

NOTES ON HYGROPHORACEAE—VIII
Taxonomic and nomenclatural notes on some taxa of *Hygrocybe*

EEF ARNOLDS*

Taxonomic status and nomenclature of several European taxa of *Hygrocybe* are discussed. It is argued why some new combinations, made in a previous paper (Arnolds, 1985b) were proposed. Three new taxa are described to replace incorrect names: *Hygrocybe cystidiata* Arnolds (= *H. obrussea* sensu Kühner), *H. lepida* Arnolds (= *H. cantharellus* sensu auct.) and *H. conica* var. *conicopalustris* (R. Haller ex) Arnolds (= *H. conicopalustris* R. Haller, nom. inval.). Three new combinations are proposed: *Hygrocybe miniata* (Fr.: Fr.) Kumm. var. *mollis* (B. & Br.) Arnolds, *H. virginea* (Wulf.: Fr.) Orton & Watl. var. *fuscescens* (Bres.) Arnolds and *H. persistens* (Britz.) Sing. var. *cuspidata* (Peck) Arnolds. The following names are reduced to synonyms of older or sanctioned names: *Hygrophorus quietus* Kühner = *Agaricus obrusseus* Fr.: Fr.; *Agaricus tristis* Pers. = *A. conicus* Schaeff.: Fr.; *Hygrocybe euroflavescens* Kühner = *Hygrophorus flavescens* C. H. Kauffm.; *Mycena acutoconica* F. Clem. = *Hygrophorus persistens* (Britz.) Britz.; *Hygrocybe aurantiolutescens* P. D. Orton = *Hygrophorus cuspidatus* Peck; *Hygrocybe pseudocuspidata* Kühner = *Hygrophorus cuspidatus* Peck; *Hygrocybe moseri* M. Bon = *Agaricus miniatus* Fr.: Fr.; *Hygrophorus strangulatus* P. D. Orton = *Agaricus miniatus* Fr.: Fr.; *Hygrophorus squamulosus* Ellis & Ev. = *Agaricus miniatus* Fr.: Fr.; *Hygrocybe vitellinoides* M. Bon = *Agaricus ceraceus* Fr.: Fr.; *Hygrocybe subceracea* Murrill = *Agaricus ceraceus* Fr.: Fr.; *Hygrophorus niveus* (Fr.) Fr. = *Agaricus virgineus* Wulf.: Fr. Descriptive notes are given on the holotypes of *Hygrocybe vitellinoides* M. Bon, *H. moseri* M. Bon, *Hygrophorus strangulatus* P. D. Orton and *Hygrocybe aurantiolutescens* P. D. Orton. Neotypes are designated and shortly described of *Agaricus miniatus* Fr.: Fr., *Agaricus ceraceus* Fr.: Fr. and *Agaricus obrusseus* Fr.: Fr.

In the framework of the 'Flora agaricina neerlandica' (see Bas, 1983) a revision was made of the genus *Hygrocybe* in the Netherlands and adjacent regions (Arnolds, in prep.). Some taxonomic and nomenclatural problems met during this work are discussed in this paper in alphabetic order of the epitheta. The yellow species with viscid stipe and pileus, placed in *Hygrocybe* subsect. *Insipidae*, e.g. *Hygrocybe glutinipes* and *H. vitellina*, will be treated in a separate paper since more extensive research in this group is necessary.

acutoconica.—*Hygrocybe acutoconica* (F. Clem.) Sing. was originally described from North America as *Mycena acutoconica* by Clements (1893: 38). In my opinion it

* Biological Station (Dept. of Silviculture and Forest ecology of the Agricultural University), Wijster (Drenthe), Netherlands.

Comm. no. 313 of the Biological Station Dr. W. Beijerinck, Wijster.

is a synonym of *H. persistens* (Britz.) Sing. and the latter name is considered to have priority. See discussion on that epithet.

alboviolacea.—*Hygrophorus alboviolaceus* was informally described by Arnolds (1974a: 94) as 'nov. spec. ad interim.' The only collection is characterized by the white lower part of the stipe, separated by a sharp line from the violaceous grey upper part. However, I have observed such a silvery white base of the stipe later on in other species of *Hygrocybe* as well, among others in *Hygrocybe fornicata* (Fr.) Sing. and *H. pratensis* (Pers.: Fr.) Murrill, always in late autumn. The white 'stockinged feet' is caused by strong aeration of the outer tissue of the stipe, apparently due to cold and wet weather conditions. Also the presence of many spores with an abnormal shape, another difference with related species, points to deviating fruiting conditions. At present I regard *H. alboviolaceus* as a synonym of *Hygrocybe subviolacea* (Peck) Orton & Watl.

Hygrophorus alboviolaceus was treated as a distinct species of *Camarophyllus* by Cléménçon (1982: 50), but fortunately not validated on that occasion.

ambigua.—*Hygrocybe coccineocrenata* forma *ambigua* Kühner is regarded as a synonym of *H. coccineocrenata* var. *sphagnophila* (Peck) Arnolds. See there.

aurantiaca.—See for a discussion on *H. chlorophana* var. *aurantiaca* M. Bon the species epithet.

aurantiolutescens.—*Hygrocybe aurantiolutescens* was described by Orton (1969: 103) as a species close to *H. langei* (= *H. persistens*), but different in (1) the 4-spored (instead of 2-spored) basidia, (2) the pileus, being first scarlet or orange-scarlet (instead of orange-red with more yellow margin), (3) the lamellae, being 'pale then deeper chrome-yellow, sometimes becoming flushed orange' (instead of 'lemon or sulphur yellow, rarely tinged slightly chrome') and (4) the less persistently, more obtusely conical pileus.

In my opinion the shape of the pileus in typical *H. persistens* varies from obtusely to very acutely conical. The differences in colour of the lamellae are very subtle. Moreover, in an earlier key Orton (1960: 254) described the lamellae of *H. langei* as follows: 'Cap golden or lemon-yellow, sometimes orange or orange-red in places; stem and gills concolorous or yellow...'

Apparently the main difference between the two species is the number of sterigmata on the basidia, also stressed by Bon (1976b: 9). As I demonstrated before (Arnolds, 1974a) this is a most variable character in the entire conica-group of *Hygrocybe*. Among 17 collections of *H. persistens* (incl. var. *cuspidata*) in the Netherlands five were predominantly 4-spored (some 2- or 3-spored basidia present), five predominantly 2-(4-, 3-, 1-)spored; five were 4- and 2-(1-, 3-)spored intermixed in almost equal proportions, one was 3- and 2-spored intermixed and one collection was predominantly 1-(2-)spored (Arnolds, 1974a: 134, 138; 1983: 383).

I studied the isotype of *H. aurantiosplendens* (Orton 2797, E) and even in that collection I found two carpophores with mainly 4-spored basidia, one 4- and 3-spored intermixed and one predominantly 2-(3-, 4-)spored.

In view of these observations I consider *H. aurantio-lutescens* as a synonym of *H. persistens* var. *cuspidata*, differing from var. *persistens* only in the red pileus in young basidiocarps (see *cuspidata*).

berkeleyanus. — *Camarophyllus berkeleyanus* Cléménçon (1982: 55) is a superfluous renaming of *Hygrocybe berkeleyi* (P. D. Orton) Orton & Watling (see there).

berkeleyi. — *Hygrocybe berkeleyi* (P. D. Orton) Orton & Watl. (= *Camarophyllus berkeleyanus* Cléménçon, 1982 = *Hygrocybe ortonii* M. Bon, 1983) has the stature, habitat and microscopic characters of *H. pratensis* (Pers.: Fr.) Murrill. In fact it only differs in much paler colours of the basidiocarps: the pileus is ivory white at first, then pale ochre or isabella. These colours show strong qualitative resemblance to the colours of *H. pratensis*, ranging in that species from pale orange to orange-brown, and in fact differ only in intensity. Therefore I prefer to treat this taxon as a variety of *H. pratensis*, even if no intermediate forms are known at present (cf. Kuyper, 1986). The correct name in this rank is *Hygrocybe pratensis* var. *pallida* (Cooke) Arnolds (1985b: 477).

cantharellus. — *Agaricus cantharellus* was described by Schweinitz (1822: 88) from North America as a small, orange agaric with an undulating pileus and few, strongly decurrent lamellae, growing gregarious on rotting wood ('Gregarie crescit in truncis putredine consumtis et in terra lignosa frequens'). The morphological characters may apply to the fungus, usually named *Hygrocybe cantharellus* (Schw.: Fr.) Murrill, but the habitat and gregarious fruiting are quite deviating: *Hygrocybe cantharellus* sensu auct. is a terrestrial fungus, often growing amongst grasses or mosses. This discrepancy was noticed before by Rald (1986: 11). He synonymized *H. cantharellus* sensu auct. with *H. turunda* (Fr.: Fr.) P. Karst., but I do not agree with that point of view: *H. turunda* is in my opinion a species with a yellow pileus already in young basidiocarps, supplied with distinct brown scales, with broadly adnate or hardly decurrent lamellae and small spores ($\pm 7-8.5 \times 4.5-5.5 \mu\text{m}$), broadened to the apex in face-view (Arnolds, 1974a: 174; 1986b). *Hygrocybe cantharellus* has an orange-red to scarlet pileus when young with concolorous or paler scales, distinctly decurrent lamellae and larger spores ($\pm 8-11.5 \times 5-7 \mu\text{m}$), not broadened in face-view.

Consequently *H. cantharellus* sensu auct. is in need of a new name. It was well described and depicted by Boudier (1897: 12, pl. 1, fig. 1) as *Hygrophorus turundus* var. *lepidus*. I wish to use Boudier's name at the rank of species, but I prefer to describe it as a new species rather than to make a new combination because in this way I have the opportunity to link this name to a type collection.

