

Short Communication

***Collybia biformis* and *C. pinastris* new to Japan**

Toshizumi Miyamoto, Tsuneo Igarashi* and Kunihide Takahashi

Department of Forest Science, Faculty of Agriculture, Hokkaido University, Sapporo 060-8589, Japan

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Two species of *Collybia* are recorded for the first time from Japan: *C. biformis* from Hokkaido, and *C. pinastris* from Hokkaido and Honshu (Nagano Prefecture). Macro- and microscopical descriptions and illustrations are provided for each species.

Key Words—basidiomycetes; *Collybia biformis*; *Collybia pinastris*; *Picea* forest.

During a study of litter-decomposing basidiomycetes in Hokkaido from 1991 to 1997, two species of *Collybia* previously unknown from Japan were collected. Subsequent studies revealed that the one is *C. biformis* (Peck) Singer and the other *C. pinastris* (Kauffman) Mitchel & Smith, both assigned to the section *Subfumosae* Singer ex Halling and known from North America (Halling, 1983). They are described and illustrated in this report.

Materials and Methods

The description of macroscopic features is based on fresh material. Names of colors and codes in parentheses are taken from Munsell (1990). For microscopic observations, dried basidiomata were placed in 95% ethanol for about 1 h and then transferred to tap water until they became pliable. Free-hand sections of the rehydrated basidiomata were examined in distilled water, 3% KOH, 10% NH₄OH plus congo red and phloxine, 1% cotton blue, and Melzer's reagent. Siderophilous granules in basidia were tested according to a prescription by Breitenbach and Kränzlin (1991). The voucher specimens have been deposited at SAPA (Herbarium of the Faculty of Agriculture, Hokkaido University, Sapporo, Japan).

A dikaryotic strain of *C. pinastris* was obtained as a multispore isolate and its cultures were stocked in 2% malt extract agar slants in test tubes. The brown needles of *Picea abies* (L.) Karst. were collected from living branches in Erlenmeyer flasks, moistened with distilled water equivalent to the needles in volume, then autoclaved at 121°C for 20 min. To observe the mycelial growth features of *C. pinastris*, mycelium was inoculated into the flask containing sterilized needles and incubated at 23°C for 2 mo in darkness.

Descriptions and Discussion

Collybia biformis (Peck) Singer, Sydowia 15: 55. 1962. Figs. 1A–B, 2

≡ *Marasmius biformis* Peck, Bull. New York State Mus. 67: 25. 1903.

= *Marasmius longistriatus* Peck, Bull. New York State Mus. 105: 25. 1906.

= *Marasmius velutipes* Berk. & Curtis, Ann. Mag. Nat. Hist. III, 4: 294. 1859.

Pileus 8–22 mm in diam, convex with incurved margin when young, becoming plane to umbilicate on the disc, rugulose sulcate on the margin when dry, edge of the margin even or sometimes undulate, surface dry, unpolished, glabrous to somewhat fibrillose under a hand lens, with dark striations when moist, dark reddish brown (5YR 3/2), reddish brown (7.5YR4/4) to strong brown (7.5YR 5/6) when wet, fading to brown (7.5YR 5/4) to light brown (7.5YR 6/4). Context thin, whitish or concolorous with pileus surface; odor and taste mild or indistinctive. Lamellae adnate, usually forming a collar around the stipe, close (17–20 reach the stipe), thin, narrow, white (10YR 8/1) to pink (7.5YR 7/3), edges entire. Stipe 23–43 × 1.2–3 mm, equal or slightly enlarged toward the base, terete or flattened, straight, tough, hollow, covered with whitish pubescence, light brown (7.5YR 6/4) downward.

Basidiospore deposit white. Basidiospores 5.8–8.3 × 2.6–3.9 μm, ellipsoid to pip-shaped, smooth, inamyloid, acyanophilous. Basidia 22–31 × 4.5–7 μm, clavate, four sterigmata, not siderophilous. Pleurocystidia absent. Cheilocystidia 25–40 × 5–16 μm, cylindrical contorted to strangulated or variously lobed. Lamellar trama subparallel, inamyloid, made up of smooth, thin-walled, 2.5–6 μm broad hyphae. Pileus trama consisting of radially oriented, inamyloid, smooth-walled, 2–6.7 μm broad hyphae. Hyphae of the pileipellis repent, radially oriented, cylindrical, 3–10 μm in diam, encrusted with a spiral to banded pigment, with diverticulate branchlets.

