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FULL PAPER

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Notes on the genus *Inocybe* of Japan. IV. Species having metuloids collected from Hokkaido, Honshu, and Kyushu

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Abstract This fourth paper in the series considers five species of *Inocybe* occurring in Hokkaido, Honshu, and Kyushu. (1) *Inocybe furfurea* (section *Tardae*) is recorded from Hokkaido as new to Japan. (2) *Inocybe luteola* sp. nov. (section *Tardae*) is described from eastern Honshu (Chiba). It has smooth basidiospores and thick-walled caulocystidia descending to the middle of the stipe. (3) *Inocybe napiformis* sp. nov. [section *Inocybe* (= *Cortinatae*)], known from Hokkaido, appears close to *Inocybe napipes*, but characters of the metuloids distinguish the two species. (4) *Inocybe grammata* (section *Marginatae*) is recorded from Hokkaido and Nagano as new to Japan. (5) *Inocybe pyriformis* sp. nov. (section *Marginatae*) is described from Kyushu (Miyazaki). It has nodulose basidiospores and caulocystidia wholly covering the stipe surface. However, *I. pyriformis* is not typical in the section, lacking a marginate bulbous base in its stipe.

Key words Agaricales · Inocybaceae · *Inocybe* · Japan · Systematics

Introduction

A monograph of the Japanese *Inocybe* was first presented by Kobayasi (1952), who recorded 41 taxa, including several new ones. Since then, more than 100 taxa of this genus have been added to the Japanese mycoflora as new to science or new to Japan by Imazeki and Toki (1955), Hongo (1958, 1959a,b, 1963a,b, 1966, 1982), Kobayashi (1993a, 1995, 2002a,b, 2003, 2005), Kobayashi and Hongo (1993), and Kobayashi and Courtecuisse (1993, 2000). However, our knowledge of *Inocybe* in Japan seems to be still incomplete, because there remain several regions of the country poorly explored, particularly in southern, warm-temperate regions (Kyushu and Okinawa Districts, etc.). In this report, three species are described as new and two European species are newly recorded from Japan based on the materials from Hokkaido, Honshu (Chiba and Nagano), and Kyushu (Miyazaki); all of these have metuloidal cystidia.

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Materials and methods

The specimens cited in this paper are deposited in herbaria of the Hokkaido University Museum (SAPA) and of the Miyazaki Prefectural Museum of Nature and History (BE: mycological herbarium), the Natural History Museum and Institute, Chiba (CBM), the National Museum of Nature and Science in Tsukuba (TNS), Conservatoire et Jardin botaniques de la Ville de Genève (G), University of Turku (TUR), Eidgen össische Technische Hochschule, Zürich (ZT), and my private herbarium (TAKK) in Sapporo, Japan. In the following descriptions, color names or notations cited in double quotation marks are those of Royal Botanic Garden, Edinburgh (1969), those in parentheses are from Kornerup and Wanscher (1967) or Munsell Color Company (1988). For microscopic observations, dried specimens were rehydrated in 10% NH_4OH and then examined. Length measurements excluded the apiculus and sterigmata for basidiospores and basidia, respectively. Sections through the pileipellis were cut at the surface of the pileus center. Two indices of slenderness, IS and ISB, were defined by Heinemann (1983) and Kobayashi (2002b), respectively.

Taxonomy

Subgenus *Inocibium* (Earle) Singer

Section *Tardae* Bon

Inocybe furfurea Kühner, Bull. Soc. Naturalistes Oyonnax 9 (Suppl.): 4, 1955. Figs. 1, 2, 8A

Fig. 1. Carpophores of *Inocybe furfurea* (SAPA 1124). *Bar* 20 mm

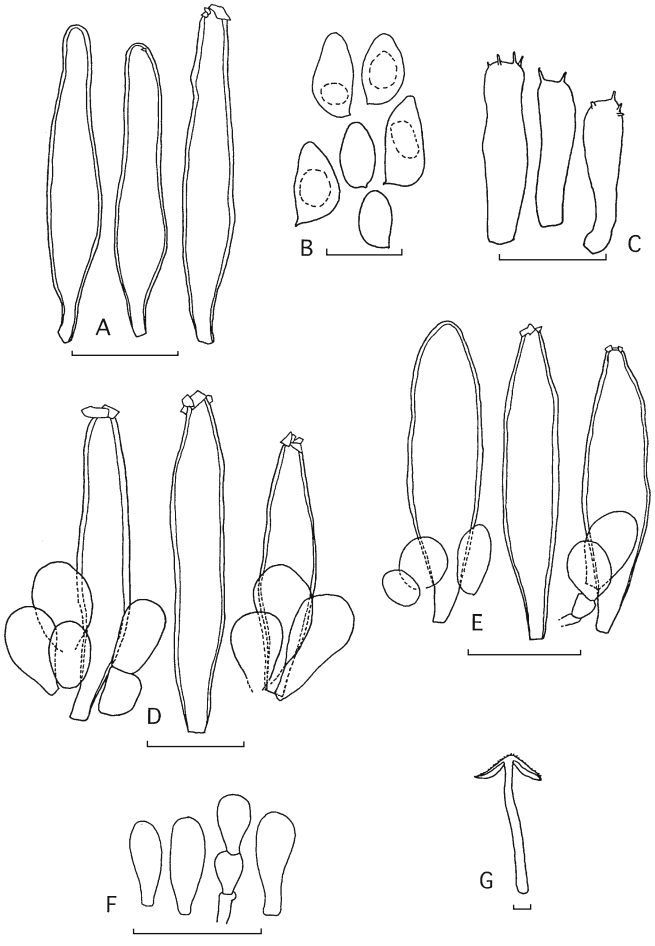

Fig. 2. *Inocybe furfurea* (SAPA 1124). **A** Pleurocystidia. **B** Basidiospores. **C** Basidia. **D** Cheilocystidia and paracystidia. **E** Caulocystidia and cauloparacystidia on stipe apex. **F** Cauloparacystidia on the lower portion of the stipe. **G** Section of carpophore. *Bars* **A**,**C**–**F** 20 µm; **B** 10 µm; **G** 10 mm

≡ *Inocybe furfurea* Kühner in Kühner & Romagnesi, Fl. Anal. Champ. Sup.: 222, pl 333. 1953 (nom. nud.).

