

Short Communication

Three species of *Cortinarius* subgenus *Phlegmacium* new to Japan

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Three species of *Cortinarius* subgenus *Phlegmacium* are described and illustrated for the first time in Japan: *C. cumatilis* var. *cumatilis*, *C. scaurus* var. *scaurus*, *C. xanthophyllus*.Key Words—Agaricales; *Cortinarius cumatilis* var. *cumatilis*; *Cortinarius scaurus* var. *scaurus*; *Cortinarius xanthophyllus*; Japan.

During a study on macrofungus flora of subalpine and montane regions in central Japan, many specimens of *Cortinarius*, including taxa previously unrecorded in Japan, have been collected. Three species belonging to the subgenus *Phlegmacium* are reported herein as new records to Japan. They are *Cortinarius cumatilis* Fr. var. *cumatilis* (Sect. *Multiformis*), *C. scaurus* (Fr.: Fr.) Fr. var. *scaurus* (Sect. *Scauri*) and *C. xanthophyllus* (Cooke) R. Henry (Sect. *Scauri*). The sections of first and second species are based on the system of Brandrud et al. (1990), and the section of the third species is based on the system of Moser (1960). Descriptions and illustrations are given for each species. In the following descriptions, macroscopic characters were based on fresh fruitbodies. Color names used are from "Manual of Color Names" (Japan Color Research Institute, 1973) and color codes in parenthesis from "The Munsell Book of Color" (Munsell Color, 1963). Microscopic features were studied with free-hand sections mounted in aqueous 5% KOH solution and in water. For the size of basidiospores, a total of 200 spores from mounted lamellae were measured in each species.

SEM photographs of the spores were taken from dried specimens. Photographs of the spore surface structure were taken with a JSM-5800LV (JEOL Ltd.).

All specimens cited are deposited in the herbarium of Yamanashi Forestry and Forest Product Research Institute (YFH), Yamanashi.

Cortinarius cumatilis Fr., Epicr.: 269. 1838. var. *cumatilis* Figs. 1A, 2A, 3A–D

Pileus 70–150 mm broad; spherical to hemispherical when young, flattened at maturity; lilac (10P 5/8) in button stages, becoming bluish gray (7.5PB 8/4) with age, finally tinged with reddish yellow (7.5YR 7/8) at center; surface smooth, viscid; margin smooth; context purplish

white (5P 9/2) to grayish white (N 9.0). Lamellae adnate to adnexed, crowded; white (N 9.5) or yellowish white (2Y 9/1) when young, then light grayish brown (4YR 6/2) when mature; margin entire, becoming eroded with age. Stipe 70–130 mm long, at apex 10–20 mm broad, base clavate-bulbous, up to 35 mm broad; stuffed; surface smooth, white (N 9.5); context concolorous with that of the pileus. Cortina fugacious lilac (10P 5/8). Universal veil well-developed, usually leaving lilac (5P 7/6) patches near the bulb. Taste mild; odor indistinctive. Spore print light yellowish brown (7.5YR 7/10) to yellowish brown (7.5YR 6/12). KOH reaction on the pileus and stipe context are trivial.

Basidiospores 10–12 × 5–6.5 μm (mean 10.9 × 6.2 μm, n=200), length/breadth ratio 1.8–2.0, amygdaliform, slightly verrucose, pale yellowish brown in water, yellowish brown in 5% KOH. Basidia 35–45 × 5–8 μm, narrowly clavate, 4-spored. Pleurocystidia and cheilocystidia absent. Sterile cells on edges of lamellae 20–40 × 5–15 μm, cylindrical to clavate, thin-walled, smooth, hyaline. Hymenophoral trama parallel, of hyphae 8–12 μm in diam. Pileipellis consisting of two distinct layers; epicutis thin, 50–60 μm thick, of hyphae 4–6 μm in diam; hypodermium well-developed, of thick-walled hyphae 8–22 μm in diam, filled with a slightly yellow pigment in water; hyphae of epicutis and veil filled with blue, intercellular, plasmatic pigment in water. Clamp connections frequent.

Habit and habitat: often growing in small groups, large rings or rows, on the ground in Japanese red pine (*Pinus densiflora* Sieb. & Zucc.) forests, with or without *Quercus serrata* Thunb., or in mixed coniferous forest (*P. densiflora*, *Tsuga sieboldii* Carr.); September and October.

Distr.: New to Japan (Yamanashi), Europe.

