

Three new species of *Crinipellis* found in Iriomote Island, southwestern Japan, and central Honshu, Japan

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Three new species of *Crinipellis* (Agaricales, Basidiomycetes) in Japan are described and illustrated: *Crinipellis canescens* sp. nov., forming small, canescent basidiomata, was found on a dead fallen twig in the subtropical laurel-leaved forest of Iriomote Island (southwestern Japan); *Crinipellis corvina* sp. nov., forming fibrillose-strigose, purplish black hairs enveloping the whole basidioma, was found on bark of *Torreya nucifera* in Mt. Takao, Tokyo; *Crinipellis nigricaulis* sp. nov., having a reddish brown pileus with a minute, black papilla and a blackish stipe accompanied by blackish, branched rhizomorphs, was found on leaf litter in the lowland forest of Kanagawa.

Key Words—Agaricales, *Crinipellis canescens*; *Crinipellis corvina*; *Crinipellis nigricaulis*; new species.

A survey of agaric flora in Iriomote Island (Okinawa, southwestern Japan) and central Honshu (especially Tokyo and Kanagawa), Japan, revealed the occurrence of three new species of *Crinipellis*. These species are described and illustrated here, and color photographs are presented showing macroscopical features of the basidiomata in primordial and mature stages. Color notations in parentheses are taken from Kornerup and Wanscher (1978). Specimens cited are preserved in the Natural History Museum and Institute, Chiba, Japan (CBM) and the Kanagawa Prefectural Museum of Natural History, Japan (KPM).

Species descriptions

Crinipellis canescens Har. Takahashi, sp. nov. Figs. 1–9

Pileo 6–15 mm lato, primo hemisphaeric, dein plano-convexo, centro depresso, fere ad centrum sulcato-striato, albo-piloso, brunneo; stipite 10–15 × 0.5–1 mm, subaequali vel ad basim leniter incrassato, cavo, primo albo, dein brunneo, piloso, apice pruinoso, mycelio basali albo affixo; lamellis adnexis, distantibus, brunneis; basidiosporis 9.2–10.4 × 3.7–4.3 μm, ellipsoideis vel subfusiformibus, levibus, hyalinis, inamyloideis; basidiis 26.4–37.3 × 6.4–8.8 μm, tetrasporis; cheilocystidiis 16–21.6 × 5–8.5 μm, subclaviformibus, aliquot breviter lobatis; pleurocystidiis nullis; pilis pilei 230–1200 × 4–7 μm, crassitunicatis, pseudoamyloideis, haud septatis; pilis stipitis similibus; hyphis fibulatis.

Holotypus: Ad ramulum delapsum in silva, Iriomote insula, Okinawa-ken, Japonia, 2 Jun. 1999, H. Takahashi (KPM-NC-0005014).

Etymology: from Latin, *canescens* = hoary, referring to the hoary fibrils enveloping the pileus and stipe.

Pileus 6–15 mm in diam, at first hemispherical with incurved margin, then convex to plane, sometimes with

an obtuse umbo or depressed center, radially sulcate-striate up to the disk, dry, canescent overall, at first reddish brown (8F7-8, 9F7-8) under hoary fibrils, then brown (7E7-8, 8E7-8) at center, brownish yellow (5C7–5C8) to yellowish brown (5D7–5D8) toward the ciliate-villose margin, orange (6B8) to brownish orange (6C8) when wet. Flesh very thin (up to 0.3 mm), concolorous with the surface, pliant, tough, odor and taste none. Stipe 10–15 × 0.5–1 mm, almost equal or slightly enlarged at the base, central, slender, terete, hollow, at first white overall, then brown (7E7-8, 8E7-8) toward the base, pruinose above, villose to hispid below, attached to a white, appressed mycelial pad over the substratum. Lamellae adnexed, distant (14–18 reach the stipe), up to 1 mm broad, slightly intervenose, concolorous with the pileus; edges even, concolorous.

Spore print pure white. Basidiospores 9.2–10.4 × 3.7–4.3 μm, ellipsoid to subfusiform, smooth, colorless, inamyloid, thin-walled. Basidia 26.4–37.3 × 6.4–8.8 μm, clavate, four-spored; basidioles clavate. Cheilocystidia 16–21.6 × 5–8.5 μm, forming a compact sterile edge, subclavate to irregularly shaped, with one or several finger-like appendages 2.4–4.2 μm wide, or shortly lobed or knobbed, smooth, colorless or pale melleous, inamyloid, thin-walled. Pleurocystidia none. Hymenophoral trama regular; element hyphae similar to those of the pileitrama. Pileipellis a hypotrachelial layer of subcylindrical cells 30–60 × 6–12 μm, often inflated, with orange (6B8) to brownish orange (6C8) walls up to 1 μm thick, with brownish orange (6C8) incrustation, brownish red (11C8) in Melzer's reagent (dextrinoid); hairs of pileus 230–1200 × 4–7 μm, arising directly from the hypotrachelium, repent or erect, cylindrical, tapering to an obtuse apex or with a broadly rounded apex, sometimes flexuous, smooth, brownish violet (11D8) to violet brown (11E8) in Melzer's reagent (strongly dextrinoid), with colorless or

