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NEW SPECIES OF OUDEMANSIELLA AND POUZARELLA (BASIDIOMYCETES: AGARICALES) FROM PUERTO RICO

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ABSTRACT: ***Oudemansiella fibrillosa*** **and** ***Pouzarella caribaea*** **are described as new from the Guilarte National Forest Preserve in Puerto Rico.**

KEY WORDS: Entolomataceae, Greater Antilles, Tricholomataceae

INTRODUCTION

Over the past decade several papers have been published on members of Agaricales from Puerto Rico (Baroni and Lodge, 1998; Baroni et al., 1999; Cantrell and Lodge, 2000 & 2001; Guzmán, et al., 1997; Lodge, 1988; Lodge et al.. 2001; Lodge and Pegler, 1990; Miller et al., 2000; Pegler, et al., 1998; Singer and Lodge, 1988. Much of the previous literature discussing publications on agarics for Puerto Rico can be found in Baroni and Lodge (1 998) and Lodge (1 996).

A recent study by one of us (BO) on the agaric mycota in the Guilarte State Forest, a wet subtropical forest located in the Cordillera Central of southwestern Puerto Rico (18°07N, 66°27W), has turned up two new species of agarics. Previously Bor (1969) had reported only nine species total from the Guilarte State Forest in Puerto Rico. We now have documented an additional 14 species, which includes the two new taxa described below. However, many collections from the Guilarte State Forest have yet to be identified to species, and thus this number will continue to rise.

The main collecting area was the Monte Guilarte Peak trail between 1000 and 1205 m elevation. The trail flora is mainly composed of *Prestoea montana* (R. Grah.) Nichols, *Micropholis chrysophylloides* Pierre, *Buchenavia capitata* (Vahl) Eichl. and *Cyathea arborea* (L.) J. E. Smith.

MATERIALS AND METHODS

Collection and preparation of fresh specimens by B. Ortiz for later study followed standard technique. Color names are given as general hues and were not matched to color references. Measurements of microscopic structures were made in 3% KOH or 10% NH_4OH unless otherwise noted. In the description of the basidiospores, n = 30 indicates that a total of 30 spores were measured; L^m = mean length; W^m = mean width; Q = length/width of individual spores and is given as a range; Q^m = the mean of all Q values in a sample. Basidiospores were measured with an Olympus BHS light microscope under a 100x Hoffman interference lens using a semi-automated image analysis system (a GTCO digitizer pad and Metrics5 software written by Dr. David Malloch). Descriptive statistical analysis of the measurements was obtained using EXCEL 5.0. All scanning electron micrographs were made on an ISI Supra IIIA scanning electron microscope generally run at 10 Kev. Methods for preparation of samples for SEM are those of Baroni (1981). All line drawings of microscopic structures were made with the aid of a drawing tube.

DESCRIPTIONS

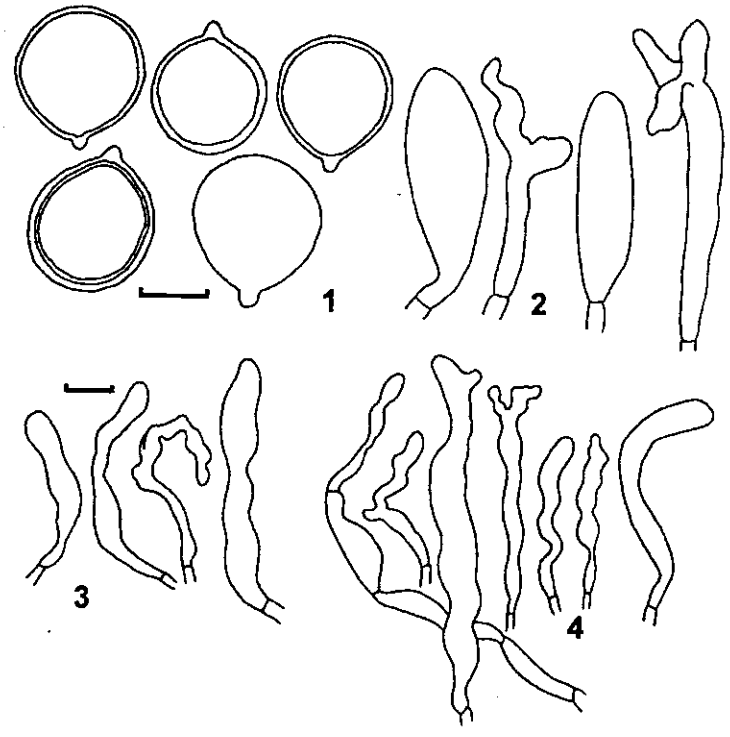
Oudemansiella fibrillosa T. J. Baroni & B. Ortiz, sp. nov.

