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FULL PAPER

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Notes on the genus *Inocybe* of Japan: I

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Abstract Three species of the genus *Inocybe* are reported as new species or new records from Japan. *Inocybe phaeodisca* Kühner var. *geophylloides* Kühner is redescribed by specimens collected in Chiba Prefecture; this is the first record of *I. phaeodisca* var. *geophylloides* for Japan. *Inocybe pseudoreducta* Stangl & Glowinski is also redescribed by materials collected in Hokkaido and Chiba Prefecture, new to Japan. *Inocybe subtilis* Takahito Kobayashi sp. nov. is proposed for material collected from Tokyo. The sectional position of this species is noted.

Key words Agaricales · Cortinariaceae · *Inocybe phaeodisca* var. *geophylloides* · *Inocybe pseudoreducta* · *Inocybe subtilis* · Japan

Introduction

During taxonomic studies on the genus *Inocybe*, the author encountered several apparently hitherto unknown taxa from Japan. Some of these have been reported by Kobayashi and Courtecuisse (1993, 2000) and Kobayashi (1993, 1995). In this article, a new species of *Inocybe*, *I. subtilis* Takahito Kobay., is established from Tokyo, central Honshu, Japan. Also, new records of two *Inocybe* species, *Inocybe phaeodisca* Kühner var. *geophylloides* Kühner and *Inocybe pseudoreducta* Stangl & Glowinski, are reported based on specimens collected in Japan.

Materials and methods

The specimens cited in this paper are deposited in the herbaria of the Hokkaido University Museum (SAPA), the Natural History Museum and Institute, Chiba (CBM), 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% NH_4OH and 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 Courtecuisse 1993). ISB is also an index of slenderness; it includes the width of base of stipe, defined here:

$$\mathrm{ISB} = \frac{l^3}{p \times s \times b}$$

where l is the length of the stipe, p is the diameter of the pileus, s is the diameter of the stipe at the middle, and b is the diameter of the stipe at the base.

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Taxonomy

Inocybe phaeodisca Kühner, var. ***geophylloides*** Kühner, Suppl. Bull. Soc. Nat. d'Oyonnax 9:5, 77, 1955. Figs. 1, 2
Pileus 9–19 mm broad, subumbonate, surface smooth, rimulose, shiny, white (2.5Y 8/2), cream to slightly ochraceous, at umbo cream to pale yellow (2.5Y 8/4). Lamellae adnate to sinuate, close to subdistant, yellowish-brown (10YR 5/4), light olive-brown to grayish, edge farinaceous, white. Stipe 13–25 × 1.5–3.0 mm, equal, solid, surface smooth, striped, yellow (2.5Y 8/6), at the apex farinaceous, pure white. Cortina present, white. Context in pileus thin, white, in stipe white. Odor strong, spermatic, fungoid to fish-like. Taste indistinct. IS = 4.1–18.5; ISB = 26.1–198.8.

Chemical reactions on pileus: $FeCl_3 \cdot 6H_2O$ (20%) negative, KOH (5%) negative, aniline (pure) first negative, becoming partly reddish within 15 min, phenol (2%) first negative, red (pink) within 15 min; on lamellae: $FeCl_3 \cdot 6H_2O$ (20%) first negative, becoming olive within 15 min, KOH

