Eight Unrecorded Higher Fungi Identified at the Korea National Arboretum

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A total of 560 higher fungal specimens were collected in the Gwangneung Forest from May to November of 2007. All of the collected specimens were identified; categorized into 8 classes, 19 orders, 69 families, 165 genera, and 296 species; and deposited in the herbarium of the Korea National Arboretum. Of the identified specimens, 8 were confirmed as being new to Korea and are as follows: *Cudoniella acicularis* (Korean name: Jeombakisotugubeoseos), *Discina ancilis* (Korean name: Jomwonbanbeoseos), *Helvella costifera* (Korean name: Galbidaeanjangbeoseos), *Entoloma cephalotrichum* (Korean name: Jomkkaltaejiweodaebeseos), *Mycena leptcephala* (Korean name: Yalbeungatweojuleumbeoseos), *Naematoloma gracile* (Korean name: Ganeundaegaeambeoseos), *Sistotrema octosporum* (Korean name: Hweosekcheonbeoseos), and *Hydnellum peckii* (Korean name: Pijeopkkaltaegibeoseos).

KEYWORDS : Korea National Arboretum, Unrecorded higher fungi

The Korea National Arboretum (KNA) is located in the Gwangneung Forest, between Namyangju-si and Pocheon-si, in the Gyeonggi Province. The KNA has 15 specialized plant gardens. The woody plants of 1,863 species and the herbaceous plants of 1,481 species have been maintained in these gardens for 500 yr. The KNA has an environment suitable to fungal growth. Despite the floral diversity at the KNA, an intensive study to identify the resident fungal flora had never been conducted. Thus, regular field trips were made to this area over 32 days from May to November of 2007 to collect fresh fungal specimens for identification. A total of 560 fungal specimens were collected, and all specimens were taxonomically identified to the species level on the basis of their morphological and microscopic characteristics. Of the identified species, 8 species were identified as unrecorded taxa in Korea.

Materials and Methods

The macroscopic and microscopic features of carphophores were observed, the fruit bodies were measured, and the characteristics of the pileus, lamellae, stipe, and other features were investigated based on the method described by Largent *et al.* [1]. The microscopic characteristics were sketched using a drawing tube, and more than 30 measurements were made to ascertain the average dimensions of each characteristic. The color terms described previously by Komerup and Wanscher [2] were used. All specimens examined are preserved in the herbarium of the KNA.

Taxonomy. Various identification systems were used for the general taxonomic classification and to describe the identified taxa. The system of Dennis [3] was used for the Ascomycetous fungi, that of Singer [4] was used for the Agaricales fungi, and that of Donk [5] was used for the Polyporales fungi. The illustrations of Breitenbach and Kränzlin [6], of Gilbertson and Ryvarden [7], and of Imazeki and Hongo [8] were referenced to aid in the taxonomic characterization of general fungi.

In accordance with modern systematics, the latest scientific names were considered for identification of Korean higher fungi. However, few morphological characteristics of Korean higher fungi were found to be different from those of other countries. Therefore, these typical morphological characteristics were taken into consideration during the identification of the species.

Results and Discussions

A total of 560 fungal specimens were collected, all of which were identified to the species level. The fungi were categorized into 8 classes, 19 orders, 69 families, 165 genera, and 296 species. Eight of the species were confirmed as being new to Korea. These 8 species are identified below, and their macroscopic and microscopic characteristics are described.

***Cudoniella acicularis* (Bull.) J. Schröt (Korean name: Jeombakisotugubeoseos) (Fig. 1A)**

Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2(1~2): 21 (1893) [1908].

Synonyms: *Fungus minimus* Ray, Syn. pl.: 9 (1689); *Helotium aciculare* (Bull.) Pers., Syn. Fung. Amer. Bor.:

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Fig. 1. Carphophores of some previously unrecorded species of Korean fungi. A, *Cudoniella acicularis*; B, *Discina ancilis*; C, *Helvella costifera*; D, *Entoloma cephalotrichum*; E~F, *Mycena leptcephala*; G~H, *Naematoloma gracile*; I, *Sistotrema octosporum*; J, *Hydnellum peckii*.