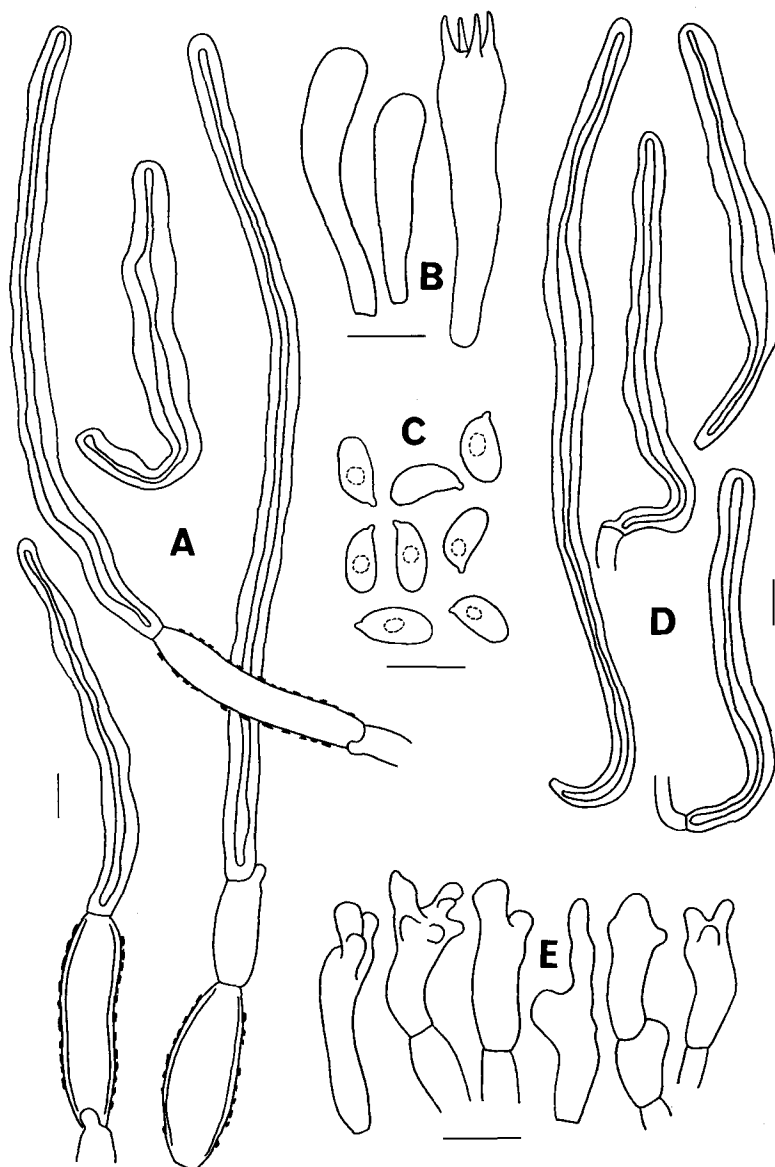


Fig. 1. *Crinipellis canescens*.

A. Elements of the pileipellis. B. Basidium and basidioles. C. Basidiospores. D. Hairs of the stipitipellis. E. Cheilocystidia. Scales: 10 μm . All figures from the holotype.

pale melleous walls 1.6–3.2 μm thick, without a secondary septum. Hyphae of pileitrama 6–16 μm wide, parallel, cylindrical to subfusiform, often inflated, smooth, with pale melleous cytoplasmic pigments, brownish red (11C8) in Melzer's reagent (dextrinoid), thin-walled. Stipitipellis of fasciculate hairs arising from cutis hyphae; hairs of stipe similar to those of the pileus. Stipe trama composed of longitudinally running, cylindrical hyphae 5.3–8 μm wide, smooth, with pale melleous to brownish orange (6C8) cytoplasmic pigments, brownish red (11C8) in Melzer's reagent (dextrinoid), thin-walled. Clamps present in all tissues.

Distribution: Iriomote Island (southwestern Japan).

Specimens examined: KPM-NC-0005014 (holotype), solitary to scattered on a dead fallen twig of broad-

leaved tree (forest dominated by *Quercus miyagii* Koidz. and *Ficus erecta* Thunb.), along the Urauchi River, Iriomote Island, Okinawa Pref., 2 Jun. 1999; CBM-FB-24120, *ibid.* 1 Oct. 1996; CBM-FB-24121, *ibid.* 15 May 1997; CBM-FB-24122, *ibid.* 6 Jun. 1998.

Japanese name: Shiraga-nise-houraitake.

Notes: This species is characterized by the radially sulcate-striate, canescent pileus colored brownish yellow at maturity, the white or brown, villose to hispid stipe attached by the white, appressed mycelial pad to the substratum, the distant lamellae concolorous with the pileus, the subclavate or irregularly shaped cheilocystidia with one or several finger-like appendages, the hairs without secondary ladder-septation, and the basidiome formation on dead branches.



Figs. 2–5. *Crinipellis canescens*.

2–4. Immature basidiomata. 5. Mature basidiomata. Scales: 2, 3=1 mm; 4, 5=5 mm. All figures from the holotype.

The lack of bright pigments, the relatively long (more than 7 mm) and central stipe, the relatively small (less than $9\ \mu\text{m}$ broad) and elongated basidiospores, and the absence of pleurocystidia suggest that this species belongs in the section *Crinipellis*, subsection *Crinipellis*, as defined in Singer (Singer, 1942, 1986). Within the subsection, *C. canescens* appears to be closely related to several neotropical taxa with a small pileus (less than 10 mm) and cheilocystidia with several appendages, such as *C. pseudostipitaria* Singer (Pegler, 1983; Singer,

1942), *C. septotricha* Singer (Pegler, 1983; Singer, 1942), and *C. stupparia* (Berk. & M. A. Curtis) Pat. (Pegler, 1983). The latter three taxa, however, are distinct in having a pileus with a dark papillate umbo and in lacking basal mycelium. Moreover, *C. pseudostipitaria* grows on grass debris, while *C. septotricha* and *C. stupparia* have hairs with secondary ladder-septations. *Crinipellis canescens* is also similar to *C. omostricha* (Berk.) D. A. Reid, redescribed by Pegler (Pegler, 1986) from material collected in Sri Lanka. *Crinipellis*



Figs. 6–9. *Crinipellis canescens*.

6. Mature basidioma forming obtusely umbonate pileus. 7. Close-up of base of the stipe attached to a mycelial pad over a substratum. 8. Surface view of mature pilei. 9. Underside view of mature pileus. Scales: 6=2 mm; 7–9=1 mm. 6, 7 from CBM-FB-24122; 8, 9 from CBM-FB-24121.

omotricha differs in its simple cheilocystidia and in its graminicolous habitat. *Crinipellis hepatica* Corner (Corner, 1996), recently described from Malaysia, seems to be most closely allied with *C. canescens*. The former differs in having a persistently reddish brown pileus, insititious stipe, subfusiform basidiole, and subventricose to subfusiform cheilocystidia without appendages.

***Crinipellis corvina* Har. Takahashi, sp. nov. Figs. 10–18**

Pileo 10–15 mm lato, primo hemisphaerico, dein plano-convexo, centro depresso papillato zona leniter elevato, fibrilloso-squamuloso, atro-purpureo; stipite 20–

30 × 1–1.5 mm, subaequali vel ad basim leniter incrassato, cavo, atro-purpureo, strigoso-fibrilloso, mycelio basali non affixo; lamellis adnexis, confertis, albis; basidiosporis 6.5–8 × 3.5–4.5 μm, ellipsoideis, levibus, hyalinis, inamyloideis; basidiis 22–30 × 4–8 μm, tetrasporis; cheilocystidiis 20–40 × 4–12 μm, irregulariter cylindraceutis vel ventricosis; pleurocystidiis nullis; pilis pilei 500–1500 × 3.5–6 μm, crassitunicatis, pseudoamyloideis, septatis; pilis stipitis similibus; hyphis fibulatis.

