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FULL PAPER

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Two new *Marasmiellus* species found on the bark of living coniferous and broad-leaved trees in Japan

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Abstract Two new species of *Marasmiellus* (Tricholomataceae, Agaricales) are described and illustrated from Japan: (1) *Marasmiellus crassitunicatus* sp. nov. (subsection *Inodermini* of section *Marasmiellus*) forms dark reddish-brown, orbicular to reniform basidiomata constantly accompanied by tufts of short filiform rhizomorphs, growing on the bark of living coniferous or broad-leaved trees; and (2) *Marasmiellus vernalis* sp. nov. (subsection *Quercini* of section *Dealbati*) forms small brown basidiomata with nondiverticulate pileipellis elements, growing on the bark of living *Pinus thunbergii* in spring (April to June).

Key words Agaricales · *Marasmiellus crassitunicatus* · *Marasmiellus vernalis*

Introduction

The genus *Marasmiellus* Murrill (Singer 1973; Pegler 1977, 1983, 1986; Antonín and Noordeloos 1993; Corner 1996) includes about 250 species and distributes almost worldwide. In Japan, only 5 species, *M. candidus* (Bolton) Singer, *M. chamaecyparidis* (Hongo) Hongo, *M. leiophyllus* (Berk. & M.A. Curtis) Neda, *M. nigripes* (Schwein) Singer, and *M. tricolor* (Alb. et Schwein.) Singer var. *graminis* (Murrill) Singer, had been known in the genus until 3 other new taxa were recently added to the Japanese flora (Takahashi 2000, 2001). As this genus is still poorly explored in Japan, it seems that many species remain to be described. Although most members of the genus are known as leaf litter decomposers, several taxa are known to have lignicolous or corticolous habits. This article reports 2 new species of *Marasmiellus* which grow characteristically on the bark of living coniferous or broad-leaved trees. These species are described and illustrated with photographs showing their habits. Color notations in parentheses are taken from Kornerup and Wanscher (1978). Specimens cited are preserved in Kanagawa Prefectural Museum of Natural History, Japan (KPM).

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Species descriptions

1. ***Marasmiellus crassitunicatus*** Har. Takah. et Degawa sp. nov. Figs. 1, 2

Pileo 2.5–7 mm lato, reniformibus, convexo dein planoconvexo, mox applanato, fibrilloso vel tomentoso, fusco; odore saporeque nullo; stipite 2–5 × 0.4–0.8 mm, subaequali vel apice dilatato et basi attenuato, excentrico, furfuraceo vel fibrilloso-tomentoso, fusco, mycelio basali non affixo; lamellis adnato-subdecurrentibus, late distantibus; basidiosporis 8–11 × 2.5–3.5 µm, subcylindraceis, inamyloideis; basidiis tetrasporis; basidiolis fusoideis vel claviformibus; cheilocystidiis subcylindraceis vel subclaviformibus, apice processibus pluribus formantibus, tenuitunicatis, aciem lamellae sterilem efficientibus; pileipelle ex hyphis repentibus cylindricis composita, granulis pigmentosis brunneis incrustata; tramate stipitis ex hyphis fusiformibus inflatis crassitunicatis composito; hyphis fibulatis.

Etymology: from Latin, *crassi-* (thick-) + *tunicatus* (walled), referring to the thick-walled elements of the stipe trama.

Holotypus: In cortice vivo arboris *Abieti firmae* Siebold et Zucc. in silva, Mons Takao, Tokyo, July 15, 1999, W. Ikeda et H. Takahashi (KPM-NC0005064).

Pileus 2.5–7 mm in diameter orbicular to reniform, convex then applanate with involute then reflexed margin, smooth; surface minutely fibrillose to felty-tomentose, evenly colored dark reddish-brown (8E7-8E8 to 9E7-9E8); margin entire or sometimes undulating. Flesh up to 0.5 mm thick, whitish or pale brownish, tough, reviving; odor and taste not distinctive. Stipe 2–5 × 0.4–0.8 mm, relatively short, curved, subequal or somewhat tapering toward the base,

