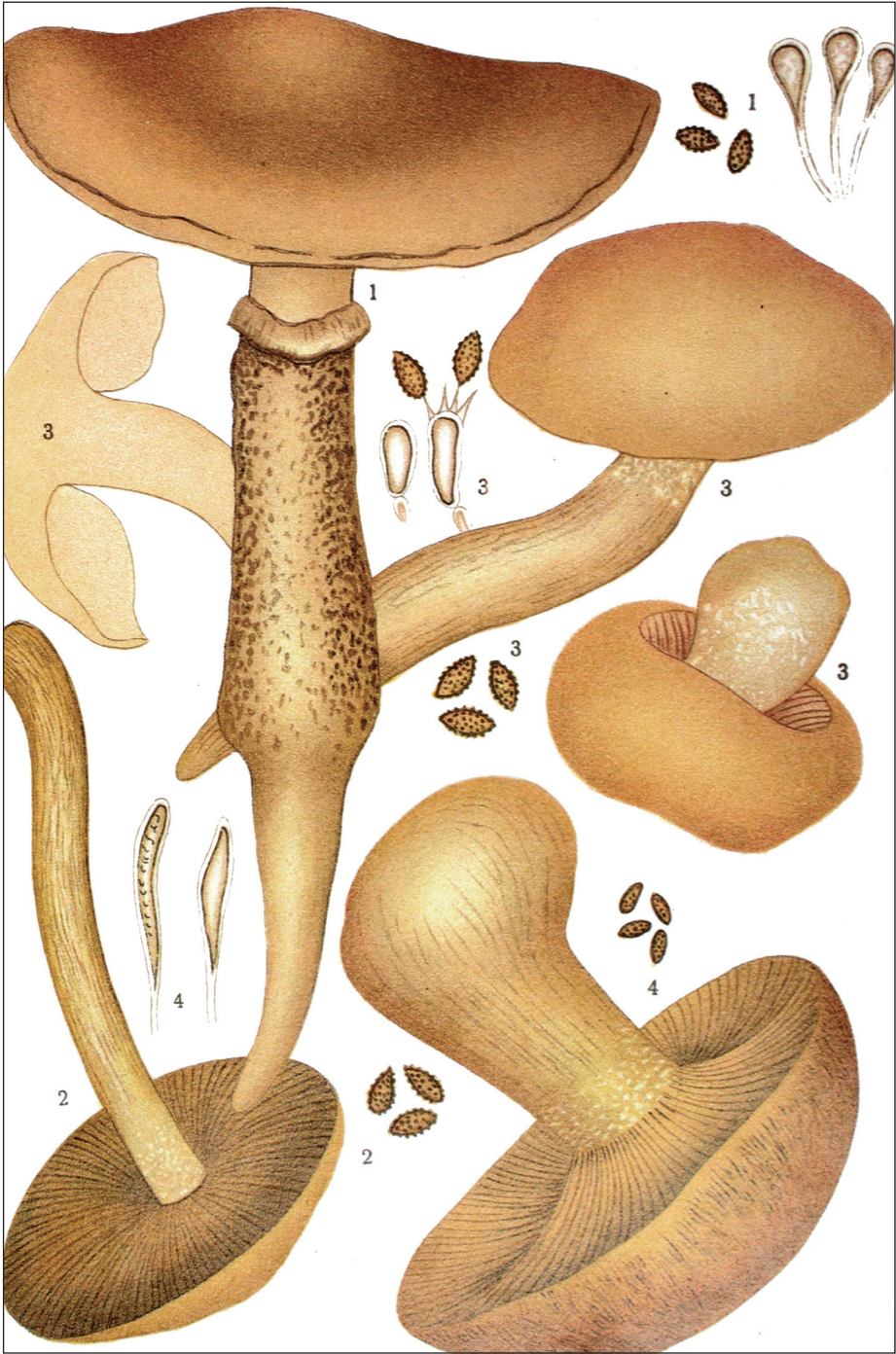


Fig. 1. *Hebeloma versipelle* s. Ricken (Blätterpilze Deutchl.: Taf. 33, fig. 3)