Figs. 1-10

Pileus flavido- vel roseo-bruneus, 22-44 mm latus, convexus; discus fusco-brunneus, squamis tenuifibrillosis brunneis supra discum atque marginem versus adspersis praeditus. Lamellae pallide subroseo-bubalinae adnatae, dente brevi vel brevi-decurrentes, aggregatae. Stipes super apicem pallide subroseo-bubalinus, basem versus brunnescens, ad basem paene fuscus, ad apicem 3-5 mm latus, 20-35 mm longus, aequus vel subclavatus, infra annulum superiorem fibrillosum evanescentem fibrillis implexis obtectus. Basidiosporae 13.8-21.5 x 12.8-20.3 µm, Q = 1.06, globosae vel subglobosae, crassitunicatae (0.8-2.4 µm), laeves. Cheilocystida anguste ventricosa, alia apicibus contortis vel cylindrice contortis atque alia apicibus ramuloso-contortis praedita. Pleurocystidia ventricosa vel late ventricoso-rostrata, maximam partem parietibus crassis refractivis 720-250 x 21-60 µm. Pileipellis e hyphis gelatinis 2-4.8 µm diametro atque hyphis non gelatinis inflatis 7-26 µm diametro immixtis composita; hyphae inflatae pilocystidia clavata late ventricosa vel contorta cylindrica 52-162 x 8-26 µm producentes. Fibulae nullae.

Pileus (Fig. 6) yellowish brown or pinkish brown with a darker brown disc, developing more yellow hues upon expansion, with tine fibrillose brown scales on the disc, these tine scales becoming sparse and more scattered toward the margin, 22-44 mm broad, convex becoming plano-convex and slightly depressed over the disc, smooth, margin finely striate and translucent-striate, crenulate around the edge. Lamellae pale pinkish buff, adnate with a decurrent tooth or short decurrent with expansion, crowded, with 2 tiers of

lamellulae, 3-5 mm broad, irregularly serrate on margin. ***Stipe*** pale pinkish buff over apex, becoming progressively darker brown toward base, deep dark brown or nearly fuscous at very base, 3-5 mm broad at the apex, 20-35 mm long, equal or subclavate, covered with matted fibrils below an evanescent fibrillose, superior annular ring, hollow with age. ***Basidiospores*** (Figs. 1 and 11-12) 13.8-21.5 x 12.8-20.3 µm (n = 30, L^m = 17.5, W^m = 16.5, Q = .98-1.15, Q^m = 1.06), globose or subglobose, ± hyaline, inamyloid, thick walled (0.8-2.4 µm) with two or three layers, thin outer wall distinctly cyanophilic, inner walls hyaline in all reagents, smooth, with large rounded apiculus, 1.6-2.4 µm long and 2.4 µm wide, filled with refractive droplets. ***Basidia*** (2-) 4-sterigmate, clavate, filled with refractive droplets, cyanophilic bodies absent, 54-74 x 20-24 µm.



Figs. 14. *Oudemansiella fibrillosa* (all from HOLOTYPE): Fig. 1 Basidiospores. Fig. 2. Pilocystidia. Fig. 3 Caulocystidia. Fig. 4 Cheilocystidia. Scale bar for Fig. 1 = 10 µm. Scale bar for Figs. 2-4 = 20 µm.

