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Pluteus nothopellitus sp.nov. and a review of white species in *Pluteus* section *Pluteus*

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Abstract — A new white species of *Pluteus* sect. *Pluteus* is described. *Pluteus nothopellitus* is characterized by the absence of clamp connections, relatively big spores and habitat on angiosperm wood. The status of *Pluteus pellitus* is analyzed, with comments on taxa with white basidiocarps within the section.

Key words — *Pluteaceae*, biodiversity

Introduction

Section *Pluteus* of the genus *Pluteus* Fr. is characterized by the presence of metuloid pleurocystidia and pileipellis arranged as a cutis (Vellinga & Schreurs 1985). The identity of taxa with white basidiocarps within the section, especially *Pluteus pellitus*, has been the subject of many controversies over the past decades. Some authors (Kühner & Romagnesi 1953, Singer 1956, Moser 1983, Bonnard 1995) regard *P. pellitus* as a species with clamp-connections and small spores, while others consider this species as lacking clamps and having bigger spores (Vellinga 1987, 1990; Banerjee & Sundberg 1995).

Collections from Europe and North America have been revised and two species are recognized: *Pluteus pellitus* is considered the correct name for the species with clamps, following the neotypification by Bonnard (1995), while a new name is proposed for the species without clamps, viz. *Pluteus nothopellitus*. A key to all known representatives of section *Pluteus* with white basidiocarps is provided.

Materials and methods

Standard methods for describing the basidiocarps were applied, using the terminology of Vellinga (1988, 1990). Terminology for describing the pleurocystidia follows Singer (1986) and Bonnard (1988): *cervinus*-type cystidia

are generally fusiform, provided with 2-4 (6) apical hooks; *magnus*-type cystidia lack apical hooks and usually have a rather acute apex; intermediate cystidia is the term used for the pleurocystidia situated near lamella edge, which are described separately from the rest. Color annotations in the macroscopical descriptions are from Munsell soil color charts (2000). The notation [270, 9, 9] indicates that measurements were made in 270 spores in 9 samples in 9 collections. All structures were measured in Congo Red or an equal mixture of Congo Red and KOH (5%). The following abbreviations are used: avl for average length, avw for average width, Q for quotient of length and width and avQ for average quotient.

Taxonomic descriptions

1. *Pluteus nothopellitus* Justo & M.L. Castro **sp. nov.** **Fig. 1, 2**

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Misapplied—*Pluteus pellitus* sensu Vellinga, Fl. Agaricina Neerlandica 2: 37. 1990, sensu Banerjee & Sundberg, Mycotaxon 52: 220. 1995

Pluteus pellitus *similis sed differt sporis majoribus et hyphis sine fibulis.*

Holotypus: "Spain: A Coruña: Cambre, Cecebre, on fallen branch of *Quercus robur*, 30 September 2004, coll. A. Justo 58 (MA)"

Etymology: *nothopellitus*, from the greek "νοθος" and the epithet *pellitus*, means false pellitus because of its similarity and previous confusion with *P. pellitus.*

Pileus 35-70 mm hemispherical when young, later applanate or plano-convex, with or without low umbo and slightly depressed at centre in older specimens; surface smooth or innately fibrillose at centre, dry or slightly viscid when moist, white, sometimes with some light brown spots around centre (10YR 5/3-5/4); margin translucently striate, especially in older specimens. **Lamellae** L = 40-65, l = 1-3, moderately crowded, free, ventricose, up to 8 mm broad, white when young, later pale pink (2.5YR 8/3-8/4), with white even edge, flocculose under lens. **Stipe** 40-65 × 3.5-10 (15) mm, cylindrical, with broad bulbous base, white, smooth to innately fibrillose, solid. **Context** in pileus white or pinkish (2.5YR 7/4, 7/6) near lamellae; in stipe white to greyish. **Smell** indistinct. **Taste** indistinct (recorded as subraphanoid in one collection). **Spore print** pink to brownish pink (2.5YR 5/6, 6/6, 7/6).