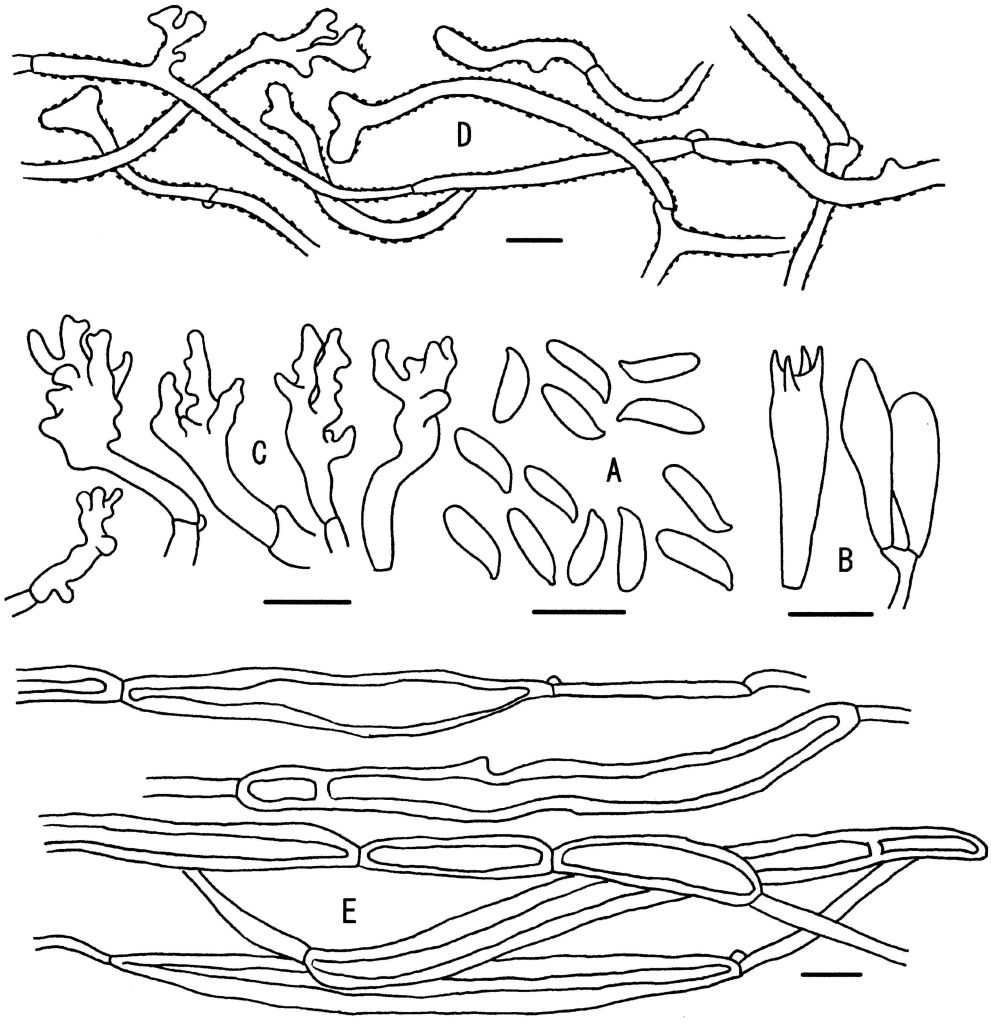

Fig. 1. *Marasmiellus crassitunicatus.* **A** Basidiospores. **B** Basidium and basidioles. **C** Cheilocystidia. **D** Elements of the pileipellis. **E** Tramal elements of the stipe. All figures from the holotype. *Bars* 10 μm

strongly eccentric, slender, terete, solid, tough; surface furfuraceous to fibrillose-tomentose, dark reddish-brown (9F7-9F8) to dark violet-brown (10F7-10F8); basal mycelium absent. Lamellae adnate to adnate-subdecurrent, distant (6–11 reach the stipe), up to 0.9 mm broad, with 0–3 series of lamellulae, sometimes forked, concolorous with the pileus; edges even, concolorous.

