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Records of lignicolous agaricoid fungi (Agaricales, Basidiomycota) from Mexico

Registro de hongos agaricoides (Agaricales, Basidiomycota) lignícolas de México

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ABSTRACT

The diversity of lignicolous agaric fungi is poorly known in Mexico. This group of fungi is responsible for the primary decomposition of wood, providing mineral elements that allow the nutrient cycles. The objective of this work was to reveal and confirm some lignicolous species present in Mexico with both morphological and molecular data. Thirteen species of eight genera, belonging to six families of lignicolous agaricoid fungi of the Agaricales were recorded, discussed, and illustrated, of which 11 are new records for Mexico. Considering our results, we confirm that Mexico is a Nearctic and Neotropical convergence zone of fungal taxa from both regions.

Keywords — *Anthracophyllum; Collybiopsis; Hohenbuehelia; Mycena; Pholiota*.

RESUMEN

La diversidad de hongos agaricoides lignícolas en México es poco conocida. Este grupo de hongos es el responsable de la descomposición primaria de la madera,

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aportando elementos minerales que permiten los ciclos de nutrientes. El propósito de este estudio fue revelar y confirmar, con datos tanto morfológicos como moleculares, algunas especies lignícolas presentes en México. Trece especies lignícolas de ocho géneros, pertenecientes a seis familias de hongos agaricoides de los Agaricales, fueron registradas, discutidas e ilustradas, de las cuales 11 son nuevos registros para México. Con base en nuestros resultados, confirmamos que México es una zona de convergencia neártica y neotropical de taxones fúngicos de ambas regiones.

Palabras clave — *Anthracophyllum; Collybiopsis; Hohenbuehelia; Mycena; Pholiota*.

INTRODUCTION

This work was focused on lignicolous fungi to honor the life and academic work of Mario Rajchenberg, an excellent Argentine mycologist, who dedicated his life mainly to research on lignicolous fungi and published a great number of papers about them (e.g., Rajchenberg, 1982, 1994, 2006; Rajchenberg *et al*., 2011, 2015, 2019; Rajchenberg & Pildain, 2012).

Lignicolous fungi are essential in the dynamics of forest ecosystems, since they are responsible for wood decay and organic matter reintegration (Lonsdale *et al*., 2008; Copot & Tnase, 2019). Also, these fungi represent a significant part of the fungal diversity; for instance, in a study carried out in a Mexican forest, this trophic group reached 58% from the total of the fungi present (García-Saldaña *et al*., 2019).

As in many parts of the world, the diversity of fungi in Mexico is poorly known. Guzmán (1998) calculated that it could be a figure of around 200,000 spp. of fungi in the country, of which, only less than 3.5% (approx. 7,000 spp.) were known. Then, 16 years later, Aguirre-Acosta *et al*. (2014), considered 5% (10,000 spp.) of the species known in Mexico. Thus, there is an urgent need to make taxonomic and inventorying studies to know this missing diversity.

Recently, it has been found with molecular data that many species previously considered to have a wide distribution are not present in North America. For example, Thorn *et al*. (2020) found that *Gymnopilus junonius* (Fr.) P. D. Orton [commonly recorded as *G. spectabilis* (Weinm.) A. H. Sm.] does not occur in North America, but *G. luteus* (Peck) Hesler, *G. subspectabilis* Hesler, *G. ventricosus* (Earle) Hesler, and *G. voitkii* Malloch & Thorn do.

On the other hand, not every species found in Mexico are undescribed. In this country, two biogeographical regions converge, the Nearctic and Neotropical, thus it is possible to found both Nearctic and Neotropical taxa, mainly in the transition zone (Morrone, 2019). In this way there are many species, already described in other parts, especially in North America and South America, which could be present in Mexico. This work was especially designed to uncover some of these species present in Mexico. Here, we studied 13 species of eight genera, belonging to six families of lignicolous Agaricales. Some of the species included in this work were previously studied only with morphology, thus, the goal of the present work was to confirm with molecular data if they correspond with previous determinations.

The following genera were studied:

Anthracophyllum Ces. (Omphalotaceae) has 12 species according to He *et al.* (2019), wood rotting fungi, normally found in the tropics or near "the warmer belt of the temperate zones" (Singer, 1949). To our knowledge, it was not previously cited from Mexico.

Collybiopsis (J. Schröt.) Earle (Omphalotaceae) was recently accepted as the current name for a large clade of non-typical *Gymnopus*, which include 53 taxa (Petersen & Hughes, 2021; Kim *et al.*, 2022; Bartrop & Haelewaters, 2022). In Mexico, three species have been cited by Villarruel-Ordaz (2006): *C. confluens* (Pers.) R. H. Petersen, *C. peronata* (Bolton) R. H. Petersen, and *C. subnuda* (Ellis ex Peck) R. H. Petersen, all of them under the name *Collybia* (Fr.) Staude.

Hohenbuehelia Schulzer (Pleurotaceae) has c. 50 species according to He *et al.* (2019). In Mexico, the genus only has been studied under morphology. Gándara & Ramírez-Cruz (2005) cited 11 species to the country; however, their work was mainly focused on Veracruz state.

Mycena (Pers.) Roussel (Mycenaceae) is a large genus, having c. 600 species according to He *et al.* (2019), mainly saprobic and with a wide worldwide distribution, commonly growing in leaflitter, decaying logs, twigs, lignicolous on the bark of living trees, or among mosses or grasses (Aravindakshan & Manimohan, 2015; Aronsen & Læssøe, 2016). In Mexico, 48 taxa have been cited (Herrera & Guzmán, 1972; Bandala-Muñoz *et al.*, 1988; Cortés-Pérez *et al.*, 2015, 2017, 2019a, 2019b), most studied only morphologically.

Omphalotus Fayod (Omphalotaceae) has six species according to He *et al.* (2019). They are white rotting fungi with four species known in North America: *O. illudens* (Schwein.) Bresinsky & Besl, *O. mexicanus* Guzmán & V. Mora, *O. olivascens* H. E. Bigelow, O. K. Mill. & Thiers, and *O. subilludens* (Murrill) H. E. Bigelow (Kirchmair *et al.*, 2004). From Mexico, according to Cifuentes (2008), the species recorded are *O. mexicanus*, *O. olivascens*, and *O. olearius* (DC.) Singer.

Pholiota (Fr.) P. Kumm. (Strophariaceae) has c. 157 species (He *et al.*, 2019). There are at least 10 species of *Pholiota* recorded for Mexico (Cifuentes, 2008). However, all of them were determined just with morphology and many under European names. For example, Montoya-Esquivel *et al.* (2001) cited *P. lenta* (Pers.) Singer from Tlaxcala, a European species, which most likely is not found in Mexico.

Strobilurus Singer (Physalacriaceae) has 11 species, usually occurring on cones or branches of various conifers and seed pods of *Magnolia* L. (Qin *et al.*, 2018). In Mexico, only *S. tenacellus* (Pers.) Singer has been cited by Cifuentes (2008).

Tetrapyrgos E. Horak (Marasmiaceae) has 18 species (He *et al.*, 2019). Recently, Komura *et al.* (2020) described six species from Brazilian Amazon. In Mexico, only *T. nigripes* (Fr.) E. Horak sensu lato has been cited (Cifuentes, 2008).

MATERIAL AND METHODS

Morphology

The specimens were collected in different localities in Mexico, in the states of Jalisco, Oaxaca, and Veracruz, between 1985 and 2021, and deposited at the Herbarium IBUG, with some loans requested to XAL. Macroscopic descriptions were based on fresh or dry material, according to Largent *et al*. (1977) and Lodge *et al*. (2004). In the descriptions, color codes are from Kornerup & Wanscher (1978). Microscopic features were observed under a Carl Zeiss Axioscope 40 or PrimoStar 3 light microscopes. Images were captured using Zen 2.3 lite software on the same microscopes. At least 30 structures were measured from each mature specimen. The material was mounted in 5% KOH, 1% Congo red, and Melzer's reagent. Colors in the microscopic structures are the ones seen in KOH. The following notations were used for basidiospores measurements: (a–) b–c (–d), where "a" is the lowest value, "b–c" covers 90% of the values, and "d" is the highest value; Q = ratio between the length and width of the spores, indicated as a range of variation. Previous literature, especially Herrera & Guzmán (1972), Bandala-Muñoz *et al*. (1988), Cifuentes (2008), Sánchez-Jácome & Guzmán-Dávalos (2011), and many specific works according to the genera, were reviewed to check the known distribution of the species in Mexico.

Extraction, PCR, and DNA sequencing

Total genomic DNA was extracted from dried specimens, using a modified salt-extraction method with 1% PVP (Aljanabi & Martinez, 1997). ITS was amplified by PCR. Each 53 μL PCR reaction contained 50 μL of PCR mix [35 μL of PCR water, 6 μL of 10X Taq reaction buffer without MgCl2, 3 μL of 50 mM MgCl2, 3 μL of 5 mM dNTP, 3 μL of 2 μg/μL Bovine Serum Albumine (BSA)], 0.5 μL of each 10 μM primer, 0.15 μL of Platinum™ Taq DNA Polymerase High Fidelity (5U/μL), and 2 μL of DNA template. The primer pairs ITS1F/ITS4S were used to amplify the entire ITS (Gardes & Bruns, 1993; Kretzer *et al*., 1996). The primer pairs ITS1F/ITS2 and ITS5/ITS5.8S were used to amplify the ITS1 and ITS3/ITS4B or ITS3/ITS4 to amplify the ITS2 (Vilgalys & Hester, 1990; White *et al*., 1990; Gardes & Bruns, 1993). PCR amplifications were performed on an ESCO Swift MaxPro thermocycler with PCR cycling conditions described (Guzmán-Dávalos *et al*., 2003). PCR products were cleaned using Illustra GFX columns (GE Healthcare). Purified products were sent to the University of Arizona Genetics Core for DNA sequencing.

Phylogenetic analysis

Sequence annotations were made with Chromas Pro 2.1.10 (http://technelysium.com.au/wp/chromaspro/). Sequence assembly and alignments were carried out in MacClade 4.08 (Maddison & Maddison, 2000) or in PhyDE v. 0.9971 (Müller *et al*., 2010), checked by eye and manually corrected when necessary. Gblocks (Castresana, 2000) was used to remove ambiguously alignment regions in all datasets, except to

*Mycen*a, in this case ambiguously alignment regions were excluded manually. Information on the sequences used in each analysis is found in Supplementary Tables 1–8; likewise, the bibliographic citations of exclusive reference to the sequences can be found in the Supplementary Material.

Analyses were performed with Maximum Parsimony (MP), Bayesian inference (BI), and Maximum Likelihood (ML). Heuristic or branch-and-bound searches were implemented in PAUP* 4.0a GUI version for Macintosh (Swofford, 2003), with the following conditions: gaps were treated as missing, initial trees were obtained via stepwise addition, the addition sequence was random or furthest, initial 'maxtrees' setting = 100, automatically increased by 100 when the limit is hit, and branches collapsed (creating polytomies) if maximum branch is zero. In the case of the heuristic searches, the number of replicates was 1000 and branch-swapping algorithm used was tree-bisection-reconnection (TBR) with no reconnection limit. Support for nodes was obtained from 10,000 bootstrap replications through a fast-heuristic search or 1000 bootstrap replications with full heuristic searches, with 10 replicates each, and the same conditions as for the heuristic searches.

The most likely model of evolution was determined using jModelTest 2.1.10 (Darriba *et al.,* 2012). BI were run in MrBayes 3.2.7 (Ronquist *et al*., 2012) or in CIPRESS portal Science Gateway 3.3 (Miller *et al*., 2010). Two independent runs, with two million generations each (except to the *Mycena* dataset, where 10 million were ran), with trees sampled every 100 generations were carried out. The convergence of the runs of the Markov Chain Monte Carlo (MCMC) was also diagnosed in Tracer 1.71 (Rambaut *et al*., 2018). The first 10% of the samples, representing the burn-in phase, were discarded and posterior probabilities (PP) were calculated from a consensus of the remaining tree. For the BI the datasets were partitioned in ITS1, 5.8S, and ITS2 except for *Mycena*. ML analyses were executed in RAxML 7.0.4 (Stamatakis, 2006) or in RAxMLGUI 2.0 (Edler *et al*., 2021) using a GTRGAMMA model and empirical base frequencies, then 1000 rapid bootstrap inferences were performed with all free model parameters estimated by the software. MP and ML bootstrap (BS) values higher than 70% and a PP greater to 0.95 was considered significant. Trees were visualized in FigTree 1.4.1 (Rambaut, 2011).

RESULTS AND DISCUSSION

Thirteen species of eight genera, belonging to six families of lignicolous Agaricales, are here presented in alphabetic order of genus.

Anthracophyllum lateritium (Berk. & M. A. Curtis) Singer,
Lilloa 22: 206 (1951) [1949]
≡ *Xerotus lateritius* Berk. & M. A. Curtis,
J. Linn. Soc., Bot. 10 (no. 45): 303 (1868) [1869]
Figs. 1A, 2A–C, 6

Pileus 3–13 mm diam., sessile, flabelliform to conchate, dorsally attached, margin incurved, crenulate, striate or radially rugose, surface dry, dull, glabrescent, somewhat

Fig. 1. Basidiomata. A) *Anthracophyllum lateritium,* O. Castro Jauregui 1824 (IBUG). B–C) *Mycena luxarboricola*, A. Cortés-Pérez 1812 (XAL). B) General view *in situ*. C) Bioluminescence in the stipe and in damaged parts of the pileus at night. D) *Mycena rebaudengoi*, A. Cortés-Pérez 2041 (IBUG). E) *Mycena semivestipes*, A. Cortés-Pérez 2154 (IBUG). F) *Omphalotus subilludens*, O. Castro Jauregui 2463 (IBUG). G) *Strobilurus conigenoides*, A. Cortés-Pérez 2156 (IBUG). H) *Tetrapyrgos atrocyanea*, A. Cortés-Pérez 2101 (IBUG).

