

FULL PAPER

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Notes on the genus *Inocybe* of Japan: II

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Abstract Three species of the genus *Inocybe* are reported as new species or a new record from Japan. *Inocybe ovoidea* sp. nov. and *Inocybe furcata* sp. nov. are described from Hokkaido. The distribution of caulocystidia in the former is noted. *Inocybe oblectabilis* is redescribed based on specimens collected in Honshu. This is the first record of *I. oblectabilis* for Japan.

Key words Agaricales · Cortinariaceae · *Inocybe furcata* · *Inocybe oblectabilis* · *Inocybe ovoidea* · Japan

Introduction

In the first publication of this series, the author (Kobayashi 2002b) redescribed *Inocybe phaeodisca* Kühner var. *geophylloides* Kühner and *Inocybe pseudoreducta* Stangl & Glowinski as new records in Japan, and described *Inocybe subtilis* Takah. Kobay. as a new species from Japan. In this article, the second of the series, two new species of *Inocybe*, *Inocybe ovoidea* Takah. Kobay. and *Inocybe furcata* Takah. Kobay., are established from Sapporo, Hokkaido. *Inocybe oblectabilis* (Britzelm.) Sacc., new to Japan, is reported in Honshu.

Materials and methods

The specimens cited in this article are deposited in the herbaria of the Hokkaido University Museum (SAPA), the

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University of Washington Herbarium (WTU), the Abo Akademi University (TURA), and the author's private herbarium (TAKK), Sapporo, Japan. The color notations used are those from Munsell Color Company (1988). For microscopic observations, dried specimens were rehydrated in 10% NH₄OH and then examined. Length measurements excluded the apiculus and sterigmata for spores and basidia, respectively. The abbreviation Q is the ratio of spore length to its width; IS is an index of slenderness; for a definition, see Kobayashi and Courtcuisse (1993). ISB is also an index of slenderness; it includes the width of base of stipe, defined in Kobayashi (2002b).

Taxonomy

Inocybe ovoidea Takah. Kobay., sp. nov.

Figs. 1, 2, 6A

Pileo 18–24mm lato, subconico dein appanato, subumbonato, rimuloso, ochraceo; lamellis adnexis vel emarginatis, avellaneis; stipite 17–21 × 3.0–4.5mm, aequalo, solido, pruinoso, albo vel cremeo; cortina absenti; carne cremea; sporis 6.0–8.0 × 3.5–5.0μm, amygdaliformibus, luteo-brunneis; basidiis 19–24 × 6.0–7.2μm, tetrasporis; pleurocystidiis 36–50 × 13–20μm, late fusiformibus vel obovoideis, collo deficientibus, pachydermicis; cheilocystidiis pleurocystidio conformibus 38–52 × 14–22μm, pachydermicis; caulocystidiis pachydermicis, apice praesentibus, base absentibus; fibulis praesentibus. Holotypus: TAKK 02.7.28.1-1 in SAPA.

Pileus 18–24mm broad, subconic when young with inflexed margin, then appanate with straight margin, subumbonate, surface almost smooth, scaly only near margin, rimulose halfway to margin, ochraceous to yellowish brown (10YR 5/8), darker at center, pale yellow (2.5Y 8/4) near margin. Lamellae adnexed to emarginate, close to crowded, pale gray when young, then grayish-brown, pale brown (10YR 6/3) to brown (10YR 5/3); edge pruinose, white to paler. Stipe 17–21 × 3.0–4.5mm, equal, never bulbate, solid, surface pruinose wholly, without brown

