
Three type specimens designated in *Oudemansiella*

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Type specimens are designated for three species epithets in *Oudemansiella*: *O. canarii*, an apparently pantropical species, *O. platensis*, type species of the genus and apparently distributed in tropical and subtropical New World, and *O. mucida*, common and indigenous on *Fagus* wood in Europe. Detailed descriptions are furnished for the designated types of all three and the backgrounds of all three epithets are traced.

Key words: nomenclature, type specimens

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Introduction

Farr (1973: 924-925) furnished an abbreviated summary of literature which, if followed, provides a recapitulation of confusion concerning the distribution and taxonomy of Spegazzini's (1880) species, *Oudemansia* [*nom. illeg.*, later renamed as *Oudemansiella*; Spegazzini, 1881] *platensis*.

Saccardo (1887: 653-654) considered that Spegazzini's *Agaricus* (*Tricho-loma*) *platensis* (*Fungi Argent. pug. 1: 161. 1880*) was an earlier introduction, probably based only on the specific epithet.

Hennings (1900, in Engler & Prantl, *Natürl. Pflanzenf. 1 (Abt. 1): 221*) gave the distribution of *O. platensis* as Argentina and Ecuador.

Rick (1905: 238) listed the species for Rio Grande do Sul in southern Brazil, and discussed characters which seem diagnostic for *Oudemansiella* (*i.e.* pleurocystidia too large for *Mycena*), although not necessarily for *O. platensis*. If correctly identified, distribution was enlarged to include Brazilian subtropics, although he considered basidiomata as representing a species of *Mycena* parasitized by a "*Phycomycete*."

Von Höhnel made several attempts to understand the complex of taxa which he thought surrounded *Oudemansiella*. At first (1908. *Frag. Mykol. V, Sitzungber. Kaiserl. Akad. Wissenschaft. Wien 117: 985-1031*), in reviewing Hennings' genus *Phaeolimacium* [which von Höhnel considered to be the same as *Oudemansiella*, and which he recapitulated later (1911. *Resultate der Revision von Paul Hennings' Pilzgattungen. Ann. Mycol. 9: 166-175.*)], von Höhnel listed five species he considered to belong in *Oudemansiella*: 1) *Ag. (Collybia) apalosarcus* Berk. & Broome; 2) *Ag. (Collybia) magisterium* Berk. & Broome; 3) *Ag. (Collybia) euphyllus* Berk & Broome; 4) *Phaeolimacium bulbosum* Henn.; and 5) *Pluteus macrosporus* Henn.. After lengthy discussion, von Höhnel (1908: 1007) emended the characters of Spegazzini's *Oudemansiella* and listed two species, *O. platensis* Speg. and *O. apalosarca* (Berk. & Broome) Höhn., as accepted in *Oudemansiella*, with the aforementioned five names as synonyms (but not clearly synonyms of what). The following year (von Höhnel. 1909. *Frag. Mykol. 6, Sitzungber. Kaiserl. Akad. Wissenschaft. Wien 118: 276*) he recombined Junghuhn's *Agaricus canarii* as *Oudemansiella canarii*. In a further

attempt, von Höhnel (1910. Frag. Mykol. 12, Sitzungber. Kaiserl. Akad. Wissenschaft. Wien 119: 877-958) listed three species [*O. mucida* (Schrad.) Höhn., *O. cheimonophyllum* (Berk. & M.A.Curtis) Höhn., *O. canarii* (Jungh.) Höhn.] each with its own synonyms. Previously (von Höhnel 1908) in prose, *Armillaria mucida* was associated although it was characterized by the presence of a well-developed annulus at maturity, but later (1913. Frag. Mykol. XV, Sitzungber. Kaiserl. Akad. Wissenschaft. Wien 122: 255-309), emphasizing basidiome development and the role of the universal veil, he conjectured that *A. mucida* was better in *Armillaria* or *Lepiota*, where annulate veils were prominent.

Petch (1910) took up what he called *Oudemansiella apalosarca* (Berk. & Broome) Höhn., listing as synonyms the same names as those reported by von Höhnel in 1911 (see above). Petch's informal description states: "It [*O. apalosarca*] resembles an *Armillaria*, but lacks a ring, and the stalk is distinct from the pileus. Its general diaphanous appearance recalls *A. mucida*. Young specimens (5 mm. diameter) are usually dark brown, studded with minute white fragments of the universal veil." The white floccules are recognized as common in the modern concept of *O. canarii* and of *O. platensis*. Previously, Petch (1907: 33-34) cited examples of difficulties in interpretations of Ceylon fungi, using *Collybia magisterium* Berk. & Broome as an example of a species with conflicting descriptions and at least three names. Parenthetically, Petch (1910) also transferred *Marasmius subaurantiacus* Berk. & Broome to *Oudemansiella*.

With such a plethora of names and disparate reports of geographic sightings, it is little wonder that Singer (1964) and Pegler (1986) could list a full page of synonyms under *O. canarii* (including multiple species epithets). Furthermore, *O. canarii* was used for a South American species, although its type locality was Java.

Corner (1994), whose field experience emphasized Southeast Asian locales from Singapore to Kinabalu, spent relatively little time in South America, but a few collections were gathered in Brazil. When the Brazilian *Oudemansiella* specimens were compared to those from Pacific landmasses, he concluded

that at least two species, macroscopically similar but differing microscopically, were involved. He concluded that *O. platensis*, characterized by a polycystoderm pilepellis, was a New World species, while *O. canarii*, exhibiting a disarticulated trichoderm, was common in the western Pacific and Southeast Asia. If these names (*O. canarii*, *O. platensis*) represented different organisms, there was reason to deduce that one organism might be Old World and the other New World. A solution to this problem lies in the microanatomy of their type specimens.

Horak (1968: 425) did not report on the type specimen of *O. platensis* for his redescription of the species, although one of the consulted specimens [Uruguay, Depto. Montevideo, III-IV.1935, leg. Herter, Plantae Uruguayenses Exs. (G)] was collected across the estuary of the Rio de la Plata from the topotype location. Horak wrote: "... Diese pantropische Art interpretieren wir nach Singer (1950: 185; 1964: 145) ..." The second consulted specimen (Matheson Hammock, X.1942, leg & det R Singer as *O. canarii*; FH) was collected in Florida, USA, and was not distinguished by Horak from the Uruguay collection.

In order to understand the species of *Oudemansiella*, it is necessary to test Corner's hypothesis against the traditional (Singerian) extensive synonymy. It was soon discovered, however, that Spegazzini's type specimen of *O. platensis* was worthless for detailed study (as previously reported by Baroni and Ortiz, 2002), and that no Junghuhn type specimen survived for *Agaricus canarii*. The intent of this paper, therefore, is to designate and describe type specimens for these two organisms. We also designate a neotype specimen for the common European species, *O. mucida*. In the case of *O. mucida*, a detailed description is necessary only to secure the type specimen to detailed taxonomic characters. The species (until now without a type specimen) is the only representative of the genus in Europe and has been described numerous times (see below).

Materials and Methods

All microscopic observations were made using an Olympus BX60 microscope equipped with Phase Contrast (PhC) optics. In descrip-



Fig. 1. *Oudemansiella canarii* (from Neotype, DED 6886). Basidiomata. $\times 0.7$.

tions below, E = spore length divided by spore width; E^m = median E of a population of spores; L^m = median spore length over a population of spores. TFB = Tennessee field book number, assigned to fresh specimens for documentation, including photos. Colors within quotation marks are from Ridgway (1912); colors cited alphanumerically are from Kornerup and Wanscher (1967). Herbarium acronyms are from Index Herbariorum (<http://sciweb.NYBG.org/science2/IndexHerbariorum.asp>)

Results

Agaricus canarii Junghühn. Praemissa in floram cryptogamicam Javae Insulae, Fasc. 1: 82-83 (1838).

