

NOTULAE AD FLORAM AGARICINAM NEERLANDICAM—VIII  
Pluteus Fr. in West-Europe

ELSE C. VELLINGA &amp; JAN SCHREURS

*Rijksherbarium, Leiden*

Keys to, a checklist of and critical notes on the West-European species of the genus *Pluteus* are given. One new section, *Pluteus* section *Villosi* Schreurs & Vellinga is described and a new combination *Pluteus* subsection *Hispidodermini* Vellinga & Schreurs is made. One new species, *P. insidiosus* Vellinga & Schreurs and three new varieties, viz. *P. atricapillus* var. *albus* Vellinga, *P. hispidulus* var. *cephalocystis* Schreurs and *P. umbrosus* var. *albus* Vellinga are described; the new combinations *P. podospileus* f. *minutissimus* (Maire) Vellinga and *P. nanus* f. *griseopus* (P. D. Orton) Vellinga are made. Furthermore the critical species *P. ephebeus* and *P. plautus* are fully described.

The genus *Pluteus* is characterized macroscopically by free, pink-coloured lamellae, and absence of volva and annulus, microscopically by inverse hymenophoral trama, presence of cheilocystidia, and smooth, mostly broadly ellipsoid, non-amyloid, cyanophilous spores.

In this paper a key to the West-European species is given, followed by an annotated checklist with notes on taxonomy and nomenclature. This seems necessary because of the confusion existing in European literature on *Pluteus*. Some critical species are fully described here, whereas full descriptions of all species occurring in the Netherlands will appear in the second volume of the 'Flora agaricina neerlandica'.

The part of this paper concerning section *Villosi* and subsection *Hispidodermini* is based on an unpublished report of the second author who revised these groups for the Netherlands and adjacent regions.

The genus *Pluteus* is subdivided into three sections based on the structure of the pileipellis and characters of the pleurocystidia. Two main types of pileipellis occur: (i) a differentiated cutis and (ii) a derm consisting of more or less erect elements varying in shape from cylindrical to spheropedunculate. There are also two main types of pleurocystidia: (i) thick-walled narrowly fusiform cystidia with more or less prominent hooks at the apex and (ii) thin-walled variously shaped cystidia without hooks at the apex but sometimes with apical projections.

Section *Pluteus* is characterized by the combination of a differentiated cutis and thick-walled pleurocystidia, section *Villosi* by a differentiated cutis combined with thin-walled pleurocystidia, and section *Celluloderma* by a derm-like pileipellis in combination with thin-walled cystidia.

A more or less similar division of the genus has been proposed by Kühner (1926: 160 and 1980: 401); the genus was subdivided by him into two sections, corresponding with section *Pluteus* and section *Celluloderma* in our concept; the species with a differentiated cutis in combination with thin-walled pleurocystidia are not mentioned. Other authors (Fayod, 1889; Lange, 1917 and 1937; Imai, 1938; Singer, 1956) divided the genus in three sections in the following way: (i) a section with a differentiated cutis and thick-walled pleurocystidia, (ii) a section with a pileipellis consisting of elongated elements and with thin-walled pleurocystidia and (iii) a section with a pileipellis consisting of clavate to spheropedunculate elements and with thin-walled pleurocystidia.

In this classification the second section includes species with quite different types of pileipellis structure; only to the shape of the elements forming the pileipellis is given weight, whereas the arrangement of these elements is neglected. Furthermore, the position of the group of species with a pileipellis made up of a combination of clavate to spheropedunculate elements and elongate fusiform elements is not clear in this classification. Generally this group is considered to belong to the third section with short elements in the pileipellis, without further explanation. In the present paper section *Celluloderma* is divided into three subsections according to the shape of the elements forming the pileipellis.

As pointed out by several authors (Homola, 1975, Kühner, 1980) section *Pluteus* can be considered as the most primitive group of the genus, though the presence of thick-walled, hooked pleurocystidia is regarded as an evolved character by Homola (1975: 140); Kühner (1980: 404), on the other hand, considers it as a primitive character, as in his opinion these hooked pleurocystidia are directly derived from the basidia. This, however, is incorrect, as the cystidia are rooting in the hymenophoral trama and not like the basidia arising from the subhymenium.

We agree with Homola that the presence of a cutis-like pileipellis, clamp-connections in some species, dull colours and large basidiocarps make section *Pluteus* a primitive one. The most derived group within the genus is subsection *Eucellulodermini*, group with a hymenidermal pileipellis, made up of clavate to spheropedunculate elements, with small basidiocarps, and with bright colours in some species. It is not possible to derive the latter group directly from the primitive clamp-bearing *Plutei* with a differentiated cutis and thin-walled pleurocystidia, because other characters than those mentioned above, for instance the implantation of the cheilocystidia, seem to interfere with such a simple hypothesis.

## PLUTEUS Fr.

*Pluteus* Fr., Fl. scan.: 338. 1835. — Type: *Agaricus pluteus* Batsch: Fr. (= *P. atricapillus*).

### KEY TO SECTIONS AND SUBSECTIONS

- 1a. Pileipellis a trichoderm, a hymeniderm or a transition between a hymeniderm and an epithelium, consisting of cylindrical to narrowly fusiform or spheropedunculate to clavate elements or a mixture of those two types . . . . . Section *Celluloderma*.2
- b. Pileipellis a differentiated cutis consisting of repent to apically ascending hyphae . . . . . 4

- 2 a. Pileipellis consisting of two different types of elements, viz. cylindrical to narrowly fusiform elements and spheropedunculate to clavate elements . . . . . Subsection *Mixtini*
- b. Pileipellis consisting of only one type of elements, either cylindrical to narrowly fusiform or spheropedunculate to clavate . . . . . 3
- 3 a. Pileipellis consisting of cylindrical to fusiform elements . . . . . Subsection *Hispidodermini*
- b. Pileipellis consisting of spheropedunculate to clavate elements . . Subsection *Eucellulodermini*
- 4 a. Pleurocystidia with thickened wall and apical hooks . . . . . Section *Pluteus*
- b. Pleurocystidia absent or if present thin-walled and without apical hooks . . . . . Section *Villosi*

### Section *Pluteus*

Holotype: *Agaricus pluteus* Batsch: Fr. (= *Pluteus atricapillus*).

*Pluteus* section *Trichoderma* Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889. — Lectotype (design. nobis): *Pluteus atricapillus* (Batsch) Fay.

*Pluteus* [AQ] *Coronatae* J. Lange in Dansk bot. Ark. 2(7): 4. 1917 (illegitimate, no rank indicated).

*Pluteus* section *Fibrillosi* Imai in J. Fac. Agric. Hokkaido (imp.) Univ. 43: 159. 1938. — Lectotype (design. nobis): *Pluteus cervinus* (Schaeff.->) Kumm.

Characteristics.— Stipe solid; pleurocystidia very abundant, with more or less prominent hooks at apex and thick-walled at least at apex; cheilocystidia implanted on a layer of hyphae parallel to edge of lamellae; pileipellis a differentiated cutis; clamp-connections absent or present.

### KEY TO THE SPECIES

- 1 a. Edge of lamellae brown or grey-brown . . . . . 2. *P. tricuspιδatus*
- b. Edge of lamellae white or concolorous with surface of lamellae . . . . . 2
- 2 a. Clamp-connections present, at least in pileipellis . . . . . 3
- b. Clamp-connections absent . . . . . 5
- 3 a. Pileus whitish, black fibrillose to squamulose . . . . . 3. *P. pseudoroberti*
- b. Pileus brown or grey . . . . . 4
- 4 a. Pileus grey, sometimes slightly brownish, with very dark greenish or bluish squamulose centre; on deciduous wood . . . . . 1. *P. salicinus*
- b. Pileus brown; on coniferous wood . . . . . 4. *P. pouzarianus*
- 5 a. Smell strongly raphanoid . . . . . 5. *P. atricapillus*
- b. Smell sweet or fungoid . . . . . 6
- 6 a. Pileus shiny white, with age at centre cream-coloured, with smooth surface; spores (6.5–)7.0–8.5(–9.0) × 4.5–5.5(–6.5) μm; cheilocystidia crowded; basidiocarps solitary . . . 6. *P. pellitus*
- b. Pileus white to cream-coloured, brown fibrillose to squamulose, sometimes viscid; spores (5.0–)5.5–8.0(–9.5) × 3.5–5.0(–5.5) μm; cheilocystidia scarce; basidiocarps mostly fasciculate . . . . . 7. *P. petasatus*

#### 1. *Pluteus salicinus* (Pers.: Fr.) Kumm.

*Agaricus salicinus* Pers., Ic. Descr. Fung.: 9. 1798. — *Agaricus salicinus* Pers.: Fr., Syst. mycol. 1: 202. 1821. — *Pluteus salicinus* (Pers.: Fr.) Kumm., Führ. Pilzk.: 99. 1871. — *Rhodosporus salicinus* (Pers.: Fr.) J. Schroet. in Cohn, Krypt.-Fl. Schlesien 3(1): 620. 1889.

Misapplied names. — *Pluteus salignus* sensu Fay. in Ann. Sci. nat., Bot. sér.VII, 9: 364. 1889. — *Pluteus petasatus* sensu Rick., Blätterpilze: 277. 1913.

Selected descriptions & illustrations. — Konr. & M., Ic. sel. Fung. 1: pl. 21 fig. 1. 1925; J. Lange, Fl. agar. dan. 2: Pl. 69C. 1937; R. Phillips, Paddest. Schimm.: 119. 1981.

## 2. *Pluteus tricuspidatus* Velen.

*Pluteus tricuspidatus* Velen., Novit., mycol.: 143. 1939.

*Pluteus cervinus* var. *nigroflocosus* R. Schulz in Verh. bot. Ver. Brandenb. 54: 102. 1913. — *Pluteus nigroflocosus* (R. Schulz) J. Favre in Mat. Fl. Cryptog. Suisse 10: 104. 1948.

*Pluteus cervinus* var. *atromarginatus* Sing. in Z. Pilzk. 4: 40. 1925. — *Pluteus cervinus* subsp. *atromarginatus* (Sing.) Konr. in Bull. trimest. Soc. mycol. Fr. 43: 148. 1927. — *Pluteus atromarginatus* (Sing.) Kühn. & Romagn., Fl. anal. Champ. sup.: 420. 1953 (not validly published, basionym not mentioned).

Misapplied names. — *Pluteus umbrosus* sensu Quél. in Mém. Soc. Emul. Montbéliard, sér. II, 5: 437. 1876 (Champ. Jura Vosges Suppl. 3); sensu Bres., Fungi trident. 2: 11. 1892; sensu Farl. & Burt., Ic. farlowianae: Pl. 44. 1929. — *Pluteus cervinus* var. *umbrosus* sensu J. Lange in Dansk bot. Ark. 9(6): 79. 1938.

Selected illustrations. — Konr. & M., Ic. sel. Fung. 1: Pl. 19. 1925 (as *P. cervinus* subsp. *atromarginatus*); Farl. & Burt., Ic. farlowianae: Pl. 44. 1929 (as *P. umbrosus*).

This species is generally known as *Pluteus atromarginatus* (Sing.) Kühner, but Velenovský (1939: 143) was the first to recognize this taxon on specific level.

## 3. *Pluteus pseudoroberti* Mos. & Stangl *emend.* Vellinga — Fig. 1

*Pluteus pseudoroberti* Mos. & Stangl in Z. Pilzk. 29: 39. 1963.

Type-study of *Pluteus pseudoroberti*.

Herbarium Meinh. Moser 51/100, German Federal Republic, Baden-Württemberg, Aalen, Spitalwald, 30 Aug. 1951, M. Moser, (M).

Spores ( 5.8–)6.4–7.0(–7.1) × (3.7–)4.1–4.3(–4.6) μm, Q = 1.5–1.65(–1.7), Q̄ = 1.6, oblong-ellipsoid. Pleurocystidia very abundant, (65–)70–80(–85) × (11–)13–17 μm, narrowly fusiform with 3–4 not very prominent hooks at apex, with wall in the upper half up to 3 μm thick. Cheilocystidia crowded, (27–)33–50(–75) × 10–18 μm, narrowly clavate to clavate, thin-walled and colourless. Pileipellis a differentiated cutis of colourless 3–6 μm wide hyphae with 1–3 fusiform-inflated terminal elements, 60–160 × 14–25 μm, with brown intracellular pigment; clamp-connections abundant.

The characters of this species, as mentioned above, viz. the shape of the cheilocystidia and the presence of clamp-connections in the pileipellis, are not mentioned by Moser & Stangl (1963: 38). The other collection simultaneously described by them belongs to *Pluteus petasatus* on account of the following characters: cheilocystidia scarce, narrowly clavate and thin-walled; pileipellis a cutis of cylindrical pale brown hyphae; clamp-connections absent.

*Pluteus pseudoroberti*, in this new concept, is up till now only known from the type-collection. Wichanský (1963: 73) has described a species with marginal and facial cysti-

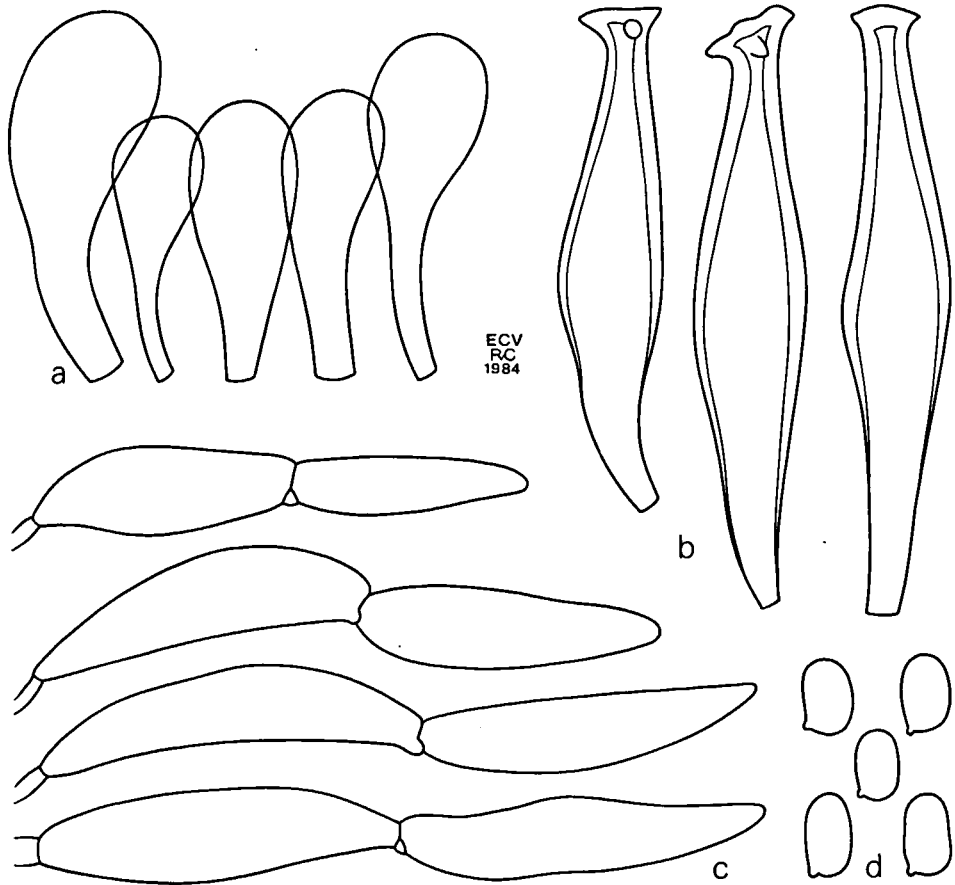


Fig. 1. *Pluteus pseudoroberti*, type. — a. Cheilocystidia ( $\times 1000$ ). — b. Pleurocystidia ( $\times 1000$ ). — c. Elements of pileipellis ( $\times 500$ ). — d. Spores ( $\times 1500$ ).

dia with apical hooks, viz. *P. pseudocervinus*. This would be the only species in Europe with this character; in some American species, e.g. *P. spinulosus* Murrill and *P. ampicystis* Sing., pleuro- and cheilocystidia are also isomorph (Pegler, 1983: 310, 313).

*Pluteus pseudoroberti* differs from the other clamp-bearing species in this section, viz. *P. atomarginatus*, *P. salicinus* and *P. pouzarianus*, in the size of the spores, the structure of the pileipellis and the shape of the elements of the pileipellis, and in the not coloured cheilocystidia.

#### 4. *Pluteus pouzarianus* Sing.

*Pluteus pouzarianus* Sing. in Sydowia 36: 283. ('1983')1984.

Selected description. — Sing. in Sydowia 36: 283–286. ('1983')1984.

This species has been known under the provisional name *Pluteus emarginatus* Pouz. (Singer, 1975: 437). It resembles *P. atricapillus* in habit and is characterized by the presence of clamp-connections in pileipellis, pileitrama, stipitepellis and stipitetrama; furthermore, the pileipellis consists of two layers, an outer layer of non-coloured hyphae and an underlying layer of hyphae with brown intracellular pigment. The smell of *P. pouzarianus* is in general not like that of *P. atricapillus* strongly raphanoid, but sweet, fungoid or very faintly reminding of raw potatoes. *Pluteus pouzarianus* has a preference for coniferous wood (*Picea* and *Abies*) in mountainous and colline regions in Europe, but has also been found in the Netherlands, growing on a stump of *Pinus*.

### 5. *Pluteus atricapillus* (Batsch) Fay.

*Agaricus atricapillus* Batsch, Elench. Fung. Contin. 1: 77. 1786. — *Pluteus atricapillus* (Batsch) Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889.

*Agaricus pluteus* Batsch, Elench. Fung.: 79. 1786. — *Agaricus pluteus* Batsch: Fr., Syst. mycol. 1: 199. 1821.