Hygrocybe lepida Arnolds, spec. nov.

Pileus 7–22(–30) mm, semiglobatus vel convexus, dein plano-convexus, disco vulgo depressus vel umbilicatus, margine vulgo crenulatus, hygrophanus, miniatus vel aurantio-ruber, dein aurantio-flavus, siccus, disco squamulis parvis pilosis aurantiis obtectus. Lamellae (L = 16–30, l = 1–3(–7)) decurrentes, distantes, albae, dein cremeae vel pallide luteae, interdum pro parte aurantio-flavae. Stipes 15–50(–65) \times 1.5–4 mm, aequalis, miniatus vel aurantio-ruber, dein aurantio-flavus, ad basium pallide luteus vel albidus. Caro concolor. Odor et sapor nulli. Sporae (7–)8–11.5 \times (4.5–)5–7(–7.5)

μm , $Q = 1.4-1.7(-1.9)$, ellipsoideae(-oblongae) vel obovoideae(-oblongae), frequente pro parte phasecoliformae, haud lentiformae, interdum leviter strangulatae. Basidia $35-65(-72) \times 7.5-11.5 \mu\text{m}$, clavata, 4-(2-)sporigera. Lamellarum acies fertilis. Lamellarum trama subregularis, cellulis brevis, $26-110 \times (5.5-9-20(-25)) \mu\text{m}$. Pileipellis cutiformis, ad discum trichodermiformis, hyphis ad septa strangulatis, cellulis exterioris subcylindraceis vel clavatis, $30-125 \times (4.5-7-17) \mu\text{m}$. Stipitipellis cutiformis, hyphis $2.5-5.5 \mu\text{m}$ latis. Fibulae frequentes. Inter graminosis et muscos ad terram. — Holotypus: Netherlands, prov. Drenthe, Dwingeloo, Lheebroekerzand, near Kliploo, in juniper scrub, 8 Nov. 1968, *Barkman 8871* (WBS).

I refrain here from giving a description in English since several modern descriptions are available (e.g. Arnolds, 1974a; Kühner, 1976, 1979) and an extensive description based on collections from the Netherlands will be published in 'Flora agaricina neerlandica' Vol. 2 (Arnolds, 1986b).

It is interesting to know which species Schweinitz (1822) had in mind when describing *Agaricus cantharellus*, especially since this name was sanctioned by Fries in the Index of Systema (1832).

Rald (1986) suggested that *A. cantharellus* is identical with *Gerronema grossulum*, but this seems unlikely as the latter species has an olivaceous yellow pileus, whereas the former species was described as 'aurantiacus'. Kuyper (pers. comm.) noted that *A. cantharellus* fits in all respects with *Omphalina luteicolor* Murrill, a well known agaric growing gregariously on conifer logs that seems to be restricted to the Pacific northwest of America (Bigelow, 1970). However, as Schweinitz (1822) reported his species from eastern North America (Carolina), such an identity may be questioned too. For the time being I regard therefore *A. cantharellus* as a nomen dubium.

ceracea. — *Agaricus ceraceus* was described and sanctioned by Fries (1821: 102) as a small species with an obtuse, yellow, viscid pileus, $\pm 13-25$ mm broad, a thin, yellow stipe and broad, adnate to more or less decurrent lamellae ('adnato-decurrentibus'), common in meadows. The epithet has become confusing since Hesler & Smith (1963: 240) described *Hygrophorus ceraceus* from North America with a viscid stipe and rather broad spores, $5.5-8 \times 4-5 \mu\text{m}$. A similar fungus with a dry stipe and narrower spores ($5-7.5 \times 2.5-3.5 \mu\text{m}$) was redescribed by them as *Hygrophorus subceraceus* (Murrill) Murrill. Among the collections studied they listed also one from the Netherlands (*Maas Geesteranus 13478*). This concept of *H. ceracea* was followed by e.g. Kühner (1977: 74) and Moser (1978: 85).

I have argued before (Arnolds, 1974a: 206; 1983: 386) that Fries in his descriptions (1821: 102, 1838: 330, 1851: 138, 1874: 417) never attributed a viscid stipe to *Agaricus* (*Hygrophorus*) *ceraceus* and that the species that is widespread in N.W. Europe has no viscid stipe indeed. Consequently *Hygrocybe subceracea* Murrill is a synonym of *H. ceracea* and *Hygrophorus ceraceus* sensu Hesler & Smith is a misapplication.

The typification of *Agaricus ceraceus* is rather complicated. The authors are usually quoted as 'Wulf.: Fr.', but this is not correct since Fries (1821: 103) excluded *Agaricus ceraceus* Wulf. as a separate form ('b A. cer. Wulf. . .') with a dry pileus. Among the references under *A. ceraceus* Fr. are *Agaricus ceraceus* Sow. (1796: pl. 20) and *A. ceraceus* Pers. (1801: 336), but since these authors (indirectly) refer to *A. ceraceus* Wulf.

their names and concepts are not relevant from a nomenclatural point of view. It is remarkable, by the way, that Persoon, like Von Wulfen (in Jacquin, 1781: 105) described the pileus as not viscid, but that Fries (l.c.) enumerated Persoon's description under *Agaricus ceraceus* with viscid pileus. Whatever it may be, according to article 48 of IBCN ('When an author adopts an existing name but explicitly excludes its original type, he is considered to have published a later homonym that must be ascribed solely to him...') the sanctioned name *Agaricus ceraceus* must be ascribed to Fries.

In view of the existing confusion it seems useful to select a neotype of *Hygrocybe ceracea*. I failed to obtain well-annotated collections from South Sweden for this aim. The exsiccata distributed by Lundell & Nannfeldt as *Hygrocybe ceracea* (No. 542) represent in fact *H. chlorophana*, a quite different fungus with almost free lamellae and a trama of the conica type. In this case I prefer to select a well-annotated, rich collection from another region than the type locality.

Therefore I propose as neotype of *H. ceracea* (Fr.) Kumm. the collection Arnolds 3095 (10 Nov. 1973, Wilp, Gelderland, the Netherlands), preserved at the Biological Station at Wijster (WBS). This material has been described and depicted before (Arnolds, 1983: 386, fig. 184, pl. 5C).

chloroides.—The combination *Hygrocybe conica* var. *chloroides* (Malençon) Arnolds was recently made (Arnolds, 1985b; Nov. 1985), but it is antedated by a publication by Bon (1985a: 52). See also discussion on *H. conica*.

chlorophana.—At present *Hygrocybe chlorophana* (Fr.: Fr.) Wünsche is usually regarded as a species with strictly regular trama, a lemon to chrome yellow, viscid to glutinous pileus, narrowly adnate, pale yellow lamellae and a yellow, viscid stipe. The pileipellis is an ixotrichodermium, whereas the stipitipellis is an ixocutis or an ixotrichodermium, 50–200(–550) μm wide.

A closely related species is *H. flavescens* (C. H. Kauffm.) Sing. (= *H. euroflavescens* Kühner, see there) with orange basidiocarps, a viscid to glutinous pileus and a dry to slightly viscid stipe, covered with a cutis or ixocutis ± 15 –50(–60) μm wide. The situation has become more complicated by the description of *H. chlorophana* var. *aurantiaca* M. Bon (1976a: 42), combining orange colours with a viscid stipe, with a microscopical structure similar to typical *chlorophana*.

In the Netherlands these three taxa have been found as well (Arnolds, 1986b), but they could not always be clearly distinguished. Between *H. flavescens* and *H. chlorophana* var. *aurantiaca* intermediate forms were observed with a slightly viscid stipe covered with a rather thin, ± 40 –70 μm wide ixocutis. An additional complication is the fact that the macroscopic appreciation of the surface of the stipe may differ considerably from the microscopic analysis: a dry stipe to the touch may reveal a thick ixocutis, whereas an undoubtedly viscid stipe may be correlated with only a thin ixocutis. Therefore I am increasingly inclined to reunite *H. chlorophana* and *H. flavescens* into one species, possibly with several varieties. One fact restraining me for the moment is the lack, at least to my knowledge, of collections uniting pale yellow basidiocarps with a dry to subviscid stipe. See also *flavescens*.

clivialis.—*Hygrocybe clivialis* (Fr.) Orton & Watl. is considered a synonym of *H. fornicata* var. *fornicata* (see there).

conica.—According to Kühner (1977: 84) the name *Hygrocybe conica* (Scop.: Fr.) Kumm. sensu stricto should be restricted to a blackening species with a yellow pileus at first. Such 'forms' have usually been described as *Hygrocybe tristis* (Pers.) Moell. (e.g. Moser, 1978: 86) or *H. conica* var. *chloroides* (e.g. Bon, 1976b: 5).

Fries (1821: 103) at first had a very wide concept of *Agaricus conicus*, including blackening and non-blackening forms with a colour of the pileus varying from yellow, orange and red to dark brown ('fuliginous'). The name must be applied to a blackening agaric since Fries (l.c.) wrote: 'Color variat; sed *fractus nigrescit!* quod nulla in affini specie vidimus.' He simultaneously described four forms (a) with yellow pileus, (b) later blackening, (c) with dark brown pileus, (d) with orange or scarlet pileus. In *Epicrisis* (1838: 331) Fries mentioned the yellow form as the most widespread form of a variable species ('Valde versicolor (etiam *laete coccineus!*), *vulgo flavus*, . . .'). If *Agaricus conicus* is typified with Fries' description from 1821 it seems reasonable indeed to restrict this name to the yellow taxon. The fungus with an orange to red pileus should have a different name, e.g. *Hygrocybe pseudoconica* J. Lange as suggested by Kühner (l.c.).

