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Pluteus magnus and *Pluteus podospileus* f. *podospileus*, two agaric species new to Japan

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Abstract Two taxa of the genus *Pluteus*, i.e., *Pluteus magnus* and *Pluteus podospileus* f. *podospileus*, are newly recorded from Japan. The macroscopic and microscopic features of these two species are described and illustrated.

Key words Agaricales · Fungal diversity · New records · Pluteaceae

Recently, some new taxonomic studies and distributional records of *Pluteus* Fr. have been reported from Japan (Takehashi 2001a,b; Kobayashi 2002; Takehashi and Kasuya 2007). However, the flora of this genus has not yet been comprehensively studied in this country. During our floristic investigations of *Pluteus* in Japan, two noteworthy fungi of this genus have been collected. Those specimens are identified as *Pluteus magnus* McClatchie and *P. podospileus* Sacc. & Cub. f. *podospileus* on the basis of morphological observations. These two species are new records for Japan. In this article, we describe and illustrate morphological characters of two species based on the Japanese specimens and compare the present species with some related taxa.

The specimens examined in this study are deposited in the herbaria of the Natural History Museum and Institute, Chiba (CBM), and the National Museum of Nature and Science (TNS). Macroscopic characters were described by observations on dried or fresh materials. *Pluteus magnus* is described by observations only on dried materials. Method of light microscopic observations followed Takehashi and Kasuya (2007).

Pluteus magnus McClatchie, Proc. South California Acad. Sci. 1:383, 1897. Figs. 1, 3–8

Pileus 4.6–8.4 cm broad, campanulate when young, later expanding to convex or applanate, often upturned at maturity, incurved at margin, pale brownish gray to brownish, with low broad dark umbo at center, appressed dark brown squamules, especially conspicuous in the center, not translucently striate. Flesh white. Lamellae crowded, white to pale pink, free, ventricose up to 1.1 cm broad, edge smooth. Stipe 5.8–6 × 1.6–2.1 cm, cylindrical, robust, attenuate or enlarged toward base, pale grayish brown to brownish, white at apex, slightly longitudinally fibrous-striate, solid, covered with white mycelium at the base.

Basidiospores 5.5–7.0(–8.0) × (3.5–)4.0–4.5(–5.0) μm, $Q_{ave.} = 1.5$ ($Q = 1.3–1.7$, $n = 30$), ellipsoid to oblong, colorless to grayish pink, surface smooth. Basidia 19–31 × 7–8 μm, short clavate, four-spored, without basal clamp-connections. Cheilocystidia 37–80 × 9–12 μm, crowded, cylindrical to cylindrical-clavate with peduncle, sometimes capitate at the apex, colorless, thin-walled, often with granular contents in the upper part, without clamp-connections. Metuloid elements near lamella edge 30–56 × 6–15 μm, scattered, narrowly fusiform with narrow neck, mostly gradually tapering to acute apex or often dichotomously branched (*magnus* type), sometimes with few lateral spinules in the upper part, thick-walled (up to 1 μm), colorless, without clamp-connections. Pleurocystidia 35–80 × 9–15 μm, crowded, narrowly fusiform with narrow neck, mostly gradually tapering to acute apex or often dichotomously branched (*magnus* type), more rarely with three horns, sometimes with a few spinules in the upper part, thick-walled (up to 1 μm), colorless, without clamp-connections. Pileipellis a cutis with repent and ascending hyphae; terminal elements 39–85 × 7–22 μm, narrowly elongate fusiform to clavate with peduncle, colorless to pale brown or brown, without clamp-connections.

Habitat. Scattered on waste sawdust medium after cultivation of *Grifola frondosa* (Dicks.) Gray.

Distribution. Japan (Chiba) and United States.