Fig. 1. Basidiomas. A) *Anthracophyllum lateritium*, O. Castro Jauregui 1824 (IBUG). B–C) *Mycena luxarboricola*, A. Cortés-Pérez 1812 (XAL). B) Vista general *in situ*. C) Bioluminiscencia en el estípite y en partes dañadas del píleo, en la noche. D) *Mycena rebaudengoi*, A. Cortés-Pérez 2041 (IBUG). E) *Mycena semivestipes*, A. Cortés-Pérez 2154 (IBUG). F) *Omphalotus subilludens*, O. Castro Jauregui 2463 (IBUG). G) *Strobilurus conigenoides*, A. Cortés-Pérez 2156 (IBUG). H) *Tetrapyrgos atrocyanea*, A. Cortés-Pérez 2101 (IBUG).

rough under the lens, light brownish orange (7C5, 7D5) to dark brown (7F5) near the center. Lamellae distant, few, radiating from the point of union to the substrate, broad, margin smooth, oxide reddish (8D8) to dark brown (8F8) near the center, then dark reddish brown (8F3) when dry. Stipe absent.

Basidiospores (7.2–) 8–9.6 (–11.2) × 4.8–6.4 μm, Q = 1.42–2, ellipsoid to elongate, without germ pore, thin-walled, smooth, hyaline with greenish to bluish or cinnamon brown refringent content, inamyloid. Basidia 29–39 × 6–7.5 µm, 2 (–4) spored, narrowly clavate, with constrictions and undulations, hyaline, with greenish to bluish or cinnamon brown content. Hymenial elements 28–39.5 × 5–8 µm, narrowly clavate to clavate, rarely broadly clavate, sometimes with mucronate to rostrate apex, thin to thick-walled, hyaline, rarely with cinnamon brown refringent content. Hymenophoral trama interwoven, hyphae 2–5 µm diam., thick-walled, with clamp connections, hyaline or with refringent content, intermixed with crystalline structures, cinnamon brown to dark blue. Subhymenium ramose, hyaline. Pileipellis elements 2–3 µm diam., semierect to recurved, with numerous diverticula, thin-walled, hyaline to yellowish. Slides with alcohol liberate abundant reddish brown pigment, then greenish to greyish brown when combined with KOH.

Habit and habitat.— Gregarious to scattered, on dead twigs of *Hippocratea volubilis* L. and *Podocarpus* Pers., in cloud and deciduous tropical forests.

Specimens studied.— MEXICO. Jalisco, Municipality of Casimiro Castillo, cañón de Tentemata, 15–IX–1985, *C. Gómez s.n.* (IBUG); Municipality of San Sebastián del Oeste, approximately 100 m before Potrero de Mulas, 3–X–2020, *O. Castro Jauregui 1824* (IBUG; DNA-BF71); Jardín Botánico Haravéri, 3–X–2020, *O. Castro Jauregui 1835* (IBUG; DNA-BF72).

Remarks.— *Anthracophyllum lateritium* is the most common neotropical species of the genus, known in America from Brazil, Cuba, and in the USA (Florida, Georgia, Louisiana, South Carolina, Texas) (Singer, 1949; Pegler & Young, 1989; Putzke, 2002). The Mexican specimens are macro and micromorphologically similar to this species, characterized by its small and sessile basidiomes, reddish brown pileus, distant and deep brick red to blackish brown lamellae, and bisporic basidia (Singer, 1949; Pegler & Young, 1989). The basidiospores of the Mexican specimens tend to be smaller than those mentioned by Pegler & Young (1989), that referred to 9.5–15 × 5.5–8 µm. Actually, our measures fit better with those reported by Putzke (2002), that found 9.5–12.5 × 5.5–8 µm. We must highlight that it was very difficult to find basidiospores in the three studied specimens; we managed to measure 25 but after many fragments of lamellae mounted on slides. The cells in the hymenium were called by Singer (1949) as "pseudoparaphysis" and by Pegler & Young (1989) as cheilocystidia. They were very abundant, as the basidioles but differentiated as cystidia; thus, we preferred to treat them as hymenial elements.

According to the molecular data, the sequences formed a supported clade (85% ML-BS, 1 PP, 89% MP-BS), with two sequences from the USA of *A. lateritium* (Fig. 6). Another clade with Asian sequences was recovered, one of them (KP757737) named as *A. lateritium*, surely a misidentification because this species is American (Singer, 1949; Pegler & Young, 1989; Putzke, 2002). This is the first mention of the species for Mexico.

Collybiopsis subpruinosa (Murrill) R. H. Petersen, in Petersen & Hughes, Mycotaxon 136 (2): 344 (2021)
≡ *Marasmius subpruinosus* Murrill, N. Amer. Fl. (New York) 9 (4): 266 (1915)
Figs. 2D–H, 7

Pileus approximately 20 mm diam., convex to campanulate, with a depressed center, dry, glabrous, sulcate-striate at the margin, pale yellow (4A3) to yellowish white (2A2), with pink tinges (7A2). Lamellae narrowly adnate, sometimes anastomosing, whitish to beige or yellowish white (2A2), edge entire. Stipe cylindrical, somewhat bulbous, central, white to reddish brown (8D8) or cinnamon brown toward the base, with white basal mycelium, rhizomorphs abundant.

Basidiospores 7.5–10 × 4.2–5.2 μm, Q = 1.5–2.3, ellipsoid to oblong or cylindric, thin-walled, hyaline, guttulate, amyloid. Basidia 26–45 × 7–8 μm, narrowly clavate, thin-walled, hyaline, inamyloid. Pleurocystidia absent. Cheilocystidia 22–61 (–72) × 5.5–14 μm, variable in form, cylindrical, flexuose, clavate, few spheropedunculate, apex rostrate, subcapitate or obtuse, thin-walled, hyaline, inamyloid. Subhymenium ramose, hyphae 1–6 μm diam., hyaline, inamyloid. Hymenophoral trama subregular, hyphae 1.5–12 μm diam., thin to thick-walled (0.5–1 μm thick), hyaline, inamyloid. Pileipellis a cutis, hyphae 2–8 μm diam., diverticulate, thin-walled, hyaline, inamyloid; terminal prostrate elements 20–58 × 4–12 μm, clavate, cylindrical, flexuose, rostrate, few narrowly lageniform, thin-walled, hyaline, inamyloid, scarce. Pileus trama interwoven, hyphae 2–15 μm diam., cylindrical to inflated, thin to thick-walled (0.5–0.8 μm thick), hyaline, with encrusted pigment, inamyloid. Stipitipellis composed by hyphae 1.5–9.5 μm diam., thick-walled (0.5–1 μm thick), hyaline, inamyloid. Caulocystidia 12–94 × 5–11 μm, variable in form, cylindrical, flexuose, clavate, apex rostrate, obtuse, sometimes bifurcated, hyaline, thin-walled, hyaline, inamyloid, in fascicles. Clamp connections present.

Habit and habitat.— Gregarious, on hardwood debris in cloud forest.

Specimen studied.— MEXICO, Veracruz, Municipality of Coatepec, km 6 road Xalapa-Coatepec, Congregación Zoncuantla, 1270 m a.s.l., 14–V–2014, *G. Guzmán 39671* (XAL); 4–II–2015, *G. Guzmán 40742-A* (XAL; DNA-BF90).

Remarks.— *Collybiopsis subpruinosa* is characterized by relatively small basidiomes with plane-convex, rugulose striate, brown pileus, adnate to adnexed, beige lamellae, and a pubescent to tomentose stipe, with a pallid apex and greyish brown toward the base, and strigose basal mycelium; 6.4–8.2 (–9.3) × 3.9–5 (–5.4) μm basidiospores, versiform cheilocystidia, and pileocystidia often in chains of 2–3 cells (Desjardin *et al*., 1999; Martínez & Lechner, 2021). The Mexican collections agree well with *C. subpruinosa*; however, presented smaller cheilocystidia and pileocystidia than those cited (cheilocystidia 25–80 × 5–16 μm, pileocystidia 15–80 × 5–12 μm) by Desjardin *et al*. (1999).

In the ITS phylogeny (Fig. 7), the Mexican sequence resulted in a well-supported clade (100% ML-BS, 1.00 PP, 98% MP-BS) with other samples of the same taxon from India, Madeira, and the USA. This species has a wide distribution, it has been recorded from Argentina, Brazil, Costa Rica, Ecuador, Hawaii, Jamaica, Madeira, New Zealand, Panama, Puerto Rico, and the USA, growing in hardwood

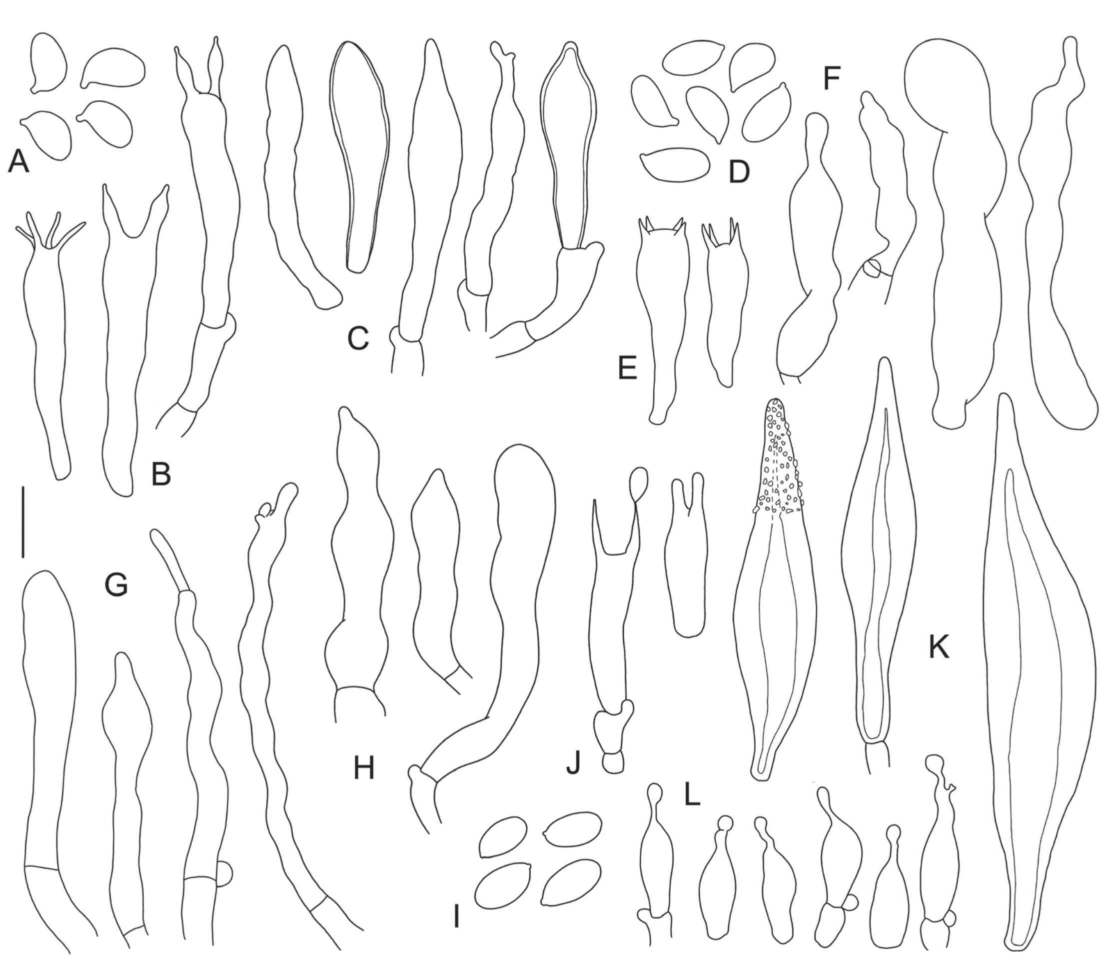

Fig. 2. A–C) *Anthracophyllum lateritium,* O. Castro Jauregui 1824 (IBUG). A) Basidiospores. B) Basidia. C) Hymenial elements. D–H) *Collybiopsis subpruinosa*, G. Guzmán 39671 (XAL). D) Basidiospores. E) Basidia. F) Cheilocystidia. G) Pileocystidia. H) Caulocystidia. I–L) *Hohenbuehelia portegna*, V. Ramírez-Cruz 3498 (IBUG). I) Basidiospores. J) Basidia. K) Pleurocystidia. L) Cheilocystidia. Scale bar = 10 μm.

Fig. 2. A–C) *Anthracophyllum lateritium*, O. Castro Jauregui 1824 (IBUG). A) Basidiosporas. B) Basidios. C) Elementos himeniales. D–H) *Collybiopsis subpruinosa*, G. Guzmán 39671 (XAL). D) Basidiosporas. E) Basidios. F) Queilocistidios. G) Pileocistidios. H) Caulocistidios. I–L) *Hohenbuehelia portegna*, V. Ramírez-Cruz 3498 (IBUG). I) Basidiosporas. J) Basidios. K) Pleurocistidios. L) Queilocistidios. Escala = 10 μm.

litter (Desjardin *et al*., 1999; Song *et al*., 2019; Martínez & Lechner, 2021). This is the first mention of the species for the country, from Veracruz state.