Specimens examined: Japan, Yamanshi Pref., Kofu,

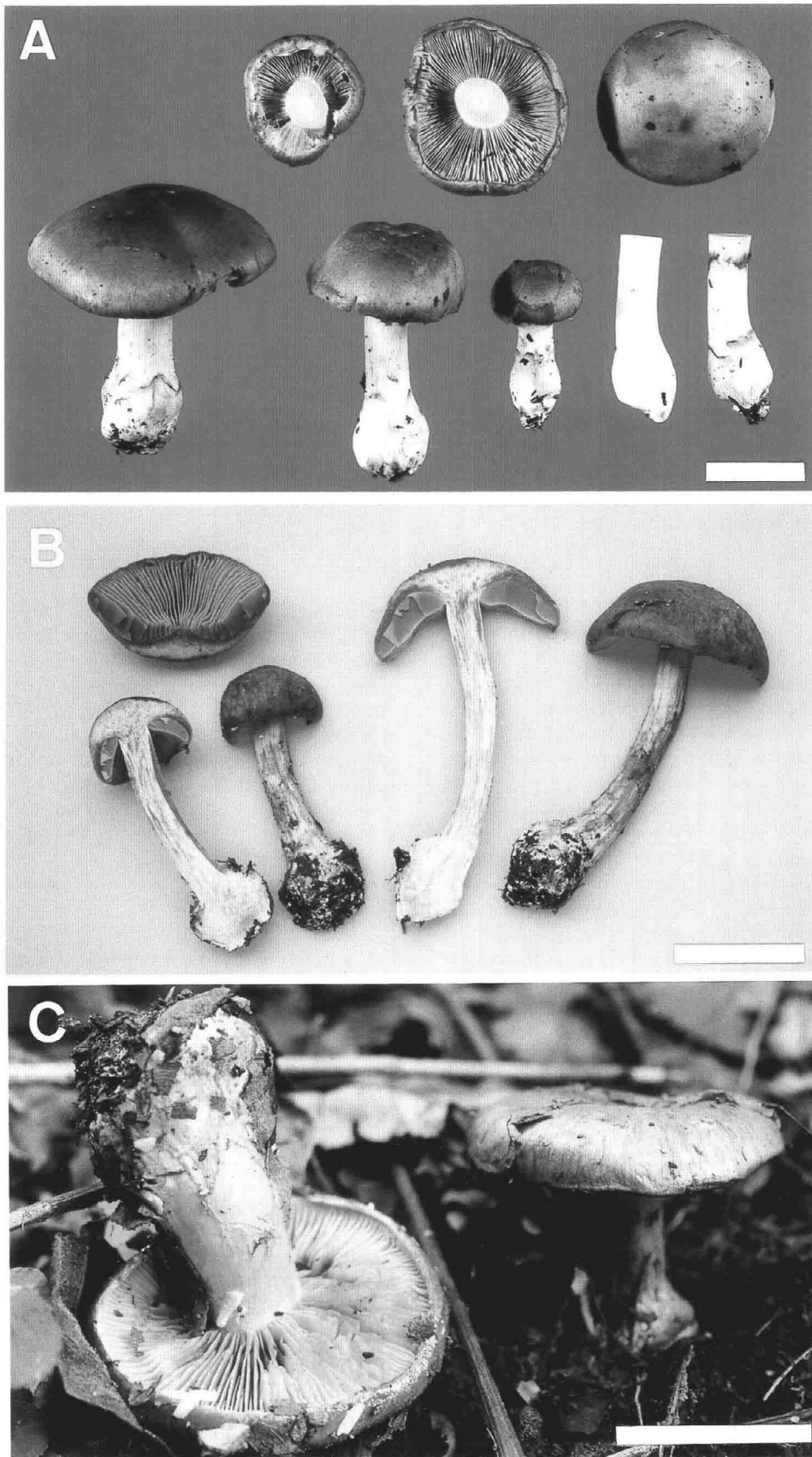


Fig. 1.