However, Fries (l.c.) listed numerous references in his protologue. In my opinion this name is typified by *Agaricus conicus* Schaeff. (1774: 2). His description and plate agree with the current use of the epithet *conicus* ('pileo . . . croceo-coccineo . . .; in senio totus nigrescens'). The authors are usually quoted as Scop.: Fr. It is true that *Agaricus conicus* Scop. (1772: 443) is an older valid name, but I reject this as type of *A. conicus* Fr. since Fries (1821) indicated Scopoli's description only by page number, not by name, under form d. (Voss & al., 1983; ICBN, art. 37.2). Under the main text he gave only a direct reference to *A. conicus* Schaeff. Schaeffer (l.c.) referred to *A. conicus* Scop. with a ?. This is quite understandable since it concerns a different species with a dark red ('coccineus'), conical pileus and yellow lamellae, without any suggestion of blackening.

Consequently I regard *Agaricus conicus* Schaeff. as the name sanctioned by Fries in 1821 and therefore this name can be maintained in its current concept. See also *conicopalustris*, *pseudoconica* and *tristis*.

conicopalustris.—The name *Hygrophorus conico-palustris* R. Haller (1953: 141) has not been validly published since Haller (l.c.) simultaneously proposed the name *Hygrocybe conico-palustris* (ICBN, art. 34). Bon (1985b: 38) made the new combination *Hygrocybe conicopalustris* (R. Haller) M. Bon, with a reference to the basionym *Hygrophorus conicopalustris* R. Haller and indicating between brackets 'nom. alternativum.' Apparently Bon (l.c.) intended to validate this name, but in my opinion he did not succeed since he neither gave a (reference to) a Latin diagnosis and an indication of the type, nor rejected one of Haller's names but instead used one of the names (*Hygrophorus conicopalustris*) as basionym for the other (*Hygrocybe conicopalustris*).

Consequently the name has still to be validated. However, in my opinion the only difference between *H. conicopalustris* and *H. conica* (forma *conica*) is the dwarfish size of basidiocarps in the former taxon, the cap diameters ranging from 4–10(–15) and

12–60(–70) mm, respectively. Therefore I accept *H. conicopalustris* only in the rank of variety and the following validation and new combination is proposed: *Hygrocybe conica* (Schaeff.: Fr.) Kumm. var. *conicopalustris* (Haller ex) Arnolds, var. nov.

A Latin diagnosis is provided by Haller (1953: 141). Holotypus: Switzerland, Kanton Aargau, Flachmoor bei Vogelrüti, nahe Mellingen, *R. Haller s.n.*, June–Aug. 1953 (ZT).

constrictospora.—*Hygrocybe constrictospora* Arnolds is a new name for *Hygrophorus strangulatus* sensu Arnolds (1974a, 1977). See Arnolds 1985b: 476, 1986a.

cuspidata.—Hesler & Smith (1963: 135) wrote that ‘the bright red color at once distinguishes *H. cuspidatus* Peck from *H. acutoconicus*.’ Elsewhere (l.c.: 139) they wrote ‘When faded, specimens of *H. cuspidatus* are indistinguishable from specimens of *H. acutoconicus*. Unless the red color of the former is preserved in drying, herbarium specimens of the two are also indistinguishable.’ I fully agree with these observations and therefore proposed (Arnolds, 1974a: 137, 1985b: 475) to reduce *H. cuspidatus* to a variety of *H. acutoconica*, the more so since intermediate forms with an entirely or partly orange-red pileus are sometimes found. Such an intermediate collection has been figured for instance by Bresadola as *Hygrophorus croceus* (1928: 348). The two taxa are usually well separated, however.

Since in my opinion *Hygrocybe persistens* has priority over *H. acutoconica* (see *persistens*) a new combination is necessary: *Hygrocybe persistens* (Britz.) Sing. var. *cuspidata* (Peck) Arnolds, comb. nov. (Basionym: *Hygrophorus cuspidatus* Peck in Bull. Torrey bot. Club 24: 141. 1897). See also pseudocuspidata.

cystidiata.—*Hygrocybe cystidiata* is described here as a new species in order to replace *H. obrussea* sensu Kühner & al. since *Agaricus obrusseus* Fr.: Fr. is an earlier synonym of *Hygrophorus quietus* Kühner (see *obrussea*).

Hygrocybe cystidiata Arnolds, spec. nov.—Figs. 1–4

Pileus 25–70 mm latus, conicus vel campanulatus, dein convexus, umbonatus, citrinus vel aureus, glaber vel fibrilloso-striatus, siccus. Lamellae librae, ventricosae, distantes, crassae, albae vel pallide citrinae. Stipes 40–80 × 6–15(–30) mm, equalis, vulgo compressus, striatus-sulcatus, glaber, siccus, citrinus, ochraceus vel aurantio-luteus. Caro fragilis, tenuis, pilei et stipitis concolor. Odor et sapor nulli. Sporae 6.5–9.5 × (4.0–)4.5–5.5(–6.5) μ m, Q = (1.3–)1.4–1.6(–1.8), ellipsoideae, ovoideae vel phaseoliformae. Basidia 39–46 × 7–9 μ m, 4-(2-, 3-)sporigera. Lamellarum acies fertilis; cheilocystidia (pseudocystidia) pauca, 90–130 × 8.5–17 μ m, subfusiformia, apices conica. Pleurocystidia nulla. Lamellarum trama regularis, cellulis 150–500 × 14–31 μ m, vulgo apice attenuatis. Pileipellis cutis, 40–50 μ m latus, hyphis 3.5–10 μ m latis, cylindricis, interdum pro parte minor erectis. Stipitipellis cutis, 30–70 μ m latus, hyphis pro parte ascendendis vel erectis, 3.5–6 μ m latis, cylindricis. In pratis ad terram. — Holotypus: Switzerland, Teufenthal, in Moos, 9 July 1953, *R. Haller* (herb. E. Horak 63/350).

Notes on the type.—Three well-dried basidiocarps. Pileus 20–42 mm broad, convex with umbo, ochre-brown. Lamellae free, strongly ventricose, distant, up to 5 mm wide. Stipe up to 42 × 7 mm.

Spores $6.5-8.5(-9.5) \times (4-4.5-5.5(-6.5)) \mu\text{m}$. $Q = (1.3-1.4-1.6(-1.8))$, ellipsoid, obovoid to phaseoliform, rarely ellipsoid-oblong, not constricted, not broader in front-view, with small, acute apiculus. Basidia $37-47 \times 7-8(-9.5) \mu\text{m}$, $Q = (4.5-5-6.5)$, slenderly clavate, 4-spored. Edge of lamellae sterile, but with scattered pseudocystidia, originating from the trama, projecting up to $65 \mu\text{m}$ over the edge, $90-130 \times 8.5-17 \mu\text{m}$, slenderly fusiform with conical apex, hyaline, thin-walled. Hymenophoral trama regular, made up of long, broad elements, $150-500 \times 17-31 \mu\text{m}$, often tapering to the ends, but also with rounded ends, without long, twisted apex. Pileipellis a thin, dry cutis, $40-50 \mu\text{m}$ broad, gradually passing into the trama, made up of rather loose, repent hyphae, $3.5-10 \mu\text{m}$ wide, some ascending, with a few free ends. Pileitrama regular, made up of $9-23 \mu\text{m}$ wide hyphae, in upper part with intracellular yellow pigment, with scattered, refractive, vascular hyphae, $4.5-7 \mu\text{m}$ wide. Stipitipellis a cutis to almost a trichodermium, up to $70 \mu\text{m}$ thick, made up of rather loosely interwoven, ascending to erect hyphae, $\pm 3.5-6 \mu\text{m}$ wide. Clamps present.

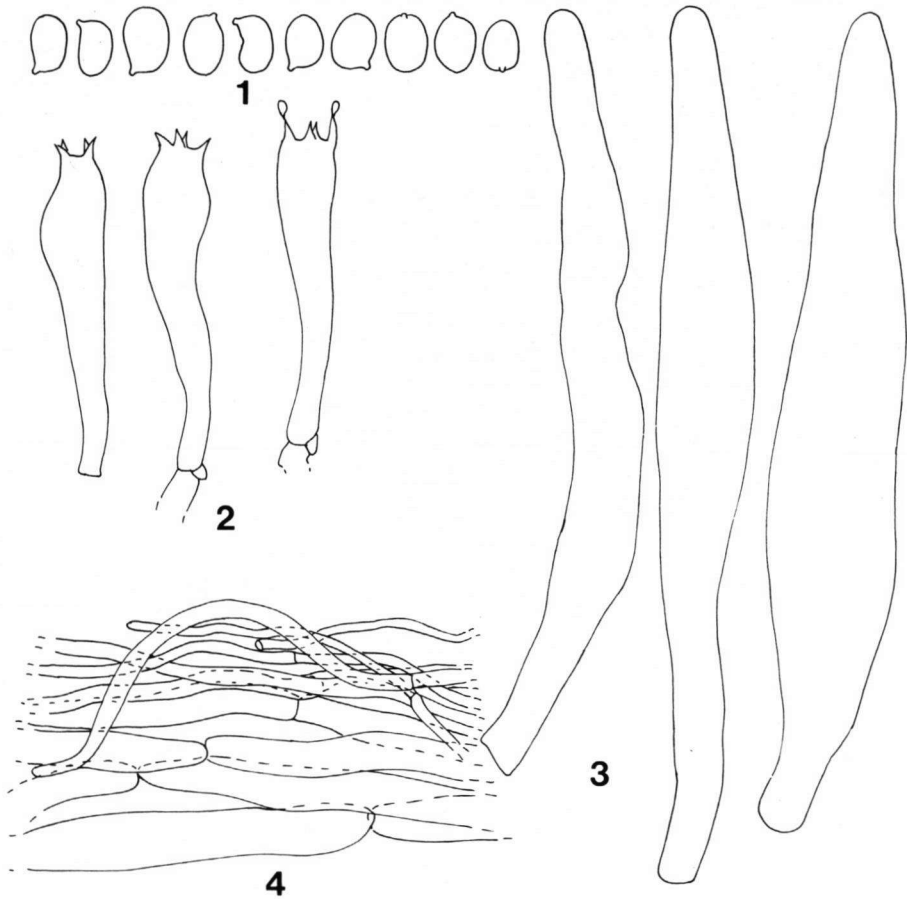
The microscopic details in the English description are entirely based on my study of the holotype. In spite of repeated requests no collections made by Kühner or Kristiansen were received on loan. For macroscopic characters of fresh specimens I have to refer to Kühner (1947: 20), Haller (1954: 84) and Kristiansen (1981: 120). *Hygrocybe cystidiata* is unknown from the Netherlands.