Holotypus: Ad corticem *Torreyae nuciferae* Sieb. et Zucc. et ramulum delapsum in silva, Mt. Takao, Hachiojishi, Tokyo, Japonia, 8 Aug. 1998, H. Takahashi (CBM-

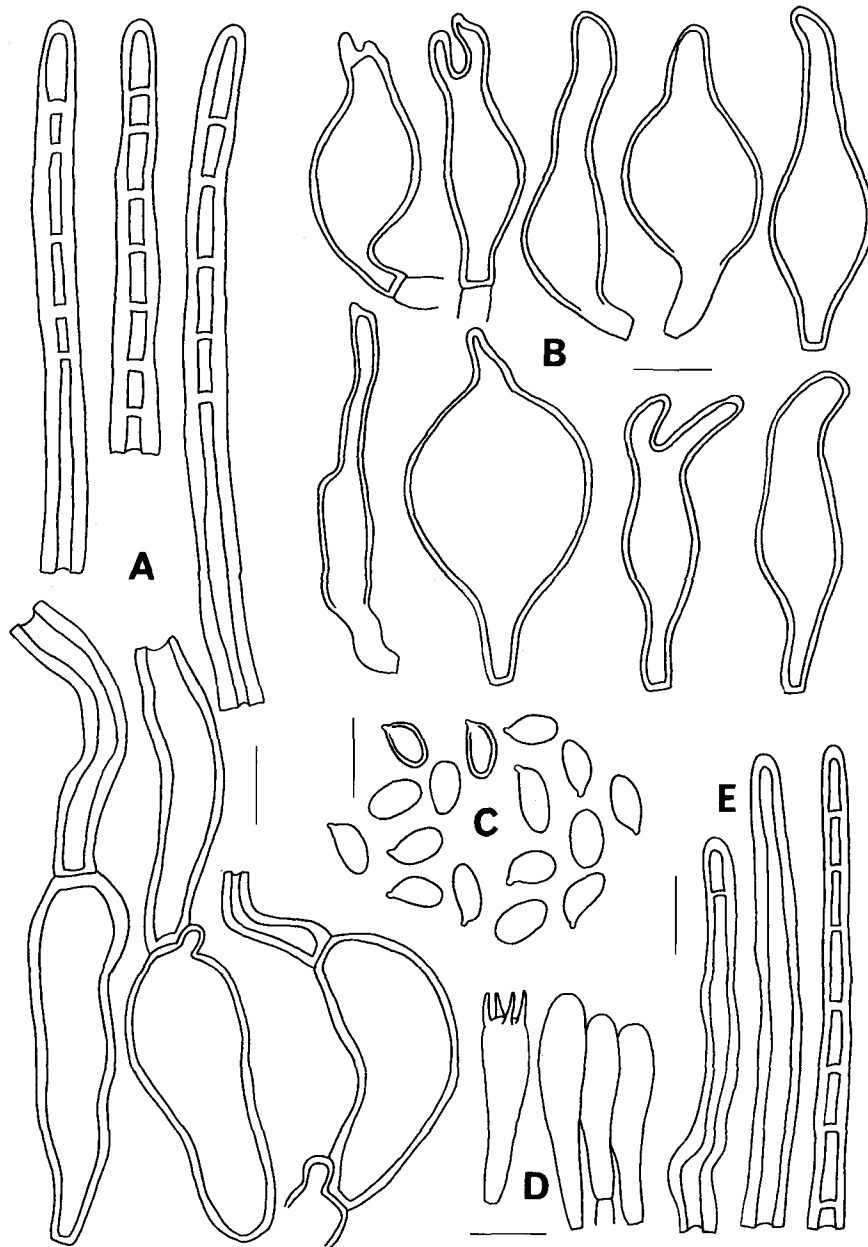
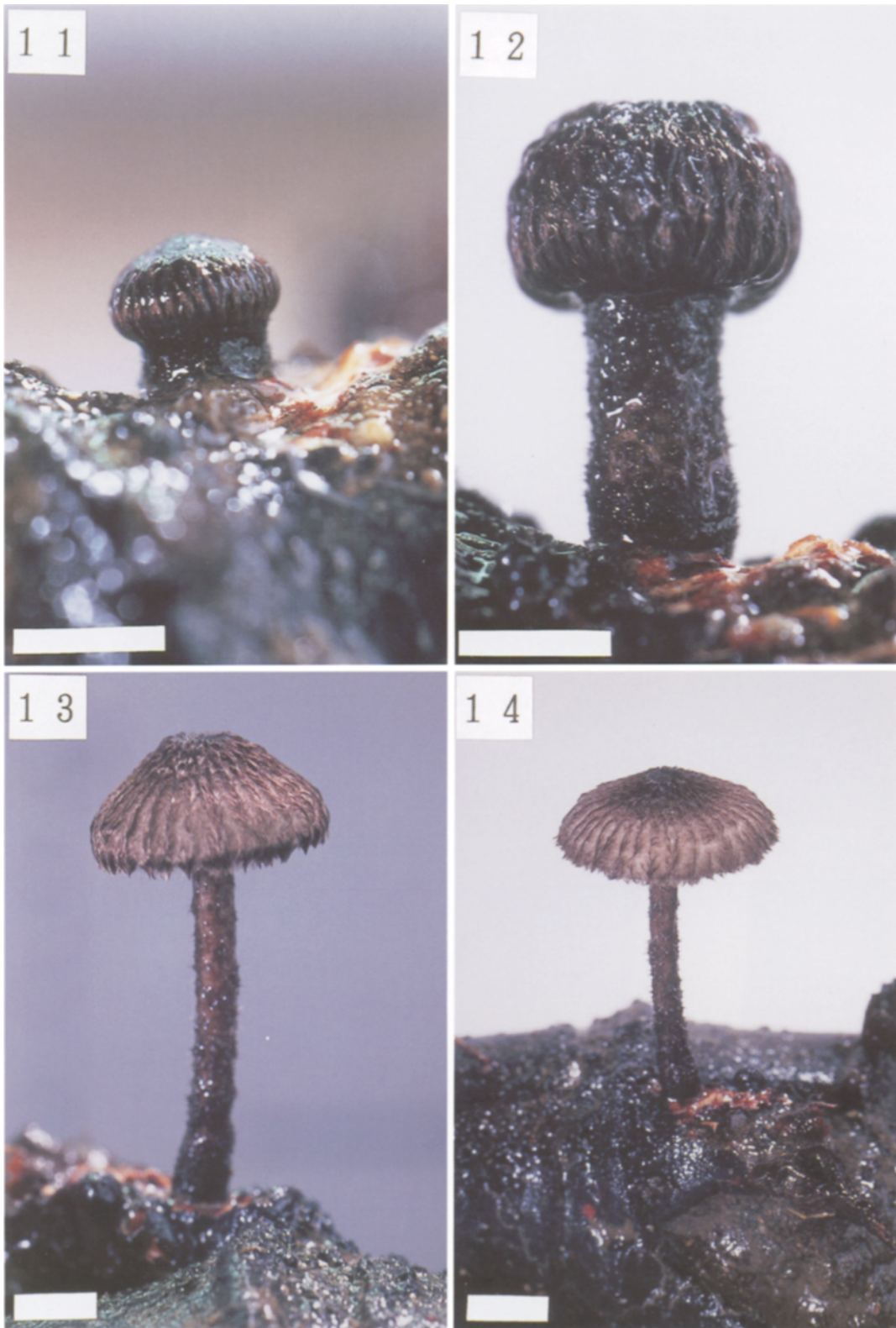