Spore print white. Basidiospores 8–11 × 2.5–3.5 μm (Q = length/breadth, 2; *n* = 20 spores per two specimens), subcylindrical, colorless, smooth, inamyloid, thin-walled. Basidia 16–25 × 5–7 μm, clavate, four-spored; basidiole fusoid to clavate. Cheilocystidia 15–27 × 5–10 μm, forming a sterile edge, subcylindrical to subclavate, with irregularly branched, apical diverticulae, colorless or sometimes pale brownish, inamyloid, thin-walled. Pleurocystidia none. Hymenophoral trama subregular; element hyphae 4–8 μm wide, cylindrical, incrusted with granular dark brown pigment, insoluble in ammonium hydroxide, inamyloid, thin-walled. Pileipellis a poorly developed and discontinuous *Rameales* structure of loosely interwoven, filiform hyphae 3–6 μm wide, with scattered rodlike or knoblike diverticulae, incrusted with granular dark brown pigment, insoluble in ammonium hydroxide, inamyloid, thin-walled. Hyphae of pileitrama 4–7 μm wide, cylindrical, subparallel to interwoven, smooth, colorless, not incrusting, inamyloid, thin-walled. Stipitipellis a cutis of parallel, repent, filiform hyphae 3–5 μm wide, occasionally with scattered rodlike or knoblike diverticulae, heavily incrusted with granular dark brown pigment that is insoluble in ammonium hydroxide, inamyloid, thin-walled; caulocystidia absent. Stipe trama composed of longitudinally running, cylindrical, or fusoid hyphae with cells 40–130 × 3–15 μm, smooth, colorless, inamyloid, sometimes with a secondary septum (without clamps), with highly thickened walls up to 5 μm. Clamps present in all tissues.

Known distribution: Japan (Kanagawa, Nagano, Tokyo, Yamaguchi).

Habitat: Densely gregarious or caespitose on the bark of living *Abies firma* Siebold et Zucc., *Carpinus* sp., *Chamaecyparis obtusa* Endl., or *Pinus thunbergii* Parl., in summer and autumn seasons (June to October).

Specimens examined: KPM-NC0005064 (holotype), Mt. Takao, Tokyo, on bark of living *A. firma*, July 15, 1999, coll. W. Ikeda and H. Takahashi; KPM-NC0005077, same loca-