The name of this species refers to the large sterile elements along the edge of the lamellae. Since these elements originate from the trama they are considered as pseudocystidia. Pseudocystidia are regularly found in the section *Hygrocybe* (type: *H. conica* (Schaeff.: Fr.) Kumm.), although not constant in any species. These pseudocystidia are the projecting ends of (vascular) hyphae, of irregular shape, and are usually without septae at the base (Arnolds, 1974a, figs. 76, 77; Métrod, 1941). The pseudocystidia of *H. cystidiata* have a rather constant shape, a septum at the base and seem to be present in all collections, although they are often scarce, and absent from some lamellae.

Hygrocybe cystidiata is a very interesting species from a taxonomic point of view since it combines characters of the subgenera *Hygrocybe* (type: *H. conica*) and *Pseudohygrocybe* (type *H. coccinea* (Schaeff.: Fr.) Kumm.), viz. \pm conical pileus, free lamellae and strictly regular hymenophoral trama (*Hygrocybe*); small spores with small apiculus and slender basidia (*Pseudohygrocybe*) (Bon, 1977). It should be noticed that the elements of the hymenophoral trama are the shortest found in subgenus *Hygrocybe*, whereas in *Pseudohygrocybe* some species are found with approximately similar trama elements, e.g. *H. helobia* (Arnolds) M. Bon and *H. aurantioviscida* Arnolds (Arnolds, 1986b).

Bon (1977: 229) suggested that the difference in structure of the hymenophoral trama between the subgenera *Hygrocybe* and *Pseudohygrocybe* is as fundamental as between *Hygrocybe* and *Cuphophyllus* (= *Camarophyllus* sensu auct.), consequently that *Pseudohygrocybe* may be regarded as a genus in his own right. In my opinion the two groups are linked by too many intermediate forms to justify such a separation.

Hygrocybe cystidiata is related to *H. intermedia* (Passerini) Fay., a species with a similar habit and often with pseudocystidia, but with a red, at centre squamulose pileus, larger spores, broadly clavate basidia, and a pileipellis with a different structure (Arnolds, 1986b).



Figs. 1–4. *Hygrocybe cystidiata*. — 1. Spores $\times 1000$. — 2. Basidia $\times 1000$. — 3. Cheilocystidia $\times 400$ (all from R. Haller, 9 July 1953, holotype).

distans.—*Hygrocybe distans* (Berk.) Bon & Chevassut is regarded as a synonym of *H. fornicata*. See there.

euroflavescens.—Kühner (1976: 463) introduced *Hygrocybe euroflavescens* as a new name for *H. flavescens* sensu Favre (1955), Orton (1960), Arnolds (1974a), auct. eur. on the basis of some discrepancies with the description of *H. flavescens* (C. H. Kauffm.) Sing., published by Hesler & Smith (1963: 211). The American collections should have a drier pileus, a more viscid stipe and lack the pruines on the stipe observed in European collections. In two American collections (*Bigelow 3296*, *Smith 6371*) Kühner (1977: 82) found the stipitipellis to be an ixotrichodermium.

However, in another American collection (*Smith 13713*) I observed only a thin ixocutis on the stipe, like in European collections (Arnolds, 1974a: 147). It is striking that Hesler & Smith (l.c.) placed *H. flavescens* in their subsection *Punicei*, characterized by a dry stipe, whereas the related *H. chlorophana* (Fr.) Wünsche was assigned to subsection *Psittacini*, characterized by a viscid to glutinous stipe. In their observations Hesler & Smith (l.c.) stressed the (almost) dry stipe surface of *H. flavescens* as the main difference with *H. chlorophana* and state that Kauffman too in his unpublished notes separated it from *H. chlorophana* by this character. This obviously contradicts Kühner's observations.

I could also not find any difference in the structure of the pileipellis between European and American collections of *H. flavescens*, ranging from a thin ixocutis (80 μm) to a thick ixotrichodermium (500 μm ; see Arnolds, 1986b). The pruinosity of the stipe apex may have been overlooked or neglected by Hesler & Smith (1963) and, in any way, it is not a character of strong taxonomic importance in my opinion.

Taking everything into account, I do not see any reason to reject the name *H. flavescens* for the European collections. It is not impossible that the collections from North America, quoted by Hesler & Smith (l.c.: 212) are heterogeneous, also including collections with a viscid stipe. Such collections with orange basidiocarps can be assigned to *H. chlorophana* var. *aurantiaca* M. Bon (1976a: 42). It remains dubious whether *H. chlorophana* and *H. flavescens* are good species, after all (see *chlorophana*).

flavescens.—For a discussion on the nomenclature and taxonomic position of *H. flavescens* (Kauffm.) Sing., see *H. euroflavescens* and *H. chlorophana*.

fornicata.—*Hygrocybe fornicata* (Fr.) Sing. has been accepted in a wide sense, including *H. clivialis* (Fr.) P.D. Orton & Watling, *H. streptopus* (Fr.) Sing. & Kuthan, and *H. distans* sensu M. Bon (1976a). Two varieties can be distinguished: var. *fornicata* with a whitish to pale ochraceous pileus and var. *streptopus* (Fr.) Arnolds (1985b: 476) with a pale to dark grey-brown pileus. Variability, taxonomy and nomenclature were amply discussed in another paper (Arnolds, 1985a).

fuscescens.—Like the original author, Bresadola (1928), I prefer to distinguish this fungus as a variety of *Hygrocybe nivea* (= *H. virginea*): the stature, habitat and microscopic characters of the basidiocarps are completely identical. The only difference is the presence of a brown to greyish brown spot at the centre of the pileus. Occasionally even intergrading populations are found, in which part of the basidiocarps show a beige or pale brown centre of the pileus.

Since I did not accept the name *Hygrocybe virginea* until this paper a new combination is necessary: *Hygrocybe virginea* (Wulf.: Fr.) Orton & Watl. var. *fuscescens* (Bres.) Arnolds, *comb. nov.* (Basionym: *Hygrophorus niveus* var. *fuscescens* Bres., Iconogr. mycol. 7: pl. 330. 1928).

griseopallida.—*Hygrocybe griseopallida* Arnolds (1985) appears to be a form of *Hemimycena mairei* with almost smooth hyphae of the pileipellis (see Arnolds, 1986a).

konradii.—For a discussion on the variability of *Hygrocybe konradii* R. Haller, see pseudopersistens.

langei.—*Hygrocybe langei* Kühn. is regarded as a synonym of *H. persistens* (Britz.) Sing. See there.

lepida.—*Hygrocybe lepida* Arnolds is the valid name of *H. cantharellus* sensu auct. See that epithet.

miniata.—*Agaricus miniatus* was originally described by Fries (1821: 105) as a small fungus (pileus \pm 13–25 mm; stipe \pm 50 \times 2 mm) with a red, dry pileus and adnate, yellow and red ('flavo-miniatae') lamellae. The characteristic squamules were not mentioned by Fries until his description of *Hygrophorus miniatus* (Fr.: Fr.) Fr. in *Epicrisis* (1838: 330). However, since there is no contradiction between the descriptions from 1821 and 1838 it seems justified to maintain this name for a fungus with a red pileus with concolorous scales, as is custom nowadays.

The name *Hygrophorus miniatus* is interpreted in different ways by various authors. For instance Kühner (1976: 484) regards it as an alpine species with whitish yellow, yellow to orange-red lamellae and not constricted, ellipsoid, uninucleate spores, measuring 8–11 \times (4–)5–6.5 μ m, $Q = 1.5$ –1.8; Orton (1960: 249) as a lowland species with vermillion to orange-red lamellae at fist and not constricted, ellipsoid(-oblong) spores, measuring 7.5–10(–11) \times 5–6(–7) μ m. On the other hand it was described by Arnolds (1974a: 181; 1983: 389) as a species with pinkish red to orange-yellow lamellae, and spores broadened and often constricted in face-view. Such collections were also described by Kühner (1976: 481) from lowland habitats without giving them a formal name and by Orton (1960: 266) as *Hygrophorus strangulatus* (see also *strangulata*).

The only way to clarify this situation was to study some collections answering the original description by Fries (l.c.) and found in the same region. With this aim I investigated *exsiccata*, made by M. Moser (Innsbruck) near Femsjö and kindly put to my disposal. One of them (*Moser 80/372*, IB) is designated here as *neotype* and described below.

