



TRAVAUX MYCOLOGIQUES

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A RARE BUT WIDESPREAD *AMANITA* ASSOCIATED WITH *ALNUS*

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Résumé. — L'auteur propose pour un Amanite des aulnaies : *Amanitopsis friabilis* P. Karst. la combinaison nouvelle : *Amanita friabilis* (P. Karst.) Bas, et discute de son identité avec *Amanita sternbergii* Velen. et *Amanita alnicola* Rouzeau et Massart.

Although the vast majority of species of the genus *Amanita* probably are mycorrhizal, and *Alnus* is the partner of many mycorrhizal agarics, it is unusual to find species of *Amanita* growing with *Alnus*. Therefore it is remarkable that in the European literature three amanitas are described for which *Alnus* is specially mentioned as the accompanying tree genus. These species are *Amanitopsis friabilis* P. Karst. (1879), *Amanita sternbergii* Velen. (1920), and *A. alnicola* Rouzeau et Massart (1966).

Even a cursory comparison of the original descriptions of the three species mentioned leads to the conclusion that they probably are identical, as in all three cases a relatively small fungus is described with a grey-brown cap decorated with volval warts or patches and a striate margin, with an exannulate stem entirely decorated with dark flocks to scales and with a small basal bulb.

In September 1971, during a foray of the Dutch Mycological Society in the hills of the Eifel in Germany I had the good fortune to see a fresh specimen given to me by Dr. F. TJALLINGII and collected by him on the moist wooded slopes south of Gerolstein, where many alders are growing. This was not, however, the first record for Germany. A few weeks previously I had received some *Amanita*-specimens for naming from Dr. D. BENKERT (Berlin) collected in *Alneta* near Potsdam, two of which belong to the same species.

Apparently this small *Alnus*-loving *Amanita* is widespread in Europe. Yet it was a great surprise to me, having frequently collected in *Alneta* in the Netherlands without having found any interesting *Amanita*, that in the autumn of 1972 Mr. J. FRENCKEN and Dr. G.-A. DE VRIES collected two beautiful fruitbodies of this species under alders in the south-eastern part of the Netherlands.

Some time earlier material was received from the type locality of *A. alnicola* and recently, together with the type of Karsten's *Amanitopsis friabilis*, I got on loan some other collections from Finland. Together with some of FAVRE's specimens from the Alps I have studied ten collections that have served as a base for the following description :

***Amanita friabilis* (P. Karst.) Bas, comb. nov.**

Figs. 1-5

Amanitopsis vaginata subsp. *friabilis* P. Karst., Hatsvampar. In Bidr. Känn. Finl. Nat. Folk 32 : 547. 1879 (basionym). — *Amanitopsis friabilis* (P. Karst.) Sacc., Syll. Fung. 5 : 22. 1887. — *Pseudofarinaceus friabilis* (P. Karst.) O. Kuntze, Rev. Gen. Plant. 2 : 868. 1891. — *Vaginata friabilis* (P. Karst.) O. Kuntze, Rev. Gen. Plant. 3 (2) : 539. 1898.