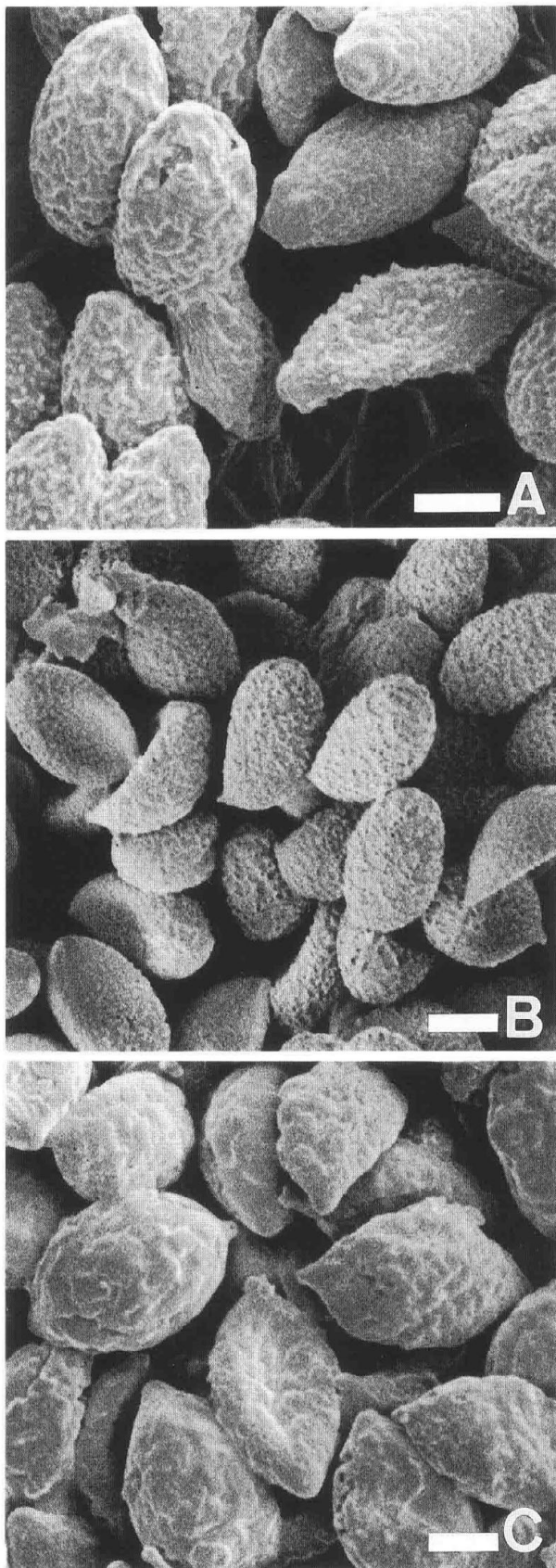


Fig. 2.

Takeda-no-mori, in *P. densiflora* artificial forest with *Q. serrata*, 30 Sept. 1996, coll. H. Shibata, YFH 960901; same locality and same vegetation, 5 Oct. 1996, coll. H. Shibata, YFH 961107; Yamanashi Pref., Ashiwada, Yacho-no-mori, in *T. sieboldii*-*P. densiflora* forest, 7 Oct. 1996, coll. H. Shibata, YFH961001; Yamanashi Pref., Tsuru, Takara-no-yama, in *P. densiflora* artificial forest, 15 Oct. 1996, coll. H. Shibata, YFH 961003.

Japanese name: Rairakku-fusentaké

These collections coincide well with *C. cumatilis* reported by Brandrud et al. (1990). *Cortinarius cumatilis* var. *cumatilis* can be easily recognized in the field by its viscid and lilac-tinted pileus. This taxon belongs to subgenus *Phlegmacium*, section *Multiformis* (Brandrud et al., 1990) and includes three varieties (Moser, 1960), namely, *C. cumatilis* var. *cumatilis*, *C. cumatilis* var. *haasii* (Moser) Moser and *C. cumatilis* var. *robustus* (Moser) Moser. Among the three varieties, *C. cumatilis* var. *cumatilis* is characterized by distinctly white or yellowish white lamellae in young specimens. *Cortinarius cumatilis* var. *haasii* has violaceous bluish lamellae and *C. cumatilis* var. *robustus* has clay-pallid lamellae (Moser, 1960). The fungus reported in this paper has white to yellowish white lamellae when young and is identified as *C. cumatilis* var. *cumatilis*. Among Japanese members of *Phlegmacium* (Hongo, 1987), *Cortinarius praestans* (Cordier) Gillet somewhat resembles *C. cumatilis* var. *cumatilis* macroscopically, especially when young. However, *C. praestans* is a larger, more massive species with radial wrinkles at the pileus margin, and its basidiospore size is distinctly larger: $15.5\text{--}21 \times 9\text{--}10.5 \mu\text{m}$ (Hongo, 1987). Further, it generally grows in deciduous forests on calcareous soil (Hongo, 1987). *Cortinarius coerulescens* (Schaeff.) Fr. also resembles *C. cumatilis* var. *cumatilis* macroscopically, but the lamellae of *C. coerulescens* are bluish or lilac (Ito, 1959).

Cortinarius scaurus (Fr.: Fr.) Fr., Epicr.: 268. 1838. var. *scaurus* Figs. 1B, 2B, 4A–D
 Basionym: *Agaricus scaurus* Fr., Obs. mycol. 2: 75. 1818.

