

NOTES ON HYGROPHORUS—I

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(With five Text-figures)

Hygrophorus (Hygrocybe) helobius Arnolds, a new species from bogs is described, and a number of new combinations are given.

From 1969 on I have studied the taxonomy and ecology of species of the Friesian genus *Hygrophorus* in the Netherlands; until 1971 as a part of my university education in biology, under the supervision of Dr. C. Bas (Rijksherbarium, Leiden). Special attention has been given to the grassland-inhabiting species of the subgenera *Cuphophyllus* (= *Camarophyllus sensu auct.*), *Hygrocybe*, and *Hygrotrama*. Many dozens of collections were made. The results of my studies, including a key and detailed descriptions of all taxa, have been published in a report in the Dutch language (Arnolds, 1974a). The most important results however will be published separately as notes in this journal. In the present notes a new species is described and some new combinations used in the above report are validated.

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Hygrophorus helobius Arnolds,

sp. nov.—Figs. 1-5

MISAPPLIED NAMES.—*Hygrocybe miniato-alba* (Pat.) Möller *sensu* Möller, *Fungi Faeröes* 1: 154, pl. 1 fig. c. 1945. — *Hygrocybe mollis* (Berk. & Br.) Moser *sensu* Moser in *Z. Pflzk.* 33: 9. 1967.

Pileus 10-25 mm latus, convexus, dein expansus vel planus, disco depressum, margine undulato-lobatus, coccineus vel miniatus, posterior aurantius vel aurantio-luteus, disco squamulis parvis pilosis miniatis vel aurantiis obtectus. Lamellae (L = 19-29, l = 1-3) adnatae vel late adnatae, ventricosae, subdistantes, vulgo primo pallidissime roseae vel salmicolores, dein saepe cremeae. Stipes (15-) 18-58 × (1.5-) 1.8-3.5(-5) mm, deorsum aequalis vel attenuatus, vulgo leviter flexuosus, cavus, primo miniatus, dein aurantius vel aurantio-luteus, basi vulgo flavo-albus, siccus. Odor et sapor nulli. Sporae 7-11(-12.5) × (4-) 4.5-6.5 (-7) μm, vulgo ellipsoideo-ovoideae vel -oblongae, interdum cylindricae vel pyriformes, haud

raro strangulatae. Basidia $34-45 \times (6-)7.5-11(-13) \mu\text{m}$, 4(2-)sporigera. Lamellarum acies fertilis. Lamellarum stipitisque trama subregularis, cellulis longissimis, $(67-)98-670(-710) \times (8.5-)9.5-34(-37) \mu\text{m}$ formata. Pileipellis trichodermiformis, hyphis ad septa strangulatis, cellulis exterioris clavatis, $6-12 \mu\text{m}$ latis. Aestate. Inter Sphagna in locis uliginosis. Holotypus: 'Zegveld, De Meye, 18 Aug. 1970, *E. Arnolds 511*' (L).

ETYMOLOGY: ἔλος, a marsh; βίος, life.

Cap 10–25 mm wide, first convex or broadly flattened conical, then expanded with depressed centre, often with wavy, lobed margin, scarlet, vermilion or orange-red at first, gradually discolouring to orange or orange-yellow, finally brownish yellow, not viscid when moist, with small concolorous or slightly paler, fibrillose-pilose scales especially at centre; margin not striate. Gills [$L=19-29$, $l=1-3$] moderately to broadly adnate, mostly with decurrent tooth, ventricose, thickish, rather distant, rosy white to very pale salmon pink at first, then yellowish white to pale salmon orange with pale yellowish edge.