*Present address: 3-7-5, Koyo-cho, Kitahiroshima-shi, Hokkaido 061-1134, Japan.



Fig. 1. Basidiomata of *Collybia biformis* and *C. pinastris* and rhizomorphoid mycelial cords of *C. pinastris*.

A, B: Basidiomata of *C. biformis* (HUCO96019). C, D: Basidiomata of *C. pinastris* (C, HUCO9510; D, HUCO9508). E: Rhizomorphoid mycelial cords (arrow) of *C. pinastris* connecting needles of *Picea abies* (HUCO9507). F: Basidiomata of *C. pinastris* and its rhizomorphoid mycelial cords (arrow) on a corn of *P. glehnii* (HUCO9509). G: Rhizomorphoid mycelial cords (arrow) formed in vitro on sterilized needles of *P. abies*. All scale bars = 10 mm.

Hyphae of the stipitipellis, parallel, hyaline to pale brownish in 3% KOH, 3–5.2 μm in diam, thick-walled. Caulocystidia cylindrical contorted to strangulated, up to 7 μm in diam, thick-walled (up to 0.9 μm thick). Clamp connections present in all tissues.

Habit and habitat: Gregarious or subcespitate on litter of leaf, needle, or herbaceous plants in mixed conifer-hardwood or coniferous forests, often along the sides of unpaved roads.

Specimens examined: HUCO96006, 4 Aug. 1996, on litter of hardwood and herbaceous plants in the space

between stones on a woodland path in mixed conifer-hardwood forest, elev. 500 m, Muroran-dake, Kagawa-cho, Muroran-shi, Hokkaido. HUCO96019, 6 Sept. 1996, in conifer-hardwood forest, elev. 300 m, Uryu Experimental Forest of Hokkaido University, Horokanai-cho, Uryu-gun, Hokkaido; HUCO97005, 28 June 1997, in *P. abies* plantation forest, the same locality. All specimens were collected by T. Miyamoto.

Japanese name: Yamazi-no-karebatake (new name).

Diagnostic macroscopic characteristics of this species are the slender, pubescent stipe colored light brown