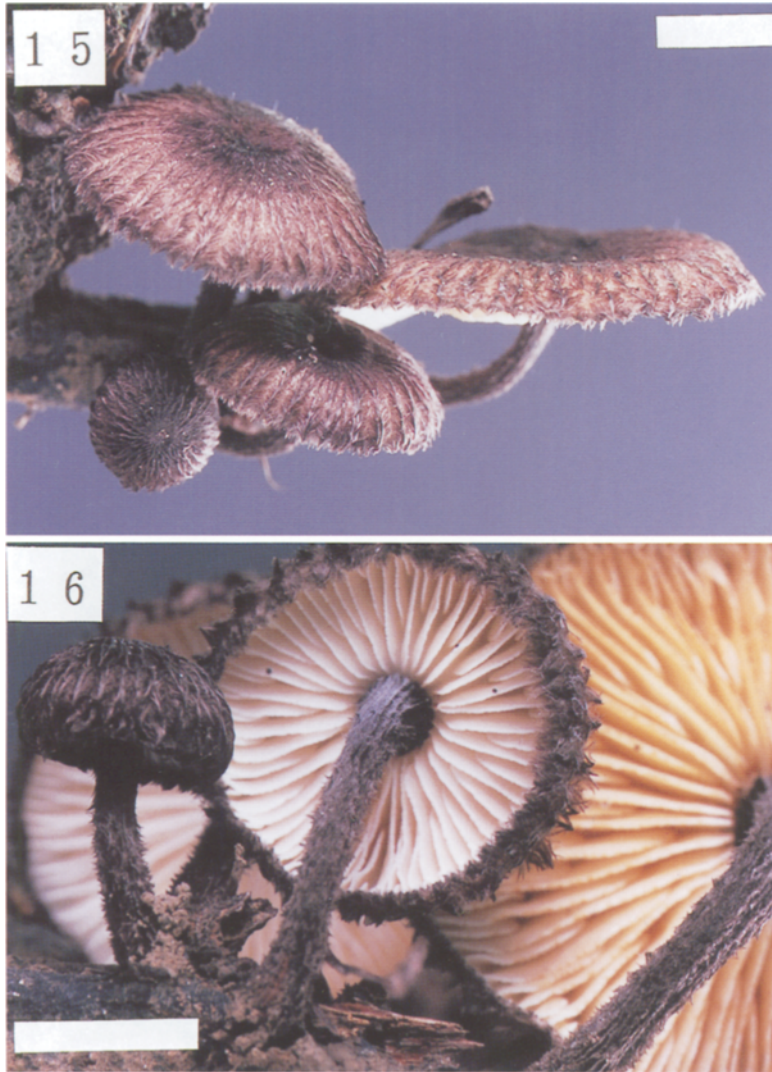
Fig. 10. *Crinipellis corvina*.

A. Elements of the pileipellis. B. Cheilocystidia. C. Basidiospores. D. Basidium and basidioles. E. Hairs of the stipitipellis. Scales: 10 μm. All figures from the holotype.



Figs. 11–14. *Crinipellis corvina*.

11–13. Immature basidiomata. 14. Mature basidioma. Scales: 11, 12=1 mm; 13=2 mm; 14=4 mm. All figures from CBM-FB-24123.



Figs. 15, 16. Basidiomata of *Crinipellis corvina* densely gregarious on dead fallen culm. 15. Side view. 16. Underside view. Scales: 4 mm. All figures from the holotype.

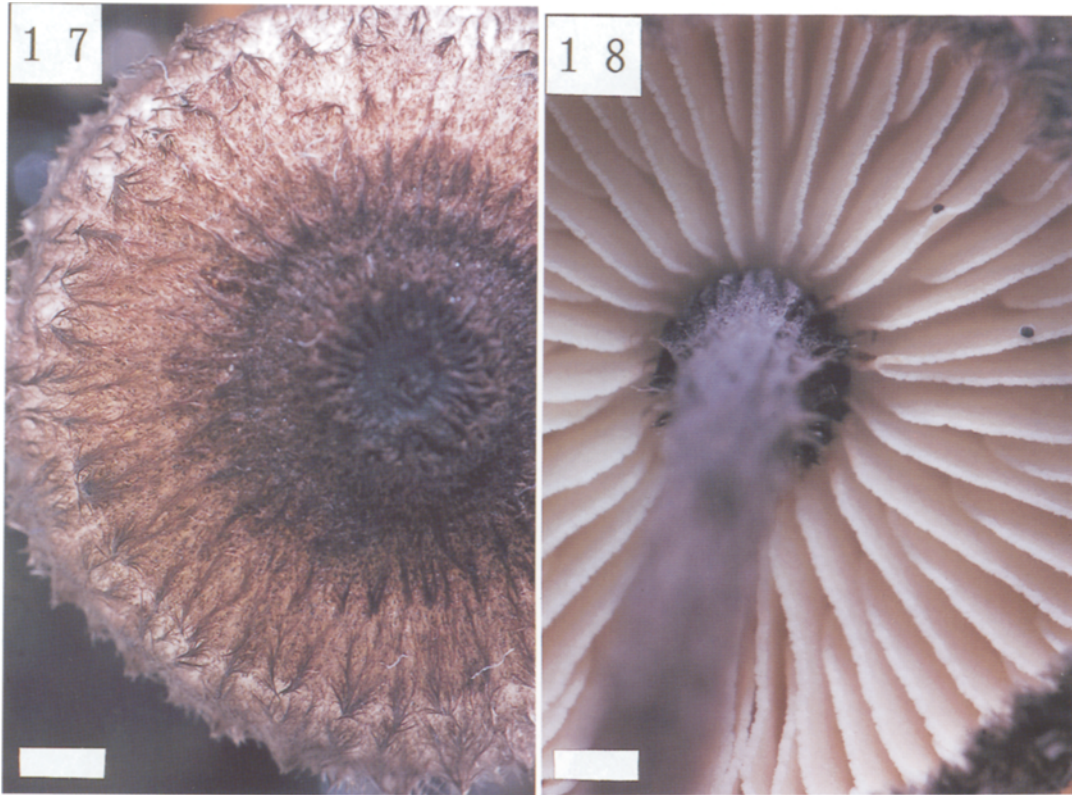
FB-24124).