Pileus 20–34(–41) mm broad, convex to obtusely conical, sometimes subumbonate; surface finely squarrose, reddish brown, "umber" to "bay." Lamellae adnate, close to crowded, pale brown, "fawn" to "vinaceous buff," with fimbriate white edges. Stipe 41–53 × 3.6–5.5(–6.3) mm, more or less equal above a somewhat swollen base (up to 7.2 mm in diameter), solid; surface pruinose overall, not fibrillose, pale reddish brown, "fawn" to "clay pink." Cortina absent. Context thin in pileus, pure white; striate in stipe, white, near surface tinted reddish brown to "bay," strongly shiny. Odor strong, spermatic. Taste none. IS = 16.5–22.7; ISB = (117.1–)145.2–184.8. Basidiospores 7.5–11 × (4.5–)5–6.3 µm, range of average value 8.8–9.1 × 5.3–5.8 µm, Q = 1.3–1.9, amygdaliform with a conical apex in side view, ovoid to oblong in frontal view, yellowish brown. Basidia 26–32 × 8.4–9.6 µm, often 4-spored, rarely 2-spored, narrowly clavate to cylindrical, with pale yellow pigment. Pleurocystidia as metuloids 53–76 × 12–17.5 µm, narrowly ventricose to narrowly cylindrical with a short-pedicellate base, thick walled (up to 2.5 µm thick), very pale yellow, sometimes with yellowish-brown intracellular pigment. Cheilocystidia as thick-walled metuloids similar to pleurocystidia, 54–79 × 12.7–16.8 µm, intermixed with abundant paracystidia. Paracystidia almost hyaline to pale yellow, rarely catenate with terminal cells 14–22 × 9.6–15.6 µm, broadly cylindrical to broadly clavate. Hymenophoral trama subregular; hyphae 4–9.6 µm in diameter, sometimes swollen, up to 13.2 µm in diameter; almost hyaline to very pale yellow. Caulocystidia as metuloids descending down one-third of the stipe, at extreme apex similar to pleurocystidia but broader, 50–73 × 14.4–19.2 µm, very abundant. Cauloparacystidia descending down below the middle of the stipe, similar to lamellar ones, terminal cells 6–13 × 4.3–6 µm, subglobose, obovoid to broadly cylindrical, almost hyaline, rarely with pale yellow content, very abundant. Pileipellis of the cutis type, duplex; of the upper layer up to 35 µm thick, composed of regular to subregular hyphae 4.5–7.5 µm in diameter, partly agglutinated at the surface, pale yellow; subtending layer up to 36 µm thick, composed of subregular hyphae 3.8–8.8 µm in diameter, pale yellow to rusty brown. Clamp connections abundant in all tissues but not always at septa. Hyphae covering stipe base 3.2–5 µm in diameter, interwoven, almost hyaline.

Specimens examined: Hokkaido: Prov. Iburi, Usu-gun, Ootaki-mura, *Abies sachalinensis* (Fr. Schmidt) Mast. forest, July 24, 2004, coll. by Takahito Kobayashi, SAPA 1124 (= TAKK 04.7.24.4); same data, TAKK 04.7.24.10.

Japanese name: Seichi-sasakure-tomaya-take (new name).

Notes: This species belongs to subgenus *Inocibium* (Earle) Singer section *Tardae* Bon, because it has metuloid caulocystidia descending to one-third only, pruinose surface of stipe, and amygdaliform basidiospores. The characters of the Japanese collections coincide with this European species reported by Kühner (1955), Alessio and Rebaudengo (1980), Enderle and Stangl (1981), Kuyper (1986), Stangl (1989), and Cervini (2005), except for the habitat. In Europe, *Inocybe furfurea* had been known to occur under frondose trees (Kuyper 1986; Cervini 2005) or in mixed forests (Alessio and Rebaudengo 1980; Keller and Moser 2001), but the Japanese material had been collected in a conifer

(*Abies*) forest. I observed a fresh material of this species in Switzerland (VD, St. Sulpice, in the garden under broad-leaved and conifer trees, May 24, 1994, coll. by J. Bonnard, TAKK 94.5.24.1) and found that it closely matched the Japanese materials in its features. Furthermore, my examination of the lectotype of *I. furfurea* var. *furfurea* (France: Paris, Bois de Vincennes, Aug. 17, 1931, coll. by R. Kühner, G00053152) revealed that its salient features matched those of the Japanese fungus, although it lacked an agglutinate uppermost layer in the pileipellis.

Inocybe luteola Takah. Kobay., sp. nov. Figs. 3, 4

Pileo 5.5–9.5 mm lato, convexo dein plano-convexo, subumbonato, rimuloso, fusco; lamellis sinuosis vel adnexis, brunneis vel ferrugineis; stipite 14–19 × 1.5–2.5 mm, subaequali, solido, apice pruinoso, luteolo; cortina absenti; carne cremea; basidiosporis 5–7.5 × 4–5.5 µm, ellipsoideis, luteobrunneis; basidiis 19–26 × 7.5–9.5 µm, tetrasporis; pleurocystidiis 40–70 × 13.8–21.3 µm, fusiformibus, columnaribus, pachydermicis; cheilocystidiis 34–48 × 12.5–21.3 µm, fusiformibus, haud capitatis, pachydermicis; caulocystidiis metuloideis, ad apicem mediumque stipitis praesentibus, ad basim stipitis absentibus; fibulis praesentibus. Holotypus: SAPA 1123 (= TAKK 06.6.4.1–1). Isotypus: TNS-F 19016 (= TAKK 06.6.4.1–2).

Etymology: *luteolus* (Latin) refers to the pale yellow stipe.

