

## **Agaricales of Indonesia. 1. A new cyphelloid genus (*Lecanocybe lateralis* gen. et sp. nov.) from Java and the Hawaiian Islands**

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The new cyphelloid genus *Lecanocybe*, with a single species *L. lateralis*, is described from material collected in Java and the Hawaiian Islands. Micro-morphology suggests that *Lecanocybe* is allied with the genus *Mycena*. A comprehensive description, illustrations, and comparisons with phenetically similar taxa are provided.

Keywords: agarics, fungal systematics.

This is the first in a series of papers presenting new data on the Agaricales (*sensu* Singer, 1986) of Indonesia, focusing primarily on taxa from Java and Bali. During the course of documenting the diversity of Agaricales from the Hawaiian Islands (see Desjardin & al., 1992; 1999; Horak & Desjardin, 1993; Horak & al., 1996; Desjardin & Hemmes, 1997) we encountered an unusual cyphelloid agaric growing gregariously on senescent leaves of yellow ginger on the islands of Maui and Moloka'i. Subsequently, we discovered the same taxon growing on ginger and on senescent banana leaves at two sites on Java. Basidiomes of the new taxon are shaped like an inverted soup ladle, reminiscent of basidiomes formed in the genera *Cymatella* and *Skepperiella*. The inverted-cupulate pilei are elevated by a well-developed lateral stipe and the basidiomes either lack lamellae or have a single lamella that transverses the pileus from the lateral stipe to the opposite margin.

A comprehensive description, illustrations and comparisons with phenetically similar taxa are provided below. Spore statistics include:  $\bar{x}$ , the arithmetic mean of the spore length by spore width ( $\pm$  standard deviation) for  $n$  spores measured in a single sample (specimen);  $\bar{x}_n$ , the range of spore means and  $\bar{x}_m$ , the mean of spore

means ( $\pm$  SD) where more than one specimen is available; Q, the quotient of spore length and spore width in any one spore, indicated as a range of variation in n spores measured;  $\bar{Q}$ , the mean of  $\bar{Q}$ -values in a single sample;  $\bar{Q}_n$ , the range of  $\bar{Q}$ -values and  $\bar{Q}_m$ , the mean of  $\bar{Q}$ -values where more than one specimen is available. All specimens are deposited in SFSU unless specified otherwise.

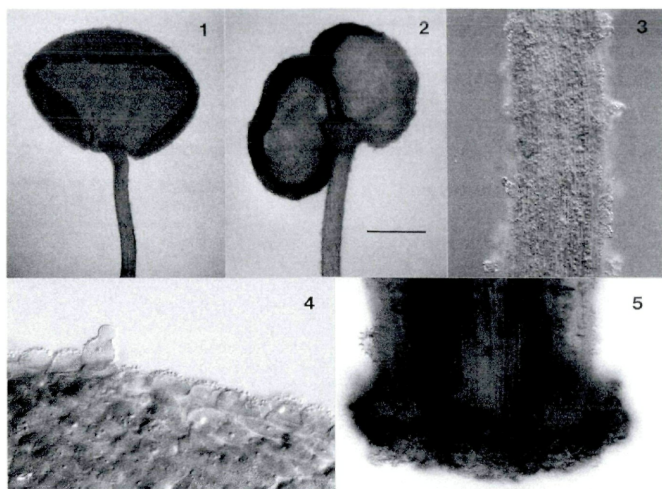
### Taxonomy

***Lecanocybe lateralis*** Desjardin & E. Horak, gen. & sp. nov. – Figs. 1–11.

Pileus 0.5–1.5 (–2.0) mm, minutissimus, primo convexo hemisphericus dein applanatus vel radialiter bilobatus instructus, incurvatus, intactus vel indentatus ad basim stipitis versus, siccus, glabrus vel minute granulosis, albus dein pallide brunneus. Caro concolor. Odor saporque nulli. Lamellae nullae vel septum unicum lamelliforme praesens, ad stipitem lateralem adnatum, album, haud fimbriatum. Stipes 0.5–3.5  $\times$  0.01 mm, lateraliter affixus, cylindricus, siccus, pruinosis, insiticiis vel ex disco minuto granulosoque emergens, toto albus, ad basim brunescens. Basidiosporae 12–17  $\times$  6.7–10  $\mu$ m, late ellipsoideae, inequilaterales, leves, hyalinae, inamyloideae, tenui-tunicatae. Basidia 30–38  $\times$  11.5–17.5  $\mu$ m, clavata, 4-sporigera, fibulata. Cheilocystidia rara, habitu cellulis pileipellis similia. Pleurocystidia nulla. Pileipellis hymeniformis, ex acanthocystidiis et cellulis cate-nulatis spinulosisque compositis, acanthocystidia 16–37  $\times$  12.5–30  $\mu$ m, late clavata, globosa vel sphaeropedunculata. Trama pilei irregulare, ex hyphis cylindricis, haud gelatinosis, levibus, subdextrinoideis instructum. Hyphae stipitis monomiticae, subincrassatae, forte dextrinoideae, spinulis polymorphis obtectae. Caulocystidia 16–30  $\times$  8–13  $\mu$ m, rara, clavata, cellulis stipitis valde similia. Fibulae praesentes.