Etymology: from Latin, *corvina*=corvine, referring to the fibrillose-squamulose, blackish purple hairs like corvine feathers.

Pileus 10–15 mm in diam, at first hemispherical to convex with incurved margin, then nearly plane, sometimes with depressed center, usually forming a cratered, circular ridge around the concave disk, dry, radially fibrillose-squamulose with strigose, blackish purple hairs projecting beyond the margin, often concentrically zoned, dull, opaque. **Flesh** very thin (up to 0.4 mm), pallid, pliant but easily broken, odor and taste none. **Stipe** 20–30 × 1–1.5 mm, subequal or slightly enlarged at the base, central, slender, terete, hollow, entirely strigose-fibrillose with blackish purple hairs, basal mycelium not seen. **Rhizomorphs** 10–15 × 0.3–0.6 mm in diam, thread-like, tough, whitish, not branched, growing into the air, scattered on the substratum, independent of the formation of basidiomata. **Lamellae** abruptly adnex-

ed, close (28–35 reach the stipe), up to 1.5 mm broad, white, light brown (6D6–6D7) in age; edges ciliate to fimbriate, concolorous.

Spore print pure white. **Basidiospores** 6.5–8 × 3.5–4.5 μm, ellipsoid, smooth, colorless, inamyloid, thin- or slightly thick-walled. **Basidia** 22–30 × 4–8 μm, clavate, four-spored; basidioles clavate. **Cheilocystidia** 20–40 × 4–12 μm, forming a compact sterile edge, projecting from the hymenium, ventricose to pyriform, occasionally with one or two cylindrical apical appendages 3–20 × 3–7 μm, smooth, colorless, inamyloid, moderately thick-walled (up to 1 μm thick). **Pleurocystidia** none. **Hymenophoral trama** regular; element hyphae similar to those of the pileitrama. **Pileipellis** a hypotrachelial layer of subcylindric cells 20–100 × 5–25 μm, more or less inflated, with smooth, colorless or light brown walls up to 2 μm thick, weakly dextrinoid; hairs of pileus 500–1500 × 3.5–6 μm, arising directly from the hypotrachelium, repent or erect, cylindric, with rounded apex, sometimes



Figs. 17, 18. *Crinipellis corvina*.

17. Surface view of mature pileus. 18. Underside view of mature pileus. Scales: 1 mm. All figures from CBM-FB-24123.

flexuous, with smooth, brown (7E8) walls $1\text{--}3\ \mu\text{m}$ thick, strongly dextrinoid, often with several or numerous secondary septa forming ladder structure. Hyphae of pileitrama $5\text{--}20\ \mu\text{m}$ wide, parallel, subcylindric to subfusiform, often inflated, smooth, colorless, inamyloid, thin or slightly thick-walled. Stipitipellis a cutis of parallel, repent hyphae $2\text{--}5\ \mu\text{m}$ wide, cylindric, with numerous secondary septa (without clamps) or without them, with smooth, light brown walls up to $1\ \mu\text{m}$ thick, dextrinoid; hairs of stipe similar to those of the pileus. Stipe trama composed of longitudinally running, cylindric hyphae $5.3\text{--}8\ \mu\text{m}$ wide, with smooth, colorless or light brown walls up to $1\ \mu\text{m}$ thick, dextrinoid. Clamps present in all tissues.

Distribution: Japan (Tokyo).

Specimens examined: CBM-FB-24123, scattered on bark of *Torreya nucifera* Sieb. et Zucc. (300 m alt.), Mt. Takao, Hachiouji, Tokyo, 13 sept. 1997; CBM-FB-24124 (holotype), scattered to densely gregarious on bark of *Torreya nucifera* and dead fallen twig or culm, Mt. Takao, Hachiouji, Tokyo, 8 Aug. 1998.

Japanese name: Kuro-nise-houraitake (first collected and named by Mr. Minoru Aoki).

Notes: This species is well characterized by the blackish purple, fibrillose-squamulose hairs enveloping the whole basidioma, the pileus with a cratered, circular ridge around the concave disk, the moderately thick-walled, ventricose to pyriform cheilocystidia with occasional apical appendages, the hairs with numerous

secondary ladder-septations, and the lignicolous habitat.

The lack of bright pigments, the relatively long (more than 7 μm) and central stipe, the relatively small (less than $9\ \mu\text{m}$ broad) and elongated basidiospores, and the absence of pleurocystidia suggest that this species belongs in the section *Crinipellis*, subsection *Crinipellis*, as defined in Singer (Singer, 1942, 1986). *Crinipellis corvina* differs from all previously described taxa of the subsection *Crinipellis* in its blackish purple hairs enveloping the whole basidioma and in its thick-walled, projecting cheilocystidia which form ciliate lamella edges.

Crinipellis brunneipurpurea Corner (Corner, 1996), recently described from Singapore, has macromorphological similarities to *C. corvina*. *Crinipellis brunneipurpurea* differs micromorphologically in having much larger basidiospores ($12\text{--}14 \times 4.5\text{--}5.5\ \mu\text{m}$) and thin-walled, subcylindric cheilocystidia.

Crinipellis nigricaulis Har. Takahashi, sp. nov.