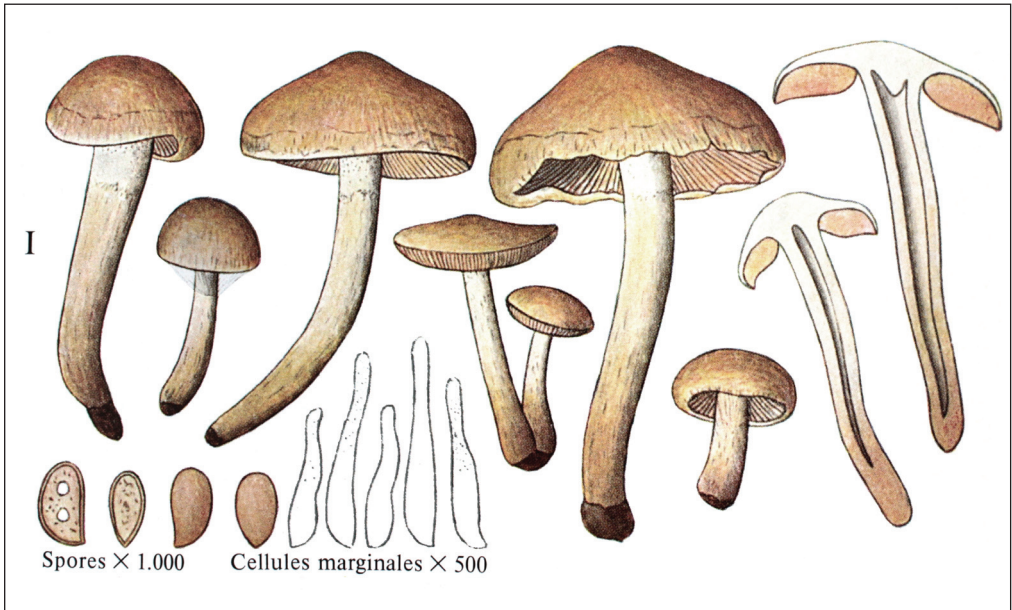


Fig. 2. *Hebeloma versipelle* s. Konrad & Maublanc (Icon. select. fung: Pl. 78, I)

From a present day's perspective, *H. versipelle* s. Konrad & Maublanc is most likely *Hebeloma dunense* L. Corb & R. Heim, as indirectly suggested by VESTERHOLT (1989 and 2005), respectively as *Hebeloma subcaespitosum* Bon and *H. collariatum* Bruchet, and BON (2000) as *H. subcaespitosum*. According to the morphological and molecular analyses of the types carried out by BEKER ET AL. (2016), both taxa are later synonyms of *H. dunense*.

(\* Puzzlingly, BON (2000), who in his Section *Hebeloma*, Serie *Versipelle* includes among others *Hebeloma aprile* Romagn., *H. collariatum*, *H. dunense*, *H. psammicola* Bohus and *H. subcaespitosum* as distinct and independent taxa (all synonyms of *H. dunense* according to BEKER ET AL., 2016), separates also a "*Hebeloma versipelle* ss. str. Bohus, Bon etc." (with reference to BOHUS, 1978 and BON & CHEVASSUT, 1974) as *Hebeloma bohussii* nom. nov. ad int.).

***Hebeloma versipelle* s. Romagnesi, Bull. Soc. Mycol. Fr. 81(3): 321-344**

ROMAGNESI (1965), similarly, described *Hebeloma versipelle* as a member of sect. *Hebeloma*, namely with the typical lageniform to ventricose cheilocystidia and ellipsoid spores, but in this case his fungus had smaller spores:  $7.7\text{-}9.2 \times 5\text{-}5.7 \mu\text{m}$ . (Fig. 3). Macroscopically, it differed from *H. mesophaeum* in its calling to mind *Flammula carbonaria* (Fr.) P. Kumm. [(*Pholiota highlandensis* (Peck) Smith & Hesler)]. The fungus was described as having an abundant cortinate veil, a smell "d'herbe, de persil, persistante, non de rave", growing also on fire-sites.

Such an interpretation also gained some currency (e.g. BON & CHEVASSUT, 1974; MOSER, 1983; SMITH ET AL., 1983). However, as in the case of Konrad & Maublanc's interpretation, ROMAGNESI (1983) later renamed his interpretation *Hebeloma flammuloides* Romagn., mostly because Fries in *Hymenomyces* had modified the original diagnosis of *Agaricus versipellis* to the point that it did not match any longer the fungus he had previously described under this name.