Collybiopsis polygramma (Mont.) R. H. Petersen was the sister group of the clade formed by *C. subpruinosa*, differing in the brown orange, translucent pileus, smaller basidiospores, 6–8.8 × 3.2–4.8 μm, and cylindrical to claviform cheilocystidia and caulocystidia (Mata & Petersen, 2003; Dutta *et al*., 2015).

Hohenbuehelia portegna (Speg.) Singer, Lilloa 22: 256 (1951) [1949]
≡ *Agaricus portegnus* Speg., Anal. Soc. Cient. Argent. 12 (1): 15 (1881)
Figs. 2 I–L, 8

Pileus 5–8 mm diam., convex, dimidiate, margin entire, striated, incurvated, grayish brown (7F3) when young, then light brown (6D4) when mature, margin yellowish white, fibrillose toward the margin and hirsute toward the base, hairs whitish. Lamellae very crowded, edge entire and slightly wavy, white to yellowish white (4A2). Context thin, whitish. Stipe absent.

Basidiospores 8–9.6 (–11.0) × (3.2–) 4.0–4.4 μm, Q = 2–2.4, elongate to cylindrical, without germ pore, thin-walled, with a small apiculus, hyaline. Basidia 24–41.5 × 4.5–5.5 μm, 2–spored, with long sterigmata 4–16 × 0.8–1.6 μm, clavate, hyaline. Pleurocystidia metuloid 32–83 × 8–15 μm, fusiform, lanceolate, with the apex covered with a layer of crystals, thick-walled (0.8–6.4 μm), hyaline. Cheilocystidia 16–25.5 × 4–6.5 μm, lecythiform, apex capitate or some branched, thin-walled, hyaline. Subhymenium ramose, hyphae 2.5–4 μm diam., thin-walled, hyaline. Pileus trama interwoven composed by two layers: 1) 66–400 μm thick, hyphae 1.5–7 diam., hyaline, thick-walled, up to 1.6 μm thick, 2) 60–125 μm thick, hyphae 1.6–2 μm diam., embedded in a gelatinized layer, thin-walled, hyaline. Pileipellis a cutis, 30–50 μm thick; hyphae 2.5–5 μm diam., sometimes erected in groups, with encrusted olive brownish pigment forming bands; terminal hyphae 12–28 × 4–7 μm, thin-walled, hyaline. Clamps connections present.

Habit and habitat.— Gregarious on decayed wood, in medium evergreen forest.

Specimen studied.— MEXICO. Oaxaca, Municipality of Santiago Comaltepec, San Martín Soyolapam, 17°41’40.4”N, 96°16’ 54.6”W, 150 m a.s.l., 30–IX–2017, *V. Ramírez-Cruz 3498* (IBUG; DNA-BF30).

Remarks.— The Mexican specimen fit very well with the macro and micromorphological features described for *Hohenbuehelia portegna*: brown pileus with tomentose to hirsute surface, margin slightly striate, similar size of the hairs in the pileipellis, and hyphae of the pileipellis with brown encrusted pigment (Putzke & Cavalcanti,1995; Silva-Filho & Cortez, 2017). The basidiospores in the Mexican specimen are slightly smaller than those cited by Putzke & Cavalcanti (1995), who found 9.5–12 × 4.5–6.5 μm, and Silva-Filho & Cortez (2017), who reported 7–11.5 × 3–5 μm; however, Singer & Digilio (1951) cited basidiospores most similar in size than our specimens, with 8.3–9.8 (–11.8) μm long [as *Hohenbuehelia atrocoerulea* f. *portegna* (Speg.) Singer]. Another difference is the narrower cheilocystidia compared with those cited by Silva-Filho & Cortez (2017), who pointed out cheilocystidia of 4–13 μm wide.

Our sequence formed a well-supported clade (96% ML-BS, 0.99 PP, 95% MP-BS), with additional sequences from Argentina, Réunion (France), Mexico, and a sequence probably from China (KC505559) (Fig. 8). This species has been cited from Argentina, Brazil, and Mexico; thus, this is the second well-documented record to the country. It was previously recorded from Oaxaca, Mexico, growing in a tropical deciduous forest (Villarruel-Ordaz *et al*., 2021) and now is recorded in medium evergreen tropical forest.

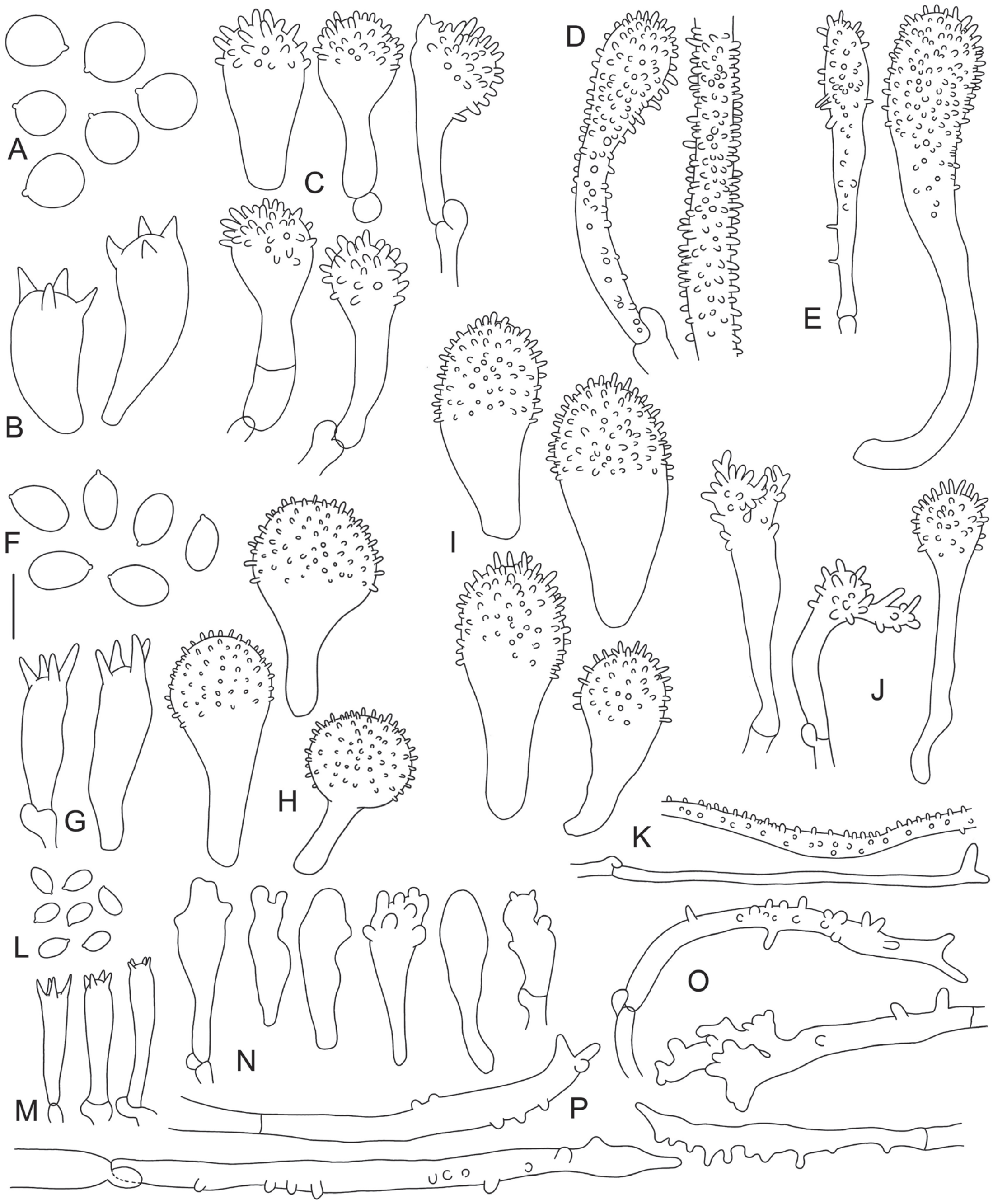

Fig. 3. A–E) *Mycena luxarboricola*, A. Cortés-Pérez 1812 (XAL). A) Basidiospores. B) Basidia. C) Cheilocystidia. D) Terminal element and hypha of pileipellis. E) Caulocystidia. F–K) *Mycena rebaudengoi*, A. Cortés-Pérez 2041 (IBUG). F) Basidiospores. G) Basidia. H) Pleurocystidia. I) Cheilocystidia. J) Terminal elements of pileipellis. K) Terminal element and hyphae of stipitipellis. L–P) *Mycena semivestipes*, A. Cortés-Pérez 2154 (IBUG). L) Basidiospores. M) Basidia. N) Cheilocystidia. O) Terminal elements of pileipellis. P) Terminal elements of stipitipellis. Scale bar = 10 μm.

Fig. 3. A–E) *Mycena luxarboricola*, A. Cortés-Pérez 1812 (XAL). A) Basidiosporas. B) Basidios. C) Queilocistidios. D) Elemento terminal e hifa del pileipellis. E) Caulocistidios. F–K) *Mycena rebaudengoi*, A. Cortés-Pérez 2041 (IBUG). F) Basidiosporas. G) Basidios. H) Pleurocistidios. I) Queilocistidios. J) Elementos terminales de pileipellis. K) Elemento terminal e hifas de stipitipellis. L–P) *Mycena semivestipes*, A. Cortés-Pérez 2154 (IBUG). L) Basidiosporas. M) Basidios. N) Queilocistidios. O) Elementos terminales del pileipellis. P) Elementos terminales del stipitipellis. Escala = 10 μm.

Mycena luxarboricola Desjardin, B. A. Perry & Stevani,
Mycologia 102 (2): 467 (2010)
Figs. 1B–C, 3A–E, 9

Pileus 1–3.5 mm diam., broadly parabolic or hemispherical to campanulate, umbonate, moist to dry, glabrous, pale yellowish white (paler than 4A2), disc and striations pale brown to brownish yellow (5C7, 5F8), margin striate by transparence to sulcate-striate, bruising pale reddish. Context thin, concolorous to the pileus. Lamellae adnate to arcuate, moderately broad, subdistant (10–12), with one series of lamellulae, white (4A1) to pale yellowish (4A3). Stipe 5–18 × 0.5–0.8 mm, central, uniform, terete, hollow, apex pruinose, above base glabrous, apex white or pale yellowish (4A2), base pale yellowish (4A2) or yellowish (4A3), with white strigose basal mycelium. Bioluminescent in the stipe and in damaged parts of the pileus.

Basidiospores (7.5–) 8–9 (–9.5) × (7.5–) 8–9 (–9.5) µm, Q = 1–1.23, globose to subglobose, thin-walled, smooth, hyaline, amyloid. Basidia 23–28 (–30) × 10.5–13 µm, 4 spored, sterigmata 3–6 µm long, clavate to broadly clavate, hyaline, inamyloid. Pleurocystidia absent. Lamellar edge infertile or mixed with cheilocystidia, basidia, and basidioles. Cheilocystidia (15–) 19–34 (–35) × (7–) 8–14 (–16) µm, subcylindrical, broadly clavate or subglobose-pedunculate, thin-walled, hyaline, inamyloid, densely spinulose over the upper half; spinulae 1.5–4 × 1–1.5 µm, cylindrical, apex obtuse, hyaline. Subhymenium inflated-ramose, hyaline, inamyloid, non-gelatinized. Lamellar trama subregular, hyphae 2–20 µm diam., cylindrical or inflated, thin-walled, hyaline, dextrinoid. Pileipellis a cutis; terminal elements 23–120 × 8–10.5 µm, repent, subcylindrical to narrowly clavate, hyaline, inamyloid, densely spinulose over the upper half; spinulae 1–3 × 0.5–1.5 µm, cylindrical, apex obtuse, hyaline; hyphae 1.5–14 µm diam., cylindrical to inflated, thin-walled, densely spinulose, hyaline, inamyloid, non-gelatinized; spinulae same as the terminal elements but frequently over the entire surface. Pileus trama with hyphae 2.5–35 µm diam., cylindrical to inflated, thin-walled, hyaline, dextrinoid. Caulocystidia 28–42 (–63) × 6–12 µm, clavate to subcylindrical-tortuose, spinulose over the upper half; spinulae 1–3 × 1–1.5 µm, cylindrical, apex obtuse, hyaline, inamyloid. Stipitipellis hyphae 2–6.5 µm diam., with spinulae, short cylindrical, scattered, hyaline, inamyloid; medullary hyphae 3–25 µm diam., cylindrical, hyaline, dextrinoid. Clamp connections present.

Habit and habitat.— Gregarious on moss-covered bark of living *Cedrella odorata* L. trees in coffee plantations.

Specimens studied.— MEXICO. Veracruz, Municipality of Coatepec, Libramiento de Coatepec, 19°27’30”N, 96°55’59”W, 1218 m a.s.l., 23–VIII–2016, *A. Cortés-Pérez 1640* (XAL; DNA-My26); 26–VIII–2016, *A. Cortés-Pérez 1677* (XAL; DNA-My23), 5–IX–2016, *A. Cortés-Pérez 1812* (XAL; DNA-My24).