Basidiospores [270, 9, 9] (6.0) 6.5-9.0 (9.5) × 4.5-6.5 (7.0) µm, avl × avw = 7.3-8.0 × 5.1-5.8 µm, Q = (1.15)1.2-1.7, avQ = 1.36-1.54 (broadly) ellipsoid, a very few oblong. **Basidia** (18) 20-35 × 6-9 (10) µm, 4-spored, broadly clavate. **Pleurocystidia** 55-90 (100) × 15-25 µm, metuloid, (narrowly) fusiform to cylindrical, sometimes with long peduncle, with 2-4 acute or obtuse hooks at apex, with up to 4 µm thick wall. **Intermediate cystidia** similar to pleurocystidia, but sometimes with thin (up to 0.5-1 µm) wall and/or without conspicuous hooks at apex. **Cheilocystidia** 20-70 (75) × 10-25 (30) µm, (narrowly) clavate,

spheropedunculate, colorless. **Pileipellis** a cutis; hyphae 5-28 µm wide, cylindrical, mostly colorless, but sometimes (at centre of pileus) with some pale brown pigment; terminal elements (40) 65-180 (215) µm long, cylindrical or fusiform, usually tapering towards obtuse apex. **Stipitipellis** a cutis; hyphae 5-15 (25) µm wide, cylindrical, colorless. **Clamp-connections** absent.

Habitat and distribution—Solitary on wood of broad-leaved trees (*Alnus, Corylus, Fagus, Quercus*). Known with certainty from Spain, The Netherlands, Germany and U.S.A (Michigan), but probably more widespread. August-October.

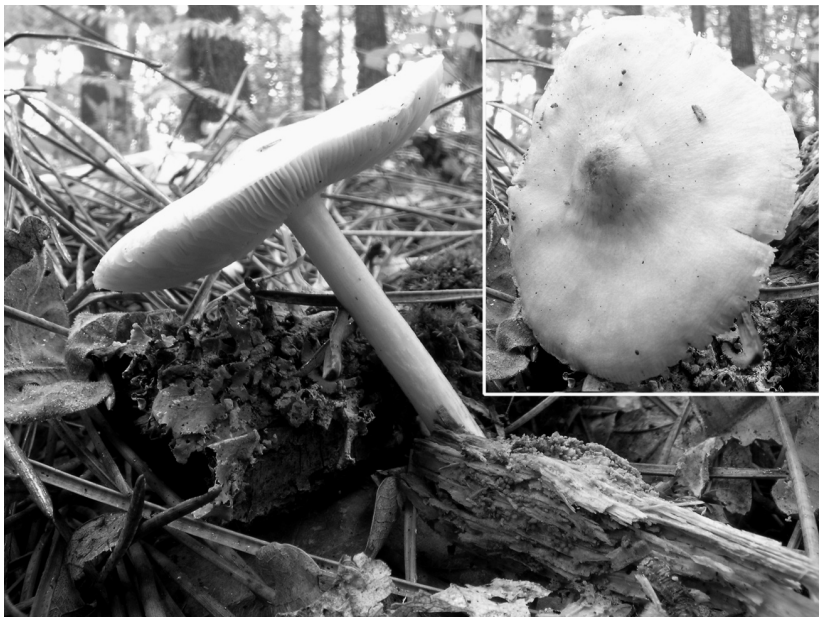

Fig. 1: *Pluteus nothopellitus*—basidiocarp and pileus detail (both from holotype). Photo by Juan Carlos Alonso.