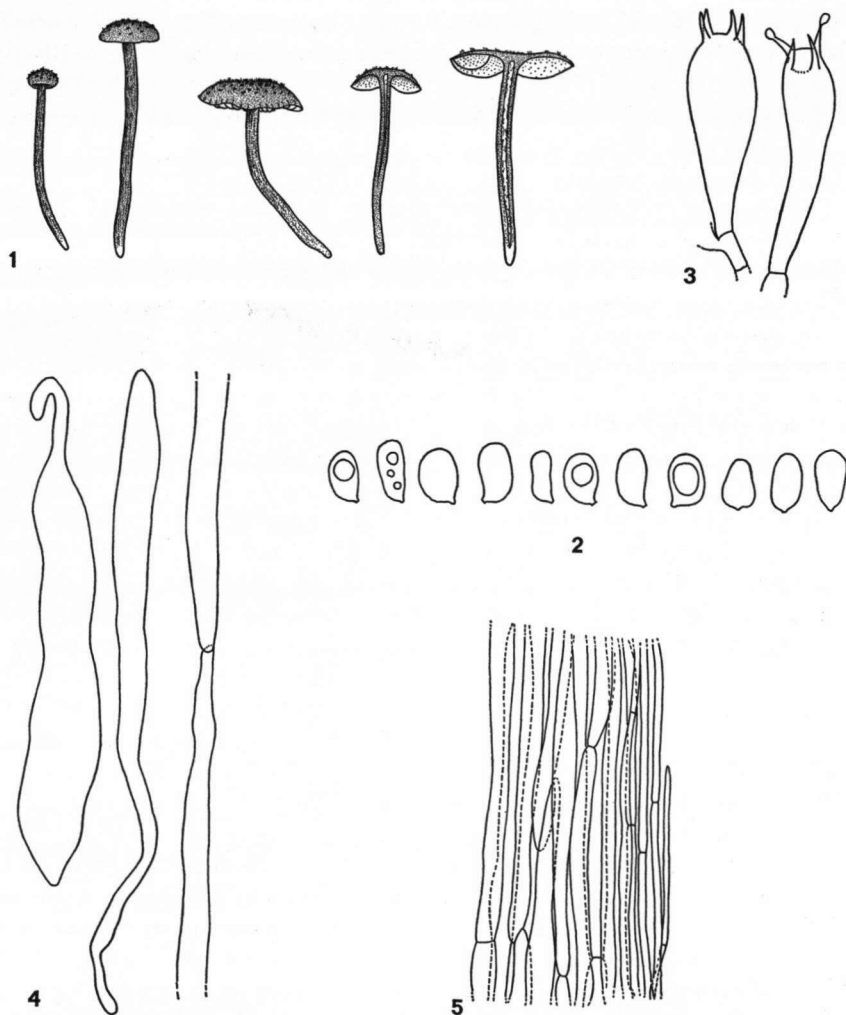
Stem $(15-)18-58 \times (1.5-)1.8-3.5(-5) \text{ mm}$, 1/b (= length-breadth ratio) $(7.8-)8.3-18.0$, slender, hollow, often somewhat flexuose, equal or attenuate at base, fragile, orange-red or vermilion at first, discolouring from base upwards to orange or orange-yellow, at base often yellowish white, and white tomentose, otherwise smooth and dry, sometimes at apex slightly pruinose. Flesh in cap thin, very fragile, in centre pale orange-yellow, otherwise concolorous with surface of cap and stem. Smell and taste none.

Spores $[75/6/5]^1 7-11(-12.5) \times (4-)4.5-6.5(-7) \mu\text{m}$, 1/b $(1.3-)1.4-2.3(-2.6)$; very variable in a given mount, in side-view mostly ellipsoid, ellipsoid-oblong or ovoid, but sometimes pear-shaped or cylindrical, and constricted, in face-view mostly broader, ovoid or maize grain-shaped, with rather large oblique apiculus, colourless in water and bases, yellowish in Melzer's (Fig. 2). Basidia $[32/5/4] 34-45 \times (6-)7.5-11(-13) \mu\text{m}$, 1/b $(3.2-)3.5-5.2(-5.5)$, rather broadly clavate, 4-spored, sometimes a few 2-spored (Fig. 3). Pleuro- and cheilocystidia absent. Trama of gill composed of parallel hyphae with very long and broad tubular cells more or less attenuate towards septa, often flexuose near ends, measuring $[45/5/4] (67-)98-670(-710) \times (8.5-)9.5-34 \mu\text{m}$, 1/b $(4.0-)6.6-37.5$, usually with scattered irregularly twisted and branched, vascular hyphae $3-5(-7) \mu\text{m}$ broad (Fig. 4). Pileipellis² a trichodermium, composed of repent hyphae and especially at centre erect hyphae forming small upright squamules made up of many rather short cylindrical cells more or less constricted at septa; terminal cells rounded or somewhat clavate and $6-12 \mu\text{m}$ broad. Trama of pileus consisting of somewhat interwoven radially disposed hyphae with long cylindrical cells, $8-22 \mu\text{m}$ broad. Stipitepellis³ a poorly developed layer of repent hyphae with some scattered erect ends $4.5-8 \mu\text{m}$ broad (Fig. 5). Stipite-trama composed of parallel hyphae with very long tubular cells $11-23(-26) \mu\text{m}$ broad, and scattered vascular hyphae $2.5-6 \mu\text{m}$ broad (Fig. 5). Clamps frequent at basidia, also found in subhymenium and on hyphae of pileipellis.