*Agaricus lividus* Bull., Herb. France: pl. 382. 1788. — *Entoloma lividum* (Bull.) Quél. in Mém. Soc. Emul. Montbéliard. sér. II, 5 (Champ. Jura Vosges 1): 116. 1872.

*Agaricus latus* Bolt., Hist. Fung.: 2. 1788.

*Agaricus curtisii* Berk. in Hook. J. Bot. 1: 98. 1849. — *Pluteus curtisii* (Berk.) Sacc., Syll. Fung. 5: 675. 1887.

*Agaricus cervinus* Schaeff., Fung. Bavariae 4: 6. 1774; non *Agaricus cervinus* Hoffm.: Fr., Syst. mycol. 1: 82. 1821 (= *Clitocybe* spec.) — *Pluteus cervinus* (Schaeff. → Kumm., Führ. Pilzk.: 99. 1871. — *Rhodosporus cervinus* (Schaeff. → Kumm.) J. Schroet. in Cohn, Krypt.-Fl. Schlesien: 620. 1889.

Excluded. — *Pluteus curtisii* sensu Sing. in Trans. Br. mycol. Soc. 39: 160. 1956; sensu Mos. in Gams, Kl. Kryptog. Fl. 2b/2, 5. Aufl.: 214. 1983 (= *P. petasatus*). — *Entoloma lividum* sensu Quél. in Mém. Soc. Emul. Montbéliard. sér. II, 5 (Champ. Jura Vosges 1): 116. 1872 (= *E. eulividum*).

Selected descriptions & illustrations. — J. Lange, Fl. agar. dan. 2: pl. 69A. 1937 (as *P. cervinus*); Sing. & Cléménçon in Nova Hedwigia 23: 332–336. 1972; R. Phillips Paddest. Schimm.: 119. 1981.

### KEY TO THE VARIETIES

- 1 a. Pileus brown, pale brown to dark brown. . . . . *P. atricapillus* var. *atricapillus*  
 b. Pileus white . . . . . *P. atricapillus* var. *albus*

### *Pluteus atricapillus* var. *albus* Vellinga, var. nov.

Differt a typo in coloribus albis pilei stipitisque. — Holotypus: C. Bas s.n., 30.V.1983, 'Leiden, prov. Zuid-Holland, Netherlands' (L).

Differing from the typical variety of *Pluteus atricapillus* in the completely white, only with age slightly browning pileus and stipe. Not all pigments, however, are absent, as the lamellae are pink-coloured.

Habitat. — In fascicle of some basidiocarps on trunk of *Populus*.

Collections examined. — NETHERLANDS, prov. Zuid-Holland, Leiden, 30 May 1983, C. Bas (coll. *E. C. Vellinga 534*; L) (holotype); ibidem, 4 Oct. 1983, C. Bas (coll. *E. C. Vellinga 557*; L).

### 6. *Pluteus pellitus* (Pers.: Fr.) Kumm.

*Agaricus pellitus* Pers., Syn. meth. Fung.: 366. 1801. — *Agaricus pellitus* Pers.: Fr., Syst. mycol. 1: 198. 1821. — *Pluteus pellitus* (Pers.: Fr.) Kumm., Führ. Pilzk.: 98. 1871. — *Rhodosporus pellitus* (Pers.: Fr.) J. Schroet. in Cohn., Krypt.-Fl. Schlesien 3(1): 619. 1889.

Excluded — *Pluteus pellitus* sensu Rick., Blätterpilze: 277. 1913 (= *P. petasatus*). — *Pluteus pellitus* sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 420. 1953; sensu Mos. in Gams, Kl. Kryptog. fl. 2b/2, 5. Aufl.: 213. 1983 (= *Pluteus spec.*).

Selected descriptions & illustrations. — Konr. & M., Ic. sel. Fung. 1: pl. 21. 1925; Bres., Iconogr. mycol. 11: pl. 536. 1929; J. Lange, Fl. agar. dan. 2: pl. 70A. 1937.

*Pluteus pellitus* is considered here as a species with a shiny white pileus and lacking clamp-connections in pileipellis, pileitrama, and in other tissues. On the other hand Kühner & Romagnesi (1953: 420), followed by Moser (1983: 213), reported the presence of clamp-connections in pileipellis and stipe. Their descriptions differ also in other respects, e.g. spore-size, from *P. pellitus* in our concept. Although this latter character suggests *P. petasatus*, *P. pellitus* sensu Kühner & Romagnesi belongs to another, as yet unknown species, with numerous clamp-connections, and is, on account of the small spores, not a white variety of *P. salicinus* or *P. tricuspidatus*.

### 7. *Pluteus petasatus* (Fr.) Gillet

*Agaricus petasatus* Fr., Epicr.: 142. 1838. — *Pluteus petasatus* (Fr.) Gillet, Hyménomycètes: 395. 1876. — *Pluteus cervinus* var. *petasatus* (Fr.) Mass., Br. Fung. Fl. 2: 285. 1893.

*Agaricus patricius* S. Schulz. in Kalchbr., Ic. sel. Hymenomyc. Hungariae: 20. 1874. — *Pluteus cervinus* var. *patricius* (S. Schulz.) Mass., Br. Fung. Fl. 2: 284. 1893. — *Pluteus patricius* (S. Schulz.) Boud., Ic. mycol. 1: Pl. 87. 1904.

*Pluteus straminiphilus* Wichanský in Mykol. Sb., Praha 45: 119. 1968.

Misapplied names. — *Pluteus curtisii* sensu Sing. in Trans. Br. mycol. Soc. 39: 160. 1956; sensu Mos., in Gams, Kl. Krypt. Fl. 2b/2,5. Aufl.: 214. 1983. — *Pluteus pellitus* sensu Rick., Blätterpilze: 277. 1913.

Excluded. — *Pluteus petasatus* sensu Rick., Blätterpilze: 277. 1913 (= *P. salicinus*).

Selected illustrations. — J. Lange, Fl. agar. dan. 2: pl. 70C. 1937; Romagn., Nouv. Atl. Champ. 3: pl. 187. 1961 (as *P. patricius*).

*Pluteus petasatus* is generally considered as a species with a smooth, slightly viscid surface of pileus with some brown fibrils, and *P. patricius* as a species with a squamose surface of pileus. But it turned out that these two can not be separated from each other, as all kinds of transitions have been observed. Differences in spore-size, as suggested by Moser (1983: 214) are not correlated with other characters.

### *Pluteus* section *Villosi* Schreurs & Vellinga, *sect. nov.*

Holotype: *Pluteus ephebeus* (Fr.: Fr.) Gillet.

Stipes solidus; pleurocystidia sine cornibus ad apicem, tenuiparietalia, aut absentia; cheilocystidia radiacantia in trama hymenophorali; pileipellis cutis differentiatia fascicularum hypharum, 2–6 (aut plurium) elementorum; fibulae absentes in speciebus pluribus.

Characteristics. — Stipe solid; pleurocystidia present and then without hooks at apex and thin-walled, or absent; cheilocystidia rooting in hymenophoral trama; pileipellis a differentiated cutis made up of bundles of hyphae of 2 to 6 elements, with terminal elements inflated; clamp-connections in most species absent.

#### KEY TO THE SPECIES

- 1 a. Pleurocystidia present and moderately abundant to abundant; basidiocarps big (pileus > 30 mm; stipe > 45 mm) . . . . . 8. *P. ephebeus*  
 b. Pleurocystidia absent or very rare; basidiocarps small (pileus < 25 mm; stipe < 40 mm) . . . . . 9. *P. hispidulus*

#### 8. *Pluteus ephebeus* (Fr.: Fr.) Gillet — Figs. 2, 3

*Agaricus ephebeus* Fr., *Observ. mycol.* 2: 87. 1818 (nom. nov. for *A. villosus* Bull.). — *Agaricus ephebeus* Fr.: Fr., *Syst. mycol.* 1: 238. 1821. — *Pluteus ephebeus* (Fr.: Fr.) Gillet, *Hyménomycètes*: 392. 1876.

*Agaricus villosus* Bull., *Hist. Champ. France*: pl. 214. 1785; non *Agaricus villosus* Fr.: Fr., *Flench. Fung.* 1: 28. 1828 (= *Pholiota* spec.); nec *Agaricus villosus* Scop., *Fl. carn.*: 470. 1772; nec *Agaricus villosus* Bolt., *Hist. Fung. Halifax* 1: 42. 1788 (= *Pholiota* spec.). — *Pluteus villosus* (Bull. →) Quel., *Fl. mycol. France*: 187. 1888.

*Pluteus murinus* Bres. in *Annls mycol.* 3: 160. 1905.

*Pluteus pearsonii* P. D. Orton in *Trans. Br. mycol. Soc.* 43: 361. 1960.

Misapplied names. — *Pluteus drepanophyllus* sensu Sing., *Agaricales mod. Taxon.*: 439. 1975. — *Pluteus plautus* sensu A. Pears. in *Trans. Br. mycol. Soc.* 35: 108. 1952.

Selected descriptions & illustrations. — Decary in *Bull. trimest. Soc. mycol. Fr.* 43: pl. 19. 1927 (as *P. villosus*); Romagn. in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 212. 1956 (as *P. villosus*).

Pileus (30–)35–70(–90) mm, when young hemispherical with umbo, expanding to more or less applanate with broad low umbo, brown, grey-brown to brownish grey (Munsell 5 YR 2.5/2–4/2, 7.5 YR 3/4–5/4, 10 YR 2/2–5/4), in centre tomentose to delicately squamulose towards margin more fibrillose; underlying white context showing between those fibrils as regular or irregular streaks. Lamellae (L = 55–110/1 = (0–)1–3(–4)) moderately crowded, free, hardly to broadly ventricose, up to 7 mm broad, when young whitish or pale greyish, later via pink, dark pink to brownish pink, with concolorous or white flocculose, fimbriate or even edge. Stipe (22–)45–90(–95) × (2.5–)4–8(–11) mm, cylindrical to slightly broadening downwards, with more or less abrupt bulbous base up to 1.5 × wider than middle part of stipe, solid, rarely stuffed or fistulose, shiny, silvery white to grey and white striate, fibrillose striate, very rarely glabrous; mostly innate dark fibrillosity decreasing in intensity from base upwards. Context in pileus moderately to very thick, white, in stipe shiny white to greyish in base. Smell indistinct. Taste not unpleasant at first, later strongly unpleasant in throat, astringent. Spore print reddish or rust brown (Munsell 5 YR 4/4–5/6).

Spores (5.5–)6.0–8.0(8.5) × (4.5–)5.0–6.0(–7.0) μm, Q = (1.05–)1.1–1.5(–1.55),  $\bar{Q}$  = 1.2–1.35, broadly ellipsoid to ellipsoid, some subglobose. Basidia (20–)22–



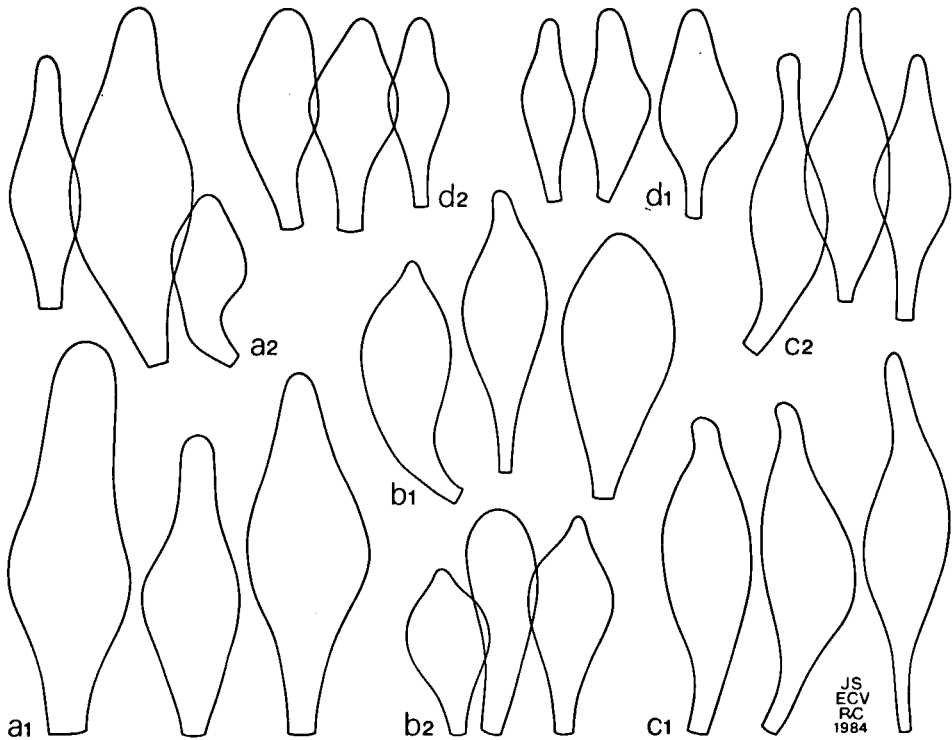


Fig. 2. *Pluteus ephebeus*. 1. Pleurocystidia ( $\times 500$ ) and 2. cheilocystidia ( $\times 500$ ). — a. J. Schreurs 658. — b. Th. W. Kuyper 1793. — c. E. Kits van Waveren, 2 Sept. 1967. — d. J. Schreurs 527.

$38(-42) \times 6.5-9.5(-10.5) \mu\text{m}$ , mostly 4-spored. Pleurocystidia scarce to abundant,  $(25-40)40-90(-120) \times (11-14)14-32(-45) \mu\text{m}$ , varying in shape and size within one collection, and particularly between collections, broadly utriform, fusiform to broadly conical, sometimes lageniform, mucronate to subcapitate, thin-walled and colourless. Cheilocystidia crowded,  $(15-25)25-75(-92) \times (7-9)9-35(-40) \mu\text{m}$ , with a wide range of variation in size and shape, clavate to broadly utriform-lageniform, mucronate or subcapitate or with up to  $15 \mu\text{m}$  long projection, thin-walled or with thickened wall at apex, colourless or with pale brown pigment. Pileipellis a differentiated cutis of radial adnate bundles of hyphae, with particularly at centre ascending tips, consisting of  $(1-2)2-3(-5 \text{ or more})$  elements,  $7-15(-25) \mu\text{m}$  wide; terminal elements cylindrical to fusiform with obtuse apex,  $(35-50)50-240(-450) \times (7-9)9-27(-65) \mu\text{m}$ , with brown intracellular pigment; in some collections all elements very broad and irregularly shaped. Stipitepellis a cutis of  $5-15 \mu\text{m}$  wide, colourless hyphae, usually (but not always) on lower part of stipe with adnate to ascending, branched hyphae with brown intracellular pigment and cylindrical to fusiform terminal elements,  $30-180 \times 6-20(-28) \mu\text{m}$ ; these brown hyphae decreasing in number and density towards apex; at base of stipe with external pigment.

**Habitat & distribution.** — Solitary to subgregarious, rarely in fairy rings, terrestrial, sometimes against or rarely on wood of deciduous trees, in deciduous woods throughout Europe with preference for clayey soils. June to October.

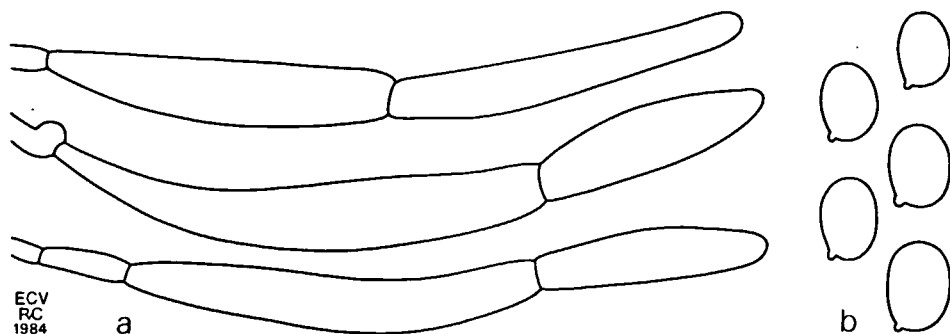


Fig. 3. *Pluteus ephebeus*. — Elements of pileipellis ( $\times 500$ ) and spores ( $\times 1500$ ) (type of *Pluteus murinus*).

Collections examined. — NETHERLANDS, prov. Gelderland: Neerijnen, estate 'Neerijnen', 21 Aug. 1979, *J. Schreurs 311* and *312* (L); ibidem, 14 Oct. 1980, *J. Schreurs 533* (L); ibidem, 29 Sept. 1981, *J. Schreurs 650* (L); prov. Utrecht: Amerongen, castle Amerongen, 16 Oct. 1960, *E. Kits van Waveren* (L); prov. Noord-Holland: Vogelenzang, Vogelenzangse Bos, 9 Oct. 1983, *C. Bas* (coll. E. C. Vellinga 565) (L); Amsterdam, Amsterdamse Bos, 11 July 1968, 21 Aug. 1971 and 4 Aug. 1973, *E. Kits van Waveren* (L); prov. Zuid-Holland: Voorschoten, estate 'Ter Horst', 21 Sept. 1980, *C. Bas 7690* (L); ibidem, 4 June 1981, *C. Bas 7773* (L); Leiden, Hortus Botanicus, 16 Sept. 1976, *C. Bas 7037* (L); prov. Zeeland: Axel, Axelse Bos, 8 June 1981, *A. de Meijer 303* (L); ibidem, 30 June 1981, *A. de Meijer 303b* (L); de Braakman, Noorderbossen, 26 Aug. 1981, *A. de Meijer & J. Schreurs 607* (L); ibidem, 19 Sept. 1980, *A. de Meijer 80 N 147* (L); IJsselmeerpolders: O. Flevoland, 't Spijk, 18 June 1980, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; ibidem, 11 Sept. 1980, *J. Schreurs 488* (L); O. Flevoland, Lelystad, Langeveld, 16 June 1981, *C. Bas 7779* (L); O. Flevoland, Roggebotsbos, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*, 11 July 1975; O. Flevoland, Harderbos, 13 Sept. 1976, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; O. Flevoland, Bremerbergbos, 8 Sept. 1975, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; ibidem, 5 Sept. 1981, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; ibidem, 4 Oct. 1981, *J. Schreurs 658* (L). — GERMAN FEDERAL REPUBLIC, Nordrhein-Westfalen, Detmold, Externsteine, 7 Oct. 1976, *J. Schreurs 44* (L). — FRANCE, dept. Ain, Nantua, 27 Aug. 1957, *H. S. C. Huijsman* (L). — ITALY, Alto Adige, Trento, Gocciadoro, 1 Oct. 1903, *G. Bresadola* (S) (holotype of *P. murinus*). — HUNGARY, Budapest, Csúcs-Hegy, 17 Sept. 1981, *Th. W. Kuyper 1793* (L). — GREAT BRITAIN, Sussex, Chichester, Plindon Park, 21 Sept. 1967, *E. Kits van Waveren* (L); Surrey, Mickleham, Norbury Park, 8 Oct. 1949, *A. A. Pearson* (K) (holotype of *P. pearsonii*).