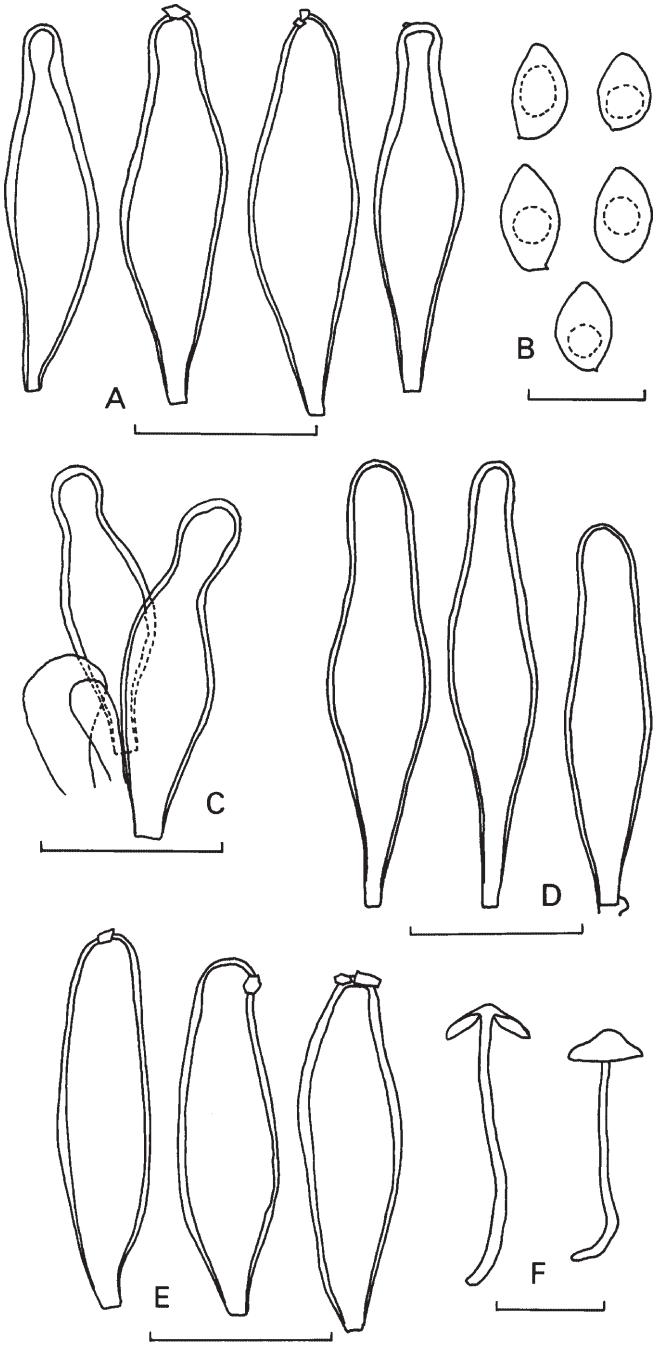

Fig. 1. *Inocybe phaeodisca* Kühner var. *geophylloides* Kühner. **A** Pleurocystidia. **B** Spores. **C** Cheilocystidia and paracystidia. **D** Caulocystidia on apex of stipe. **E** Caulocystidia on middle of stipe. **F** Carpophores. *Bars* **A**, **C–E** 20 μm; **B** 10 μm; **F** 10 mm

(5%) negative, aniline (pure) partly reddish within 15 min, phenol (2%) first negative, pink within 15 min; on stipe: $FeCl_3 \cdot 6H_2O$ (20%) negative, KOH (5%) negative, aniline (pure) slightly green immediately, phenol (2%) first negative, becoming partly pink within 15 min.

Spores 6.5–12.0 × 5.0–7.0 μm, on average 8.2 × 5.6 μm, Q = 1.2–1.6(–1.9), amygdaliform with acute apex in side view, ovoid in frontal view, smooth, yellowish-brown, walls thick, orange-brown. Basidia 23–31 × 6.0–8.4 μm, 4-spored or 2-spored, narrowly clavate to cylindrical, almost hyaline to slightly yellow. Pleurocystidia as metuloids 37–68 × 11.3–16.8 μm, fusiform with a pedicel, thick-walled, almost hyaline to slightly yellow. Cheilocystidia as metuloids similar to pleurocystidia, ventricose to broadly fusiform, thick-walled. Paracystidia abundant on the edge of lamellae, mixed with cheilocystidia, terminal cells up to 16 × 9.6 μm, broadly ellipsoid, thin-walled, almost hyaline to slightly yellow. Caulocystidia as metuloids descending to middle of stipe, similar to pleurocystidia, at the apex 36–61 × 10.8–15.6 μm, ventricose to fusiform with a pedicel, thick-walled, abundant; at the middle ventricose to fusiform with a short pedicel, thick-walled, scanty. Cauloparacystidia abundant at the apex, mixed with metuloids, sometimes catenate, terminal cells up to 22 × 13.2 μm, clavate to broadly ellipsoid, thin-walled, almost hyaline to slightly yellow. Pileipellis composed of interwoven hyphae, of hyphae 4.0–6.5 μm in diameter, sometimes with swollen hyphae, up to 11.5 μm in diameter, the layer up to 77 μm thick, the subtending layer up to 134 μm thick, composed of subregular hyphae 2.0–5.5 μm in diameter, almost hyaline to slightly gray. Clamp connections abundant in all tissues but not at all septa.