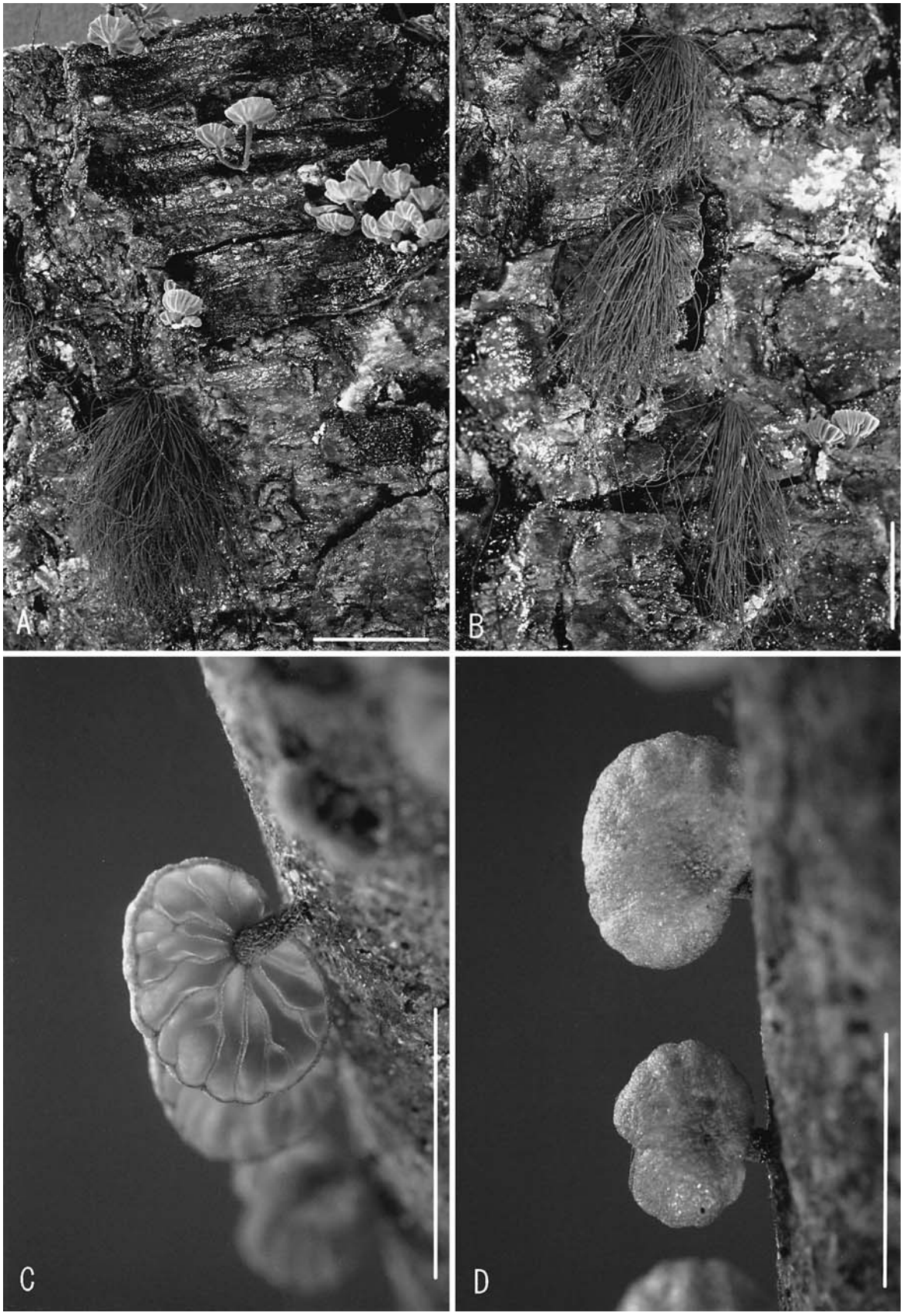

Fig. 2. Basidiomata of *Marasmiellus crassitunicatus* and tufts of short filiform rhizomorphs on the bark of living *Abies firma*. **A**, **B** Basidiomata accompanied by tufts of short filiform rhizomorphs. **C** Underside view of the expanded pileus. **D** Surface view of the expanded pileus. **A**, **B** from the holotype; **C**, **D** from KPM-NC0006724. *Bars* **A**, **B** 15 mm; **C**, **D** 8 mm

tion, August 13, 1999, coll. W. Ikeda and H. Takahashi; KPM-NC-0006041, same location, July 15, 1999, coll. W. Ikeda and H. Takahashi; KPM-NC0006724, same location, June 15, 2000, coll. H. Takahashi; KPM-NC0007933, same location, September 18, 2000, coll. H. Takahashi; KPM-NC0008691, same location, June 24, 2001, coll. H. Takahashi; KPM-NC0012147, same location (but other habitat: on bark of *C. obtusa*, October 26, 2003, coll. H. Hagiwara, S. Ono, H. Murano, and Y. Degawa); KPM-NC0012845, Jakuchikyo, Yamaguchi Prefecture, on bark of living *A. firma*, July 22, 2000, coll. M. Izawa; KPM-NC0012846, Matsubarako, Koumicho, Nagano Prefecture, on bark of living *Carpinus* sp., August 1, 2004, coll. M. Kobayashi; on bark of living *P. thunbergii*, Odawara, Kanagawa Prefecture, June 11, 2005, coll. Y. Degawa.

Japanese name: Murasaki-yamanba.

Notes: The distinctive features of the present species are its small, dark reddish-brown, orbicular to reniform basidiomata; microscopically, the dark brown incrustations in the hyphae of the cortical layer and the thick-walled, inflated, fusiform hyphal cells of the stipe trama are characteristic.

Its small, dark reddish-brown basidiomata with a strongly eccentric stipe, and its pileipellis consisting of a poorly developed and discontinuous *Rameales* structure, suggest placement in the subsection *Inodermini* Singer of the section *Marasmiellus* in Singer's classification (Singer 1973, 1986). Within the subsection, *M. crassitunicatus* is comparable with two tropical taxa in having a deep vinaceous pileus and lamellae, viz., *Marasmiellus goossensiae* (Beeli) Pegler (Pegler 1977, 1986) from East Africa and Sri Lanka, and neotropical *Marasmiellus purpureus* (Berk. et M.A. Curtis) Murrill (Singer 1973; Pegler 1983). The latter two taxa, however, differ in forming a plicate-sulcate pileus, a whitish stipe, and slightly broader basidiospores.