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Fig. 1. Dried specimens of *Pluteus magnus* McClatchie (CBM-F-36790). **a** Surface of basidioma. **b** Lamellae and stipes of basidiomata. Bars 10 mm

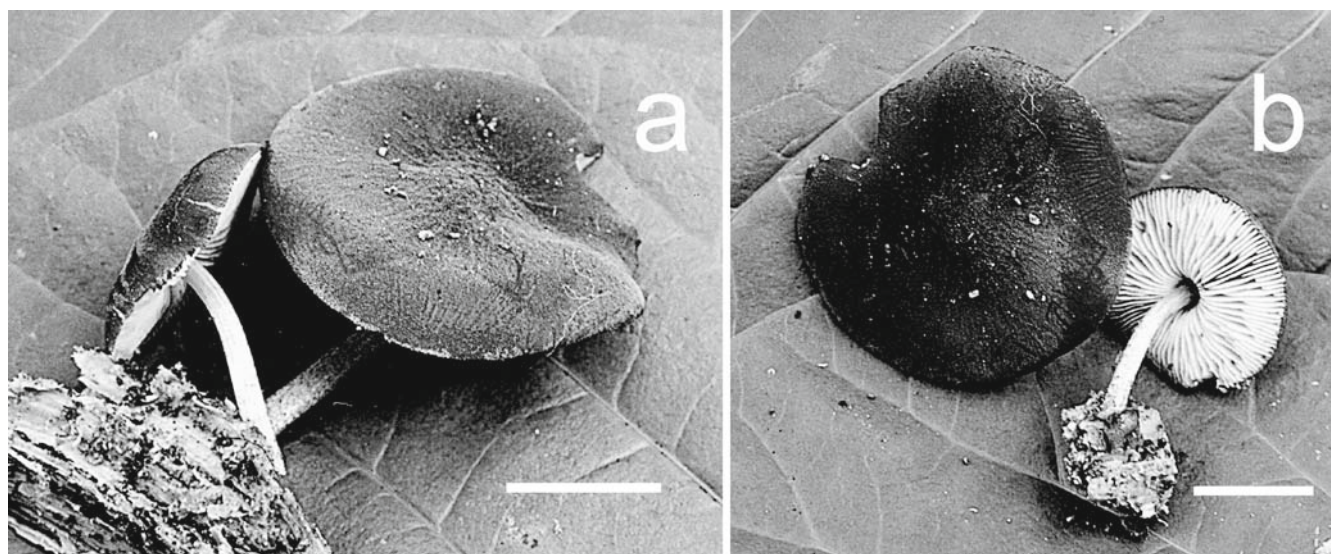


Fig. 2. *Pluteus podospileus* Sacc. & Cub. f. *podospileus* (TNS-F-12398). **a** Surface of basidioma. **b** Lamellae and stipes of basidiomata. Bars 10 mm

Specimen examined. Japan, Chiba Pref., Chosei-gun, Nagara-machi, April 17, 2007, coll. A. Yashiro, CBM-F-36790.

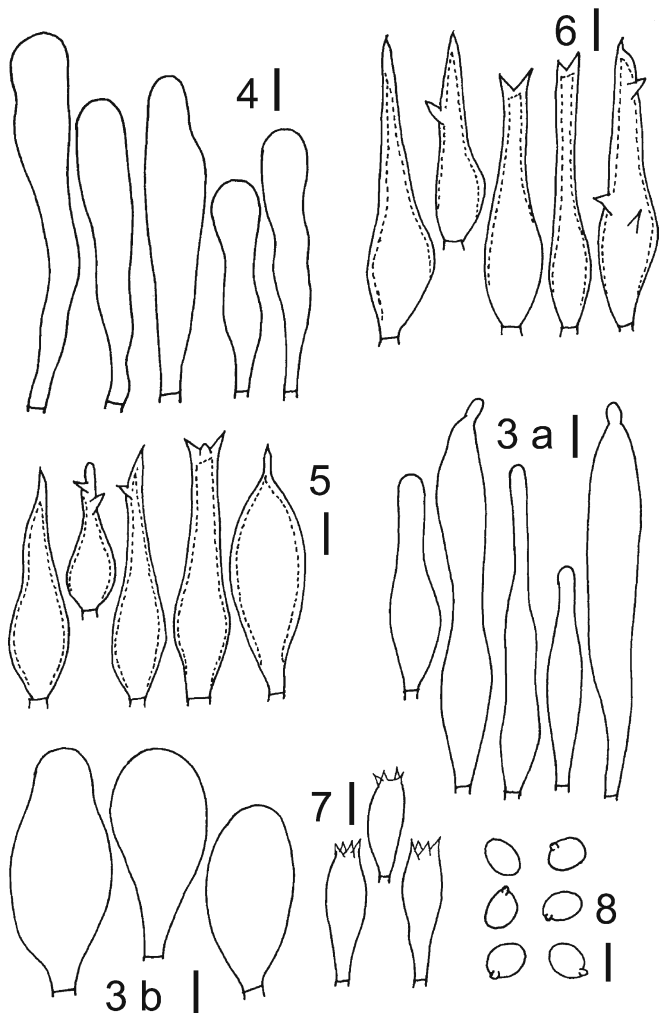
Japanese name. Toge-urabenigasa (newly named).