Pileus 30–60 mm broad; spherical to hemispherical at first, then convex, plano-convex at maturity; when young dark olive-gray (2.5Y 4/2) or dark greenish gray (5G 4/1), with maturity becoming dark brown (7.5YR 3/3, 3/4), center reddish brown (5YR 3/4); margin smooth, often hygrophanous, with dark reddish gray (5YR 4/2) spots that are hygrophanous; surface smooth, viscid and somewhat greasy when wet, often scattering pale greenish yellow patches of veil remnants, especially over the center; context yellowish brown (10YR 5/6) to dark yellowish brown (10YR 4/6). Lamellae adnate to adnexed, crowded; margin smooth; at first dark olive (10Y 3/4) to

Fig. 1. Basidiomata. A. *Cortinarius cumatilis* var. *cumatilis* [YFH961010]. B. *C. scaurus* var. *scaurus* [YFH871005]. C. *C. xanthophyllus* [YFH871007]. All scale bars = 30 mm.
 Fig. 2. Basidiospores in SEM. A. *C. cumatilis* var. *cumatilis* [YFH961010]. B. *C. scaurus* var. *scaurus* [YFH960905]. C. *C. xanthophyllus* [YFH871007]. All scale bars = 5 μm .

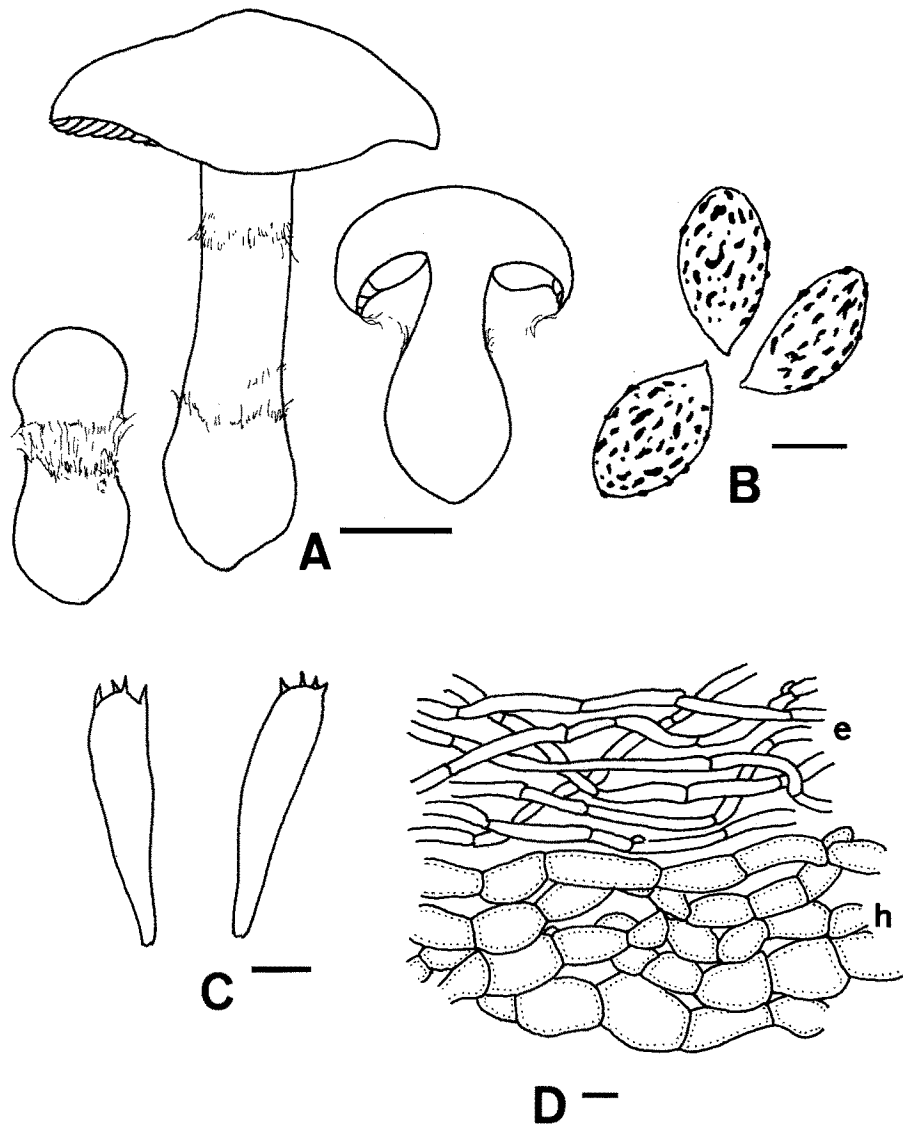


Fig. 3. *Cortinarius cumatilis* var. *cumatilis* [YFH961010]. A. Basidiomata. B. Basidiospores. C. Basidia. D. Hyphae of epicutis (e) and hypodermium (h). Scale bars: A=30 mm; B=5 μ m; C, D=10 μ m.