The species is also well characterized by its habitat on the bark of living coniferous (*Abies, Chamaecyparis, Pinus*) and hardwood (*Carpinus*) trees. It should be noted that in all cases that we examined the basidiomata of *M. crassitunicatus* were consistently accompanied by tufts of short filiform rhizomorphs of a fungus (Fig. 2A,B). This sterile structure is independently produced near the basidiomata and has the following morphological features: rhizomorphs 15–25 × 0.025–0.11 mm, filiform, pliant, dark reddish-brown, fasciculate in small clusters, reminiscent of tufted sporangia of *Stemonitis splendens* Rostaf. (Myxomycetes); external elements 3–5 μm wide, parallel, repent, filiform, heavily incrusted with granular dark brown pigment that is insoluble in ammonium hydroxide, inamyloid, thin-walled; internal elements 50–200 × 4–15 μm, parallel, cylindrical or fusoid, sometimes branched, smooth, colorless, inamyloid, thin- or thick-walled (1–5 μm), numerous clamps present.

These morphological characters and the growing habit strongly suggest that the rhizomorphs are produced by *M. crassitunicatus*. Further critical investigations, including cultural or molecular studies, are necessary to prove whether the rhizomorphs are congeneric with *M. crassitunicatus*.

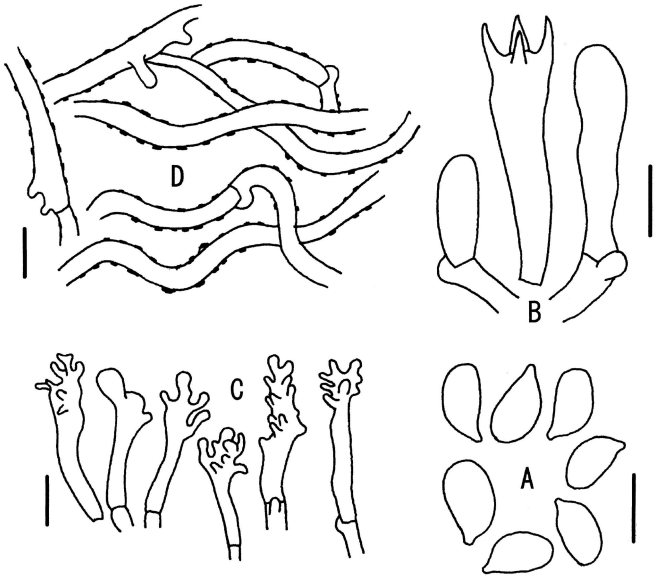

Fig. 3. *Marasmiellus vernalis*. **A** Basidiospores. **B** Basidium and basidioles. **C** Cheilocystidia. **D** Elements of the pileipellis. All figures from the holotype. *Bars* 10 μm

2. ***Marasmiellus vernalis*** Har. Takah., sp. nov. Figs. 3, 4

Pileo 3–8 mm lato, primo hemisphaerico, dein plano-convexo, striato-sulcato, fibrilloso-tomentoso vel floccoso-tomentoso, brunneo; odore saporeque nullo; stipite 3–6 × 0.5–0.7 mm, subaequali, centrali, cavo, furfuraceo vel fibrilloso-tomentoso, brunneo, mycelio basali albo affixo; lamellis adnatis, distantibus, brunneolis; basidiosporis 9–11 × 5–6 μm, ellipsoideis, levibus, hyalinis, inamyloideis; basidiis 22–42 × 6–9 μm, tetrasporis; cheilocystidiis 25–38 × 5–10 μm, abundantibus, subcylindraceis, diverticulatis; pleurocystidiis nullis; pileipelle ex hyphis repentibus cylindricis composita, granulis pigmentosis brunneis incrustata; hyphis fibulatis.