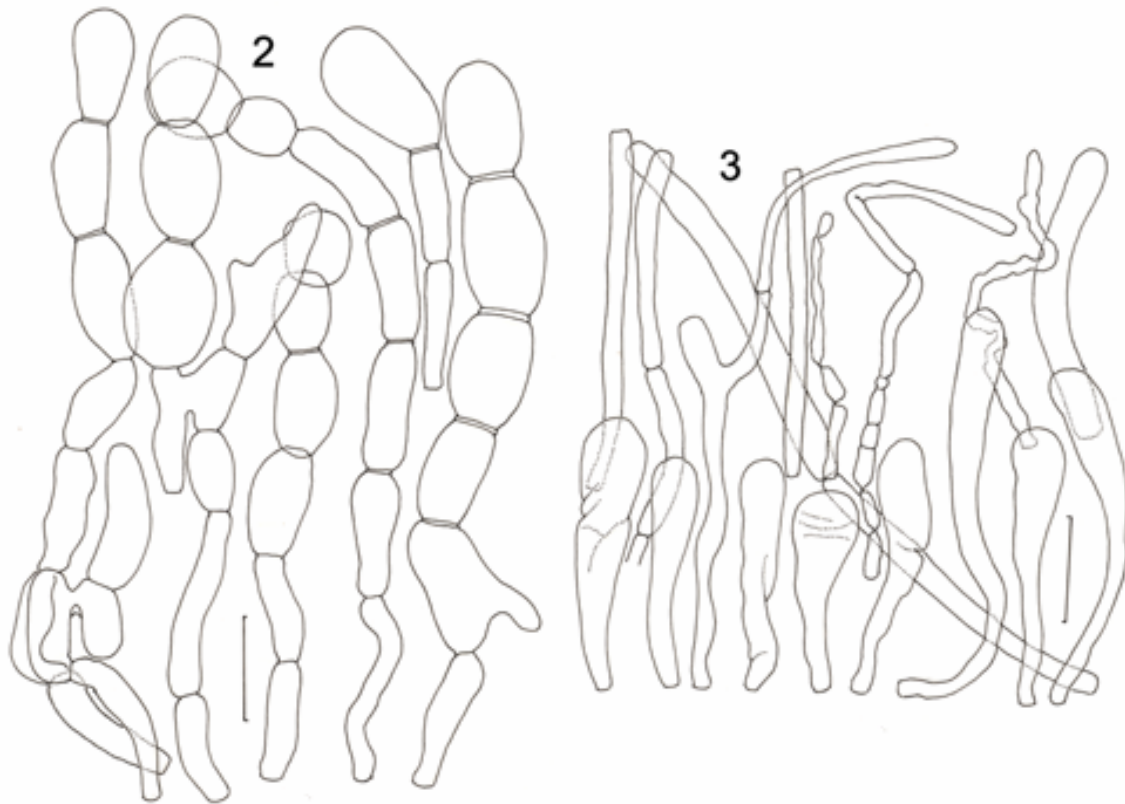
≡ *Amanitopsis canarii* (Jungh.) Saccardo. 1887. Syll. Fung. 5: 27 [listed as questionable]

≡ *Oudemansiella canarii* (Jungh.) von

Höhnel. 1909. Sitzungber. Kaiserl. Akad. Wissenschaft. Wien 118: 276.

Neotypus hic design.: INDONESIA, Java, Mt. Halimun Nat. Park., loop trail from Cikaniki, ~1000 m elev., 8.I.1999, coll DE Desjardin, DED 6886 (SFSU, BO).

Basidiomata (Fig. 1) several, collybioid or marasmioid. *Pileus* (20-)40-65 mm diam, plano-convex sometimes with a small, broad and flattened central umbo or central shallow depression, pellucid-striate, glabrous, glutinous to viscid with scattered small flecks on or embedded in gluten; disc gray-orange (5B5) to orange-white to light orange (5A3-4; "pinkish buff") paler toward margin to pale orange-white (5A2), with some pale pink-orange tints overall (6A3-4) or rarely nearly white; superficial floccules usually off-white when young and fresh, becoming sordid grayish by maturity; margin usually paler than limb or disc, translucent, sometimes (especially in younger



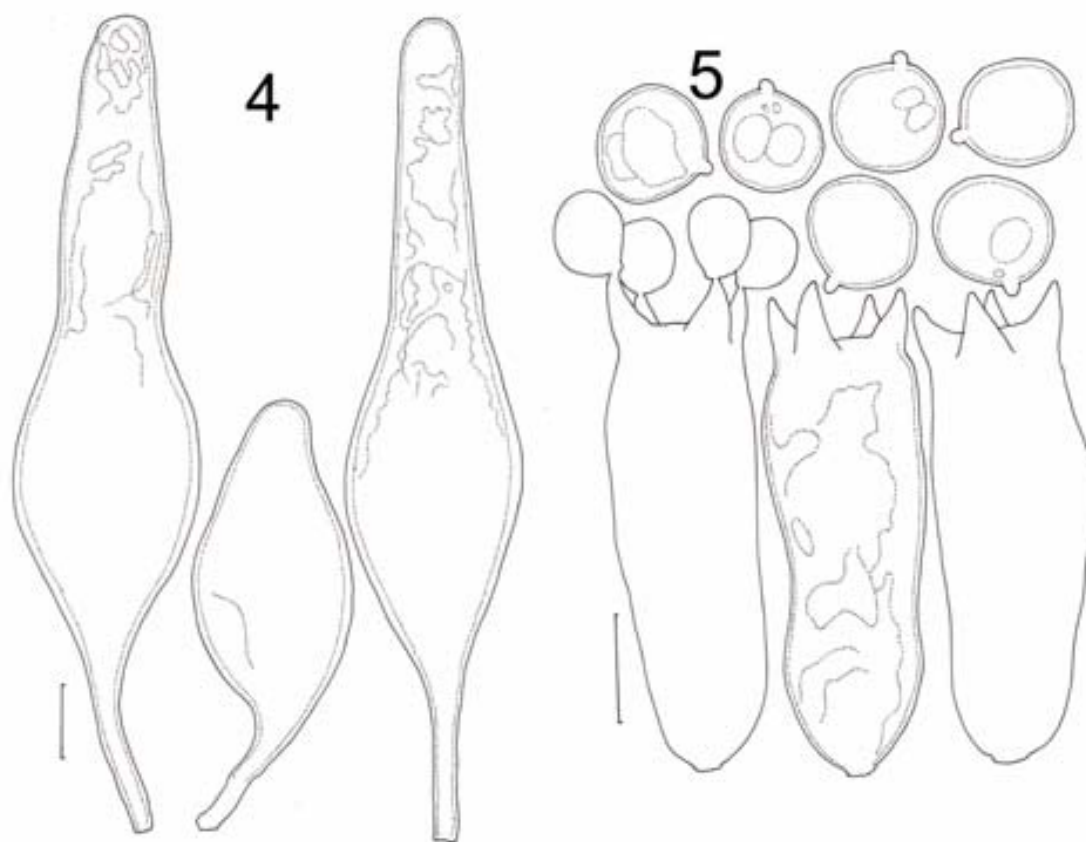
Figs 2, 3. *Oudemansiella canarii* (from **Neotype**). **2.** Hyphae of superficial pileal patches. **3.** Pileipellis elements. Below: clavate hyphal terminals. Above: rod-like superficial, disarticulated cells. Bars = 20 μ m.

individuals), with occasional, small, white, triangular appendicula as remnants of ephemeral partial veil. *Lamellae* horizontal, broadly adnate to shallowly adnexed, subdistant to distant with 2-3 series of lamellulae, convex, broad (-5 mm), thick, white when young, orange white (5A2) to pink white (6-7A2) in age. *Stipe* 30-50(-80) mm long, 2-5(-7) mm broad at apex, 5-8(-13) mm broad at base, central to eccentric, curved, tough, fibrous, solid; surface covered at first with evanescent, buff to pale pinkish white floccules (not part of partial veil), pale pinkish white (7A2) at first, darkening at apex to gray red (7B4-5), at base slightly darker, later longitudinally fibrillose, gradually enlarged downward to a subbulbous or bulbous base.

Habitat: Scattered on fallen tree (of *Canarium communis* Linn., *teste* Junghühn).

Pileipellis (Fig. 3) an ixotrichoderm consisting of an erect branched hyphal system with terminal cells often slightly expanded up to 8 μ m diam, appearing as though devoid of protoplasm or with protoplasm coagulated against cell wall, surmounted by chains of

rod-shaped cells 38-80 \times 3-6.5 μ m, easily disarticulated or crumpled so as to appear disarticulated, generally repent at or near surface of glutin, the whole system arising from interwoven outer pileus tramal hyphae as side branches, thin-walled, without clamp connections; contents of subterminal cells homogeneous, hyaline. *Pileus tramal hyphae* inflated up to 27 μ m diam, thin- to thick-walled (wall never more than 1 μ m thick), with rare clamp connections, constricted at septa; contents homogeneous, hyaline. Anatomy of scattered *flecks on pileus surface* (Fig. 2): typical slender, cylindrical pileipellis hyphae (without clamp connections) converge and gather into congested patches of erumpent hyphal chains in which terminal cells become increasingly inflated, eventually shorter and more broadly fusoid than the slender hyphae from which they arise. Terminal cells 12-55 \times 12-17 μ m, firm- to thick-walled (wall never more than 1 μ m thick); contents homogeneous, hyaline singly, slightly more pigmented terminally. "H-" connections and branched hyphae numerous. *Pleurocystidia* (Fig. 4) arising deep in subhymenium, 242-280