Pileus 5.5–9.5 mm broad, convex when young, then plano-convex, subumbonate; surface smooth, rimulose at the margin, dark brown, chocolate (6F4) to teak (6F5). Lamellae sinuate to adnexed, close, light brown, sunburn (6D5), brown to rust brown (6E8), with fimbriate white edges. Stipe 14–19 × 1.5–2.5 mm, almost equal, slightly swollen toward the base (up to 2.8 mm in diameter), solid; surface of the apex pruinose, not fibrillose, light yellow (4A4) to pale yellow (4A3). Cortina absent. Context thin in pileus, pure white; weakly striate in stipe, cream, satiny. Odor weak, fungoid. Taste none. IS = 15.2–35; ISB = 103.1–238.2. Basidiospores 5–7.5 × 4–5.5 µm, average value 6.6 × 4.6 µm, Q = 1.3–1.6, ellipsoid to broadly ellipsoid, yellowish brown to orange brown. Basidia 19–26 × 7.5–9.5 µm, 4-spored, rarely 1-spored, narrowly clavate, with pale yellow pigment. Pleurocystidia as metuloids 40–70 × 13.8–21.3 µm, fusiform to cylindrical, sometimes with a capitate apex, thick walled (up to 2.0 µm thick), very pale yellow, with an almost hyaline to slightly brown intracellular pigment. Cheilocystidia as metuloids 34–48 × 12.5–21.3 µm, similar to pleurocystidia but without a capitate apex. Thin-walled cheilocystidia also present, narrowly cylindrical and mixed with metuloidal cheilocystidia. Paracystidia intermixed with cheilocystidia, abundant, almost hyaline to pale yellow, sometimes catenate with terminal cells up to 19 × 10 µm, cylindrical to narrowly clavate, thin walled. Hymenophoral trama subregular; hyphae 3.8–5.8 µm in diameter, sometimes swollen, up to 8.3 µm in diameter; very pale yellow. Caulocystidia as metuloids descending halfway down the stipe, similar to pleurocystidia, 34–54 × 13.8–17.5 µm. Thin-walled caulocystidia descending down to base of the stipe, 29–53 × 6.3–13.8 µm, narrowly cylindrical to narrowly

Fig. 3. Carpophores of *Inocybe luteola* (TAKK 06.6.4.1). *Bar* 20 mm

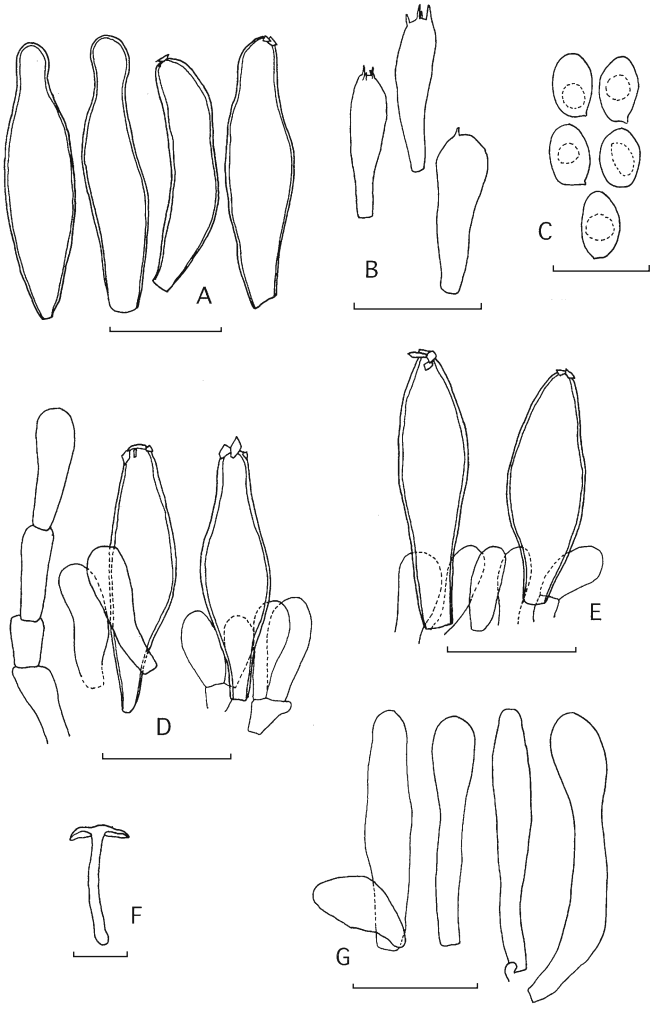

Fig. 4. *Inocybe luteola* (TAKK 06.6.4.1). **A** Pleurocystidia. **B** Basidia. **C** Basidiospores. **D** Metuloidal cheilocystidia, thin-walled cheilocystidia, and paracystidia. **E** Metuloidal caulocystidia and cauloparacystidia on stipe apex. **F** Section of carpophore. **G** Thin-walled caulocystidia and cauloparacystidium. *Bars* **A**, **B**, **D**, **E**, **G** 20 µm; **C** 10 µm; **F** 10 mm

clavate, not catenate, with slightly brown intracellular pigment. Cauloparacystidia descending down to base, similar to lamellar ones, terminal cells 11–18 × 6.3–10 µm, obovoid to ellipsoid, rarely with slightly brown content. Pileipellis a subregularly arrayed cutis, duplex; the upper layer up to 55 µm thick, composed of hyphae 2.5–5 µm in diameter, agglutinated, pale gray to pale yellow; subtending layer up to 33 µm thick, composed of hyphae 2.5–4.5 µm in diameter, brown to dark brown. Clamp connections abundant in all tissues but not always at septa.

Specimens examined: Honshu: Chiba Pref., Chiba-shi, Wakaba-ku, Tabeta-cho, Heiwa Park, on soil under *Quercus acutissima* Carruth., *Q. serrata* Thunb. ex Murray, *Q. myrsinaefolia* Blume, *Carpinus tschonoskii* Maxim., *Castanopsis sieboldii* (Makino) Hatus. ex T. Yamaz. & Mashiba and *Pinus densiflora* Siebold & Zucc., June 4, 2006, coll. by K. Oosaku & T. Kobayashi, SAPA 1123 (holotype, = TAKK 06.6.4.1–1), TNS-F 19016 (isotype, = TAKK 06.6.4.1–2).

Japanese name: Kiashi-tomaya-take (new name).

Notes: This species belongs to subgenus *Inocibium* (Earle) Singer section *Tardae* Bon, because it has thick-walled caulocystidia descending to about one-half of the stipe, and smooth basidiospores.