dark olive-green (2.5GY 3/4), then olive-brown (2.5Y 4/8), toward apex of stipe with a persistent olivaceous tinge. Stipe 40–80 mm long, at apex 5–10 mm broad, base marginate or abruptly bulbous when young, clavate-bulbous, up to 20 mm broad when mature; stuffed; surface glossy, more or less fibrillose when young, at apex light purplish gray (5P 7/2) or light greenish gray (5G 8/2), bulb yellowish gray (5Y 6/4); context at apex bluish gray (5PB 7/4) to purplish gray (6P 7/2), base light yellowish brown (10YR 6/4). Cortina fugacious, dark green; universal veil well-developed, at bulb margin deep yellowish green (7.5GY 5/4) to dull green (2.5G 3/4). Taste mild; odor distinct, honey-like. Spore print deep brown (7.5YR 4/8). KOH reaction on the pileus is trivial and on the stipe context is deep yellowish green.

Basidiospores 9–10.5 \times 6–7 μ m (mean 9.8 \times 6.3 μ m, n=200), length/breadth ratio 1.5–1.7, ellipsoid, walls thick, distinctly and densely verrucose, pale yellowish

brown in water, yellowish brown in 5% KOH. Basidia 30–40 \times 5–8 μ m, narrowly clavate, 4-spored. Pleurocystidia and cheilocystidia absent. Sterile cells of lamella edges abundant, 20–30 \times 5–15 μ m, thin-walled, cylindrical to clavate or pyriform, smooth, hyaline. Hymenophoral trama parallel, of hyphae 8–11 μ m in diam. Pileipellis consisting of two distinct layers; epicutis thin, 40–50 μ m thick, of hyphae 4–6 μ m in diam, filled with pale green intracellular granular pigments; hypodermium well-developed, of hyphae 10–18 μ m in diam filled with slightly yellowish pigment in water. Hyphae of veil with green intracellular pigment. Clamp connections frequent.

Habit and habitat: often growing in small groups or solitary, on the ground in nutrient-poor montane, subalpine coniferous forests (*Abies veitchii* Lindley, *Tsuga diversifolia* (Maxim.) Masters); September and October.

Distr.: New to Japan (Yamanashi), Europe.