Pileus in *exsiccata* 8–20 mm wide, expanded to applanate with depressed centre, dull brownish orange (when dried), with small, adpressed, concolorous scales around the centre. Lamellae broadly adnate, brownish pink. Stipe up to 25 \times 3 mm.

Spores [20/2]6.5–9(–9.5) \times 4–5.5(–6) μ m, $Q = (1.3$ –)1.5–1.8, in side-view ellipsoid, ellipsoid-oblong to slightly obovoid(-oblong), in one basidiocarp not constricted, in another a small proportion weakly constricted; in front-view 5–6.5(–7) μ m broad, $Q = 1.2$ –1.5(–1.6), usually broadened towards the base, often constricted, obovoid, heart-shaped to obpyriform. Basidia 44–59 \times 5.5–8.5 μ m, slenderly clavate, 4-spored. Cheilocystidia in one basidiocarp absent, in another frequent, scattered or in small groups, 19.5–44 \times 2–3 μ m, subcylindrical, often tortuose or furcate. Hymenophoral trama subregular, made up of rather short elements, 39–140 \times 4–16 μ m. Pileipellis at centre a trichodermium, towards the margin a cutis with trichodermial tufts, made up of ascending and erect hyphae, constricted at the septae, with short elements; terminal elements

clavate, ovate or attenuate, $20-59 \times 6.5-13.5 \mu\text{m}$. Stipitipellis a cutis up to $25 \mu\text{m}$ broad, made up of repent, cylindrical hyphae, $2.5-5 \mu\text{m}$ wide, in places with erect hyphal tips, projecting up to $45 \mu\text{m}$. Clamps present.

Collections examined.—SWEDEN, Smoland, near Femsjö, 'Stensje'; along road amongst grass, 21 Sept. 1980, *M. Moser 80/372* (IB, neotypus).

Another collection from Femsjö (*M. Moser 80/287*, 17 Sept. 1980, IB) had similar microscopic characters, including spores broadened towards the base and often obpyriform.

The neotype is identical with *H. miniata* sensu Arnolds and *H. strangulata* (P. D. Orton) Švrček. *Hygrophorus miniatus* sensu Orton may be identical with *Hygrocybe calciphila* Arnolds (see Arnolds, 1986a). *Hygrocybe miniata* sensu Kühner seems to be a different fungus without appropriate name.

mollis.—*Hygrophorus turundus* var. *mollis* was originally described by Berkeley & Broome (1871: 434) as a golden yellow fungus with concolorous scales on the pileus ('Aureus; pileo . . . pilis mollibus brevibus radiantibus concoloribus . . .'). In the Netherlands such a fungus is not uncommon on acid, sandy and peaty soils. It is identical with *Hygrocybe miniata* in microscopical respect, including the characteristic ovoid to obpyriform spores in face-view (see *miniata*). The main difference is the yellow colour of the pileus in young basidiocarps, since older basidiocarps of *H. miniata* are discolouring yellowish as well. In addition the lamellae are pale yellow without the red or orange colours usually found in *H. miniata*. The two taxa are often found together and occasionally intermediate forms occur. Therefore it is not justified, in my opinion, to treat it as a separate species like done by e.g. Orton (1960: 249). I regard it as a variety: *Hygrocybe miniata* (Fr.: Fr.) Fr. var. *mollis* (B. & Br.) Arnolds, *comb. nov.* (Basionym: *Hygrophorus turundus* var. *mollis* B. & Br. in Ann. Mag. nat. Hist., Ser. IV, 7: 434. 1871 (Notic. Br. Fungi 26).

Hygrocybe mollis sensu Moser (1967: 9) is identical with *H. helobia* (Arnolds) M. Bon. I studied Moser's collection, made 30 VII 1966 (IB) and found the hymenophoral trama made up of long elements, tapering to the ends, $175-515 \times 14-32 \mu\text{m}$, characteristic of *H. helobia* (see also Arnolds, 1974b: 90). *Hygrocybe mollis* sensu Moser has nothing to do with *H. moseri* M. Bon (see there).

moseri.—*Hygrocybe moseri* was described by Bon (1976a: 42) in order to rename *H. mollis* sensu Moser (1967: 9). However, Bon apparently did not study the authentic collections made by Moser since he indicated one of his own collections (3926B) as type and since his description shows great discrepancies with the description by Moser.

I studied a collection of *H. mollis* sensu Moser and found it to be identical with *H. helobia* (Arnolds) M. Bon as already suggested in 1974 (Arnolds, 1974b: 90). For details see discussion on *mollis*.

I also studied the holotype of *H. moseri* M. Bon (herb. Bon), consisting of one fragmented basidiocarp in bad condition. This study revealed some discrepancies between the type and the diagnosis by Bon: The hymenophoral trama is made up of short ele-

ments, $38-66 \times 10.5-14 \mu\text{m}$ (Bon: $100-300 \mu\text{m}$ long); the pileipellis is a trichodermium, made up of hyphae $\pm 4.5-8$ (Bon: $7-12(-16) \mu\text{m}$ wide; the spores measure $7-8.5(-9) \times 4.5-5(-5.5) \mu\text{m}$ and are in front-view often broader to the base, obovoid to obpyriform (Bon in diagn. $6-10 \times 4.5-6 \mu\text{m}$; in later key (1976b: 18) $8-10 \times 4-5.5 \mu\text{m}$!). It is remarkable that Bon's own notes on the type of *H. moseri*, kindly sent along with the collection, are in better accordance with my observations than with his own diagnosis: 'spores $6.5-8.5 \times 4.5 \mu\text{m}$; hyphae de la trame courtes; hyphae d'épicutis $\times (3-)6-8(-12) \mu\text{m}$.'

The type of *H. moseri* perfectly fits in with my concept of *H. miniata* (see there). Since the colours of the pileus in the type were described as 'jaune (un peu orangé sur le frais)' I synonymize it with *H. miniata* var. *mollis* (B. & Br.) Arnolds.

murinacea.—*Agaricus murinaceus* (Bull.: Fr.) was sanctioned by Fries (1821: 116) with references to i.a. *Agaricus murinaceus* Bull. (pl. 520) and *Agaricus nitratus* Pers. (1801: 356). The most important character according to Fries is the nitrose smell, which is found in several other species of *Hygrocybe* too: *H. ovina* (Bull.: Fr.) Kühner and *H. nitiosa* (Blytt) Mos. These species are reddening or blackening when touched and since Fries (l.c.) did not mention this character it is likely that *Agaricus murinaceus* Fr. and *A. nitratus* Pers. are identical. However, I reject the former name since it is typified by a plate by Bulliard (1791: pl. 520), representing a different fungus with very large, stout, dark brown basidiocarps, one of them tinged reddish on the pileus. In the accompanying description (Bulliard & Ventenat, 1812: 588) no characteristic smell is mentioned. In my opinion *A. murinaceus* Bull. may very well be identical with *Hygrophorus metapodius* (Fr.) Fr., in which case the epithet *murinaceus* has priority. Since I do not know *H. metapodius* personally, I do not want to make a final decision. Whatever it may be, *A. murinaceus* Bull. is not the same as *A. nitratus* Pers. and therefore the correct name of this well-known species is *Hygrocybe nitrata* (Pers.) Wünsche.

Another interesting point in favour of this concept is that Fries in 1874 (: 421) listed his *Agaricus murinaceus* 1821 as a synonym of *Hygrophorus nitratus* with explicit exclusion of the plate by Bulliard.

nebularis.—*Camarophyllus nebularis* Cléménçon has been invalidly published and is a synonym of *Hygrocybe griseopallida*. See there.

nigrescens.—Several authors (e.g. J. Lange, 1923: 24; Hesler & Smith, 1963: 113; Arnolds, 1974a: 112; Kühner, 1977: 84) have stressed the fact that *Hygrophorus puniceus* var. *nigrescens* was originally described by Quélet (1884: 503) as a taxon with a white pileus at first, later yellow with rose or orange fibrils. Moreover the basidiocarps are described as extremely large with the pileus 100 mm broad. These characters are copied in Quélet's later description of *Hygrophorus nigrescens* (1888: 254).

I reject this name for the smaller taxon with red pileus from the beginning, at present by most authors indicated as *H. nigrescens*. An alternative name is *Hygrocybe pseudoconica* J. Lange (see there).

nitrata.—*Hygrocybe nitrata* (Pers.) Wünsche is the correct name of *H. murinacea* sensu Fr., auct. eur. non Bull. See *murinacea*.

nivea.—*Hygrocybe nivea* (Fr.) Murrill is a synonym of *H. virginea* (Wulf.: Fr.) Orton & Watl. See there.

obrussea.—*Agaricus obrusseus* was described and sanctioned by Fries (1821: 104). The name has been used in widely different meanings since, e.g. sensu Konrad & Maublanc (1937: 386; = *Hygrocybe konradii* R. Haller); sensu Ricken (1910: 21; = *H. persistens* (Britz.) Sing.); sensu Bresadola (1928: 346, fig. 2; = *H. aurantiosplendens* R. Haller); sensu J. Lange (1940: 23; = *H. flavescens* (C. H. Kauffm.) Sing.) and sensu Kühner (1947: 20). The last-mentioned interpretation was accepted by most European mycologists, e.g. by Haller (1954: 84), Dennis & al. (1960: 80), Moser (1978: 87) and Kristiansen (1981: 120). Kühner (l.c.) described *H. obrusseus* as a species related to *H. conica* with a strictly regular hymenophoral trama, a yellow, campanulate pileus, $\pm 30\text{--}70$ mm broad; free, strongly ventricose, pale yellow lamellae, a cylindrical, often compressed stipe, $55\text{--}80 \times 6\text{--}15$ mm, without remarkable smell. This description indeed has much in common with the original diagnosis of *A. obrusseus* by Fries (l.c.), but Kühner overlooked one very important difference: Fries described the lamellae as adnate ('lamellis adnatis ventricosis distantibus') whereas they are free in Kühner's collections. The attachment of the lamellae is of fundamental importance within *Hygrocybe*: free lamellae are only found in subgenus *Hygrocybe* (trama regular), broadly adnate lamellae only in subgenus *Pseudohygrocybe* (trama subregular).