Lamella trama hyaline, of parallel or somewhat interwoven, cylindric or slightly inflated, thin-walled, often subgelatinized hyphae, 4-16 µm in diam, at the edges extending into a long projecting (100-200 µm beyond the flanking basidia near the edge), sterile column-like layer of hyaline, thin-walled, closely packed, gelatinized or subgelatinized hyphal cells with Cheilocystidia (Fig. 4) densely packed at their tips, cheilocystidia narrowly ventricose or narrowly clavate or cylindrical or of various other shapes, not infrequently also with contorted or

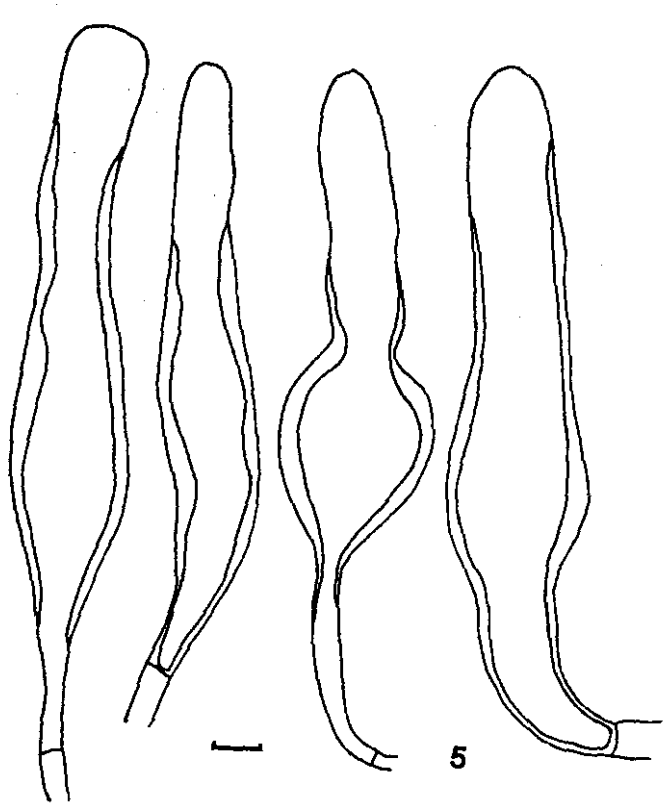


Fig. 5. *Oudemansiella fibrillosa* (HOLOTYPE). Pleurocystidia. Scale bar = 20 µm.

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branched and contorted apices, 54-150 x 6-16 µm. ***Pleurocystidia*** (Fig. 5) projecting 50-175 µm beyond basidia, abundant, hyaline, ventricose or broadly ventricose-rostrate, mostly with thick refractive walls (1.6-2.4 µm) except for apex and very base which remain thin-walled, 120-250 x 21-60 µm. ***Pileus context*** hyaline, composed of interwoven, cylindric or inflated, thin walled hyphae, 6.4-24 µm in diam. ***Pileipellis*** (Fig. 7) a dull brown layer in 3% KOH, 200 µm or more thick, ± a disrupted hymeniform layer, composed of loosely entangled, cylindric, gelatinized hyphae, 2-4.8 µm in diam. intermixed with inflated hyphae, 7-26 µm in diam, these inflated hyphae producing clavate, broadly ventricose or occasionally branched or contorted cylindrical pilocystidiate end cells (Fig. 2), 52-162 x 8-26 µm, which appear hyaline or more often filled with abundant dark brown plasmatic pigment. ***Stipitipellis*** a hyaline or pale melleous layer of repent, parallel, cylindric hyphae, 4-8 µm in diam, producing single or scattered clusters of erect. thin-walled caulocvstidia (Fig. 3), 60-100 x 10-12 µm, similar in shape to cheilocystidia. ***Stipe contest*** at apex and base, similar to *O. canarii,* monomitic, not obviously sarcondimitic (but see Redhead, 1987). ***Clamp connections*** absent.

Gregarious or subcaespitose on decayed downed log. October.