Figs. 19–27

Pileo 3–6 (11) mm lato, primo hemisphaerico, dein plano, papilla atro-brunnea in disco umbilicato, fibrillostrigoso, brunneo-rufo; stipite $25\text{--}50 \times 0.3\text{--}0.8$ mm, filiformis, cavo, brunneo-rufo vel atro-brunneo, strigoso, mycelio basali albo affixo; lamellis liberis vel adnexis, distantibus, albis; basidiosporis $7\text{--}9 \times 4\text{--}5\ \mu\text{m}$, ellipsoideis, levibus, hyalinis, inamyloideis; basidiis $20\text{--}30 \times 5\text{--}8\ \mu\text{m}$, tetrasporis; cheilocystidiis $17\text{--}30 \times 6\text{--}11\ \mu\text{m}$, cylindraceis vel claviformibus; pleurocystidiis nullis; pilis pilei

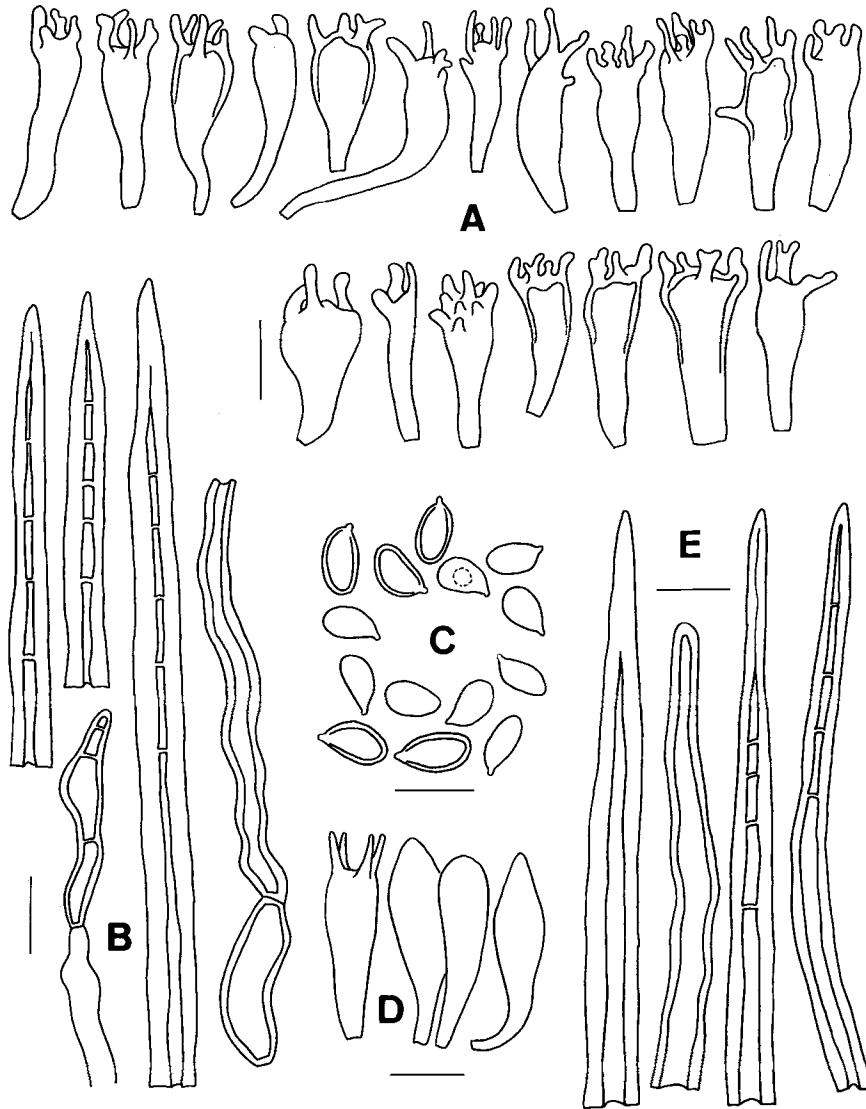


Fig. 19. *Crinipellis nigricaulis*.

A. Cheilocystidia. B. Elements of the pileipellis. C. Basidiospores. D. Basidium and basidioles. E. Hairs of the stipitipellis. Scales: 10 μm . All figures from the holotype.

200–1500 \times 3–11 μm , crassitunicatis, pseudoamyloideis, septatis; pilis stipitis similibus; hyphis fibulatis.

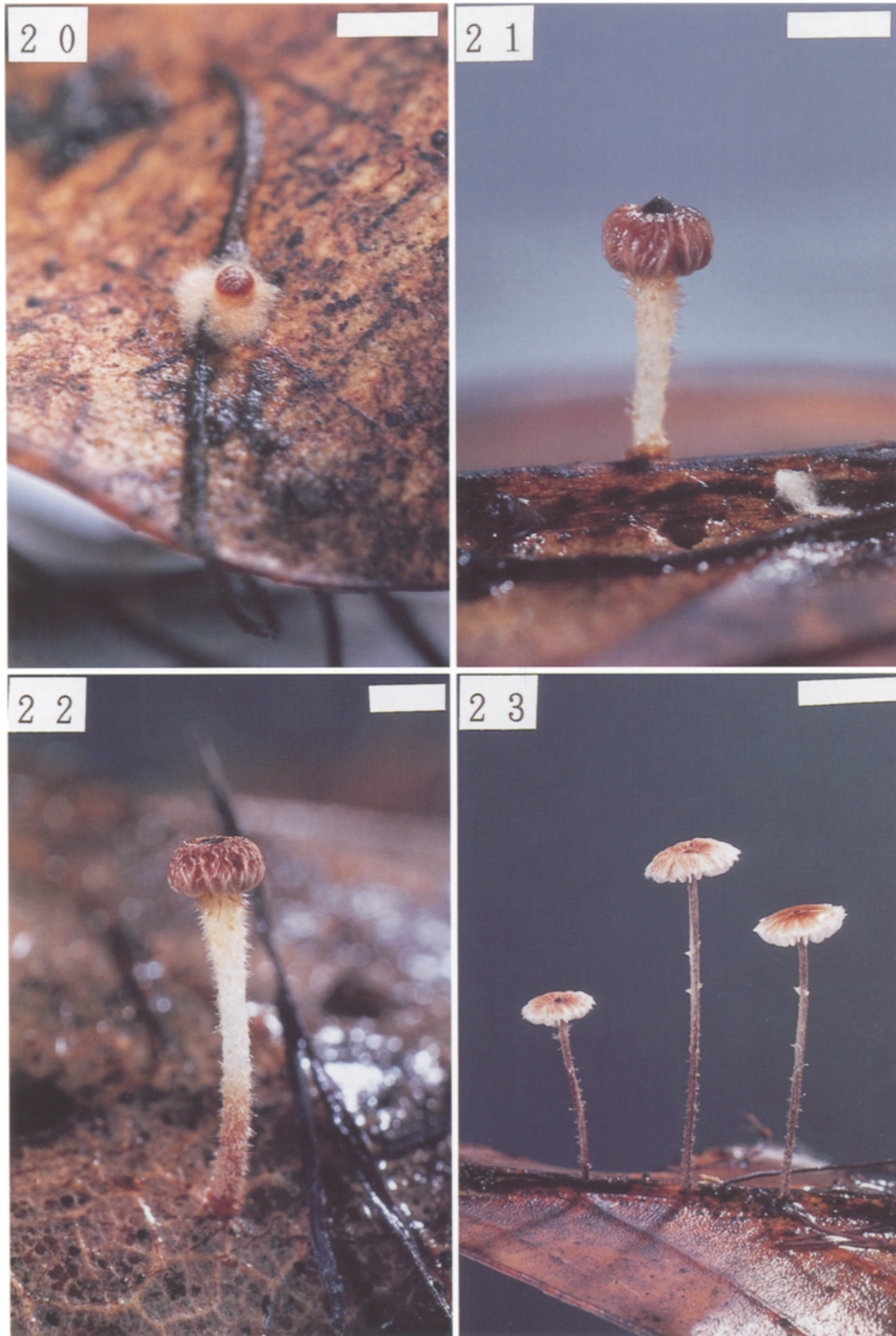
Holotypus: Ad folias dejectas inter rhizomorphas nigras filiformes, Zushi-shi, Kanagawa-ken, Japonia, 20 Jul. 1998, H. Takahashi (CBM-FB-24126).