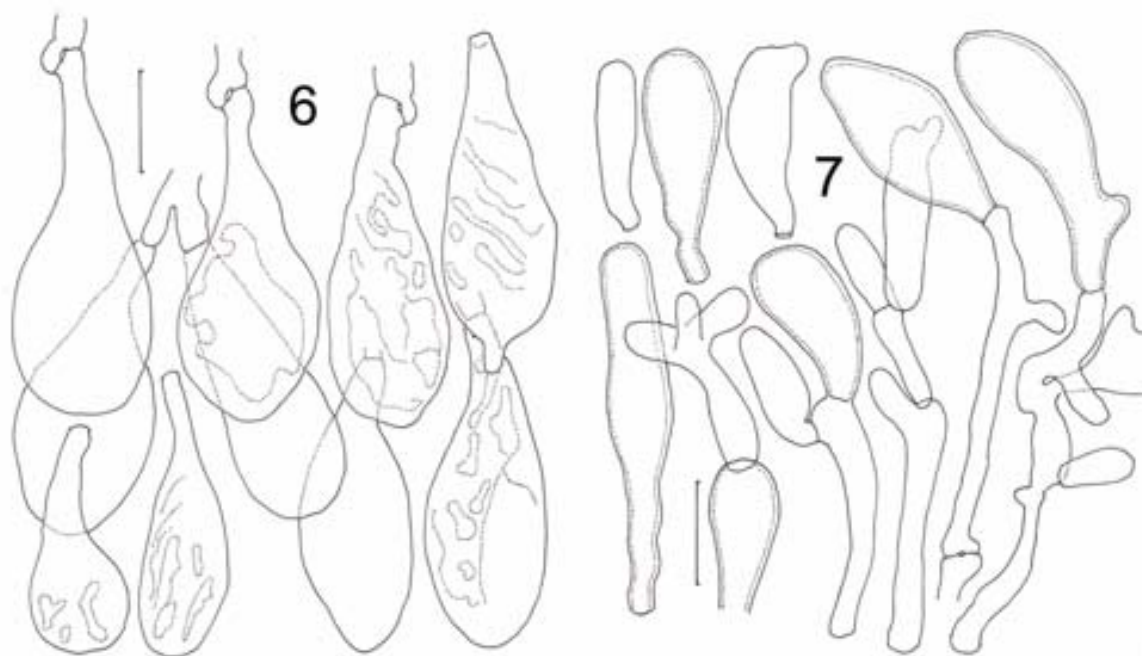
Figs 4, 5. *Oudemansiella canarii* (from Neotype). 4. Pleurocystidia. 5. Basidia and basidiospores. Bars = 20 μ m.

\times 44-50 μ m (at widest point), pedicellate, broadly proximally inflated with extended, subcylindrical neck, obscurely clamped, thick-walled (wall up to 2.5 μ m thick over bulb, up to 1.5 μ m thick over extended neck); contents more or less homogeneous in bulb, with coagulated protoplasm in neck, subrefrangent at apex; individuals from near the lamellar margin generally shorter, 125-160 \times 40-47 μ m, long-pedicellate, clamped, otherwise as above. *Basidia* (Fig. 5) 78-90 \times 25-30 μ m, broadly clavate to suburniform from a severely pinched base, obscurely clamped, refringent (PhC) when mature, then losing refringency, thick-walled (wall up to 1.5 μ m thick); contents heterogeneous, somewhat coagulated by maturity. *Basidiospores* (from hymenium; Fig. 5) 19-25 \times 18-23 μ m ($E = 1.00-1.15$; $E^m = 1.06$; $L^m = 21.8 \mu$ m), globose to subglobose, irregular in outline, refringent, thick-walled (wall up to 0.5 μ m thick); contents multigranular, developing an amorphous guttule by maturity. *Lamellar edge* sterile, not significantly extending in KOH, a solid beard of cheilocystidia. *Cheilocystidia* (Fig. 6) 42-72 \times 13-29 μ m, pedicellate,

clavate to broadly clavate, conspicuously clamped, thin-walled; contents homo- to heterogeneous, condensed near wall, hyaline. *Stipe surface* generally smooth, of repent, thick-walled (wall up to 1.5 μ m thick) hyphae. Patches of caulocystidia similar to pileus floccules, scattered, small, ill-defined. *Caulocystidia* (Fig. 7) uni- to few-celled, keg-shaped to clavate, firm- to thick-walled (wall up to 1.5 μ m thick), without clamp connections on terminal or subterminal septa; contents heterogeneous, of ill-defined protoplasm, hyaline.

Commentary: DED's field drawings of basidiomata point out stipe floccules as well as pileus floccules. In both cases, these appear not to be remnants of a partial or universal veil, but productions of the outermost pileipellis tissues themselves. Corner's (1934) detailed account of the partial veil cannot be seen in mature material but only in very small primordial.

Junghuhn specifically drew attention to what he interpreted as a veil. Some references follow: "...*velo simplici, universali, fugaci*..." "...*velo universali floccoso-membranaceo e basi stipite orto fugaci*..." "...*Velum universale, e*



Figs 6, 7. *Oudemansiella canarii* (from Neotype). 6. Cheilocystidia. 7. Caulocystidia. Bars = 20 μ m.

basi stipitis incrassato surgenes, totum fungum primo obtegens, citissime rumpens, deorsum subpersistens, volvamque brevissimam ocreaeformem tuberculo stipitis adnatum efficiens, sursum vero (in superficie pilei) fatiscens, squamulis s. membranulis adglutinatis hinc inde residuis sparsis." It is likely, however, that Junghühn saw only dried material and interpreted the superficial flecks on pileus and perhaps on stipe as evidence of a previous veil. Corner's (1934, as *Collybia apalosarca*) detailed description of basidiome ontogeny in what he later considered to be *O. canarii* (Corner, 1994) included an account of the veil, which while universal at an early stage, is quickly evanescent. But even Corner understood the scattered flecks on pileus surface to be vestigial velar tissue. Similarly, Berkeley and Curtis (1868) thought their *Agaricus cubensis* was similar to *Amanita gemmata* through just such scattered, raised flecks, and Saccardo concluded his incorrect placement of *A. canarii* in *Amanitopsis* probably on Junghühn's description of the volva-like veil. Interestingly, however, Junghühn did not mention a viscid or glutinous pileus surface, a feature shared by all basidiomata examined by us. Corner (1934) was able to record basidiome ontogeny including presence of a fugacious veil. All evidence for this veil disappeared very early in basidiome develop-

ment, unlike the annulus of *O. mucida* and similar basidiomata.

Pleurocystidia from near lamellar attachment to pileus are, on the average, longer and stouter than those from nearer to the lamellar edge. Apices of the latter are often unextended, so the pleurocystidia appear pedicellate and broadly fusoid rather than ten pin-shaped or with neck even more extended.

Corner (1934) studied ontogeny of basidiomata in *Collybia apalosarca*, which he later equated (1994: 49) with *Oudemansiella canarii*. In the earlier paper, based on specimens from Singapore, he was able to furnish figures (1934: Figs. 3, 4) of pileipellis structures which clearly equate to his later description. He interpreted the terminal cells as erect, emerging through a slimy matrix. Our observations are from sections and the orientation of the pileipellis tissue could not be accurately concluded. The question is whether these chains of cells are erect [as figured by Corner (1994: 64, Fig. 6 for *O. lianicola*; 66, Fig. 7 for *O. platensis*] or whether they are decumbent, as in *Megacollybia* and *Clitocybula*. Baroni and Ortiz (2002) furnished the clearest illustration of this pileipellis, showing cells of the pileipellis itself and of a portion of one of the superficial floccules (specimen Baroni 8001, cited below).

Traditionally, *O. canarii* has been

considered pantropical, including New and Old World tropics as well as Africa. Corner's (1994) recent contribution questioned this premise, separating *O. canarii* from *O. platensis* (South America) and adding some new species from the Old World (*i.e.* *O. lianicola* Corner, *O. crassifolia* Corner, *O. submucida* Corner). In addition to the neotype specimen of *O. canarii* (see above), additional basidiomata with identical disarticulated ixotrichoderm, superficial floccules, pleuro- and cheilocystidia have been seen from tropical and subtropical New World locations. Thus, at least as far as morphology can be employed, *O. canarii* is present in the New World.

New World specimens of *O. canarii* examined:
MEXICO, Veracruz, Mpio.de Cajete, Plan de Cedeño, 5.VI.1981, coll F Ventura (as *Oudemansiella*), Ventura 18568 (FCME). **UNITED STATES**, Florida, Alachua Co., Gainesville, San Felasco State Preserve, 6.VIII.1992, coll TJ Baroni, J Kimbrough, S. Both (as *O. canarii*), TFB 6865 (CORT); same location, 8.VIII.1996, coll TJ Baroni, TJB 8001 (CORT); same location, 19.VIII.1996, coll TJ Baroni, TJB 8083 (CORT). Marion Co., Ocala Nat. For., Juniper Springs Nature Trail, 7.XII.1998, coll KWH, TFB 10230 (TENN 57140). Texas, Hardin Co., Saratoga, Lance Rosier Unit, Big Thicket National Preserve, Teel Rd at Cypress Swamp, 14.VI.2007, coll Eastfield College Class, det DP Lewis, DPJ 7927 (TENN).