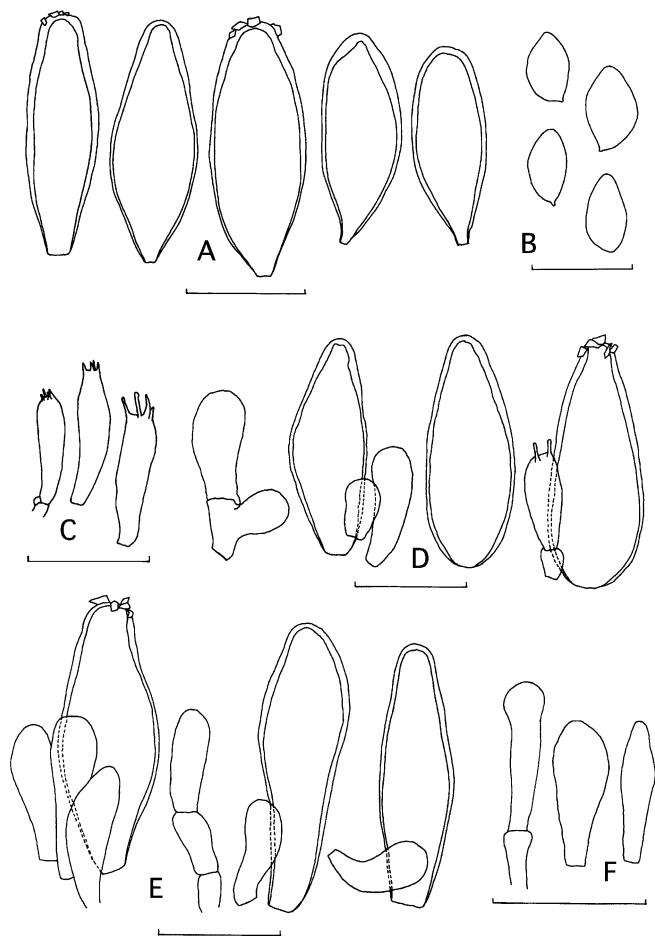


Fig. 1. *Inocybe ovoidea* (TAKK 02.7.28.1). **A** Pleurocystidia. **B** Spores. **C** Basidia. **D** Cheilocystidia, paracystidia, and basidium. **E** Caulocystidia and cauloparacystidia on apex of stipe. **F** Cauloparacystidia on base of stipe. Bars **A, C–F** 20 μ m; **B** 10 μ m



Fig. 2. Carpophores of *Inocybe ovoidea*. Bar 10 mm

fibrils, striped, white to cream. No traces of a cortina could be seen. Context in pileus thin, pure white, not shiny, in stipe cream, shiny. Odor strong when cut, spermatic. Taste none to indistinct. IS = 2.9–8.2; ISB = 11.0–49.0.

Chemical reactions on pileus: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) olive immediately, KOH (5%) darkened immediately, aniline (pure) first negative, becoming dark reddish-brown within 9 h, phenol (2%) first negative, becoming violet-black within 2.5 h; on lamellae: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) first negative, becoming dark olive within 15 min, KOH (5%) negative, aniline (pure) first negative, becoming dull red within 14 h, phenol (2%) first negative, dark violet within 15 min; on stipe: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) first negative, becoming dark brown within 9 h, KOH (5%) negative, aniline (pure) first negative, becoming red within 9 h, phenol (2%) first negative, dark violet within 15 min.

Spores 6.0–8.0 \times 3.5–5.0 μ m, on average 7.0 \times 4.5 μ m, Q = 1.4–1.8, smooth, amygdaliform with a subconical to conical apex, yellowish-brown. Basidia 19–24 \times 6.0–7.2 μ m, usually 4-spored, rarely 2-spored, short clavate to cylindrical, filled with pale yellow intracellular pigment. Pleurocystidia as metuloids 36–50 \times 13–20 μ m, broadly fusiform to obovoid without a cylindrical neck, almost lacking a pedicel, thick-walled, very pale yellow, contents almost hyaline. Hymenophoral trama subregular, composed of hyphae 4.8–12.0 μ m in diameter, sometimes swollen, up to 17.5 μ m in diameter, very pale yellow. Cheilocystidia as metuloids 38–52 \times 14–22 μ m, ovoid to broadly fusiform without a cylindrical neck, with a rounded base, thick-walled, very pale yellow, contents almost hyaline. Paracystidia mixed with cheilocystidia, sometimes catenate, terminal cells 16–25 \times 7.2–9.6 μ m, clavate to obovoid, thin-walled, very pale yellow, rather abundant. Caulocystidia as metuloids present at apex only, 30–50 \times (10–)14–23 μ m, oblong to broadly fusiform, thick-walled, very pale yellow, contents almost hyaline, rather scanty. Cauloparacystidia descending to base; at apex mixed with metuloids, sometimes catenate, terminal cells 14–30 \times 7.2–12.0 μ m, cylindrical, narrowly clavate to clavate, rarely fusiform, thin-walled, very pale yellow, abundant; from middle to base never mixed with metuloids, similar to those at apex, rather scanty to scanty. Pileipellis a cutis, duplex; the uppermost layer up to 14 μ m thick, composed of regular to subregular hyphae 3.5–6.5 μ m in diameter, very pale yellow, the subtending layer up to 68 μ m thick, made up of subregular hyphae 1.5–5.5 μ m in diameter, brown to orange-brown. Clamp connections abundant in all tissues but not always at septa.