Fig. 2. Microscopic and macroscopic structures of *Cudoniella acicularis*. A, Ascospores ($\times 1,000$); B, Paraphyses ($\times 400$); C, Ascus ($\times 400$), Scale bar = $10\ \mu\text{m}$ ($\times 1,000$), $25\ \mu\text{m}$ ($\times 400$).

677 (1801); *Helvella acicularis* Bull., *Herbier de la France* 10: tab. 473, Fig. 1 (1790); *Leotia acicularis* Pers., (1800); *Peziza acicularis* (Bull.) Fr., *Syst. Mycol. (Lundae)* 2(1): 156 (1822); *Peziza acicularis* var. *acicularis* (Bull.) Fr., *Syst. Mycol. (Lundae)* 2(1): 156 (1822); *Sarea acicularis* (Bull.) Schwein., *Trans. Am. Phil. Soc., New Series* 4: 178 (1832).

Macroscopic features. Fruiting body: 1–5 mm broad, cup-shaped to turbinate when young (soon expanded), becomes distinctly stiped with a planopulvinate cap as it matures. Whole fruiting body: white to light gray; later becomes grayish to brownish and smooth with a margin that is sometimes turned under. Stipe: cylindrical, 2–8 mm long.

Microscopic features. Spores: irregularly fusiform, smooth, hyaline, no droplets, sometimes has 1 septum, $20\text{--}28 \times 5\text{--}6\ \mu\text{m}$. Asci: eight-spored, spores irregularly biserial, $110\text{--}130 \times 10\text{--}12\ \mu\text{m}$. Paraphyses: filiform, septate, gradually thickened toward the tips to $2.5\ \mu\text{m}$ (Fig. 2).

Habit & Habitat: Gregarious on dead branches of broad-leaved trees.

Distribution: Korea, Europe and North America.

Materials examined: KM07-0578, Gwangneung, Pocheon-si, Gyeonggi-do, 31 Aug. 2007.

Remarks: When young, the fruiting body of *C. acicularis* is white to light gray; dark brown spots occur on the cap as it matures. Eventually, the whole fruiting body turns grayish brown. This species is distinguishable from similar apothecial species by the small brown spots that develop as it matures. The spores of this species are larger than those of European species.

***Discina ancilis* (Pers.) Sacc. (Korean name: Jomwon-banbeoseos) (Fig. 1B)**

Summa veg. Scand., Section Post. (Stockholm): 348 (1849).

Synonyms: *Acetabula ancilis* (Pers.) Lambotte, (1880); *Discina perlata* (Fr.) Fr., *Summa Veg. Scand., Section Post. (Stockholm)*: 348 (1849); *Gyromitra ancilis* (Pers.) Kreisel, *Boletus, SchrReihe* 1: 29 (1984); *Gyromitra perlata* (Fr.) Harmaja, *Karstenia* 9: 11 (1969); *Peziza ancilis* Pers., *Mycol. Eur. (Erlanga)* 1: 219 (1822); *Peziza perlata* Fr., *Syst. Mycol. (Lundae)* 2(1): 43 (1822).

Macroscopic features. Fruiting body: 30–100 (150) mm broad, cup shaped when young, soon expanded, saucer-like, then wavy of flattened to very broadly convex or umbonate. Outline: round to irregular, veined-wrinkled, sinuous margins, red-brown to chestnut brown. Outer surface: whitish to ochre or brownish pink. Stipe: 10–20 mm long, sometimes wrinkled. Context: odorless, whitish, mild.

Microscopic features. Ascospores: hyaline, elliptical, $25\text{--}30 \times 13\text{--}15\ \mu\text{m}$, finely warty, finely reticulate with a $3\text{--}5\ \mu\text{m}$ hyaline apiculus at each end when mature, one large central oil droplet. Asci $300\text{--}350 \times 16\ \mu\text{m}$, eight-spored. Paraphyses cylindrical, slightly clavate, tips $7\text{--}10\ \mu\text{m}$ thick, with septa (Fig. 3).

Habit & Habitat: Solitary or gregarious on conifer stumps.

Distribution: Korea, Japan, North America, and Europe.

Materials examined: KM07-0011, Gwangneung, Pocheon-si, Gyeonggi-do, 24 Apr. 2007; KM07-0023, Gwangneung,

Fig. 3. Microscopic and macroscopic structures of *Discina ancilis*. A, Ascospores ($\times 1,000$); B, Ascus ($\times 400$); C, Paraphyses ($\times 400$), Scale bar = $10\ \mu\text{m}$ ($\times 1,000$), $25\ \mu\text{m}$ ($\times 400$).