Collections examined—Spain: A Coruña: Cambre, Cecebre, on fallen branch of *Quercus robur*, 30.IX.2004, A. Justo 58 (MA, Holotype); idem, LOU-Fungi 18726 (Isotype); **Germany:** Teutoburgerwald, on stump (probably *Fagus*), in mixed deciduous woods on calcareous loamy soil, 25.IX.1965, C. Bas 4560A (L); **The Netherlands: Drenthe:** Gellbroek, on very rotten fallen branch of *Alnus*, in *Alnus* forest on moist, rich humose soil, 26.IX.1984, EJM Arnolds 5201 (L); Nieuw-Balinge, St. Bos, on trunk of broad-leaved tree, 3.IX.1974, (L); **Flevoland:** Noordoostpolder, on dead branch of *Quercus*, 12.IX.1986, F. Tjallingii s.n. (L); **Gelderland:** Middagten, on dead stem of *Corylus*, 29.X.1972, F. Tjallingii s.n (L); Winterswijk, on unidentified wood (probably *Fagus*), 26.X.1975, J. Schreurs 30 (L); **Utrecht:** Baarn, Groeneveld, on *Fagus*, 10.VIII.1971, G.A. De Vries s.n. (L)**; U.S.A: Michigan:** Tahquamenon Falls State Park, on unidentified wood of broad-leaved tree, 3.IX.1953, A. H. Smith 42452 (MICH).

Comments—*Pluteus nothopellitus* is separated from other members of section *Pluteus* by the following combination of characters: white basidiocarps; smell and taste indistinct; habitat on wood of broad-leaved trees; average spore size 7.3-8.0 × 5.1-5.8 µm and absence of clamp-connections.

The name *Pluteus pellitus* has been used for this species (Vellinga 1990, Banerjee & Sundberg 1995); however, *P. pellitus* is a different species with clamp connections and smaller spores, on average 5.8-6.5 × 4.3-4.6 µm (Bonnard 1995; see also discussion under *P. pellitus*).

Other clampless members of section *Pluteus* with white basidiocarps are briefly discussed here:

Pluteus albineus Bonnard has narrower spores (4-5(6) µm) and dimorphic cheilocystidia: long cystidia (reaching 100 µm) on the centre of gill edge and short on both sides (Bonnard 2001). This species is only known from Switzerland.

Pluteus atricapillus var. *albus* Vellinga differs in the raphanoid smell and taste. This variety was described by Vellinga (Vellinga & Schreurs 1985) but later subsumed in the synonymy of *Pluteus cervinus* (Schaeff.) P. Kumm. by the same author (Vellinga 1990). It is known from the type locality (Leiden, The Netherlands).

Pluteus cinerascens P. Banerjee & Sundb. has a raphanoid smell and taste and the injured or bruised places along margin of pileus become grey. The presence of *magnus*-type pleurocystidia near lamella edge was emphasized by Banerjee & Sundberg (1995). However in the original description the same authors described these structures as "pleurocystidia near lamella edge mostly of *cervinus*-type interspersed with a few *magnus*-type" (Banerjee & Sundberg 1993).

Pluteus lipidocystis Bonnard grows on coniferous wood, has narrower spores (4-5.1 µm), longer cheilocystidia (up to 102 µm) and is mainly characterized by the presence of cells with lipid contents in the hymenium (Bonnard 1986). Up to now it is only known from the type collection (Les Bougeries, Switzerland)

Pluteus petasatus (Fr.) Gillet usually has a distinct sweet or sweet-nauseating smell, smaller spores (avl × avw = 6.1-7.0 × 4.3-4.8 µm in the Spanish collections), and lacks a well-developed strip of cheilocystidia. This species is widely distributed in Europe and North America (Vellinga 1990, Banerjee & Sundberg 1995; pers. obs.)

Pluteus viscidulus Singer comes very close to *P. nothopellitus*, but it has smaller spores (5-6.5 × 3.5-4 µm). The isotype of *P. viscidulus* [Argentina: Tucumán: near Tapia, 1.I.1949, R. Singer T797 (MICH, Isotype)] was examined and the following observations were made:

Basidiospores [30,1,1] 5-6.5 × 3.5-4 µm, Q = 1,45-1,65; avQ = 1,53, (broadly) ellipsoid. **Basidia** 13-24 × 6-8 µm, 4-spored. **Pleurocystidia** 75-100 × 16-22 µm, fusiform, sometimes pedunculate, with 2-4 conspicuous hooks at apex.