Remarks.— The Mexican collections agree satisfactorily with *Mycena luxarboricola* described from southern Brazil by Desjardin *et al*. (2010). This species is distinguished by its luminescent basidiome, small pale brown pileus, arcuate lamellae, globose to subglobose amyloid basidiospores averaging 8.5 × 8 µm, broadly clavate and densely spinulose cheilocystidia, and by growing on the bark of living trees (Desjardin *et al*., 2010). Although this species was described with the entire

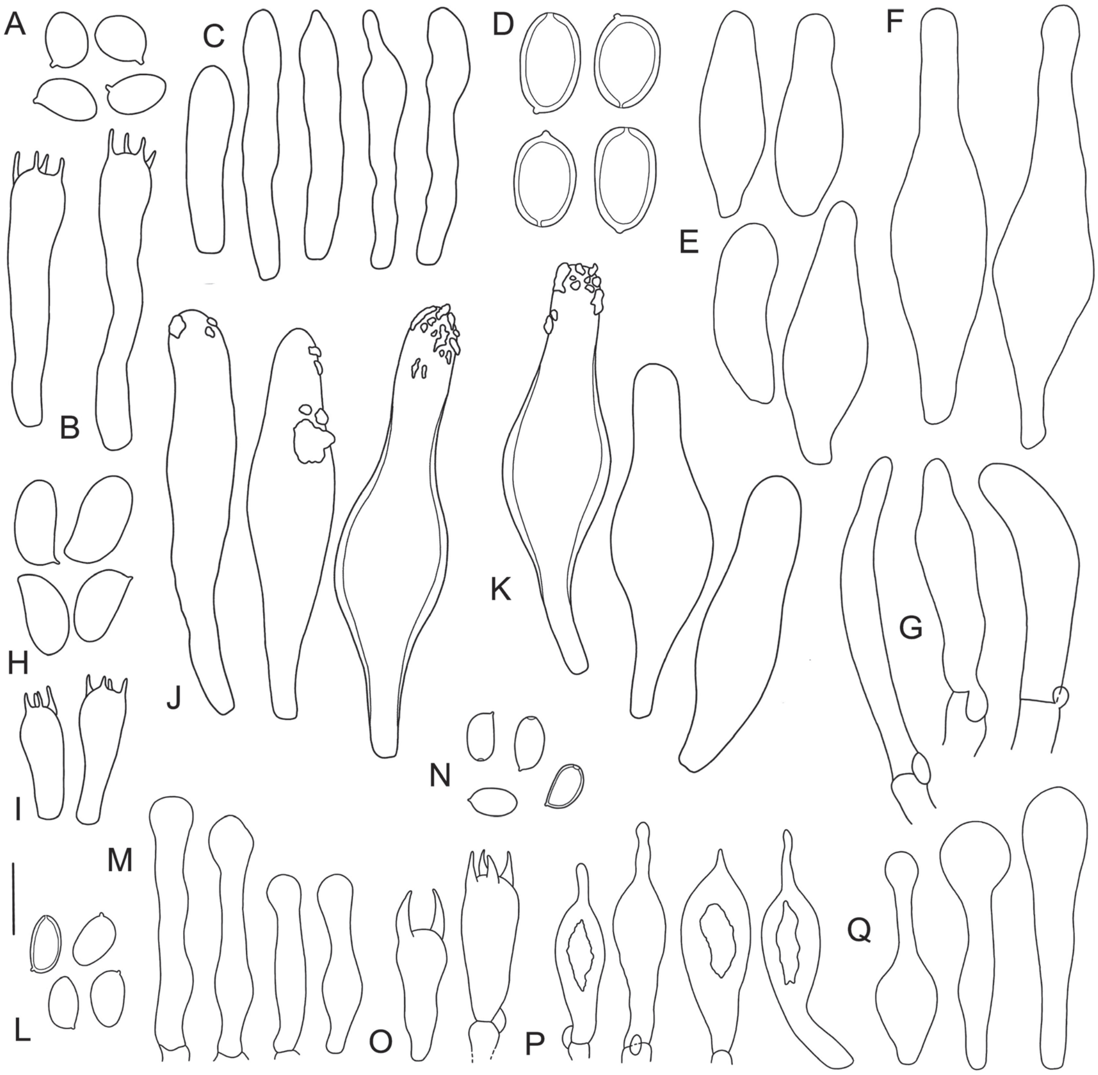

Fig. 4. A–C) *Omphalotus subilludens*, O. Castro Jauregui 2463 (IBUG). A) Basidiospores. B) Basidia. C) Terminal cystidial elements. D–G) *Pholiota castanea*, A. G. Naranjo López 9 (IBUG). D) Basidiospores. E) Cheilocystidia. F) Pleurocystidia. G) Caulocystidia. H–K) *Pholiota rufodisca*, V. M. Bandala-Muñoz 34 (XAL). H) Basidiospores. I) Basidia. J) Pleurocystidia. K) Cheilocystidia. L–M) *Pholiota tennesseensis*, M. L. Fierros 666 (IBUG). L) Basidiospores. M) Cheilocystidia. N–Q) *Pholiota terrestris*, V. Ramírez-Cruz 3554 (XAL). N) Basidiospores. O) Basidia. P) Pleurocystidia as chrysocystidia. Q) Cheilocystidia. Scale bar = 10 μm, except D and H = 5 μm.

Fig. 4. A–C) *Omphalotus subilludens*, O. Castro Jauregui 2463 (IBUG). A) Basidiosporas. B) Basidios. C) Elementos cistidiales terminales. D–G) *Pholiota castanea*, A. G. Naranjo López 9 (IBUG). D) Basidiosporas. E) Queilocistidios. F) Pleurocistidios. G) Caulocistidios. H–K) *Pholiota rufodisca*, V. M. Bandala-Muñoz 34 (XAL). H) Basidiosporas. I) Basidios. J) Pleurocistidios. K) Queilocistidios. L–M) *Pholiota tennesseensis*, M. L. Fierros 666 (IBUG). L) Basidiosporas. M) Queilocistidios. N–Q) *Pholiota terrestris*, V. Ramírez-Cruz 3554 (XAL). N) Basidiosporas. O) Basidios. P) Pleurocistidios como crisocistidios. Q) Queilocistidios. Escala = 10 μm, excepto D y H = 5 μm.

basidiome emitting yellowish green light (Desjardin *et al.*, 2010), in the Mexican specimens only parts, especially in the stipe, were luminescent.

Here we generated sequences belonging to this taxon for the first time. BLAST sequence similarity searches (https://blast.ncbi.nlm.nih.gov/Blast.cgi) were performed for My23, 24 & 26 ITS sequences and resulted in 94.9% of similarity with *M. oculis-*

nymphae Desjardin, B. A. Perry & Stevani, another bioluminescent species of *Mycena* sect. *Supinae* Konr. & Maubl., described from the state of São Paulo, Brazil. This species differs from *M. luxarboricola* in forming a pale brownish gray pileus, bigger basidiospores (10–14.5 x 11–13.5 μm), cheilocystidia with few apical spinulae, and absence of caulocystidia (Desjardin *et al*., 2016).

In the ITS phylogeny (Fig. 9), *M. luxarboricola* formed a well-supported monophyletic clade (100% ML-BS, 1 PP, 91% MP-BS), sister to *M. oculisnymphae*, both species belonging to the traditional *Mycena* sect. *Supinae*. However, these two species were not grouped with the rest of the species of this section, leaving this section as polyphyletic. These two species were grouped with *M. rebaudengoi*, different because it has oblong basidiospores and longer cheilocystidia (Robich, 2003; and this paper, see below). *Mycena luxarboricola* was known from Paraná state, Brazil in a riparian forest (Desjardin *et al*., 2010), and now it is first recorded from Mexico.

Mycena rebaudengoi Robich, Riv. Micol. 44 (1): 26 (2001)
Figs. 1D, 3F–K, 9

Pileus 4–7 mm diam., paraboloid to campanulate, moist, glabrous, disc and striations dark brownish gray (6F8), elsewhere pale brown or orange gray (5B2), margin translucent-striate, yellowish white or pale yellow (4A2, 4A3). Context thin, pale brown. Lamellae adnate, subventricose, close (17–21), with one to three series of lamellulae, margin even, white or yellowish white (4A2). Stipe 28–42 × 0.5–0.8 mm, central, uniform, terete, hollow, glabrous, dark brown (9F5), grayish brown (9F3–9E3), apex whitish to light brown (6D4), base pale brown (6D7), with basal white strigose mycelium.

Basidiospores (7.5–) 8–9 (–10) × (4.8–) 5–6 μm, Q = 1.3–1.8, ellipsoid to oblong, thin-walled, smooth, hyaline, amyloid. Basidia 21–34 × 6.5–8 μm, 4 spored, sterigmata 2–5 μm long, clavate to cylindrical, hyaline, inamyloid. Pleurocystidia 23–40 × 11–20 μm, broadly clavate, obpyriform or globose-pedunculate, thin-walled, hyaline, inamyloid, densely spinulose over the upper half; spinulae 1.5–3 × 1–1.5 μm, cylindrical, apex obtuse, hyaline. Lamellar edge infertile with cheilocystidia and basidioles. Cheilocystidia (23–) 25–40 (–43) × (8–) 11.5–18 (–21) μm, similar to pleurocystidia; spinulae 1.5–4 × 1.5–2 μm. Subhymenium ramose, thin-walled, hyaline, inamyloid. Lamellar trama subregular, hyphae 2–20 μm diam., cylindrical or inflated, thin-walled, hyaline, dextrinoid. Pileipellis a cutis; terminal elements 19–51 × 6.5–15 μm, prostrate, subcylindrical to narrowly clavate, spinulose only in the apex, hyaline, inamyloid; spinulae 1–5 × 1–1.5 μm, cylindrical, apex obtuse; hyphae 4–18 μm diam., prostrate, thin-walled, densely spinulose, hyaline, inamyloid, non-gelatinized; spinulae same as the terminal elements but frequently over the entire surface. Pileus trama with hyphae 2–37 μm diam., subglobose to cylindrical, thin-walled, hyaline, dextrinoid. Caulocystidia not observed. Stipitipellis hyphae 1.5–7 μm diam., with spinulae, short, scattered; medullary hyphae 3–25 μm diam., hyaline, dextrinoid. Clamp connections present.

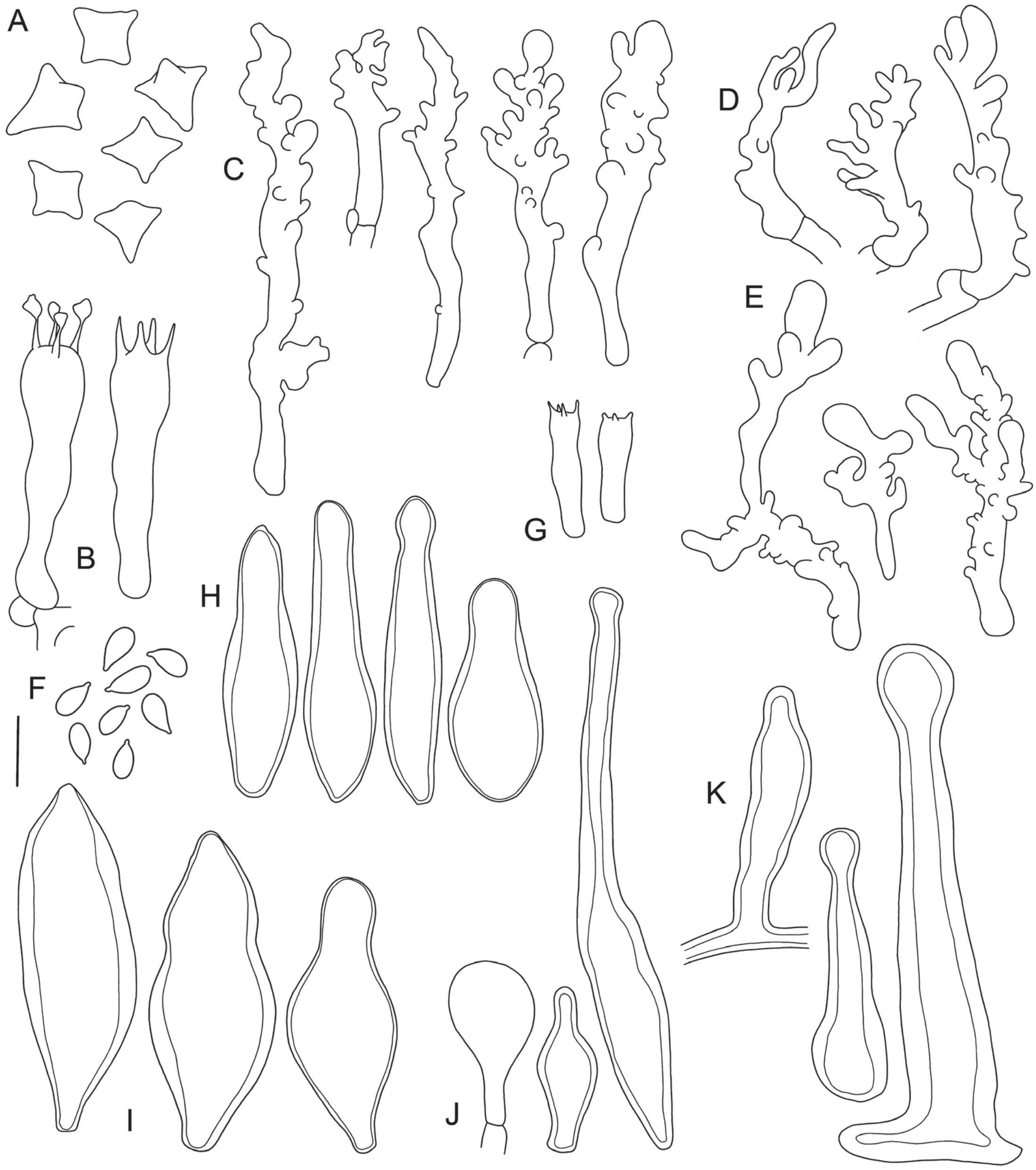

Fig. 5. A–E) *Tetrapyrgos atrocyanea*, A. Cortés-Pérez 2101 (IBUG). A) Basidiospores. B) Basidia. C) Cheilocystidia. D) Pileocystidia. E) Caulocystidia. F–K) *Strobilurus conigenoides*, L. Guzmán-Dávalos 1587 (IBUG) & A. Cortés-Pérez 2156 (IBUG). F) Basidiospores. G) Basidia. H) Cheilocystidia. I) Pleurocystidia. J) Pileocystidia. K) Caulocystidia. Scale bar = 10 μm.