This species is in European literature generally known as *Pluteus villosus* (Bull.) Quéf. However, Fries (1818: 87) introduced and subsequently sanctioned (1821: 238) a new name. *Agaricus ephebeus*, for the agaric described by Bulliard (1785: pl. 214) as *A. villosus* Bull., a later homonym of Scopoli's *A. villosus* (1772: 420). *Agaricus villosus* Bull. is also illegitimate, because of the existence of *A. villosus* Fr.: Fr. (= a species of *Pholiotata*). The plate of Bulliard is automatically the type-plate of the species *P. ephebeus*.

Although macroscopically distinguishable, *P. murinus* Bres. and *P. pearsonii* P. D. Orton are considered here synonyms of *P. ephebeus*. *Pluteus murinus* is characterized as a

relatively short-stiped fungus with a brown pileus and a non-striate stipe; *P. ephebeus* as a relatively long-stiped and slender fungus with a brown pileus and a regularly splitting pileipellis and *P. pearsonii* as a large fungus with a greyish pileus and an irregularly splitting pileipellis. However, because of the great variation in microscopical features, which is not correlated with the variation in macroscopical characters, and because of the existence of intermediates, these taxa do not deserve formal rank. The very characteristic taste of *P. ephebeus* is present in all three variants mentioned.

Singer (1956: 226) studied one of Bresadola's collections of *Pluteus murinus* Bres. in NY. We have studied the collection present in S, collected by G. Bresadola, 1 Oct. 1903, Gocciadoro, 'nel prato ad terram'. The following observations on this collections were made:

Spores (6.8–)6.9–7.6(–8.0) × (4.6–)4.9–5.6(–6.2) μm, Q = (1.2–)1.3–1.5,  $\bar{Q} = 1.4$ . Pleurocystidia scattered, 35–72 × 17–35 μm, narrowly utriform to broadly lageniform with 4–7 μm wide apex or rarely narrowly clavate, colourless, thin-walled. Cheilocystidia not crowded, 30–63 × 14–28 μm, clavate, narrowly utriform to broadly lageniform with 5–8 μm wide apex, colourless, thin-walled. Pileipellis a differentiated cutis of repent hyphae; terminal elements cylindrical to slenderly fusiform, 10–20 μm wide, with brown intracellular pigment. Stipitepellis a cutis of colourless 4–9 μm wide cylindrical hyphae.

This collection agrees with Bresadola's description and represents the holotype of the species. Singer (1956: 226) mentioned a pileipellis consisting of two types of elements: spherical and fusiform elements. Therefore the collection studied by him and incorrectly designated as lectotype, is considered here as not conspecific because of serious disagreements with the original description (Bresadola, 1905: 160).

### 9. *Pluteus hispidulus* (Fr.: Fr.) Gillet — Fig. 4

*Agaricus hispidulus* Fr., *Observ. mycol.* 2: 97. 1818. — *Agaricus hispidulus* Fr.: Fr., *Syt. mycol.* 1: 201. 1821. — *Pluteus hispidulus* (Fr.: Fr.) Gillet, *Hyménomycètes*: 391. 1876.

#### KEY TO THE VARIETIES

- 1 a. Cheilocystidia narrowly clavate to clavate, a very few subcapitate . *P. hispidulus* var. *hispidulus*
- b. Cheilocystidia narrowly utriform to narrowly clavate, subcapitate to distinctly capitate  
*P. hispidulus* var. *cephalocystis*

### *Pluteus hispidulus* var. *hispidulus*

*Pluteus exiguus* var. *aberrans* Romagn. in *Bull. trimest. Soc. mycol.* Fr. 53: 120. 1937.

*Pluteus hispidulus* f. *typicus* Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol.* Fr. 72: 183. 1956 (inadmissible epitheton).

*Pluteus hispidulus* f. *terrestris* Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol.* Fr. 72: 182. 1956.

Misapplied name. — *Pluteus exiguus* sensu Romagn. in *Rev. Mycol.* 2: 95. 1937.

Excluded. — *Pluteus hispidulus* sensu Konr. & M., *l.c. sel. Fung.* 1: pl. 25. 1925. (= probably *P. exiguus*).

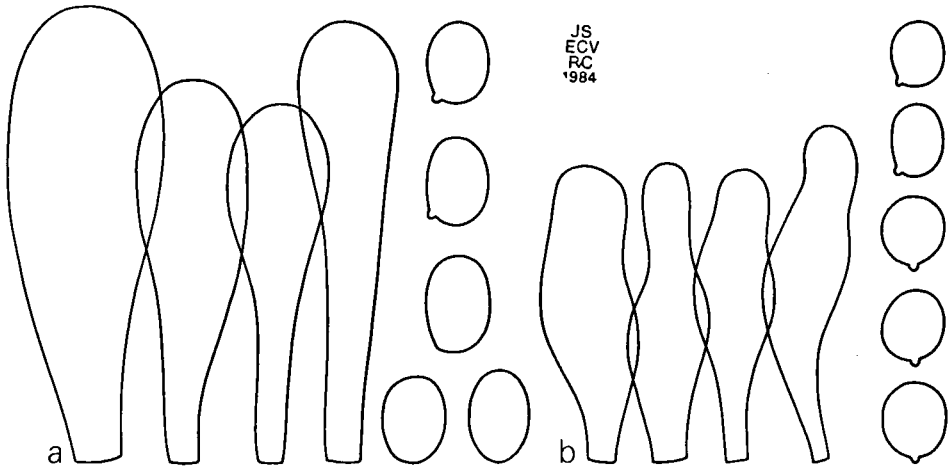


Fig. 4. *Pluteus hispidulus*. — Cheilocystidia ( $\times 1000$ ) and spores ( $\times 1500$ ). — a. *Pluteus hispidulus* var. *hispidulus* (E. Kits van Waveren, 1 June 1960). — b. *Pluteus hispidulus* var. *cephalocystis* (holotype).

Selected descriptions & illustrations. — Romagn. in Rev. Mycol. 2: 95 1937 (as *P. exiguus*); J. Lange, Fl. agar. dan. 2: pl. 70B. 1937; Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 183–187. 1956 (as *P. hispidulus* f. *typicus* and f. *terrestris*).

***Pluteus hispidulus* var. *cephalocystis* Schreurs, var. nov.**

Differt a typo in cheilocystidiis subcapitatis vel capitatis. — Holotypus: *H. Piepenbroek & G. Piepenbroek-Grooters 1243*, 27-IX-1981, 'estate Windesheim, Zwolle, prov. Overijssel, Netherlands' (L).

*Pluteus hispidulus* var. *cephalocystis* differs from the type variety in the shape of the cheilocystidia: subcapitate to capitate narrowly utriform to narrowly clavate versus narrowly to broadly clavate in var. *hispidulus* (Fig. 4). This variety resembles *P. exiguus* in the shape of the cheilocystidia, but differs in pileipellis structure: a differentiated cutis with ascending elements in *P. hispidulus* and a trichoderm in *P. exiguus*.

Habitat. On wood or woodchips of deciduous trees in frondose woods on rich soils.

Collections examined. — NETHERLANDS, prov. Overijssel, Windesheim, estate Windesheim, 27 Sept. 1981, *H. Piepenbroek & G. Piepenbroek-Grooters 1243* (holotype, L). — GREAT BRITAIN: Berkshire: Ascot, Swanley Park, 26 Oct. 1971 (K), *E. E. Green & I. Ryvarden* (K); Windsor, Ascot Park, 26 May 1965, *P. W. James* (K); Swanley Park, Windsor Great Park, 23 Aug. 1967, *D. A. Reid, R. W. G. Dennis & E. E. Green* (K); Sussex: Duncton, Duncton Hill, 12 Sept. 1970, *D. A. Reid*, (K); Somerset: Horner Water, 30 Aug. 1967, *P. D. Orton 3054* (E); Horner Water, 3 Sept. 1967, *P. D. Orton 3055* (E). — FRANCE, dept. Ain, Nantua-Bourg, 22 May 1957, *H. S. C. Huijsman* (L).

Section *Celluloderma* Fay.

*Pluteus* section *Celluloderma* Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889. — Lectotype (Sing. in Lloydia 21: 259. 1958): *Pluteus nanus* (Pers.: Fr.) Kumm.

*Pluteus* section *Hispidoderma* Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889. — Lectotype (Sing. in Lloydia 21: 216. 1958): *Pluteus leoninus* (Schaeff.: Fr.) Kumm.

*Pluteus* section *Pruinosi* Imai in J. Fac. Agric. Hokkaido (imp.) Univ. 43: 161. 1938. — Lectotype (design. nobis): *Pluteus nanus* (Pers.: Fr.) Kumm.

*Pluteus* section *Nudi* Imai in J. Fac. Agric. Hokkaido (imp.) Univ. 43: 163. 1938. — Lectotype (design. nobis): *Pluteus phlebophorus* (Ditm.: Fr.) Kumm.

Characteristics. — Stipe solid to fistulose; pleurocystidia absent or present and then without hooks at apex and thin-walled; cheilocystidia either implanted on layer of parallel hyphae or rooting in hymenophoral trama; pileipellis a hymeniderm, a transition between a hymeniderm and an epithelium or a trichoderm.

*Pluteus* subsection *Hispidodermini* (Fay.) Vellinga & Schreurs, *comb. & stat. nov.*

Basionym: *Pluteus* section *Hispidoderma* Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889. — Lectotype (Sing. in Lloydia 21: 216. 1958): *Pluteus leoninus* (Schaeff.: Fr.) Kumm.

*Pluteus* [A $\beta$ ] *Depauperatae* J. Lange in Dansk bot. Ark. 2(7): 4. 1917 (illegitimate, no rank indicated).

Characteristics. — Cheilocystidia implanted on a layer of hyphae parallel to edge of lamellae; pileipellis a hymeniderm made up of elongated elements only, with  $\bar{Q} > 3$ , or a trichoderm.

## KEY TO THE SPECIES

- 1 a. Pleurocystidia absent or very rare . . . . . 2  
 b. Pleurocystidia present and moderately abundant to abundant . . . . . 3  
 2 a. Spores mainly broadly ellipsoid to ellipsoid,  $\bar{Q} = 1.25 - 1.35$ ; cheilocystidia colourless . . . . . 10. *P. exiguus*  
 b. Spores mainly subglobose,  $\bar{Q} = 1.1$ ; cheilocystidia partly with brown content . . . . . 11. *P. pusillulus*  
 3 a. Stipe not flocculose, at base often with some squamulose structures, without differentiated caulocystidia . . . . . 4  
 b. Stipe flocculose all over; differentiated caulocystidia present . . . . . 5  
 4 a. Pileus yellow to yellow-brown; stipe white, pale yellow at base, not pink coloured . . . . . 12. *P. leoninus*  
 b. Pileus brown to brown-grey; stipe whitish, pink coloured at base . . . . . 13. *P. roseipes*  
 5 a. Either pileus brown, edge of lamellae brown and stipe brown flocculose, or basidiocarp entirely white; caulocystidia in squamules ascending from stipitepellis . . . . . 14. *P. umbrosus*  
 b. Basidiocarps dark brown to white; edge of lamellae concolorous with surface; caulocystidia in tufts, patent . . . . . 15. *P. plautus*

10. *Pluteus exiguus* (Pat.) Sacc.

*Agaricus exiguus* Pat., Tab. anal. Fung. 1: 190. 1886. — *Pluteus exiguus* (Pat.) Sacc. in Syll. Fung. 5: 671. 1887.

Excluded. — *Pluteus exiguus* sensu Romagn. in Rev. Mycol. 2: 95. 1937 (= *P. hispidulus* var. *hispidulus*).

Selected descriptions. — Huijsman in Fungus 25: 34–35. 1955; Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 187–190. 1956.

### 11. *Pluteus pusillulus* Romagn. — Fig. 5

*Pluteus minimus* Romagn. in Rev. Mycol. 2: 133. 1937; non *Pluteus minimus* P. Henn. in Verh. bot. Ver. Brandenb. 40: 139. 1889. — *Pluteus pusillulus* Romagn. in Rev. Mycol. 5: 23. 1940 (change of name).

Type-study of *Pluteus pusillulus*.

Herbarium H. Romagnesi: France, dept. Seine-et-Oise, Villecresnes, Bois de la Grange, H. Romagnesi.

Spores (5.2–)5.5–6.3(–6.5) × (4.9–)5.2–5.8(–6.3) μm, Q = (1.0–)1.05–1.15 (–1.2), Q = 1.1, subglobose, a few globose or broadly ellipsoid. Basidia 23–33(–37) × 6.5–8.5(–9) μm, 4-spored. Pleurocystidia absent. Cheilocystidia (33–)42–72(–77) × 10–15(–17) μm, subcapitate narrowly fusiform, mostly not coloured, partly with brown vacuolar pigment. Pileipellis a hymeniderm of narrowly fusiform elements, (72–)80–130(–145) × (10–)12–19(–23) μm, with dark brown vacuolar pigment. Stipitepellis a cutis of cylindrical hyphae.

Romagnesi (1937) first described this species under the name *Pluteus minimus* Romagn. This name, however, is illegitimate because it is a younger homonym of *P. minimus* P. Henn. (1889). In 1940 Romagnesi changed the name of the present species to *P. pusillulus* without mentioning the basionym. From circumstantial evidence is perfectly clear, however, that this was a change of name for his *P. minimus*.

### 12. *Pluteus leoninus* (Schaeff.: Fr.) Kumm.

*Agaricus leoninus* Schaeff., Fung. Bavariae 4: 21. 1774. — *Agaricus leoninus* Schaeff.: Fr., Syst. mycol. 1: 199. 1821. — *Pluteus leoninus* (Schaeff.: Fr.) Kumm., Führ. Pilzk.: 98. 1871.

*Agaricus sororiatatus* P. Karst. in Not. Sällsk. Fauna Fl. fenn. Förh. 9: 339. 1868. — *Pluteus sororiatatus* (P. Karst.) P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 254. 1879.

*Pluteus luteomarginatus* Rolland in Bull. Soc. mycol. Fr. 5: 167. 1889.

*Pluteus fayodii* Damblon, Darimont & Lambinon in Lejeunia 21: 93. ('1957') 1959.

*Pluteus flavobrunneus* J. Favre in Ergebn. Wiss. Unters. Schweiz. Natn. Parks, n.F.VI, 42: 559. 1960 (not validly published, no type indicated).

*Pluteus luteomarginatus* f. *gracilis* Métrod in Rev. Mycol. 11: 77. 1946 (not validly published, no latin diagnosis).

Excluded. — *Pluteus leoninus* sensu P. Karst, Ryssl., Finl. Skand. Halföns Hattsvamp.: 257. 1879; sensu Sing. in Beih. bot. Cbl. 46 (2 Abt.): 105. 1930; sensu Imai in J. Fac. Agric. Hokkaido (imp.) Univ. 43: 163. 1938; sensu Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 233. 1956 (in all these cases = *P. chrysophaeus*). — *Pluteus luteomarginatus* sensu Sing. & Cléménçon in Nova Hedwigia 23: 336. 1972 (= *P. roseipes*).

Selected description & illustrations. — Cooke, Ill. Brit. Fung. 3: pl. 421. 1884; Konr. & M., Ic. sel. Fung. 1: pl. 20. 1925. Romagn., Nouv. Atl. Champ. 3: pl. 192. 1961 (as *P. luteomarginatus*); R. Phillips, Paddest. Schimm.: 120. 1981.