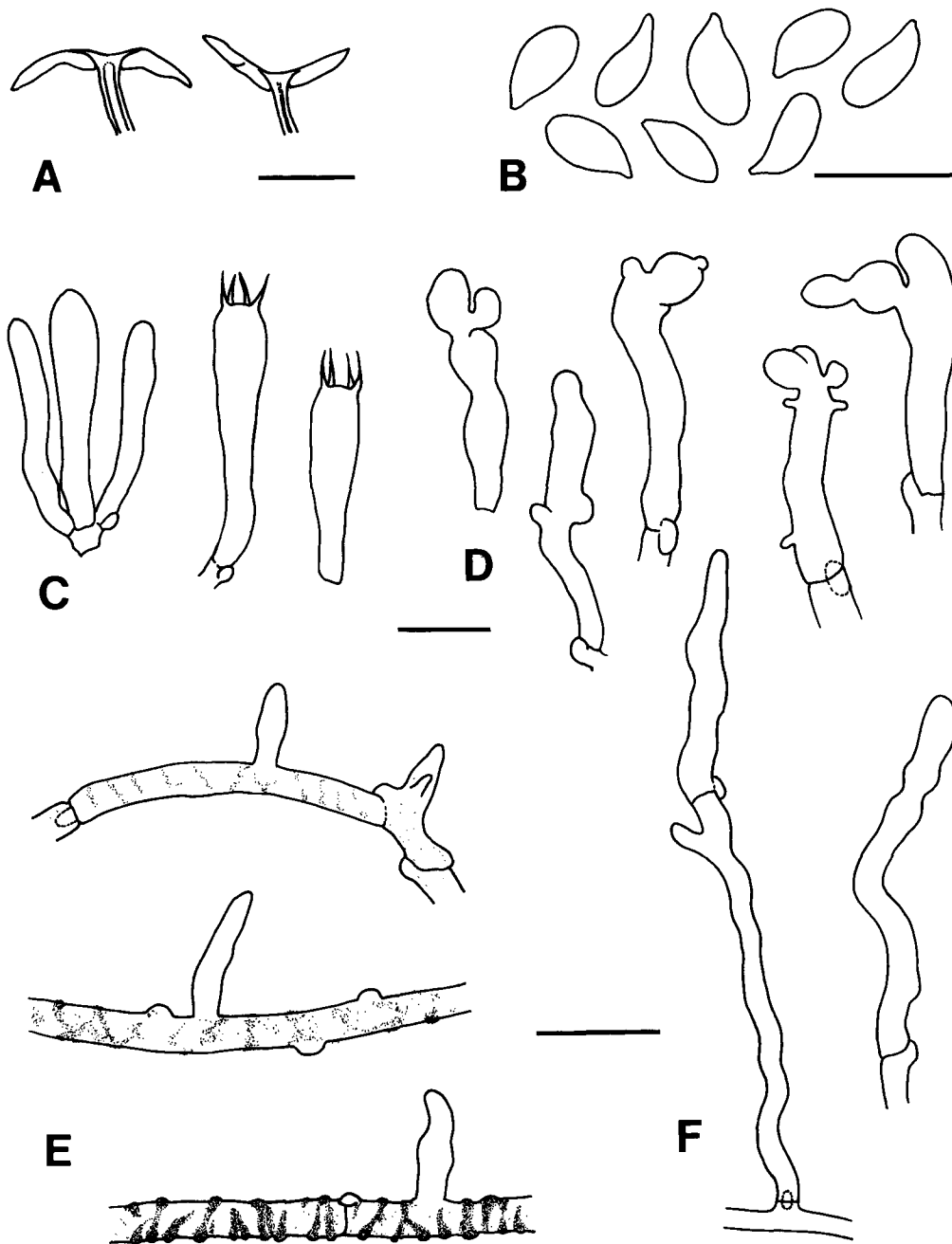


Fig. 2. *Collybia biformis*. A: Sections of pilei (left, HUCO96019; right, HUCO96006). B: Basidiospores (HUCO96019). C: Basidia and basidioles (HUCO96019). D: Cheilocystidia (HUCO96019). E: Elements of pileipellis (HUCO96019). F: Caulocystidia (left, HUCO96019; right, HUCO96006). Scale bars: A=10 mm; B=10 μ m; C, D=10 μ m; E, F=10 μ m.

below, close lamellae that usually form a collar around the stipe, and the brown pileus that becomes nearly plane in age. Microscopically the hyphae of the pileipellis with diverticulate branchlets are characteristic. *Collybia subnuda* (Ellis ex Peck) Gilliam (so far not known in Japan) and *C. confluens* (Pers.: Fr.) Kummer might be confused with *C. biformis* in the field. However, *C. subnuda* is usually bitter to taste and lacks diverticulate branchlets in the pileipellis hyphae (Halling, 1983). *Collybia*

confluens has a much paler brownish pileus, very crowded lamellae and few diverticulate branchlets on the pileipellis hyphae.

Regarding the habitat, this species is said to grow most frequently on soil and occasionally on leaf or needle in North America (Halling, 1983), while three collections we obtained in Hokkaido were all found not on soil but on leaf or needle litter. More collections seem necessary to clarify the ecology of this species in Japan.

Collybia pinastris (Kauffman) Mitchel & Smith, *Mycologia* 70: 1044. 1978. Figs. 1C–G, 3
 ≡ *Marasmius pinastris* Kauffman, *Pap. Michigan Acad. Sci.* 1: 144. 1921.

Pileus 4–16 mm in diam, convex to hemispherical with incurved margin when young, becoming plane to umbilicate or obtusely umbonate, rugose or rugose striate to the margin, edge of the margin even or sometimes undulate, surface dry, unpolished, glabrous, strong brown (7.5YR 5/6) to reddish brown (2.5YR 5/4–6/4) at the center, paler to pinkish white (5YR 8/2) outward, or very pale brown (10YR 7/4–8/4) to yellow (10YR 7/6) overall when fresh, fading to very pale brown (10YR 7/4–8/4) with age. Context thin, concolorous with pileus surface, soft, occasionally watery; odor mild, or sometimes strongly unpleasant, taste indistinctive or slightly of alliaceous. Lamellae adnate to subdecurrent,

subdistant (13–23 reach the stipe), often intervenose and forked, thin, narrow, very pale brown (10YR 8/4) to whitish, edges entire. Stipe 20–38 × (0.6–)1–1.5(–1.8) mm, equal or apex slightly enlarged, tough and pliant, surface dry, pubescent to tomentose or strigose toward the base, very pale brown (10YR 7/4–8/4), yellow (10YR 7/6), or pinkish white (5YR 8/2) at the apex, strong brown (7.5 YR 5/6), reddish brown (2.5YR 4/4–5/4), or dark reddish gray (5YR 4/2) toward the base, interior white, solid; at the base with rhizomorphoid mycelial cords ca. 0.3 mm in diam, black to dark brown.