Specimens examined. Japan: Chiba Prefecture, Chiba City, Wakaba-ku, Tabeta-cho, Heiwa Park, under *Quercus myrsinaefolia* Blume, *Carpinus tschonoskii* Maxim., and *Camellia japonica* L. [2 July 2000, collected by Takahito Kobayashi, TAKK 00.7.2.5 in SAPA; 19 Oct. 2001, collected by T.K. & K. Oosaku, TAKK 01.10.19.1; 23 Oct. 2001, collected by T.K. & T. Fukiharu, TAKK 01.10.23.1 in CBM]; Noro-cho, Izumi Nature Park, 30 Sept. 2000, TAKK 00.9.30.15.

Remarks. This *Inocybe* belongs to the subgenus *Inocibium* (Earle) Singer section *Inocybe* [=*Lacerae* Fr.].

The characters of the Japanese collections coincide with this taxon as reported by Kühner (1955), Kuyper (1986), and Stangl (1989). *Inocybe phaeodisca* Kühner var. *geophylloides* Kühner is close to *Inocybe geophylla* (Sowerby: Fr.) P. Kumm. var. *geophylla*, but the latter has spores with an obtuse apex (Kuyper 1986; Kobayashi 1999). Macroscopically, *I. geophylla* does not have a rimulose surface of the pileus.

Inocybe pseudoreducta Stangl & Glowinski, Karstenia 21:30, 1981. Figs. 3, 4

Pileus 18–43 mm broad, subumbonate, surface with recurved large scales, rimulose to rimose, pale orange-brown, at center smooth, orange-brown. Lamellae emarginate, close, grayish-brown, edge farinaceous, white. Stipe 21–41 × 3.5–5.8 mm, equal with a marginate base, up to 9.0 mm in width, solid, surface farinaceous, almost toward base, shiny, striped, cream to pale reddish-brown, at the apex white, bulb white. No traces of a cortina could be seen. Context in pileus thin, white. Odor strong, fishlike. Taste fungoid. IS = 6.8–10.2; ISB = 31.1–45.1.

Chemical reactions on pileus: $FeSO_4$ (10%) first negative, becoming olive-black within 1.5 h, KOH (5%) negative; on lamellae: KOH (5%) negative; on stipe: KOH (5%) pale yellow within 10 min.

Fig. 2. Carpophores of *Inocybe phaeodisca* var. *geophylloides*. *Bar* 10 mm

Spores (7.5–)8.8–12.3 × 5.3–7.5 μm, on average 9.4 × 6.0 μm, Q = 1.3–1.9, smooth, amygdaliform with a subconical apex. Basidia 23–32 × 8.4–10.3 μm, 4-spored, sometimes 2-spored, cylindrical to clavate, almost hyaline usually, sometimes filled with yellow intracellular pigment. Pleurocystidia as metuloids, 61–82 × 13.9–21.6 μm, ventricose to broadly ventricose with a cylindrical neck, with a short pedicel, thick-walled, almost hyaline to slightly yellow. Cheilocystidia as metuloids, 56–64 × 18.0–27.6 μm, broadly ventricose to broadly fusiform with a short neck, with a short pedicel, thick-walled, almost hyaline to slightly lemon, rarely with intracellular orange-yellow pigment at the apex. Paracystidia on edges of lamellae often catenate, terminal cells clavate, up to 32 × 13.9 μm, thin-walled, almost hyaline. Hymenophoral trama subregular, composed of hyphae 4.0–7.5 μm in diameter, sometimes swollen, up to 18 μm in diameter, almost hyaline. Caulocystidia as metuloids, descending to base; at apex of stipe 59–80 × 14.4–19.2 μm, ventricose, broadly ventricose to broadly fusiform with a cylindrical neck, with a short pedicel, thick-walled, almost hyaline to slightly yellow, abundant; at base of stipe similar to apical ones, thick-walled, rather scanty. Cauloparacystidia descending to base, mixed with metuloids; at apex of stipe often catenate, total length 19.5 μm long, terminal cells cylindrical, ellipsoid to broadly ellipsoid, thin-walled, almost hyaline to slightly yellow, rather abundant; at base of stipe similar to apical ones, thin-walled, rather abundant. Pileipellis a cutis, duplex, with the uppermost layer up to 81 μm thick, subregular, composed of agglutinated hyphae 2.0–5.5 μm in diameter, almost hyaline, the subtending layer up to 44 μm thick, composed of subregular hyphae 1.5–5.5 μm in diameter, orange-brown. Clamp connections abundant in all tissues but not at all septa.