According to the description of Schaeffer (1774: 21) and his plate (1762: pl. 48), the name *Pluteus leoninus* is the correct name for the golden yellow species belonging to

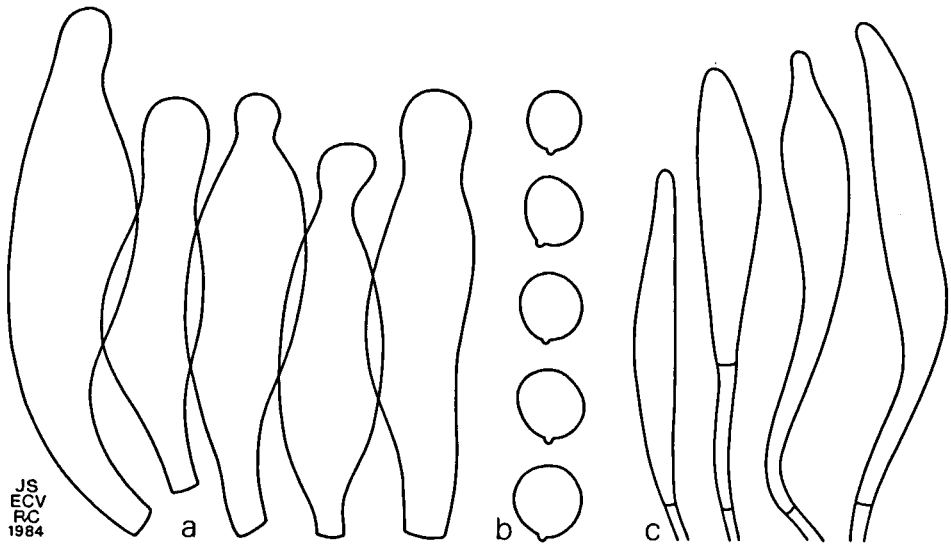


Fig. 5. *Pluteus pusillulus*, type. — a. Cheilocystidia ( $\times 1000$ ). — b. Spores ( $\times 1500$ ). — c. Elements of pileipellis ( $\times 500$ ).

subsection *Hispidodermini*. An additional argument is the fact that Schaeffer was able to discriminate between two yellow-capped species of *Pluteus*; his *Agaricus chrysophaeus* is clearly characterized as a species with a hymenidermal pileipellis ('pileo saturate aureo, pulverulente', 1774: 67).

*Pluteus sororiatius* (P. Karst.) P. Karst. is described as a yellow species with a squamulose-velvety pileus, and consequently microscopically with a pileipellis consisting of elongated elements, whereas Karsten (1879: 257) considered *P. leoninus* as a species with a smooth pileipellis. It is evident, therefore, that *P. sororiatius* has to be placed in the synonymy of *P. leoninus*.

*Pluteus luteomarginatus* Rolland, already considered as a synonym of *P. sororiatius* by Singer (1956: 184), is in this concept considered as a larger variant of *P. leoninus*, with a dark tinge on the pileus, but not as a distinct species.

*Pluteus fayodii* Damblon, Darimont & Lambinon is a superfluous new name for *P. leoninus* in the sense as is described here; the yellow species with clavate to spheropedunculate elements in the pileipellis is *P. chrysophaeus*.

### 13. *Pluteus roseipes* Höhn.

*Pluteus roseipes* Höhn. in Sber. Akad. Wiss. Wien 61: 1010. 1902.

*Pluteus carneipes* Kühner in Bull. mens. Soc. linn. Lyon 19: 100. 1950.

*Pluteus subatratus* J. Favre in *Ergebn. wiss. Unters. schweiz. NatnParks*, n.F. VI, 42: 563. 1960 (not validly published, no type indicated).

Misapplied name. — *Pluteus luteomarginatus* sensu Sing. & Cléménçon in Nova Hedwigia 23: 336. 1972.

Selected descriptions & illustrations. — Kühner in Bull. mens. Soc. linn. Lyon 19: 100–102. 1950 (as *P. carneipes*); J. Favre in Ergebn. wiss. Unters. schweiz. Natn Parks, n.F. VI, 42: 563–565. 1960 (as *P. subatratus*); Romagn., Nouv. Atl. Champ. 3: pl. 191B. 1961.

#### 14. *Pluteus umbrosus* (Pers.: Fr.) Kumm.

*Pluteus umbrosus* Pers., Ic. Descr. Fung. 1: 8. 1798. — *Agaricus umbrosus* Pers.: Fr., Syst. mycol. 1: 200. 1821. — *Pluteus umbrosus* (Pers.: Fr.) Kumm., Führ. Pilzk.: 98. 1871. — *Pluteus cervinus* var. *umbrosus* (Pers.: Fr.) J. Lange in Dansk bot. Ark. 9(6): 79. 1938.

Excluded. — *Pluteus umbrosus* sensu Cooke, Ill. Brit. Fung. 3: pl. 304. 1883; sensu Sacc. in Syll. Fung. 5: 667. 1887; sensu Bres., Fung. trident. 2: 11. 1892; sensu Farl. & Burt., Ic. farlowianae: pl. 44. 1929; *Pluteus cervinus* var. *umbrosus* sensu J. Lange in Dansk bot. Ark. 9(6): 79. 1938 (in all these cases = *Pluteus tricuspidatus*).

Selected descriptions & illustrations. — Konr. & M., Ic. sel. Fung. 1: pl. 26. 1925; Locq. in Bull. trimest. Soc. mycol. Fr. 59: 37. 1943; Sing. in Trans. Br. mycol. Soc. 39: 189. 1956; Romagn., Nouv. Atl. Champ. 3: pl. 188A. 1961; R. Phillips, Paddest. Schimm.: 119. 1981.

#### KEY TO THE VARIETIES

- 1 a. Pileus brown; edge of lamellae brown; stipe brown flocculose. . . . . *P. umbrosus* var. *umbrosus*  
 b. Pileus white; edge of lamellae white; stipe white flocculose. . . . . *P. umbrosus* var. *albus*

#### *Pluteus umbrosus* var. *albus* Vellinga, var. nov.

Differt a typo in coloribus albis pilei, aciei lamellarum, stipitisque. — Holotypus: *T. Læssøe* 596, 17-IX-1983; 'Strødam Reservatet, Sjaelland, Denmark' (C).

This variety differs from the type-variety of *P. umbrosus* in the absence of brown pigments. Consequently pileus, edge of lamellae and stipe are white; cheilocystidia, pleurocystidia, elements of pileipellis, and caulocystidia are colourless. The lamellae, however, are pink-coloured.

Habitat. — Solitary on rotten *Fagus sylvatica*-trunk.

Collection examined. — DENMARK, Sjaelland, Strødam Reservatet, 17 Sept. 1983, *T. Læssøe* 596 (holotype, C).

#### 15. *Pluteus plautus* (Weinm.) Gillet — Figs. 6–9

*Agaricus plautus* Weinm., Hymenomyc. Gastromyc. Imp. ross. obs.: 136. 1836. — *Pluteus plautus* (Weinm.) Gillet, Hyménomycètes: 394. 1876.

*Agaricus semibulbosus* Lasch in Fr., Epicr.: 141. 1838. — *Pluteus semibulbosus* (Lasch.) Gillet, Hyménomycètes: 395. 1876.

*Pluteus granulatus* Bres. Fungi trident. 1: 10. 1881.

*Agaricus praestabilis* Britz. in Ber. naturh. Ver. Augsburg 27: 193. 1883 (Hymenomyc. Südbayern 3).



*Pluteus candidus* Pat., Tab. anal. Fung. 2: 31. 1887.

*Pluteus pellitus* var. *gracilis* Bres. in S. Schulz. in Hedwigia 24: 134. 1885. — *Pluteus gracilis* (Bres.) J. Lange in Dansk bot. Ark. 2(7): 6. 1917.

*Pluteus puberulus* Velen., České Houby: 607. 1921.

*Pluteus stylobates* Velen., České Houby: 608. 1921.

*Pluteus inflatus* Velen., České Houby: 609. 1921.

*Pluteus depauperatus* Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 181. 1956.

*Pluteus boudieri* P. D. Orton in Trans. Br. mycol. Soc. 43: 352. 1960.

*Pluteus punctipes* P. D. Orton in Trans. Br. mycol. Soc. 43: 363. 1960.

*Pluteus dryophiloides* P. D. Orton in Not. roy. bot. Gdn Edinb. 29: 115. 1969.

*Pluteus punctatus* Wichanský in Mykol. Sb., Praha 49: 1. 1972.

Misapplied names. — *Pluteus roseoalbus* sensu Velen., České Houby: 606. 1929; Vaček in Stud. bot. Cech. 9: 37. 1948. — *Pluteus hiatus* sensu Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 215–218. 1956.

Excluded. — *Pluteus semibulbosus* sensu J. Lange in Dansk bot. Ark. 2(7): 8. 1917; P. D. Orton in Trans. Br. mycol. Soc. 43: 349. 1960 (both = *P. inquilinus*). — *Pluteus plautus* sensu A. Pears. in Trans. Br. mycol. Soc. 35: 108. 1952 (= *P. ephebeus*).

Selected descriptions & illustrations. — Boud., Ic. mycol.: pl. 89. 1905; Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 218–220, 221–224. 1956 (as *P. granulatus* and *P. depauperatus*); P. D. Orton in Trans. Br. mycol. Soc. 43: 352, 363. 1960 (as *P. boudieri* and *P. punctipes*); Romagn., Nouv. Atl. Champ. 3: pl. 190, pl. 191B. 1961 (as *P. granulatus* and *P. hiatus*); P. D. Orton in Not. roy. bot. Gdn Edinb. 26: 56–57. 1964; R. Phillips, Paddest. Schimm.: 120. 1981 (as *P. depauperatus*).

Pileus (7–)10–50(–65) mm, when young hemispherical, later obtuse conical or appanate with more or less distinct umbo, hygrophanous when moist translucently striate.

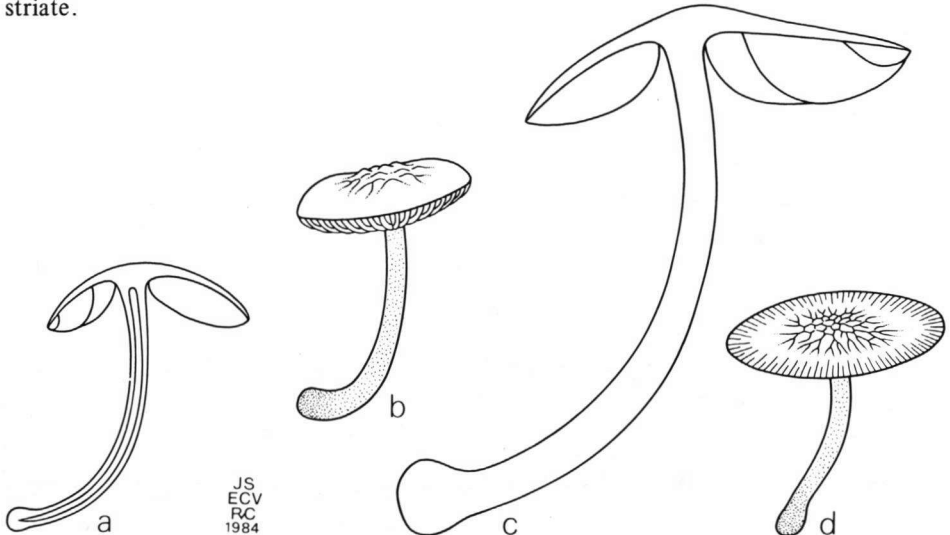


Fig. 6. *Pluteus plautus*. — Habits ( $\times 1$ ). — a. *J. Schreurs* 735 (white basidiocarp). — b. *E. C. Vellinga* 537 (pale basidiocarp). — c. *J. Schreurs* 653 (brown basidiocarp). — d. *J. Schreurs* 521 (dark brown basidiocarp).

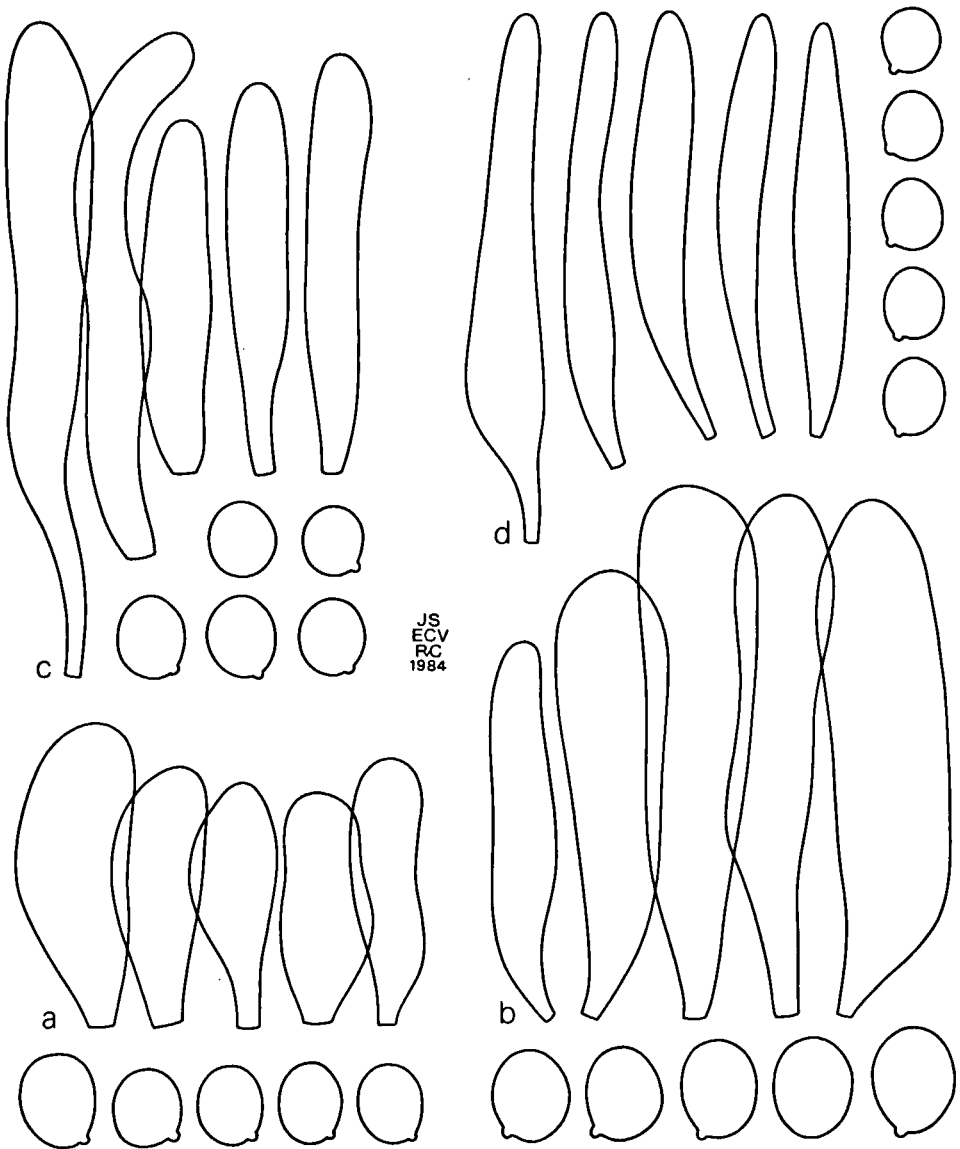


Fig. 7. *Pluteus plautus*. — Elements of pileipellis ( $\times 500$ ) and spores ( $\times 1500$ ). — a. R. A. Maas Geesteranus 10521 (white basidiocarp). — b. E. C. Vellinga 537 (pale basidiocarp). — c. J. Schreurs 653 (brown basidiocarp). — d. J. Schreurs 521 (dark brown basidiocarp).

up to half-way pileus, varying in colour from white, with olive tinge at centre and translucently pink, to dark blackish brown at centre and pallescent to brown at margin, with all shades of brown possible between those two extremes, like yellow-brown, greyish brown at centre, always paler at margin (Munsell 2.5 Y 8/2, 10 YR 4/3, 7.5 YR 3/4, 7.5

YR 3/2), on drying paler, mostly with a shade of translucent pink, not or slightly sulcate, larger basidiocarps with up to 2 mm broad veins round centre, when young glabrous to subgranulate or squamulose, later velvety-tomentose to distinctly squamose at centre, more glabrous at margin. Lamellae ( $L = 30-68/l = 1-3$ ) moderately crowded to crowded, free, moderately broad to broadly ventricose, up to 10 mm broad, when young white or pale grey or pale brown, later sordid pink with white, concolorous, even or flocculose edge. Stipe (10-)15-60(-115) × (1-)1.5-5(-11) mm, cylindrical, often with abrupt bulbous base, stuffed or fistulose with age, white, whitish cream or whitish at apex and yellowish brown at base, fibrillose striate, flocculose all over, white-flocculose, or at apex white-flocculose and at base brown-flocculose, or up to apex brown flocculose, with white to greyish tomentum, often with hairs at base. Context in pileus when moist white, greyish, brown-grey or grey, on drying pallescent to white or whitish; in stipe concolorous with context in pileus, darker at base, shiny. Smell absent to unpleasant like *Lepiota cristata*. Taste absent or slightly unpleasant. Spore print reddish brown (Munsell 5 YR 6/5).

— Spores (5.0-)5.5-8.5(-9.5) × 4.5-7.0(-7.5)  $\mu\text{m}$ ,  $Q = (1.0-)$ 1.05-1.35(-1.85),  $\bar{Q} = (1.1-)$ 1.15-1.25(-1.65), subglobose to broadly ellipsoid, some globose or ellipsoid. Basidia (20-)22-30(-32) × 7-10  $\mu\text{m}$ , 4-spored. Pleurocystidia abundant to scattered, (28-)35-90(-105) × (8-)11-33(-39)  $\mu\text{m}$ , narrowly utriform, utriform with 7-15  $\mu\text{m}$  wide apex, clavate, subfusiform or subcapitate fusiform, colourless, or with intracellular brown pigment, or with some distinct vacuoles with brown pigment or with granular refracting contents. Cheilocystidia moderately crowded to crowded, (20-)30-65(-85) × (7-)10-25(-37)  $\mu\text{m}$ , clavate, narrowly clavate, narrowly utriform, or fusiform, colourless, very rarely a few with brown intracellular pigment. Pileipellis a hymeniderm of cylindrical, narrowly clavate or narrowly fusiform elements, (30-)45-155(-180) × (6-)9-30(-35)  $\mu\text{m}$ , colourless, or with very pale yellowish brown to dark brown intracellular pigment. Stipitepellis a cutis of 5-15  $\mu\text{m}$  wide colourless cylindrical hyphae with tufts of caulocystidia, 30-75(-125) × 10-25  $\mu\text{m}$ , cylindrical to narrowly clavate, narrowly fusiform with rounded apex, colourless or with brown intracellular pigment at base of stipe and colourless at apex, or with brown intracellular pigment over whole length of stipe.