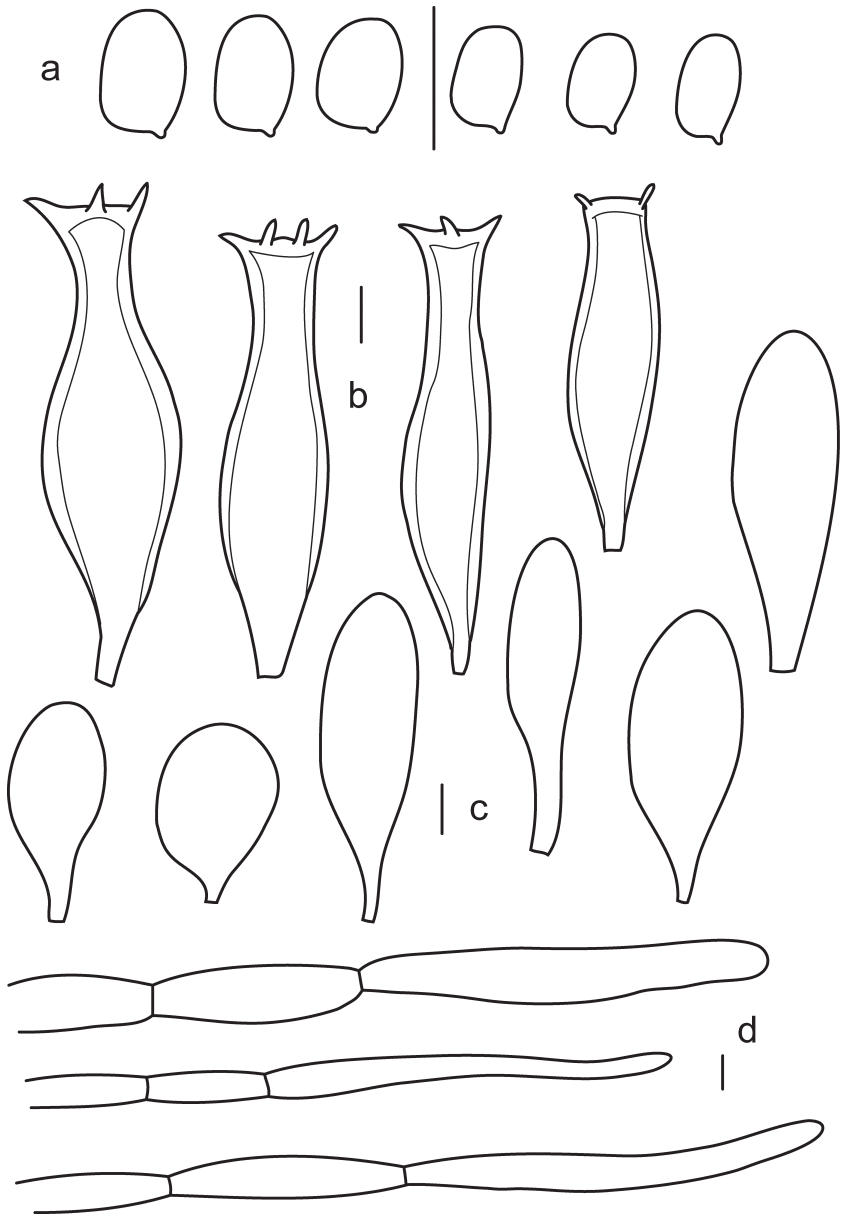

Fig. 2: *Pluteus nothopellitus*—a: spores; b: pleurocystidia; c: cheilocystidia; d: pileipellis (all from holotype). Scale bars = 10 μm.

Cheilocystidia clavate or spheropedunculate 30-55 × 15-20 µm. **Pileipellis** a cutis; hyphae 5-19 µm wide, cylindrical, mostly colorless, rarely with some pale brown pigment; terminal elements 60-130 µm long, cylindrical, usually tapering towards obtuse apex. **Stipitipellis** a cutis; hyphae 5-14 µm wide, cylindrical, colorless. **Clamp connections** absent.

Singer (1958) also cites a collection from Gainesville (Florida, U.S.A.) that he hesitantly places together with the South American collections. According to Singer (1958) the Florida collection has bigger spores. As this collection has not been studied by us, no conclusions can be drawn about its identity but it probably belongs to *P. nothopellitus*.