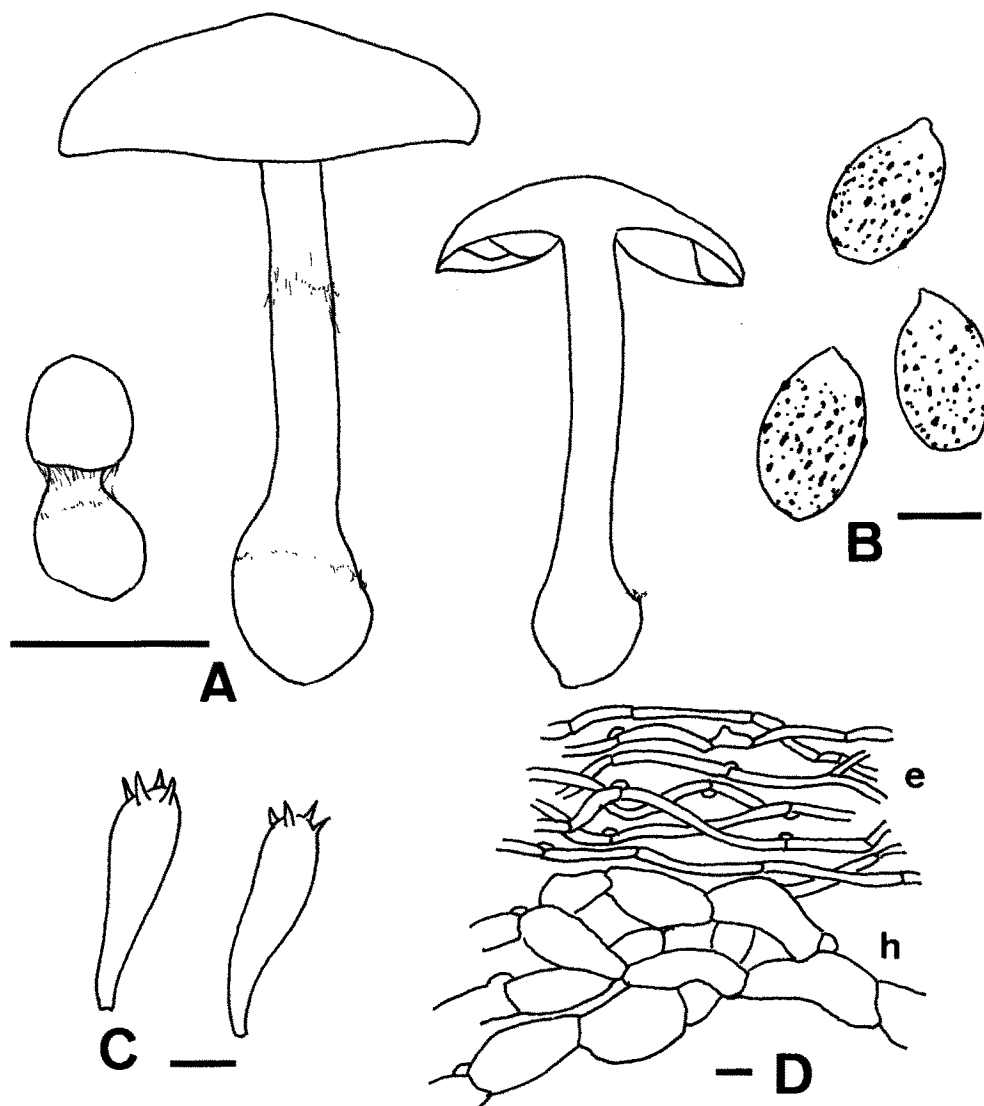


Fig. 4. *Cortinarius scaurus* var. *scaurus* [YFH871005]. A. Basidiomata. B. Basidiospores. C. Basidia. D. Hyphae of epicutis (e) and hypodermium (h). Scale bars: A=20 mm; B=5 μ m; C, D=10 μ m.

Specimens examined: Japan, Yamanashi Pref., Narusawa, Mt. Fuji (3rd stage, 1800 m above sea-level), in *Abies veitchii* forest, 5 Oct. 1987, coll. H. Shibata, YFH871003; same locality, in *A. veitchii*-*T. diversifolia* forest, 3 Sept. 1996, coll. H. Shibata, YFH960905; Yamanashi Pref., Narusawa, Mt. Fuji (4th stage, 2000 m above sea-level), in *A. veitchii* forest, 5 Oct. 1987, coll. H. Shibata, YFH871005; Yamanashi Pref., Fujiyoshida, Mt. Fuji (2nd stage, 1600 m above sea-level), in *A. veitchii* forest, 4 Sept. 1996, coll. H. Shibata, YFH960904.

Japanese name: Madara-fusentaké.

These collections coincide well with *C. scaurus* var. *scaurus* reported by Brandrud et al. (1994). *Cortinarius scaurus* includes three varieties (Brandrud et al., 1994), namely, *C. scaurus* var. *scaurus*, *C. scaurus* (Fr.: Fr.) Fr. var. *herpeticus* (Fr.) Quél. and *C. scaurus* (Fr.: Fr.) Fr. var. *sphagnophilus* (Peck) Brandrud. Among the three varie-

ties, *C. scaurus* var. *scaurus* is characterized by lamellae that are distinctly colored green to olivaceous green in young specimens and lacks the blue tinge of *C. scaurus* var. *herpeticus*. *Cortinarius scaurus* var. *sphagnophilus* is devoid of green or bluish green colors in the lamellae. The fungus reported in this paper has lamellae dark olive to olive-green when young and is identified as *C. scaurus* var. *scaurus*. Other diagnostic characters of *C. scaurus* var. *scaurus* includes a yellowish green veil and its habitat on nutrient-poor acid soil. This taxon of north and central Europe has been recorded in *Picea* and *Pinus* forests (Moser, 1960; Brandrud, 1994). Although these forests are also present in Yamanashi Pref., I have found this taxon only in *Abies* and *Tsuga* forest there.

Cortinarius xanthophyllus (Cooke) R. Henry, Rev. Mycol. 8, Suppl.: 30. 1943. Figs. 1C, 2C, 5A-D