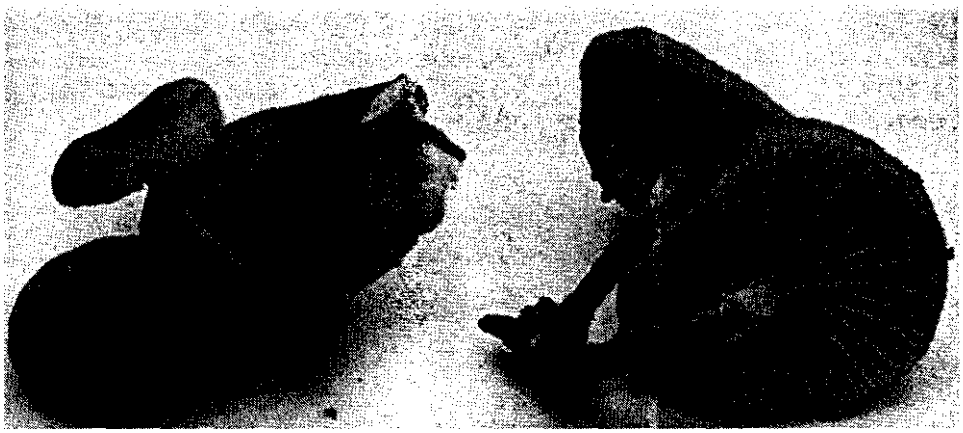


Fig. 6. *Oudemansiella fibrillosa* (HOLOTYPE). Top and bottom views of basidiomata. approx. 1X.

Material examined: PUERTO RICO: Adjuntas, Guilarte State Forest. Beside main trail to the Monte Guilarte Peak, 1100 m, among *Cyathea arborea, Prestoea montana,* and *Cecropia schreberiana,* 21 October 1995, B. Ortiz #28 (BOS #28) (**MAPR, HOLOTYPE**).

Additional material examined: ARGENTINA: Palermo, October 1880, C. Spegazzini, type of *Oudemansiella platensis* (Speg.) Speg. (LPS, HOLOTYPE). UNITED STATES: Florida, Alachua Co., vicinity of Gainesville, San Felasco Hammock State Preserve, 19 August 1996,8083 T. J. Baroni (CORT).

Commentary: Oudemansiella fibrillosa is recognized by the very large, globose, smooth, thick-walled, cyanophilic, hyaline basidiospores, the conspicuous thick-walled pleurocystidia, and the gelatinized lamella edges that bear profuse cheilocystidia. At first glance the macromorphological characters of this species remind one of an Armillaria. Such features as the lignicolous basidiomata. the finely scattered fibrils on the pileus surface, the fibrillose annulus on a fibrous-tough stipe which is progressively darker colored toward the caespitose bases, the adnate to short decurrent lamellae, and the pale colored basidiospores are all typical characters found in many Armillaria taxa. In fact we first thought this was an undescribed species of Armillaria and in the past other species now considered to be *Oudemansiella* have been mistaken for *Armillaria* (Volk and Burdsal, 1995). However, the unusual combination of micromorphological features found in *Oudemansiella fibrillosa,* such as the large, globose, smooth, thick-walled basidiospores, the very large projecting pleurocystidia and the distinctive disrupted hymeniform pileipellis readily distinguishes *Oudemansiella fibrillosa* from *Armillaria.*

Under the light microscope the basidiospore wall is very thick and multiple layered (Fig. 1). It appears the outer basidiospore wall becomes more loosely attached as the basidiospores mature (compare Figs. 9 and IO), thus when the basidiospores are placed under the vacuum of a scanning electron microscope, this outer wall layer wrinkles. Such wrinkling is not obvious under the light microscope. This wrinkling of the outer basidiospore wall with maturity

(Fig. 10) for *O. fibrillosa* is similar to the textured basidiospore surfaces found in *Oudemansiella* and *Xerula* (Pegler and Young, 1986; Singer, 1986).