Habitat & distribution. — Solitary or subgregarious on wood, twigs, trunks, or woodchips of mostly deciduous but also of coniferous trees, also found on cardboard, mostly in woods on more or less calcareous soils, throughout Europe, but not frequent. August to November, rarely already in May.

Collections examined. — NETHERLANDS: prov. Friesland: isl. Terschelling, decoy near Hoorn, 26 Oct. 1974, *A. E. Jansen* 76 (L); isl. Vlieland, Oostervallei, 30 Oct. 1976, *C. Bas* 7121 (L); Leeuwarden, Museum for Natural History, 16 Sept. 1971, *G. Stobbe* (L); prov. Overijssel: Zwolle, estate Windesheim, 27 Sept. 1981, *H. Piepenbroek* & *G. Piepenbroek-Grooters* (Coll. J. Schreurs 652 and 653, L); ibidem, 7 Oct. 1981, *J. Schreurs* 661 (L); ibidem, 27 Oct. 1981, *J. Schreurs* 669 (L); ibidem, 27 Aug. 1983, *H. Piepenbroek* & *G. Piepenbroek-Grooters* (coll. E. C. Vellinga 537) (L); Delden, estate 'Twickel', 11 Oct. 1965, 15 May 1970 and 1 Oct. 1979, *E. Kits van Waveren* (L); Oldenzaal, Smoddebos, 18 Oct. 1967, *E. Kits van Waveren* (L); Singraven, 22 Sept. 1961, *E. Kits van Waveren* (L); prov. Gelderland: Zoelen, estate 'Soelen', 11 Oct. 1979, *J. Schreurs* 335 and 336 (L); Valburg, estate 'Oosterhout', 23 Aug. 1980, *C. Bas* (coll. J. Schreurs 457) (L); prov. Utrecht: Bunnik, Notenlaan, 18 Aug. 1978, *J. Schreurs* 171 (L); ibidem, 17 Oct. 1978, *J. Schreurs* 199 (L); prov. Noord-Holland: Santpoort, Duin en Kruidberg, 22 Oct. 1966 and 1 Sept. 1974, *E. Kits van Waveren* (L); Vogelenzang, 12 Oct. 1966, *E. Kits van Waveren* (L); 's-Graveland, greenhouse of firm Steenvoorde, 4 May 1972, *J. Daams* (L); prov. Zuid-Holland: Wassenaar, estate 'Voorlinden', 5 Nov. 1983, *Th. W. Kuyper* (coll. E. C. Vellinga 574) (L); Voorschoten, estate 'Ter

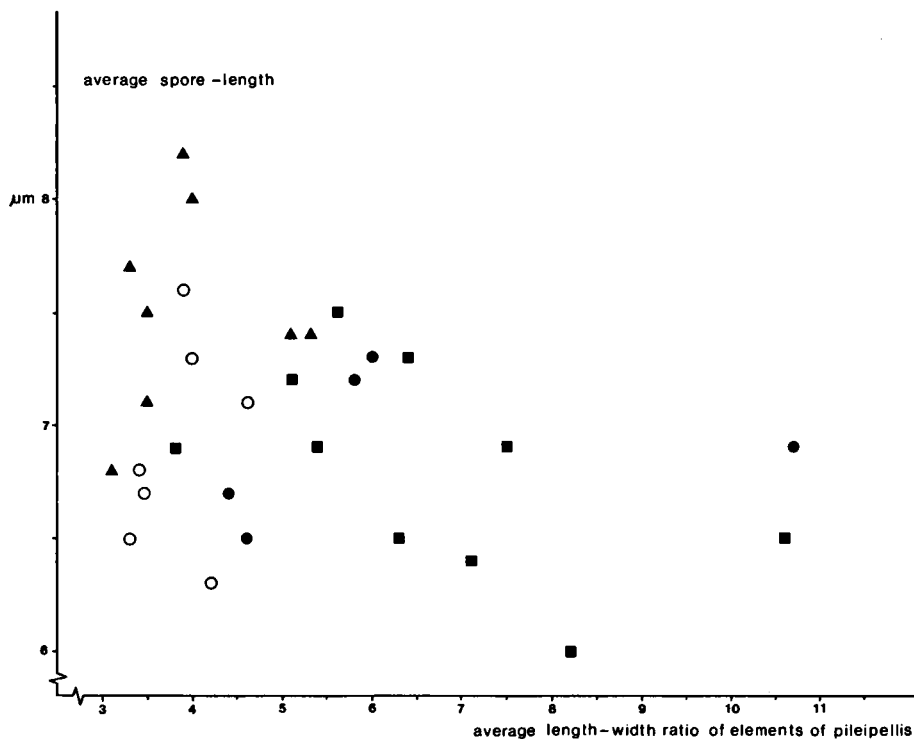


Fig. 8. *Pluteus plautus*. — Scatterdiagram, spore-length plotted against length-width ratio of elements of pileipellis. Each dot represents an average of 10 measurements per collection. (○) white basidiocarp. — (△) pale basidiocarp. — (●) brown basidiocarp. — (■) dark brown basidiocarp.)

Horst', 14 Aug. 1980, *C. Bas* 7655 (coll. J. Schreurs 433) (L); Wassenaar, estate 'Raaphorst', 17 Aug. 1966, *C. Bas* 4633 (L); prov. Noord-Brabant: Eindhoven, Feldershof, 7 Oct. 1965, *E. Kits van Waveren* (L); prov. Limburg: Linne, 11 July 1972, *C. Ph. Verschuere* (L); Horn, 31 July 1967, *C. Ph. Verschuere* (L); Valkenburg, Gerendal, 10 Oct. 1975, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; St. Geertruid, Savelsbos, 11 Oct. 1970, *C. Bas* 5456 (L); ibidem, 13 Oct. 1980, *J. Schreurs* 492 (L); ibidem, 29 Oct. 1980, *J. Schreurs* 547; ibidem, 24 Sept. 1981, *J. Schreurs* 637; IJsselmeerpolders: N.O. Polder, Voorsterbos, 11 Oct. 1983, *C. Bas* (coll. E. C. Vellinga 564) (L); O. Flevoland, Harderbos, 16 June 1977, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*. — BELGIUM: prov. Namur: Ave-et-Auffe, Fond d'Auffe, 3 Oct. 1982, *E. C. Vellinga* (coll. J. Schreurs 735) (L); Ave-et-Auffe, Le Roptai, 6 Oct. 1977, *Th. W. Kuyper & J. Schreurs* 121, (L); Rochefort, Bois de Famenne, 26 Sept. 1974, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; Han-sur-Lesse, Bois banal, 8 Sept. 1975, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*; Resteigne, Bois de Resteigne, 24 Sept. 1974, *F. Tjallingii & G. J. M. G. Tjallingii-Beukers*, ibidem, 8 Sept. 1975, *C. Bas* 6610 (L); ibidem, 4 Oct. 1977, *W. Hane-graaff* (coll. J. Schreurs 115 and 116) (L); ibidem, 22 Aug. 1980, *J. Schreurs* 452 (L). — GERMAN FEDERAL REPUBLIC: Niedersachsen: Oldenburg, Hasbruch, 27 Aug. 1962, *C. Bas* 2675 (L); Bad Bentheim, Bentheimer Wald, 27 Aug. 1982, *J. Schreurs* 705 (L); Nordrhein-Westfalen: Detmold, Externsteine, 7 Oct. 1976, *J. Schreurs* 41 (L); Münster-Mecklenbeck, Lövelinglohbüsche, 11 Oct. 1981, *A. Runge* (L); Warburg-Scherfede, Hellberg, 21 Oct. 1982, *A. Runge* (L); Rhein-

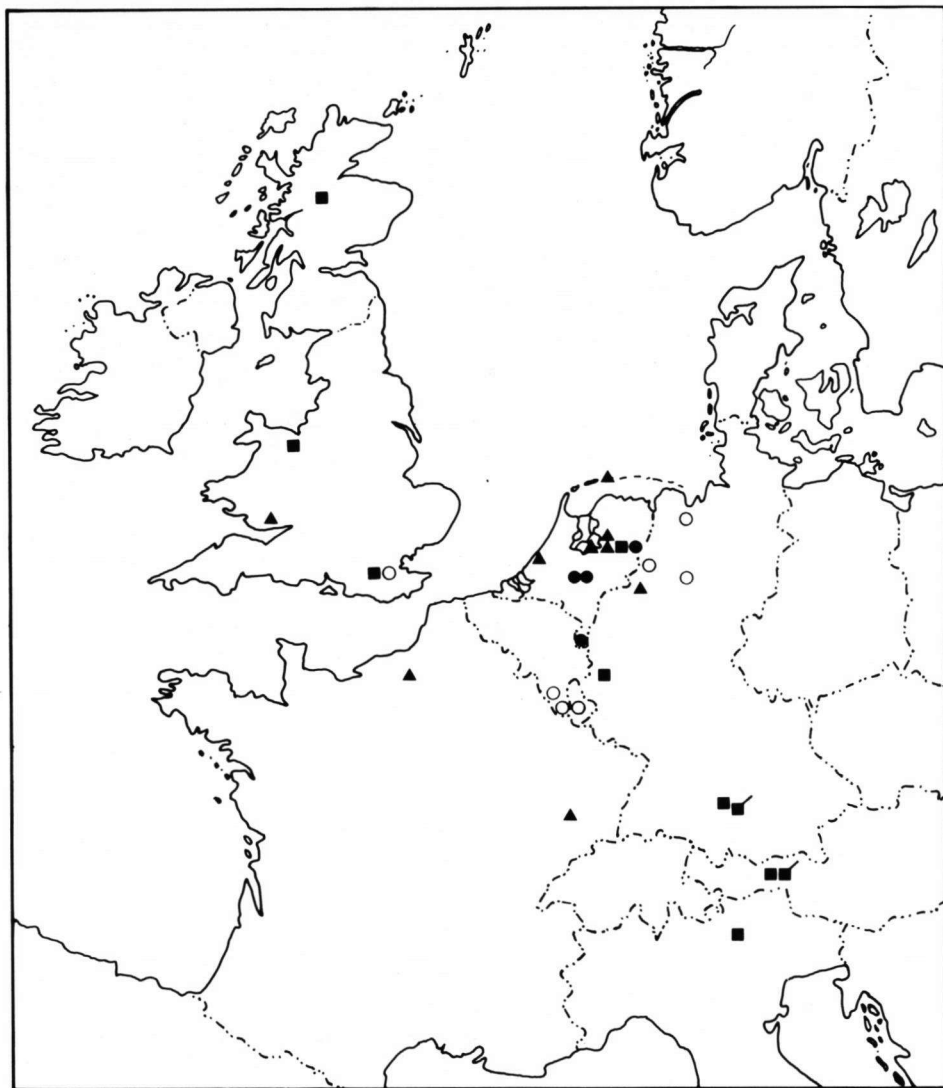


Fig. 9. *Pluteus plautus*. — Distributionmap of the collections of Fig. 8. — ■ growing on coniferous wood. — ○, ▲, ●, and ■ growing on deciduous wood.

Land-Pfalz: Gerolstein, Gees, Reichswald, 25 Sept. 1980, *M. E. Noordeloos* (coll. J. Schreurs 521) (L); Bayern: Leibi, Donau-Auwald, 24 Sept. 1981, *M. Enderle*; Wellenburg, 4 Aug. 1982, *Th. W. Kuyper 2100* (L). — LUXEMBOURG, Grundhof, valley of the Ern z Noire, 18 Aug. 1955, *R. A. Maas Geesteranus 10521* (L). — FRANCE: dept. Doubs, Lougres, 18 Sept. 1956, *H. S. C. Huijsman* (coll. C. Bas 1097) (L); dept. Seine-et-Oise, Yerres, Chateau de la Grange, June–Aug. 1936, *H. Romagnesi* (lectotype of *P. depauperatus*); dept. Oise, Lamorlaye, 10 Oct. 1946, *H. Romagnesi*. —

ITALY: Alto Adige: Estate, Aug. 1882, *G. Bresadola* (S) (lectotype of *P. granulatus*); Cavellmonte, Aug. 1898, *G. Bresadola* (S); Trento, parco Gocciadoro, 26 Sept. 1981, *Th. W. Kuyper 1856* (L). — AUSTRIA, Tirol: Mille, Gnadenwald, 9 Sept. 1982, *H. Schirmer*, (coll. J. Schreurs 714) (L); Reiterkogel, 8 Sept. 1982, *J. Stangl* (coll. J. Schreurs 713) (L). — GREAT-BRITAIN: Invernessshire: Tomich, Plodder Falls, 10 Sept. 1968, *E. Kits van Waveren* (L); Perthshire: Black Wood of Rannoch, 4 Sept. 1966, *E. Kits van Waveren* (L); Surrey: Mickleham, Juniper Hill, 12 Oct. 1952, *P. D. Orton* (holotype *P. punctipes*) (K); ibidem, 1 Oct. 1955, *P. D. Orton* (holotype *P. boudieri*) (K); Shropshire: Oswestry, Llangedwyn Est., 19 Sept. 1967, *E. Kits van Waveren* (L); Glamorgan: Pontypridd, St. Gwynno's Forest, 17 Sept. 1963, *E. Kits van Waveren* (L); Cardiff, Dinas Paris Wood, 13 Sept. 1973, *E. Kits van Waveren* (L).

The species *Pluteus punctipes* P. D. Orton, *P. punctatus* Wichanský, *P. granulatus* Bres., *P. dryophiloides* P. D. Orton, *P. depauperatus* Romagn., *P. semibulbosus* (Lasch) Gillet, *P. boudieri* P. D. Orton, *P. gracilis* (Bres.) J. Lange, *P. puberulus* Velen., *P. stylobates* Velen. and *P. inflatus* Velen., mainly distinguished on colour, habit, striation of pileus, absence or presence of squamules on pileus, but all characterized by a hymenidermal pileipellis, a stipe covered with floccules (microscopically with tufts of caulocystidia) and colourless cheilocystidia, are considered here all to belong to one very variable species, viz. *P. plautus*.

In our opinion up to now too much emphasis has been laid on the colour of the basidiocarps. However, when pigment is available, not only the pileipellis but also the caulocystidia and sometimes the pleurocystidia are coloured in varying degrees. Therefore, many supposed differences between the above-mentioned taxa are quantitative, not qualitative.

In an attempt to arrive at a rational subdivision of the *P. plautus* complex possible correlations between the following characters have been studied: colour of basidiocarps, and size and shape of spores, pleurocystidia, elements of pileipellis, and of caulocystidia.

Four different colour-classes of the pileus are recognized, viz.:

- (i) dark brown in centre (more or less corresponding to *P. plautus*, *P. punctatus* and *P. punctipes*);
- (ii) middle brown in centre (more or less corresponding to *P. granulatus*);
- (iii) pale brown in centre (more or less corresponding to *P. depauperatus* and *P. dryophiloides*);
- (iv) white (more or less corresponding to *P. boudieri*, *P. gracilis* and *P. semibulbosus*).

The microscopical characters have been scored quantitatively, based on the average of 10 measurements per collection. A scatterdiagram showing the distribution of 30 variously coloured collections with average spore-length plotted against average length-width ratio of elements of the pileipellis is given in Fig. 8.

From this diagram the following conclusions can be drawn. Generally speaking, white and pale basidiocarps tend to have larger spores and shorter elements in the pileipellis than dark-coloured specimens. So, it is evident that white and pale variants cannot be considered as pigmentless or poorly pigmented variants of a species with usually distinctly coloured basidiocarps, as they differ also in other characters than colour only. However, the diagram also shows much overlap in characters, which effectively precludes any

meaningful classification of these variants. For this reason we firmly believe that the formal recognition of taxa, even on infraspecific level, is unwarranted.

In Fig. 9 the distribution of the examined collections of Fig. 8 in Europe is given and occurrence on coniferous or deciduous wood is indicated. No ecological or phytogeographical pattern seems to emerge: both basidiocarps with pale and dark colours has been found on deciduous wood. However, it might be added that in natural conifer forests in central Europe only dark coloured basidiocarps were found.

An explanation for the wide variation present in *P. plautus* might be found in the hypothesis that a white taxon with relatively short elements in the pileipellis and large spores has come in contact with a dark taxon with relatively long elements in the pileipellis and small spores, causing a (hybrid-)swarm of variants with basidiocarps in all shades of brown. Whether this represents a case of true hybridization of distinct species or only secondary genetical contact between morphological distinct but conspecific populations cannot be determined. However, the fact that specimens in the intermediate group are bigger and more fleshy, whereas many of the white and all the dark variants have basidiocarps that are more fragile, suggests some kind of hybrid vigour and possibly indicates true hybridization.

*Pluteus plautus* is with some authors (for instance Métrod, 1943: 16) a species growing only on coniferous wood, but in the original description (Weinman, 1836) the substrate given is discarded wood, without mention of its nature.

*Pluteus semibulbosus* is taken here as a species with a hymenidermal pileipellis of elongate elements, and not as a species with a pileipellis made up of spheropedunculate to clavate elements as it is the concept of Lange (1917: 8) and Orton (1960: 349) (see also under *P. inquilinus*. p. 370).

Heim & Romagnesi (1934: 166) published a description under the name *P. roberti* (Fr.) P. Karst., based on a few French collections. Later Romagnesi (1956: 182, 215–218) came to the conclusion that in 1934 the name *P. roberti* had been misapplied and described the taxon concerned as a new species, viz. *P. hiatusulus* Romagn., citing an additional collection (Lamorlaye, 10 Oct. 1946).