Gyeonggi-do, 2 May, 2007; KM07-0028, Gwangneung, Pocheon-si, Gyeonggi-do, 10 May, 2007.

Remarks: The best growing time for *D. ancilis* is the spring. Because it develops quite slowly, spores are not produced until the fruiting body is fully grown. Sterile specimens are often encountered.

***Helvella costifera* Nannf. (Korean name: Galbidaean-jangbeoseos) (Fig. 1C)**

Fungi Exsicc. Suec., Fasc.: 37 (1953).

Synonyms: *Acetabula costifera* (S. Lundell & Nannf.) Benedix, Westfälische Pilzbriefe 5:113 (1965); *Paxina costifera* (Nannf.) Stangel (1963).

Macroscopic features. Fruiting body: 30~80 mm broad, up to 4 cm deep, ivory to grayish ochre in color, bud to cup- or bowl-shaped when young, then expanded, undulating, and split at the margin. Outer surface: light ivory to grayish ochre in color, finely downy, blunt and rounded longitudinal ribs that gradually extend into the cup. Stipe: deeply ribbed base, 10~50 × 5~30 mm, tapering into the pointed stipe, convoluted or chambered on cross-section. Flesh: thin, rather brittle.

Microscopic features. Ascospores: hyaline, broadly elliptical, 16~20 × 12~14 µm, central oil droplet, smooth. Asci: 250~300 × 12~14 µm, eight-spored. Paraphyses: cylindri-

cal, slightly clavate, 3~5 µm thick tips, 2~3 septa (Fig. 4).

Habit & Habitat: Solitary or gregarious in conifer forests.

Distribution: Korea, Japan, North America, Europe.

Materials examined: KM07-0238, Gwangneung, Pocheon-si, Gyeonggi-do, 6 Jul. 2007.

Remarks: This species looks like a cross between a cup fungus and an elfin saddle. The well-developed ribs that extend far up the underside of the cup help to distinguish it from other *Helvella* species. *H. costifera* is smaller than *H. acetabulum*, and the fertile surface of *H. costifera* is brighter.

***Entoloma cephalotrichum* (P.D. Orton) Noordel. (Korean name: Jomkkaltaejiweodaebeseos) (Fig. 1D)**

Persoonia 1: 260 (1979).

Synonyms: *Alboleptonia cephalotricha* (P.D. Orton) P.D. Orton, Mycologist 5(3): 125 (1991); *Eccilia molluscus* sensu Reid [TBMS 41: 433 (1958)]; *Leptonia cephalotricha* (P.D. Orton), Trans. Br. Mycol. Soc. 43: 291 (1960).

Macroscopic features. Pileus: 5~15 mm broad; convex when young but becomes slightly infundibuliform as it matures; surface (under a hand lens) is smooth, dull, slightly hygrophanous; finely chalk-white and radially fibrillose on a cream-white background; striate when moist; margin

Fig. 4. Microscopic and macroscopic structures of *Helvella costifera*. A, Ascospores (× 1,000); B, Ascus (× 400); C, Paraphyses (× 400), Scale bar = 10 µm (× 1,000), 25 µm (× 400).

Fig. 5. Microscopic and macroscopic structures of *Entoloma cephalotrichum*. A, Basidiospores (× 1,000); B, Basidia (× 1,000); C, Pileipellis (× 400), Scale bar = 10 µm (× 1,000), 25 µm (× 400).

undulating; browns with age. Flesh: white, thin, odorous, farinaceous taste. Lamellae: white when young, becomes pink as it matures, broad, distinctly decurrent, smooth edges. Stipe: 15~30 × 0.5~1.5 mm, cylindrical, solid to hollow, fragile, whitish-hyaline, smooth, covered in fine white hairs.

Microscopic features. Spores: 5~7 angled, 8.2~11 × 5.8~7.9 µm; Q: 1.2~1.7. Basidia clavate: 35~40 × 12~15 µm, 4 sterigmata, no basal clamp, no cystidia. Pileipellis: composed of short-celled, periclinal hyphae 4~30 µm in width; interspersed with some exserted capitate hyphal ends, no clamps on septa. Capitate hairs (on stipe base): up to 120 µm long (Fig. 5).