MOSER (1983) had explicitly accepted *Hebeloma versipelle* in ROMAGNESI's (1965) sense: a species with a facies similar to that of *Pholiota carbonaria* (Fr.) Singer [*Pholiota highlandensis* (Peck) Smith &

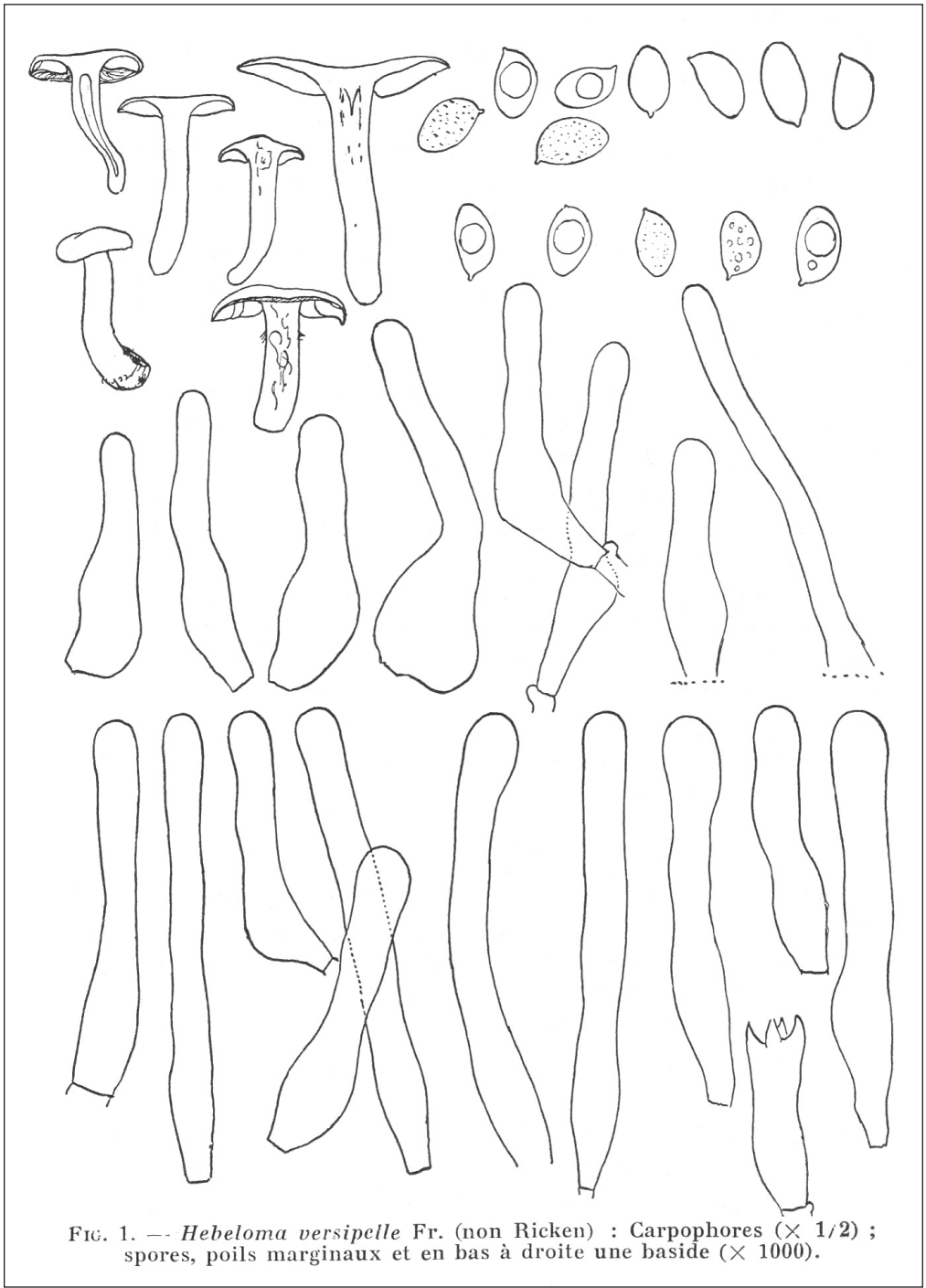


FIG. 1. -- *Hebeloma versipelle* Fr. (non Ricken) : Carpophores ( $\times 1/2$ ) ; spores, poils marginaux et en bas à droite une baside ( $\times 1000$ ).