Basionym: *Cortinarius dibaphus* Fr. var. *xanthophyllus*

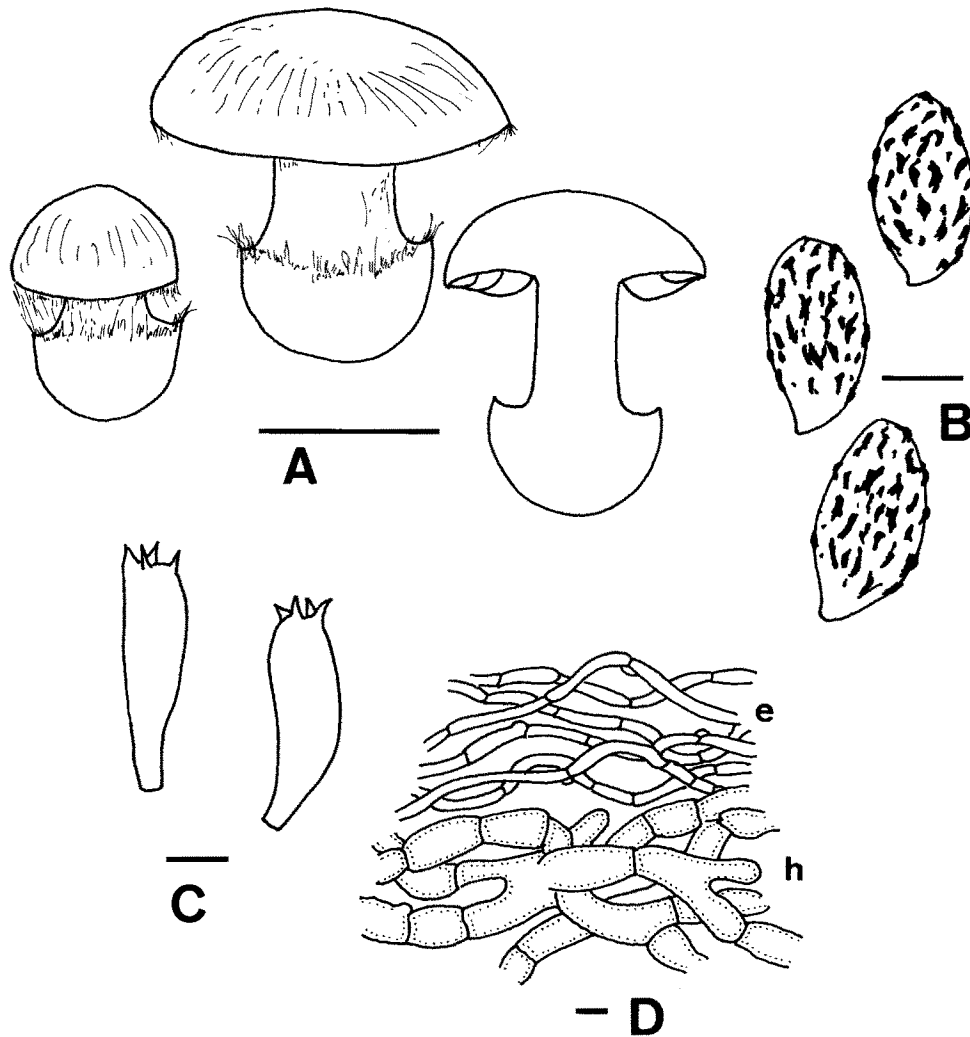


Fig. 5. *Cortinarius xanthophyllus* [YFH871007]. A. Basidiomata. B. Basidiospores. C. Basidia. D. Hyphae of epicutis (e) and hypodermium (h). Scale bars: A=30 mm; B=5 μ m; C, D=10 μ m.

Cooke, *Illustr. Br. Fung.* 5: pl. 713. t. 753. 1886–1888.

Pileus 40–110 mm broad; spherical to hemispherical when young, then convex, plano-convex at maturity; lilac (6P 6/7) or bright purple (7.5P 4/10) entirely when young, discoloring to light yellowish brown (10YR 6/4) or dull yellow (5Y 7/5) at the center when mature; edge smooth; surface smooth, viscid and somewhat greasy when moist, minutely tomentose on drying; context pale yellow (5Y 7/4) to light yellow (5Y 9/6), undersurface of the pileus bright purple (7.5P 6/10). Lamellae adnate to adnexed, crowded; margin smooth; bright yellow (2.5Y 6/8, 5Y 6/8) to light greenish yellow (7.5Y 8.5/10) when young, then olive-yellow (2Y 7.5/6). Stipe 40–80 mm long, at apex 10–20 mm broad, base marginately bulbous up to 30 mm broad; stuffed; surface more or less smooth to fibrillose; concolorous with lamellae when young, then pale yellow (5Y 8/4), cortina pale yellow (5Y 8/4); context pale yellow (5Y 9.0/3). Taste mild; odor faintly mucid when fresh, but virose like rotted fish when dried. Spore print yellowish brown (10YR 4/6). KOH reaction

on the pileus and stipe context orange-red within one minute.