Notes. This species is placed in section *Pluteus*, stirps *Magnus* (Singer 1986). *Pluteus magnus* is well characterized by a cutis as pileipellis, thin-walled, cylindrical to clavate and pedunculate cheilocystidia, *magnus*-type pleurocystidia, and the absence of clamp-connections. Regarding the habitat of *P. magnus*, it usually grows solitarily or occasionally scattered on decayed broad-leaved wood, sometimes on buried wood (Banerjee and Sundberg 1995).

P. magnus is microscopically similar to *P. spinulosus* Murrill because the latter has pleurocystidia with *magnus*-type elements. However, *P. spinulosus* has marginate lamellae and clamp-connections (Singer 1956; Smith and Stuntz 1958; Pegler 1983; Lee et al. 1992; Banerjee and Sundberg 1993).

Pluteus podospileus Sacc. & Cub. f. *podospileus*, Syll. Fung. 5:672, 1887. Figs. 2, 9–14

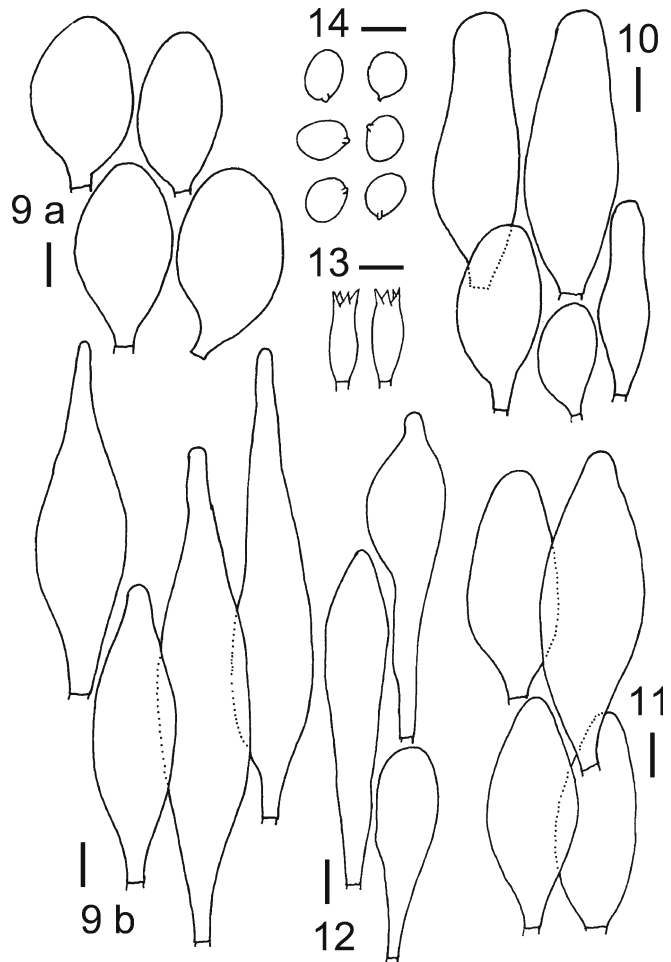
= *Pluteus seticeps* (G.F. Atk.) Singer, Lloydia 21: 272, 1958.