Inocybe luteola appears to be most closely allied to *I. neomicrospora* Kobayasi, but the latter has a bulbous base of stipe, narrower basidiospores (Q = 1.5–1.7), and thicker walled (up to 2.5 µm) pleurocystidia (Kobayasi 1952; Kobayashi 2002a). *Inocybe furfurea* var. *rufotacta* (Schwöbel & Stangl) Kuyper is similar to *I. luteola*, but it differs from the latter in having recurved scales on the pileus (Schwöbel and Stangl 1982), a red-brown stipe (Kuyper 1986), and larger basidiospores: 9–11 × 5–6 µm (Schwöbel and Stangl 1982), 8–9.5 × 5–5.5 µm (Kuyper 1986), 8.5–10 × 5–5.5 µm (Stangl 1989), and 8–10(–11) × 5–6 µm (Ferrari 2006). *Inocybe lutea* Kobayasi & Hongo is also similar to this species in having a yellow stipe, but it has radially arranged fibrils of pileus surface and nodulose basidiospores (Kobayasi 1952; Hongo 1954; Kobayashi 2002a).

Subgenus *Inocybe*

Section *Inocybe*

Inocybe napiformis Takah. Kobay., sp. nov. Figs. 5, 6, 8B

Pileo 10–16 mm lato, conico vel convexo, subumbonato, fibrilloso, rimuloso, rubicundo-brunneo; lamellis adnatis vel sinuatis, brunneis; stipite 26–38 × 1.5–2.2 mm, bulboso (usque ad 6.5 mm crasso), solido, rubicundo-brunneo, apice luteo; carne cremea; basidiosporis 7–10 × 5–7 µm, angularibus vel nodulosis, luteo-brunneis; basidiis 20–28 × 7.5–8.8 µm, tetrasporis vel bisporis; pleurocystidiis 45–55 × 13.8–16.3 µm, fusiformibus, pachydermicis; cheilocystidiis fusiformibus, pachydermicis; caulocystidiis metuloideis, ad apicem stipitis praesentibus, ad basim stipitis absentibus; fibulis praesentibus. Holotypus: SAPA 1127 (= TAKK 04.10.3.9). Isotypus: FB 37597 (CBM, = TAKK 04.10.3.9–2).

Etymology: *napiformis* (Latin) refers to the napiform-bulbous stipe base.

Fig. 5. Carpophores of *Inocybe napiformis* (TAKK 04.10.3.9). *Bar* 10 mm

Pileus 10–16 mm broad, obtusely conical, broadly conical to convex, subumbonate; surface fibrillose, rimulose; color reddish brown, "snuff brown"; umbo dark reddish brown to "cigar brown." Lamellae adnate to sinuate, close, brown; edges flocculose, white. Stipe 26–38 × 1.5–2.2 mm, equal with a napiform-bulbous base (up to 6.5 mm in diameter), solid, pruinose at the apex only; color reddish brown to "umber," at the apex pale yellow (close to "e"), at the base white. Context in pileus thin, pure white, or pale yellowish white (close to "b"); in stipe cream, tinted reddish brown near the surface, satiny, striate; pure white in bulb. Odor strong, spermatic. IS = 42.2–43.1; ISB = 248.7–258.5. Basidiospores 7–10 × 5–7 µm, average value 8 × 5.6 µm, Q = 1.3–1.8, angular in outline to nodulose with weak nodules, yellowish brown to orange brown at the wall. Basidia 20–28 × 7.5–8.8 µm, often 4-spored, sometimes 2-spored, narrowly clavate, with slightly brown contents. Pleurocystidia as metuloids 45–55 × 13.8–16.3 µm, fusiform with a pedicellate base, often with a short neck, thick walled (up to 4.0 µm thick), very pale yellow, with slightly brown intracellular pigment. Cheilocystidia as thick-walled metuloids of two types: (1) similar to pleurocystidia, 40–46 × 12–16.3 µm; (2) narrow cystidia, 31–69 × 8.3–12.5(–13.8) µm, flexuose, often subcapitate, rarely possessing crystals at the apex, very pale yellow, filled with slightly brown intracellular pigment,

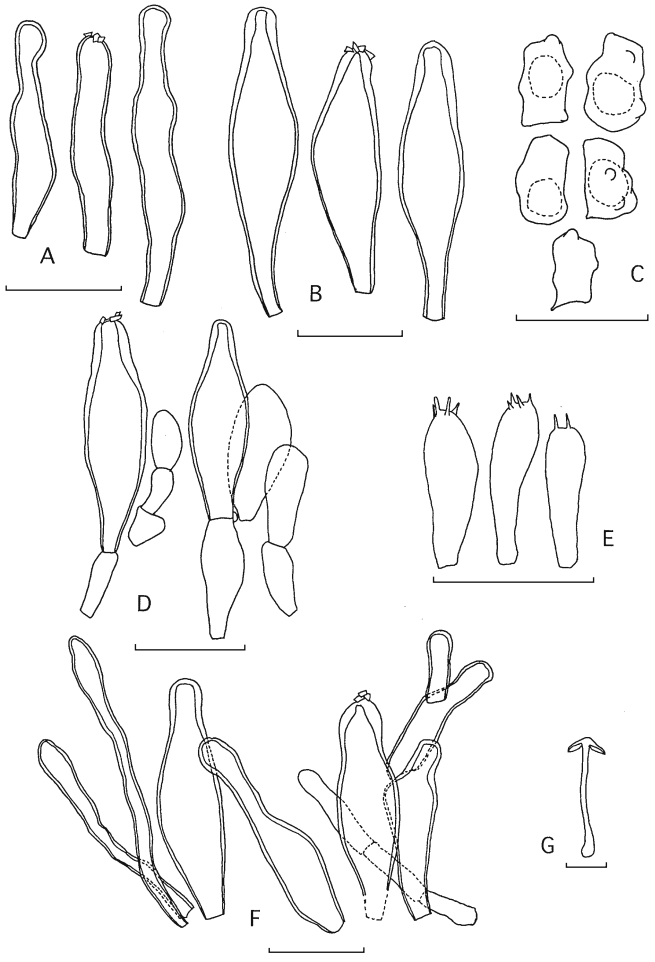

Fig. 6. *Inocybe napiformis* (TAKK 04.10.3.9). **A** Cheilocystidia (narrow-type cystidia). **B** Pleurocystidia. **C** Basidiospores. **D** Cheilocystidia and paracystidia. **E** Basidia. **F** Caulocystidia and cauloparacystidia on stipe apex. **G** Section of carpophore. *Bars* **A**, **B**, **D–F** 20 μm; **C** 13 μm; **G** 10 mm