The Lamorlaye-collection has been studied by one of us (J.S.) and is characterized as follows: spores (7.0–)7.3–8.4 × (5.5–)6.2–7.2(–7.5) μm, Q = 1.05–1.25,  $\bar{Q}$  = 1.15, subglobose to broadly ellipsoid; pileipellis a hymeniderm made up of 50–100 × 15–24 μm large colourless elements on a cutis-like underlayer; stipitepellis with narrowly clavate caulocystidia. On account of these characters this collection belongs to *P. plautus*. The characters, particularly the structure of the pileipellis, are in contradiction with those as mentioned by Romagnesi (1956: 217).

It is not quite clear from the descriptions if *P. hiatusulus* belongs to section *Villosi*, as suggested by Romagnesi or to *P. plautus*. One of the collections mentioned in 1934 (not studied by us) should be designated as lectotype and restudied. Until then the identity of *P. hiatusulus* remains uncertain.

One of the six collections on which the original description of *P. depaupertus* Romagn. is based (Yerres, Chateau de la Grange, June–Aug. 1936) has been examined by one of

us (J.S.) and is characterized by the following characters: spores  $6.5-7.0 \times (3.8-4.0-4.4 \mu\text{m})$ ,  $Q = 1.5-1.7(-1.85)$ ,  $\bar{Q} = 1.65$ ; elements of the pileipellis  $(40-45-75(-80) \times 15-20 \mu\text{m})$ , not or slightly coloured. The ellipsoid-oblong spores are exceptional within *P. plautus* and have not been recorded by Romagnesi, since he mentions subglobose to broadly ellipsoid spores (1956: 223). Despite its more slender spores this collection is considered conspecific with *P. plautus* and this collection is here designated as the lectotype of *P. depauperatus*.

In the Bresadola herbarium at Stockholm (S) four collections of *P. granulatus* Bres., collected by Bresadola himself, are conserved, and bear the following data:

- (i) Estate, Aut. 1882. Orti dei pratis sulle asei d'abete marcete.
- (ii) Aug. 1898. Cavelmonte, ad truncos abiegnos.
- (iii) 1901, Andalo, ad truncos conifer.
- (iv) Sept. 1904, Sopramonte, in truncis abiegnis.

The type-collection from Val di Sole is apparently missing. Singer (1959: 223) studied in NY another of Bresadola's collections of this species: (v) Aug. 1904, Mendalo, on coniferous trunks.

The characters of these collections are:

(i) Spores  $(7.2-7.3-8.1(-9.0) \times (5.5-5.7-6.8(-7.6) \mu\text{m})$ ,  $Q = 1.15-1.3(-1.4)$ ,  $\bar{Q} = 1.25$ , broadly ellipsoid, a few ellipsoid; cheilocystidia not observed; pleurocystidia present, near pileus  $43-65 \times 8-13 \mu\text{m}$ , narrowly lageniform; pileipellis consisting of scattered clusters of erect elements,  $55-100 \times 13-25 \mu\text{m}$ , with brown intracellular pigment; underlying layer a cutis of brown coloured hyphae; stipitepellis a cutis of  $4-10 \mu\text{m}$  wide cylindrical hyphae with clusters of pale brown to colourless caulocystidia.

(ii) Spores  $6.8-7.6 \times 5.3-6.0(-6.4) \mu\text{m}$ ,  $Q = 1.2-1.35(-1.4)$ ,  $\bar{Q} = 1.25$ , broadly ellipsoid, a few ellipsoid; pleurocystidia  $50-70 \times 13-27 \mu\text{m}$ , narrowly lageniform to utriform-ovoid, with  $7-15 \mu\text{m}$  wide apex; cheilocystidia  $28-68 \times 11-35 \mu\text{m}$ , narrowly clavate, narrowly subutriform, some broadly clavate; pileipellis a hymeniderm of pale coloured elements, narrowly clavate-fusiform,  $80-115 \times 20-33 \mu\text{m}$ ; stipitepellis a cutis with numerous brown coloured caulocystidia.

(iii) Spores  $(6.9-7.0-8.0(-8.4) \times (5.3-5.9-6.4 \mu\text{m})$ ,  $Q = (1.15-1.2-1.3(-1.4))$ ,  $\bar{Q} = 1.25$ , broadly ellipsoid, some ellipsoid; pleurocystidia  $41-80 \times 16-28 \mu\text{m}$ , lageniform-utriform; cheilocystidia  $38-57 \times 11-24 \mu\text{m}$ , clavate, narrowly lageniform; pileipellis a trichohymeniderm of pale coloured elements, up to  $220 \times 22 \mu\text{m}$ , fusiform; stipitepellis a cutis of cylindrical  $5-10 \mu\text{m}$  wide hyphae with at base some squamule-like structures.

(iv) Spores  $(6.7-7.0-8.0 \times (5.2-5.8-6.4 \mu\text{m})$ ,  $Q = 1.15-1.3(-1.35)$ ,  $\bar{Q} = 1.2$ , broadly ellipsoid; pleurocystidia clavate; cheilocystidia  $45-57 \times 10-20 \mu\text{m}$ , narrowly lageniform with  $4-6 \mu\text{m}$  wide apex; pileipellis a hymeniderm of pale brown coloured elements, up to  $95 \times 15 \mu\text{m}$ ; stipitepellis a cutis of cylindrical  $5.5-13 \mu\text{m}$  wide hyphae.

(v) (according to Singer, 1959: 223) Spores  $7-8.8 \times 6-7 \mu\text{m}$ , subglobose to short cylindrical; pleuro- and cheilocystidia  $50-78 \times 7.7-13.2 \mu\text{m}$ , often short-pedicellate, narrowly lageniform, some subcapitate; pileipellis a differentiated cutis of  $20-25 \mu\text{m}$  wide hyphae, yellowish hyaline to yellow, with fascicles of spheropedunculate to clavate elements,  $16-50 \times 11-16.5 \mu\text{m}$ .



The first collection, though in rather bad condition, is chosen here as the lectotype of *P. granulatus*; the second also represents *P. granulatus*; the third and the fourth collection probably represent *P. roseipes*, but notes of the colour of the stipe are lacking.

#### Subsection *Mixtini* Sing. ex Sing.

*Pluteus* subsect. *Mixtini* Sing. ex Sing. in *Lloydia* 21: 257. 1958. — Holotype: *Pluteus psychiophorus* (B. & Br.) Sacc.

Characteristics. — Cheilocystidia implanted on a layer of parallel hyphae; pileipellis a hymeniderm consisting of broadly clavate to clavate and fusiform, narrowly conical and cylindrical elements.

#### KEY TO THE SPECIES

- 1 a. Pleurocystidia present; cheilocystidia not rostrate; stipe white or whitish, glabrous to innately brown fibrillose, rarely brown flocculose . . . . . 16. *P. podospileus*  
 b. Pleurocystidia absent or very rare; cheilocystidia rostrate; stipe grey with white (rarely brown) floccules . . . . . 17. *P. thomsonii*

#### 16. *Pluteus podospileus* Sacc. & Cub.

*Pluteus podospileus* Sacc. & Cub. in Sacc., Syll. Fung. 5: 672. 1887. — *Pluteus nanus* var. *podospileus* J. Rick in *Lilloa* 3: 444. 1938.

*Pluteus nanellus* Murrill in *N. Amer. Fl.* 10: 130. 1917.

*Pluteus minutissimus* Maire in *Publicions Inst. bot., Barcelona* 3: 94. 1937. — *Pluteus psychiophorus* var. *minutissimus* (Maire) Sing. in *Trans. Br. mycol. Soc.* 39: 214. 1956 (as *Pluteus 'psychiophorus'* var. *minutissimus*; not validly published, basionym not mentioned).

*Leptonia seticeps* Atk. in *J. Mycol.* 8: 116. 1902. — *Leptoniella seticeps* (Atk.) Murrill, *N. Amer. Fl.* 10: 92. 1917. — *Pluteus psychiophorus* var. *seticeps* (Atk.) Sing. in *Trans. Br. mycol. Soc.* 39: 214. 1956 (as *Pluteus 'psychiophorus'* var. *seticeps*; not validly published, basionym not mentioned). — *Pluteus seticeps* (Atk.) Sing. in *Lloydia* 21: 272. 1959.

*Pluteus granulatus* var. *tenellus* J. Favre in *Mat. Fl. cryptog. Suisse* 10: 213. 1948.

*Pluteus minutissimus* f. *major* Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 182. 1956.

Misapplied name. — *Agaricus spilopus* sensu B. & Br. in *Ann. Mag. nat. Hist., ser. V*, 7: 126. 1881.

#### KEY TO THE FORMAE

- 1 a. Stipe entirely innately dark brown fibrillose or brown flocculose *P. podospileus* f. *podospileus*  
 b. Stipe entirely smooth or innately dark brown fibrillose at base only  
*P. podospileus* f. *minutissimus*

#### *Pluteus podospileus* f. *podospileus*

Selected descriptions & illustrations. — P. D. Orton in *Trans. Br. mycol. Soc.* 43: 363. 1960 (as *P. podospileus*); R. Phillips, *Paddest. Schim.*: 118. 1981 (as *P. podospileus*).

***Pluteus podospileus* f. *minutissimus* (Maire) Vellinga, *stat. & comb. nov.***

Basionym: *Pluteus minutissimus* Maire in *Publicions Inst. bot.*, Barcelona 3: 94. 1937.

*Pluteus minutissimus* f. *typicus* Kühn. in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 190. 1956 (inadmissible epitheton).

Selected description. — Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 190–192. 1956 (as *P. minutissimus* f. *typicus*).

Grauwinkel & al. (1984: 15–26) consider *Pluteus podospileus* and *P. minutissimus* identical. We follow, however, Kühner (1956: 190–195) who treats these taxa as conspecific formae, unfortunately using the incorrect name *P. minutissimus* for the species concerned. The only difference between the two formae is found in the covering of the stipe, viz. innately dark brown fibrillose or brown flocculose in f. *podospileus* against not dark brown fibrillose at all or only at the base of the stipe in f. *minutissimus*.

**17. *Pluteus thomsonii* (B. & Br.) Dennis**

*Agaricus thomsonii* B. & Br. in *Ann. Mag. nat. Hist.*, ser. IV, 17: 131. 1876 (Notic. Brit. Fung. 1523) (as *Agaricus thomsonii*). — *Entoloma thomsonii* (B. & Br.) Sacc. in *Syll. Fung.* 5: 693. 1887.

— *Pluteus thomsonii* (B. & Br.) Dennis in *Trans. Br. mycol. Soc.* 31: 206. 1948.

*Pluteus cinereus* Qué! in *Ann. Sci. nat. Bordeaux*: pl. 1. 1884.

*Pluteus reisneri* Velen. in *České Houby*: 610. 1921.

*Pluteus pilatii* Velen. in *Mykologia* 6: 25. 1929 (as *Pluteus pilati*).

*Pluteus cinereus* var. *venosus* Vaček in *Studia bot. Čech.* 11: 47. 1948.

*Pluteus cinereus* f. *typicus* Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 199. 1956 (inadmissible epitheton).

*Pluteus cinereus* f. *evenosus* Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 181. 1956.

Misapplied name. — *Pluteus godeyi* sensu Kühn. & Romagn., *Fl. anal. Champ. sup.*: 423. 1953.

Excluded. — *Pluteus thomsonii* sensu Sing. in *Trans. Br. mycol. Soc.* 39: 216. 1956 (= *Pluteus cinereofuscus*).

Selected descriptions & illustrations. — Kühner in Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 199–206. 1956 (as *P. cinereus* f. *typicus* and f. *evenosus*). — D. Reid in *Fung. rar. Ic. col.* 2: 20–22, pl. 14 b. 1967.

**Subsection *Eucellulodermini* Sing. ex Sing.**

*Pluteus* subsect. *Eucellulodermini* Sing. ex Sing. in *Lloydia* 21: 274. 1958. — Lectotype: *Pluteus nanus* (Pers.: Fr.) Kumm. (Sing. in *Lloydia* 21: 275. 1958).

*Pluteus* sect. *Pruinosi* Imai in *J. Fac. Agric. Hokkaido (imp.) Univ.* 43: 161. 1938. — Lectotype: *Pluteus nanus* (Pers.: Fr.) Kumm.

*Pluteus* sect. *Nudi* Imai in *J. Fac. Agric. Hokkaido (imp.) Univ.* 43: 163. 1938. — Lectotype: *Pluteus phlebophorus* (Ditm.: Fr.) Kumm.

*Pluteus* [B] *Micaceae* J. Lange in *Dansk bot. Ark.* 2(7): 4. 1917 (illegitimate, no rank indicated).

Characteristics. — Cheilocystidia rooting in hymenophoral trama; pileipellis from a hymeniderm of elements with  $Q < 3$  to transition between hymeniderm and epithelium.

## KEY TO THE SPECIES

- 1 a. Pileus white . . . . . 30. *P. inquilinus*  
 b. Pileus orange-red, brown, grey, yellow or olive-tinged, not white . . . . . 2  
 2 a. Pileus orange-red . . . . . 31. *P. aurantiorugosus*  
 b. Pileus brown, grey, yellow or olive-tinged, not orange-red . . . . . 3  
 3 a. Stipe chrome yellow, at least at base . . . . . 19. *P. romellii*  
 b. Stipe white, at most slightly yellowish cream at base or grey . . . . . 4  
 4 a. Pleurocystidia absent or scarce . . . . . 5  
 b. Pleurocystidia present and moderately abundant to abundant . . . . . 7  
 5 a. Spores subglobose to broadly ellipsoid ( $\bar{Q} = 1.15$ ); cheilocystidia partly rostrate  
     22. *P. insidiosus*  
 b. Spores ellipsoid to oblong ( $Q = 1.5 - 1.65$ ); cheilocystidia not rostrate . . . . . 6  
 6 a. Stipe without caulocystidia; surface of pileus radially splitting and breaking up into granules  
     20. *P. diettrichii*  
 b. Stipe, when young, with caulocystidia; surface of pileus glabrous . . . . . 21. *P. poliocnemis*  
 7 a. Pileus dark grey, dark brown, soot-coloured, sometimes with slight olive tinge; surface of pileus becoming 'opaque' when gently rubbed; stipe white greyish striate, or grey all over and then white flocculose when young . . . . . 18. *P. nanus*  
 b. Pileus yellow to dark brown, grey or olive-tinged, not becoming 'opaque' when gently rubbed; stipe white or pale cream, or with distinct bluish or greenish grey tinges in lower part and then not white flocculose when young (group of *P. phlebophorus*). . . . . 8  
 8 a. Stipe, at least in lower part, distinctly greenish or bluish grey . . . . . 28. *P. cyanopus*  
 b. Stipe lacking bluish or greenish grey tinges, but white or pale cream at base . . . . . 9  
 9 a. Edge of lamellae brown at least near margin of pileus . . . . . 29. *P. luctuosus*  
 b. Edge of lamellae concolorous with surface . . . . . 10  
 10 a. Pileus with distinct papilla . . . . . 27. *P. mammifer*  
 b. Pileus not distinctly papillate, mostly broadly umbonate . . . . . 11  
 11 a. Pileus yellowish, ochraceous brown, golden yellow at margin, sometimes with olive tinge; brown or hyaline elements of pileipellis in centre lying on a layer of yellow hyphae  
     23. *P. chrysophaeus*  
 b. Pileus brown, grey-brown, with or without olive tinges, not yellow . . . . . 12  
 12 a. Pileus slightly or not hygrophanous, venose to venulose, brown to dark brown  
     24. *P. phlebophorus*  
 b. Pileus distinctly hygrophanous, smooth to venulose in centre, grey-brown, brown, with or without olive tinges . . . . . 13  
 13 a. Pileus greyish brown to brown, with distinct olive tinge, especially when young; pleurocystidia in full-grown basidiocarps mostly narrowly lageniform . . . . . 25. *P. cinereofuscus*  
 b. Pileus dark brown to brown; pleurocystidia broadly utriform to ovoid-oblong in full-grown basidiocarps . . . . . 26. *P. pallescens*

18. *Pluteus nanus* (Pers.: Fr.) Kumm.

*Agaricus nanus* Pers., Syn. meth. Fung.: 357. 1801. — *Agaricus nanus* Pers.: Fr., Syst. mycol. 1: 200. 1821. — *Pluteus nanus* (Pers.: Fr.) Kumm., Führ. Pilzk.: 98. 1871.

*Pluteus satur* Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 182. 1956 (Compl. Fl. anal. Champ. sup. 8).

*Pluteus griseopus* P. D. Orton in Trans. Br. mycol. Soc. 43: 356. 1960.

Excluded. — *Pluteus satur* sensu Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 226. 1956 (= *Pluteus pallescens*).

Selected descriptions & illustrations.— Konr. & M., Ic. sel. Fung. 1: pl. 22. 1925; J. Lange, Fl. agar. dan. 2: pl. 72G. 1937; P. D. Orton in Trans. Br. mycol. Soc. 43: 358. 1960.

## KEY TO THE FORMAE

- 1 a. Stipe when young entirely covered with floccules . . . . . *P. nanus* f. *griseopus*  
 b. Stipe when young smooth . . . . . *P. nanus* f. *nanus*

***Pluteus nanus* f. *griseopus* (P. D. Orton) Vellinga, stat. & comb. nov.**

Basionym: *Pluteus griseopus* P. D. Orton in Trans. Br. mycol. Soc. 43: 356. 1960.

*Pluteus nanus* and *P. griseopus* are usually distinguished on the nature of the stipe surface: glabrous in *P. nanus*, white-flocculose in *P. griseopus* when young. Moreover, Orton (1960: 356) described the colour of the stipe more grey in *P. griseopus* than in *P. nanus*. As these are the only distinctive characters and the stipe of *P. nanus* is not pure white but shows a greyish striation, I (E.C.V.) prefer to reduce *P. griseopus* to a forma of *P. nanus*. The pileipellis structures of *P. griseopus* and *P. nanus* are identical.