Ad folia putrida Zingiberacearum. Indonesia, Java, Cibodas Hortus Botanicus, Mt. Gede, 11 Jan. 1998, leg. E. Horak in E. Desjardin 6752 (Holotypus, SFSU; Isotypus, BO).

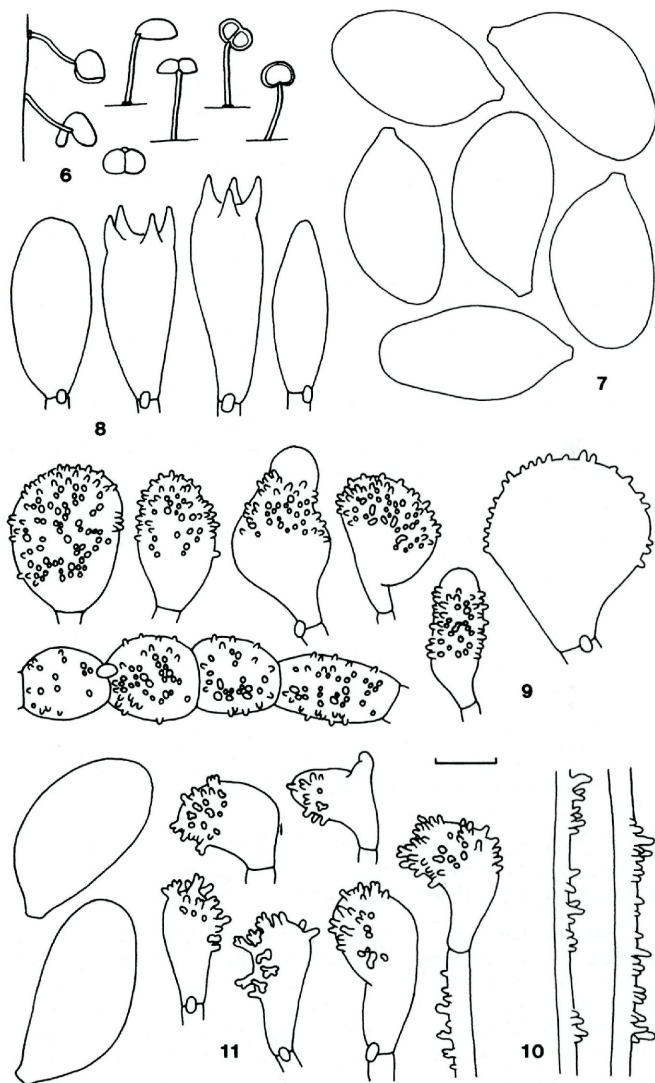
Pileus (Figs. 1, 2, 6) 0.5–1.5(–2.0) mm diam, convex to hemispheric when young, remaining so in age or expanding to broadly convex and often bilobed, i.e., in top view with a single radial groove extending from the point of stipe attachment at one margin to the opposite margin; margin incurved to straight, even and entire, often with a cleft at point of stipe attachment; surface dull, dry, glabrous to minutely granulose, opaque; white overall or rarely pale pinkish buff, drying pale buff-brown to tan. Context extremely thin, concolorous. – Odor not distinctive. – Taste not distinctive. – Lamellae absent or only one and then narrowly adnate to the lateral stipe, narrow; edges straight, non-marginate; white. – Stipe 0.5–3.5  $\times$  0.01 mm, lateral or nearly so, attached at apex of cleft in those pilei with a cleft or attached just inside pileus margin, cylindrical, dull, dry, pruinose, insititious or arising from a minute granulose basal disc (Fig. 5); white overall when young, base darkening with age to pinkish brown or brown.



Figs. 1–5. Features of *Lecanocybe lateralis*. – 1. Hymenial view of basidiome lacking lamella (DED 6752, HOLOTYPE). – 2. Hymenial view of basidiome with one lamella (DED 5800). – 3. Stipe showing spinulose cortical hyphae and caulocystidia (DED 5800). – 4. Pileipellis acanthocysts (DED 5800). – 5. Stipe base showing small basal disc with spinulose cystidia (DED 6752). – Scale bar = 0.5 mm for Figs. 1, 2; 60  $\mu$ m for Fig. 3; 40  $\mu$ m for Figs. 4, 5.