Specimens examined. Japan: Chiba Prefecture, Noda City, under *Cryptomeria japonica* (L. f.) D. Don and *Castanopsis sieboldii* (Makino) Hatus. ex T. Yamaz. & Mashiba, Oct. 18, 2001, collected by Takahito Kobayashi & K. Oosaku, TAKK 01.10.18.7 in SAPA; Hokkaido, Sapporo City, Asahiyama-kinen-koen, *Picea abies* (L.) H. Karst. Forest, Sept. 23, 2001, collected by T.K., TAKK 01.9.23.12.

Remarks. *Inocybe pseudoreducta* Stangl & Glowinski belongs to the subgenus *Inocibium* (Earle) Singer section *Splendentes* Singer.

This modern name was accepted in the revision by Kuyper (1986) as a well-defined species. The characteristics of Japanese specimens coincide with this species as reported by Stangl and Glowinski (1981), Kuyper (1986), and Stangl (1989), although Stangl and Glowinski (1981) reported that *Inocybe pseudoreducta* has a slightly acid odor.

Inocybe subtilis Takahito Kobayashi, sp. nov. Fig. 5
Pileo 8–19 mm lato, convexo, umbonato, brunneo, rimoso; lamellis adnatis vel adnexis, brunneolis; stipite 34–40 × 0.8–1.0 mm, aequalo, ad basim leviter dilatato et usque ad 1.4 mm crasso, solido, farinaceo, luteo; cortina absenti; carne alba; sporis 8.0–11.0 × 6.5–8.0 μm, prominenter nodulosis, luteo-brunneis; basidiis 20–24 × 8.4–10.8 μm, tetrasporis vel bisporis; pleurocystidiis 44–54 × 18.7–26.0 μm, ventricosis vel late fusiformibus, collo deficientibus, pachydermicis; cheilocystidiis pleurocystidio conformibus 45–51 × 19.0–22.4 μm, pachydermicis; caulocystidiis pleurocystidio conformibus, basi leviter attenuatis, pachydermicis, stipite omnine praesentibus. Holotypus: TAKK 1392-1 in SAPA.

Pileus 8–19 mm broad, convex to umbonate, surface rimose, brown (7.5YR 4/4), on umbo dark brown (7.5YR