Figs. 3–8. *Pluteus magnus* (CBM-F-36790). **3** Terminal element of the hyphae. **a** Pileipellis at center of pileus. **b** Pileipellis at margin of pileus. **4** Cheilocystidia. **5** Metuloid elements near lamella edge. **6** Pleurocystidia. **7** Basidia. **8** Basidiospores. Bars **3–7** 10 μm ; **8** 5 μm

Pileus 1.6–2.9 cm broad, convex to applanate, dark brown to brown with reddish tinge, with broad umbo at the center, velvety, covered with minutely appressed fibrillose squamules, especially conspicuous in the center, coarse irregularly raised and wrinkled rugulose to striate from the center to the margin, vaguely at around. Flesh white, unchanging in color when cut, thin; odor and taste indistinct. Lamellae free, crowded, dingy pink, ventricose; edge crenulate, sometimes brownish. Stipe 3–4.2 \times 0.2–0.3 cm, cylindrical, equal or slightly enlarged at the base, fragile, shiny, watery white when young, later covered with dark brown squamules on pale brownish background, especially increasing toward the base. Spore print pinkish.

Basidiospores 5.0–6.0(–7.0) \times 4.0–5.5(–6.0) μm , $Q_{\text{ave.}} = 1.14$ [$Q = (1.0\text{--}1.1\text{--}1.3\text{--}1.5)$, $n = 20$], broadly ellipsoid to subglobose or rarely globose (6 in 20 measured basidiospores), pale pink, surface smooth, with hilar appendage and small oil drops. Basidia 20 \times 7 μm , short clavate, four-spored, without basal clamp-connections. Cheilocystidia 25–65 \times 12–22 μm , utriform to clavate and broadly fusiform



Figs. 9–14. *Pluteus podospileus* f. *podospileus* (TNS-F-12398). **9** Cells of pileipellis. **a** Pyriform to clavate cells. **b** Elongate fusiform cells. **10** Cheilocystidia. **11** Pleurocystidia. **12** Caulocystidia. **13** Basidia. **14** Basidiospores. Bars **9–13** 10 μm ; **14** 5 μm

with short peduncle, crowded, colorless, thin-walled, without clamp-connections. Pleurocystidia 50–75 \times 18–27 μm , broadly fusiform with short peduncle, scattered, colorless, thin-walled, without clamp-connections. Pileipellis hymeniform, composed of dimorphic elements with pyriform to clavate cells and elongated fusiform cells; pyriform to clavate cells 37–70 \times 20–30 μm , with short peduncle, with brownish pigments in KOH solution; fusiform cells 70–120 \times 18–25 μm , attenuate to the apex, narrowly fusiform with long neck and peduncle, brown with slightly reddish intracellular pigments in water, brown to dark brown intracellular pigments in KOH solution, without clamp-connections. Caulocystidia 35–110 \times 9–20 μm , clustered, clavate with peduncle to cylindrically fusiform, often with papilliform projection at the apex, brown to dark brown intracellular pigment in KOH solution, without clamp-connections.

Habitat. A few together on decayed broad-leaved wood.

Distribution. Japan (Hokkaido), Europe and North Africa.

Specimen examined. Japan, Hokkaido Pref., Shiribeshi Prov., Otaru-shi, Nagahashi, July 17, 2005, coll. K. Yamamoto, TNS-F-12398.

Japanese name. Zaratsuki-urabenigasa (newly named).

Notes. *Pluteus podospileus* f. *podospileus* is well characterized by its pileus and stipe covered with minutely appressed fibrillose squamules, dimorphic pileipellis that contain brownish to brown intracellular pigments, and cheilo- and pleurocystidia that are mainly utriform to broadly fusiform with short peduncle. This species belongs to the section *Celluloderma*, subsection *Mixtini* Singer ex Singer (Vellinga and Schreurs 1985).