Pluteus viscidulus is known with certainty from South America (Argentina, Brazil).

2. *Pluteus pellitus* (Pers.: Fr.) P. Kumm., Führer Pilzk.: 98. 1871 **Fig. 3**

Agaricus pellitus Pers., Syn. Meth. Fung.: 366. 1801; *Agaricus pellitus* Pers. : Fr., Syst Mycol. 1: 198. 1821.

Excluded—*Pluteus pellitus* sensu Vellinga, Fl. Agaricina Neerlandica 2: 37. 1990, sensu Banerjee & Sundberg, Mycotaxon 52: 220. 1995 (= *Pluteus nothopellitus*).

Neotypus—France: Môle, 31.VII.1960, R. Kühner SA-60-2 (G-K coll. 19803)

Type study

Basidiospores [30/1] 5.5-7.5 (8.0) × 3.8-5.3 (5.5) µm; avl × avw = 6.5 × 4.6 µm, Q = 1.18-1.67 (1.75); avQ= 1.42; (broadly) ellipsoid, rarely oblong. **Pleurocystidia** abundant, metuloid, 67-95 × 18-24 µm, thick walled, with 2-4 hooks at apex, (narrowly) fusiform. **Cheilocystidia** abundant but mostly collapsed, (narrowly) clavate or spheropedunculate, 25-45 × 14-23 µm. **Pileipellis** a cutis, with some ascending hyphae, colorless; terminal elements 60-150 × 10-14 µm, cylindrical or fusiform, tapering towards obtuse apex. **Stipitipellis** a cutis; hyphae 7-18 µm wide, colorless. **Clamp connections** present in all tissues.

Composite description

Pileus 40-75 mm hemispherical when young, later applanate or plano-convex, with or without low umbo at centre; surface smooth, innately fibrillose or squamulose at centre, dry or slightly viscid when moist, white; margin translucently striate in older specimens. **Lamellae** L = 43-72, l = (0)1-3, moderately crowded, free, ventricose, up to 7 mm broad, white when young, later pale pink (2.5YR 8/3-8/4), with white even edge, flocculose under lens. **Stipe** 40-60 × 5-15 mm, cylindrical, with broad bulbous base, white, smooth to innately fibrillose, solid. **Context** in pileus white or pinkish near lamellae; in stipe white. **Smell and taste** indistinct. **Spore print** not recorded.

Basidiospores [90, 3, 3] 5.0-7.5 (8.0) × 3.5-5.0 (5.5) µm, avl × avw = 5.8-6.5 × 4.3-4.6 µm, Q = 1.2-1.6 (1.7), avQ = 1.34-1.46 (broadly) ellipsoid, rarely oblong. **Basidia** 15-32 × 6-9 (10) µm, 4-spored, broadly clavate. **Pleurocystidia** 50-95