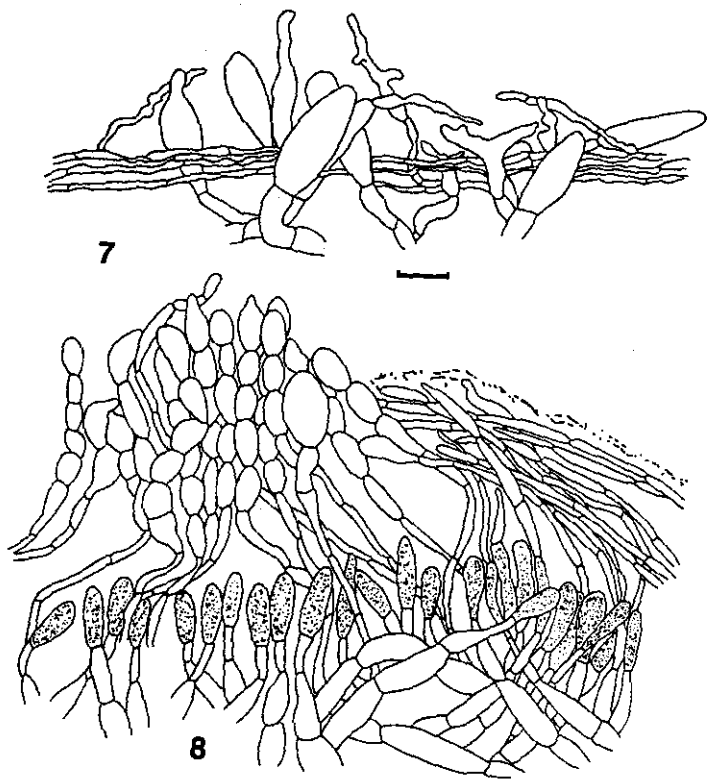
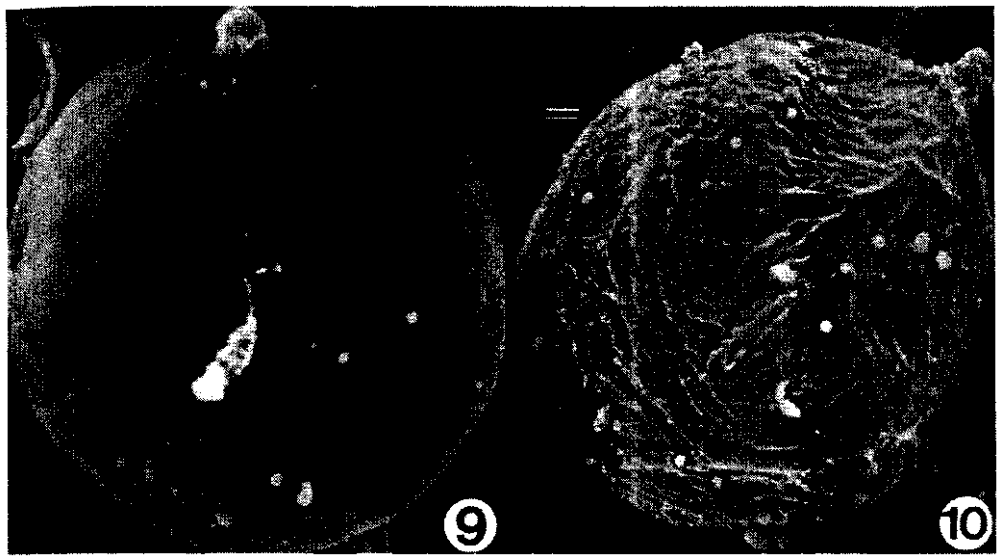


Fig. 7. *Oudemansiella fibrillosa* (HOLOTYPE), pileipellis. Fig. 8. *Oudemansiella canarii,* T. J. Baroni 8083, pileipellis. Scale bar = 20 µm.