abundant. Paracystidia rather abundant on the edge of lamellae, mixed with cheilocystidia, often catenate, with terminal cells 11–23 × 7.5–12.5 μm, oblong to ellipsoid, thin walled, almost hyaline. Hymenophoral trama subregular; hyphae 6.3–10 μm in diameter, sometimes swollen and up to 20 μm in diameter; with walls somewhat thickened (up to 1.3 μm thick), very pale yellow, with slightly yellow-brown intracellular pigment. Caulocystidia as metuloids present at the apex of stipes only, of two types: (1) similar to pleurocystidia, 48–52 × 13.8–16.3 μm; (2) narrow cystidia, 50–70 × 7.5–8.8 μm, flexuose, sometimes with a subcapitate apex, thick walled (up to 3.0 μm thick), very pale yellow, with slightly brown intracellular pigment, abundant. Cauloparacystidia similar to lamellar ones present at the apex only, mixed with caulocystidia; terminal cells up to 23 × 7.5 μm, narrowly cylindrical, filled with slightly brown intracellular contents, scanty. Surface of stipe rarely with standing hyphae 7.5–12 μm in diameter and almost hyaline. Pileipellis a subregularly arrayed cutis, duplex; with the upper layer up to 83 μm thick, composed of hyphae 3.9–5 μm in diameter, not agglutinated, yellow; the subtending layer up to 40 μm thick, composed of hyphae 3.8–8.8 μm in diameter, brown to orange brown. Clamp connections abundant in all tissues but not always at septa.

Specimens examined: Hokkaido: Prov. Ishikari, Ishikari-gun, Toubetsu-cho, Tsukigata, Doomin-no-mori, *Abies sachalinensis* dominant mixed forest, Oct. 3, 2004, coll. by T. Kobayashi, SAPA 1127 (holotype, = TAKK 04.10.3.9–1), FB 37597 (CBM, isotype, = TAKK 04.10.3.9–2).

Japanese name: Kyukon-tomaya-take (new name).

Notes: This *Inocybe* belongs to subgenus *Inocybe* (= *Clypeus* Britzelm.) section *Inocybe* (= *Cortinatae* Kühner & Boursier), because it has a napiform bulb at stipe base, nodulose basidiospores, and metuloidal caulocystidia present at the apex only.

Inocybe napiformis seems closest to *I. umbrina* Bres. [= *I. assimilata* (Britzelm.) Sacc. sensu Stangl (Stangl 1989)] from Europe (Bresadola 1881; Stangl 1989) and Japan (Kobayasi 1952; Kobayashi 2002a), but differs from the latter in the less gibbous basidiospores, faintly reddish apex of stipe (Bresadola 1881), yellowish-brown subtending layer of pileipellis (Kobayashi 2002a), and lack of narrow and flexuose cheilocystidia. *Inocybe epidendron* Matheny, Aime & T. W. Henkel from Guyana is somewhat similar, but it has an even stipe and a trichoderm pileipellis (Matheny et al. 2003). *Inocybe napipes* J. E. Lange, another species similar in having a napiform bulb of stipe, is distinguishable by its prominent nodules of basidiospores and lack of the neck of metuloids (Lange 1917; Grund and Stuntz 1970; Stangl 1989; Kobayashi 1993b, 2002a).

Section *Marginatae* Kühner emend. Singer

Inocybe grammata Quél., Bull. Soc. Amis Sci. Naturalistes Rouen 2: 162, 1879. Figs. 7, 8C

= *Inocybe albodisca* Peck, N. Y. State Mus. Rep. 51:290. 1898.
= *Inocybe hiulca* Fr. sensu Bres., Fungi Trid. 2:15. 1892.
= *Inocybe grammata* Quél. var. *chamaesalicis* Bon & E. Ferrari, Boll. Micol. Bres. Tr. 45:16. 2002.

Selected Icons.: Quélet, Bull. Soc. Amis Sci. Naturalistes Rouen 2: pl. 2. 1879.; Alessio & Rebaudengo, Iconogr. Mycol. 29: pl. 82. 1980.; Stangl, Hoppea 46: pl. 35/2. 1989.; Breitenbach & Kränzlin, Fungi of Switzerland 5: pl. 77. 2000.; Ferrari, Fungi non Delineati 34–35–36:448–450. 2006.

Pileus 17–28 mm broad, obtusely conical to convex, umbonate; surface smooth, weakly rimulose, silky, "milky coffee," at the center "cinnamon." Lamellae adnexed to sinuate, close, "buff"; edge pruinose, white. Stipe 42–51 × 2.8–4.5 mm, equal with a conspicuously bulbous base (up to 9.0 mm in diameter), solid; pruinose entirely, pale yellow to cream, or more or less ocher (near "h"), sometimes with slightly pinkish tint. No traces of a cortina seen. Context in pileus thin and pure white, in stipe white and satiny, in bulb cream to slightly yellow. Odor strong, acidulous, fungoid to spermatic. Taste none or grassy. IS = 19.7–44.5; ISB = 144.8–444.5. Basidiospores (6.4–)7.5–11 × 4.8–7 μm, range of average values 7.5–8.8 × 5.5–6 μm, Q = 1.3–2, nodulose with