Fig. 5. A–E) *Tetrapyrgos atrocyanea*, A. Cortés-Pérez 2101 (IBUG). A) Basidiosporas. B) Basidios. C) Queilocistidios. D) Pileocistidios. E) Caulocistidios. F–K) *Strobilurus conigenoides*, L. Guzmán-Dávalos 1587 (IBUG) & A. Cortés-Pérez 2156 (IBUG). F) Basidiosporas. G) Basidios. H) Queilocistidios. I) Pleurocistidios. J) Pileocistidios. K) Caulocistidios. Escala = 10 μm.

Habit and habitat.— Scattered, on leaflitter of *Fagus mexicana* Martínez, in cloud forest.

Specimen studied.— MEXICO. Veracruz, Municipality of Acatlán, volcán de Acatlán, 19°40’43”N, 96°51’13”W, 1943 m a.s.l., 8 X 2019, *A. Cortés-Pérez* 2041 (IBUG; DNA-My97).

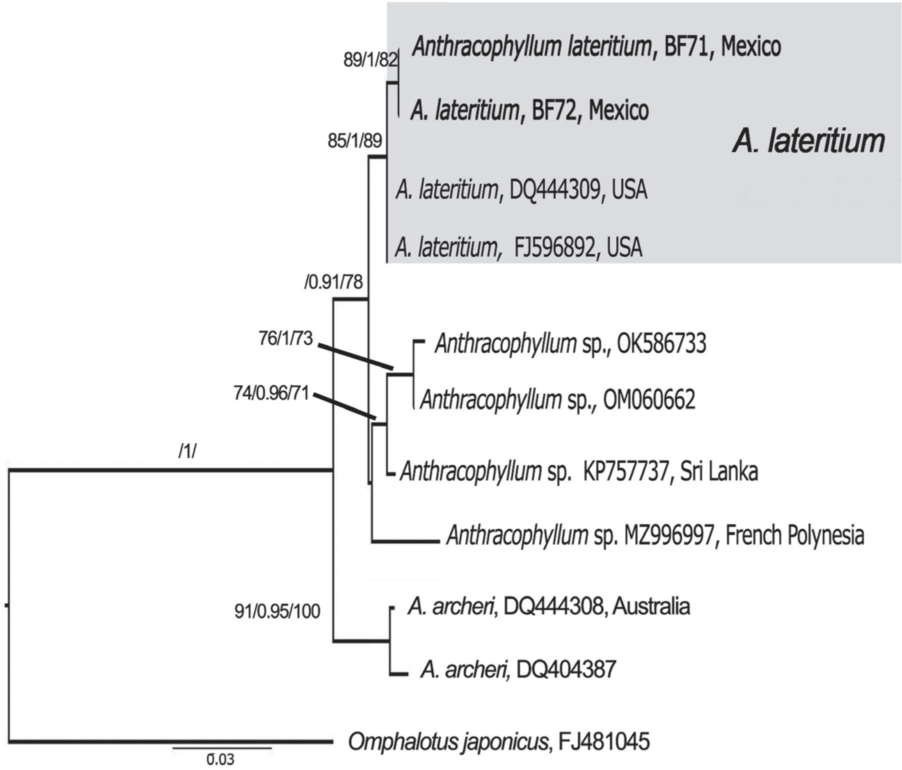

Fig. 6. Maximum Likelihood (ML) tree of *Anthracophyllum* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequences obtained in this work are indicated in boldface.

Fig. 6. Árbol de Máxima Verosimilitud (MV) de *Anthracophyllum* basado en secuencias ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. Las nuevas secuencias obtenidas en este trabajo se indican en negrita.

Remarks.— The Mexican specimen is macro and micromorphological similar to materials described from Italy as *Mycena rebaudengoi*, which is distinguished by a brownish pileus, adnate lamellae, 8–10 × (5.5–) 6–7.5 μm basidiospores, clavate or subpyriform cheilocystidia, with apical 1–3 μm long spinulae, and pleurocystidia similar in shape to cheilocystidia (Robich, 2003). The differences between the Mexican collections and the holotype description are the paler pilei and longer cystidia (cheilocystidia 25–80 x 15–37 μm, pleurocystidia 24–70 × 12–25 μm) as Robich (2000, 2003) described.

BLAST (https://blast.ncbi.nlm.nih.gov/Blast.cgi) sequence similarity searches were performed; comparison of the ITS sequence of the Mexican specimen (My97) showed 99–100% similarity with four sequences of *M. rebaudengoi*. In the ITS phylogeny (Fig. 9), the Mexican sequence clustered in a well-supported monophyletic clade with four sequences from Italy, Hungary, Norway, and the USA (89% ML-BS, 0.84 PP, 81% MP-BS). *Mycena rebaudengoi* was the sister group to the clade formed by *M. luxarboricola* and *M. oculisnymphae*, from which it is distinguished by the ellipsoid to oblong basidiospores and the larger cheilocystidia and pleurocystidia in *M. rebaudengoi*.

Mycena rebaudengoi was recorded from Italy growing on leaflitter in mixed deciduous forest (*Carpinus betulus* L., *Fagus* L., *Quercus pubescens* Willd.) and on lawns

(Robich, 2003). This is the first record of the species in America and Mexico, from the state of Veracruz in a cloud forest dominated by *F. mexicana.* It seems to be a species with a wide distribution, present until now in America and Europe.

Mycena semivestipes (Peck) A. H. Sm.,
North Amer. Species of *Mycena*: 324 (1947)
≡ *Omphalia semivestipes* Peck, Bull. Torrey Bot. Club 22: 200 (1895)
Figs. 1E, 3L–P, 9

Pileus 3–6 mm diam., convex-hemispheric to convex, subviscid, glabrous, disc pale brown (5E7), elsewhere pale yellowish (4A3, 4A2), margin whitish (4A1), margin translucent-striate to striate. Context thin, pale brown. Lamellae adnate, broad, close (20–22), with three series of lamellulae, margin even, white. Stipe 13–25 × 0.5–0.8 mm, central, uniform, terete, hollow, glabrous, pale brown (5D8), apex yellowish white (4A3, 4A4), base brown (6F8), base with white strigose mycelium.

Basidiospores 4–5 × 2–3 μm, Q = 1.4–2, ellipsoid to oblong, thin-walled, smooth, hyaline, amyloid. Basidia 16–24 × 4–4.5 μm, 4 spored, sterigmata 2–4 μm long, clavate to cylindrical, hyaline, inamyloid. Pleurocystidia not observed. Lamellar edge infertile with crowded cheilocystidia. Cheilocystidia 15–32 (34) × 5–10 μm, cylindrical to clavate, simple or bumpy, often irregular in shape, thin-walled, hyaline, inamyloid; protuberances 2–4 × 2–3.5 μm, rounded to cylindrical, apex obtuse, hyaline. Subhymenium ramose, thin-walled, hyaline, inamyloid, non-gelatinized. Lamellar trama subregular, hyphae 2–21 μm diam., thin-walled, hyaline, dextrinoid, non-gelatinized. Pileipellis an ixocutis, 78–85 μm thick; terminal elements 25–86 × 4–5 μm, cylindrical, some branched at the apex, irregularly bumpy, hyaline, inamyloid; hyphae 2–8 μm diam., thin-walled, hyaline, inamyloid. Pileus trama with hyphae 2–14 μm diam., cylindrical to inflated, thin-walled, hyaline, dextrinoid. Stipitipellis with terminal hyphae 36–85 × 4–5 μm, cylindrical, some branched at the apex, bumpy, hyaline, inamyloid; hyphae 2–6.5 μm diam., with protuberances, short, scattered; medullary hyphae 3–25 μm diam., hyaline, dextrinoid. Clamp connections present.

Habit and habitat.— Gregarious to caespitose, on hardwood logs in cloud forest.

Specimen studied.— MEXICO. Jalisco, Municipality of Cuautitlán de García Barragán, Estación Científica Las Joyas, Sierra de Manantlán, 19°35'13"N, 104°16'07"W, 1987 m a.s.l., 19 IX 2021, A. *Cortés-Pérez 2154* (IBUG; DNA-My74).

Remarks.— The collection from Jalisco agrees well with the description of *Mycena semivestipes* reported from Canada and the USA by Smith (1947). This species is characterized by a "dark brown, fading to sordid grayish brown, sordid whitish or grayish in age" pileus, with a thin gelatinous pellicle, small 4–6 × 2–3 μm basidiospores, 23–32 × 7–11 μm inconspicuous cheilocystidia, clavate, simple or occasionally with rounded protuberances at the apex, and an ixocutis-type pileipellis (Smith, 1947). However, Maas Geesteranus (1992) considered *M. semivestipes* as having larger basidiospores, 6.3–7.3 × 3.7–4 μm, and narrower cheilocystidia, 18–30 x 4.5–8 μm, and placed this species in *Mycena* sect. *Fragilipedes* (Fr.) Quél. The collection studied differs from the protologue of *M. semivestipes* (Smith, 1947) in that no pleurocystidia were observed.

A macroscopically similar species is *M. tintinnabulum* (Fr.) Quél., described from Europe, which also presents brown and viscid pileus, differing from *M. semivestipes* in forming slightly longer basidiospores, 4.5–6.5 × 2–3 μm (Q = 1.8–2.4), oblong to cylindrical, and cheilocystidia with fairly few, coarse, simple to branched, more or less curved outgrowths, 1.5–11 × 1–2 μm (Aronsen & Læssøe, 2016; Smith, 1947).

BLAST sequence similarity searching (https://blast.ncbi.nlm.nih.gov/Blast.cgi) of ITS sequence of the specimen from Mexico (My74) showed 97.33–99.67% similarity with four sequences determined as *M. semivestipes* from China and the USA. In the phylogeny with the ITS region (Fig. 9), the sequence of the Mexican specimen formed a well-supported clade with the sequences from China and the USA (100% ML-BS, 1 PP, MP-BS 100%). It is interesting to note that the clade formed by *M. semivestipes* was recovered separately from the rest of the taxa of *Mycena* sect. *Fragilipedes* included in the phylogenetic analysis.

Mycena semivestipes was recorded from Canada and the USA, in deciduous forests (Smith, 1947; Maas Geesteranus, 1992); this is the first mention of the species in Mexico.

Omphalotus subilludens (Murrill) H. E. Bigelow, *Sydowia* 35: 67 (1982)
≡ *Clitocybe subilludens*, Q. Jl. Fla. Acad. Sci. 8 (2): 198 (1945)
Figs. 1F, 4A–C, 10

Pileus 33–83 mm wide, plane-concave to subinfundibuliform, margin incurved, dry, dull, somewhat fibrillose, yellowish orange (5A7), ochraceous orange (5C7), or pumpkin orange (6A8, 6B8), with reddish brown (E8, 8F8) and ferrugineous hues. Lamellae decurrent, broad to subventricose, crowded, concolorous to the pileus but lighter and with more yellowish tinges, margin entire to subpruinose, yellowish. Stipe 67–80 × 11–14 mm, excentrical, cylindrical to subventricose, fibrillose, concolorous to the pileus or lighter and with brown and olivaceous tinges near the base. Context yellowish white to orangish white. Smell similar to play-doh, taste sweet to slightly bitter. KOH 10% greenish brown on pileus surface.

Basidiospores 7–9 (–10) × 5–6 (–7.5) μm, Q = (1.27–) 1.33–1.6 (–1.63), ellipsoid, rarely broadly ellipsoid or elongated, without germ pore, thin-walled, smooth, hyaline with refringent content. Basidia 28–45 × 7–8 μm, (2–) 4–spored, clavate, hyaline with refringent content. Terminal cystidial elements 28–38 × 5–6 μm, cylindrical to narrowly clavate, apex obtuse to mucronate, thin-walled, hyaline. Pileipellis a cutis; hyphae thin-walled, hyaline or with orange to greenish brown refringent content, intermixed with dark greenish elements. Clamps connections present.

Habit and habitat.— Caespitose, on dead roots of an unidentified *Eucalyptus* L'Hér.

Specimen studied.— MEXICO. Jalisco, Municipality of Zapopan, colonia Ecológica Seattle, Calle D, 50 m before vivero Terranostra, 20°43'8.64"N 103°23'16.1"W, 1–XI–2022, *O. Castro Jauregui 2463* (IBUG; DNA-BF67).