Agaricus mucidus Schrader: Fries. Syst. Mycol. 1: 28 (1821).

Although the species epithet, *mucidus* (in *Agaricus*), has a nomenclatural starting date of 1821 (Fries, 1821), the name was adopted by Fries from the epithet proposed by Wilhelm Adolph Schrader. Schrader (see Stafleu and Cowan, 1985; Daniels and Stafleu, 1974) was resident and director at the Göttingen, Germany, Botanical Gardens, and although his *Spicilegium Florae Germanicae* was published in 1794, he was a contemporary of Christiaan Hendrik Persoon (1801), who also adopted the epithet. In order to honor taxonomic history, therefore, it is necessary to seek a type specimen for Schrader's epithet from the environs of Göttingen.

A collection of *A. mucidus* was gathered by state forest personnel in Thuringia, passed to DK, thence to RHP, and is designated here to serve as neotype. A detailed description of the specimen follows only to unmistakably link the epithet to a circumscription. Basidiomata of this fungus are so common in Europe on *Fagus*

sylvatica (usually standing, occasionally reclining) that most mycophiles recognize them on sight. Several recent and classic works include it under one of its generic names. For example, Walvogel *et al.* (2001), Breitenbach and Kränzlin (1991), Lange (1935), Kühner and Romagnesi (1953), Kreisel (1987) and Boekhout (1999) all take up the organism and Fries (1821) wrote "*In truncis vetustis, apprime Fagi, vulgaris, Jul.-Dec.* (v.v.)" *Fagus* was present only in southern Sweden at the time of his writing of *Systema Mycologicum*.

Agaricus mucidus Schrader. Spicilegium Florae Germanicae, pars prior: 116 (1794).

≡ *Agaricus mucidus* Schrader: Fries. Syst. Mycol. 1: 28 (1821).

≡ *Armillaria mucida* (Schrader: Fr.) P. Kummer.: 135 (1871).

≡ *Collybia mucida* (Schrader: Fr.) Quélet. Enchirid. Fung.: 27 (1886).

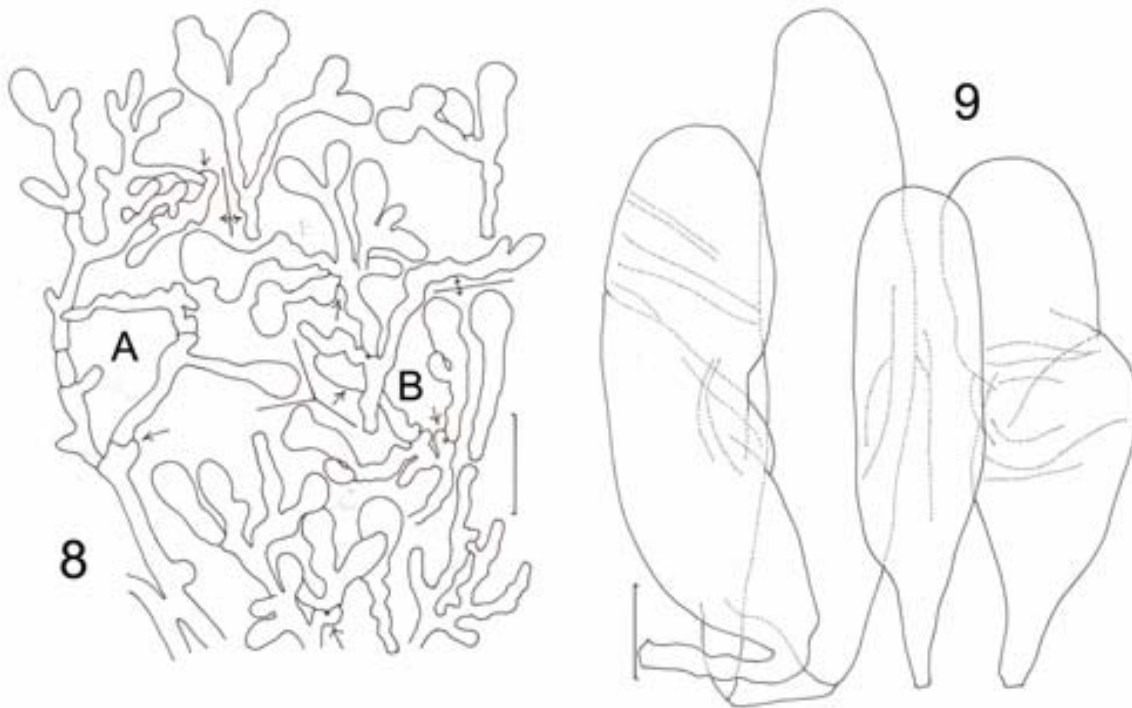
≡ *Lepiota mucida* (Schrader: Fr.) Schröter in Cohn. Kryptog.-Fl. Schlesien 3(1): 671 (1889).

≡ *Mucidula mucida* (Schrader: Fr.) Patouillard. Hymenomy. Eur.: 96 (1887).

≡ *Oudemansiella mucida* (Schrader: Fr.) v. Höhnel. Sber. Akad. Wiss. Wien 119: 9 [Fragm. Mykol. 12] (1910).

Neotypus hic design.: GERMANY, Thuringia, Unstrut-Hainich Co., vic. Craula, Hainich Nat. Park, 51°4'58.84" N, 10°30'51.89" E, elev 1135 ft, 16.X.2007, coll S. Kunnert & J. Wilhelm, comm. D. Krüger, TENN 62246.

Pileus -40 mm broad, shallowly convex with inrolled margin (including appendiculate tissue), randomly wrinkled (not radially), off-white overall when young, gradually darkening with age to plumbeo-fuscous, but always with transparent glutinous surface so as to appear as porcelain, usually darker over disc, somewhat lighter toward margin, smooth; margin significantly appendiculate when young, with edge attached to annulus at about half way between lamellar extent and stipe surface; appendiculate margin viscid when fresh, dark cream buff. *Lamellae* adnate with significant decurrent tooth, subdistant, white to pale buff, without conspicuous pleurocystidial necks; margin even, not marginate. *Stipe* longitudinally lined, silky-striate, off-white or cream above annulus when fresh, downward increasingly gray to gray-

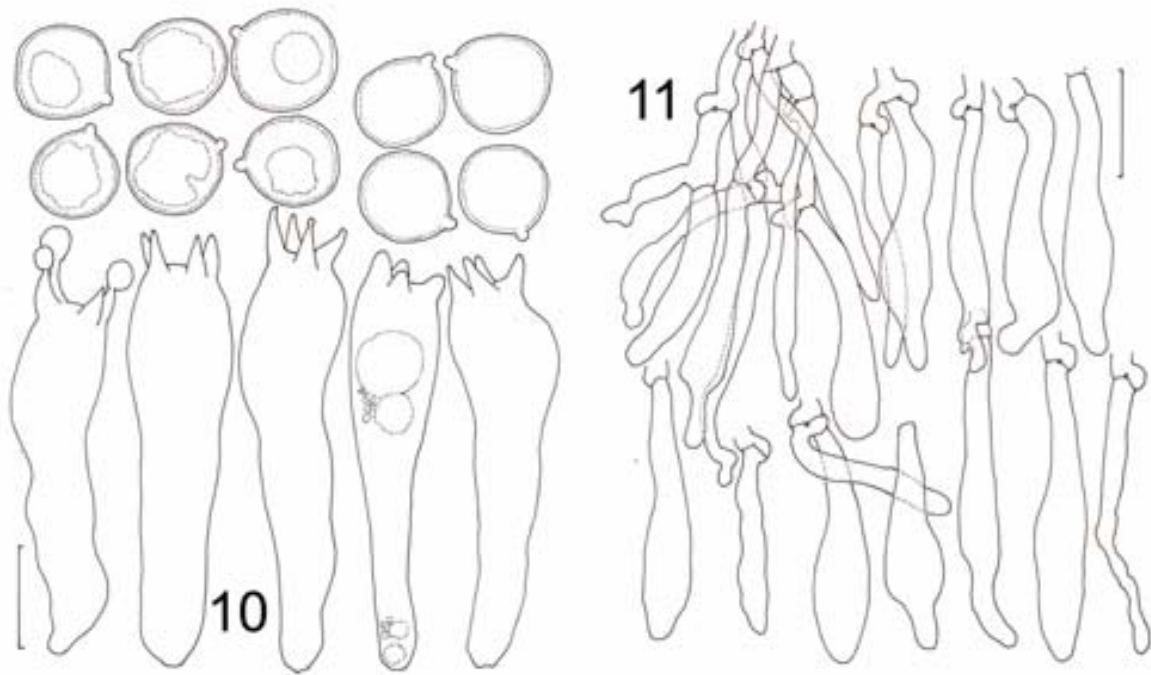


Figs 8, 9. *Oudemansiella mucida* (from Neotype). **8.** Pileipellis elements. **A.** From pileus disc. **B.** From pileus margin. **9.** Pleurocystidia. Bars = 20 μm .