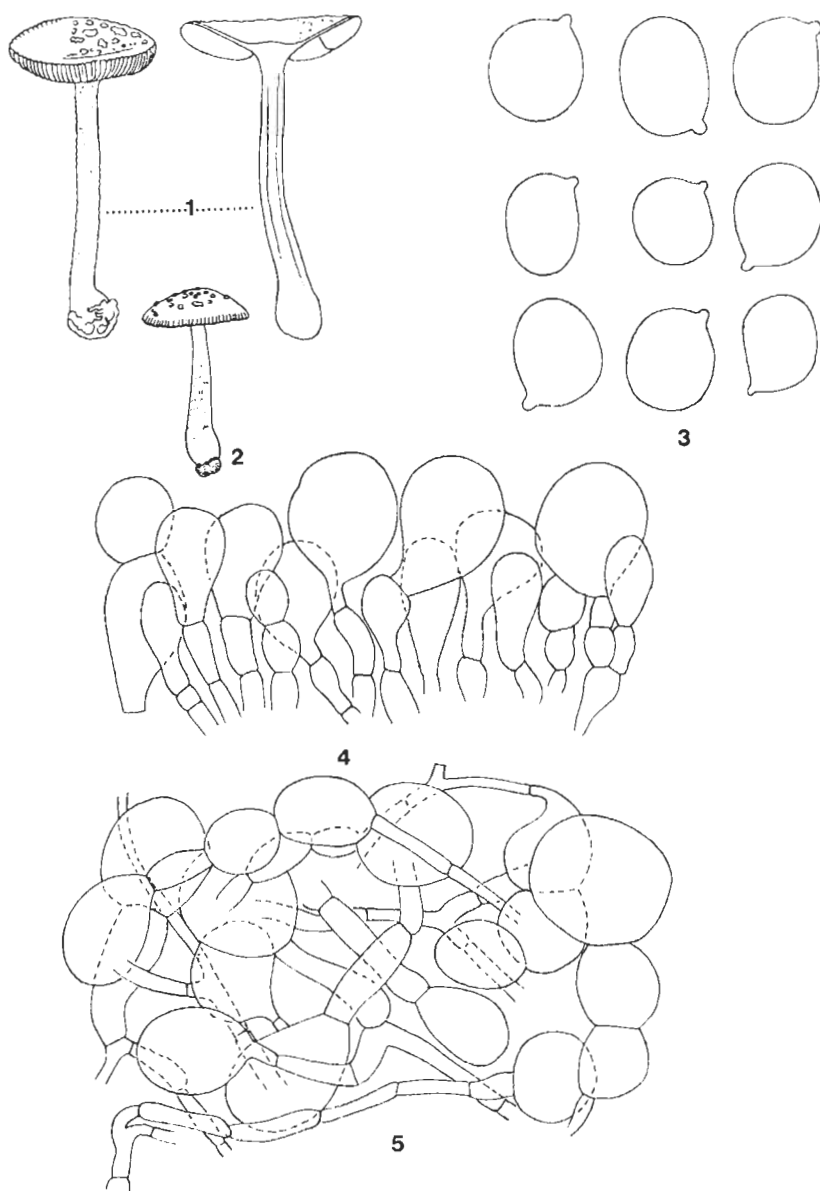
? *Amanita sternbergii* Velen., ¹ Ceské Houby 1 : 192. 1920. — *Amanitopsis vaginata* var. *sternbergii* (Velen.) J. Favre, Catal. descr. Champ. supér. Zone subalp. . . . In Ergebn. wiss. Unters. schweiz. Natn Parks 6 (Neue Folge) : 566. 1960 (not val. publ.; basionym lacking). — *Amanitopsis sternbergii* (Velen.) J. Favre, l. c. Fig. 100. 1960 (not val. publ.) — *Amanita vaginata* f. *sternbergii* (Velen.) Vesely in Annls mycol. 31 : 296. 1933.

Amanita alnicola Rouzeau et Massart In Act. Soc. linn. Bordeaux 103 (A 3) : 5. 1966 (not val. publ.); Rouzeau et Massart apud Rouzeau -In Act. Soc. linn. Bordeaux 104 (A 9) : 4. 1967 (not val. publ.; type not indicated).

Fruit-bodies (Figs. 1, 2) very small to medium, usually slender, solitary to subgregarious. Cap (10-) 30-55 (-80) mm wide, thin-fleshed, ovoid to hemispherical, then convex to plano-convex, finally concave, sometimes with slight umbo, with margin sulcate-striate and non-appendiculate and its sulcation short to rather long (0.15-0.35 R), sepia, grey-brown, brownish grey to grey (Munsell² 10 YR 5/4 in Bas 5730), becoming paler towards margin on expansion (Munsell 10 YR 6/2 to 6/4 in Bas 5730), subviscid and shiny, but sometimes mat and paler (as if covered with a very thin non-gelatinized layer) especially at centre, with concolorous or paler greyish (according to ROUZEAU, 1967 : 3, sometimes even flesh pink), subfloccose-subfelted volval remnants forming small, conical to irregularly shaped warts to irregularly shaped patches usually covering greater part of cap but in some cases nearly completely disappearing. Gills rather crowded, free,

1. See discussion.

2. Munsell Color Company (1954). Munsell soil color charts. Baltimore.



Figs. 1-5. *Amanita friabilis*. — 1. 2. Fruit-bodies (x 1/2). — 3. Spores (x 1250). — 4. Marginal tissue (x 550). — 5. Crushed tissue of volval remnant on cap (x 325). (Fig. 1 from Bas 5730; 2 from specimen in liquid sent by Mr. ROUZEAU; 3 from lectotype; 4 from coll. SCHULMANN, 1 Aug. 1952; 5 from coll. FRENCKEN et de VRIES, 15 oct. 1972).