Basidiospore deposit white or cream. Basidiospores (7.3–)7.7–10.3(–10.9) × 3.2–4.6(–5) μm, ellipsoid to lacrymoid, smooth, inamyloid, acyanophilous. Basidia clavate, 30–50 × 5.2–9 μm, with four sterigmata, not siderophilous. Hymenial cystidia absent. Lamellar trama interwoven, inamyloid, made up of 2–5.2 μm broad

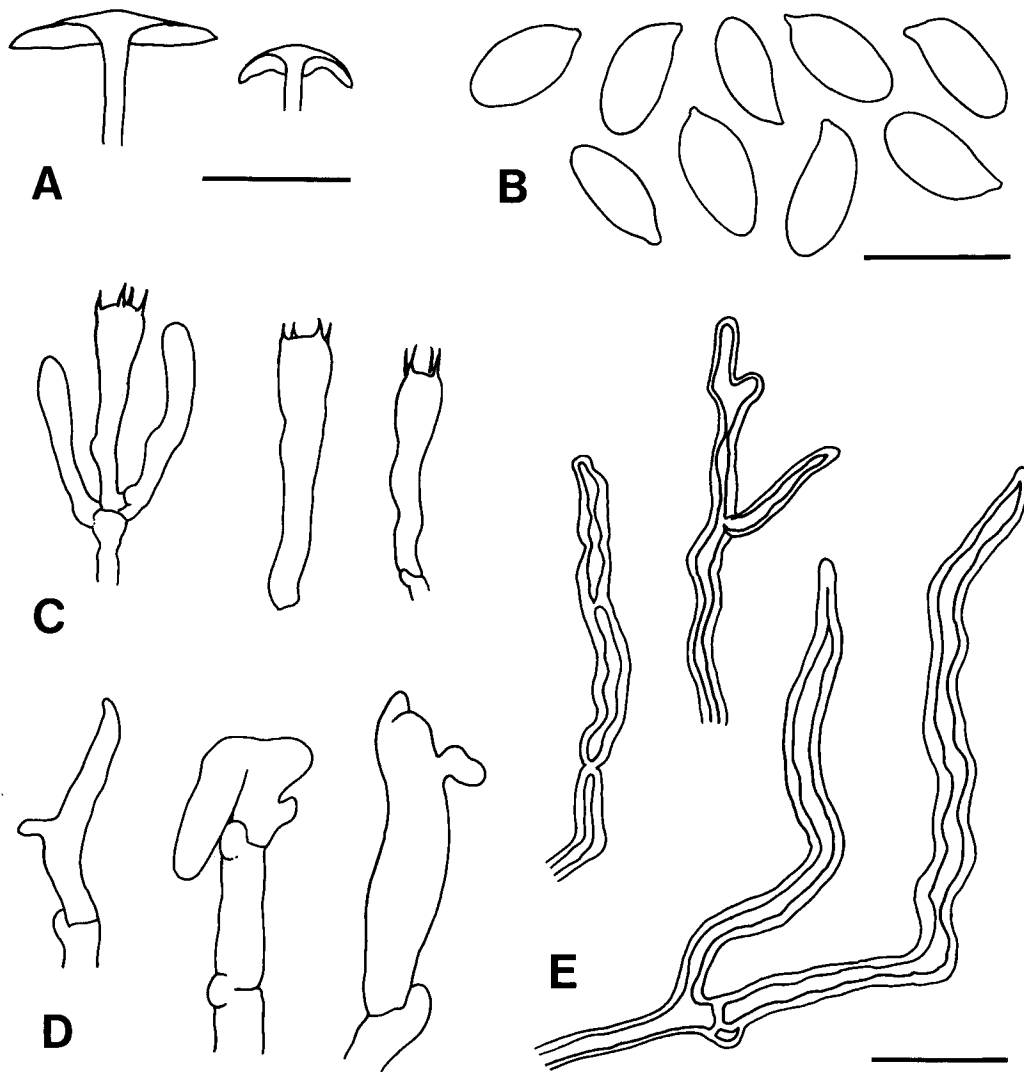


Fig. 3. *Collybia pinastris*.