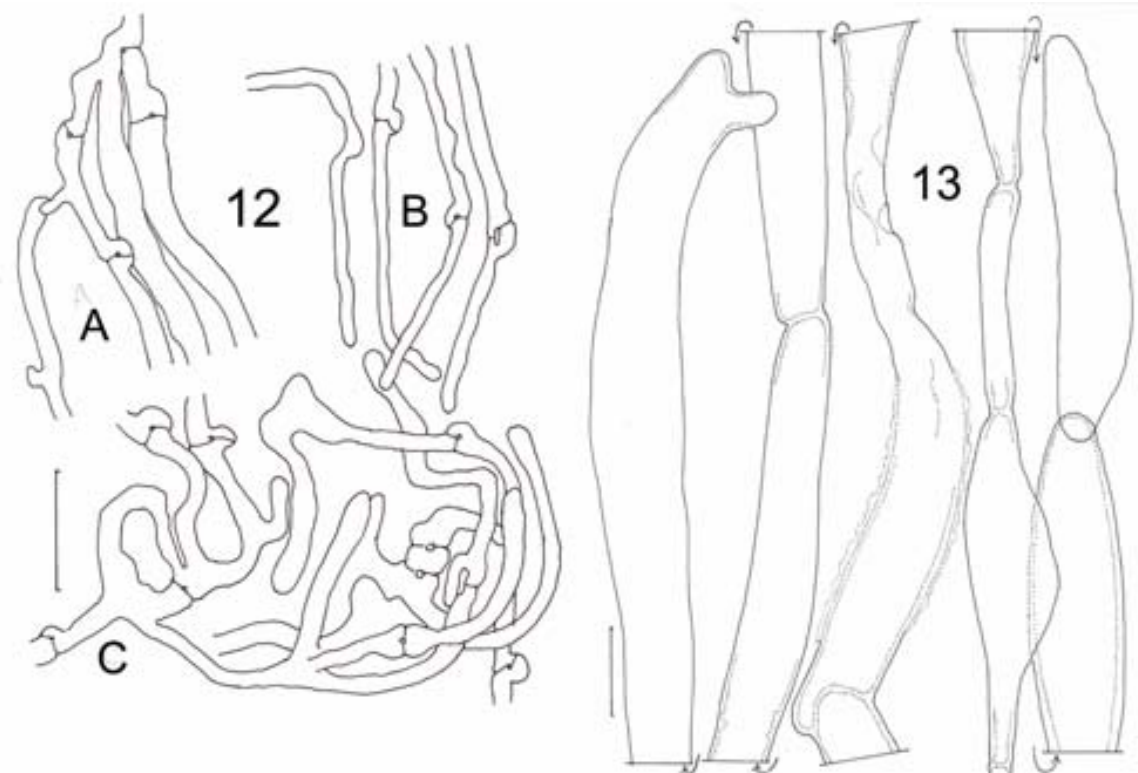
brown, more or less equal, expanded at base into an obpyriform or pad-like base on bark; *annulus* tightly tomentose, off-white when fresh, obvious, flaring or pendant, cream-colored on upper surface, developing deep grey on lower surface by maturity, often minutely papillose on lower surface near margin.

Pileipellis over disc (Fig. 8A) embedded in viscid matrix, constructed of coralloid-branched processes, with apices occasionally inflated into small pileocystidia. *Hyphae* 3-6 μm diam, thin-walled, occasionally conspicuously clamped (but usually not so), hyaline. *Pileocystidia* 18-32 \times 6-8 μm , clavate, thin-walled, not clamped; contents homogeneous, hyaline. *Pileipellis near margin* (Fig. 8B) embedded in viscid matrix, constructed of coralloid-branched hyphal systems, with apices often inflated into clavate pileocystidia. *Hyphae* 3-6 μm diam, thin-walled, hyaline, occasionally conspicuously clamped. *Pileocystidia* 20-38 \times 9-11 μm , clavate, thin-walled, not clamped; contents homogeneous, hyaline. *Pleurocystidia* (Fig. 9) widely scattered, almost submerged in hymenium, 84-103 \times 34-41 μm , pedicellate, utriform, thin-walled, probably clamped, hyaline; contents homogeneous, hyaline. Subhymenial

layer thick, of tightly interwoven, strangulate, slender (never more than 3 μm diam), hyaline, thin-walled, frequently clamped hyphae producing basidia of different ages (stages of maturity), often as digitate, uninflated terminal cells. No inflated tramal cells seen. *Basidia* (Fig. 10) 65-100 \times 19-23 μm , subcylindrical when immature, clavate when mature, distinctly clamped (especially evident in young individuals), with slightly pinched base, 4-spored; contents coscinoidal to multigranular when immature, with scattered large guttules by maturity, refringent (PhC). *Basidiospores* (Fig. 10) 16-20 \times 15-19 μm ($E = 1.00-1.18$; $E^m = 1.06$; $L^m = 18.7 \mu\text{m}$), globose to subglobose, smooth, uniguttulate when mature, thin-walled (but appearing thick-walled as guttule differentiates), hyaline; contents uniguttulate when mature, refringent (PhC). *Cheilocystidia* (Fig. 11) a solid beard, poorly developed, 25-65 \times 7-11 μm (at widest point), prominently clamped, digitate when immature, eventually broadening somewhat apically; contents scattered-multiguttulate at all ages. *Stipe surface above annulus* smooth, a thick repent layer of slender hyphae, 2-3 μm diam, thin-walled, rarely but conspicuously clamped, which appear to be free or



Figs 10, 11. *Oudemansiella mucida* (from **Neotype**). **10.** Basidia and basidiospores. **11.** Cheilocystidia. Bars = 20 μm .



Figs 12, 13. *Oudemansiella* species. **12.** *Oudemansiella mucida* (from **Neotype**). Hyphae from annulus. **A.** Hyphae from upper surface toward annulus margin. **B.** Hyphae of fibrillose attachment to stipe. **C.** Hyphae from gray inrolled annulus margin. **13.** *Oudemansiella platensis* (from **Epitype**). **(1)** Pilepellis hyphae **(2)**. Portion of hyphal wall shown as stippling is semi-gelatinized. Bars = 20 μm .



Figs 14, 15. *Oudemansiella platensis*. Basidiomata. **14.** Epitype, $\times 0.7$. **15.** DED 8084, Brazil, $\times 0.7$.

slightly coherent but not strongly so (liberating in squashes). Hyphae becoming somewhat thicker (4-6 μm diam) toward stipe medullary tissue but otherwise as surface hyphae. *Stipe surface below annulus* identical to above, with thick superficial layer of slender, frequently and conspicuously clamped hyphae 2-3 μm diam. Hyphae inward somewhat stouter (-7 μm diam) with semi-gelatinizing walls and rare clamps. *Upper surface of annulus* (Fig. 12A) fibrillose as attached to stipe surface; hyphae slender (2-4 μm diam), equal, thin-walled, frequently clamped, similar to those of grey inrolled annulus margin. Hyphae of inner surface (upper surface of annulus away from stipe; Fig. 12B) constructed of slightly wider hyphae (3-5 μm diam, thin-walled, frequently clamped, equal, somewhat strangulate). Tissue of inrolled gray margin of annulus (Fig. 12C) constructed of tightly interwoven, free, slender hyphae (2-5 μm diam, quite equal except for branching areas), frequently and conspicuously clamped, hyaline, thin-walled (just like those of stipe surface – see above); gloeoplerous hyphae common, 4-7 μm diam, aseptate, subrefrangent.

Commentary: All basidiome surfaces are constructed of complex hyphae. Pileipellis and hymenium include subpellis and subhymenial layers of coralloid, slender, clamped hyphae, and cheilocystidia are produced by identical hyphae with conspicuous clamps. Annulus tissues and stipe surface are composed of very slender, frequently clamped hyphae.

Corner (1994: Fig. 10, p 71) figured the pileipellis of *O. mucida* (as compared to that of *O. submucida*). Clavate pileocystidia were correctly pictured, but the coralloid hyphal system which produces them was not shown. Two pilocystidia were shown as fusiform with mammilate tip, but we see no such on this (or other) specimen.