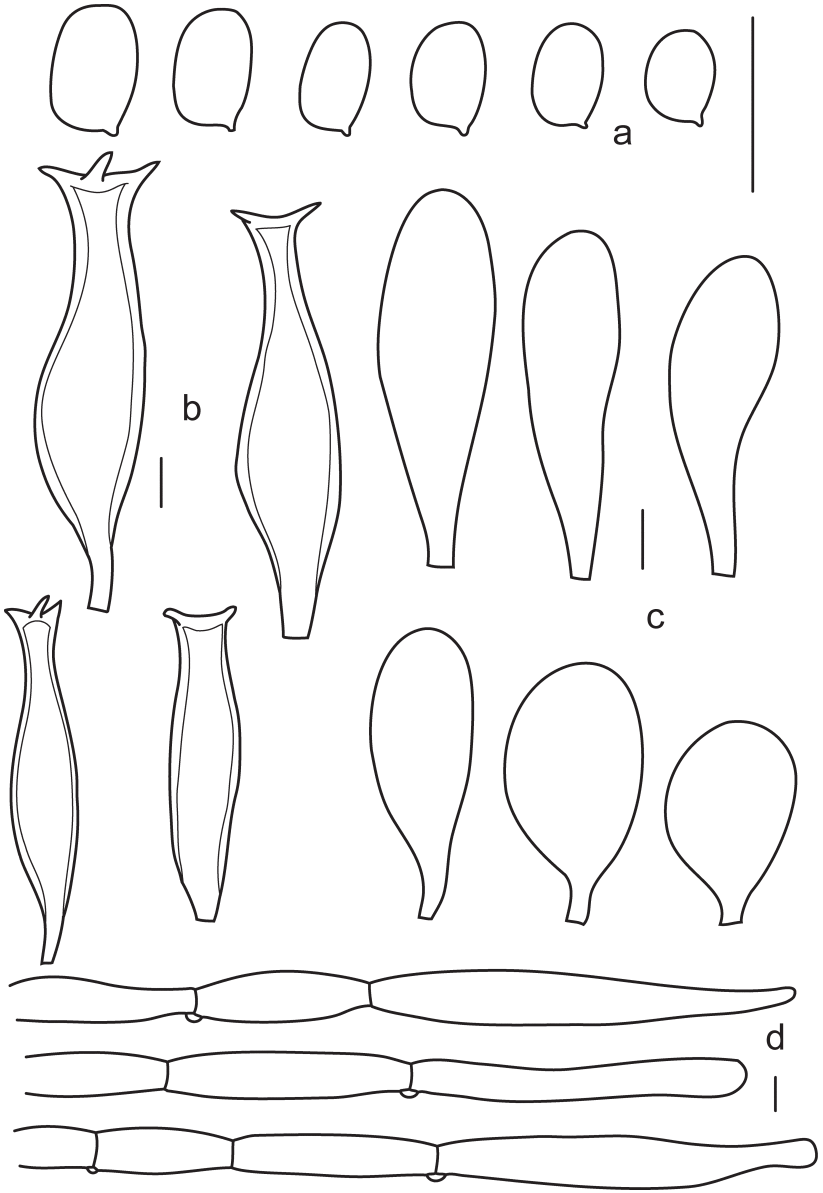

Fig. 3: *Pluteus pellitus*
a: spores (from neotypus); b: pleurocystidia (from neotypus and LOU-Fungi 15215); c: cheilocystidia (from LOU-Fungi 15215); d: pileipellis (from LOU-Fungi 15215). Scale bars = 10 µm.

× 12-25 µm, metuloid, (narrowly) fusiform to cylindrical, sometimes with long peduncle, with 2-4 acute or obtuse hooks at apex, with up to 3 µm thick wall. **Intermediate cystidia** similar to pleurocystidia, but sometimes with thin (up to 0.5-1 µm) wall and/or without conspicuous hooks at apex. **Cheilocystidia** 25-65 × 13-27 µm, (narrowly) clavate, spheropedunculate, colorless. **Pileipellis** a cutis; hyphae 7-25 µm wide, cylindrical, colorless, terminal elements 60-165 µm long, cylindrical or fusiform, usually tapering towards obtuse apex. **Stipitipellis** a cutis; hyphae 6-20 µm wide, cylindrical, colorless. **Clamp connections** present in all tissues.

Habitat and distribution—On wood of angiosperms, probably also terrestrial (see below). Known with certainty from France and Spain, but probably more widespread, at least in Europe.

> **Collections examined—Spain: Pontevedra:** Pontevedra, A Xunqueira, on stump of *Eucalyptus cinerea*, 7.V.1998, M. Lago & D. Solís, LOU-Fungi 15215; ibidem, on remnants of *Eucalyptus globulus*, 2.VI.1997, M. Lago, LOU-Fungi 15216; **France**: Môle, 31.VII. 1960, R. Kühner SA-60-2 (G-K, Neotype).