Specimen examined. Japan: Hokkaido, Sapporo City, Asahiyama, among moss in *Betula platyphylla* Sukaczew var. *japonica* (Miq.) H. Hara dominant mixed forest, July 28, 2002, collected by Takahito Kobayashi, TAKK 02.7.28.1-1 in SAPA (holotype) and TAKK 02.7.28.1-2 (isotype).

Etymology: from Latin *ovoideus* (=ovoid), referring to the ovoid pleurocystidia.

Remarks: This *Inocybe* belongs to the subgenus *Inocibium* (Earle) Singer section *Tardae* Bon, because it has smooth spores that are amygdaliform, metuloids in the hymenium and stipe apex, an equal stipe, and a smooth surface in the pileus.

Macroscopically, the stipe surface of *I. ovoidea* is wholly pruinose. However, metuloid caulocystidia are present only at the stipe apex. Normally, cauloparacystidia of members

of subgenus *Inocybium* descend together with thick-walled caulocystidia, but the cauloparacystidia of *I. ovoidea* descend to base without metuloids. The pruinose stipe surface of *I. ovoidea* is formed only by cauloparacystidia at the lower part.

Inocybe ovoidea is characterized by its ochraceous pileus, amygdaliform spores, ovoid to broadly fusiform cheilocystidia, and caulocystidia present at the apex only. *Inocybe langei* R. Heim seems closest to *I. ovoidea* by ovoid pleurocystidia and cheilocystidia, amygdaliform spores and a spermatic odor (Heim 1931). However, this species has caulocystidia that descend almost to the base and a short pedicel in the cheilocystidia (Kuyper 1986). Further, in the original description of Heim (1931), metuloids of the hymenium were described to usually have a subcapitate apex. The author examined a specimen of *I. langei* from Finland [Varsinais-Suomi, Turku, town, Kurjenmaeki hospital area, west side of the area, at a parking place under *Betula*, July 4, 1998, Vauras 13640F in TURA (duplicate in TAKK)] and confirmed these character differences between the two species. The pileipellis structure of *I. langei* was not clearly described by Heim (1931) and Kuyper (1986). The author's observation of Finnish material revealed that its pileipellis has grayish-brown standing hyphae on the surface.

Inocybe cryptocystis D.E. Stuntz is also similar but differs from *I. ovoidea* in having a rounded submarginate edge in the stipe base and a lubricous pileus surface (Stuntz 1954). In addition, the author's examination of the holotype (USA, Mackinaw City, July 29, 1949, Stuntz 5400 in WTU) revealed that its pleurocystidia are fusiform to narrowly ventricose, sometimes with a cylindrical neck and a pedicel.

Inocybe albovelutipes Stangl is close to *I. ovoidea* by having a cinereous-cream to pale ochraceous pileus and an equal stipe, but *I. albovelutipes* has a cortina, an obtuse spore apex, and larger spores: $8\text{--}10\text{--}(12) \times 5.0\text{--}5.8\text{--}(6.0) \mu\text{m}$ (Stangl et al. 1980). *Inocybe elliptica* Takah. Kobay. is also close to *I. ovoidea*, but *I. elliptica* has a pileus that is not rimulose, ellipsoid to oblong spores, pedicellate pleurocystidia, and weakly thickened walls in the pleurocystidia (Kobayashi 2002a).

Inocybe furcata Takah. Kobay., sp. nov.

Figs. 3, 6B
Pileo 21–50 mm lato, convexo dein applanato, subumbonato, rimuloso, avellaneus; lamellis adnexis, luteo-brunneis; stipite 37–52 × 3.0–5.4 mm, aequalo, solido, saturate brunneo, apice pruinoso; cortina absentis; carne alba; sporis 8.5–11.5 × 5.5–7.0 μm, nodulosis, luteo-brunneis; basidiis 23–30 × 8.8–11.3 μm, tetrasporis; pleurocystidiis 60–76 × 14–24 μm, fusiformibus, pachydermicis, apice acutis vel furcatis; cheilocystidiis pleurocystidio conformibus, pachydermicis; caulocystidiis pleurocystidio conformibus, pachydermicis, apice praesentibus, base absentibus; fibulis praesentibus. Holotypus: TAKK 01.9.22.1-1 in SAPA.