**19. *Pluteus romellii* (Britz.) Sacc.**

*Agaricus romellii* Britz., Hymenomyc. Südbayern 8: 5. 1891. — *Pluteus romellii* (Britz.) Sacc., Syll. Fung. 11: 44. 1895.

*Agaricus nanus* var. *lutescens* Fr., Epicr.: 141. 1838 — *Pluteus nanus* var. *lutescens* (Fr.) P. Karst., Ryssl., Finl., Skand. Halföns Hattsvamp.: 256. 1879. — *Pluteus lutescens* (Fr.) Bres., Iconogr. mycol. 11: 544, 1. 1929. — *Pluteus nanus* subsp. *lutescens* (Fr.) Konr. & M., Ic. sel. Fung. 6: 55. 1930.

*Pluteus sternbergii* Velen., České Houby: 610. 1921.

*Pluteus splendidus* A. Pears. in Trans. Br. mycol. Soc. 35: 110. 1952.

Misapplied name.—*Pluteus chrysophaeus* sensu Métrod in Revue Mycol. 7: 19. 1943.

Selected descriptions & illustrations.— J. Lange, Fl. agar, dan. 2: pl. 72F. 1937 (as *P. nanus* var. *lutescens*); Stangl. & Bresinsky in Z. Pilzk. 34: 96. 1968; Homola in Mycologia 64: 1243. 1972 (as *P. lutescens* var. *lutescens*); R. Phillips, Paddest. Schimm.: 120. 1981.

On account of the characters mentioned by Velenovský (1921: 610), viz. the combination of the brown pileus and the yellow stipe, *Pluteus sternbergii* is considered as a synonym of *P. romellii*.

Pearson (1952: 110) described *P. splendidus*, macroscopically characterized by the bicoloured aspect of the pileus, chrome yellow at centre and dark yellowish brown elsewhere, and the chrome to lemon yellow stipe. The two collections gathered by Pearson and conserved in K, have been examined: spores 6.0–7.0(–7.4) × (4.8–)5.1–6.0(–6.5) μm, Q = 1.05–1.25,  $\bar{Q}$  = 1.15, subglobose to broadly ellipsoid; pleurocystidia broadly clavate to broadly utriform; pileipellis a hymeniderm of narrowly clavate, clavate to spheropedunculate cells, with brown vacuolar pigment. The exsiccates do not show the bicoloured aspect of the pileus; all elements of the pileipellis are filled with brown pigment. On account of the shape of the pleurocystidia and the characters mentioned above this species is regarded as a synonym of *P. romellii*. The oldest collection (*A. A.*

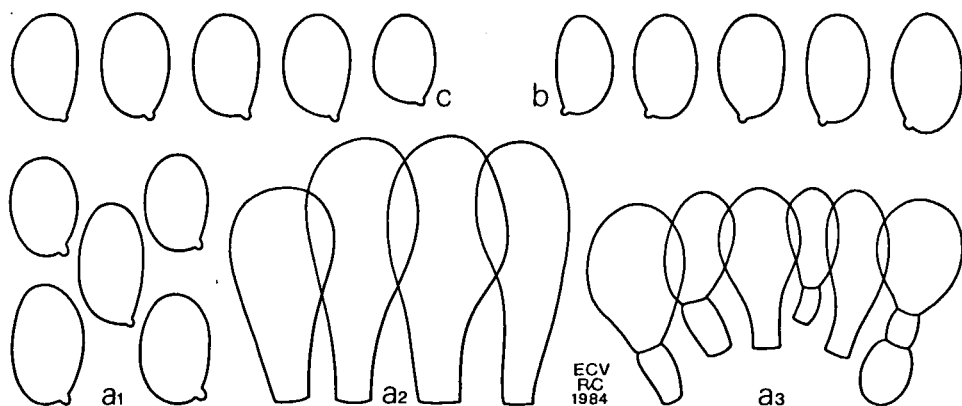


Fig. 10. *Pluteus diettrichii*. — a1. Spores ( $\times 1500$ ). — a2. cheilocystidia ( $\times 1000$ ). — a3. elements of pileipellis ( $\times 500$ ) (a. from lectotype). — b. Spores ( $\times 1500$ ) (*G. Bresadola*, 8 July 1903). — c. Spores ( $1500\times$ ) (lectotype of *Pluteus rimulosus*).

*Pearson*, 27 Sept. 1948, Great Britain, Yorkshire, Masham, Swinton Park (K) is designated as the lectotype of *P. splendidus*.

## 20. *Pluteus diettrichii* Bres. — Fig. 10

*Pluteus diettrichii* Bres. in *Annls mycol.* 3: 160. 1905.

*Pluteus rimulosus* Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 182. 1956.

Selected illustrations & descriptions. — Bres., *Iconogr. mycol.* 11: pl. 546. 1929; Kühn. & Romagn. in *Bull. trimest. Soc. mycol. Fr.* 72: 195–197, 224–226. 1956 (as *P. rimulosus*).

The two collections mentioned by Bresadola (1905: 160) and conserved in the Bresadola herbarium in Stockholm (S) have been studied; their characters are:

'*Diettrich*, Oct. 1904, Arco, in agris':

Spores  $(8.2-8.3-10.8(-11.6) \times (5.3-5.6-6.3(-6.8) \mu\text{m})$ ,  $Q = 1.4-1.75(-1.85)$ ,  $Q = 1.55$ ; pleurocystidia absent; cheilocystidia  $25-37 \times 10-16 \mu\text{m}$ , narrowly clavate, some narrowly utriform; elements of pileipellis  $25-42 \times (12-13-25 \mu\text{m})$ , narrowly clavate to spheropedunculate, with brown vacuolar pigment; stipitepellis a cutis of  $4-5 \mu\text{m}$  wide cylindrical pale brown hyphae.

'*Bresadola*, 8 July 1903, Gocciadoro':

Spores  $8.4-10.0(-10.1) \times (5.1-5.2-6.3(-6.5) \mu\text{m})$ ,  $Q = 1.55-1.8(-1.85)$ ,  $\bar{Q} = 1.65$ ; pleurocystidia absent; cheilocystidia  $28-56 \times 11-25 \mu\text{m}$ , narrowly clavate to narrowly utriform; elements of pileipellis  $42-62 \times 24-42 \mu\text{m}$ , narrowly clavate to spheropedunculate, with brown vacuolar pigment; stipitepellis a cutis of  $9-15 \mu\text{m}$  wide cylindrical hyphae.

The surface of the pileus of both exsiccata is radially splitting towards the margin and the underlying white context is showing.

In addition one of the original collections of *P. rimulosus* Kühn. & Romagn. has been studied (*H. Romagnesi*, 22 July 1947, France, dept. Seine-et-Oise, Luzarches; herb. H. Romagnesi). The characters found agree with the description (1956: 226):

Spores (7.5–)7.6–9.0(–9.2) × (5.2–)5.4–5.9(–6.2)  $\mu\text{m}$ ,  $Q = (1.35\text{--})1.4\text{--}1.6$ ,  $\bar{Q} = 1.5$ ; pleurocystidia absent; cheilocystidia (36–)42–56(–61) × (15–)16–29(–32)  $\mu\text{m}$ , narrowly clavate to clavate; elements of pileipellis (30–)33–53(–58) × 18–32(–36)  $\mu\text{m}$ , with brown vacuolar pigment; stipitepellis a cutis of cylindrical 5–10  $\mu\text{m}$  wide hyphae. This collection is designated as lectotype of *P. rimulosus*.

*Pluteus rimulosus* is considered as a synonym of *P. diettrichii* on account of the characters mentioned above, viz. the shape of the spores, the absence of pleurocystidia, the shape of the elements in the pileipellis, and macroscopically the surface of the pileus. The difference in spore-size between Bresadola's collections and the collection made by Romagnesi is insufficient for considering them as non-conspecific.

Diettrich's collection of *P. diettrichii* is chosen as the lectotype of the species, because of the presence of macroscopic notes with this collection; both collections in the Bresadola herbarium are in good condition.

## 21. *Pluteus poliocnemis* Kühner

*Pluteus poliocnemis* Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 182. 1956.

Selected illustration & description. — Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 197–199. 1956.

## 22. *Pluteus insidiosus* Vellinga & Schreurs, *spec. nov.* — Fig. 11

Pileus 25–40 mm, planoconvexus vel planus, leviter umbonatus, hygrophanus, humidus in centro fuscobrunneo-ater, ad marginem brunneus, margine striatula, in siccitate brunneus, venulosus in disco vel glaber. Lamellae liberae, ex roseae incarnatae vel brunneo-roseae, ad aciem integrae. Stipes 35–45 × 3–4 mm, aequalis vel leviter incrassatus ad basim, albidus vel argenteo-griseus, fibrillosus, glaber. Caro in pileo ex grisea in siccitate albida; in stipite grisea vel albida. Odor et sapor nulli. Sporae (5.5–)6.0–8.0(–8.5) × (5.0–)5.5–7.0(–7.5)  $\mu\text{m}$ , subglobose vel late ellipsoideae. Pleurocystidia absentia vel rara. Cheilocystidia non densa, tenuiter clavata, tenuiter utriformia, vel acute fusiformia, nonnulla rostrata. Pileipellis hymenidermium elementorum sphaeropedunculatorum vel clavatorum brunneo-vacuolatorum. Ad truncos *Alni* et *Fagi*; VIII–X. — Holotypus: 'M. E. Noordeloos 983, 22-VIII-1979, loampits, Buren, prov. Gelderland, Netherlands' (L).

Pileus 25–40 mm, planoconvex, applanate, with low umbo, slightly hygrophanous, when moist very dark brown to black in centre, pallescent towards margin to dark brown or brown (Munsell 7.5 YR 2/1–3/3), with translucently striate margin, on drying pallescent to brown (Munsell 7.5 YR 4/4), in centre venulose or smooth. Lamellae (L = 48–72 / 1 = 0–3) fairly crowded, free, slightly ventricose, up to 5 mm broad, first pink, later incarnate, sordid or brownish pink, with even concolorous edge. Stipe 35–45 mm, cylindrical or slightly broadening downwards, solid, whitish or silverish grey, innately fibrillose, glabrous and shiny. Context in pileus hygrophanous, when moist grey, pallescent on drying to whitish; in stipe concolorous with surface. Smell absent or bitterish; taste absent or slightly unpleasant.

Spores (5.5–)6.0–8.0(–8.5) × (5.0–)5.5–7.0(–7.5)  $\mu\text{m}$ ,  $Q = 1.05\text{--}1.25(–1.4)$ ,  $\bar{Q} = 1.15$ , subglobose to broadly ellipsoid, a few ellipsoid. Basidia (21–)27–36(–43) × 6–9(–11)  $\mu\text{m}$ , 4-spored. Pleurocystidia absent or very rare, 45–75 × 19–40  $\mu\text{m}$ , utriform to broadly utriform, thin-walled and colourless. Cheilocystidia not crowded, (23–)26–44(–50) × (7–)8–14(–19)  $\mu\text{m}$ , clavate to narrowly subutriform, some

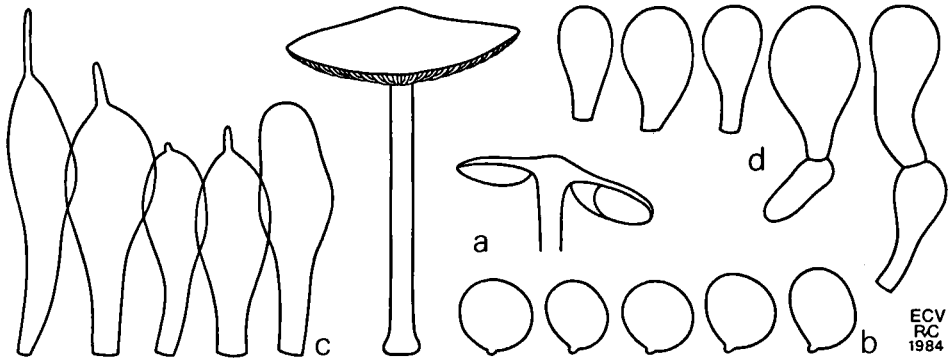


Fig. 11. *Pluteus insidiosus*, type. — a. Habit ( $\times 1$ ). — b. Spores ( $\times 1500$ ). — c. Cheilocystidia ( $\times 1000$ ). — d. Elements of pileipellis ( $\times 500$ ).

with narrow, needle-like, 3–40  $\mu\text{m}$  long appendix at apex, colourless or with granular colourless content. Pileipellis a hymeniderm of spheropedunculate to narrowly clavate elements, (23–)42–50(–60)  $\times$  (10–)15–24(–33)  $\mu\text{m}$ , with dark brown vacuolar pigment. Stipitipellis a cutis of cylindrical, colourless, 4–10  $\mu\text{m}$  wide hyphae; caulocystidia not present.

Habitat.— Solitary on stumps of deciduous trees (*Alnus*, *Fagus*) in resp. Alnetum and Fagetum nudum; August–October.

Collections examined.— NETHERLANDS, prov. Gelderland: Buren, loam-pits, 22 Aug. 1979, *M. E. Noordeloos* 983 (coll. J. Schreurs 315, holotype, L); ibidem, 22 Aug. 1979, *M. E. Noordeloos* s.n., (coll. J. Schreurs 316 L). — GERMAN FEDERAL REPUBLIC, Rheinland-Pfalz: Gees, Reichswald, 5 Oct. 1979, *J. Schreurs* 354 (L).

Macroscopically *Pluteus insidiosus* resembles *P. nanus* and *P. phlebophorus*, but microscopically it is easily distinguished by the characteristic cheilocystidia and the absence of pleurocystidia, two features it has in common with *P. thomsonii* from which it can easily be separated on account of a different type of pileipellis and stipe-covering.

### 23. *Pluteus chrysophaeus* (Schaeff.) Quél.

*Agaricus chrysophaeus* Schaeff., Fung. Bavariae 4: 67. 1774. — *Agaricus leoninus* g *chrysophaeus* (Schaeff.) Fr.: Fr., Syst. mycol. 1: 199. 1821. — *Pluteus chrysophaeus* (Schaeff.) Quél. in Mém. Soc. Emul. Montbéliard, sér. II, 5: 82. 1872 (Champ. Jura Vosges 1).

*Pluteus luteovirens* Rea in Trans. Br. mycol. Soc. 12: 208. 1927.

*Pluteus galeroideus* P. D. Orton in Trans. Br. mycol. Soc. 43: 354. 1960

*Pluteus xanthophaeus* P. D. Orton in Trans. Br. mycol. Soc. 43: 366. 1960.

Misapplied names.— *Pluteus leoninus* sensu P. Karst., Ryssl., Finl. Skand. Halföns Hattsvamp.: 257. 1879; sensu Sing. in Beih. bot. Cbl. 46 (2. Abt.): 105. 1930; sensu Imai in J. Fac. Agric. Hokkaido (imp.) Univ. 43: 163. 1938; sensu Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 233. 1956.

Excluded.— *Agaricus chrysophaeus* sensu Fr., Epicr.: 142. 1838 (= *P. phlebophorus*). — *Pluteus chrysophaeus* sensu Fay. in Ann. Sci. nat., Bot. sér. VII, 9: 364. 1889 (= *Inocybe spec.*). —

*Pluteus chrysophaeus* sensu Métrod in Revue Mycol. 7: 19. 1943 (= *P. romellii*). — *Pluteus chrysophaeus* sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 424. 1953 (= *P. phlebophorus*).

Selected descriptions & illustrations. — J. Lange, Fl. agar. dan. 2: pl. 72D. 1937; Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 233–236. 1956 (as *P. leoninus*); P. D. Orton in Trans. Br. mycol. Soc. 43: 354, 366. 1960 (as *P. galeroideus* and *P. xanthophaeus*); D. Reid, Fung. rar. Ic. col. 3: 18–21. 1968 (as *P. xanthophaeus*); R. Phillips, Paddest. Schimm.: 120. 1981 (as *P. luteovirens*).

Unlike Kühner & Romagnesi (1953: 424) and Orton (1960: 367) we consider *Pluteus chrysophaeus* and *P. phlebophorus* as two distinct species. This opinion is based mainly on a careful re-examination of Schaeffer's original description (1774: 67).

Judging from the original plate (conserved in K) — showing a slender white-stiped *Pluteus* with an umbonate yellow-brown pileus — *P. luteovirens* Rea is identical with *P. chrysophaeus*, just as, in our opinion, *P. galeroideus* P. D. Orton and *P. xanthophaeus* P. D. Orton are conspecific with *P. chrysophaeus*. Microscopically these four 'species' are inseparable; macroscopically they only differ in colour, — yellow-brown, straw-coloured or more lemon yellow —, differences considered of minor importance by us.

#### 24. *Pluteus phlebophorus* (Ditm.: Fr.) Kumm.

*Agaricus phlebophorus* Ditm. in Sturm, Deutschl. Fl. 3: 31. 1817. — *Agaricus phlebophorus* Ditm.: Fr., Syst. mocol. 1: 200. 1821. — *Pluteus phlebophorus* (Ditm.: Fr.) Kumm., Führ. Pilzk.: 98. 1871. — *Pluteus chrysophaeus* var. *phlebophorus* (Ditm.: Fr.) Quéll., Fl. mycol. France: 185. 1888. — *Pluteus nanus* subsp. *phlebophorus* (Ditm.: Fr.) Konr. & M., Ic. sel. Fung. 1: 23. 1925.

Misapplied names. — *Agaricus chrysophaeus* sensu Fr., Epicr.: 142. 1838. — *Pluteus chrysophaeus* sensu Kühn. & Romagn., Fl. anal. Champ. sup.: 424. 1953; sensu Kühn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 206. 1956.