Basidiospores (Fig. 7) ( $11.2\text{--}12\text{--}17 \times 6.7\text{--}10 \mu\text{m}$  [ $\bar{x}_r = 13.2\text{--}15.5 \times 7.1\text{--}8.6 \mu\text{m}$ ,  $\bar{x}_m = 14.2 \pm 1.2 \times 8.0 \pm 0.7 \mu\text{m}$ ,  $Q = 1.5\text{--}2.2$ ,  $\bar{Q}_r = 1.69\text{--}1.84$ ,  $\bar{Q}_m = 1.79 \pm 0.07$ ,  $n = 15\text{--}30$  spores per 4 specimens], broadly ellipsoid, inequilateral in profile, with a prominent hilar appendix, smooth, hyaline, inamyloid, thin-walled. – Basidia (Fig. 8)  $30\text{--}38 \times 11.5\text{--}17.5 \mu\text{m}$ , broadly clavate, 4-spored, clamped. – Basidioles (Fig. 8) clavate and obtusely fusoid. – Cheilocystidia rare, similar to pileipellis cells in those pilei with lamellae. – Pleurocystidia absent. – Pileipellis (Figs. 4, 9) primarily a hymeniform layer of acanthocysts, but with uncommon chains of repent, inflated spinulose cells interspersed; acanthocysts  $16\text{--}37 \times 12.5\text{--}30 \mu\text{m}$ , broadly clavate, globose or sphaeropedunculate, rarely cylindrical or broadly lageniform, covered over the upper half

Figs. 6–11. Features of *Lecanocybe lateralis* (DED 6752, HOLOTYPE). – 6. Basidiomes. – 7. Basidiospores. – 8. Basidia and basidioles. – 9. Pileipellis acanthocysts and a chain of spinulose cells. – 10. Stipe cortical hyphae. – 11. Caulocystidia. – Scale bar = 2 mm for Fig. 6; 5  $\mu$ m for Fig. 7; 10  $\mu$ m for Figs. 8–11.



with unevenly spaced spinulae, seldom with the apex lacking spinulae but the central portion with dense spinulae, inamyloid, thin-walled; spinulae  $0.5\text{--}1.5 \times 0.5\text{--}1.0\text{ }\mu\text{m}$ , cylindrical or irregular in outline, sometimes lobed or several fused, hollow to nearly solid, thick-walled, hyaline, inamyloid to weakly dextrinoid. – Pileus trama interwoven,  $6\text{--}20\text{ }\mu\text{m}$  thick; hyphae  $2.5\text{--}4.0\text{ }\mu\text{m}$  diam, cylindrical, non-gelatinous, non-incrusted, hyaline, weakly dextrinoid; hypodermium lacking. – Stipe tissue monomitic; cortical hyphae (Figs. 3, 10)  $3\text{--}6\text{ }\mu\text{m}$  diam, cylindrical, parallel, thin- to moderately thick-walled, non-gelatinous, non-incrusted, hyaline (apex) to pale yellowish brown (base) in 3% KOH, strongly dextrinoid, covered with scattered spinulae like those on pileipellis cells; medullary hyphae  $2.5\text{--}6.5\text{ }\mu\text{m}$  diam, similar to cortical hyphae but smooth and weakly dextrinoid. – Stipitipellis of scattered caulocystidia (Figs. 3, 11)  $16\text{--}30 \times 8\text{--}13\text{ }\mu\text{m}$ , clavate, covered over the upper half with irregular, unevenly spaced spinulae similar to those on pileipellis cells but often longer and lobed to nodulose. Basal disc cystidia forming a narrow ring around point of stipe attachment to the substrate (Fig. 5), similar to caulocystidia but often apically thick-walled. – Clamp connections common in all tissues.

**Habit, habitat and distribution.** – Scattered to gregarious on senescent leaves of yellow ginger (*Hedychium flavescens* N. Carey ex Roscoe [Zingiberaceae]; Hawai'i), undetermined ginger (Java), or banana (*Musa* sp. [Musaceae]; Java). Java (Holotype), Maui, Moloka'i.

