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Phaeocollybia longistipitata sp. nov. from Costa Rica

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Abstract: *Phaeocollybia longistipitata* is described as a new species from the Talamanca Mountains of Costa Rica. Macroscopically, the taxon is easily recognized both by its small and slender stature and the very long, equally cylindrical stipe lacking a distinctive pseudorhiza. This differs markedly from the gradual or abruptly tapering to fusoid pseudorhiza shape usually found in the genus. Distinctive microscopic features are the amygdaliform roughened basidiospore with an unusually low apical callus and the presence of clamp connections.

Key Words: páramo, oak forests, Cordillera Talamanca, montane neotropics, *Comarostaphylis*, *Quercus*.

Introduction: There has been a long, but intermittent, history of work investigating the diversity of Costa Rican macro-fungi (see discussions in Halling and Franco-M. 1996, Halling and Mueller 1999b, Baroni and Halling 2000). Currently there is a great emphasis on obtaining additional data on the macrofungi of Costa Rica through the Costa Rican National Biodiversity Inventory, a multinational project coordinated by the Costa Rican National Biodiversity Institute (INBio) (Mueller and Mata 2001). Work to date has documented a highly diverse macrofungal community (Mata 1999; Halling and Mueller 2002, 2005).

Extensive field work focusing on different ecological habitats revealed that in Costa Rica numerous taxa of *Phaeocollybia* occur, particularly in montane oak forests. Three species were originally described by Singer (1987) from Costa Rica, viz. *Ph. oligoporpa* Singer, *Ph. quercetorum* Singer and *Ph. subarduennensis* Singer. In their field guide, Halling and Mueller (2005) include these first two taxa as well as *Ph. ambigua* E. Horak & Halling and *Ph. caudata* E. Horak & Halling. The Macrofungi of Costa Rica website (Halling and Mueller 1999a) also lists *Ph. pseudolugubris* Bandala & E. Horak and *Ph. singularis* E. Horak & Halling, bringing the known total of *Phaeocollybia* species in Costa Rica to seven.

In this paper, we describe and illustrate another unique taxon, *Phaeocollybia longistipitata*. Microscopically, this species is characterized by the following features: an almond-shaped, minutely verrucose or roughened basidiospore with a small apical callus (that may be misinterpreted as a germ pore if not viewed under high power oil immersion), polymorphic, subcapitate cheilocystidia, and clamp connections. Macroscopically it has an umbonate-campanulate pileus and a small and fragile basidiome stature relative to other phaeocollybias. The most distinctive macro-character, however, is the very slender and long, equal-cylindrical stipe which differs markedly from the gradually tapering or fusoid-rooting (pseudorhiza) stipe shape encountered in the majority of *Phaeocollybia* species. *Phaeocollybia* basidiomes having this atypical, equal-cylindrical stipe are rare and reported for only a few described taxa viz. *Ph. pleurocystidiata* Norvell & Redhead (2000), a widely distributed species in conifer forests of the Pacific Northwest (Washington, Oregon), *Ph. singeri* (Mexico: Guzmán et al. 1987), *Ph. odorata* and *Ph. tentaculata* (Papua New Guinea: Horak 1977) and three still unpublished species (New Zealand: Horak 2008).

Worldwide descriptions referring to about 85 species of *Phaeocollybia* have been published in the pertinent literature. Basidiomes of the rarely encountered taxa occur in various habitats of broadleaf and/or conifer forests in temperate, subtropical and tropical regions of both the northern and southern hemispheres (Horak 1977). The most comprehensive regional contributions towards taxonomy and ecology of *Phaeocollybia* are: Europe (Bon 1991, Laber 1991), USA (Smith 1957; Smith and Trappe 1972; Norvell 1998, 2000, 2002, 2004; Norvell & Redhead 2000; Redhead & Malloch 1986; Redhead and Norvell, 1993); Mexico (Bandala et al. 1989, 1996; Guzmán et al. 1989); Colombia, Bolivia (Singer 1970, Horak and Halling 1991); India (Horak, 1974); Australia (Rees and Wood 1995), and New Zealand (Horak 1973, 2008).