HABITAT.—In the Netherlands known from several mesotrophic bog areas, among *Sphagnum* and other mosses in regularly mown reedy marshes belonging to the plant community Pallavicinio-Sphagnetum Meltzer 1945, and poor, unmanured, wet hayfields, belonging to the plant community Cirsio-Molinietum Siss. & de Vries 1942 (see Westhoff & den Held, 1969).

¹ Spores $[75/6/5]$... means: 75 spores, taken from 6 fruitbodies belonging to 5 collections measured, ...

² With regard to the use of these terms, cf. Bas (1969: 327).



Figs. 1-5. *Hygrophorus helobius*. — 1. Fruit-bodies, $\times 1/2$. — 2. Spores, $\times 750$. — 3. Basidia, $\times 750$. — 4. Elements of trama of gill, $\times 300$. — 5. Longitudinal section of stipitetrans (stipitellus to the right), $\times 175$.

COLLECTIONS EXAMINED.—THE NETHERLANDS: prov. Overijssel, Wanneperveen, Zuideindinger Wiede, 24 June 1961, *Barkman 7541* (Wag-W); prov. Utrecht: Zegveld, De Meye, 18 Aug. 1970, *Arnolds 511* (holotype, L); prov. Zuid-Holland: Nieuwkoop, Nieuwkoopse Plassen, 27 June 1957, *Bas 1208* (L); Nieuwkoop, De Haeck, 31 Aug. 1971, *Kortselius* (Arnolds 622; L).

FAEROES: Syderø, 28 Aug. 1938, *F. H. Möller* (C); Strömö, 13 July 1938, *F. H. Möller* (C).

This species is related to *H. miniatus* (Fr.) Fr., but differs from it macroscopically by the very pale colour of the gills and the fragile context, microscopically by the very long elements in the trama of the gills [for comparison: the cells of the gills in 5 Dutch collections of *H. miniatus* measure (37-)43-124(-192) × (6.5-)8.5-19(-22.5) μm], and somewhat shorter and broader basidia [*H. miniatus*: (32-)34-53(-59) × 5.5-10(-10.5) μm, cf. Arnolds, 1974a], ecologically by the occurrence in bogs and by early fructification. In ecological respect there is more agreement with *H. coccineocrenatus* Orton (= *H. turundus sensu* Lange, Kühner & Romagnesi etc.), which fructificates also in summer among *Sphagnum*. The latter, however, has a brownish or blackish scaly cap, larger spores [according to Orton, 1960: 262, 10-13(-14) × 6-8 μm; after my own observations (8-)8.5-12.5 × (5-)5.5-7.5(-8) μm] and much shorter elements in the trama of the gills, like *H. miniatus* (see above). It is also interesting to note, that up till now *H. helobius* has been found in the Netherlands only in the western holocene part of the country in bogs, and *H. coccineocrenatus* only in the eastern pleistocene part in peatmoors and closing fens. This seems to indicate an ecological difference between these two species. Probably *H. helobius* prefers a more mesotrophic and less acid habitat than *H. coccineocrenatus* does (cf. Arnolds, 1974b).

Hygrophorus helobius has been described and figured before by Möller (1945: 154, pl. I C) from the Faeroes, as "*Hygrocybe miniato-alba* (Pat.) comb. n." Patouillard (1913: 213) introduced the name *Hygrophorus miniatoalbus* for a fungus, collected in Indo-China. The type, labelled "*Hygrophorus miniatoalbus* Pat., M. Demange 367, Thai Ha, Hanoi, 6-7-1909," is kept in the Farlow Herbarium. A study of this collection made it clear to me that it represents another fungus than the one described by Möller. The cap of *H. miniatoalbus* Pat. is strongly umbilicate and the gills are deeply decurrent. Some microscopic characters are different also: basidia [8/1/1] are (46-)54-66 × (8-)9.5-11(-12) μm, l/b (4.7-)5.0-6.6, that is longer and more slender than in Möller's material; the elements in the trama of the gill measure [5/1/1] 42-86 × 9-20 μm; that is much shorter than in *H. helobius*. According to my observations the dimensions of the spores are [10/1/1] 7-9.5 × 5-6 μm. I was unable to reinflate sufficiently the outermost tissue of the cap for an examination of the pileipellis. The original description says that it was "pelucheux à la loupe."