Etymology: from Latin, *nigri*=black, *caulis*=stemmed, referring to the black, branched rhizomorph from which the basidioma sometimes arises.

Pileus 3–6 (11) mm in diam, at first hemispherical to convex with incurved margin, becoming nearly plane, with a blackish, minute, conical umbo or papilla at slightly umbilicate center, radially fibrillose-strigose along the plicate ridges, not concentrically zoned, dry, dull, opaque; hairs reddish brown (9F7–9F8, 9E6–9E8) over a whitish ground; margin ciliate-fibrillose. Flesh very thin (up to 0.5 mm), white, pliant, tough, odor and taste none. Stipe 25–50 \times 0.3–0.8 mm, filiform, cylindric,

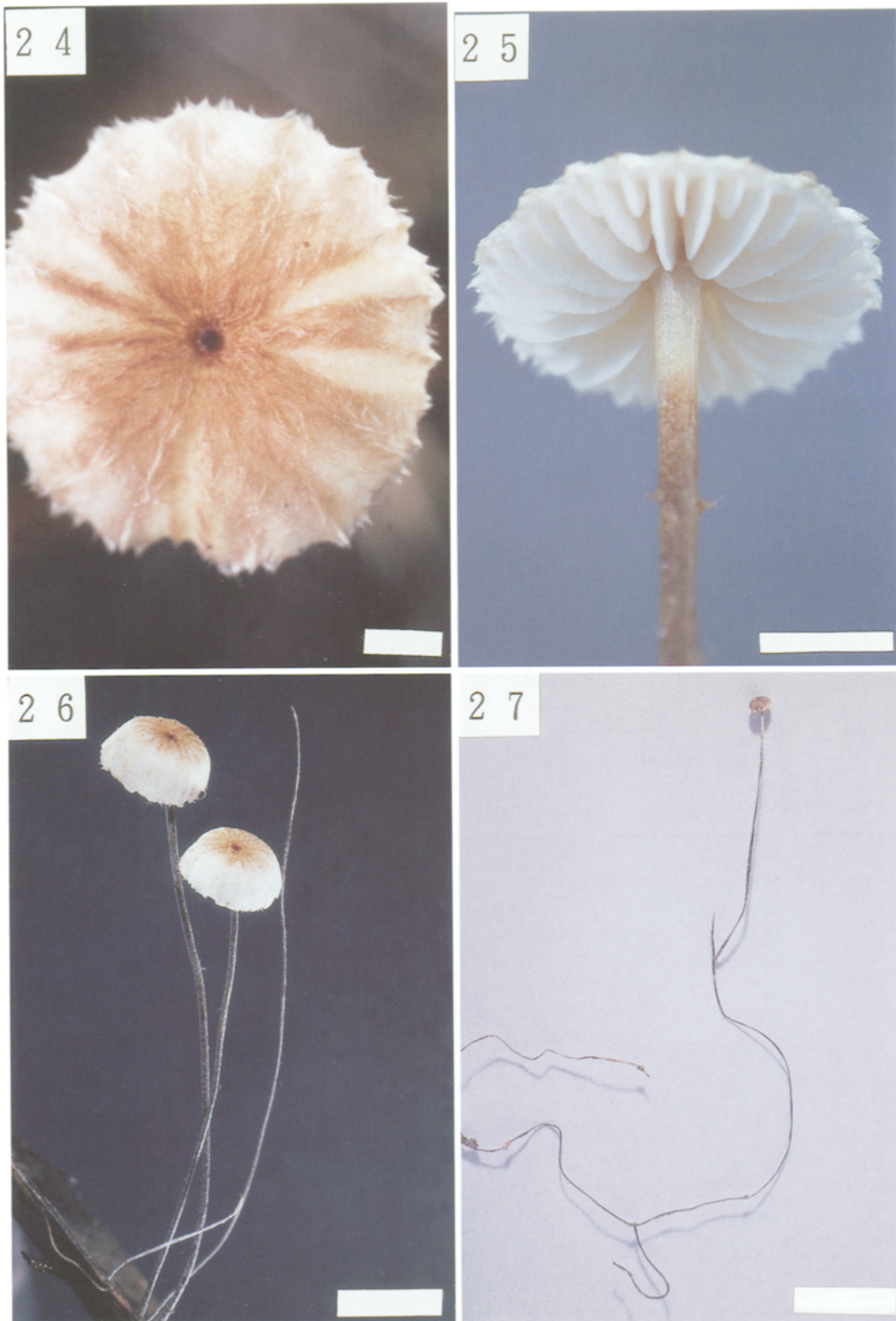
central, terete, hollow, at first white, then reddish brown (8F5–8F7) from the base upward, in age entirely dark brown (7F5–7F7) or blackish, densely hispid to strigose with whitish or reddish brown hairs; base covered with short, pale brownish hairs or tomentum, sometimes arising directly from black, branched rhizomorphs. Rhizomorphs 30–150 \times 0.2–0.5 mm, filiform, tough, blackish, covered with concolorous appressed hairs, often branched, scattered on leaves. Lamellae subfree or adnexed, distant to subdistant (15–18 reach the stipe), up to 0.5–1 mm broad, white; edges fimbriate, concolorous.

Spore print pure white. Basidiospores 7–9 \times 4–5 μm , ellipsoid, smooth, colorless, inamyloid, thin- or slightly thick-walled. Basidia 20–30 \times 5–8 μm , clavate, four-spored; basidioles fusiform to subfusiform-clavate. Cheilocystidia 17–30 \times 6–11 μm , forming a compact sterile edge, cylindric or clavate with several irregularly



Figs. 20–23. *Crinipellis nigricaulis*.