Materials and Methods: Color designations (e.g., 4A3) in the following description are from Kornerup and Wanscher (1983). All measurements of microscopic structures were made from dried material revived in 3% KOH. Herbarium acronyms are from Holmgren et al. (1990).

Phaeocollybia longistipitata Halling and E. Horak *sp. nov.*

Pileus 5-15(-20) mm, obtuse conicus vel umbonatus, primo umbrinus vel fuscus dein ochraceobrunneus, vix hygrophanus, minute fibrillosus vel ad discum subrugulosus, subviscidus. Lamellae adnexae vel subliberae, primo argillaceae dein ferrugineae. Stipes (80-)100-150(-250) × 1.5-2 mm, cylindricus, (semper) aequalis, pileo ±concolor, flexilis, glabrus, siccus. Odor saporque ingrati vel raphanoidei. Basidiosporae 7.5-9 × 4-5(-5.5) µm, amygdaliformes, ferrugineae, minute verruculosae, poro germinativo instructae. Cheilocystidia 20-40 x 4-6 µm, subfusoidea, saepe constricta, subcapitata. Pleurocystidia et caulocystidia nulla sed cystidia tibiiformia ad basim stipitis adsunt. Pileipellis ex hyphis cylindraceis cutem vel ixocutem formantibus, 3-6 µm diam., membrana subgelatinosa instructis, pigmento brunneo obtectis. Fibulae praesentes. Ad terram inter folia deiecta in silvis latifoliis montanis. Costa Rica. Holotypus (Halling 8427, USJ; isotypus, NY).

Pileus 5-15(-20) mm diam, in young and mature specimens conical with obtuse papilla or umbonate, not expanding, subviscid when moist, dark brown (7E8) to deep date brown (6E8) with pale reddish brown tinge, darker in center, becoming yellow-brown or ochre-brown upon drying, weakly hygrophanous, finely radially fibrillose towards margin, occasionally minutely wrinkled at disk; margin translucent-striate, weakly hygrophanous. *Lamellae* 20-28 reaching stipe, 5-15 lamellulae, adnexed to almost free, narrow, 1.5-2.5 mm broad, pale yellowish white (4A2) at first, soon tan, dull pale brown, finally rust brown, even edges concolorous. *Stipe* (80-) 100-120 × 1.5-2 mm, occasionally up to 250 mm (!) long, slender cylindrical, persistently equal (or inconspicuously tapering near or at base only), radicating in deep litter, with age color changing from pale pinkish brown or concolorous with pileus at the apex, soon dark brown or fuscous overall, occasionally paler towards base, tough but pliable, smooth or very finely appressed fibrillose to silky fibrillose, with interior pithy, becoming hollow in age, dry, solitary. *Cortina* or veil remnants absent. *Context* thin, tough-pliable, pale brownish yellow, unchanging upon exposure. *Odor* and *taste* raphanoid or otherwise unpleasant (like burnt rubber).

Figure 5. Photo

Spore print rust brown. *Basidiospores* 7.5-9 × 4-5(-5.5) µm, amygdaliform, mucro absent at apex, rust brown, minutely verruculose or roughened, thin-walled, distinctive apical callus often present, perispore and plage absent. *Basidia* 22-30 × 5-7(-8) µm, subclavate, 4-spored, clamped. *Cheilocystidia* 20-40 × 4-6 µm, polymorphic, subfusoid with swollen apex, often constricted, thin-walled, hyaline. *Pleurocystidia* and *caulocystidia* absent, but numerous tibiiform processes at base of stipe present. *Pileipellis* a cutis (or indistinct ixocutis) of repent, cylindrical hyphae, 3-6 µm diam; terminal cells not differentiated, non-gelatinized or with subgelatinized hyaline wall, encrusted with brown pigment. *Subpellis* of short-celled, cylindrical hyphae, 8-15 µm diam, minutely encrusted with brown pigment; oleiferous hyphae absent. *Clamp connections* present but scattered.