In my opinion *Agaricus obrusseus* Fr.: Fr. is nothing else than *Hygrophorus quietus*, described by Kühner (1947: 31) in the same paper. It is different from *H. obrussea* in the adnate lamellae, sweet smell like *Lactarius quietus*, constricted spores and subregular hymenophoral trama with short elements. The macroscopic characters of this species perfectly agree with Fries' *A. obrusseus*, except for the fact that Fries did not indicate a special smell. However, it is very likely that Fries missed the smell, especially since he did not describe a sweet smell for *Agaricus quietus* Fr.: Fr. (= *Lactarius quietus* (Fr.: Fr.) Fr.) either (Fries, 1821: 69: 'odor nullus').

This hypothesis is supported by the fact that Lundell & Nannfeldt (1979: 46) distributed exsiccata under the name of *Hygrophorus obrusseus*, which without any doubt belong to *H. quietus*, not to *H. obrusseus* sensu Kühner. So proof has been given that the species with constricted spores really occurs in South Sweden, whereas the presence of *H. obrussea* sensu Kühner still has to be demonstrated. It is remarkable that Lundell & Nannfeldt also failed to notice the special smell of this fungus. Consequently I propose to select the collection described by Lundell & Nannfeldt at Uppsala as neotype of *Agaricus obrusseus* Fr.: Fr. For macroscopic characters I refer to their concise description (l.c.). Some notes on microscopic characters are:

Spores $(7.5\text{--})8\text{--}8.5 \times 4\text{--}4.5\text{--}(5) \mu\text{m}$, $Q = 1.7\text{--}2.0$, ellipsoid-oblong, but in great majority ($\pm 90\%$) weakly to strongly constricted in any view. Basidia $41\text{--}51 \times 7\text{--}8.5 \mu\text{m}$, slenderly clavate, 4-spored, clamped. Hymenial cystidia absent. Hymenophoral trama subregular, made up of short elements, $30\text{--}65 \times 4.5\text{--}15 \mu\text{m}$. Pileipellis a thin, dry cutis,

15–35 μm thick, made up of repent hyphae, 2.5–5 μm wide, with a few erect, free ends. Stipitipellis a cutis up to 45 μm thick, made up of loose, repent hyphae, in places with erect ends, projecting up to 60 μm .

Collections examined.—SWEDEN, Uppland, Uppsala, Carolinaparken; in sparse lawn under frondose trees, 29 Aug. 1959, *H. Belin s.n.* (Fungi Exsiccati Suecici nr. 2870; UPS, neotypus).

It is clear that *Hygrophorus obrusseus* sensu Kühner is in need of a new name. Since I could not find an appropriate name in literature I propose as new name *Hygrocybe cystidiata* Arnolds (see that epithet).

ortonii.—*Hygrocybe ortonii* M. Bon (1983: 27) is a superfluous renaming of *H. berkeleyi* (P. D. Orton) Orton & Watl. = *H. pratensis* var. *pallida* (Cooke) Arnolds.

pallida.—*Hygrocybe pratensis* var. *pallida* (Cooke) Arnolds is the name preferred here for *H. berkeleyi* (P. D. Orton) Orton & Watl. See that epithet.

perplexa.—*Hygrocybe perplexa* (A. H. Smith & Hesl.) Arnolds is the correct name for *H. sciophana* sensu auct. eur. nec Fr. See *sciophana*.

persistens.—*Hygrophorus conicus* var. *persistens* was described by Britzelmayer (1890: 200) with a very short, ambiguous diagnosis: 'weissl., St. u. H. blass \pm -g.; H. klebr., sich nicht schwärz.' In 1893 (: 98) the variety was raised to the rank of species with an extended description: 'Sporen 10–16 \times 6–10 μm . L. weissgelblich, z.g., H. meist klebrig; H. u. St. rotgelb bis blassgelb, sich nicht schwärzend; Heiden, Waldwies, A. (Augsburg, the author), dann s. häufig um N.; dem *H. conicus* v.' In 1899 an even more complete description was published, including the size and shape of the basidiocarps: pileus conical but also campanulate and expanding, 80 mm wide; stipe 100 mm long, lamellae 10 mm broad. Apparently these dimensions should be regarded as maximum values since the accompanying plate (figs. 75–77) shows basidiocarps with the pileus 35–65 mm broad and the stipe 50–85 \times 7–12 mm.

It is clear that Britzelmayer's species belongs to the group of *H. langei* = *H. acutoconica* (*Hygrocybe* subsect. *Macrospora* R. Haller ex M. Bon). The stout basidiocarps and pale lamellae may suggest synonymy with *H. subglobispora* (P. D. Orton) Mos., but the elongate, in part constricted spores figured by Britzelmayer (l.c.) exclude this possibility and suggest a close relationship to *H. langei* Kühner. Bresinsky & Strangl (1966: 19) regarded the two species as identical and I agree with their view. A strong argument in favour of this opinion is that they actually found *H. langei* in great quantities in the localities indicated by Britzelmayer. They noticed also that they found only small to mediumsized basidiocarps, in this respect deviating from Britzelmayer's description (but not his plates!).

Singer & Kuthan (1976: 10) distinguished *H. persistens* from *H. acutoconica* (= *H. langei*) on the basis of the presence of clamps and the gelatinized stipitipellis. However, clamps are constantly present in 4-spored forms of typical *H. acutoconica* (Arnolds, 1974a: 133, 1986b) with dry stipe. Indeed, the stipe in the latter species is dry to slightly

greasy and the stipitipellis is a cutis. I cannot establish at the moment whether the viscid stipe in *H. persistens* sensu Sing. & Kuthan warrants the description of a different taxon. However, if this would be the case it should not be named *H. persistens* because Britzelmayer (l.c.) described only the pileus as viscid, not the stipe. Moreover, it is said to be an abundant species near Augsburg, which does certainly not apply to *H. persistens* sensu Sing. & Kuthan.

Consequently I regard *H. persistens* as conspecific with *H. acutoconica*. Unfortunately both *Hygrophorus persistens* (Britz.) Britz. and *Mycena acutoconica* F. Clem. were described in 1893. According to Stafleu & Cowan (1976: 350) the publication by Britzelmayer has become available at least as early as May 1893. In spite of strong efforts the exact date of publication of Clements' work could not be traced. Until further proof is given I regard it to be published in December 1893. Consequently in my opinion Britzelmayer's name has priority.

pseudoconica.—*Hygrocybe pseudoconica* J. Lange (1923: 24) is the correct name for the fungus, usually named *H. nigrescens* (Quél.) Quél. The latter epithet is rejected (see *nigrescens*).

I demonstrated earlier (Arnolds, 1974a) that the differences between *H. conica* and *H. pseudoconica* (as *H. nigrescens*), mentioned by European authors (e.g. Orton, 1960: 252; Moser, 1978: 87) do not exist in reality. This was confirmed by Kühner (1977). Hesler & Smith (1963: 109) shared this view with regard to the North American collections.

It may only be useful to distinguish between a small form with a pileus \pm 15–40 mm (forma *conica*) and a larger form with a pileus \pm 40–70 mm (forma *pseudoconica* (J. Lange) Arnolds, 1985b: 476), but variable in all other characters such as size of spores, number of sterigmata of the basidia and colour of the pileus, ranging from orange-yellow to red.

pseudocuspidata.—Kühner (1977: 105) introduced the name *Hygrocybe pseudocuspidata* for a fungus close to *H. langei* (= *H. persistens*), but with a red to orange-red pileus and stipe. Since no Latin diagnosis was provided the species was not validly published. In my opinion this fungus is identical with *H. persistens* var. *cuspidata* (Peck) Arnolds, originally described from North America (see *cuspidata*). An American collection of *H. cuspidata* (Hesler 24694, L) did not show any significant difference with collections from the Netherlands. If a European name is preferred over *H. cuspidata* the name *H. aurantiolescens* P. D. Orton is available (see there).

pseudopersistens.—Bon (1978: 69, 1979b: 5) separated *Hygrocybe konradii* var. *pseudopersistens* from var. *konradii* on the basis of the red or orange-red colours on the pileus, especially near the margin, and on the stipe, especially near the apex. In var. *konradii* the entire pileus and stipe are said to be yellowish or orange. According to Bon (l.c.) occasionally the two varieties occur together and intermediate basidiocarps are known.

In the Netherlands the two colour forms are known as well, next to intermediate forms, e.g. basidiocarps combining a lemon yellow or orange-yellow pileus with an orange-red stipe (e.g. *Bas* 7100, L).

In my opinion and in view of the taxonomic concepts accepted in the 'Flora agaricina neerlandica' (Kuyper, 1986) the variation described above has to be expressed in the formal rank of formae. Therefore the combination *Hygrocybe konradii* forma *pseudopersistens* (M. Bon) Arnolds has been proposed (Arnolds, 1985b: 476).

quieta. — *Hygrocybe quieta* (Kühner) Sing. is considered as a synonym of *H. obrussea* (Fr.: Fr.) Wünsche. See there.

sciophana. — *Hygrocybe sciophana* (Fr.: Fr.) Wünsche is described by most European authors as a species close to *H. psittacina* with a similar habit and glutinous pileus and stipe. The pileus is dark brownish red, brick red or dark blood-red, the lamellae are first ascending, then \pm horizontal, adnate to strongly emarginate (like *H. psittacina*), orangeish brown to flesh coloured, the stipe is concolorous with the pileus or paler. Representative descriptions have been published by e.g. Josserand (1933: 366), Kühner & Romagnesi (1953: 52) and Švrček (1970: 125); plates by Ricken (1910: pl. 8, fig. 7), Bresadola (1928: pl. 339), Konrad & Maublanc (1937: pl. 387, fig. 2) and Kotlaba (in Švrček 1970, pl. 77).