20–22. Immature basidioma. 23. Mature basidiomata. Scales: 20–22=2 mm; 23=6 mm. All figures from the holotype.



Figs. 24–27. *Crinipellis nigricaulis*.

24. Surface view of mature pileus. 25. Underside view of mature pileus. 26. Basidiomata accompanied by black rhizomorphs. 27. Basidioma arising directly from the branched rhizomorph (dried material). Scales: 24=1 mm; 25=2 mm; 26, 27=10 mm. 24, 25, 27 from CBM-FB-24125; 26 from CBM-FB-24127.

cylindric apical appendages $1.5\text{--}6 \times 1\text{--}2 \mu\text{m}$, smooth, colorless, inamyloid, thin or slightly thick-walled ($0.5\text{--}1 \mu\text{m}$ thick). Pleurocystidia none. Hymenophoral trama regular; element hyphae similar to those of the pileitrama. Pileipellis a hypotrighial layer of subcylindric cells $15\text{--}80 \times 3\text{--}12 \mu\text{m}$, inflated or not, with smooth, colorless walls up to $1 \mu\text{m}$ thick, inamyloid or weakly dextrinoid; hairs of pileus $200\text{--}1500 \times 3\text{--}11 \mu\text{m}$, arising directly from the hypotrighium, repent or erect, cylindric, tapering to an acute apex or sometimes with a rounded apex, with smooth, yellowish brown (5E8–5F8) walls $1\text{--}3 \mu\text{m}$ thick, strongly dextrinoid, often with several or numerous secondary septa forming ladder-structure. Hyphae of pileitrama $2\text{--}14 \mu\text{m}$ wide, parallel, cylindric to subcylindric, often inflated, with smooth, colorless walls up to $1 \mu\text{m}$ thick, inamyloid. Stipitipellis a cutis of parallel, repent hyphae $2.5\text{--}4 \mu\text{m}$ wide, cylindric, smooth, with pale brown to brown membranal pigments, dextrinoid, thin- or slightly thick-walled; hairs of stipe similar to those of the pileus. Stipe trama composed of longitudinally running, cylindric hyphae $3\text{--}7 \mu\text{m}$ wide, with smooth, pale brown walls up to $1 \mu\text{m}$ thick, dextrinoid. Clamps present in all tissues.

Distribution: Eastern Japan (Kanagawa).

Specimens examined: CBM-FB-24125, scattered to densely gregarious on leaf litter in lowland forest dominated by *Ardisia japonica* (Thunb.) Blume, *Castanopsis cuspidata* (Thunb.) Schottky var. *sieboldii* (Mak.) Nakai, *Quercus salicina* Blume, and *Quercus acuta* Thunb., Zushi, Kanagawa, 12 Jul. 1996; CBM-FB-24126 (holotype), *ibid.* 20 Jul. 1998; CBM-FB-24127 scattered on leaf litter in lowland forest dominated by *Castanopsis cuspidata* (Thunb.) Schottky var. *sieboldii* (Mak.) Nakai, Odawara, Kanagawa, 27 Sept. 1998.

Japanese name: Kurokami-ochibatake.

Notes: Distinctive features of this species are found in the reddish brown, radially fibrillose-strigose pileus with a minute blackish papilla in umbilicus, the blackish, densely hispid stipe occasionally associating with the blackish, branched rhizomorphs, the subclavate cheilocystidia with several finger-like apical appendages, the acutely pointed hairs with numerous secondary ladder-septations, and the basidiome formation on leaf litter.

The lack of bright pigments, the relatively long (more than 7 mm) and central stipe, the relatively small (less than $9 \mu\text{m}$ broad) and elongated basidiospores, and the absence of pleurocystidia suggest that this species be-

longs in the section *Crinipellis*, subsection *Crinipellis*, as defined in Singer (Singer, 1942, 1986). Within the subsection, there are two similar neotropical species with blackish papillate umbo on the pileus disk and subcylindric to subclavate cheilocystidia with several finger-like apical appendages: *C. foliicola* Singer (Singer, 1976) and *C. phyllophila* Singer (Singer, 1976). These differ from the present species primarily in lacking rhizomorphs. Furthermore, *C. foliicola* has close, cream-colored lamellae and yellow to melleous-hyaline cheilocystidia, while *C. phyllophila* has a pileus with a central circular wall around the disk, close lamellae, and hairs of pileus without ladder-structure. *Crinipellis nigricaulis* is most similar to *C. actinophora* (Berk. & Broome) Singer (Singer, 1955), redescribed by Pegler (Pegler, 1986) from material collected in Sri Lanka, which has dark brown, 'hair-blight' rhizomorphs. The latter species differs in forming a concentrically zoned pileus, incrustated hypotrighial elements, cylindric hairs with a rounded apex, and growth on dead twigs.

Acknowledgements—I am grateful to Dr. Toshimitsu Fukiharu (CBM) for allowing the specimens cited to be kept in the Natural History Museum and Institute, Chiba. Thanks are also owed to Dr. Yousuke Degawa (KPM) for allowing the specimens cited to be kept in the Kanagawa Prefectural Museum of Natural History.

Literature cited

- Corner, E. J. H. 1996. The agaric genera *Marasmius*, *Chaetocalathus*, *Crinipellis*, *Heimiomyces*, *Resupinatus*, *Xerula* and *Xerulina* in Malesia. *Beiheft Nova Hedwig*. 111: 1–164.
- Kornerup, A. and Wanscher, J. H. 1978. *Methuen handbook of colour*, 3rd. ed. Methuen & Co., London.
- Pegler, D. N. 1983. *Agaric flora of the Lesser Antilles*. Kew Bulletin Add. Ser. IX. Her Majesty's Stationery Office, London.
- Pegler, D. N. 1986. *Agaric flora of Sri Lanka*. Kew Bulletin Add. Ser. XII. Her Majesty's Stationery Office, London.
- Singer, R. 1942. A monographic study of the genera "*Crinipellis*" and "*Chaetocalathus*." *Lilloa* 8: 441–534.
- Singer, R. 1955. Type studies on Basidiomycetes VIII. *Sydowia* 9: 367–431.
- Singer, R. 1976. *Marasmiaceae* (Basidiomycetes – Tricholomataceae). *Flora Neotropica Monograph* 17: 1–347.
- Singer, R. 1986. *Agaricales in modern taxonomy*, 4th. ed. Koeltz Scientific books, Koenigstein.