Habit, habitat, and distribution: Solitary but gregarious, deeply radicating in decomposing litter and debris, in montane cloud forest dominated by *Quercus costaricensis* Liebm. (Fagaceae) with scattered *Comarostaphylis arbutoides* Lindley (Ericaceae), *Vaccinium consanguineum* Klotzsch (Ericaceae), *Pernettya prostrata* (Cav.) DC. (Ericaceae), *Chusquea* sp. or in páramo dominated by *C. arbutoides*. Restricted to the higher elevations of the northern and central Cordillera Talamanca of Costa Rica.

Material examined: COSTA RICA: San José: Dota, San Gerardo, ±500 m S of Interamerican Highway on road to San Gerardo de Dota, 9°36'13"N, 84°47'26"W, 3000 m alt., 5 June

2003, *Halling 8357* (NY, USJ); same locality, 24 June 2003, *Halling 8427* (holotype, USJ; isotype, NY); Perez Zeledon, Villa Mills, C.A.T.I.E. Experimental Forest, 9°33'3"N, 83°40'56"W, 2850 m, 21 June 2003, *Halling 8402* (NY, USJ); same locality, *E. & A. Horak 10418* (INB, ZT); Cerro de la Muerte, near summit, 9°40'N, 83°45'W, 3490 m, 13 November 2002, *E. & A. Horak 10319* (INB, ZT).

Additional material examined: *Phaeocollybia singeri* Guzmán & al.: MEXICO: Prov. Veracruz, NE of Coatepec, 1410 m alt., on soil in montane mesophilic forest, 28 August 1986, *V.M. Bandala 1008* (isotype, XAL). - *Phaeocollybia phaeogaleroides* Norvell: USA: Oregon, Benton Co., Mary's Peak Resource Area, on soil in conifer forest, 540 ft. alt., 17 December 1999, *R.L. Exeter 199-64* (isotype, WTU). - *Phaeocollybia odorata* E. Horak: PAPUA NEW GUINEA: Morobe District, Bulolo, Watut, on soil in *Lithocarpus* forest, *ca*. 1200 m alt., 22 November 1972, *E. Horak 73-313* (holotype, ZT). - *Phaeocollybia tentaculata* E. Horak: PAPUA NEW GUINEA: Morobe District, Wau, Mt Kaindi, on soil in *Nothofagus* forest, *ca*. 2300 m alt., 23 May 1973, *E. Horak* (holotype, ZT).

Commentary: *Phaeocollybia longistipitata* is encountered in Costa Rica at high elevations (›2800 m alt.) and appears under *Comarostaphylis arbutoides* in the páramo and just below timberline where that ectomycorrhizal ericaceous tree is mixed with *Quercus costaricensis*.

Macroscopically, *Phaeocollybia longistipitata* is readily recognized by the comparatively small and fragile stature with an extraordinarily long, slender and equal-cylindrical stipe. In one collection (ZT 10319) made near the summit of Cerro de la Muerte, one basidiome was observed whose flexuous stipe reached 250 mm in length. Microscopically, the species is well defined by the amygdaliform basidiospores with roughened or minutely verruculose wall. The apex of the basidiospores lacks a mucro but at high magnification often a ±distinctive apical callus (that might easily be misinterpreted as a germ pore under lower magnification) can be observed. The subfusoid often constricted cheilocystidia (with swollen apices) and the presence of clamp connections are additional distinctive features typical for this species.

The general habit and the minutely roughened basidiospores of the Costa Rican *Phaeocollybia longistipitata* recall *Ph. phaeogaleroides* (Norvell, 2002), a species of conifer forests in the Pacific Northwest (Oregon, British Columbia). The two species, however, are readily separated by the distinctly larger basidiospores (9-12 x 5-6.2 µm) reported for *Ph. phaeogaleroides*.