Remarks.— The Mexican specimen is macro and micromorphologically like *Omphalotus subilludens* from the USA, characterized by its orange to reddish brown

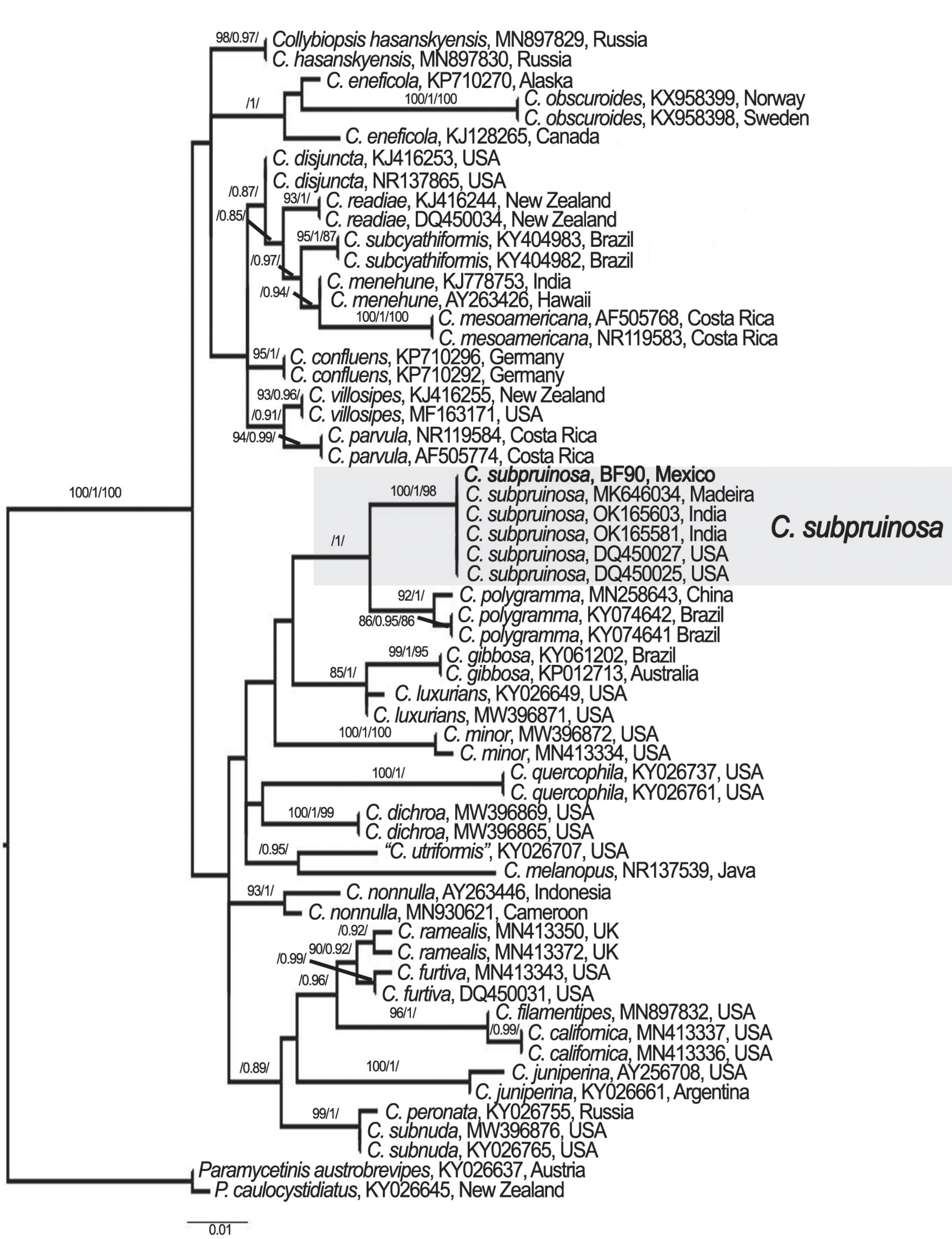

Fig. 7. Maximum Likelihood (ML) tree of *Collybiopsis* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequence obtained in this work is indicated in boldface.

Fig. 7. Árbol de Máxima Verosimilitud (MV) de *Collybiopsis* basado en secuencia ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. La nueva secuencia obtenida en este trabajo se indica en negrita.

pileus, concolorous lamellae, deep yellow to orange yellow stipe, caespitose habit, and basidiospores elongate, ovoid or ellipsoid (Murrill, 1945; Kirchmair *et al*., 2002). Nevertheless, the studied specimen has smaller pileus and slightly wider basidiospores than those described by Murrill (1945, as *Clitocybe subilludens*), pileus 100–150 mm diam. and basidiospores 7–9 × 5 μm. Furthermore, the protologue mentioned this species has no cystidia, but Kirchmair *et al.* (2002) illustrated cheilocystidia from a specimen from Texas, USA; we found similar structures to those described by Kirchmair *et al.* (2002), but we prefer to call them terminal cystidial elements because they are poorly differentiated.

In the phylogeny (Fig. 10), the Mexican sequence (BF67) formed a moderately (89% ML-BS, 1 PP, 84% MP-BS) supported clade with two sequences from the USA, and this clade was the sister group of a clade with two European sequences of *O. olearius.* This last species is very similar to *O. subilludens*, which is distinguished by its subglobose basidiospores and Palearctic distribution (Kirchmair *et al.*, 2002). Both species have been confused and cited from Mexico; for instance, by Herrera & Guzmán (1972), Bandala-Muñoz *et al.* (1988), and García-Saldaña *et al.* (2019). However, *O. olearius* is a European species, while the type of *O. subilludens* is from Florida, USA (Murrill, 1945; Kirchmair *et al.*, 2002, 2004). Our specimen matches both the morphological description and the geographic distribution, as well as the phylogenetic position of the Mexican sequence in the *O. subilludens* clade. Therefore, the other specimens from Mexico cited as *O. olearius* most likely represent *O. subilludens.* Guzmán (1977) cited this species, as *O. olearius*, as one of the main toxic fungi in Mexico, in a list of less than 40 species.

Pholiota castanea A. H. Sm. & Hesler,
The North American species of *Pholiota*: 235 (1968)
Figs. 4D–G, 11

Translation from notes in Spanish by the collector:

'Pileus 1–4 cm diam., egg yellow to brownish, dry, smooth. Lamellae crowded, yellowish to brownish. Stipe 6 × 0.5 cm, yellow'.

Notes from the **dry** specimen:

Pileus approx. 8–25 mm diam. in dry condition, convex to plane-convex, subumbonate, or depressed, viscid (debris attached), smooth, glabrous, brownish red (8D8) in young pilei to orange, brownish orange, or brighter than burnt sienna (7D8) in adults when dry, irregularly bruising to brownish red, edge incurved. Lamellae adnate to narrowly adnate, segmentiform, close, yellowish brown (5D8) with some olive tints when dry, margin concolorous or lighter. Stipe approx. 30–55 × 2–4 mm in dry condition, uniform, terete to compressed, glabrous to fibrillose, apex pruinose, yellowish to yellow, reddish brown in bruised parts, with rest of the veil, base with abundant whitish to yellowish mycelia; veil not observed or as scattered fibrils on the stipe. KOH 10% pileus (+) dark red.

Basidiospores 6.4–8.9 × 4–5.2 μm, Q = (1.53–) 1.6–1.8, oblong, apex rounded, with a very small germ pore, thick-walled, smooth, with granulose content, yellowish brown to orange, dextrinoid in Melzer's reagent, cyanophilic, non-metachromatic. Hymenophoral trama subparallel, thin- to subthick-walled hyphae. Basidia 18.5–22.5 × 5.5–7 μm, 4–spored, clavate, with or without central constriction, with granulose,

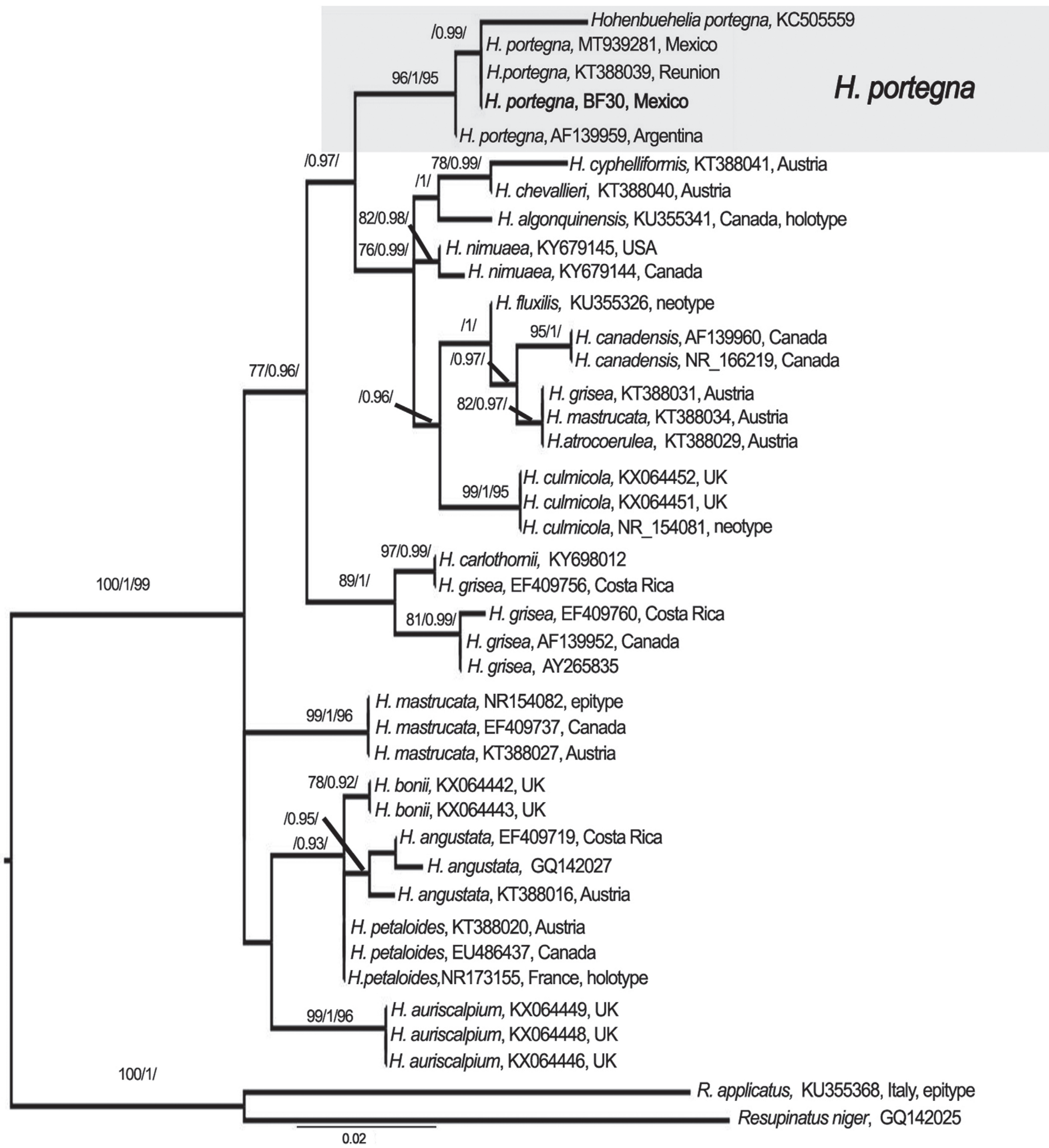

Fig. 8. Maximum Likelihood (ML) tree of *Hohenbuehelia* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequence obtained in this work is indicated in boldface.

Fig. 8. Árbol de Máxima Verosimilitud (MV) de *Hohenbuehelia* basado en secuencia ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. La nueva secuencia obtenida en este trabajo se indica en negrita.

refringent yellowish content. Pleurocystidia 52–61.5 × 12–15 μm, lageniform, with long necks, apices obtuse to subcapitate, thin to subthick-walled up to 1 μm thick, in some up to 4 μm thick, hyaline, with or without irregular granulose yellowish to orangish content, originated from the subhymenium, very abundant. Cheilocystidia 23–36 × 7–11 μm, the majority suboblong, some subfusiform or narrowly utriform, very few lageniform, apex obtuse or subcapitate, thin-walled, few subthick-walled, up to 1 μm thick, hyaline, with or without yellowish granulose content. Subhymenium ramose or inflated-ramose, hyaline, gelatinized. Pileus trama interwoven to the pileus and radial to the hymenium, with thin- to sub-thick-walled hyphae. Pileipellis an ixotrichoderm, approx. 50 μm wide; hyphae 2.5–5.5 μm diam., suberect, tortuose, with uniform to granulose content, yellow, with pigment encrusted in the walls forming bands or irregular, septate, with clamp connections; subpellis approx. 10 μm wide, with compact hyphae, 3–9.5 μm diam., with pigment encrusted in the walls, yellowish brown or orangish brown. Caulocystidia 32–44 × 5–9 μm, cylindrical to narrowly utriform, apex obtuse, hyaline, yellowish when in tufts, in the apex of the stipe, very rare. Veil with hyphae 1.5–5.5 μm diam., forming cords, or interwoven, hyaline to yellowish, without wall pigment encrusted, septate with clamps. A yellow pigment is released when mounted in KOH.

Habit and habitat.— Caespitose, on soil.

Specimen studied.— MEXICO. Jalisco, Municipality of Atoyac, km 2.3 highway to Unión de Tula, road to El Cajón, 16–VII–2000, *A. G. Naranjo López 9* (IBUG; DNA-BF96).

Remarks.— *Pholiota castanea* may not be a true lignicolous species, although it was described growing "on soil and rotten wood" (Smith & Hesler, 1968), or "on burned debris, burned soil, and charcoal" (Matheny *et al*., 2018); the fresh notes of the Mexican specimen indicate only "on soil". However, we include it here, along with the other species of this genus because the genus is generally considered as lignicolous. Matheny *et al*. (2018) mentioned *P. castanea* as a pyrophilous species (viz., growing on burned areas in post-fire habitats), specifically as a "later successional pyrophilous species", although they did not confirm the presence of burnt remains in all the specimens they studied, nor is it mentioned in the notes of the Mexican specimen; nevertheless, it is extremely common for the pine-oak forests of Jalisco to suffer frequent forest fires, so the mushroom could be growing on previously burned ground.