Comparing the recent literature on Oudemansiella (Pegler and Young, 1986; Singer, 1986; Yang and Zang, 1993) it is clear that 0. fibrillosa belongs in Subgenus Oudemansiella Section Oudemansiella. From 0. canarii it differs by lacking the wart-like brownish plaques or squamules on the pileus, by possessing appressed brown fibrillose scales on the pileus, by producing cylindric, ventricose or narrowly clavate thin-walled cheilocystidia from a gelatinized lamella edge, and by the less complex pileipellis construction (compare Fig. 7 and Fig. 8). Several other additional features further differentiate 0. canarii and 0. fibrillosa. The pleurocystidia in 0. fibrillosa can range up to 250 µm in length versus the 180 µm reported for 0. canarii (Pegler, 1983), and the pleurocystidia for *O. fibrillosa* are strikingly more thick-walled. *O. fibrillosa* lacks clamp connections while *O. canarii* has clamp connections. *O. yunnanensis* Z. L. Yang and Zang, from southwest China (Yang and Zang, 1993), has a white, glabrous, viscid pileus and much larger basidiospores, 24-38 x 23-33 µm. *O. australis* Stev. and G. Taylor, from New Zealand, also has a white pileus, rugulose and intervenose lamellae, and is terrestrial with a subterranean pseudorhiza which indicates this taxon is most likely a Xerula.



Figs. 9110. Oudemansiella fibrillosa (HOLOTYPE) 9. Young basidiospore with smooth outer wall layer. 10. Older, mature basidiospore with wrinkled outer spore wall layer. Scale bars = 1 µm.

O. canarii, the most common pantropical species of *Oudemansiella,* has a large number of synonyms (Dennis, 1952; Pegler, 1983; Singer, 1986), but none of these appear to match *O. fibrillosa* (also see the detailed account of Dennis, 1952). The illustration of the pileipellis of *O. platensis* (Speg.) Speg. (= *O. canarii* fide Horak, 1968) is somewhat similar to that presented here for *O. fibrillosa* (Fig. 7), but *O. platensis* lacks fibrils on the pileus surface, lacks cheilocystidia and lacks a gelatinized lamella edge (Spegazzini, 1881; Horak, 1968). Since Horak (1968) did not actually study the type collection of *O.* platensis, an examination of the type of *O. platensis* was conducted to try to determine the make-up of the pileipellis and the anatomical structure of the lamella edge. Unfortunately, the tissues would not revive sufficiently to make such observations, and contaminant hyphae were also present obscuring details.

The anatomical structure of the pileipellis of *O. canarii,* as described by Singer (1945), Dennis (1952), and Pegler (1977 and 1983), needs some further descriptive information, clarification, and illustration, which we provide here from a study of collection TJB 8083 made in Florida. The pileipellis of *O. canarii* is complex and three layered. The suprapellis, which makes up the velar squamules, is composed of globose to pyriform chains of cells (a polycystoderm). The mediopellis is a thick layer of cylindrical, mostly gelatinized, loosely interwoven and ascendant hyphae embedded in a gelatinous matrix. Finally the subpellis is composed of an even or disrupted hymeniform layer of clavate cells with pale brown, plasmatic pigment (Fig. 8). The cells forming the subpellis can collapse and then this layer is difficult to demonstrate. This highly complex structure of the pileipellis for 0. canarii is distinctive and therefore should be useful when trying to identify or confirm dried material.

Pouzarella caribaea T. J. Baroni and B. Ortiz, sp. nov.