Pileus 21–50 mm broad, convex then applanate, subumbonate, surface squarrose at center, smooth from middle to margin, rimulose at margin, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2), scales concolorous (10YR 3/2) to very dark brown (10YR 2/2). Lamellae

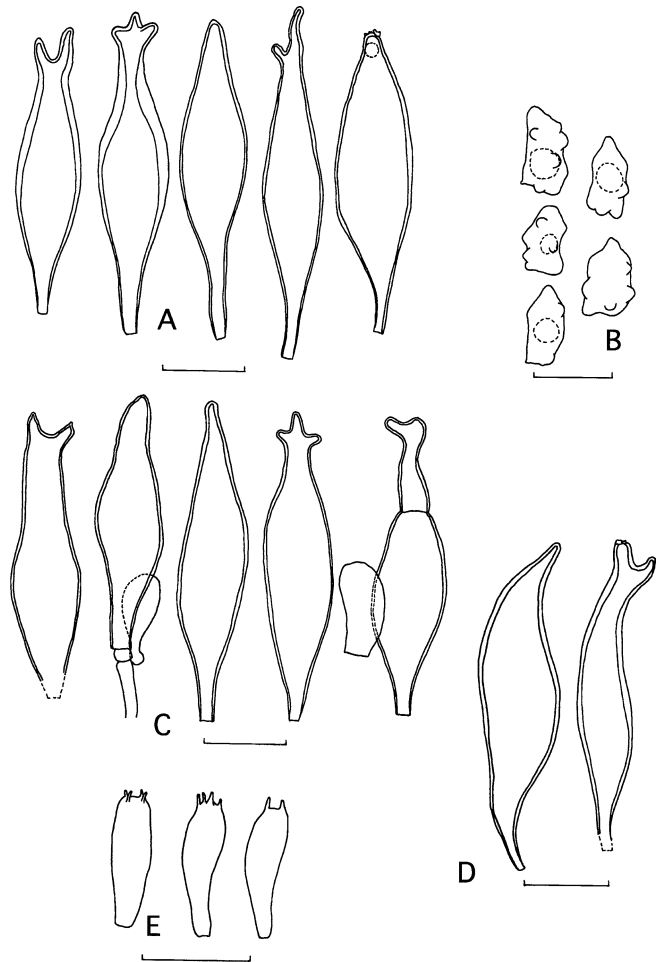


Fig. 3. *Inocybe furcata* (TAKK 01.9.22.1). **A** Pleurocystidia. **B** Spores. **C** Cheilocystidia and paracystidia. **D** Caulocystidia on apex of stipe. **E** Basidia. Bars **A**, **C–E** 20 μm; **B** 10 μm

adnexed, close, pale yellow (2.5Y 7/4) to light yellowish-brown (2.5Y 6/4); edge pruinose, white. Stipe 37–52 × 3.0–5.4 mm, equal, solid, surface smooth, pruinose at apex, silky white, downward strong brown (7.5YR 4/6), at base dark brown (7.5YR 4/4). No traces of a cortina could be seen. Context in pileus thin, pure white, in stipe white, discoloring to light yellowish-brown (10YR 6/4) downward, brown near surface, at base white. Odor strong, fungoid. Taste indistinct. IS = 5.8–28.4; ISB = 45.2–351.7.

Chemical reactions on pileus: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) black within 1 h, KOH (5%) darkened immediately, aniline (pure) first negative, becoming black within 14 h; on lamellae: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) first negative, becoming black within 1 h, KOH (5%) negative, aniline (pure) first negative, becoming dull red within 14 h; on stipe: $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (20%) first negative, becoming black within 1 h, KOH (5%) first negative, becoming reddish-brown partly within 14 h, aniline (pure) first negative, becoming dark red within 1 h.