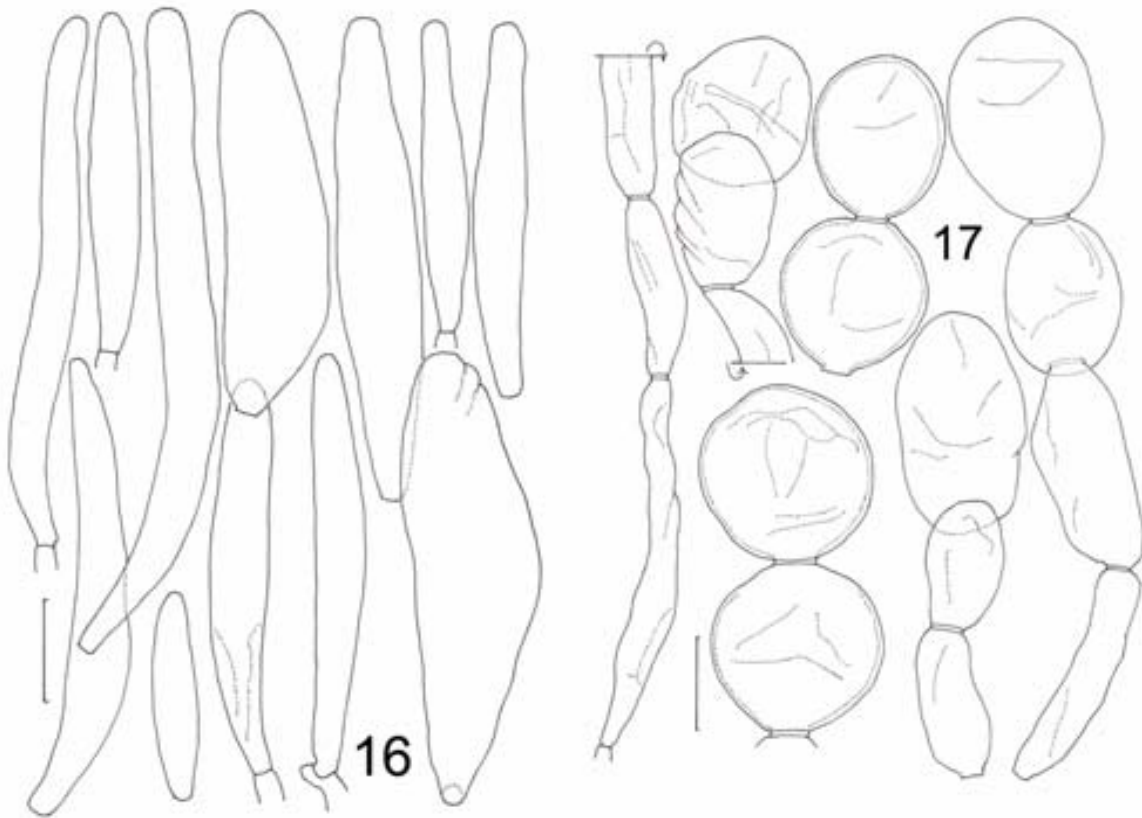
The structure and attachment of pileus margin and annulus has not been accurately described (to our knowledge) in this species. The annulus clearly does not attach to the normal pileus margin, but the pileus margin extends significantly (with no flesh and no lamellar extension) and the suture line between pileus margin and annulus is clearly marked. As disarticulation occurs, minute, delicate fibrils of annular tissue remain attached to the

pileus margin as appendiculae, although too small to be seen without a lens. Very soon after disarticulation, these fibrils are adsorbed and become virtually invisible. All this was not described by Corner (1934, 1994), who dealt with *O. canarii*, which does not exhibit an annulus in mature basidiomata.

Hyphae of annulus tissues resemble those of the stipe surface both above and below annulus (slender, strangulate, frequently median-clamped, thin-walled, hyaline). The only difference between upper and lower annular surfaces is that the upper surface is covered with spores.

Horak (1968) included *Mucidula*, and examined a specimen of *M. mucida* (France, Carnelle (S.-et-O.), X.1898, leg. N. Patouillard (FH). The specimen was cited as “lectotype.” The type specimen for *Mucidula mucida*, nomenclaturally, must be the same as that for *Agaricus mucidus*, for Patouillard did not propose a new species but only proposed a transfer from *Agaricus* to *Mucidula* with no change in typification of the epithet.

A morphological variant of *O. mucida* occurs in temperate Asia, differing in less complex pileipellis tissue, larger spores, more prominent pleurocystidia, well-developed cheilocystidia and paler basidiome color. Before distinguishing this variant, Petersen and Halling (1994) reported on a series of pairing experiments in *O. mucida*. Normally, dikaryons produced in pairings among Asian isolates and among European isolates produced abundant clamp connections. In vitro experiments pairing monokaryon isolates of Asian collections versus monokaryon isolates of European collections of *O. mucida*, however, showed sexual compatibility when resultant dikaryons were observed using a nuclear stain, but produced no clamp connections. Examination of the basidiomata from which the monokaryon isolates were derived confirmed that the Asian basidiomata were of the morphological variant (which will be proposed elsewhere). The inference from these experiments is that sexual compatibility was conserved for nuclear compatibility and nuclear migration (usually ascribed to the mating type A gene), but not for formation of clamp connections (usually ascribed to the mating type B gene).



Figs 16, 17. *Oudemansiella platensis* (from **Epitype**). **16.** Pileipellis hyphae terminal cells. **17.** Cells and hyphae of superficial pileal flecks. Bars = 20 μ m.

Oudemansia platensis Spegazzini. An. Soc. Cient. Argen. 10(6): 280 (1880).

\equiv *Oudemansiella platensis* (Speg.) Speg. An. Soc. Cient. Argen. 12: 24. (1881).

\equiv *Psalliota platensis* (Speg.) Herter, Est. Bot. Reg. Uruguay, III Florula Uruguay. Pl. Avasculares (Montevideo): 43 (1933).

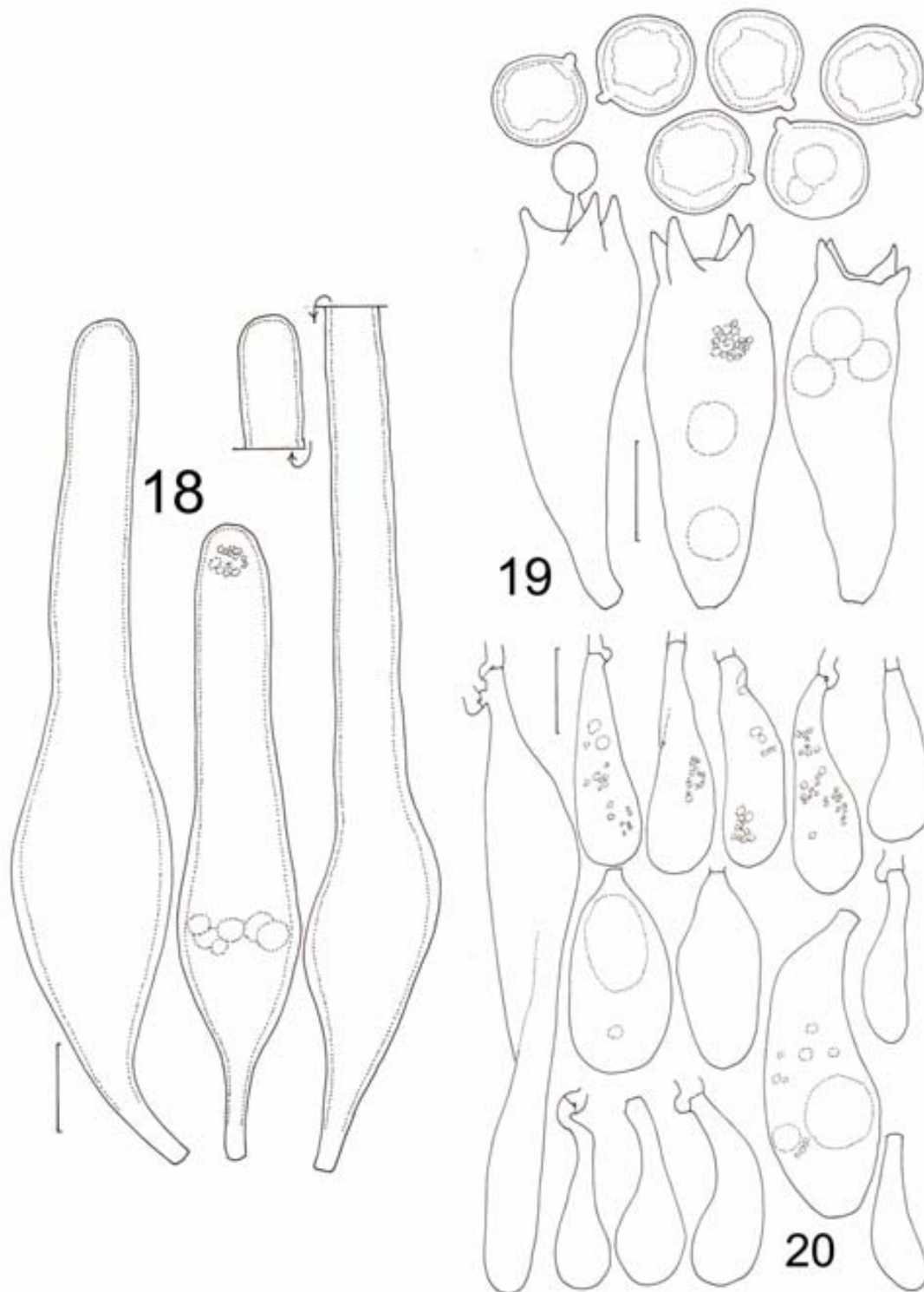
Holotypus (design. Spegazzini, 1880): ARGENTINA, Dist. Federal, Palermo, X.1880, on dead branches of *Erythrina cristagalli* L. (LPS!)