In my opinion this interpretation is deviating in some important characters from the original description. *Agaricus sciophanus* has originally been described by Fries (1821: 102) as a species, related to *H. pratensis*, but also intermediate between *H. psittacina* and *H. laeta* ('Affinis A. pratenti, medius inter psittacinum et laetum') with similar, orange-brown to fulvous colours ('subtestaceus, sordide fulvescens') as *H. pratensis* and decurrent lamellae. In 1838 (: 329) and 1874 (: 417) the description is almost identical and the similarity with *H. pratensis* is stressed again (1874: 'Habitus et color opace fulvescens *H. pratensis*, sed tenuis...'). This description is deviating from the usual interpretation of *Agaricus sciophanus* as outlined above, e.g. in the colours and the decurrent lamellae. In fact that fungus does not remind to *H. pratensis* at all. In my opinion *Agaricus sciophanus* Fr. is likely to be in fact a form of the variable *H. laeta* (Pers.: Fr.) Kumm., which is characterized by \pm decurrent lamellae and rather often has a colour of the pileus reminding *H. pratensis*.

These discrepancies have been noticed before in Europe by Josserand (1933: 364) and apparently also by Kühner & Romagnesi (1953: 550) who listed this species in the index of the 'Flore analytique' as '*sciophanus* Qué. (nec Fr.).'

The use of the epithet *sciophanus* for the brownish red fungus with emarginate lamellae is apparently based on Fries' description in Monographia (1851: 137) where the lamellae were described as 'attenuato adnatae, primitus leviter adscendentes', and on the plate in Icones selectae Hymenomycetes (1882: pl. 167, fig. 1), showing ascending, narrowly adnate lamellae, also in mature basidiocarps. This plate indeed represents *H. sciophana* sensu auct. eur. non Fr. 1821. In the description it is stressed that the attachment of the lamellae is not characteristic of *H. sciophana* ('lamellarum insertio minus typica').

However, the latter descriptions are not important from a nomenclatural point of view. Therefore, Smith & Hesler (1954: 328) rightly introduced the name *Hygrophorus perplexus* for a North American taxon that is very close to the current interpretation of *H. sciophana* by European authors. The lamellae are described by Smith & Hesler (l.c.)

as 'amber yellow' when young, then 'apricot yellow'. In the collections from the Netherlands the lamellae are orange, orangeish brown, greyish orange to flesh-coloured like the descriptions by most European authors. However, Rea (1922: 303) described the lamellae 'of the same colour as the pileus [deep tawny or brick colour], or yellowish' and Kühner & Romagnesi (1953: 52) as 'jaune d'or foncé, se teintant de rose-brique avec l'âge, au moins dans le fond.' So it seems that orangeish yellow lamellae fit into the variation of this species, too. Another small discrepancy between European and North American collections is the size of the spores: $6-8 \times 4-5 \mu\text{m}$ according to Smith & Hesler (l.c.) against $(6.5-7-9(-10) \times 4.5-6(-6.5) \mu\text{m}$ in the collections from the Netherlands. Jossierand (1933: 367) measured them $6.5-9 \times 5-6.5 \mu\text{m}$. This difference seems not to be significant as well.

Thus I reject the name *H. sciophanus* for the species discussed here and propose to call it *Hygrocybe perplexa* (A.H. Smith & Hesl.) Arnolds (1985b: 477).

sphagnophila.—*Hygrophorus miniatus* var. *sphagnophilus* was first described by Peck (1901: 856). Hesler & Smith (1963: 146) studied the type and observed large spores, $9-12(-14) \times 5.5-7(-8.5) \mu\text{m}$, and a pileipellis made up of 'septate, constricted, fuscous hyphae, the terminal elements clavate.' They regarded it as a variety of *Hygrophorus turundus* (Fr.: Fr.) Fr. with a red pileus at first, with scales not or only slightly darker than the ground colour, occurring in *Sphagnum* bogs. *Hygrophorus turundus* var. *turundus* sensu Hesler & Smith has a scarlet pileus with dark brown scales.

Orton (1960: 262) has demonstrated that *Agaricus turundus* Fr.: Fr. is a species with a yellow pileus with dark scales (see *turundus*). He renamed the red species *Hygrophorus coccineocrenatus* (= *H. turundus* sensu Hesler & Smith). Therefore I proposed the combination *Hygrocybe coccineocrenata* var. *sphagnophila* (Peck) Arnolds (1985b: 475).

Kühner (1976: 463, 495) rejected the epithet *sphagnophila* for apparently the same fungus, because Hesler & Smith (1963: 146) mentioned the occurrence of cuneate spores in the type of *H. miniatus* var. *sphagnophilus*, next to ellipsoid and subovoid spores. In my opinion the occurrence of some apparently aberrant spores cannot be a reason to reject this epithet. Therefore I regard *H. coccineocrenata* forma *ambigua* Kühner as a synonym of var. *sphagnophila*. The rank of this taxon is a matter of personal judgement.

squamulosa.—*Hygrophorus squamulosus* Ellis & Ev. is distinguished by Hesler & Smith (1963: 160) as a species close to *H. miniata* (Fr.: Fr.) Fr., but different because of the presence of cheilocystidia and possibly in the thicker, more squamulose pileus. Among the material studied they listed also a collection (*Bas 694*) from the Netherlands.

Arnolds (1974a: 185) showed that the occurrence of poorly differentiated marginal hairs in part of the collections of *H. miniata* has no taxonomic relevance. This is also demonstrated in the neotype of *H. miniata*, designated in this paper (see *miniata*): one basidiocarp has numerous cheilocystidia, whereas in another basidiocarp they are lacking completely.

strangulata.—*Hygrophorus strangulatus* was described by Orton (1960: 266) as a small species with a slightly greasy, red pileus, 5–35 mm wide, when dry minutely golden-

scurfy-scaly around centre when young; yellowish lamellae, often flushed orange to entirely orange-red; smooth, red stipe, 18–48 × 1–4 mm; ellipsoid-oblong spores, constricted in some views, 7–9 × 4–5 μm and a pileipellis made up of broad hyphae, 6–16 μm wide, with a thin layer of very narrow hyphae (1–2 μm) over these. The macroscopic appearance and microscopic structure of the pileipellis are a kind of intermediate between *Hygrocybe* subsect. *Coccineae* with a smooth pileus (pileipellis a cutis) and subsect. *Squamulosae* with a squamulose pileus (pileipellis a trichodermium, at least at the centre). Indeed, Orton (l.c.: 249, 221) keyed-out *Hygrophorus strangulatus* in these two groups. Reid (1968: 6) described under that name a species with distinct scaly pileus. On the other hand Arnolds (1977: 250) described as *H. strangulatus* collections with a smooth to slightly velvety pileus and a pileipellis made up of repent, slender hyphae, 2.5–6 μm wide, constituting a cutis. Kühner (1976: 476) found discrepancies between two collections made by Orton, for instance in the number of nuclei in the spores: Orton 3619 was binucleate, Orton 4162 uninucleate.

In order to clarify this situation I studied the isotype of *Hygrophorus strangulatus* (Orton 1554, 5 XI 1958, Witley Common, Surrey; E). The type consists of four basidiocarps in good condition. The spores measured 6.8–8.7(–10.3) × 4.7–5.3(–5.6) × (4.8–)5.1–6.1(–6.3) μm , in side-view ellipsoid or ellipsoid-oblong, some obovoid, exceptionally slightly constricted, $Q = (1.4\text{--})1.5\text{--}1.7$; in front-view almost all broader towards the base, obovoid or obpyriform, often ($\pm 70\%$) constricted. Basidia 39–47.5 × 6.5–7.5 μm , 4-spored. Hymenophoral trama subregular, made up of short elements, 28–103 × 4.5–13 μm . Pileipellis at centre a trichodermium, towards the margin a cutis with trichodermial fascicles of ascending hyphae, constricted at the septae, made up of short elements, at the tips ellipsoid or clavate, (23–)37–63 × 5.5–9.5 μm , a few hyphae with slender, cylindrical, hair-like projections, 1.5–3 μm wide.

These characters perfectly agree with *H. miniata* in the meaning accepted here (see *miniata*) and consequently I regard *H. strangulatus* P.D. Orton as a synonym of that species. This synonymy is not at all unexpected since *H. strangulatus* was described as common, whereas *H. miniatus* sensu Orton (1960: 248) is an uncommon fungus with non-constricted spores, according to Orton (in a letter) characteristic of calcareous soils. Fries (1821: 106, 1838: 330) regarded *H. miniatus* as a common species. *Hygrocybe miniatus* sensu P.D. Orton may be identical with *Hygrocybe calciphila* Arnolds (1985b: 475).

Kühner (1976: 475) also made a critical study of the *miniatus-strangulatus* complex and arrived at similar conclusions. However, he denied a synonymy of these two names because he had another concept of *H. miniata* as an alpine to subalpine fungus with not constricted spores, not broadened in face-view. The fungus from the lowlands with obpyriform spores was described by Kühner (l.c.) without formal name.