Fig. 3. *Hebeloma versipelle* s. Romagnesi [Bull. Soc. Mycol. Fr. 81(3): 323]

Hesler), with small (7.7-9.5 × 5-5.7 μm)], ellipsoid spores and lageniform cheilocystidia and growing on burnt ground. Nevertheless, the next year, MORENO & MOSER (1984), in a study of *Hebeloma* species growing on burnt ground, unaware of Romagnesi's publication of *Hebeloma flammuloides*, published it as a taxonomic novelty: *Hebeloma pyrophilum* Moreno & Moser. (See also MORENO & MOSER, 1985). Finally, MORENO (1985), after revising the types of *H. flammuloides* Romagn and *H. pyrophilum* Moreno & M.M. Moser and ascertaining their morphological conspecificity, claimed that *H. pyrophilum* had priority having been published shortly before *H. flammuloides*.

This is no more a problem because, according to the morphological and molecular analysis of the relative types by BEKER & al (2016), both *H. flammuloides* and *H. pyrophilum* are to be added to the long list of later synonyms of *Hebeloma subtortum* P. Karst.

***Hebeloma versipelle*** s. Bresadola, *Icon. Mycol.*: Tab. DCCXI (Fig. 4)

Fr., *Epicr.* P. 179 (sub *Agarico*), ejusd., *Hym. Eur.* P. 239, *Sacc., Syll. V*, P. 794, ejusd., *Fl. It. Crypt. Hym.* P. 698, Ricken, *Blätterp.* p. 118, t. 33 f. 3.

Pileus carnosus, tenuis, convexo-planus, obtuse umbonatus, e regulariter discoideo demum repandus, glutine tenaci viscosus, ambitum versus sericeo-fibrillosus, dein glaber, subpunctatus, crustulinus, sicco alutaceus, opacus, 3-6 cm latus, lamellae confertae, latae, posticae emarginate-rotundate, ex albo-carneis argillaceae vel subcinnamomeae, acie minute crenulatae, stipes tenax, farctus, demum canaliculatus, subaequalis, glabrescens, apice pruinosis, 5-8 cm longus, 4-7 mm crassus, velum fibrillosum evanidum; caro alba, ad basim stipites demum fuscenscens vel ferruginascens, odore debili, non raphaneo, sapore nullo distincto, sporae ovato-fusoideae, amygdaliformes, leves vel minute asperulatae, pallide luteae, 10-12 × 7-8 μm, basidia clavate, 30-35 × 8-10 μm; cellulae aciei lamellarum cylindraceae, 30-40 × 5-6 μm, apice capitatae, 7-10 μm crassae.

Hab.: in graminosis ad vias, subcaespitosum, aestate-autumno.

English translation: Pileus fleshy, thin, plano-convex, obtusely umbonate, regularly orbicular, then wavy, viscid due to a tenacious glue, silky-fibrillose towards margin, then glabrous, slightly punctate, the colour of bread crust, alutaceous when dry, dull, 3-6 cm broad, lamellae crowded, broad, emarginate-adnexed, from pinkish-white to argillaceous or pale cinnamon, edge finely crenulated, stipe tenacious, stuffed, then fistulose, subcylindrical, pruinose at the apex, 5-8 cm long, 4-7 mm wide, veil fibrillose evanescent; context white, at stipe base later becoming brownish or ferruginous, smell faint, non-raphanoid, taste not distinctive, spores ovoid-fusoid, amygdaliform, smooth or finely verrucose, pale yellowish, 10-12 × 7-8 μm, basidia clavate, 30-35 × 8-10 μm; cells of lamellar edge cylindrical, 30-40 × 5-6 μm, apex capitate, 7-10 μm wide.

Habitat: in grassy places or path sides, subcaespitose, summer-autumn.

At Museo Tridentino di Scienze Naturali (Trento) is housed a collection, consisting in parts of two specimens, labelled *Hebeloma versipelle*, Bres. B/261, dated Dec. 1927, which, most likely, is the very material studied by Bresadola prior to the publication of Vol. XV of *Iconographia* (1930). ITALY: Trentino-Alto Adige, Trento, "alla caserma Madruzzo"; "lungo I muri umidi", Dec. 1927; G. Bresadola (B/261).