Epitypus hic design.: ARGENTINA, Misiones Prov., Iguazú National Park, Isla San Martín, ca 500 ft elev., 24.V.2001, coll RHP and E Albertó, TFB 10746 (TENN 58954)

Basidiomata (Fig. 14; Fig. 15 of Brazilian collection DED 8084) five, armillarioid. **Pileus** 35-62 mm broad, shallowly convex, sometimes slightly depressed over stipe, viscid, radially rugulose, with scattered, dark gray, small patches or pyramidal warts, "light drab" over disc and limb; margin off-white, crenulate to sublacerate; pileus pellicle somewhat receding at margin; pileus flesh over stipe pure white, soft. **Lamellae** adnate with decurrent tooth,

distant, subventricose, -7 mm deep, white, in three ranks. **Stipe** central, bent, silky, "drab gray" upward, at base abruptly expanded, "hair brown;" evidence of partial veil none. **Odor** and **taste** negligible. On hardwood trunk.

Pileipellis a lax ixotrichodermium composed of chains of 5-8 elongate-fusiform cells (Fig. 13) ending in a narrowly fusiform, fusiform or subclavate terminal cell (Fig. 16), firm-walled (wall never more than 0.5 μ m thick); septa apparently rarely clamped, most distinctly not so; contents homogeneous throughout, becoming olive-tan toward terminus with terminal cells most strongly pigmented. Scattered patches or warts on **pileus** surface composed of a polycystoderm (Fig. 17), the proximal cells of which are relatively narrow and long (45-86 \times 8-10 μ m) becoming more and more inflated until terminal cells are subglobose to sphaeropedunculate (29-48 \times 22-44 μ m), thin- to thick-walled (wall never more than 0.5 μ m thick), with septa appearing double; clamp connections absent; contents homogeneous, hyaline. **Pileus trama** over stipe pure white, very light weight when dry (as though



Figs 18-20. *Oudemansiella platensis* (from **Epitype**). **18.** Pleurocystidia. **19.** Basidia and basidiospores. **20.** Cheilocystidia. Bars = 20 μ m.

composed of wide, loosely packed hyphae); tramal hyphae 5-20 μ m diam, long-celled but distinctly clamped, relatively loosely packed, hyaline, without evidence of any gelatinous matrix, thick-walled (wall 1-1.5 μ m thick).

Pleurocystidia (Fig. 18) scattered, obvious on lamellar surface at 30 \times in median area of lamella (not near margin and not near attachment to pileus), 135-260 \times 31-40 μ m, narrowly pedicellate, inflated somewhat proximally

(ampulliform) then extended into a long, broadly cylindrical neck and rounded apex, obscurely clamped, thick-walled (wall up to 2 μm thick over proximal swelling, then 1-1.5 μm thick over neck); contents homogeneous, hyaline. *Lamellar trama* constructed of two hyphal types: 1) 10-20 μm diam, long-celled, broadly cylindrical, constricted somewhat at septa, obscurely clamped, thick-walled (wall up to 2 μm thick); contents homogeneous, hyaline; and 2) 4.5-8.5 μm diam, equal, thin-walled, rarely septate (but clamped). Subhymenium tightly compressed but remaining filamentous (not parenchymatous), with abundant clamp connections. *Basidia* (Fig. 19) 68-80 \times 23-29 μm , broadly clavate from a pinched base, (2-)4-spored, obscurely clamped, thin- to thick-walled (wall never more than 0.7 μm thick); contents homogeneous when immature to heterogeneous/multiguttulate by maturity; sterigmata very stout, curved. *Basidiospores* from pileus surface (Fig. 19) 18-22.5 \times 17-21 μm ($E = 1-1.09(-1.14)$; $E^m = 1.07$; $L^m = 20.6 \mu\text{m}$), globose to subglobose, often irregular in outline as though a loose episporium, distinctly puckered when less than mature, refringent, thick-walled (wall never more than 0.7 μm thick); contents apparently uniguttulate, but guttule irregular in outline. Lamellar margin sterile, a solid beard of cheilocystidia. *Cheilocystidia* (Fig. 20) 38-74(-139) \times 11-26 μm , clavate to broadly clavate, conspicuously clamped, thin-walled, occasionally pleurocystidial; contents homogeneous or heterogeneous and then with scattered refringent guttules, sometimes sizable. *Upper stipe surface* silky; hyphae strictly longitudinal, tightly packed, coherent (small bits of adherent substance loose in mount). Surface hyphae variable in width, 3-14 μm diam, hyaline, firm- to thick-walled (wall up to 1 μm thick), sparsely branched, conspicuously clamped (but long-celled); widely scattered hyphal tips (caulocystidia) repent to curved-erect, 5-9 μm diam, narrowly fusiform. *Stipe surface near basal bulb* similar to above, but with very light thatch of superficial hyphae; hyphae generally longitudinal, free, 4-11 μm diam, without clamp connections, firm-walled, easily disarticulated (but some adherent substance covering hyphae very lightly and stretching over separating septa); "H-" connections common. *Stipe basal bulb*

with complex tissue: outermost layer of tightly interwoven, white tomentum perhaps the remnant of a partial veil, covering a woody rind of 2-3 layers of carbuncle tissue somewhat grayish; medullary tissue parenchymatous, resembling the tissue of *Sambucus* pith. *Hyphae of tomentum* over basal bulb similar to superficial hyphae just distal to bulb (two sentences above), but much longer-celled, apparently without clamp connections and commonly secondarily septate ("cloissons de retrait," not constricted, very thin curtains across filamentous cell), firm- to thick-walled (wall never more than 1 μm thick).

Commentary: Corner (1994: 65-66) reported that his examination of *Oudemansiella* specimens from three areas of Brazil showed that they differed from the common southeast Asian taxon he had collected in Malaysia. His conclusion was that *O. platensis* differed from *O. canarii*, and he contrasted some microcharacters. But his conclusions were based on personal experience, because no type specimens were examined (and for *O. canarii*, none existed). Baroni and Ortiz (2002) reported that the type specimen of *O. platensis* was useless (with which we concur), so until the present paper, adequate type material could not be compared.

The only illustration of putative *O. platensis* furnished by Corner (1994: Fig. 7, left) shows a polycystoderm (his term, pseudo-parenchyma-like) as contrasted to an imperfect ixotrichoderm for *O. canarii* (his Fig. 7, right). The polycystoderm seems evidently to be a section through a pileus fleck or patch (see our Fig. 17) as compared to the pileipellis separate from such a patch (see our Fig. 16). Thus, in our opinion, Corner's figures do not equate to our understanding of these structures.

Unfortunately, Corner (1934) did not describe or figure pleurocystidia or cheilocystidia of *C. apalosarca* (= *O. canarii*), so those structures cannot be equated with the specimen described above or in his later publication (Corner, 1994). Later, however, Corner (1994: Fig. 3) figured a single pleurocystidium (among basidia, for *O. canarii*) which matches the form seen in most *Oudemansiella* taxa.

It seems clear that the morphospecies *O. canarii* is present in New World tropics and subtropics (see above under *O. canarii*).

Conversely, basidiomata with pileipellis structure similar to that of *O. platensis* have been examined from other South American locations. *Oudemansiella platensis*, at least from initial observations, seems limited to the New World. At this time, no conclusions can be put forward on taxa in Africa in spite of Pegler's (1977) inclusion of *O. canarii*. He considered *O. platensis* to be a synonym under *O. canarii*, with many other synonyms accordingly.

The report by Petersen and Halling (1993) on the mating system of "*O. canarii*" was erroneous. Illustrations and descriptions of those basidiomata match the taxonomic characters of *O. platensis*.