A: Sections of pilei (HUCO96018). B: Basidiospores (HUCO9202; HUCO9506; HUCO9513). C: Basidia and basidioles (HUCO96002). D: Elements of pileipellis (HUCO9506). E: Caulocystidia (HUCO9513). Scale bars: A=10 mm; B=10 μm; C–E=10 μm.

hyphae. Pileus trama made up of interwoven, inamyloid, 3–7 μm broad, smooth and hyaline, thin-walled hyphae. Hyphae of the pileipellis repent, more or less radially oriented, cylindrical, 3.2–10 μm in diam, slightly encrusted, with scattered diverticulate branchlets; pileipellis not strongly differentiated from the trama. Hyphae of the stipitipellis parallel, 2.3–8 μm in diam, thick-walled. Caulocystidia cylindrical contorted to stragulated, sometimes branched, up to 9 μm in diam, quite thick-walled (up to 3.2 μm thick), hyaline to pale brownish in 3% KOH. Hyphae of the rhizomorphoid mycelial cords cylindrical, up to 5.3 μm in diam, quite thick-walled (up to 2.5 μm thick), hyaline to pale brownish in 3% KOH. Clamp connections present in all tissues.

Habit and habitat and phenology: Gregarious on needles, rarely on cones of *Picea*. From June to September.

Specimens examined: HUCO9202, 26 July 1992, in *P. glehnii* (Fr. Schmidt) Mast. forest; HUCO9508 and HUCO9509, 4 July 1995, the same habitat and locality; HUCO96002, 3 July 1996, the same habitat and locality. HUCO9506 and HUCO9507, 30 June 1995, in *P. abies* plantation forest, elev. 300 m, Uryu Experimental Forest of Hokkaido University, Horokanai-cho, Uryu-gun, Hokkaido; HUCO9510, 5 July 1995, the same habitat and locality; HUCO96018, 6 Sept. 1996, the same habitat, the same locality. HUCO9513, 4 Sept. 1995, in *P. glehnii* plantation forest, elev. 25 m, Ebetsu-shi, Hokkaido. HUCO9512, 23 Aug. 1995, in *P. bicolor* (Maxim.) Mayr plantation forest in Sugadaira Montane Research Center, University of Tsukuba, Sanada, Nagano prefecture. All specimens were collected by T. Miyamoto.

Japanese name: Nioi-matsu-ochibatake (new name).

From early summer to autumn, this species fruits abundantly after rainfall and dries easily with the color fading to whitish. Having a tough-elastic stipe, does not decay easily but remains for more than a week. The basidioma soon revive when soaked by rain. The diverticulate branchlets in the pileipellis and the extremely thick-walled caulocystidia are characteristic microscopically.

Our specimens are almost identical to the North American material described by Kauffman (1921), Mitch-

el and Smith (1978) and Halling (1983), except for the presence of rhizomorphoid mycelial cords associated with basidiomata (Figs. 1E, F) and the seemingly larger basidia of 30–50 \times 5.2–9 μm . In vitro, this species grew well and formed aerial mycelial cords abundantly on the sterilized needles of *P. abies* along the wall of the flask (Fig. 1G), but the color of the rhizomorphoid mycelial cords was slightly paler than in the field. Microscopically, the element hyphae were cylindrical (up to 4.8 μm broad) and quite thick-walled (up to 2.0 μm thick), having similar morphology to those of rhizomorphoid mycelial cords formed in the field.

We observed that the present species fruits relatively abundantly on needles of *P. glehnii* and *P. abies* in Hokkaido and on needles of *P. bicolor* in Nagano prefecture. Thus all our specimens have been found on the *Picea* needles. Since our observations in the Uryu Experimental Forest of Hokkaido University began in 1991, we did not observe this species on any other substrate except for *Picea* needles and cones, although other coniferous tree species (mainly *Abies sachalinensis* (Fr. Schmidt) Mast.) were present in the studied area.

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