This species was described with pileus "chestnut-brown to bister" and white when young, finally "tawny olive" lamellae by Smith & Hesler (1968). However, as Matheny *et al*. (2018) mentioned, the protologue was based in a single specimen from Tennessee, USA, thus, they completed the description, indicating a chestnut brown, reddish brown, yellowish red or dark brown pileus, and "pallid to yellowish when young, becoming pale tawny with brown spots, to Pinkish Buff, and finally umbrinous" lamellae. The dry pilei of the isotype [A. J. Sharp (L. R. Hesler 20269), MICH] (https://www.mycoportal.org/portal/taxa/index.php?taxon=367053) also show yellowish brown (5D8) with some orangish or reddish tints pilei.

On the other hand, the basidiospores in the Mexican specimen are slightly larger and thicker-walled than those reported by Smith & Hesler (1968), "6–7.5 (8) × 3.5–4 μm, wall slightly thickened (±0.3 μ)" or by Matheny *et al*. (2018), "6.0–6.9–7.5(–8.0) × 3.5–4.0–4.5(–5.0) μm" (in this case the thickness of the wall was not mentioned). Smith & Hesler (1968) considered the lack of the gelatinization of the subhymenium as one of the relevant characteristics to include *P. castanea* along with *P. olivaceophylla* A. H. Sm. & Hesler in the stirps *Olivaceophylla* A. H. Sm. &

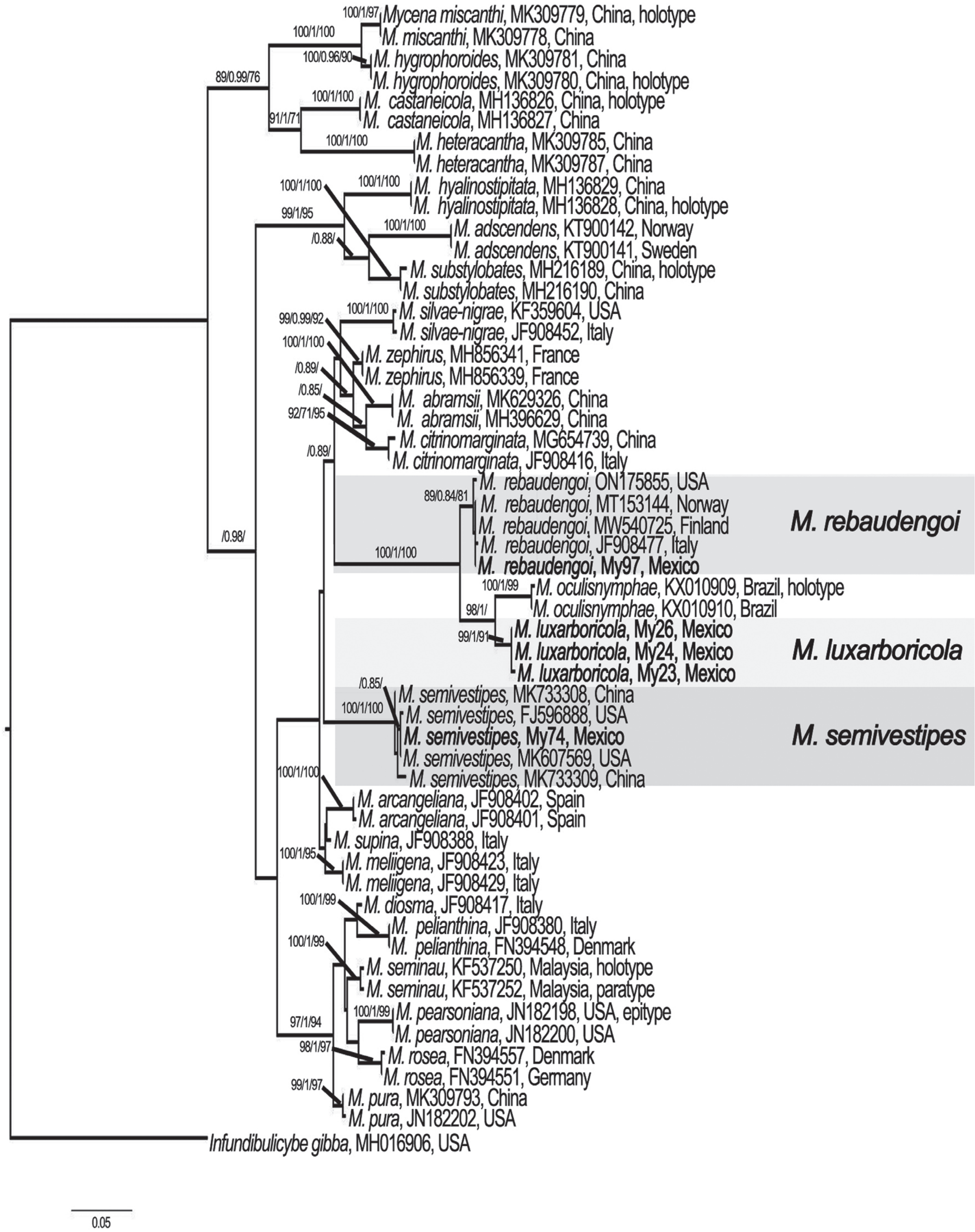

Fig. 9. Maximum Likelihood (ML) tree of *Mycena* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequences obtained in this work are indicated in boldface.

Fig. 9. Árbol de Máxima Verosimilitud (MV) de *Mycena* basado en secuencias ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. Las nuevas secuencias obtenidas en este trabajo se indican en negrita.

Hesler of the section *Flammuloides* A. H. Sm. & Hesler. Nevertheless, the Mexican specimen has a very evident gelatinized subhymenium, which was also observed in the specimens checked by Matheny *et al*. (2018). The phylogenetic position of the Mexican sequence (BF96) formed a clade (98% ML-BS, 0.91 PP, 96% MP-BS) with the sequence of the holotype of *P. castanea* from the USA and with two additional sequences also from the USA as *Pholiota* sp. (Fig. 11). This species was only known from the USA (Matheny *et al*., 2018), so this is the first record for Mexico.

Pholiota rufodisca A. H. Sm. & Hesler,
The North American species of *Pholiota*: 264 (1968)
Figs. 4H–K, 11

Translation from notes in Spanish by the collector:

'Pileus slightly squamose, yellowish with orange-brown scales, surface in young pilei pale cinnamon and the margin paler, oily, with membranous remains at the margin. Lamellae whitish to yellowish-brown, subadnated to the stipe. Stipe fibrose, whitish to yellowish, squamose in the inferior part, with rest of the annulus in the upper part'.

Notes from the **dry** specimen:

Pileus approx. 30–40 mm diam. in dry condition, convex to plane-convex, subumbonate, viscid (many debris attached), smooth, fibrillose when young, in the adult center of the pileus fibrillose and the rest squamose-fibrillose, brownish orange, rusty orange or brighter than burnt sienna (7D8), disk darker, yellowish to the edge. Lamellae adnate to narrowly adnate, ventricose, brownish yellow (5B–C8) or golden yellow (5B7), margin concolorous. Stipe approx. 70 × 5 mm, widen to the base, fibrillose, apex slightly pruinose, whitish to yellowish, reddish in bruised parts, base with abundant whitish mycelia, forming in parts a cream color to whitish tomentum. KOH pileus (+) dark red. Scattered.

Basidiospores (5.5–) 6.6–7.7 (–11.0) × 3.3–4.4 μm, Q = (1.4–) 1.5–2 (–2.3), ellipsoid to oblong, few cylindrical, some subphaseoliform or phaseoliform in frontal view, with a very small germ pore, thin-walled, smooth, apiculus very small or not evident, apex rounded, yellowish brown, non-dextrinoid in Melzer's reagent, cyanophilic, non-metachromatic. Basidia (16.5–) 20–25 × (4.5–) 5.5–6.5 μm, (3–) 4–spored, clavate, hyaline to yellowish. Pleurocystidia (56–) 64–66 (–67) × (11–) 13–17 (–19) μm, lageniform, utriform, spathuliform, clavate, with medium to long base, apex obtuse to subcapitate, thin- to thick-walled up to 2 μm thick, hyaline to yellowish, many with an amorphous-granulose yellowish or hyaline very refringent content, some with yellowish to hyaline encrustations at the apex, originated from the subhymenium. Cheilocystidia 34–60.5 × (10–) 11–13 (–14) μm, like pleurocystidia but smaller. Subhymenium 24–41 μm thick, ramose, with hyaline to yellowish hyphae, tortuose, septate with clamp connections, gelatinized. Pileus trama interwoven, with thin- to sub-thick-walled hyphae, yellowish, septate with clamp connections. Pileipellis an ixocutis, 130–180 μm wide; hyphae 3–6 μm diam., tortuose, hyaline to yellowish, yellowish brown to the surface, some with brownish orange pigment encrusted

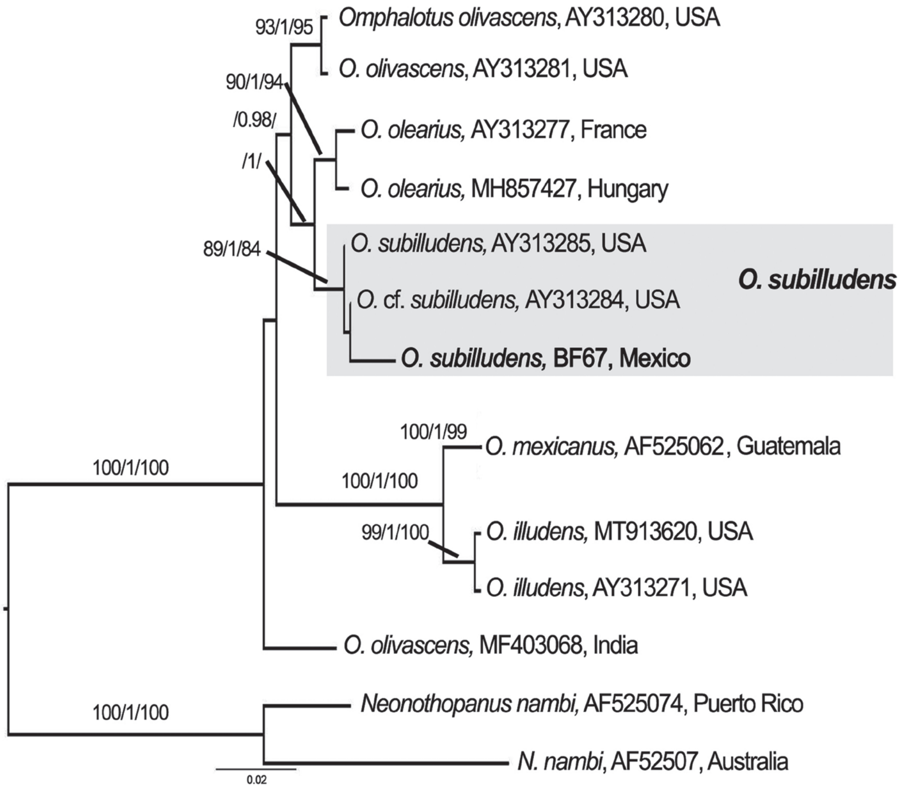

Fig. 10. Maximum Likelihood (ML) tree of *Omphalotus* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequence obtained in this work is indicated in boldface.

Fig. 10. Árbol de Máxima Verosimilitud (MV) de *Omphalotus* basado en secuencias ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. La nueva secuencia obtenida en este trabajo se indica en negrita.

in the walls forming bands, septate, with clamp connections; subpellis very thin, yellowish brown, with hyphae interwoven or radial arrangement, 3–6 μm diam., yellowish, with pigment encrusted in the walls irregular or forming bands, yellowish or yellowish brown. Caulocystidia 34–60.5 × 10–14 μm, clavate, apex obtuse, hyaline to yellowish, in tufts, in the apex of the stipe. A yellow pigment is released when mounted in KOH.

Habit and habitat.— Scattered on wood, in a *Pinus-Abies* forest.

Specimen studied.— MEXICO. Veracruz, Municipality of Xico, east zone of Cofre de Perote, 1.5 km N of Ingenio El Rosario, Los Gallos, 2820 m a.s.l., 28–III–1985, *V. M. Bandala-Muñoz 34* (XAL!, as *Pholiota decorata*, duplicate in Herbarium of ENEP-Iztacala, UNAM; DNA-BF57).

Remarks.— The Mexican specimen is macro- and micromorphological similar to *Pholiota rufodisca*, characterized by a viscid pileus with orange to rusty tinges, lamellae "buckthorn brown" (a mixture of orange and brown), basidiospores narrow in relation to length, pleurocystidia prominent with up to 2 μm thick wall, gelatinized subhymenium, and basidiomata growing under conifers (Smith & Hesler, 1968). The differences between the Mexican specimen and the protologue are the scaly pileus and the whitish lamellae when young, not glabrous pileus and yellowish lamellae as

Smith & Hesler (1968) described. Furthermore, Smith & Hesler (1968) mentioned and illustrated the basidiospores as "elliptic to ovate"; in the Mexican specimen we observed with this form, but also phaseoliform in frontal view or subphaseoliform in lateral view.

According to the molecular data, the Mexican sequence formed a slightly supported clade (0.89 PP) with two sequences from the USA of *P. rufodisca* (Fig. 11). Thus, until more specimens and new additional information are available, the Mexican material will be considered as this species. The specimen was previously determined as *P. decorata* (Murrill) A. H. Sm. & Hesler by V. M. Bandala-Muñoz (June 1985, at XAL), and published as this species by Chio (1992). *Pholiota decorata* is a different species, characterized by having a pileus "with numerous to scattered rows of concentrically arranged fibrillose scales", longer pleurocystidia, up to 90 μm long, smaller and thin-walled cheilocystidia, versiform caulocystidia, and hyphae of the cutis without pigment encrusted. Furthermore, the position of *P. decorata* in the phylogenetic tree is in a different clade, very far away from *P. rufodisca* (Fig. 11).

