

An interesting record of *Lactarius* from the Gulf and Caribe

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Summary: *Lactarius paradoxus* is recorded from a forest of *Pinus pseudostrobus* in the central region of the Gulf area of Mexico and in a forest of *P. caribaea* with *Roystonea regia* in Cuba. On the basis of the reports known at present, its area of distribution seems to be in Eastern North America, throughout the Gulf of Mexico and the Caribe. A complete description of the species is presented.

Zusammenfassung: *Lactarius paradoxus* wurde in einem *Pinus pseudostrobus*-Wald im Zentralbereich der mexikanischen Golfregion und in einem *Pinus caribaea*-Wald mit *Roystonea regia* auf Kuba nachgewiesen. Nach der derzeit bekannten Fundmeldungen scheint sein Verbreitungsgebiet das östliche Nordamerika sowie das gesamte Gebiet um den Golf von Mexiko und die Karibik zu umfassen. Vorgelegt wird eine vollständige Beschreibung der Art.

Introduction

The Caribe and the Gulf area of Mexico and the United States are interesting areas for the study of the genus *Lactarius*. The confluence of northern and southern forests results in a mixture of conifers from the north and broad-leaved trees from the south. While a number of native species of *Lactarius* prosper in these sites, several members of the genus which are associated with ectotrophic trees also occur. SINGER (1975) stated that „...The genus *Lactarius* ... becomes rare in individuals and in species as we go south from the Gulf area. Only *Lactarius neotropicus* Sing. and *L. panuoides* Sing., were fully described from the Gulf area ...“. Several additional species have been recorded in the last ten years in the Central area of the Gulf (Tamaulipas and Veracruz) in montane broad-leaved forests, as well as from tropical lowlands (GUEVARA et al. 1987, MONTOKA et al. 1990, 1996, MONTOKA & BANDALA 1996). Other reports of *Lactarius* from different localities of the Gulf and Caribbean areas are those by BEARDSLEE & BURLINGHAM (1940), BURLINGHAM (1945), MURRILL (1948), DENNIS (1970), SINGER (1975), HESLER & SMITH (1979), PEGLER & FIARD (1979), Pegler (1983), and SINGER et al. (1983) among others.

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Lactarius paradoxus BEARDSLEE & BURLINGHAM (1940) was described from Florida and, according to the records of HESLER & SMITH (1979) is widely distributed throughout Eastern U.S.A. and SE Canada. This record of the species from the Gulf area of Mexico and Cuba results the southern most known to date.

Materials and method

This study was based on collections made by the authors in Mexico and Cuba. The specimens were deposited at the herbaria of Instituto de Ecología (Mexico) (XAL) and Instituto de Ecología y Sistemática (Cuba) (HAC). The holotype of *Lactarius paradoxus* from Florida (NY) was also examined. Macroscopic data was based on fresh basidiomata. Color codes indicated in brackets correspond to those of KORNERUP & WANSCHER (1978). Microscopic analysis was carried out on dried specimens. Sections of the basidiomata were mounted in 3% KOH and in 1% congo red. The basidiospores were observed in Melzer's reagent and were measured in side view, the size of the basidiospores and height of the ornamentation were calculated separately. Measurements of spores and coefficient $Q = l/w$ are expressed in min. and max. values, including the mean (in bold type) ± 2 standard deviation. Photomicrographs of the basidiospores were prepared with a scanning electron microscope.