Holotypus: In cortice vivo arboris *Pinus thunbergii* Parl. in silva, Izumino-mori, Yamato, Kanagawa Prefecture, Japonia, May 21, 2000, H. Takahashi (KPM-NC0008713).

Etymology: from Latin, *vernalis* = vernal.

Pileus 3–8 mm in diameter, at first hemispherical with involute margin, then plano-convex, often with slightly depressed center, at first smooth but soon radially sulcate-striate almost to the disk; surface fibrillose-tomentose to floccose-tomentose, evenly colored brown (7D7-8). Flesh very thin (up to 0.2 mm), light brown; odor and taste not distinctive. Stipe 3–6 × 0.5–0.7 mm, almost equal, central, slender, terete, hollow; surface furfuraceous to fibrillose-tomentose, concolorous with the pileus, paler toward the apex; base covered with poorly developed white tomentum that is not attached to the substratum. Lamellae adnate, distant (6–11 reach the stipe), with 0–3 series of lamellulae, up to 0.5 mm broad, thin, paler concolorous with the pileus; edges entire, concolorous.

Spore print pure white. Basidiospores 9–11 × 5–6 μm (Q = length/breadth, 1.8; *n* = 20 spores per two specimens), ellip-

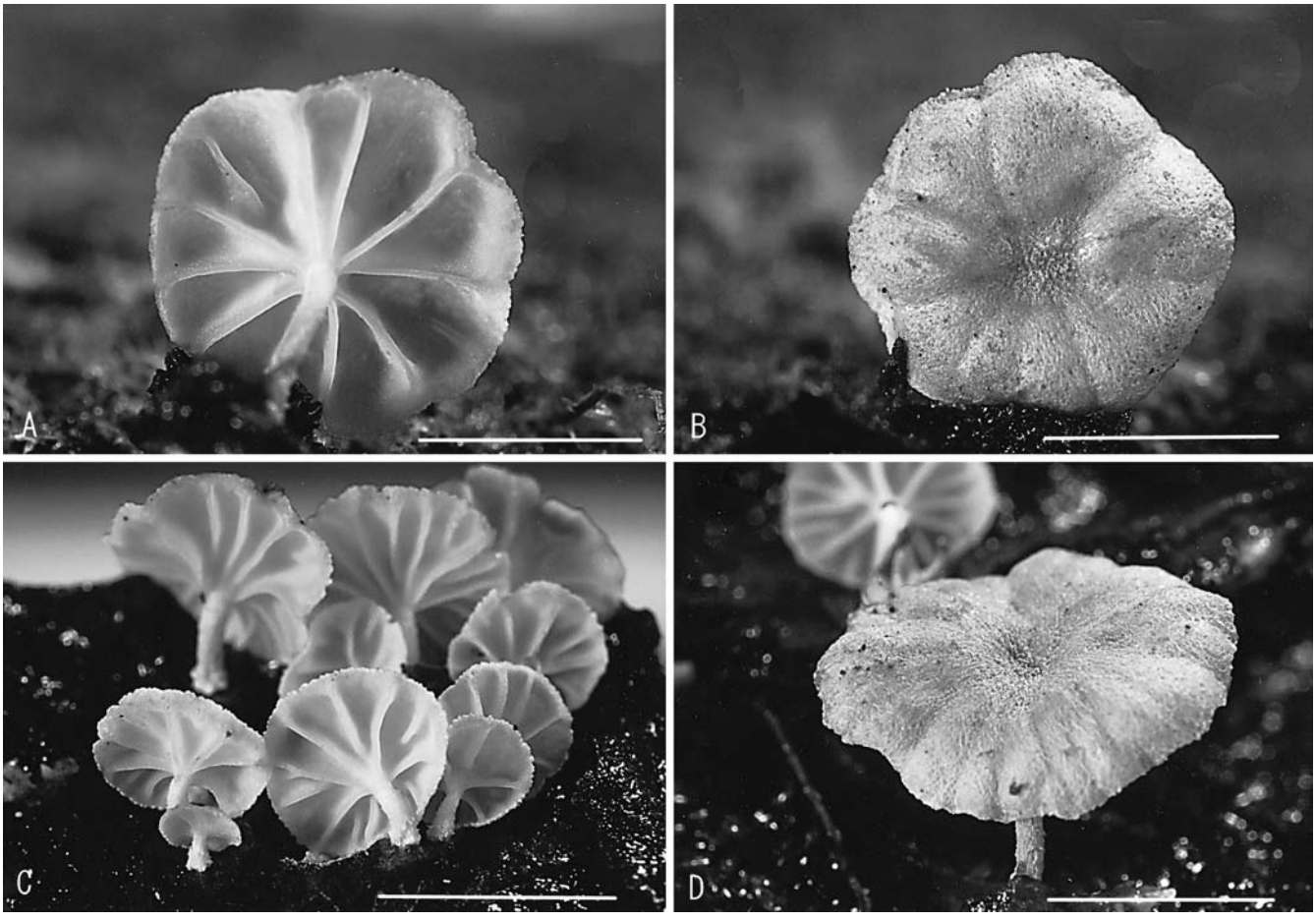

Fig. 4. Basidiomata of *Marasmiellus vernalis*. All figures from the holotype. *Bars* **A**, **B**, **D** 5 mm; **C** 10 mm

soid, smooth, colorless, inamyloid, thin-walled. Basidia 22–42 × 6–9 µm, clavate, four-spored. Basidioles subclavate. Cheilocystidia 25–38 × 5–10 µm, abundant, subcylindrical, with a variable number of digitate, 2- to 7-µm-long projections especially in upper part, colorless, thin-walled. Pleurocystidia absent. Hymenophoral trama subregular to irregular; element hyphae similar to those of the pileitrama. Pileipellis a cutis with poorly developed *Rameales* structure; constituent hyphae 3–7 µm wide, interwoven, often irregularly arranged, cylindrical, infrequently with finger-like protuberances, incrusted with granular brown pigment, thin-walled. Hyphae of pileitrama 2–7 µm wide, subparallel or irregularly arranged, cylindrical, smooth, with intercellular pale brown pigment, inamyloid, thin-walled. Stipitipellis a cutis of parallel, repent hyphae 2–6 µm wide, cylindrical, incrusted with granular brown pigment, inamyloid, thin-walled; caulocystidia absent. Stipe trama composed of longitudinally running, cylindrical hyphae 3–9 µm wide, unbranched, smooth, with intercellular pale brown pigment, inamyloid, thin-walled. All tissues with clamp connections.