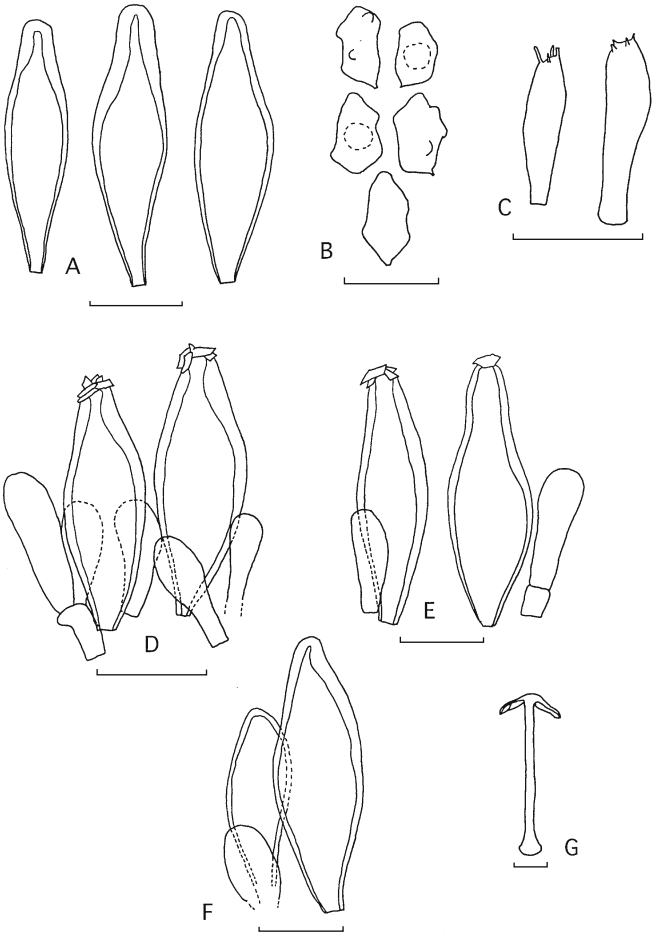

Fig. 7. *Inocybe grammata* (TAKK 05.9.25.13). **A** Pleurocystidia. **B** Basidiospores. **C** Basidia. **D** Cheilocystidia and paracystidia. **E** Caulocystidia and cauloparacystidia on stipe apex. **F** Caulocystidia and cauloparacystidia on stipe base. **G** Section of carpophore. *Bars* **A**, **C**–**F** 20 µm; **B** 10 µm; **G** 10 mm

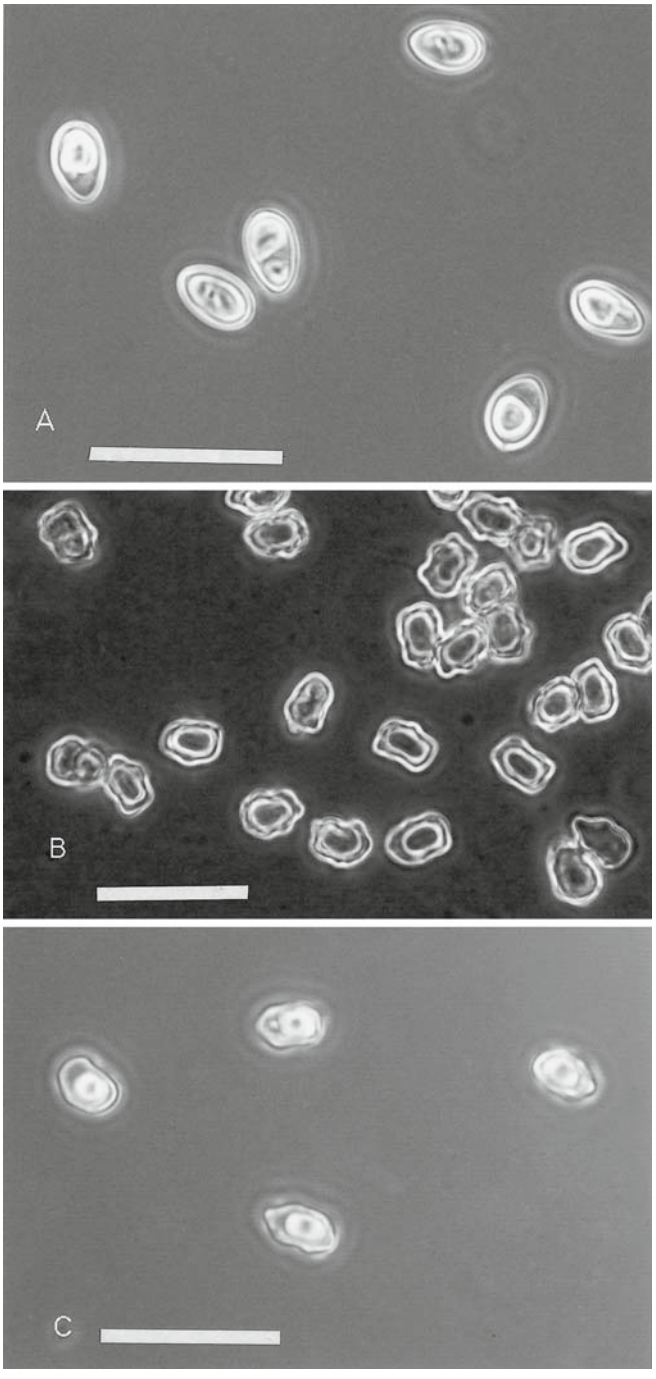

Fig. 8. Basidiospores of *Inocybe* species. **A** *Inocybe furfurea* (SAPA 1124). **B** *Inocybe napiformis* (TAKK 04.10.3.9) **C** *Inocybe grammata* (TAKK 05.9.25.13). *Bars* 20 µm

weak nodules, yellowish brown to grayish brown. Basidia 23–30 × 8.8–10.8 µm, 4-spored, narrowly clavate to cylindrical, very pale yellow. Pleurocystidia as thick-walled metuloids 58–68 × 15.6–21.6 µm, fusiform with a short neck, with a short pedicellate base, walls up to 4.5 µm thick, very pale yellow, sometimes with pale rust content. Hymenophoral trama subregular; hyphae 7–8.8 µm diameter, sometimes swollen, up to 23.8 µm diameter; walls somewhat thickened (up to 1.5 µm thick), very pale yellow. Cheilocystidia similar to pleurocystidia, (45–)49–70 × (13–)18.8–22.5 µm; walls very pale yellow, sometimes with pale yellow pigment. Paracystidia mixed with cheilocystidia, sometimes catenate, terminal cells 17–30 × 7–11.3 µm, cylindrical to clavate, thin walled, very pale yellow. Caulocystidia as metuloids descending to base, similar to pleurocystidia and often with brown pigment; at stipe apex 55–79 × 15–28.8 µm, abundant; at stipe base similar to apical ones but rarely obovoid, rather abundant. Cauloparacystidia descending to base and mixed with metuloids, similar to lamellar ones but narrower, very pale yellow; at stipe apex abundant to very abundant but rather scanty at stipe base. Pileipellis of the cutis type, simple, with the layer up to 68 µm thick, composed of regular to subregular hyphae 5–9 µm in diameter, agglutinated especially at the surface, almost hyaline to slightly gray; upper part of the subhypodermal layer with brown pigment, up to 85 µm thick, with a somewhat thickened wall. Clamp connections abundant in all tissues, but not always at septa.