Habit & Habitat: Solitary or up to a few gregarious species in forests or parks, terrestrial, found in nutrient-rich, moist soils. Summer-fall. Rare.

Distribution: Korea, Europe.

Materials examined: KM07-0265, Gwangneung, Pocheon-si, Gyeonggi-do, 18 Jul. 2007.

Remarks: *E. cephalotrichum* rarely grows on the ground of a larch (*Larix kaempferi*). Its shape resembles that of *Clitocybe* species because of its decurrent gills. Because of its tiny fruiting bodies observed under the microscope, this species was identified as belonging to the genus *Entoloma*.

***Mycena leptcephala* Gill. (Korean name: Yalbeungatweojuleumbeseos) (Fig. 1E, F)**

Hyménomycètes (Alençon): 267 (1876).

Synonyms: *Agaricus alcalinus* subsp. *leptcephalus* (Pers.) Pers., Icon. et Desc. Fung. Min. Cognit. (Leipzig) 2: 48 (1800); *Agaricus leptcephalus* Pers., Icon. et Desc. Fung. Min. Cognit. (Leipzig) 2: 48 pl.12 (1800); *Agaricus leptcephalus* subsp. *leptcephalus* Pers., Icon. Desc. Fung. Min. Cognit. (Leipzig) 2: 48 pl.12 (1800); *Mycena alcalina* var. *chlorinella* J.E. Lange, Dansk bot. Ark. 1(no. 5): 21 (1914); *Mycena ammoniaca* sensu A.A. Pearson, fide Checklist of Basidiomycota of Great Britain and Ireland (2005); *Mycena chlorinella* (J.E. Lange) Singer, Annls Mycol. 34: 430 (1936); *Mycena metata* sensu Rea (1922), auct.; fide Checklist of Basidiomycota of Great Britain and Ireland (2005).

Macroscopic features. Pileus: 10~20 mm broad, narrowly parabolic to cylindrical when young; expands as it matures, becoming conic campanulate to broadly parabolic with a surface that is smooth, dull, hygrophanous, and dark grayish brown to light ash gray in color and a margin that is acute and paler to whitish and slightly dentate. Lamellae: grayish white to light gray, broad, anastomoses, finely adnexed to somewhat adnate, smooth to slightly dentate edge. Stipe: 30~80 × 1~2 mm, cylindrical, somewhat enlarged base with white rhizoids, smooth, dull, brown apex with whitish pruinose, central attachment, no

innerveil or universal veil. Context: whitish to light gray, thin, odorous, mild taste.

Microscopic features. Basidiospores: 6.0~8.5 × 3.4~4.5 µm, elliptical, smooth, hyaline, droplets. Basidia: 18.0~25.0 × 5.0~8.0 µm, 4-spored, basal clamp. Hymenophoral trama interwoven. Cheilocystidia: 40~60 × 15~25 µm. Pileipellis: strongly diverticulate, septa with clamps (Fig. 6).

Habit & Habitat: Solitary or gregarious on soil, among leaves, conifer litter, mosses.

Distribution: Korea, Japan, North America, and Europe.

Materials examined: KM07-0005, Gwangneung, Pocheon-si, Gyeonggi-do, 17 Apr. 2007; KM07-0006, Gwangneung, Pocheon-si, Gyeonggi-do, 17 Apr. 2007; KM07-0010, Gwangneung, Pocheon-si, Gyeonggi-do, 23 Apr. 2007; KM07-0020, Gwangneung, Pocheon-si, Gyeonggi-do, 2 May, 2007; KM07-0063, Gwangneung, Pocheon-si, Gyeonggi-do, 4 Jun. 2007; KM07-0089, Gwangneung, Pocheon-si, Gyeonggi-do, 5 Jun. 2007.

Remarks: The best growing time of *M. leptcephala* is spring. This species is distinguishable from *M. stipata* by

Fig. 6. Microscopic and macroscopic structures of *Mycena leptcephala*. A, Basidiospores (×1,000); B, Basidia (×1,000); C, Cheilocystidia (×400); D, Pileipellis (×400). Scale bar = 10 µm (×1,000), 25 µm (×400).

its alkaline odor, primarily from the swollen end cell of the cortical layer of the stipe apex. *M. leptoccephala* is distinguishable from *M. silvae-nigrae* by its 2-spored basidia.