As a rule, basidiomes with equal-cylindrical stipe are rarely observed in species of *Phaeocollybia* and are reported only for the following taxa: *Phaeocollybia pleurocystidiata* Norvell & Redhead (2000), a widely distributed species in conifer forests of the Pacific Northwest (Washington, Oregon) whose basidiospore and cystidial morphologies differ substantially from *Ph. longistipitata*. *Phaeocollybia tentaculata* E. Horak (1977), recorded from montane *Nothofagus* forests in Papua New Guinea, is distinguished by the sharply pointed papilla of the pileus, distinctly capitulate (pin-head shaped) cheilocystidia, and smaller basidiospores. *Phaeocollybia odorata* E. Horak (1977), described from submontane *Lithocarpus* forests in Papua New Guinea, is recognized by cheilocystidia of different shape and the absence of clamp connections. *Phaeocollybia singeri* Guzmán et al. in Bandala et al. (1989), found in mesophytic forests in eastern Mexico, at first glance can be mistaken for the Costa Rican *Ph. longistipitata*. Both species share similar basidiospore size and shape. However, the basidiomes of the Mexican taxon are considerably more robust, the conical papilla on the pileus is more distinctive, the shape of the cheilocystidia is different and clamp connections

are absent. Finally, in broadleaf-podocarp forests of New Zealand, three species of *Phaeocollybia* with an equal-cylindrical stipe have been documented (Horak, 2008). The macro-characters and/or micro-characters of these taxa, however, are significantly different from those described for *Ph. longistipitata.*

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Literature Cited

Bandala, V.M., G. Guzmán and L. Montoya. 1989. Additions to the knowledge of *Phaeocollybia* (Agaricales, Cortinariaceae) from Mexico, with descriptions of new species. Mycotaxon 35: 127-152.

Bandala, V.M., L. Montoya, G. Guzmán and E. Horak. 1996. Four new species of *Phaeocollybia* from Mexico with notes on type specimens. Mycological Research 100: 239-243.

Baroni, T.J., and R.E. Halling. 2000. Some Entolomataceae (Agaricales) from Costa Rica. Brittonia 52: 121-135. http://dx.doi.org/doi:10.2307/2666502

Bon, M. 1991. Clé monographiques des espèces "galéro-naucorioides": stat. et comb. nov. Documents Mycologiques 21 (84): 1-84.

Guzmán, G., V.M. Bandala and L. Montoya. 1989. The known species of *Phaeocollybia* (Agaricales, Cortinariaceae) in Mexico. Mycotaxon 30: 221-238.

Halling, R.E., and A.E. Franco-M. 1996. Agaricales from Costa Rica: New taxa with ornamented spores. Mycologia 88: 666-670. http://dx.doi.org/doi:10.2307/3761165

Halling, R.E., and G.M. Mueller. 1999a. Macrofungi of Costa Rica. http://www.nybg.org/bsci/res/hall/index.html

Halling, R.E., and G.M. Mueller. 1999b. New boletes from Costa Rica. Mycologia 91: 893-899. http://dx.doi.org/doi:10.2307/3761543

Halling, R.E., and G.M. Mueller. 2002. Agarics and boletes of neotropical oakwoods. *In*: Tropical Mycology. Watling, R., J.C. Frankland, A.M. Ainsworth, S. Isaac, and C.H. Robinson, (eds.) CABI Publishing, UK. p. 1-10.

Halling, R.E., and G.M. Mueller. 2005. *Common Mushrooms of the Talamanca Mountains, Costa Rica*. New York Botanical Garden Press, Bronx. 195 p.

Holmgren, P.K., N.H. Holmgren and L.C. Barnett. 1990. Index Herbariorum, part I: The herbaria of the world. Regnum Vegetabile 120: 1-693.

Horak, E. 1973. *Phaeocollybia* (Fungi Agaricini Novazelandiae). Beihefte Nova Hedwigia 43: 183-191.

Horak, E. 1974. Two new species of *Phaeocollybia* (Agaricales, Fungi) from India. Acta Botanica Indica 2: 69-73.

Horak, E. 1977. Further additions towards a monograph of *Phaeocollybia*. Sydowia 29: 28-70.