**Microscopic description** (Fig. 5)

Spores (N: 54/1) 10.4 11.13 12 (12.5) × 6.3 6.93 7.8 (8.0) μm; Q (1.41) 1.48 1.61 1.75 (1.78).

Spores mostly broadly citriform. Ornamentation hypodistinct to subdistinct, rarely distinct. Myxosporium undilating to rugulose, very rarely vesiculate. Dextrinoidity weak (4B3, at most 5B2.5). Apical wall modification: occurrence of a papilla\*. Spore Code: O1, O2 (O3); P0, P1(P2); D2.



Fig. 4. *Hebeloma versipelle* s. Bresadola (Icon. Mycol.: Pl. 711)

Basidia 24-30 × 6.4-9.6 μm, clavate, often constricted, four-spored.

Cheilocystidia (N: 121/36/1), 27  $\frac{46.11}{76}$  (80) × (5.0)  $\frac{5.6}{7.95}$  10 (12) × 3.0  $\frac{3.82}{4.8}$  × 83.0  $\frac{6.0}{8.8}$  μm.

Lamellar edge sterile. Cheilocystidium main shape clavate to capitate-ventricose, less frequently clavate or capitate-stipitate with widened base, rarely clavate- or capitate-stipitate. Occurrence of special features: apex occasionally spatulate-constricted; refractive wall thickening, rather frequent, mostly apical, occasionally affecting the whole cystidium. Cheilocystidium Ratios: A/M 2.09; A/B 1.38; B/M 1.61.

Caulocystidia similar to cheilocystidia, but generally more irregular.