The Japanese specimen of *P. podospileus* f. *podospileus* is macro- and microscopically nearly identical with the earlier description of this species (Vellinga 1990), with the exception of surface color of the pileus. Vellinga (1990) described the color of the pileus of *P. podospileus* f. *podospileus* as very dark brown. In Japanese material, we recognized the color of pileus as dark brown to dark reddish brown. However, all other morphological features were identical with those of *P. podospileus* f. *podospileus*. Therefore, we think that the color of pileus is variable in this species.

Pluteus podospileus f. *minutissimus* (Maire) Vellinga also has the dark reddish brown pileus (Breitenbach and Kränzlin 1995); hence, the pileus color of the Japanese specimen in this study is confused macroscopically with *P. podospileus* f. *minutissimus*. However, *P. podospileus* f. *podospileus* can be separated from *P. podospileus* f. *minutissimus* because the stipe surface of the latter is glabrous or brown fibrillulose only at the base (Vellinga 1990). Further, the specimen examined is macroscopically similar to *P. thomsonii* (Berk. & Broome) Dennis having usually a dark gray pileus and a light grayish, punctate stipe. However, *P. thomsonii* is different from *P. podospileus* f. *podospileus* because the former has a tuberculate and wrinkled pileus, sometimes distinctly, and cheilocystidia with a rostrum at the apex (Orton 1960, 1986; Vellinga 1990; Breitenbach and Kränzlin 1995; Wartchow 2004).

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References

- Banerjee P, Sundberg WJ (1993) Reexamination of *Pluteus* type specimens: types housed at the New York Botanical Garden. *Mycotaxon* 49:413–435
- Banerjee P, Sundberg WJ (1995) The genus *Pluteus* section *Pluteus* (Pluteaceae, Agaricales) in the Midwestern United States. *Mycotaxon* 53:189–246
- Breitenbach J, Kränzlin F (1995) *Fungi of Switzerland*, vol 4. Boletes and agarics, 2nd part. Verlag Mykologia, Luzern
- Kobayashi T (2002) Type studies of the new species of *Pluteus* described by Seiya Ito and Sanshi Imai from Japan. *Mycoscience* 43:411–415
- Lee JN, Lee HK, Min KH, Park WH, Kim YS (1992) Studies on genus *Pluteus* of Korea. *Korean J Mycol* 20:296–301
- Orton PD (1960) New check list of British Agarics and Boleti. Part III. Notes on genera and species in the list. *Trans Br Mycol Soc* 43:159–439
- Orton PD (1986) British fungus flora. Agarics and Boleti 4, Pluteaceae: *Pluteus* & *Volvariella*. Royal Botanic Garden, Edinburgh
- Pegler DN (1983) Agaric flora of the Lesser Antilles. *Kew Bulletin Additional Series IX*. HMSO, London
- Singer R (1956) Contributions towards a monograph of the genus *Pluteus*. *Trans Br Mycol Soc* 39:145–232
- Singer R (1986) The Agaricales in modern taxonomy, 4th edn. Koeltz, Koenigstein
- Smith AH, Stuntz DE (1958) Studies on the genus *Pluteus* I. Redescriptions of American species based on a study of type specimens. *Lloydia* 21:115–136
- Takahashi H (2001a) Notes on new Agaricales of Japan 2. *Mycoscience* 42:347–353
- Takahashi H (2001b) *Pluteus romellii* (Agaricales, Basidiomycetes), new to Japan, found in Odawara (in Japanese with English summary). *Nat Hist Rep Kanagawa* 22:21–23
- Takehashi S, Kasuya T (2007) First record of *Pluteus chrysophaeus* and reexamination of *Pluteus leoninus* from Japan. *Mycoscience* 48:321–325
- Vellinga EC (1990) *Pluteus*. In: Bas C, Kuyper TW, Noordeloos ME, Vellinga EC (eds) *Flora Agaricina Neerlandica*, vol 2. Balkema, Rotterdam, pp 31–55
- Vellinga EC, Schreurs J (1985) Notulae ad Floram Agaricinam Neerlandicam VIII. *Pluteus* Fr. in West Europe. *Persoonia* 12:337–373
- Wartchow F (2004) *Pluteus thomsonii* (Pluteaceae): a northern agaric found in South America. *Mycotaxon* 89:349–353