This combination of characters suggests to me a close relationship of *H. miniatoalbus* Pat. to *H. cantharellus* (Schw.) Fr. In fact I was unable to find any difference of importance between the Netherlands' collections of the latter species and Patouillard's fungus. The notes on the habitat, "au revers d'un talus" and "sur la terre," are also in agreement with the environmental conditions at most of the localities, where *H. cantharellus* has been found in the Netherlands.

Recently *H. helobius* has been described by Moser (1967: 9) under the name *Hygrocybe mollis* (Berk. & Br.) Moser. All given characters agree with those of the collections mentioned above. The true *H. mollis*, however, is another taxon in the *H. miniatus*-complex, originally described by Berkeley & Broome (1871: 10) as a variety of *H. turundus* (Fr. ex Fr.) Fr., with a golden yellow cap ("aureus") with squamules of the same colour. *Hygrophorus mollis* is very close to *H. miniatus*; the only

differences in fact are the yellow colour of young caps and the pale gills, as described by Orton (1960: 249) and Arnolds (1974a).

The following new combinations are proposed:

- Hygrophorus** subgenus **Hygrotrama** (Sing.) Arnolds, *comb. nov.* Basionym: *Hygrotrama* Sing. in *Sydowia* 12: 221. "1958" [1959].
- Hygrophorus** subgenus **Cuphophyllus** (Donk) Arnolds, *comb. nov.* Basionym: *Hygrocybe* subgenus *Cuphophyllus* Donk in *Beih. Nova Hedwigia* 5: 45. 1962.
- Hygrophorus** sect. **Coccinei** (Fayod) Arnolds, *comb. nov.* Basionym: *Hygrocybe* sect. *Coccineae* Fayod in *Annls Sci. nat.*, VII 9: 308. 1889.
- Hygrophorus** sect. **Inspidi** (Herink) Arnolds, *comb. nov.* Basionym: *Gliophorus* sect. *Inspidi* Herink in *Act. Mus. Boh. sept. Liberec.* 1: 81. 1959.
- Hygrophorus** subsect. **Chlorophani** (Herink) Arnolds, *comb. nov.* Basionym: *Godfrinia* subsect. *Chlorophanae* Herink (sub nom. *Chlorophaninae*) in *Act. Mus. Boh. sept. Liberec.* 1: 66. 1959.
- Hygrophorus** subsect. **Laeti** Arnolds, *subsect. nov.*³ Type: *Hygrophorus laetus* (Pers. ex Fr.) Fr. *Acies lamellarum gelatinosae*, steriles, cheilocystidiis gracilibus confertis obtectae. Subhymenium gelatinosum.
- Hygrophorus conicus* var. **conicoides** (P. D. Orton) Arnolds, *comb. nov.* Basionym: *Hygrophorus conicoides* P. D. Orton in *Trans. Brit. mycol. Soc.* 43: 262. 1960.
- Hygrophorus conicus* var. **conicopalustris** (Haller) Arnolds, *comb. nov.* Basionym: *Hygrophorus conico-palustris* Haller in *Schweiz. Z. Pilzk.* 31: 141. 1953.
- Hygrophorus conicus* var. **olivaceoniger** (P. D. Orton) Arnolds, *comb. nov.* Basionym: *Hygrophorus olivaceoniger* P. D. Orton in *Trans. Brit. mycol. Soc.* 43: 263. 1960.
- Hygrophorus acutoconicus* var. **cuspidatus** (Peck) Arnolds, *comb. nov.* Basionym: *Hygrophorus cuspidatus* Peck in *Bull. Torrey bot. Club* 24: 141. 1897.
- Hygrophorus miniatus* var. **mollis** (Berk. & Br.) Arnolds, *comb. nov.* Basionym: *Hygrophorus turundus* var. *mollis* Berk. & Br. in *Ann. Mag. nat. Hist.* IV 7: 425-436 (spec. no. 1279). 1871.

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³ The names *Hygrophorus* subsect. *Laeti* Smith & Hesler (1942: 3, 68) and *Hygrocybe* subsect. *Laetinae* (Smith & Hesler) Sing. (1951: 154) are not validly published as Latin diagnoses or references to a valid basionym are lacking.

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