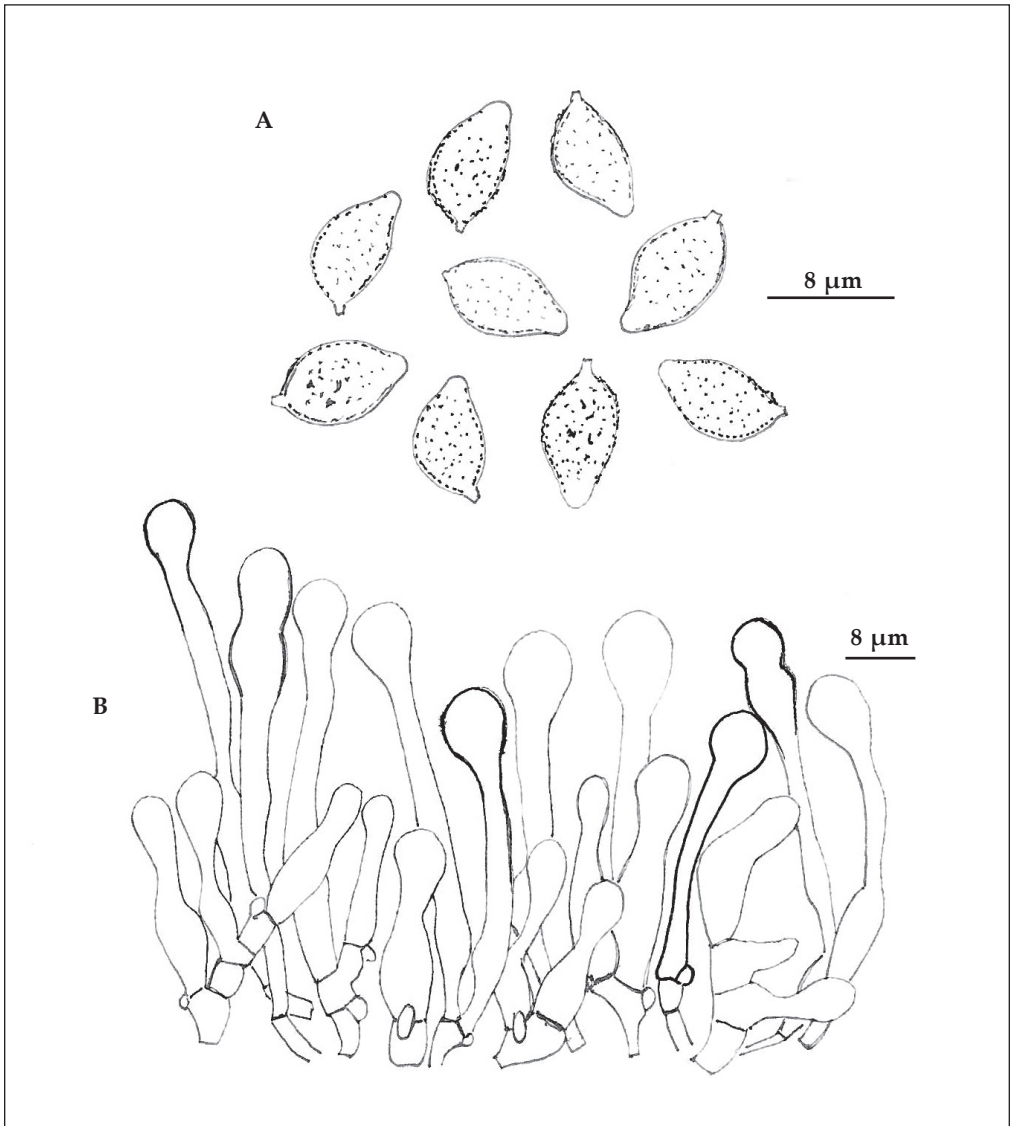


Fig. 5. *Hebeloma versipelle* s. Bresadola (Bresadola B/261): A. Spores; B. Cheilocystidia

Pileipellis two-layered (poorly rehydrating periradial section at pileus centre, description not fully dependable): suprapellis an ixotomentocutis c. 60 to 120  $\mu\text{m}$  deep, with hyphae 1.5-4.6  $\mu\text{m}$  wide, dispersed in a gel matrix; terminal elements rare; subpellis pale brownish-yellow, chromatically distinct from the pileitrama, structurally hardly legible, a dense layer of intertwined, conglutinated and short-celled hyphae.

(\* Papilla is here meant in the sense of CLEMENÇON (2004), namely an apical, abrupt thickening of the coriotunica, plus an apical thinning of the myxosporium).

## Notes and Comments

Bresadola's description and illustration of *Hebeloma versipelle* above pose a thorny problem, and it is no surprise that, apart from a cursory remark in BRUCHET (1970: 35), it has never been addressed before. Based on what is currently known regarding the European taxa of the genus *Hebeloma*, only the species of sect. *Hebeloma* and some of sect. *Scabrispora* exhibit the remnants of a fibrillose veil on the stipe, but the members of these sections, leaving aside other characters, are clearly recognizable by the tell-tale shape of their cheilocystidia. Apart from spore characters, the former conjugate the veil remnants with lageniform or ventricose cheilocystidia, while the latter, with typically small-sized, mostly cylindroid to clavuliform or clavate-lageniform cheilocystidia. By contrast, Bresadola credits the species with capitate-stipitate cheilocystidia: a shape unusual for a veiled species and typical of sect. *Denudata*.

With its mostly clavate- to capitate-ventricose cheilocystidia (Fig. 5), very similar to those drawn by Bresadola (Figs 4), Bresadola's collection (B/261) does not belong in sect. *Hebeloma*. Such dominant shape clearly places it in sect. *Denudata*, subsect. *Clepsydroidea* and the B/M ratio > 1.25 supports the placement. Unfortunately, the data regarding spore characters (size, ornamentation and dextrinoidity), necessary to go ahead with the identification process risk being misleading. Most spores appear, in fact, to be almost smooth under the microscope, giving an immediate impression that they may not be completely mature, and incomplete maturation would affect all wall layers, with consequences not only for the full development of the ornamentation, but also for myxosporium expansion and dextrinoidity. Based on the information available, dextrinoidity depends on the thickness of the eusporium, the thicker the eusporium, the stronger the reaction (BRUCHET, 1973). Likewise, the full differentiation of the ornamentation takes place within the mature myxosporium, and the possible detachment of the residual mucostratum of the myxosporium plus the sporothecium takes place only when the differentiation process of the ornamentation is concluded (CLEMENÇON, 1997; 2004).

Using the key to species of subsect. *Clepsydroidea* (BEKER ET AL., 2016), with the data on dextrinoidity reported above, the collection would key out as *Hebeloma cavipes* Huijsman. However, this does not appear to be a viable option because the spores of the latter are on average narrower and have a rather higher average Q ratio; additionally, the average width of the apex of its cheilocystidia is smaller. (See Comparison tables below) On the other hand, the rather similar *Hebeloma limbatum* Beker, Vesterh. & U. Eberh., which has a much closer average Q ratio, likewise has narrower spores and a slightly smaller cheilocystidium average width.