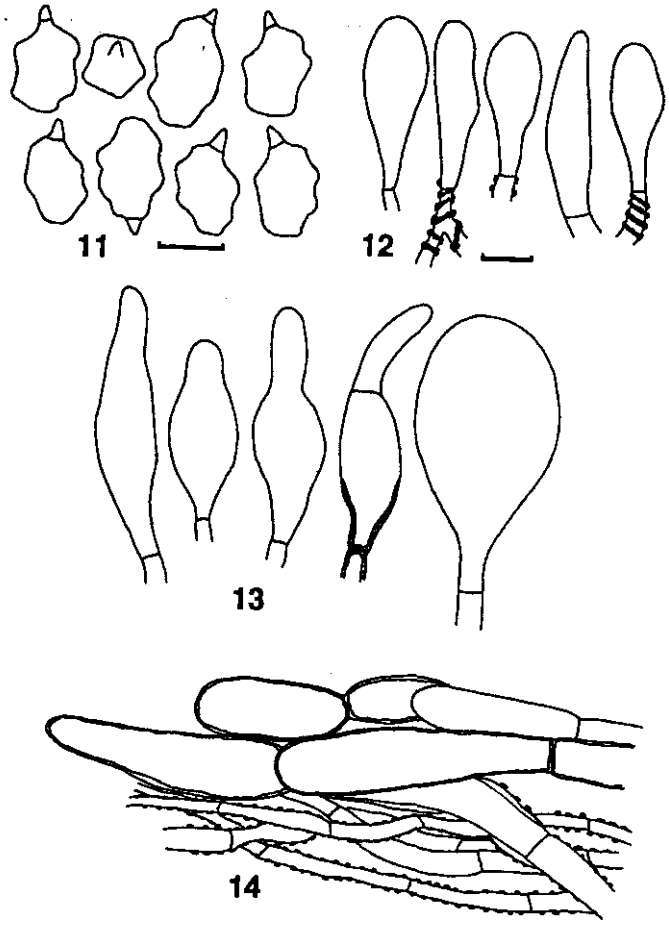
Figs. 11-14

Pileus brunneolo-griseus, 5-11 mm latus, ubique pubescens vel tomentosus; margo translucens striatus. Lamellae brunneolo-griseae, adnatae vel dente decurrenti adnatae, distantes. Stipes brunneus vel brunneolo-griseus, ad apicem 1-3 mm latus. 20-26 mm longus, aequus, ubique pubescens, ad basem strigosus. Basidiosporae 12.5–16.5x 8.3-11.3 µm, Q = 1.48, angulatae, 6-8 prismaticae. Basidia (2-)4-sterigmatophora; basidia "abortiva" abundantia pigmento fuscato-bruneo impleta. Trama lamellaris fuscato-brunnea, e hyphis parallelis cylindricis valde resinosis encrustatis composita. Cheilocystidia plerumque inflata, clavata 20-68 x 12-22 µm; parietes vivide brunnei incrassati pigmentosi. Pleurocystidia ignota. Pileipellis brunnea, plerumque repens atque cellulis ultimis elevatis praedita, prope discum gradatim trichodermium formans, cellulis ultimis (pilocystidiis) atque cellulis sustinentibus inflatis, fuscissimo-brunneis valde pigmento encrustatis, 50-86 x 1630 µm praedita, cellulis inflatis in subpelle carens. Stipitipellis brunnea, e hyphis fusco-brunneis encrustatis cylindricis 3.2-7.2 µm diametro composita, parietibus brunneis per pigmentum intraparietale praedita, cystidia ventricosa vel ventricoso-rostrata vel late clavata vel cylindrica 54-102 x 14-54 µm. Fibulae nullae.

Pileus brownish gray, 5-11 mm broad, conic, pubescent or tomentose overall, margin translucent-striate, becoming rimose. ***Lamellae*** brownish gray, adnate or adnate with a decurrent tooth, distant, with 2-3 tiers of lamellulae, 1-2 mm broad, serrate on margin. ***Stipe*** brown or brownish gray, 1-3 mm broad at apex, 20-26 mm long, equal, pubescent overall, with strigose base, hollow. ***Basidiospores*** (Fig. 11) 12.5-16.5 x 8.3-1 1.3 µm (n = 31, L^m = 14.8 ± 0.92, W^m = 9.96 ± 0.70, Q = 1.26-1.65, Q^m = 1.48), strongly angled in profile and face views with 6-8 facets, angled in polar view with 5 facets, walls non-reactive in Melzer's reagent, cyanophilic. ***Basidia*** (2-) 4-sterigmate, subclavate or clavate, 50-60 x 14-20 µm, with abundant "aborted" basidia filled with dark brown pigment. ***Lamella trama*** dark brown, of parallel, cylindric, heavily resinous encrusted hyphae, 4-8 µm in diam, subhymenium pseudoparenchymatous. ***Cheilocystidia*** (Fig. 12) abundant, forming a sterile edge, mostly inflated clavate, with deep brown pigmented walls which are very slightly thickened, 40-68 x 12-22 µm. ***Pleurocystidia*** absent. ***Pileus context*** dark brown, composed of interwoven, cylindric, heavily dark brown encrusted hyphae. ***Pileipellis*** (Fig. 14) brown, mostly repent, but with some end cells upturned and inflated forming pilocystidia, making a transition to a trichoderm near the disc, pilocystidia and supporting cells inflated, thin-walled, pale brown near margin, with thick walls near middle and disc, most cells very dark brown and heavily pigment encrusted, 50-86 x 16-30 µm, subpellis/context composed of cylindrical, encrusted hyphae, inflated cells not present. ***Stipitipellis*** brownish layer of repent, dark brown encrusted, cylindrical hyphae, 3.2-7.2 µm in diam, walls also brownish from intraparietal pigment, producing abundant, single or clustered, thin-walled or walls somewhat thickened over basal area, pale brown (intraparietal pigment) caulocystidia (Fig. 13), 54-102 x 14-54 µm, typically ventricose or broadly ventricose or ventricose-rostrate, some broadly clavate, some cylindrical, occasionally with a septum at base of rostrum. ***Clamp connections*** absent.