Comments—The identity of *Pluteus pellitus* has been disputed over the past decades and two different taxonomic concepts exist in mycological literature: Kühner & Romagnesi (1953), Singer (1986), Moser (1983) and Bonnard (1995) consider this species as having clamp-connections and relatively small spores, e.g. 5.5-7.5 × 4-5 µm according to Kühner & Romagnesi (1953). However Vellinga (1990) and Banerjee & Sundberg (1995) regard *P. pellitus* as a species without clamps and with bigger spores, e.g. 7.0-8.5 × 4.5-5.5 µm according to Vellinga (1990).

Bonnard (1995) neotypifies *P. pellitus* with a collection made by Kühner that fits the original description by Persoon (1801). According to Bonnard (1995) the presence of conspicuous fibrils on pileus is an important character of this species as it was emphasized on Persoon's description and is also mentioned in the collection chosen as neotype. The Spanish collections have innate fibrils on the pileus, especially around center, but this character is shared by many other members of the section, including *P. nothopellitus*, so it can be hardly used as a differentiating character for *P. pellitus*.

The habitat of *P. pellitus* is given as "on the ground" (Persoon 1801), "in *Fagus* forest near trunks" (Fries 1821), and "on the ground in a forest of *Juniperus*" (neotypus). The Spanish collections were gathered on *Eucalyptus*. Duchemin (2000) cites this species from Normandy (France) growing on a broad-leaved tree. Only with more collections the habitat of this species can be established with certainty.

To avoid enlargement of taxonomic confusion, the neotypification made by Bonnard is accepted here, and *Pluteus pellitus* is considered the correct name for a species of section *Pluteus* with the following combination of characters:

white basidiocarps; smell and taste indistinct; habitat on wood of angiosperms (probably also terrestrial); average spore size 5.8-6.5 × 4.3-4.6 µm and presence of clamp-connections.

Other members of section *Pluteus* with white basidiocarps and clamp-connections are briefly discussed here:

Pluteus pouzarianus var. *albus* Bonnard grows on coniferous wood and lacks the fibrillose pileus surface of *P. pellitus*.

Pluteus brunneoradiatus var. *albus* and *Pluteus primus* var. *purus* are mentioned as provisional names by Bonnard (1993) and defined mainly as white variants of these normally pigmented species, but they had not been formally (and validly!) published yet. *P. brunneoradiatus* var. *albus* grows on wood of broad-leaved trees and, as the type variety, is characterized by the scarcity of clamp-connections. *P. primus* var. *purus* differs from *P. pellitus* in the habitat on coniferous trees, bigger (> 7 × 5 µm) spores, and the cheilocystidia reaching 200 µm long (Bonnard 1993). Although they had not been validly published, both taxa are included in the key below for completeness and practical reasons.

Key to the members of sect. *Pluteus* with white basidiocarps

1. Clamp connections present 2
1. Clamp connections absent 5

2. Growing on coniferous wood 3
2. Growing on angiosperm wood or terrestrial 4

3. Cheilocystidia up to 200 µm long ..... ***P. primus* var. *purus***
3. Cheilocystidia up to 60 µm long ..... ***P. pouzarianus* var. *albus***

4. Clamp connections common in all tissues ..... ***P. pellitus***
4. Clamp connections scarce(< 10% of septa) ..... ***P. brunneoradiatus* var. *albus***

5. Cells with lipid content present in the hymenium ..... ***P. lipidocystis***
5. Cells with lipid content absent 6

6. Smell raphanoid 7
6. Smell sweet-nauseating or indistinct 8

7. Injured or bruised places along margin of pileus becoming grey ..... ***P. cinerascens***
7. Pileus not becoming grey ..... ***P. atricapillus* var. *albus***

8. Smell sweet-nauseating. Cheilocystidia absent or very scarce ..... ***P. petasatus***
8. Smell indistinct. Cheilocystidia abundant 9

9. Cheilocystidia dimorphic: up to 100 µm on the centre of lamella edge and shorter on both sides ..... ***P. albineus***
9. Cheilocystidia not dimorphic and up to 70 µm long 10

10. Spores (6.0)6.5-9.0(9.5) × 4.5-6.5(7.0) µm. Europe and North America ..... ***P. nothopellitus***
10. Spores 5.0-6.5 × 3.5-4.0 µm. South America ..... ***P. viscidulus***

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