Bas: A rare but widespread *Amanita*.

fairly broad and ventricose, white, sordid whitish or creamy, with especially near margin of cap often grey, minutely subfloccose edge; short gills usually truncate. Stem 40-90(-120) x 6-15 mm, attenuate upward but often widening just below cap and with slenderly clavate to subglobose, 10-30 mm wide bulb, stuffed to hollow, whitish to very pale greyish-brownish, with concolorous to pale grey or greyish-brownish, subfloccose-subgranular covering at apex gradually passing into greyish brown, grey-brown or brown, appressed, transverse fibrillose scales, sometimes with slight grey-brown fibrillose belt just above bulb (probably representing inner limb of volva) but without volval remnants on bulb itself. Flesh whitish, sometimes sordid or brownish in places. Taste and smell indistinct. Spore print white (according to ROUZEAU, 1967 : 3).

Spores [180/17/10]¹ (9.5-) 10-12.5 (-14.5) x (7-) 8-10 (-10.5) μ , with length-breadth ratio (1.0-) 1.1-1.5 (-1.55) (averages 1.2-1.35), subglobose to ellipsoid, colourless, mostly with one large guttule inside, with abrupt apiculus, inamyloid (Fig. 3). Basidia (45-)50-60 x 12-18 μ (but 60-85 x 12-16 μ in Schulmann-collection 1 Aug. 1952), 4-spored, clampless. Marginal tissue (Fig. 4) consisting of tufts of clavate, piriform, obovoid and spheropedunculate cells, 20-50 x 10-35 μ , often with brown intracellular pigment, terminal or in short terminal rows on hyphae. Trama of gills bilateral; subhymenium ramoso to inflated ramoso, sometimes subcellular or subcoralloid. Pileipellis and ixocutis about 80-100 μ thick at centre, composed of (2.5-) 3.5-6 μ wide interwoven to subradial hyphae with dark brown intracellular pigment, distinctly gelatinized where exposed but sometimes only slightly gelatinized under volval remnants, especially at centre of cap. Remnants of volva on cap (Fig. 5) consisting of a loose net of fairly abundant, frequently branching and septate, 3-8 (-10) μ wide hyphae, giving off about erect side-branches bearing mainly globose, but also ellipsoid, ovoid and rarely piriform, brownish to colourless, very thin-walled cells 25-80 x 20-75 μ , single or in short (2-4 cells) terminal rows. Trama of stem made up of erect slenderly clavate to fusiform terminal cells measuring up to 200 x 40 μ , on 3.5-7 μ wide branching, mainly longitudinal hyphae. Oleiferous hyphae present. Clamps not found.

HABITAT & DISTRIBUTION. — Terrestrial in damp woods with *Alnus* in western, central and northern Europe, from sea-level up to 1900 m altitude in the Alps.

1. The reliability of spore-size data not only depends on the number of spores measured (first figure), but also on the number of fruit-bodies the spores came from (second figure) and the number of collections these fruit-bodies belong to (third figure).

COLLECTIONS EXAMINED. — Finland : Pohjois-Savo : Lapinlahti, Rasila, 20 Aug. 1956, O. v. Schulmann (H); Etelä-Häme : Tammela, Heinämaa, 5 Oct. 1879, P. A. Karsten 868 (lectotype ; H) ; Tammela, Mustiala, without date, P. A. Karsten 867 (H) ; Lammi, Porraskoski Matoniemi, 1 Aug. 1952, O. v. Schulmann (H).