Selected descriptions & illustrations. — Konr. & M., Ic. sel. Fung. 1: pl. 23. 1925 (as *P. nanus* subsp. *phlebophorus*); J. Lange, Fl. agar. dan. 2: pl. 72E. 1937; Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 206–208. 1956 (as *P. chrysophaeus*.); Sing. in Trans. Br. mycol. Soc. 39: 207. 1956.

*Pluteus phlebophorus*, and the taxa around it, viz. *P. chrysophaeus*, *P. cinereofuscus*, *P. pallescens*, *P. mammifer*, *P. cyanopus* and *P. luctuosus*, form a taxonomically difficult group, as they cannot always clearly be separated from each other. For that reason it might sometimes turn out impossible to name individual specimens accurately. The main characters to distinguish these taxa are colour of the pileus (varying from yellow to dark brown or olive grey-brown), colour of the stipe (white to greenish or bluish grey), hygrophanity of the pileus (from not to slightly to very distinctly), colour of the edge of lamellae (white or brown), and shape of the pleurocystidia (narrowly lageniform to broadly utriform).

This difficulty in clearly delimiting the above-mentioned taxa seems to be caused by a comparatively recent speciation; it might even be possible that these taxa are still in a process of incipient speciation. More insight in these processes could be obtained from genetical experiments.

The differences with *P. nanus* are to be found in the structure of the pileipellis: elements loosely arranged in *P. nanus* and more tightly packed in the *P. phlebophorus*-group.



25. *Pluteus cinereofuscus* J. Lange

*Pluteus cinereofuscus* J. Lange in Dansk bot. Ark. 2(7): 9. 1917.

*Pluteus olivaceus* P. D. Orton in Trans. Br. mycol. Soc. 43: 359. 1960.

*Pluteus nanus* var. *major* Cooke ex Mass., Br. Fung. Fl. 2: 288. 1893.

Misapplied names. — *Pluteus godeyi* sensu J. Lange in Dansk bot. Ark. 2(7): 8. 1917; sensu P. D. Orton in Trans. Br. mycol. Soc. 43: 349. 1960. — *Pluteus thomsonii* sensu Sing. in Trans. Br. mycol. Soc. 39: 216. 1956.

Selected descriptions & illustrations. — J. Lange, Fl. agar. dan. 2: pl. 71G. 1937. — Kühner in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 210–212. 1956. — Mal. & Bert., Fl. Champ. sup. Maroc. 1: 95. 1970.

Orton (1969: 359) has described *Pluteus olivaceus* as a species very close to *P. cinereofuscus*, differing from *P. cinereofuscus* in the moist cap being more distinctly olive-tinged and in broader pleurocystidia. In our opinion the former character is of minor importance, as young specimens of *P. cinereofuscus* are more olive-tinged than old ones. Also the difference in shape of pleurocystidia is dependent of age: in young specimens broad and little differentiated cystidia occur; in old specimens pleurocystidia are narrowly lageniform to narrowly utriform. In conclusion, we consider *P. olivaceus* a synonym of *P. cinereofuscus*.

*Pluteus godeyi* in the sense of Lange (1917: 8) and Orton (1960: 349) is a small variant of *P. cinereofuscus*. *Pluteus godeyi* as originally described by Gillet (1876: 395) is a doubtful species. On account of the following combination of characters: pileus very glabrous, rugulose and slightly viscid, lamellae thick, subdistant and interveined, its place within the genus *Pluteus* is not sure.

26. *Pluteus pallescens* P. D. Orton

*Pluteus pallescens* P. D. Orton in Trans. Br. mycol. Soc. 43: 360. 1960.

Misapplied names. — *Pluteus umbrinellus* sensu Huijsman in Fungus 25: 38. 1955. — *Pluteus satur* sensu Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 227–230. 1956.

Selected descriptions & illustrations: Huijsman in Fungus 25: 38–39. 1955 (as *P. umbrinellus*); Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 227–230. 1956 (as *P. satur*); P. D. Orton in Trans. Br. mycol. Soc. 43: 360–361. 1960.

27. *Pluteus mammifer* Romagn.

*Pluteus mammifer* Romagn. in Bull. trimest. Soc. mycol. Fr. 94: 375. ('1978') 1979.

Selected description & illustration. — Romagn. in Bull. trimest. Soc. mycol. Fr. 94: 374–376. ('1978') 1979.

28. *Pluteus cyanopus* Quél.

*Pluteus cyanopus* Quél. in C. R. Ass. franç. Av. Sci. (Rochelle, 1882) 11: 6. 1883 (Champ. Jura Vosges Suppl. 11). — *Pluteus chrysophaeus* var. *cyanopus* (Quél.) Quél., Fl. mycol. France: 185. 1888.

*Pluteus metrodii* Mal. & Bert., Fl. Champ. sup. Maroc 1: 98. 1970 (not validly published, no Latin diagnosis).

Selected descriptions & illustrations. — Bres., Iconogr. mycol. 11: pl. 543 fig. 2. 1929; Métrod in Revue Mycol. 7: 17. 1943; Mal. & Bert., Fl. Champ. sup. Maroc 1: pl. 4. 1970; Homola in Mycologia 64: 1226. 1972; Derbsch in Z. Pilzk. 43: 181. 1977.

Métrod (1943: 17) has given a description of *Pluteus cyanopus* Quél., but according to Malençon & Bertault (1970: 98), Métrod's material differs from the real *P. cyanopus* in the following characters: stipe bluish green versus blue, pleuro- and cheilocystidia both being fusiform and of the same size in Métrod's material, versus pleurocystidia ventricose-fusiform and cheilocystidia clavate and smaller than pleurocystidia in their specimens of the true *P. cyanopus*. Malençon & Bertault introduced the name *P. metrodii* for the blue-tinged species described by Métrod.

In the Netherlands' collections examined the colour of the stipe varies from bluish to bluish-greenish grey and the shape of pleuro- and cheilocystidia varies from clavate to lageniform or ventricose-fusiform. On account of this variation *P. metrodii* is reduced to a synonym of *P. cyanopus*.

### 29. *Pluteus luctuosus* Boud.

*Pluteus luctuosus* Boud. in Bull. trimest. Soc. mycol. Fr. 21: 70. 1905. — *Pluteus marginatus* var. *luctuosus* (Boud.) Kühn. & Romagn., Fl. anal. Champ. sup.: 424. 1953 (not validly published, basionym not mentioned).

*Pluteus phlebophorus* var. *marginatus* Quél. in C. R. Ass. franç. Av. Sci. (Blois, 1884) 13: 2. 1885 (Champ. Jura Vosges Suppl. 13). — *Pluteus marginatus* (Quél.) Bres., Iconogr. mycol. 11: 546, 2. 1929.

Selected descriptions. — Kühner in Bull. mens. Soc. linn. Lyon 3: 50. 1935; Huijsman in Fungus 25: 36. 1955; Romagn. in Kühn. & Romagn. in Bull. trimest. Soc. mycol. Fr. 72: 230–233. 1956 (as *P. marginatus*).

### 30. *Pluteus inquilinus* Romagn.

*Pluteus inquilinus* Romagn. in Bull. trimest. Soc. mycol. Fr. 94: 377. ('1978') 1979.

*Pluteus alborugosus* Kühner in Kühn. & Romagn., Fl. anal. Champ. sup.: 423. 1953 (not validly published, no Latin diagnosis).

Misapplied name. — *Pluteus semibulbosus* sensu J. Lange in Dansk bot. Ark. 2(7): 8. 1917; sensu P. D. Orton in Trans. Br. mycol. Soc. 43: 349. 1960.

Selected illustration. — J. Lange, Fl. agar. dan. 2: pl. 71C. 1937 (as *P. semibulbosus*).

In Lange's (1917: 8) concept *Pluteus semibulbosus* is a species with a pileipellis consisting of spheropedunculate elements and a nearly completely glabrous stipe. But the original description by Lasch (in Fries, 1838: 141) gives the following characters of pileus and stipe: 'pileo atomato-molli, stipite subtiliter fistuloso pubescente, basi bullato'. In our opinion this evidently is a species with a pileipellis made up of more elongate elements, also on account of the stipe-covering, representing a white variant of *P. plautus*.

Kühner (1953: 423) gave a new, be it invalid, name, viz. *P. alborugosus*, to Lange's taxon, which according to Lange (1917: 8) is characterized by long and narrow (up to

115  $\mu\text{m}$  long) pleurocystidia. Records of this species from Europe are rare. The white cellulodermal *Plutei* found, usually miss the conspicuous narrow pleurocystidia (e.g. Reijnders, 1982: 72) and have pleurocystidia that are slenderly utriform to conical-fusiform, up to 80  $\mu\text{m}$  long. However, one collection from the Netherlands showed long narrow pleurocystidia and in addition more obtuse and shorter ones. The long pleurocystidia were the most conspicuous in the fresh specimen, but were collapsed in the exsiccate. On account of these data all white specimens with a  $\pm$  one-layered hymeniderm of clavate to spheropedunculate elements and long and narrow and/or shorter and broader pleurocystidia are considered here as belonging to one species of which *P. inquilinus* is the correct name.

*Pluteus inquilinus*, based on a collection of small specimens from an atypical habitat, viz. on *Carex* and *Phragmites*-rests in a swamp, is in contrast with *P. alborugosus* validly published. In Romagnesi's opinion it differs in shape of pleurocystidia and habitat from *P. alborugosus*. However, as noted above, shape and size of pleurocystidia of *P. alborugosus* are very variable, whereas habitat differences hardly allow for the description of a new species.

On account of the presence of the very long and slender pleurocystidia, *P. inquilinus* is definitely not a white variant of one of the coloured species of this subsection, but a true species.

Other white species belonging to this subsection are the American species *P. roseocandidus* Atk., *P. pallidus* Homola and *P. hololeucus* Sing; the first differing in the pileipellis consisting of 2 to 3 layers of subglobose to clavate elements; *P. pallidus* in a slightly pigmented pileus and *P. hololeucus*, with the strongest resemblance to *P. inquilinus*, in relatively small pleurocystidia (up to  $60 \times 20 \mu\text{m}$ ) and small spores, viz.  $5.5-6.5(-7.0) \times (4.5-5.0-5.5(-6.0)) \mu\text{m}$  (in *P. inquilinus*:  $(6.0-6.5-8.0(-9.0)) \times 5.5-6.5(-7.0) \mu\text{m}$ ). *Pluteus pallidus* has been recorded also from Europe (Singer, 1977: 125).

### 31. *Pluteus aurantiorugosus* (Trog) Sacc.

*Agaricus aurantiorugosus* Trog in Mittheil. Naturf. Gesell. Bern 388: 32. 1857. — *Pluteus aurantiorugosus* (Trog) Sacc. in Beibl. Hedwigia 35, 7: 5. 1896.

*Pluteus leoninus* var. *coccineus* Mass., Br. Fung. Fl. 2: 291. 1893. — *Pluteus coccineus* (Mass.) J. Lange, Fl. agar. dan. 2: 88. 1937.

*Pluteus caloceps* Atk. in Anns mycol. 7: 373. 1909.

Selected descriptions & illustrations. — J. Lange, Fl. agar. dan. 2: pl. 72C. 1937 (as *P. coccineus*); — A. Pears. in Trans. Br. mycol. Soc. 35: 109. 1952 (as *P. caloceps*).

#### ACKNOWLEDGEMENTS

The authors wish to thank all mycologists, who kindly put collections of fresh or dried specimens to our disposal. Without their help it would have been impossible to revise the more difficult groups in the genus.

The curators of the Herbaria, C, E, LIL, M, MPU, and S, and Mr. H. Romagnesi are friendly thanked for sending collections on loan; the director of K and E for hospitality during visits for the study of type collections.

The great and constant help of Thomas W. Kuyper in nomenclatural and taxonomic problems is highly appreciated. Dr. C. Bas is gratefully thanked for critical reading of the manuscript. We are grateful to Mr. D. C. Ietswaart for help with the Latin diagnoses. Ruth van Crevel was so kind as to prepare the drawings for publication.

The investigations of the first author were in part supported by the Foundation for Fundamental Biological Research (BION), which is subsidized by the Netherlands' Organization for the Advancement of Pure Research (ZWO).

## REFERENCES

- BRESADOLA, G. (1881). Fungi tridentini I. Trento.  
 — (1905). Hymenomyces novi vel minus cogniti. In *Annls mycol.* 3: 159–164.  
 BULLIARD, J. B. F. (1783). *Herbier de la France* (3). Paris.  
 FAYOD, V. (1889). Prodrôme d'une histoire naturelle des Agaricinées. In *Ann. Sci. nat., Bot. sér.* VII, 9: 181–411.  
 FRIES, E. M. (1818). *Observationes mycologicae* II. Kjøbenhavn.  
 — (1838). *Epicrisis systematis mycologici*. Upsaliae.  
 GILLET, C. C. (1874–1878). *Les Hyménomycètes*. Alençon.  
 GRAUWINKEL, B., MEUSERS, M. & MEUSERS, S. (1984). Zur Variabilität von *Pluteus minutissimus* — *Pluteus podospileus*. In *Beitr. Kenntn. Pilze Mitteleur.* 1: 15–26.  
 HEIM, R. & ROMAGNESI, H. (1934). Notes systématiques sur quelques Agarics de la flore française. In *Bull. trimest. Soc. mycol. Fr.* 50: 162–192.  
 HOMOLA, R. L. (1972). Section *Celluloderma* of the genus *Pluteus* in North America. In *Mycologia* 64: 1211–1247.  
 — (1975). Phylogenetic relationships within the genus *Pluteus*. In Bigelow & Thiers, *Studies on higher Fungi*. In *Beih. Nova Hedwigia* 51. Vaduz.  
 IMAI, S. (1938). Studies on the Agaricaceae of Hokkaido I. In *J. Fac. Agric. Hokkaido (imp.) Univ.* 43: 1–178.  
 KARSTEN, P. A. (1879). *Rysslands, Finlands och den Skandinaviska halföns Hattsvampar*. Helsingfors.  
 KÜHNER, R. (1926). Contribution à l'étude des Hyménomycètes et spécialement des Agaricacés. In *Le Botaniste* 17: 5–215.  
 — (1980). Les Hyménomycètes agaricoides. In *Bull. Soc. linn. Lyon* 49: 1–1027.  
 KÜHNER, R. & ROMAGNESI, H. (1953). *Flore analytique des champignons supérieurs*. Paris.  
 — (1956). Compléments à la 'Flore analytique'. VIII. Espèces nouvelles, critiques ou rares de Volvariaceés. In *Bull. trimest. Soc. mycol. Fr.* 72: 181–239.  
 LANGE, J. E. (1917). Studies in the Agarics of Denmark III. In *Dansk bot. Ark.* 2 (7): 1–50.  
 — (1937). *Flora agaricina danica* 2. Copenhagen.  
 MALENÇON, G. & BERTAULT, R. (1970). *Champignons supérieurs du Maroc* I. Rabat.  
 MÉTROD, G. (1943). Variabilité dans le genre *Pluteus*. In *Rev. Mycol.* 8 (3, 4): 12–21.  
 MOSER, M. (1983). Die Röhrlinge und Blätterpilze. In *Gams, Kl. Kryptog.fl.* 2 b/2, 5. Aufl. Stuttgart.  
 MOSER, M. & STANGL, J. (1963). Ein neuer *Pluteus* aus Süddeutschland: *Pluteus pseudo-roberti* Mos. et Stangl. In *Z. Pilzk.* 29: 36–39.  
 ORTON, P. D. (1960). New checklist of British agarics and boleti 3. Notes on genera and species in the list. In *Trans. Br. mycol. Soc.* 43: 159–439.  
 PEARSON, A. A. (1952). New records and observations V. In *Trans. Br. mycol. Soc.* 35: 97–122.  
 PEGLER, D. N. (1983). *Agaric Flora of the Lesser Antilles*. In *Kew Bull. add. Series* 9. London.  
 REYNDERS, A. F. M. (1982). Analyse van enige vondsten van najaar 1981. In *Coolia* 25: 68–80.  
 ROMAGNESI, H. (1937). Florule des bois de la Grange et de l'Étoile. In *Rev. Mycol.* 2: 85–95; 132–149.  
 — (1940). Les *Pluteus*. In *Suppl. Rev. Mycol.* 5: 17–25.

- SCHAEFFER, J. C. (1762). Fungorum qui in Bavaria et Palatinatu circa Ratisbonam nascuntur icones nativis coloribus expressae I. Regensburg.
- (1774). Ditto IV. Ratisbonam.
- SCOPOLI, J. A. (1772). Flora carniolica II. Viennae.
- SINGER, R. (1956). Contributions towards a monograph of the genus *Pluteus*. In Trans. Br. mycol. Soc. 39: 145–232.
- (1959). Contributions towards a monograph of the genus *Pluteus*. II. In Trans. Br. mycol. Soc. 42: 223–226.
- (1975). The Agaricales in modern taxonomy, 3rd Ed. Vaduz.
- (1977). Amerikanische und asiatische Agaricales, die in Europa und Nordafrika vorkommen. In Z. Pilzk. 43: 119–130.
- STANGL, J. & BRESINSKY, A. (1968). Beitrage zur Revision M. Britzelmayers 'Hymenomyceten aus Südbayern' 8. Amanitaceae. In Z. Pilzk. 34: 80–102.
- VELENOVSKY, J. (1921). České Houby. Praze.
- (1939). Novitates mycologicae. Praeae.
- WEINMANN, J. A. (1836). Hymeno- et Gastromycetes hucusque in Imperio rossico observatos. Petropoli.
- WICHANSKY, E. (1963). Štítovka jelínkovitá — *Pluteus pseudocervinus* sp. n. In Mykol. Sb., 40: 73.