Additional specimens of O. platensis examined:

ARGENTINA, Misiones Prov., Iguazu National Park, 24.V.2001, coll RHP and E Albertó, TFB 10746 (TENN 58954); same location, Hotel Internacional grounds, S 25°40.785', W 54°26.724', 29.V.2001, coll KWH, TFB 11306 (TENN 59012). **BRAZIL**, Rio de Janeiro, date and location unknown, coll. Glaziou, Glaziou 9145 [K(M) 154851!; **holotype** of *Agaricus radiculosus* Cooke]; Manaus, 17.X.1948, coll E.J.H. Corner (as *O. ?platensis*), s.n. (E 227801); Mato Grosso, Chavantina, 31.I.1968, coll E.J.H. Corner (as *O. platensis*), s.n. (E 227802). **COLOMBIA**, Dpto. Antioquia, Municipio de Medellín, campus universitario, Universidad de Antioquia, 12.X.2005, coll & det Doris Gallo-G, Gallo-G 100 (NY). **COSTA RICA**, Alajuela Prov., Bosque el Niño, Reserva Forestal de Grecia, N 10°08'38", W 84°14'62", 27.VI.1990, coll RHP, TFB 9649 (TENN 56610); Cartago Prov., Oresi Dist., Paraiso Co., Tapanti National Park, Panmando Trail, 9°44'57" N, 83°46'54" W, 15.VI.1999, coll J.L. Mata & R. Nuñez, TFB 10071 (TENN 58011); Guanacaste Prov., Santa Rosa, National Park, 3.VI.1994, coll T.J. Baroni, TJB 7450 (CORT); Puntarenas Prov., vic. Golfito, Pavones, Weston rainforest, N 8°15' W 83°1', 4.VII.1992, coll RHP & KWH (as *O. canarii*), TFB 4886 (TENN 51078); same location, N 8°15', W 83°15', 5.VII.1992, coll KWH (as *O. canarii*), TFB 4898 (TENN 51190); vic Santa Elena, Hotel Heliconia, 400 m before entrance to Sta. Elena Reserve, N 10°20'32", W 84°47'55". 1500-1600 m elev., 17.III.1999, coll J.L. Mata (as *O. canarii*), TFB 10059 (TENN 57626); Coto Brus Co., Hacienda La Amistad, N 8°54.218', W 82°47.401', 3.VII.1998, coll RHP (as *O. canarii*), TFB 9482 (TENN 56510); same location, N 8°54.218', W 82°47.401', 4.VII.1998, coll J. Cifuentes & RHP, TFB 9906 (TENN 56534); same location, N 8°54.218', W 82°47.401', 5.VII.1998, coll RHP (as *O. canarii*), TFB 9933 (TENN 56559). **CUBA**, VII.1857, coll. C. Wright, s.n. (FH; holotype of *Agaricus cubensis* Berk. & M.A. Curtis); location unknown, Fungi Cubenses Wrightiani No. 9, coll. C. Wright, 13.V, Wright 11 (FH, bar code: 00079977; holotype of *Agaricus cheimonophyllus* Berk. & M.A. Curtis). **DOMINICAN REPUBLIC**, Jarabaroa, Salto de Jimanoa, N 19°03.703', W 70°51.872', 6.I.2003, coll EA

Grand (as *O. canarii*), TFB 11198 (TENN 59734); San José de los Matas, vic. Los Montones, La Placeta, N 19°14.433', W 70°53.882', 8.I.2003, coll EA Grand (as *O. canarii*), TFB 11703 (TENN59771). **ECUADOR**, Napo Prov., San Carlos, INIAP – Napa-Payamino Exp. Station, 0°20' S, 76°50' W, no date, coll Catherine Barbour (as *O. platensis*), Barbour 1 (E 00218109).

Discussion

The presence of *O. canarii* in the New World has been verified, where its distribution seems to be parapatric with that of *O. platensis*. Conversely, there are no data which suggest that *O. platensis* occurs in the Old World. Molecular comparisons of collections from various locations will indicate how similar are New and Old World *O. canarii*. Accurate descriptions and illustrations from type material may aid in accurate identification.

Perhaps a similar example of such possible distribution involves *Lentinula boryana* (Berk. & Mont.) Pegler, which extends from Brazil to southern United States and *L. raphanipes* (Murrill) Mata & R.H. Petersen (also in the United States as well as Caribbean landmasses). The former was recognized for many years, but the latter was revealed through pairing experiments and type specimen studies (Petersen *et al.*, 1998; Mata *et al.*, 2001; Mata and Petersen, 2001). A somewhat contrasting pattern has been termed "the subpruinose pattern" by Petersen and Hughes (2007) and includes the Caribbean, South and/or Central America and tropical Pacific landmasses.

References

- Baroni, T.J. and Ortiz, B. (2002). New species of *Oudemansiella* and *Pouzarella* (Basidiomycetes: Agaricales) from Puerto Rico. *Mycotaxon* 82: 269-279.
- Berkeley, M.J. and Curtis, M.A. (1868). Fungi Cubensis (*Hymenomycetes*). *J. Linn. Soc.*, London 10: 282.
- Boekhout, T. (1999). *Oudemansiella*. In: *Flora Agaricina Neerlandica*, vol. 4. (eds. C. Bas, T. Kuyper, M.E. Noordeloos and E.C. Vellinga) Balkema, Amsterdam: 177-178 (with drawings).
- Breitenbach, J. and Kränzlin, F. (1991). *Fungi of Switzerland*, vol. 3. [see p. 308 with illustrations on p. 309].
- Corner, E.J.H. (1934). An evolutionary study in agarics: *Collybia apalosarca* and the veils. *Transactions of the British Mycological Society* 19: 39-88.
- Corner, E.J.H. (1994). On the agaric genera *Hohenbuehelia* and *Oudemansiella*. Part. II: *Oudemansiella* Speg. *Garden's Bull, Singapore* 46: 49-75.

- Daniels, G.S. and Stafleu, F.A. (1977). HI-IAPT portraits of botanists. *Taxon* 23: 178.
- Farr, M.L. (1973). An annotated list of Spegazzini's fungus taxa. *Biblioth. Mycol.* 2: 824-1661.
- Fries, E.M. (1821). *Systema Mycologicum. Vol. 1. Gryphswaldiae.*
- Hennings, P. (1900). *Hymenomycetinae.* In: *Die Natürlichen Pflanzenfamilien, vol. 1, Abt. 1.* (eds. A. Engler and K. Prantl). Leipzig: 105-313.
- Horak, E. (1968). Synopsis Generum Agaricalium. *Beitrage der Kryptogamenflora de Schweiz* 13: 1-741.
- Kornerup, A. and Wanscher, J.H. (1967). *Methuen handbook of colour. 2nd edn.* Methuen Co., London.
- Kreisel, H. (1987). *Pilzflora der Deutschen Demokratischen Republik.* G. Fischer Verlag, Jena. [see p. 174].
- Kühner, R., and Romagnesi, H. (1953). *Flore analytique des Champignons supérieurs.* Masson et Cie, Paris. [see p. 95, with drawings].
- Lange, J.E. (1935). *Flora Agaricina Danica.* [reprint edition, M. Candusso, 1993] Vol. 1: 400 pp + 104 pls. [see p. 65 + pl. 41].
- Mata, J.L. and Petersen, R.H. (2001). Type specimen studies in New World *Lentinula*. *Mycotaxon* 79: 217-229.
- Mata, J.L., Petersen, R.H. and Hughes, K.W. (2001). The genus *Lentinula* in the Americas. *Mycologia* 93: 1102-1112.
- Pegler, D.N. (1977). A preliminary agaric flora of east Africa. *Kew Bulletin Additional Series* 6: 1-615.
- Pegler, D.N. (1986). Agaric flora of Sri Lanka. *Kew Bulletin, Additional Series* 12: 1-519.
- Persoon, C.H. (1801). *Synopsis Methodica Fungorum.* Göttingen.
- Petch, T. (1907). Revisions of Ceylon fungi. *Annals of the Royal Botanical Gardens, Peradeniya* 4: 21-68.
- Petch, T. (1910). *Annals of the Royal Botanical Gardens, Peradeniya* 4: 373-439.
- Petersen, R.H. and Halling, R.E. (1993). Mating systems in the *Xerulaceae.* X. *Oudemansiella.* *Transactions of the British Mycological Society* 34: 409-421.
- Petersen, R.H. and Hughes, K.W. (2007). Some agaric distribution patterns involving Pacific landmasses and Pacific Rim. *Mycoscience* 48: 1-14.
- Petersen, R.H., Hughes, K.W. and Mata, J.L. (1998). *Lentinula boryana* intersterility groups and RFLP analysis. *Inoculum* 49: 41.
- Rick, J. (1905). Pilze aus Rio Grande do Sul. *Annales Mycologici* 3: 235-240.
- Ridgway, R. (1912). *Color standards and color nomenclature.* Publ. Privately, Washington, D.C.
- Saccardo, P.A. (1887). *Sylloge Fungorum, vol. 5:* 1-1146. Padua.
- Singer, R. (1952) ["1950?"]. Type studies on *Basidiomycetes.* *Lilloa* 23: 147-246.
- Singer, R. (1964). *Oudemansiellinae, Macrocystidiinae, Pseudohiatulinae* in South America. *Darwiniana* 13:146-190.
- Spegazzini, P.A. (1880). Sobré la *Oudemansia platensis.* *Annales Societe Cien. Argentina* 10: 279-280.
- Spegazzini, P.A. (1881). Fungi Argentini additis nonnullis Brasiliensibus Montevideensibusque. *Pugillus quartus.* *An. Soc. Cien. Argent.* 12: 13-30.
- Stafleu, F.A. and Cowan, R.S. (1985). *Taxonomic Literature, 2nd edn.,* vol. 5: 1-1066.
- Waldvogel, F., Neukom, H.P. and Winkler, R. (2001). *Pilze Champignons Fungi.* AT Press. [see p 374 with photo]