**Material Examined.** – INDONESIA: Java, Cibodas Botanical Garden, trail to Mt. Gede, 11 Jan. 1998, leg. E. Horak, D. E. Desjardin 6752 (Holotype, SFSU; Isotype, BO); Java, Mt. Halimun National Park, loop trail from Cikaniki, 14 Jan. 1998, leg. E. Horak & D. E. Desjardin, D. E. Desjardin 6782 (BO, SFSU). – USA, HAWAII: Maui, Iao Valley State Park, Po'ohohoao trail,  $N20^{\circ}52.975'$ ,  $W156^{\circ}32.700'$ , 25 Jul. 1993, D. E. Desjardin 5800; Maui, Makamaka'ole Stream,  $N20^{\circ}57.566'$ ,  $W156^{\circ}32.065'$ , 15 Jan. 1995, G. Wong 1340; Molokai, Kamakou Forest Preserve, Kamoku Flats,  $N21^{\circ}07.101'$ ,  $W156^{\circ}55.122'$ , 12 Jan. 1996, D. E. Desjardin 6408.

**Etymology.** – *Lecanocybe*: lecanos (Gr.) = wine bowl; cybe (Gr.) = head; referring to the inverted bowl-shaped pileus; *lateralis* (Lat.) = lateral, referring to the stipe attachment.

The new genus *Lecanocybe* is unique among the Agaricales in forming very tiny, laterally stipitate cyphelloid basidiomes in combination with a hymeniform pileipellis of acanthocysts, dextrinoid tissues and inamyloid basidiospores. Other unusual features include a very small basal disc on the stipe composed of clavate acanthocysts, both clavate and fusoid basidioles, and very broad basidia forming voluminous basidiospores. This combination of features



makes determining taxonomic relationships within the Agaricales problematical. The fusoid basidioles, dextrinoid tissues, inamyloid basidiospores, spinulose stipe cortical hyphae, and acanthocysts suggestive of *Rotalis*-type broom cells suggest alliance with the genus *Marasmius*, specifically with reduced forms in sect. *Hygrometrici* (Desjardin & al., 1992; Desjardin & Horak, 1997). However, the repent chains of inflated spinulose cells that are interspersed amongst the pileipellis acanthocysts, the unevenly distributed spinulae on acanthocysts, the tiny stipe basal disc, and the broad basidia and voluminous basidiospores are more reminiscent of *Mycena*, specifically taxa in sect. *Sacchariferae*, stirps *Alphitophora* (Desjardin, 1993, 1995). Nonetheless, based on these data, we speculate that the phylogenetic affinities of *Lecanocybe* are with *Mycena* rather than with *Marasmius*.

*Lecanocybe lateralis* shares basidiome shape, fusoid basidioles, and inamyloid spores with the genera *Anastrophella* Horak & Desjardin (1994), *Cymatella* Pat. (Singer, 1986), *Hispidocalyptella* Horak & Desjardin (1994), *Skepperiella* Pilát (Singer, 1965, 1986), and *Stipitocyphella* Kost (1998). The latter four genera all differ significantly from *Lecanocybe* in forming pileipelles composed of a Rameales-structure, in forming non-dextrinoid tissues, and much smaller basidiospores (in the range  $5-9 \times 2.0-6.5 \mu\text{m}$ ). The genus *Lecanocybe* is also somewhat reminiscent of *Anastrophella* Horak & Desjardin (1994), but species of the latter genus differ in forming basidiomes with an insititious, central pseudostipe, and pileipelles composed of a hymeniform layer of clavate to vesiculose, smooth cells with interspersed pileocystidia. We believe that the phylogenetic affinities of *Anastrophella* are with *Gloiocephala* Massee (Horak & Desjardin, 1994).

In several populations from the Hawaiian Islands and Java, basidiomes of *L. lateralis* form strictly inverted-cupulate pilei lacking any lamellae, whereas in other populations from both regions, the pilei initially lack lamellae but as pilei mature a single lamella forms extending from the lateral stipe to the opposite side of the pileus. At maturity, pilei with a single lamella look like two fused inverted-cupulate pilei arising from a single lateral stipe. Moreover, there are subtle micromorphological differences between the two forms. Basidiomes lacking lamellae tend to have pileipelles formed from uniformly-shaped acanthocysts and have slightly broader basidiospores, whereas basidiomes with a single lamella tend to have slightly narrower basidiospores and pileipelles composed of a combination of broadly clavate to globose acanthocysts with a few scattered, projecting lageniform or cylindrical acanthocysts that often have smooth apices (Fig. 4). These subtle morphological differences are of no apparent taxonomic value. We speculate that *Lecanocybe lateralis*

is native to Indo-Malesia and introduced into the Hawaiian Islands along with yellow ginger.

At present, it is unknown whether the distinctive basidiomes of *Lecanocybe* represent a primitive morphology, as suggested by Kost (1998) for *Stipitocyphella*, or a 'reduced' morphology derived from a lamellate ancestor. Although we lean towards the latter hypothesis, the direction of morphological evolution in these simple basidiomes remains an unanswered question.

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