Gregarious on soil. October.

Material examined: Puerto Rico: Adjuntas, Guilarte State Forest. On bare soil, under the first rest stop lean-to on the main trail to the Monte Guilarte Peak. 1062 m, October, 1995, B. Ortiz #37 (BOS #37) **(MAPR, HOLOTYPE).**



Figs. 11-14. Pouzarella caribaea (HOLOTYPE). Fig. 11. Basidiospores. Fig. 12 Cheilocystidia. Fig. 13. Caulocystidia. Fig. 14. Pileipellis. Scale bar for Fig. 11 = 10 µm, scale bar for Figs. 12-14 = 20 µm.

Commentary: This species belongs in Section Dysthales, Subsection Dysthales of Pouzarella sensu Mazzer (1976) because of its tomentose pileus surface and thin-walled, non-setiform caulocystidia. Pouzarella caribaea appears most phenetically similar to *P. dysthales* and *Entoloma dysthaloides* Noordeloos. *P. caribaea* differs from *P. dysthales* by shorter basidiospores with a smaller Q value, by the larger, mostly ventricose shaped caulocystidia. and by the differently shaped cheilocysitidia. The basidiospores in *P. dysthales* range from (13.5-)14-19.5(-21.5) x (7.4-)7.9-10.3 (-11) µm, with a Q of (1.5-)1.6-1.8-2.1, while the basidiospores of P. caribaea are 12.5-16.5 x 8.3-1 1.3 µm with a Q of 1.26-1.65. The caulocystidia in *P. dysthales* at the apex of the stipe are 20-55 x 10-33 µm, globose to "cylindrico-inflated" and 1-3 celled (from Noordeloos, 1979), while the caulocystidia of *P. caribaea* are 54-102 x 14-54

µm and mostly ventricose, broadly ventricose or ventricose-rostrate. Finally, the cheilocystidia of *P. caribaea* do not become globose, subglobose, obpyriform, nor catenulate as seen in *P. dysthales* (Mazzer, 1976; Noordeloos. 1979 & 1992).

Noordeloos (1979) described *E. dysthaloides* from Europe and considered it similar to *P. dysthales* but differing mainly by smaller basidiospores which are 10.5-13.5(-15) x 6.8-8.2(-8.7) µm with a Q range of 1.4-1.6-1.8 for *E. dysthaloides.* Therefore, *E. dysthaloides* produces smaller basidiospores than *P. caribaea.* In addition, the caulocystidia of E. dysthaloides are conical-attenuate, clavate or rarely slightly swollen (Noordeloos, 1979). Thus the caulocystidia of *E. dysthaloides* differ markedly from the ventricose or ventricose-rostrate caulocystidia typical of *P. caribaea.*

As with most species of *Pouzarella, P. caribaea* appears to be rather rare and is currently known only from the type locality.

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