Spores 8.5–11.5 × 5.5–7.0 μm, on average 9.9 × 6.5 μm, Q = 1.3–1.8, weakly nodulose to nodulose, yellowish-brown. Basidia 23–30 × 8.8–11.3 μm, usually 4-spored, rarely 2-spored, cylindrical to clavate, almost hyaline or yellowish-brown to orange-brown. Pleurocystidia as metuloids 60–76

× 14–24 μm, fusiform with a long pedicel, with a subacute apex often bifurcate or rarely three-pronged, thick-walled, very pale yellow. Cheilocystidia as metuloids similar to pleurocystidia. Paracystidia abundant on edge of lamellae, mixed with cheilocystidia, with terminal cells up to 28 × 10 μm, clavate to broadly cylindrical, thin-walled, almost hyaline. Hymenophoral trama subregular, made up of hyphae 3.8–7.5 μm in diameter, almost hyaline. Caulocystidia as metuloids present at apex only, up to 73 × 30 μm, narrowly fusiform to fusiform with a pedicel, often with a bifurcate apex, thick-walled, very pale yellow. Cauloparacystidia not observed. Pileipellis with a superficial trichodermal layer of hyphae 5.0–9.5 μm in diameter, total length up to 80 μm, walls somewhat thickened, filled with pale brown pigment, the subtending layer up to 65 μm thick, composed of subregular to regular hyphae 4.5–8.8 μm in diameter, brown. Clamp connections abundant in all tissues but not always at septa.

Specimen examined: Japan: Hokkaido, Sapporo City, Maeda-shinrin-koen, Sept. 22, 2001, collected by F. Sawada, TAKK 01.9.22.1-1 in SAPA (holotype), TAKK 01.9.22.1-2 (isotype).

Etymology: from Latin *furcatus* (=furcate), referring to the furcate metuloids.

Remarks: This *Inocybe* belongs to the subgenus *Inocybe* (= *Clypeus* Britzelm.) section *Inocybe* (= *Cortinatae* Kühner & Boursier). The nodulose spores, the thick-walled cystidia in the hymenium, and the absence of caulocystidia except at the apex are typical characters of section *Inocybe*.

Inocybe furcata Takah. Kobay. is close to *Inocybe lanuginella* (J. Schroet. in Cohn) Mig. (= *Astrosporina lanuginella* J. Schroet. in Cohn) but the latter has clear nodules in the spores and a truncated apex in the cystidia (Schroeter 1889). *Inocybe curvipes* P. Karst. is also similar but has differently shaped metuloids that are not furcate and acute at the apex (Stangl 1989; Kobayashi 2002a).

Inocybe oblectabilis (Britzelm.) Sacc., Syll. Fung. 11: 54, 1895. Figs. 4, 5, 6C

= *Agaricus oblectabilis* Britzelm., Hymenomyc. Südbayern 6: 23, 1890.

Selected icones: Alessio & Rebaudengo, Iconogr. Mycol. 29: pl. 83, 1980; Stangl, Hoppea 46: pl. 38/1, 1989; Bon, Doc. Mycol. 28: pl. 3/H, 1998.

Pileus (19–)32–36(–56) mm broad, convex then applanate, subumbonate, surface smooth, fibrillose, rimose to rimulose, reddish-brown (5YR 4/3 to 5/3), brown (7.5YR 4/2) to dark brown (7.5YR 3/2) at umbo. Lamellae adnexed, close, when young light gray (10YR 7/2), then pale brown (10YR 6/3) to light brown; edge pruinose, white. Stipe 26–77 × 3.3–5.0(–8.5) mm, equal with an abruptly or marginately bulbous base, up to 14.0 mm in width, solid, surface wholly pruinose, striped, pink (5YR 8/3 to 7.5YR 8/4). Cortina absent. Context in pileus thin, white, at umbo up to 2.0 mm thick, in stipe shiny, pinkish-white to light yellowish-orange. Odor strong, spermatic to fungoid. Taste as smell. IS = 10.1–30.5; ISB = 56.1–317.6.

Chemical reactions on pileus: FeCl₃·6H₂O (20%) olive-black within 5 min, KOH (2%) negative, aniline (pure)