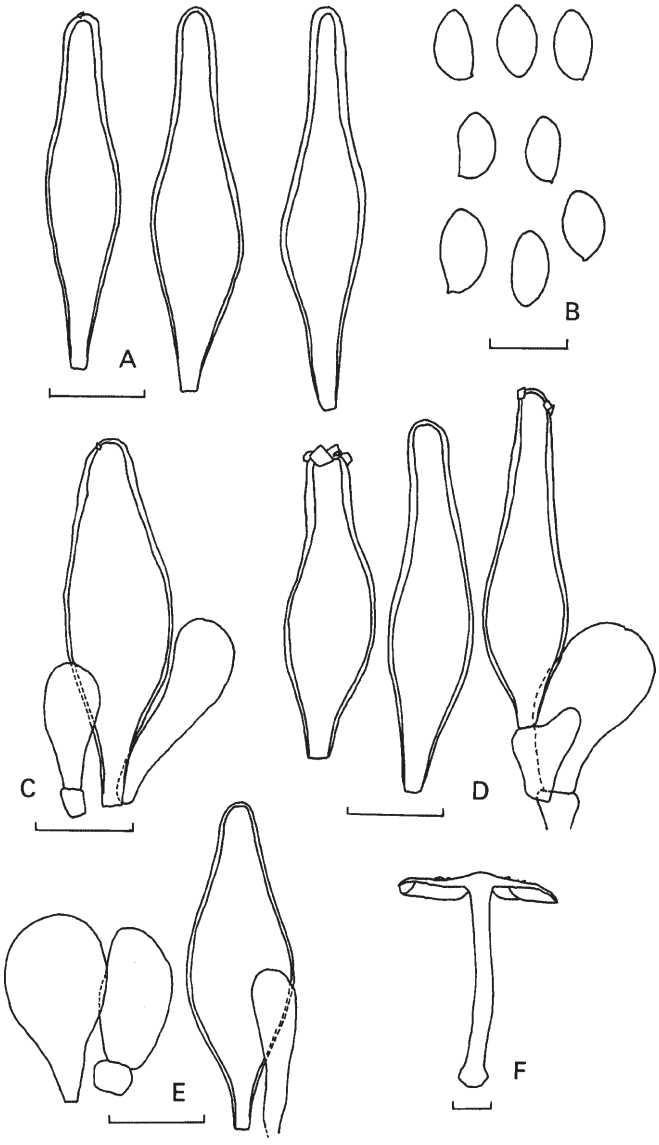

Fig. 3. *Inocybe pseudoreducta* Stangl & Glowinski. **A** Pleurocystidia. **B** Spores. **C** Cheilocystidium and paracystidia. **D** Caulocystidia and cauloparacystidium on apex of stipe. **E** Caulocystidium and cauloparacystidia on base of stipe. **F** Carpophore. *Bars* **A**, **C–E** 20 μm; **B** 10 μm; **F** 10 mm

Fig. 4. Carpophores of *Inocybe pseudoreducta*

3/4). Lamellae adnate to adnexed, subdistant, strong brown (7.5YR 4/6), edge almost entire to subfimbriate, concolorous to somewhat paler. Stipe 34–40 × 0.8–1.0 mm, almost equal to slightly swollen toward base, up to 1.4 mm in width, solid, surface farinaceous, yellow (10YR 7/6). Cortina absent. Context thin, white. Odor spermatic. IS = 93.6–180.6; ISB = 4522.6–5117.7.

Spores 8.0–11.0 × 6.5–8.0 μm, on average 9.4 × 7.4 μm, Q = 1.1–1.5, prominently nodulose with small nodules, yellowish-brown, walls thick, orange-brown. Basidia 20–24 × 8.4–10.8 μm, 4-spored, rarely 2-spored, clavate to broadly cylindrical, almost hyaline to pale yellow. Pleurocystidia as metuloids 44–54 × 18.7–26.0 μm, broadly ventricose to broadly fusiform without a cylindrical neck, with a truncate base, thick-walled, slightly yellow to pale yellow, sometimes with pale yellow intracellular pigment. Hymenophoral trama subregular, composed of hyphae 10.8–19.2 μm in diameter, sometimes swollen, up to 26.4 μm in diameter, almost hyaline to slightly yellow. Cheilocystidia as metuloids similar to pleurocystidia, 45–51 × 19.0–22.4 μm, broadly ventricose to broadly fusiform, thick-walled, sometimes with yellow intracellular pigment. Paracystidia mixed with cheilocystidia, often catenate, terminal cells up to 25 × 15.6 μm, cylindrical to broadly ellipsoid, thin-walled, slightly yellow to pale yellow. Caulocystidia as metuloids, descending to base; at apex of stipe 29–38 × 13.2–19.2 μm, ellipsoid without a cylindrical neck, with a rounded to truncate base, thick-walled, almost hyaline to slightly yellow, abundant; at base of stipe similar to cheilocystidia, ellipsoid to broadly clavate, thick-walled, abundant. Cauloparacystidia descending to base; at apex of stipe often catenate, total length up to 31 μm, terminal cells 14–22 × 10.8–14.4 μm, ellipsoid to cylindrical, thin-walled, almost hyaline to slightly yellow, abundant; at base of stipe similar to apical ones, thin-walled, abundant. Pileipellis a cutis, triplex, with the uppermost layer up to 163 μm thick, composed of subregular hyphae 3.5–8.0 μm in diameter, agglutinated, almost hyaline to slightly brown, the subtending layer up to 22 μm thick, com-