Taking into account the possibility of an anomalous sporal situation, the frequency of capitate cheilocystidia would suggest another option: *Hebeloma vaccinum* Romagn. In actual fact, the cheilocystidia of B/261 are strongly reminiscent of two collections of *Hebeloma vaccinum* Romagn. (EG-060923.04 and EG-060924.02) with cheilocystidia having a high percentage of capitate and unusually swollen apex, the determination of which was supported by sequence data. (GRILLI ET AL., in prep.) Overall, the comparison of the microscopic features appears to be more favourable, even if there remains the problem of the mycorrhizal association, which for *Hebeloma vaccinum* is most likely restricted to *Salicaceae*, namely *Populus* or *Salix*. Bresadola makes no mention of trees in association with his collection found inside a barracks in Trento. From a photograph dated 1915 of the entrance to the Madruzzo barracks (found on the internet), it is possible to see broadleaved trees inside, but the photograph does not allow for any further identification.

However, the considerations above have to reckon with the presence of velar remnants in Bresadola's description and accompanying plate. Unless this is an undescribed species gone unnoticed thus far, but the possibility is rather far-fetched, perhaps the whole problem may have arisen from the adjective "evanidus" (vanishing) with which Fries qualifies the veil.

The specimens collected by Bresadola possibly showed only dubious or no veil remnants (in the two specimens studied it was not possible to detect any obvious trace of a cortinate veil). Nonetheless, the veil being described as vanishing by Fries, Bresadola may have thought that the veil was simply no more visible, and reported its presence in the description and drew velar traces in the plate to secure full compliance with the original description. After due consideration, all this might just come down to a case of *bona fide* stretching of facts.

In conclusion, morphologically, Bresadola's *Hebeloma versipelle* seems to best fit *H. vaccinum*, even if the figures in plate 711 are not particularly evocative of Romagnesi's species (or of *H. cavipes* and *H. limbatum*, for that matter), but this is mostly due to the embarrassing presence of the cortinate veil on the stipe. The sequencing of this material might resolve the uncertainty, but it is known (BEKER ET AL., 2016) that the best locus for the separation of *Hebeloma vaccinum* from *H. cavipes* is RPB2. Unfortunately, the latter locus is less easy to amplify and sequence, especially in the case of old material.

Comparison Tables [the data on subsections *Crustuliniformia* and *Clepsydroidea*, and on *Hebeloma vaccinum*, *H. cavipes* and *H. limbatum* are from BEKER ET AL. (2016)].

	Sp. length	Sp. width	Sp. Q	Ch. L	Ch. A	Ch. M	Ch. B
Subsect. <i>Clepsydroidea</i>	9.4-15.4	5.4-8.2	1.63-2.36	41-69	5.1-9.3	< 5.5	4.3-9.3
<i>H. cavipes</i>	11-13.5	5.4-6.5	1.85-2.36	41-62	5.4-7.3	3.3-5.0	5.0-7.6
<i>H. limbatum</i>	10.2-12	5.7-6.5	1.63-1.84	41-57	5.8-7.7	3.4-4.7	5.2-6.8
<i>H. vaccinum</i>	12.2-14.3	6.6-7.9	1.63-2.0	41-64	6.1-8.0	3.0-5.1	4.3-7.9
Bresadola B/261	11.1	6.9	1.61	46	7.9	3.8	6.0

Codes & Ratios	O	P	D	A/M	A/B	B/M
Subs. <i>Clepsydroidea</i>	O2-O3 (O4)	P0-P2	D1-D3	≥ 1.40	0.74-1.68	> 1.25
<i>H. cavipes</i>	O2 O3	P0 P1 P2	D1 D2 D3	1.4-2.07	0.89-1.42	1.28-1.92
<i>H. limbatum</i>	O2, O3	P1, P2	(D2) D3	1.53-2.21	0.91-1.68	1.34-1.92
<i>H. vaccinum</i>	(O2) O3,O4	(P0) P1 P2	D2 D3	1.43-2.31	0.84-1.53	1.28-1.92
Bresadola B/261	O1, O2 (O3)	P0, P1	D1 D2	2.09	1.38	1.61

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