Horak, E. 2008. Agaricales (Basidiomycota) of New Zealand. 2. Crepidotaceae (*Crepidotus*, *Ramicola*, *Tubaria*, *Tympanella*) and Cortinariaceae (*Flammulaster*,

Inocybe/*Astrosporina*, *Phaeocollybia*, *Phaeomarasmius*, *Pleuroflammula*, *Pyrrhoglossum*). "Fungi of New Zealand", vol. 6 (in press).

Horak, E., and R.E. Halling. 1991. New records of *Phaeocollybia* from Colombia. Mycologia 83: 464-472. http://dx.doi.org/doi:10.2307/3760357

Kornerup, A., and J.H. Wanscher. 1983. *Methuen Handbook of Colour*. Ed. 3. Eyre Methuen, Ltd., London, UK. 252 p.

Laber, D. 1991. Erganzung zu 'Die europäischen Arten der Gattung *Phaeocollybia* und ihr Vorkommen in südliches Schwarzwald.' Zeitschrift für Mykologie 57: 109-116.

Mata, M. 1999. *Macrohongos de Costa Rica*. vol. 1. INBio, Santo Domingo, Costa Rica. 253 p.

Mueller, G.M., and M. Mata. 2001. The Costa Rican national fungal inventory: a large-scale collaborative project. Inoculum 52(5): 1-4.

Norvell, L.L. 1998. Observations on development, morphology and biology in *Phaeocollybia*. Mycological Research 102: 615-630. http://dx.doi.org/doi:10.1017/S0953756297005431

Norvell, L.L. 2000. *Phaeocollybia* in western North America. 1. The *Phaeocollybia kauffmanii* complex. Canadian Journal of Botany 78: 1055-1076. http://dx.doi.org/doi:10.1139/cjb-78-8-1055

Norvell, L.L. 2002. *Phaeocollybia* in western North America. 3. Two new species with notes on the *Phaeocollybia festiva* complex. Mycotaxon 81: 95-112.

Norvell, L.L. 2004. *Phaeocollybia* in western North America 4: two new species with tibiiform cheilocystidia and section *Versicolores* reconsidered. Mycotaxon 90: 241–260.

Norvell, L.L., and R.L. Exeter. 2007. *Phaeocollybia* in western North America 5: *P. ochraceocana* sp. nov. and the *P. kauffmanii* complex. Mycotaxon 102: 315-332.

Norvell, L.L. & S.A. Redhead. 2000. *Phaeocollybia* in western North America 2: The vernal *P. pleurocystidiata* sp. nov. and *P. oregonensis* reconsidered. Mycologia 92: 984–991. http://dx.doi.org/doi:10.2307/3761593

Redhead, S.A., and D.W. Malloch. 1986. The genus *Phaeocollybia* (Agaricales) in eastern Canada and its biological status. Canadian Journal of Botany 64: 1249–1254.

Redhead, S.A., and L.L. Norvell. 1993. *Phaeocollybia* in western Canada. Mycotaxon 46: 343-359.

Rees, B.J., and A.E. Wood. 1996. The genus *Phaeocollybia* in South East Australia. Mycotaxon 57: 97-116.

Singer, R. 1970. *Phaeocollybia*. Flora Neotropica 4: 3-13.

Singer, R. 1987. *Phaeocollybia* in the oak woods of Costa Rica, with notes on extralimital taxa. Mycologia Helvetica 2: 247-266.

Smith, A.H. 1957. A contribution towards a monography of *Phaeocollybia*. Brittonia 9: 195-217. http://dx.doi.org/doi:10.2307/2804723

Smith, A.H., and J. Trappe. 1972. The higher fungi of Oregon's Cascade Head experimental forest and vicinity. I. The genus *Phaeocollybia* and notes and descriptions of other species in the Agaricales. Mycologia 64: 1138-1153. http://dx.doi.org/doi:10.2307/3758079