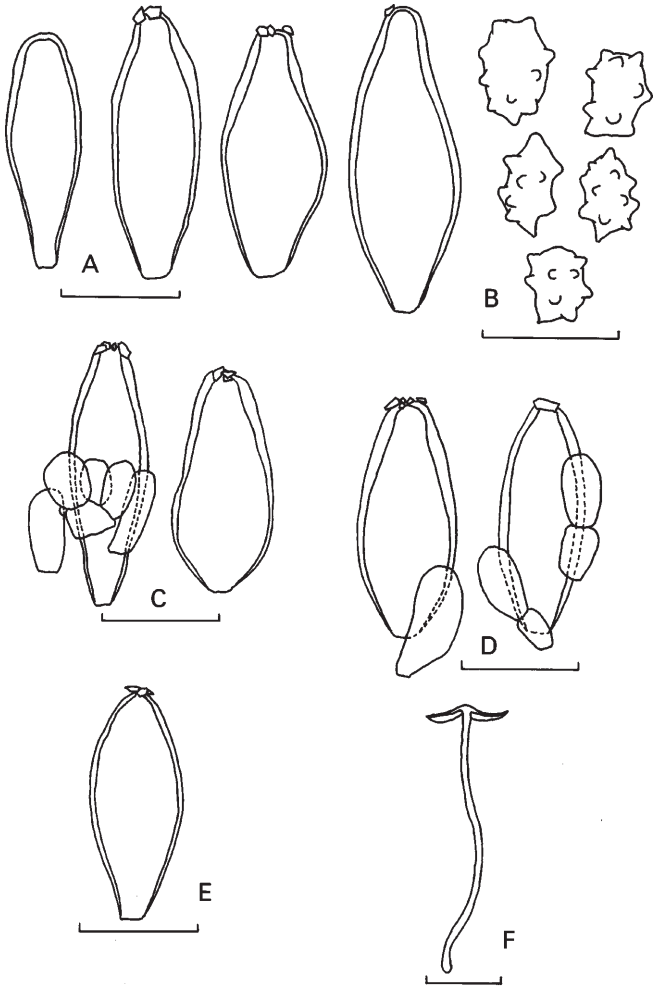

Fig. 5. *Inocybe subtilis* Takahito Kobay. **A** Pleurocystidia. **B** Spores. **C** Cheilocystidia and paracystidia. **D** Caulocystidia and cauloparacystidia on apex of stipe. **E** Caulocystidium on base of stipe. **F** Carpophore. *Bars* **A**, **C–E** 20 μm; **B** 10 μm; **F** 10 mm

posed of subregular to regular hyphae 2.0–4.5 μm, orange-brown to dark brown, the third layer up to 70 μm thick, composed of subregular to regular hyphae 1.5–5.5 μm in diameter, pale yellow to pale brown. Clamp connections abundant in all tissues but not always at septa.

Specimen examined. Japan: Tokyo, Choufu City, Jindaiji, under *Carpinus tschonoskii* Maxim., Sept. 1, 1991, collected by Takahito Kobayashi, TAKK 1392-1 in SAPA (holotype) and TAKK 1392-2 (isotype).

Remarks. This species belongs to the subgenus *Inocybe* [=*Clypeus* Britz.]. *Inocybe subtilis* Takahito Kobay. lacks a marginate base of the stipe and is therefore excluded from section *Marginatae sensu* original (Kühner 1933), whereas Singer (1986) emended the section *Marginatae* to allow for *Inocybe* species lacking a marginate base. Therefore, *Inocybe subtilis* can be admitted as a member of section *Marginatae sensu* Singer (1986).

Inocybe subtilis is characterized by its slender habit, nodulose spores, and caulocystidia throughout.

Inocybe acutata Takahito Kobay. resembles *I. subtilis* because of its slender habit, but the former has echinulate spores and has caulocystidia only at the stipe apex (Kobayashi 1993). *Inocybe lacera* f. *gracilis* J.E. Lange also resembles *I. subtilis*, but *I. lacera* f. *gracilis* has almost smooth and oblong to subcylindrical spores.

Inocybe leptoclada Takahito Kobay. & Courtec. is somewhat similar to *I. subtilis* by having caulocystidia throughout, but *I. leptoclada* has weakly nodulose spores, thicker walls in the metuloids, a white to ochroleucous pileus, and less slender carpophores (Kobayashi and Courtecuisse 2000).

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