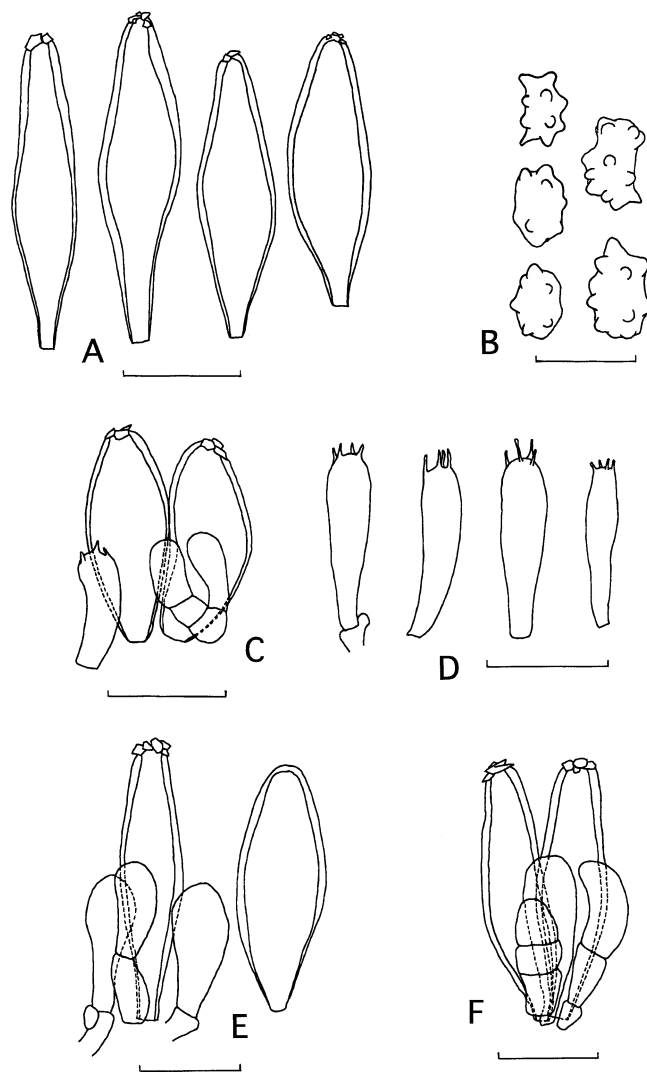


Fig. 4. *Inocybe oblectabilis*. **A** Pleurocystidia (TAKK 99.7.10.2). **B** Spores (TAKK 99.7.10.2). **C** Cheilocystidia, paracystidia, and basidium (TAKK 99.7.10.2). **D** Basidia (TAKK 99.7.10.2). **E** Caulocystidia and cauloparacystidia on apex of stipe (TAKK 97.9.24.1, 99.7.10.2). **F** Caulocystidia and cauloparacystidia on base of stipe (TAKK 99.7.10.2). Bars **A**, **C–F** 20 μm; **B** 10 μm

negative, phenol (2%) red within 5 min; on lamellae: FeCl₃·6H₂O (20%) olive-black within 5 min, KOH (2%) negative, aniline (pure) negative, phenol (2%) red within 5 min; on stipe: FeCl₃·6H₂O (20%) olive-black within 5 min, KOH (2%) negative, aniline (pure) negative, phenol (2%) red within 5 min.

Spores 8.0–11.0 × 6.2–9.8 μm, Q = 1.1–1.5, nodulose with small nodules, yellowish-brown. Basidia 24–29(–36) × 8.4–12.0 μm, 4-spored or 2-spored, narrowly clavate to narrowly cylindrical, or obovoid, very pale yellow. Pleurocystidia as metuloids, (49–)58–75 × 16–21 μm, fusiform to ventricose with a short pedicellate base, thick-walled, very pale yellow. Cheilocystidia as metuloids, similar to pleurocystidia, fusiform to broadly fusiform, pedicel almost lacking to short. Paracystidia on edge of lamellae often catenate, terminal cells narrowly clavate to broadly clavate, thin-walled,



Fig. 5. Carpophores of *Inocybe oblectabilis*. Bar 10 mm

almost hyaline. Hymenophoral trama subregular, made up of hyphae 5.5–9.6 μm in diameter, sometimes swollen, up to 22.8 μm in diameter, almost hyaline to pale yellow. Caulocystidia as metuloids, descending to base of stipe; at apex 42–61 \times 13–19 μm , ventricose to fusiform, thick-walled, very pale yellow, abundant; at base similar to apical ones, rather abundant. Cauloparacystidia descending to base of stipe, mixed with metuloids; at apex sometimes catenate, terminal cells clavate to ellipsoid, thin-walled, very pale yellow, abundant; at base often catenate, terminal cells narrowly clavate to ovoid, rather abundant. Pileipellis a cutis, with the uppermost layer up to 93 μm thick, composed of subregular hyphae 4.5–8.5 μm in diameter, yellowish-brown to orange-brown, the subtending layer up to 48 μm thick, composed of subregular hyphae 3.8–7.5 μm in diameter, very pale yellow. Clamp connections abundant in all tissues but not always at septa.