***Lactarius paradoxus* Beardslee & Burlingham**, Mycologia 32: 586, 1940 Figs. 1–4

Description: Pileus 43–70 mm diam, plano-convex to plane, becoming depressed on the disc to nearly subinfundibuliform, glabrous, with concentric canescent zones more conspicuous when drying, viscid, indigo blue (20D3–20E3) to grayish-blue, finally fading to pale blue with yellowish–straw (4A3–3A3) stains, greenish when bruised; margin incurved or slightly incurved, translucent striate, initially becoming vinaceous (11B3–11B4), finally reddish-vinaceous to pinkish-vinaceous (9D5–9D6) when mature. Lamellae close, sometimes dichotomously branched towards the stipe, adnate, lamellulae present, pinkish-vinaceous (8B3), often with salmon to ochraceous (6A2–6B3) or vinaceous-salmon (7A3–8A3) tinges, greenish (25E5–25E6) when bruised. Stipe 20–35 x 12–20 mm, subcylindric to attenuate towards the base, dry, superficially scrobiculate, rugose to fibrose; pinkish-vinaceous (9C4–9D5) to vinaceous (10B4–10C4 to 12B4), often with bluish shades, staining greenish (25E7); base with whitish rhizomorphs. Latex blood red (9E8–9E7), scant, slightly bitter. Context pinkish-white on exposure, vinaceous and staining blue near the pileus cuticle, dark vinaceous near the stipe cuticle, taste slight to bitter, somewhat astringent, odor mild. Spore print yellow-ochre (5B5–5B6). KOH on pileus and context negative.

Basidiospores ellipsoid, reticulum more or less complete with isolated verrucae 0.8–1 μ m high, bands 0.6 μ m width, suprahilar plage inamyloid or at times slightly ornamented; size:

7.2–**8.7**–9.6 x 5.6–**6.1**–7 (–7.2) μ m, $Q = 1.25$ –**1.41**–1.66(–1.71) ($n = 25$) (holotype)

7.2–**8**–8.8 x 5.6–**6.1**–6.4 μ m, $Q = 1.12$ –**1.31**–1.42 ($n = 25$) (Montoya 3212)

8–**8.1**–8.7(–8.8) x 5.6–**6.1**–6.4 μ m, $Q = 1.25$ –**1.32**–1.42 ($n = 25$) (Bandala 2726)

7.2–**8.4**–9.6 x 5.6–**6.2**–7 (–7.2) μ m, $Q = 1.25$ –**1.35**–1.54(–1.57) ($n = 25$) (Montoya 2183).

Basidia 32–48(–50.4) x 8–8.8 (–10.4) μ m, subclaviform, tetrasporic, sterigma (3.2–)4–7.2 μ m length. Cystidia absent. Pseudocystidia (1.6–)2.4–4 μ m in diam, sinuous, at times subfusiform with rounded apex, yellowish, with refringent contents, projecting beyond the hymenial trama. Pileipellis an ixocutis with loosely arranged hyphae, more compact towards the context, 1.6–4 μ m in diam, hyaline to yellowish, some with refringent contents, 4–4.8 μ m in diam. Pileus context with hyphae 2.4–4.8 μ m in diam, hyaline to yellowish; laticifers 4–6.4 μ m in diam, yellowish-brown;

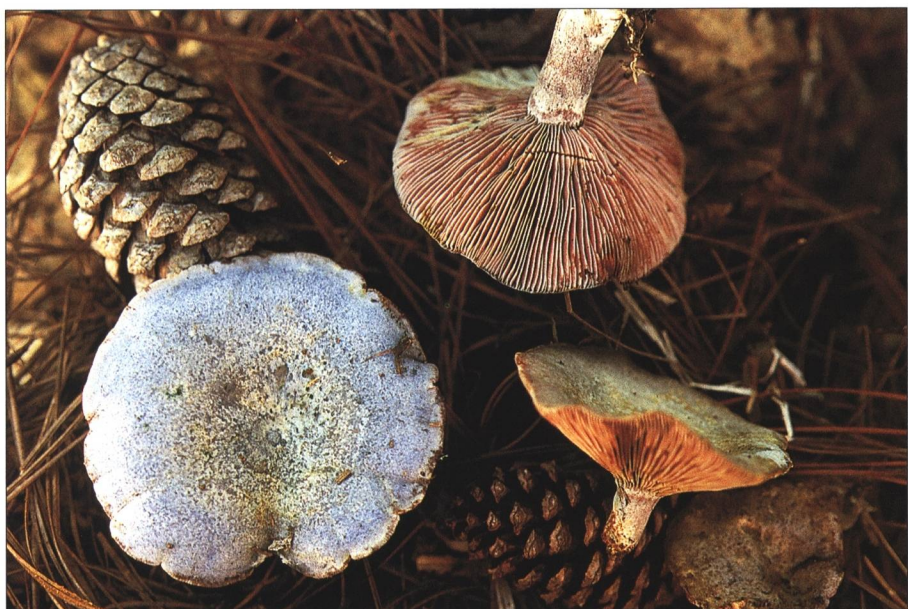


Fig. 1: Basidiomata of *Lactarius paradoxus* (Bandala 2726).