***Naematoloma gracile* Hongo (Korean name: Ganeundaegaeambeoseos) (Fig. 1G, H)**

Mem, Fac, Lib. Arts. Educ. Shiga Univ., Nat Sci. 12, p 41, (1962).

Macroscopic features. Pileus: 20–40 mm broad, bell-shaped when young (then convex to plane with a slightly incurved margin), smooth surface, not viscid, ocher to light brown, margin paler to whitish. Context: pale yellow to orange yellow, thin, slightly musty odor, mild taste. Lamellae: whitish to grayish (beige when young, violet-brown when old), broad, ascending and narrowly adnate, whitish floccose edges. Stipe: 30–50 × 2–4 mm, cylindrical, somewhat enlarged apex at times, flexuous toward the base, hollow, elastic, smooth surface, dull, light-yellow apex (increasingly yellowish orange toward the base), base attached, whitish tomentose. Stipe: central attachment, no innerveil or universal veil.

Microscopic features. Spores: elliptical, smooth, light grayish yellow, slightly thick-walled, indistinct or absent germ pore, 10–14 × 6–7.5 µm; purple-brown. Basidia clavate; 25–65 × 4–5.5 µm, 4 sterigmata with a basal clamp. Cheilocystidia: cylindrical to lageniform, 20–43 × 8–10 µm, occasional interspersed chrysocystidia. Pleurocystidia: modified as chrysocystidia, fusiform-ventricose, apical protrusion,

20–40 × 4–6 µm. Pileipellis: composed of periclinal hyphae, almost hyaline, encrusted septa with clamps, periclinal hyphae below septa (composed of oval to fusiform, brown-pigmented and encrusted cells) (Fig. 7).

Habit & Habitat: Solitary or gregarious on the rotten log of hardwood.

Distribution: Korea, East Asia, Europe, and North America.

Materials examined: KM07-0140, Gwangneung, Pocheon-si, Gyeonggi-do, 27 Jun. 2007.

Remarks: Typical of this species of *Naematoloma* are the sulfuric to yellowish colored fruiting bodies and the clustered mode of growth on rotten wood. This species can be confused with *Hyphoma elongatum*, which has smaller fruiting bodies. *H. elongatum* occurs in moss, but not with moss.

***Sistotrema octosporum* (J. Schröt. ex Höhn. & Litsch.) Hallenb. (Korean name: Hweosekcheonbeoseos) (Fig. 1I)**

Eriksson, Hjortstam & Ryvarden, Cortic. N. Europ. (Oslo) 7: 1349 (1984).

Synonyms: *Corticium muscicola* (Bres.), Ann Mycol. 1(1/2): 96 (1903); *Corticium octosporum* (J. Schröt. ex Höhn. & Litsch.), Ann Mycol. 4(3): 292 (1906); *Sistotrema camshadalicum* (Parmasto), Eesti NSV Tead. Akad. Toim., Biol. seer 14(2): 230 (1965); *Sistotrema commune* (J. Erikss.), Svensk Bot. Tidskr. 43: 312 (1949); *Sistotrema commune* f. *commune* J. Erikss., Svensk Bot. Tidskr. 43: 312 (1949); *Sistotrema estonicum* (Parmasto), Eesti NSV Tead. Akad. Toim., Biol. seer 14(2): 230 (1965); *Sistotrema subpyriforme* (M.P. Christ.), Dansk Bot. Ark. 19(no. 2): 84 (1960).

Macroscopic features. Fruiting body: fully resupinate, attached loosely to the substrate, form thin membranous-arachnoid patches several centimeters in length, white surface smooth to somewhat tuberculate-reticulate, diffuse margin. Consistency: cottony, soft, easy to wipe off.

Microscopic features. Spores: elliptical, smooth, hyaline, some with droplets, 4.5–6 × 2.5–3 µm. Basidia urniform: 10–15 × 5–7 µm, 6–8 sterigmata, basal clamp. Cystidia: absent. Hyphal system: monomitic, basal hyphae hyaline, thin-walled, 4–7 µm across, some with granular contents; hyphae in subhymenium thin-walled, hyaline, 3–5.5 µm across, all septa have clamps (Fig. 8).

Habit & Habitat: Dead logs and branches of hardwood lying on the ground.