East-Germany, Brandenburg, Fresdorf near Potsdam, 22 Oct. 1968 & 10 Aug. 1970, D. Benkert (herb. Benkert).

West-Germany, Rheinland, Eifel Gerolstein, 5 Oct. 1971, F. Tjallingii (Bas 5730 ; L).

Netherlands, prov. Limburg, Nederweert, « Groote Moost », 15 Oct. 1972, J. Frencken et G.-A. de Vries (L, herb. Frencken).

France, Gironde, Mérignac near Bordeaux, 1 Sept. 1966, C. Rouzeau (topotype *A. alnicola* ; L).

Switzerland, Graubünden, National Park, Bugliauna et Val Trupchun, 31 Aug. et 1 Sept. 1957, J. Favre 755 (CHUR).

Unfortunately the type of *Amanita sternbergii* Velen. in the Botanical Institute of the Charles University at Prague (PRC) is preserved in liquid and cannot be sent on loan. The fungus to which FAVRE applied VELENOVSKY'S name is undoubtedly identical with *A. friabilis*. But in VELENOVSKY'S original description of *A. sternbergii* the spores are said to be 12-14 μ and globose, although otherwise this description fits *A. friabilis* very well. Therefore I have placed a question mark before the name *A. sternbergii* in the synonymy of *A. friabilis*. Since observations on the shape of spores in the older literature, however, are often rather inaccurate, I expect that the question mark will be deleted as soon as the spores of the type have been carefully restudied.

In the field *A. friabilis* looks like a small grey *A. vaginata* that has lost its saccate volva. *Amanita friabilis*, however, does not have a saccate volva, as the volval tissue on the base of the stem is thin and friable, leaving hardly any remnants on the basal bulb when the fruit-body expands.

There are good reasons to consider *A. friabilis* not even related to *A. vaginata* and to place it in section *Amanita* (type : *A. muscaria*) instead of in section *Vaginatae*. The main argument for doing this is the presence of a small but distinct bulb at the base of the stem. This almost certainly means that in *A. friabilis* the primordial fruit-body develops excentrically near the upper surface of the primordial bulb and not, as in section *Vaginatae*, in or near the centre of this bulb (see BAS, 1969 : 299).

The absence of a ring in *A. friabilis* is not a serious reason for not placing this species in section *Amanita*. In fact ringless species are now

admitted to all sections of *Amanita*. In section *Amanita* several exannulate species are known but up till now all from outside Europe, e.g. the grey to brown *A. farinosa* Schw. from North America and Japan, *A. obsita* Corner et Bas and *A. sychnopyramis* Corner et Bas from Singapore, *A. subvaginata* (Clel. et Cheel) E.-J. Gilb. from Australia, and the brightly coloured species *A. bingensis* (Beeli) Heim from tropical Africa, *A. mira* Corner et Bas from Singapore, etc. Besides non-amyloid spores, a basal bulb with friable volval remnants and a lacking annulus, these species are often characterized by small fruit-bodies and relatively small (often $< 10 \mu$), globose to ellipsoid spores. Perhaps a new subsection is needed within section *Amanita* to accommodate this group of species. For the moment, however, the limits of this group are still too uncertain and I am not completely convinced yet that some of its species may not be more closely related to some of the annulate species of section *Amanita* than they are to each other.

There is still very little to say about the ecology of *A. friabilis* except that it grows with *Alnus*. Dr. BENCKERT found his specimens near Potsdam in an *Alnus-Fraxinus* forest (*Alno-Padion*). Near Gerolstein the species grows on a slope where peaty and slightly calcareous habitats alternate. The Netherlands' collection comes from an *Alnus* forest with much *Lactarius lilacinus*, situated between a canal with eutrophic water and a high water level on one side, and a low-lying rather oligo trophic heath on the other. ROUZEAU (1967 : 3) describes a locality in south-western France on the bank of a brook with *Alnus glutinosa*, *Pulmonaria*, *Primula*, *Hedera*, *Arum*, *Alliaria*, and *Chaerophyllum*. In the Alps *A. friabilis* grows under *Alnus viridis*.

From this all it seems that *A. friabilis* shows a preference for localities with *Alnus* on not too poor soil with moving eutrophic ground water.

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