Fig. 2: Basidiomata of *Lactarius paradoxus* (Montoya 3212).

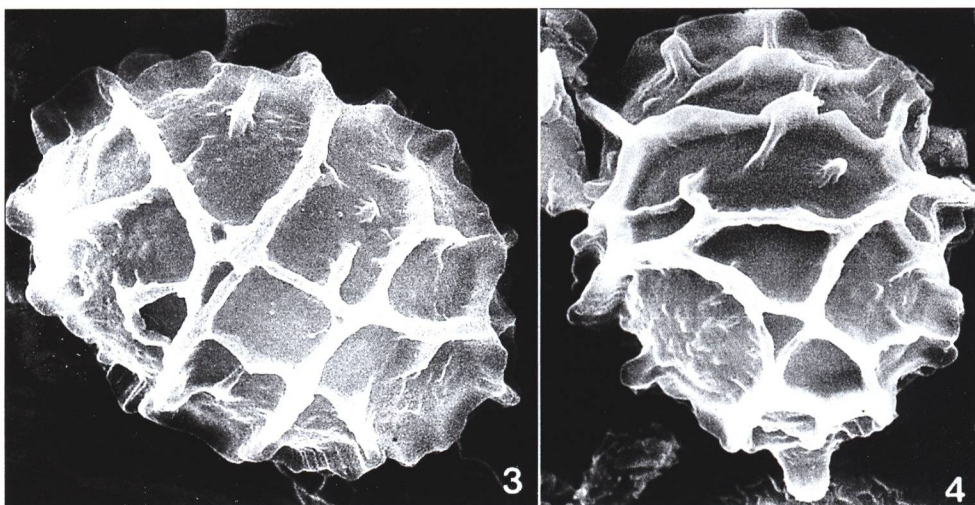


Fig. 3–4: Basidiospores of *Lactarius paradoxus* under SEM (3: holotype; 4: Bandala 2726; both $\times 10,000$).

sphaerocysts $8\text{--}20\text{ }\mu\text{m}$ in diam, hyaline to yellowish. Hymenial trama with hyphae $3.2\text{--}6.4\text{ }\mu\text{m}$ in diam, yellowish; laticifers $4.8\text{--}8\text{ }\mu\text{m}$ in diam, honey-yellowish.

Habitat: Solitary to subgregarious in *Pinus pseudostrobus* Lindl. forest (Mexico) and in *P. caribaea* Morelet forest with *Roystonea regia* O.F. Cooke (Cuba).

Studied material: CUBA: Candelaria, Reserva de la Biósfera Sierra del Rosario, Estación Ecológica, 10 Nov. 1994, Bandala 2726 (XAL; HAC). MEXICO: Veracruz, Municipio de Jilotepec, near El Esquilón, 6 Dic. 1993, Montoya 2182, 2183; 13 Jul. 1995, Montoya 3212 (XAL). U.S.A. Florida, Old Faithful, 16 Nov. 1939, Burlingham s.n. (NY, HOLOTYPE).

Discussion

Although the color of the pileus is similar to that of *Lactarius indigo* (Schw.) Fr. *L. paradoxus* can be distinguished by the color of the lamellae and the latex. HESLER & SMITH (1979) suggested that the reddish tinges of the pileus and stipe should be corroborated as we have in this study. The Mexican and Cuban specimens clearly demonstrated this character, especially at stipe apex. METZLER & METZLER (1992) included a good illustration of *Lactarius paradoxus* in their field guide and also indicated the presence of these distinctive colors. The rhizomorphs at the base of the stipe also seem to be a reliable field character.