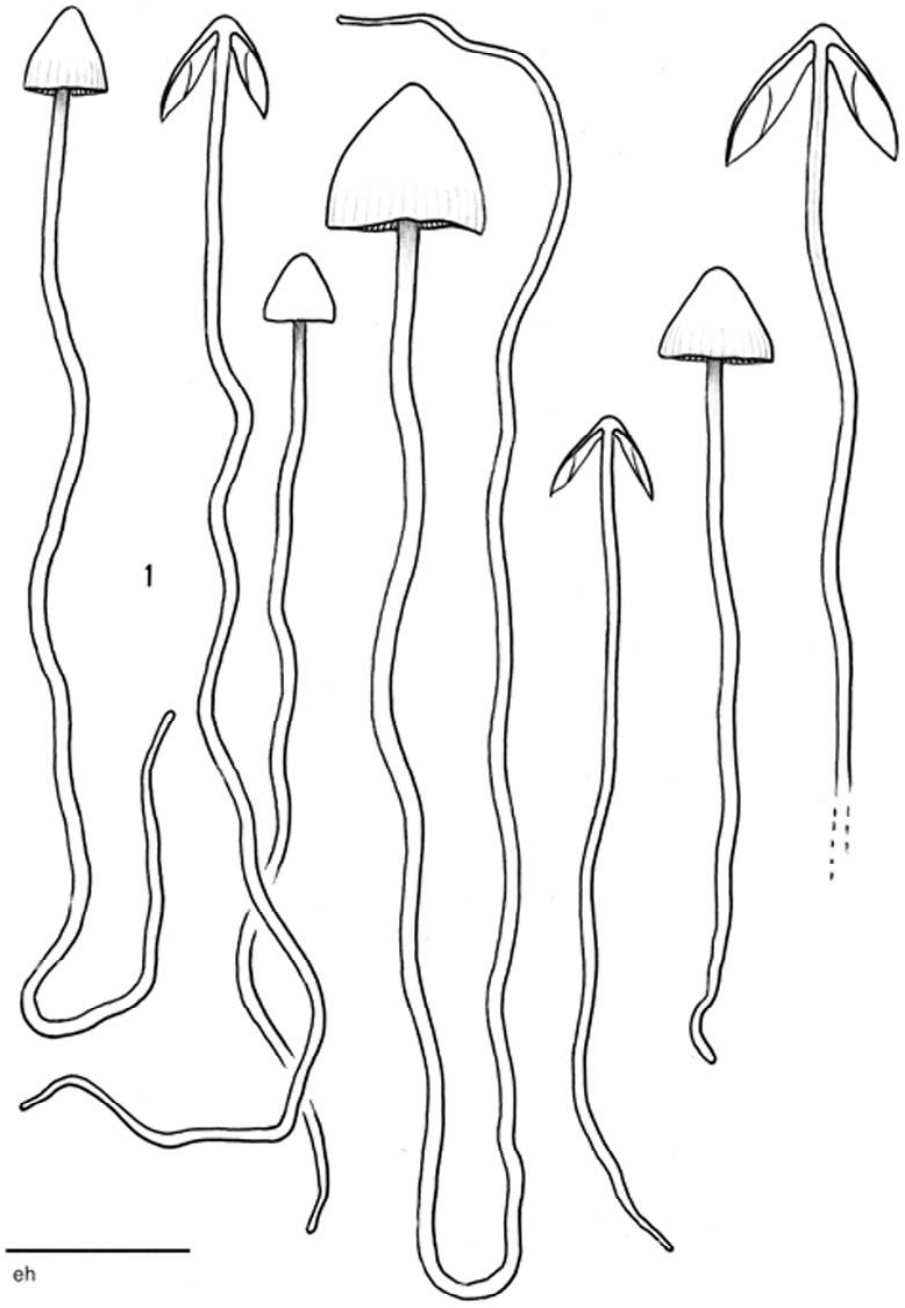

Figure 1. *Phaeocollybia longistipitata* Halling & E. Horak (topotype material, ZT 10319] 1. basidiomes (bar = 20 mm).