Specimens examined: Japan: Shiga Pref., Otsu City, July 7, 1991, TAKK 1204; Hyogo Pref., Nishinomiya City, Kitayama-cho, *Pinus densiflora* Siebold & Zucc. and *Quercus serrata* Thunb. ex Murray forest, Sept. 24, 1997, TAKK 97.9.24.1; Tokyo, Musashi Murayama City, Noyama-kita-koen, *Pinus densiflora* and *Quercus serrata* forest, July 10, 1999, collected by K. Oosaku, TAKK

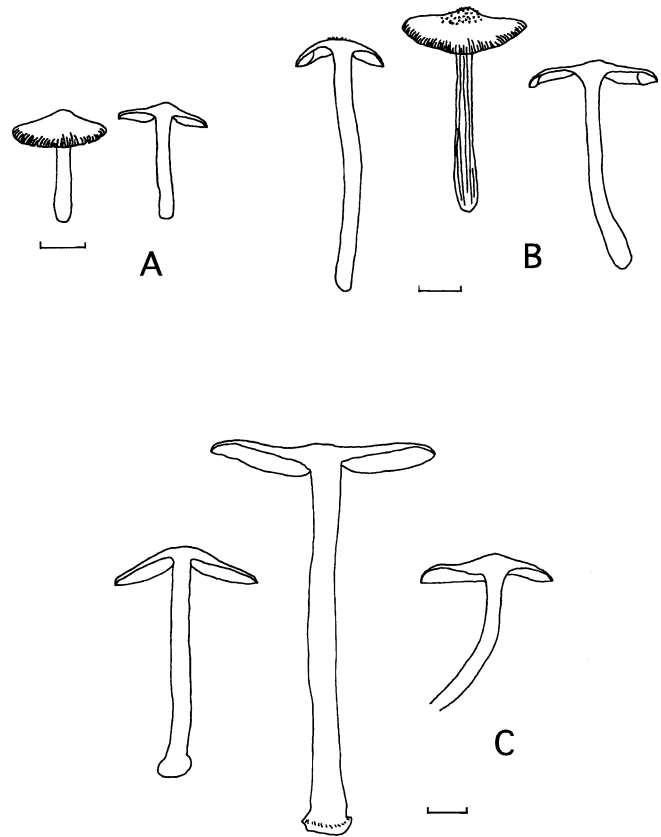


Fig. 6. Carpophores. **A** *Inocybe ovoidea* (TAKK 02.7.28.1). **B** *I. furcata* (TAKK 01.9.22.1). **C** *I. oblectabilis* (TAKK 97.9.24.1, 99.7.10.2, 01.10.19.6). Bars 10 mm

99.7.10.2 in SAPA; Chiba Pref., Chiba City, Heiwa Park, *Quercus myrsinaefolia* Blume, *Prunus* sp., *Q. serrata* and *Carpinus tschonoskii* Maxim. forest, collected by K. Oosaku & Takah. Kobay., TAKK 01.10.19.6 & TAKK 01.10.19.7.

Remarks: This *Inocybe* belongs to the subgenus *Inocybe* (= *Clypeus* Britzelm.) section *Marginatae* Kühner. The metuloids caulocystidia throughout, an abruptly or marginately bulbous stipe base, and nodulose spores are typical features of section *Marginatae*.

Morphological characters of the present specimens coincide with those of *I. oblectabilis* reported from Europe by Britzelmayr (1899), Kühner (1933), Stangl and Schwoebel (1985), and Stangl (1989), although European collections described by them have a yellow to dull yellow pileus. Pileus color of Japanese specimens agrees well with the descriptions published by Alessio and Rebaudengo (1980) and Bon (1998) for this species. The author examined a specimen of *I. oblectabilis* from the Finland [Uusimaa, Hanko, Tvarminneby, at the abandoned brick-works, yard of the house on the hill east of the factory, mainly *Pinus sylvestris*, on calcareous soil, June 30, 1998, Vauras 13606 in TURA (duplicate in TAKK)] and found that in its salient features it matched the Japanese materials. The spores of *I. oblectabilis* reported by Kühner (1933) have somewhat

stronger nodules compared with the neotype created by Stangl and Schwoebel (1985). This variability in the spores was observed in the Japanese collections also.

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