Known distribution: Japan (Kanagawa).

Habitat: Solitary to caespitose, on the bark of living *Pinus thunbergii* Parl., from April to June.

Specimens examined: KPM-NC0008713 (holotype), Izumino-mori, Yamato, Kanagawa Prefecture, May 21, 2000, coll. H. Takahashi; same location, April 23, 1998, coll. H. Takahashi; same location, April 26, 1999, coll. W. Ikeda and H. Takahashi; KPM-NC0008714, same location, June 12, 2000, coll. H. Takahashi; KPM-NC0008715, same location, May 25, 2001, coll. H. Takahashi.

Japanese name: Haruno-kinobori-houraitake.

Notes: This species is characterized by its small, brown, sulcate-striate pileus, the subcylindrical cheilocystidia with a variable number of digitate projections, the mostly nondiverticulate pileipellis elements incrusted with granular brown pigment, and the basidiome formation on the bark of living *P. thunbergii* in spring. Its entirely brown basidiomata and poorly developed *Rameales* structure in the pileipellis suggest that this species belongs in the subsection *Quercini* Singer of the section *Dealbati* (Bat.) Singer (Singer 1973, 1986).

Marasmius brunneigracilis Corner, recently described from Singapore (Corner 1996), seems to be closely related to *Marasmiellus vernalis*. The former species, however, differs from the latter in having a much larger, dark brown pileus, a wholly scurfy pruinose stipe, subdistant lamellae (14–17 reach the stipe), and clavate to ventricose or pyriform cheilocystidia. *Marasmiellus pachycraspedum* Noordel. from Netherlands (Noordeloos 1977; Antonín and Noordeloos 1993) is also similar in appearance but

differs in having a not sulcate-striate pileus, much shorter (6.5–8μm) basidiospores, clavate to subfusiform, brown-incrusted cheilocystidia, and a terrestrial habitat.

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