The species has been found in association with either *Quercus* or *Pinus*. In the type locality BEARDSLEE & BURLINGHAM (1940) noted that this species is found „... in somewhat grassy places under cabbage palmetto and live oaks in a fairly shady spot in rich soil, or in lawns having similar conditions ...“ MURRILL (1948) reported it from Gainesville (Florida) in association with red oaks or in dry mixed woods of oak and pine. SMITH (1953) collected it under *Pinus banksiana* Lamb. at Douglas Lake, Michigan and mentioned that this record of the species in northern pine forests resulted to be „curious.“ HESLER & SMITH (1979) reported it „... under Jack pine on sandy soil in Michigan ... also known from Tennessee (under pine), Alabama, Mississippi, Texas, New

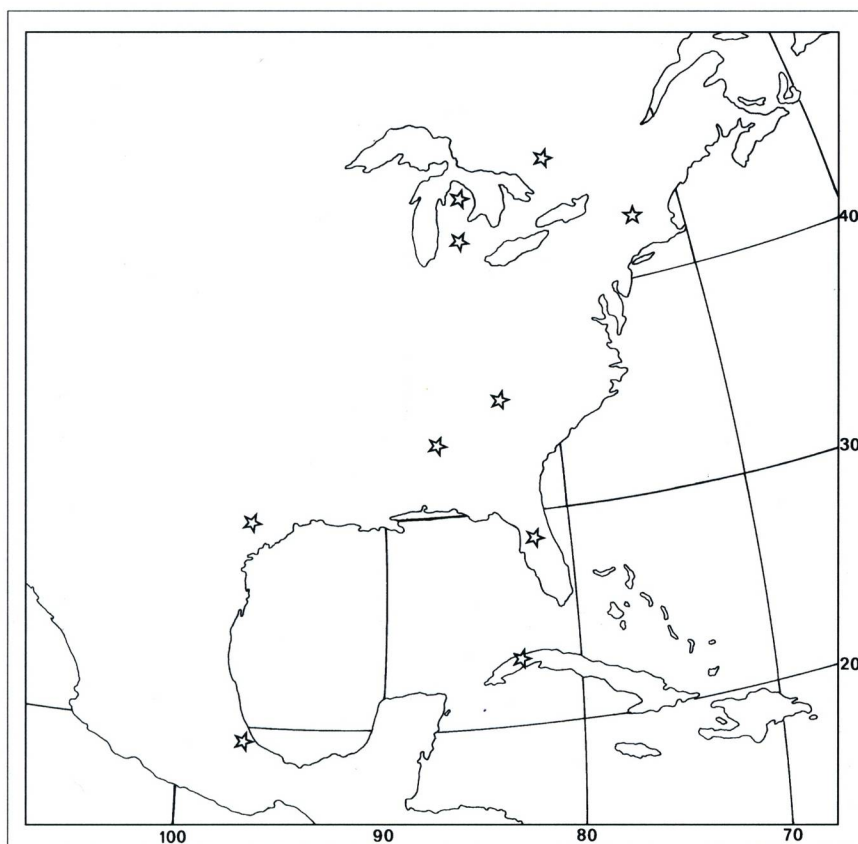


Fig. 5: Representation of the known distribution of *Lactarius paradoxus* (stars indicate approximate sites of collection).

York and Ontario in Canada ...“ In Mexico the species is found under *Pinus pseudostrabus* and in Cuba in a forest dominated by *P. caribaea* with scattered *Roystonea regia* („palma real“). The known distribution of *Lactarius paradoxus* is represented in Fig. 5. These records indicate that the major distribution of *L. paradoxus* occurs in Eastern North America including the Gulf area as well as part of the Caribe. Its presence in *Pinus* forests from Cuba and Mexico may mark its southern range.

The report of *Lactarius paradoxus* from Cuba is especially interesting, since the genus is known poorly in this country. KREISEL (1970, 1971) pointed out the important role of several genera of macromycetes, including *Lactarius*, with ectotrophic forest trees in Cuba and indicated the scarce knowledge of the genus in the country. Only one specimen of *Lactarius* was recorded by BERKELEY & CURTIS (1868) from Cuba and they commented that „... this is clearly a species of *Lactarius* from the large echinulate spores; but without notes I can not identify it ...“ PEGLER (1987) suggested that BERKELEY & CURTIS material (K) belongs to a species of section *Dulces* Heim ex Sing.

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