Distribution: Korea and Europe.

Materials examined: KM07-0188, Gwangneung, Pocheon-si, Gyeonggi-do, 5 Jul. 2007.

Remarks: This species has a very delicate and transparent fruiting body under humid conditions, but turns white

Fig. 7. Microscopic and macroscopic structures of *Naematoloma gracile*. A, Basidiospores (× 1,000); B, Basidia (× 1,000); C, Cheilocystidia (× 1,000), Scale bar = 10 µm.

Fig. 8. Microscopic and macroscopic structures of *Sistotrema octosporum*. A, Basidiospores ($\times 1,000$); B, Basidia ($\times 1,000$); C, Hyphal system ($\times 1,000$), Scale bar = $10\ \mu\text{m}$.

in the dry seasons. Almost all *Sistotrema* species have 4–8 sterigmata; *S. octosporum* and *S. brinkmannii* have 6–8 sterigmata. *S. brinkmannii* forms allantoid spores, whereas *S. octosporum* forms elliptical spores.

***Hydnellum peckii* Banker (Korean name: Pijeopkkal-taegibeoseos) (Fig. 1J)**

Peck, Bull. N.Y. St. Mus. 157: 28 (1912).

Synonyms: *Calodon diabolus* (Banker) Snell, Lloydia 19: 166 (1956); *Calodon peckii* (Banker) Snell & E.A. Dick, Lloydia 19: 163 (1956); *Hydnellum diabolus* Banker, Mycologia 5(4): 194 (1913); *Hydnellum rhizopes* Coker, J. Elisha Mitchell Scient. Soc. 55: 379 (1939); *Hydnum diabolus* (Banker) A.H. Sm., Syll. fung. (Abellini) 23: 470 (1925); *Hydnum peckii* (Banker) Sacc., Syll. fung. (Abellini) 23: 470 (1925).

Macroscopic features. Pileus: 30–100 mm broad; sometimes contains needles and other debris; pulvinate when young; whitish, dull, red-brown, with blood-red exudate when growing; later, broadly convex to plane or depressed; radially grooved; thick; erect; pointed scales; wine-red to red-brown (black-brown with age) with whitish margins;

undulating crenate; black-brown spots evident when exudate dries up; whitish (red-brown with age) decurrent spinose hymenophore on lower surface. Spines: $1\text{--}5 \times 0.5\text{ mm}$. Stipe: $10\text{--}50 \times 10\text{--}30\text{ mm}$, solid, red-brown, commonly fused with the substrate. Flesh: duplex in pileus and stipe, pale pink-brown, concentrically zoned, many interspersed small blackish dots, weakly sourish odor, hot taste, acrid.

Microscopic features. Spores: subglobose-elliptical, irregular and blunt coarse tubercles, light brown, $4.5\text{--}5.5 \times 3.5\text{--}4.5\ \mu\text{m}$. Basidia clavate: $20\text{--}27 \times 7\text{--}8\ \mu\text{m}$, 4 sterigmata, no basal clamp. Cystidia: absent. Hyphal system: monomitic, thin to thick-walled hyphae in spines, hyaline, pileal trama $2\text{--}5.5\ \mu\text{m}$ in width, brownish. Septa: some have clamps (Fig. 9).

Habit & Habitat: Solitary or gregarious on rotten logs and litter of conifer wood.

Distribution: Korea, Japan, and Europe.

Materials examined: KM07-0813, Gwangneung, Pocheon-si, Gyeonggi-do, 1 Oct. 2007.

Remarks: The bright red droplets that cling to the surface of the cap in moist weather make this a striking and easily identifiable mushroom. As for other *Hydnellum* species, the cap varies considerably in color and texture according to age and environmental condition. When

Fig. 9. Microscopic and macroscopic structures of *Hydnellum peckii*. A, Basidiospores ($\times 1,000$); B, Basidia ($\times 1,000$); C, Hyphal system ($\times 1,000$), Scale bar = $10\ \mu\text{m}$.

young, this species is white and beaded with droplets. When older, battered specimens are typically brown or dark reddish-brown with a white, beaded margin. This species can be easily confused with *H. ferrugineum*, because both species have sometimes-occurring red guttation drops in common. *H. peckii* has acrid, light pink-colored flesh with dark dots, and some septa have clamps.

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