Chemical reactions: *Pileus:* $FeCl_3$ (20%) gradually blue green within 30 min; *KOH* (5%) gradually slightly yellow within 30 min. *Stipe:* $FeCl_3$ (20%) negative; *KOH* (5%) gradually lemon yellow within 30 min.

Specimens examined: Hokkaido: Prov. Sorachi, Iwamizawa-shi, Tonebetsu, on soil under *Betula* in *Quercus mongolica* Fisch. ex Turcz. var. *grosseserrata* (Blume) Rehd. & Wils. and *Betula* dominant forest, Sept. 25, 2005, coll. by T. Kobayashi & H. Shiroyama, TAKK 05.9.25.13; Prov. Iburi, Usu-gun, Ootaki-mura, *Abies sachalinensis* forest, July 24, 2004, SAPA 1125 (= TAKK 04.7.24.11). Honshu: Nagano Pref., Sanada-cho, Hisagata, Sugadaira, *Betula platyphylla* Sukaczev var. *japonica* (Miq.) H. Hara and *Larix kaempferi* (Lamb.) Carrière forest, Aug. 22, 1991, coll. by H. Kobayashi, TAKK 1397, TNS-F 19017 (= TAKK 1398), FB 37594 (CBM, = TAKK 1401–1), TAKK 1401–2, TAKK 1402, TAKK 1403 & TAKK 1404, same locality, under *Pinus densiflora* Siebold. & Zucc. and *Pinus thunbergii* Parlat., July 23, 1992, coll. by T. Kobayashi, TAKK 1852, July 24, 1992, coll. by T. Kobayashi, TAKK 1853–1, TAKK 1853–2, TAKK 1853–3, SAPA 1122, July 25, 1992, coll. by T. Kobayashi, TAKK 1864.

Japanese name: Senjoh-tomaya-take (new name).

Notes: *Inocybe grammata* belongs to the subgenus *Inocybe*, section *Marginatae* Kühner, because it has a conspicuously bulbous base of stipe, nodulose basidiospores, and metuloid caulocystidia present overall.

Present collections coincide well with *I. grammata* reported by Quélet (1879), Stangl (1979, 1989), Stridvall and Jacobsson (1989), Vauras (1997), Zitzmann (2002), and Ferrari (2006). I examined a specimen of *I. grammata* from Finland [Pohjois-Savo: Vehmersalmi, Litmaniemi, by the old dancing hall, old yard of the dancing hall, near *Betula*, *Pinus sylvestris* L., and *Picea abies* Karst., Aug. 11, 1994, coll. by J. Vauras, Vauras 9196F (TUR-A, duplicate in TAKK)] and found that its salient features closely matched with those of the Japanese specimens. *Inocybe fastuosa* Takah. Kobay. is somewhat similar to *I. grammata*, from which it differs in the stramineous color of pileus and more gibbous basidiospores. In addition, *I. fastuosa* lacks a margination and caulocystidia at the extreme base of stipe (Kobayashi 1995).

Inocybe pyriformis Takah. Kobay. & S. Kurogi, sp. nov.
Figs. 9, 10

Pileo 10–14 mm lato, conico dein convexo, fibrilloso, rimuloso, rubicundo-brunneo vel olivaceo-brunneo; lamellis adnatis vel sinuatis, luteo-brunneolis; stipite 25–30 × 1.3–2.1 mm, aequali, solido, roseo, apice subbrunneo; carne alba; basidiosporis 8.3–11.8 × 6–8 µm, nodulosis, luteo-brunneis; basidiis 23.8–30 × 10–12 µm, tetrasporis vel trisporis; pleurocystidiis 55–63 × 21.3–27.5 µm, pyriformibus, pachydermicis; cheilocystidiis fusiformibus vel pyriformibus, pachydermicis; caulocystidiis pachydermicis, stipite omnino praesentibus; fibulis praesentibus. Holotypus: SAPA 1126 (= TAKK 06.10.4.1).

Etymology: *pyriformis* (Latin) refers to the pyriform cystidia.

Pileus 10–14 mm broad, obtusely conical, then convex; surface fibrillose, almost smooth, rimulose; color reddish brown to light yellowish brown (2.5Y 6/4), at the center light olive brown (2.5Y 5/4). Lamellae adnate to sinuate,