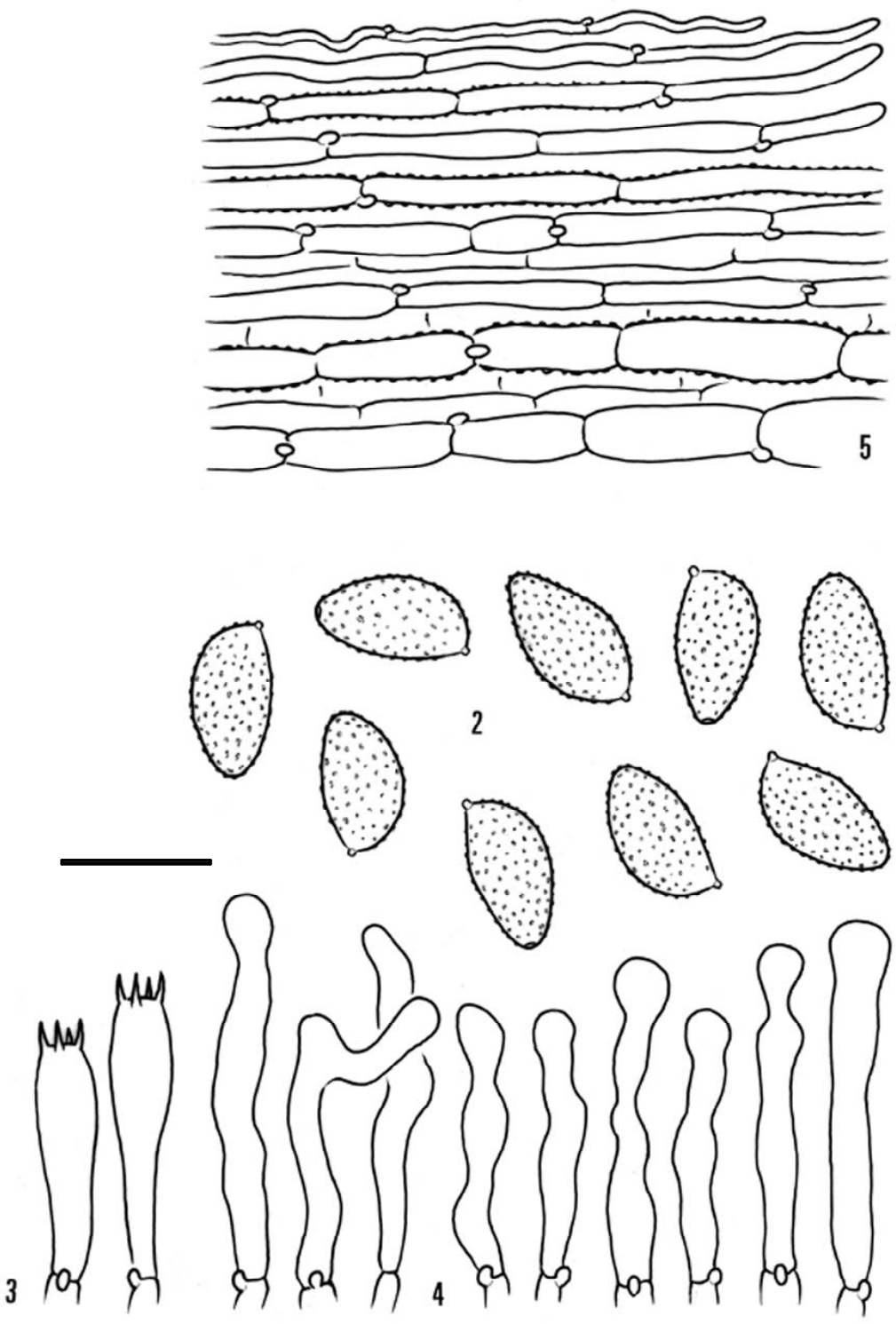

Figure 2. basidiospores (bar = 10 μm); 3. basidia (bar = 20 μm); 4. cheilocystidia (bar = 20 μm); 5. pileipellis (bar = 40 μm).

Figure 6. Habit of *Phaeocollybia longistipitata* (Halling 8357) (bar = 1 cm).