Basidiospores 10–13 \times 6–6.5 μ m (mean 11.8 \times 6.3 μ m, n=200), length/breadth ratio 1.7–2.0, amygdaliform to citriform, distinctly verrucose, almost smooth when immature, pale yellowish brown in water, brown in 5% KOH. Basidia 30–40 \times 5–10 μ m, narrowly clavate, 4-spored. Pleurocystidia and cheilocystidia absent. Edges of lamellae with sterile cells 25–45 \times 3–4 μ m, cylindrical to clavate, thin-walled, smooth, hyaline. Hymenophoral trama parallel, of hyphae 9–12 μ m in diam. Pileipellis consisting of two distinct layers; epicutis thin, 40–50 μ m thick, of hyphae 4–6 μ m in diam, hyaline in water; hypodermium well-developed, of thick-walled hyphae 8–20 μ m in diam, filled with purplish brown pigments in water. Clamp connections frequent.

Habit and habitat: often in small groups or solitary on the ground in deciduous forests (*Quercus* spp.); September and October.

Distr.: New to Japan (Yamanashi), Europe.

Specimens examined: Japan, Yamanashi Pref., Ot-suki, Sasago, in *Q. serrata* forest, 14 Oct. 1986, coll. H. Shibata, YFH861010; same locality, in *Q. serrata* forest, 28 Oct. 1994, coll. H. Shibata, YFH941009; Yamanashi Pref.,utama, Masutomi, in *Q. crispula* Blume forest, 7 Oct. 1987, coll. H. Shibata, YFH871007; Yamanashi Pref., Tabayama, Takao-ten-daira, in *Q. serrata* forest, 27 Sept. 1996, coll. H. Shibata, YFH960909.

Japanese name: Kihida-fusentakake.

These collections coincide well with *C. xanthophyllus* reported by Moser (1960) and Orton (1988). *Cortinarius xanthophyllus* is a species found in deciduous forest and remarkable for the colors of the pileus (lilac or bluish violaceous) and lamellae (yellow). No species with purplish pileus and yellowish lamellae has ever been described in Japan. *Cortinarius odorifer* Britzelmayer (Brandrud et al., 1994), a European species that is unknown in Japan, resembles this species in its appearance. However, it has a strong smell of aniseed when fresh and the context is entirely greenish yellow, lacking a purplish color beneath the pileus surface. *Cortinarius quercilicis* (Chevassut & R. Henry) R. Henry, another European species that is unknown in Japan, resembles *C. xanthophyllus* in its appearance, especially its yellowish lamellae and stipe. But *C. quercilicis* lacks an orange-red KOH reaction on the pileus and stipe context, and it also lacks the purplish color beneath the pileus surface when young (Brandrud et al., 1998). *Cortinarius rufolivaceus* (Pers. : Fr.) Fr. is another European species with a bright purplish pileus surface. However, the lamellae of *C. rufolivaceus* are bright olive and the KOH reaction of the stipe context is dark green (Bon, 1987). Thus *C. xanthophyllus* and *C. rufolivaceus* can be distinguished by the color of lamellae and the KOH reaction on the context

of the stipe.

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Literature cited

- Bon, M. 1987. The Mushrooms and Toadstools of Britain and North-Western Europe, pp. 212–213. Hodder & Stoughton, London.
- Brandrud, T. E., Lindstrom, H., Marklund, H., Melot, J. and Muskos, S. 1990. *Cortinarius* Flora Photographica (English version). Vol. 1. A47. *Cortinarius* HB, Matfors.
- Brandrud, T. E., Lindstrom, H., Marklund, H., Melot, J. and Muskos, S. 1994. *Cortinarius* Flora Photographica (English version). Vol. 3. C06, C08, C15, C21. *Cortinarius* HB, Matfors.
- Brandrud, T. E., Lindstrom, H., Marklund, H., Melot, J. and Muskos, S. 1998. *Cortinarius* Flora Photographica (English version). Vol. 4. D01, D18. *Cortinarius* HB, Matfors.
- Hongo, T. 1987. Cortinariaceae. In: Colored Illustrations of Mushrooms of Japan Vol. 1, (ed. Imazeki, R. and Hongo, T.), pp. 226–240. Hoikusha, Osaka. (In Japanese.)
- Ito, S. 1959. Mycological Flora of Japan. Vol. II, Basidiomycetes. No. 5. Agaricales, Gasteromycetales, pp. 391–392. Yokendo, Tokyo. (In Japanese.)
- Japan Color Research Institute. 1973. Manual of Color Names. Nihon Shikiken-Jigyo, Tokyo. (In Japanese with English color descriptions.)
- Moser, M. 1960. Die Gattung *Phlegmacium* (Schleimkopfe). Die Pilze Mitteleuropas, Bd. IV, pp. 235–237, 285–288. Julius Klinkhardt, Bad Heilbrunn.
- Munsell Color. 1963. The Munsell book of color. Macbeth Division of Kollmorgen Instruments, New York.
- Orton, P. D. 1988. Notes on British agarics IX. Trans. Br. Mycol. Soc. 91: 545–571.