Fig. 9. Carpophores of *Inocybe pyriformis* (BE 4409). *Bar* 10 mm

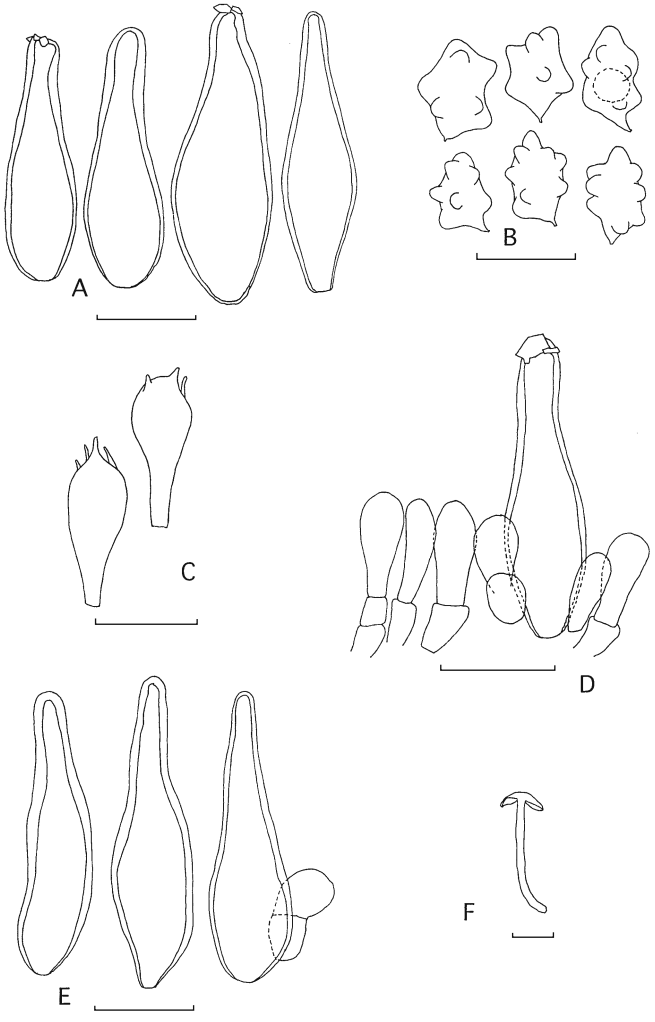

Fig. 10. *Inocybe pyriformis* (SAPA 1126). **A** Pleurocystidia. **B** Basidiospores. **C** Basidia. **D** Cheilocystidium and paracystidia. **E** Metuloidal caulocystidia and cauloparacystidia on stipe apex. **F** Section of carpophore. *Bars* **A**, **C**–**E** 20 µm; **B** 10 µm; **F** 10 mm

close, light yellowish brown (10YR 6/4) to yellowish brown (10YR 5/4) with fimbriate white to pale brown edges. Stipe 25–30 × 1.3–2.1 mm, equal to subbulbous, up to 3.7 mm in diameter at the base, solid; surface pruinose overall; color dull red, light brown (7.5YR 6/4) to pink (7.5YR 7/4), at the apex very pale brown (10YR 7/4), at the base white. Cortina absent. Context in pileus rather thin and pure white; that in stipe satiny, striate, pale red, near the surface dull red, pure white at the base. Odor strong, spermatic to fungoid. Taste unpleasant or salt like. IS = 21.6–47.8. ISB = 147.1–377.7(–711.4). Basidiospores 8.3–11.8 × 6–8 µm, average value 9.5 × 7.2 µm, Q = 1.2–1.5, elliptical-nodulose with prominent nodules, yellowish brown. Basidia 24–30 × 10–12 µm, often 4-spored, sometimes 3-spored, broadly clavate, very pale yellow. Pleurocystidia as metuloids, 55–63 × 21.3–27.5 µm, pyriform to ventricose with a truncate to rounded base, often with a short neck, thick walled (up to 4.5 µm thick), very pale yellow, with slightly brown intracellular pigment. Cheilocystidia as thick-walled metuloids, similar to pleurocystidia, 49–68 × 16.3–22.5 µm. Paracystidia abundant on the edge of lamellae, mixed with cheilocystidia, often catenate, with terminal cells of 15–18 × 10–11.3 µm, obovoid, rarely spatulate, thin walled, with slightly yellow intracellular pigment. Hymenophoral trama subregular; hyphae 3.3–8.8 µm in diameter, sometimes swollen, up to 12.5 µm in diameter; almost hyaline. Caulocystidia as metuloids, similar to pleurocystidia, present overall the stipe surface, at the stipe apex 59–74 × 16.3–30 µm and pyriform with a cylindrical neck, at the stipe base narrowly ventricose to fusiform. Cauloparacystidia mixed with thick-walled caulocystidia, similar to lamellar paracystidia; terminal cells in those at the stipe apex 11.3–18.8 × 8.8–13.8 µm, broadly ellipsoid to spatulate, very pale yellow, in those at the stipe base cylindrical to broadly ellipsoid, thin walled. Pileipellis a subregularly arrayed cutis, duplex; the upper layer up to 80 µm thick, with hyphae 5–8.8 µm in diameter and agglutinating at the surface, almost hyaline; the subtending layer up to 48 µm thick, with hyphae 3.3–7.5 µm in diameter, gray brown. Clamp connections abundant in all tissues but not always at septa.

Specimens examined: Kyushu: Miyazaki Pref., Miyazaki-shi, Gion; in soil in a garden, near *Quercus glauca* Thunb., Oct. 4, 2006, coll. by S. Kurogi, SAPA 1126 (holotype, = TAKK 06.10.4.1); the same place, Oct. 3, 2006, coll. by S. Kurogi & T. Hidaka, BE 4409.

Japanese name: Kabura-ase-take-modoki (Kurogi, new name).

Notes: This new species belongs to the subgenus *Inocybe* (= *Clypeus* Britzelm.), section *Marginatae* Kühner. The thick-walled caulocystidia present overall, metuloidal pleurocystidia and cheilocystidia, and the nodulose basidiospores are typical characters of the *Marginatae*. Although *I. pyriformis* lacks a marginate-bulbous base of stipe, it may be placed into sect. *Marginatae* emend. Singer (1986) because of the lack of a cortina, the nodulose basidiospores, the presence of the metuloids, and the caulocystidia present throughout the stipe surface. In the original sense of Kühner (1933), the *Marginatae* was characterized by possessing a marginate base of stipe, but Singer (1986) admitted those taxa that lack a marginate stipe base in the section by emending its concept.

Inocybe pyriformis seems to be the closest to *I. olivaceonigra* (E. Horak) Garrido (≡ *Astrosporina olivaceonigra* E. Horak) from Papua New Guinea (Horak 1979) in having an almost equal stipe and nodulose basidiospores, but the latter differs in having a conic knob at the apex of basidiospores, subfusoid metuloids, and its rather slender habit (Horak 1979). In addition, my examination of the holotype of *I. olivaceonigra* (PNG, Bulolo, Heads Hump, Mar. 9, 1972, coll. by E. Horak, ZT 72/192) further revealed that it had a pileipellis consisting of irregular, tomentous, and almost hyaline hyphae in the uppermost layer. *Inocybe asterospora* Quél. is also similar but differs in having stellate basidiospores and a marginate-bulbous base in its stipe.

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