I studied several other collections of *H. strangulata* made by Orton (all in E). Orton 1220 (25 X 1957) has spores 6.5–7.5 × 3.5–4.5 μm , in all views ellipsoid to oblong, a minor proportion ($\pm 20\%$) weakly constricted, and on the pileus a well developed ixocutis, in places even up to 180 μm thick, made up of thin repent hyphae, 2.5–5 μm wide. In my opinion this collection belongs to *H. marchii* (Bres.) Sing. Orton 3620 (14

IX 1969) has spores $6.5-8 \times (3.5-4-4.5 \mu\text{m})$, not broader in face-view, often (30–40%) constricted in face-view. The pileipellis is a cutis, at the centre with rather many erect hyphae, made up of cylindrical hyphae, $4.5-6 \mu\text{m}$ wide. This collection may very well be identical with *H. constrictospora* Arnolds (= *H. strangulata* sensu Arnolds). Orton 2987 (12 XI 1967) and Orton 4539 (22 I 1973) are similar to the type and consequently represent *H. miniata* (Fr.: Fr.) Fr. It is no wonder that Orton's *H. strangulatus* has caused much confusion!

streptopus.—*Hygrocybe streptopus* (Fr.) Sing. & Kuthan is considered as a variety of *H. fornicata* (see there).

subvitellina.—*Hygrocybe subvitellina* M. Bon non Imai is a synonym of *H. ceracea*. See discussion on *H. vitellinoides*.

tristis.—*Hygrocybe tristis* (Pers.) F. H. Møll. is usually regarded as a blackening species, close to *H. conica*, but with a yellow to greenish yellow pileus, e.g. by Moser (1978: 86). *Agaricus tristis* was originally described by Persoon (1796: 49) with the pileus '... primum virescente-aurantio, mox nigrescente ...', consequently also with orange colours. He referred to plates by Bulliard of *Agaricus croceus* (pl. 50 and 524, fig. 3) and by Schaeffer of *A. conicus* (1774: pl. 2, fig. 9). These plates represent typical *H. conica*. In 1822 (: 234) Persoon quoted these plates under *Agaricus conicus* and *A. tristis* is not mentioned anymore. It is inevitable to regard *A. tristis* as a superfluous name change of *A. conicus*.

I regard the (greenish) yellow collections of *H. conica* as a variety, viz. var. *chloroides* (Malençon) M. Bon (see *chloroides*).

turunda.—At least four recent interpretations exist from the name *Agaricus turundus* Fr.: Fr. (1821: 106): (1) sensu J. Lange (1940: 27), Kühner & Romagnesi (1953: 52), Hesler & Smith (1963: 143), auct. eur. p.p. maj. with a red pileus supplied with brown scales, pale lamellae and large, ellipsoid spores ($\pm 8.5-9-12.5 \times 5.5-7.5 \mu\text{m}$); (2) sensu F. H. Møller (1945: 155), P. D. Orton (1960: 270) with a yellow or orange-yellow pileus from the beginning with brown scales and slightly smaller, elongate spores ($8.5-11(-12) \times 4.5-5.5(-6) \mu\text{m}$); (3) sensu Moser (1967: 9), Arnolds (1974a: 174; 1986b) with a yellow or orange-yellow pileus from the beginning with brown scales and small spores, broadened to the apiculus in face-view ($7-8.5(-10.5) \times 4.5-5.5(-6) \mu\text{m}$); (4) sensu Rald (1986: 10) with a red to yellow pileus with concolorous scales, deeply decurrent lamellae and ellipsoid spores ($8-12 \times 5-7.5 \mu\text{m}$).

Orton (1960: 262) has indicated that *Agaricus turundus* was originally described by Fries (1818: 199, 1821: 106) as a species with a yellow pileus with grey scales ('luteo cinereo-squamuloso'). He renamed *Hygrophorus turundus* sensu Kühn. & Romagn. as *H. coccineocrenatus* P. D. Orton. *Hygrocybe turunda* sensu Rald is identical with *H. cantharellus* sensu auct. (= *H. lepida* Arnolds, see there).

Hygrocybe turunda sensu F. H. Møller, P. D. Orton and sensu Moser, Arnolds are similar in macroscopic characters, but have very different spores as stressed earlier by Kühner

(1976: 472). At the moment it is not clear which interpretation is identical with *Agaricus turundus* Fr.: Fr. This question can only be answered by study of authentic collections from South Sweden.

virginea.—*Agaricus virgineus* Fr. has been rejected earlier by me (1974a: 81) as a nomen confusum, a point of view followed by e.g. Cléménçon (1982). This rejection was based on the sanctioning description (1821: 100) and later descriptions (1851: 133, 1874: 414) by Fries. However, this discussion was not complete since *A. virgineus* Fr. is typified by *A. virgineus* Wulf. in Jacq., and the description and plate by Von Wulfen had not been studied at that time. Von Wulfen (in Jacquin, 1781: 104) described *A. virgineus* as an entirely white agaric with a striate pileus when moist and decurrent lamellae. The accompanying plate (15, fig. 2) shows rather small basidiocarps with the pileus ± 15 mm broad and the stipe $\pm 30-40 \times 3-4$ mm, exactly like the present concept of *Hygrocybe nivea* (Fr.) Murrill. Since *Agaricus virgineus* was sanctioned by Fries (1821: 100) and *niveus* was only accepted as a variety, the correct name of this species is *Hygrocybe virginea* (Wulf.: Fr.) Orton & Watl., after all.

It must be stressed that this name change does not alter my taxonomic point of view, namely that *H. nivea* and *H. virginea* sensu Orton (1960), Moser (1978), auct. eur. p.p. maj. are one and the same, variable taxon with pileus measuring 10–50(–95) mm, the stipe (15–)20–60(–90) \times 2–7(–15) mm, spores (6.5–)7–12.5 \times 3.5–7.5 μ m and basidiocarps with predominantly 2-spored, 4-spored, or intermixed 2- and 4-(1)-spored, rarely predominantly 3-spored basidia (Arnolds, 1974a: 81; 1986b). *Hygrophorus virgineus* sensu Quélet (1888), Henry (1929), Bataille (1948) with a thick, not striate pileus and small spores (5.5–7.5 \times 3.5–5.5 μ m) is a different taxon, in my opinion identical with *Hygrocybe pratensis* var. *pallida* (Cooke) Arnolds (= *H. berkeleyi* (P.D. Orton) Orton & Watl.) (see *berkeleyi*).

vitellinoides.—*Hygrocybe vitellinoides* was described by Bon (1979a: 39) as a nomen novum for *H. subvitellina* M. Bon (1976a: 41), a later homonym of *H. subvitellina* (Imai) Ito.

According to Bon (l.c.; 1977: 205) it is a species with an egg-yellow to orange, lubricous to slightly viscid pileus, $\pm 20-30$ mm broad; broadly adnate to more or less decurrent, yellow lamellae; a dry, yellow stipe $\pm 10-30 \times 2-4$ mm, sometimes a weak smell of *Hygrocybe quieta*, spores $\pm 7-8 \times 3.5-4$ μ m, in majority constricted; the pileipellis an ixocutis to ixotrichodermium above a hypocutis; the stipitipellis a dry cutis. This description matches the descriptions of *H. ceracea* by Arnolds (1974: 202, 1983: 386) and of *H. subceracea* by Kühner (1977: 73) very well, except perhaps for the well-developed hypodermium in *H. vitellinoides*.

I studied the type of *H. subvitellina* (Bon 741014, Herbarium M. Bon), consisting of a single fragmented basidiocarp in very poor condition and found the spores (6–)6.5–7.5 \times 3.5–4 μ m, about 60 % constricted; the basidia 32–39 \times 6–7.5 μ m, 4-spored; the hymenophoral trama subregular, made up of short elements, 20–56 \times 5–17 μ m, and the pileipellis a thin ixocutis made up of repent hyphae, 2–5 μ m wide. I could neither recognize a well differentiated hypoderm nor erect slender hyphae as figured by Bon

(1977: 211, fig. 2-C), but I must admit that it was hardly possible to reinflate the tissues of the exsiccatum, even in boiling KOH.

In fact it is difficult to find reliable differences between *H. subvitellina* and *H. ceracea* in Bon's own key (1976: 14, 15). *Hygrocybe subvitellina* was keyed-out in a group with the 'lamellae more or less decurrent . . . with omphalioid habit'; *H. ceracea* in a group with 'the lamellae adnate, rarely subdecurrent, habit more or less collybioid or subconical.' However, in the next description of *H. subvitellina* the habit is described as 'omphalioid or collybioid when the lamellae are slightly decurrent.' Bon (l.c.) quoted a plate of *H. citrina* by Lange (1940: pl. 167A) that shows a fungus with adnate gills, for the rest deviating from both *H. vitellinoides* and *H. ceracea* in the lemon yellow basidiocarps. The only remaining difference between these species is the size of the basidiocarps: 10–30 (–35) mm in *H. vitellinoides*, 20–50 mm in *H. ceracea*. It is remarkable that Bon in a later publication (1977) extensively discussed the relationship of *H. vitellinoides* and *H. vitellina*, which are different species indeed, but hardly spends a word to the affinity with *H. ceracea*.

According to Bon (1977: 208) *H. vitellinoides* is extremely common, whereas *H. ceracea* (1976: 15) is said to be rather rare or overlooked. This statement again is remarkable since *H. ceracea* is one of the classical species, described already by Fries (1821: 103) as 'vulgaris' which is true for entire North-West Europe.

My conclusion is that *H. vitellinoides* is a synonym of *H. ceracea* (Fr.: Fr.) Fr. See also that epithet.

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