Pholiota rufodisca is known from Idaho, New Mexico, Oregon, and Washington in conifer forest (Smith & Hesler, 1968), and here corresponds the first mention of the species in Mexico, from the state of Veracruz, also in conifer forest at a high altitude.

Pholiota tennesseensis A. H. Sm. & Hesler,
The North American species of *Pholiota*: 95 (1968)

= *P. caespitosa* A. H. Sm. & Hesler,
The North American species of *Pholiota*: 96 (1968)

= *P. melliodora* A. H. Sm. & Hesler,
The North American species of *Pholiota*: 161 (1968)

= *P. olivaceodisca* A. H. Sm. & Hesler,
The North American species of *Pholiota*: 128 (1968)

Figs. 4L–M, 11

Notes from the **dry** specimen:

Pileus approx. 17–23 mm diam. in dry condition, plane-convex, umbonate, viscid (debris attached), smooth or uneven, fibrillose, few fibrils in tufts, fibrils bright orange to orangish brown on a light orange (5A5) to brownish orange (5B5) surface, irregularly bruising to brownish or brownish red, edge incurved to revolute. Lamellae adnate to subdecurrent or with decurrent tooth, ventricose, close to subdistant, brown (6D8), margin concolorous. Stipe approx. 15–30 × 2–4 mm in dry condition, bended, more or less uniform or widen to the apex, terete to compressed, finely fibrillose, longitudinally striate, apex pruinose, yellowish, reddish brown or orange in bruised parts, with rest of the veil, base with few whitish mycelia; veil not observed or as scattered fibrils on the stipe. KOH 10% pileus (+) orange brown.

Basidiospores 7.2–8.0 (–8.8) × 4–4.8 μm, Q = 1.6–2.0, oblong, apex rounded to subacute, with a very small germ pore, thin- to subthick-walled (up to 0.5 μm

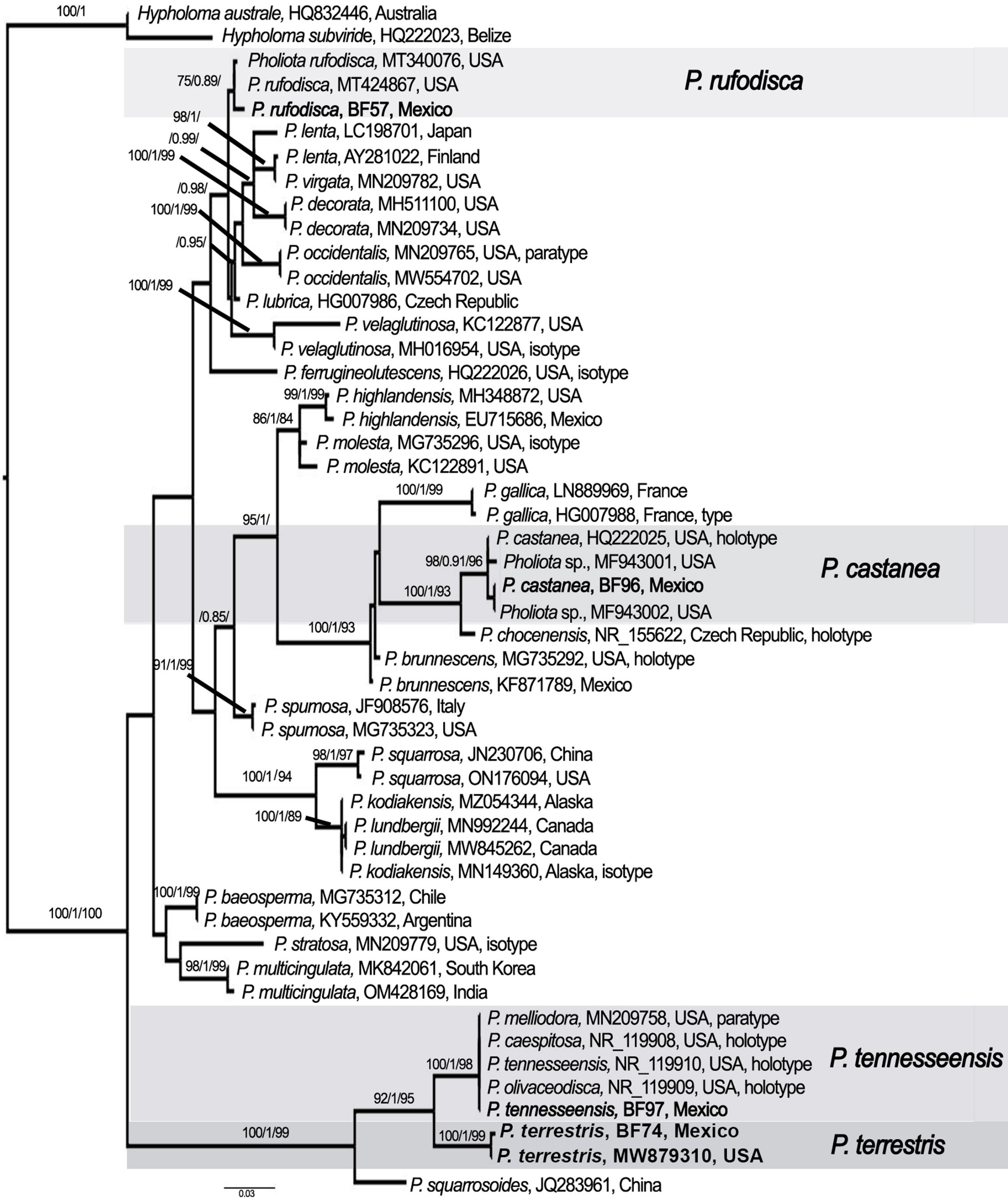

Fig. 11. Maximum Likelihood (ML) tree of *Pholiota* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequences obtained in this work are indicated in boldface.

Fig. 11. Árbol de Máxima Verosimilitud (MV) de *Pholiota* basado en secuencias ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. Las nuevas secuencias obtenidas en este trabajo se indican en negrita.

thick), smooth, with granulose content, yellowish, non-dextrinoid in Melzer's reagent, acyanophilic, non-metachromatic. Hymenophoral trama subparallel, thin- to subthick-walled hyphae, with clamp-connections. Basidia 23–27 × 5.5–7 μm, 4–spored, clavate, without central constriction, with granulose, refringent content, hyaline. Pleurocystidia not observed. Cheilocystidia 25–36 × 5–6.5 μm, cylindrical-flexuose, few narrowly lageniform, apex subcapitate or capitate apex, thin-walled, few with thickened wall, hyaline to yellowish brown. Subhymenium ramose, hyaline, gelatinized. Pileus trama radial. Pileipellis an ixocutis, approx. 60 μm wide; hyphae 2.5–6.5 μm diam., straight to tortuose, hyaline or yellowish, with pigment encrusted in the walls forming bands or irregular, septate, with clamp connections; subpellis approx. 45 μm wide, with hyphae septate, with clamp connections, yellowish. Caulocystidia 28–54 × 5–8 μm, cylindrical to clavate, some flexuose, apex obtuse or subcapitate, septate, with clamp connections, thin- to subthick-walled, hyaline, yellowish when in tufts. Veil with hyphae 2.5–6.5 μm diam., hyaline to yellowish, without wall pigment encrusted, septate with clamp connections. A yellow pigment is released when mounted in KOH.

Habit and habitat.— Caespitose, oak and pine forest.

Specimen studied.— MEXICO. Jalisco, Municipality of Tecolotlán, Sierra de Quila, km 15.5–16.3 highway Tecolotlán-Quila, 1760 m a.s.l., 24–VIII–1994, *M. L. Fierros 666* (IBUG; DNA-BF97).

Remarks.— *Pholiota caespitosa*, *P. melliodora*, *P. olivaceodisca*, and *P. tennesseensis* were suggested as conspecific by Tian & Matheny (2021) based on molecular data. Here we also found a clade with a polytomy of the four species (Fig. 11), including the Mexican sequence (BF97), strongly supported (100% ML-BS, 1 PP, 98% MP-BS). However, three of them (*P. caespitosa, P. melliodora*, and *P. tennesseensis*) were described with pleurocystidia as chrysocystidia, not present in *P. olivaceodisca* (Smith & Hesler, 1968) and in the specimen studied here. A deeper review of the characters that distinguish the four species and the comparison with our specimen, as well as the molecular data, leads us to think that they actually correspond to a single highly variable species and that the macromorphological features depend on the degree of freshness of the basidioma when it was collected. For nomenclature reasons the name that should be applied is *P. tennesseensis*.

This species has whitish, honey yellow or olive buff pileus when fresh, fibrillose to scaly, stipe also fibrillose to scaly, basidiospores 5–7.5 × 3.5–4 (–4.5) μm (or slightly bigger in the Mexican specimen), with or without pleurocystidia as chrysocystidia, cheilocystidia 14–48 × 3–9 μm, subcylindrical, filamentous, fusoid, utriform with the apex rounded or subcapitate, and gelatinized to subgelatinized subhymenium (Smith & Hesler, 1968). When Smith & Hesler (1968) described *P. tennesseensis*, they mentioned as an important distinguish characteristic the presence of chrysocystidia; however, they pointed out "the bright yellow pseudocystidia in the hymenium are fairly rare in the material examined to date but we feel they are significant as a species character". Now, with this data and the previous information by Tian & Matheny (2021), we confirmed that the presence of chrysocystidia is not a relevant character to distinguish this species. *Pholiota tennesseensis* and all its synonyms were only known from the USA, so this is the first record of the species to Mexico.

Fig. 12. Maximum Likelihood (ML) tree of *Strobilurus* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequence obtained in this work is indicated in boldface.

Fig. 12. Árbol de Máxima Verosimilitud (MV) de *Strobilurus* basado en secuencias ITS de ADNr. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. La nueva secuencia obtenida en este trabajo se indica en negrita.

Pholiota terrestris Overh.,
N. Amer. Fl. (New York) 10 (4): 268 (1924)
Figs. 4N–Q, 11

Pileus 13–44 mm diam., convex to plane-convex, umbonate, viscid, fibrillose, adpressed fibrils forming a scaly surface, to squamulose in the disk, surface straw yellow, yellowish brown, or orangish brown in the disk, fibrils and scales dark yellowish brown, edge inflexed to involute when dry. Lamellae narrowly adnate, segmentiform, close, grayish yellow, yellowish brown (5E8) when dry, margin slightly crenulate, whitish. Stipe 60–100 × 4 mm, uniform, terete, something twisted, cover by fibrils forming scales, finely squarrose, apex pruinose, surface whitish, yellowish, to yellowish brown to the base, fibrils and scales dark yellowish brown, reddish brown in bruised parts, with apical rests of the veil, base with sparse whitish mycelia. Context whitish, not stained when bruised; stipe hollow, context whitish to bright yellow. Odor and taste unappreciated. KOH 10% pileus (-) when dry.

Basidiospores 5.6–7.2 × 3.2–4 µm, Q = (1.4–) 1.5–2 (–2.3), ellipsoid to oblong, few cylindrical, with a small germ pore, thick-walled, smooth, apex rounded or slightly truncated, yellowish brown. Basidia 18.5–23 × 5.5–7 µm, (2–) 4–spored, sterigmata 2.5–6.5 µm long, clavate, with or without constrictions, hyaline, some with granular refringent content, some with basal clamp connection. Pleurocystidia chrysocystidia type, 17.5–33.5 × 5–9 µm, lageniform to clavate, with short to long base, apex mucronate short to long, thin-walled, hyaline with refringent yellowish orange amorphous inclusion, or hyaline with slightly refringent content, some with basal clamp connection. Cheilocystidia 25.5–39 × 6.5–9.5 µm, clavate, cylindrical-ventricose or lageniform, apex capitate, subcapitate or obtuse, hyaline, some with granular refringent content, some with basal clamp connection. Subhymenium very thin, probably gelatinized. Hymenophoral trama subparallel, hyphae 3–11 µm diam., thin- to thick-walled, hyaline to yellowish. Pileus trama radial, hyphae 5–18 µm diam., hyaline to yellowish. Pileipellis an ixocutis with three layers; epicutis 32–57 µm thick, hyphae 6–11.5 µm diam., some inflated, prostrated, some suberect, non-gelatinized, hyaline, with dark brown pigment encrusted in the walls forming bands; subcutis gelatinized; layer near the context thin and with compact hyphae. Caulocystidia not observed. A yellow pigment is released when mounted in KOH.

Habit and habitat.— Caespitose, in soil, pine-oak forest.

Specimen studied.— MEXICO. Jalisco, Municipality of Tapalpa, Juanacatlán, Agua Escondida, 28–VIII–2019, *V. Ramírez-Cruz 3554* (IBUG; DNA-BF74).

Remarks.— *Pholiota terrestris*, despite its name, can grow on soil, buried wood or stumps (Smith & Hesler, 1968). The Mexican specimen is apparently growing on soil in a large cluster, as it is common in this species. In Figure 11, its sequence is in a highly supported clade (100% ML-BS, 1 PP, 99% MP-BS) with a sequence of a specimen of *P. terrestris* from the USA, where this species was described. Smith & Hesler (1968) mentioned that this is a species that is typically found growing caespitose on the side of the road, characterized by a wood brown, sepia or cinnamon brown pileus covered by fibrillose scales, small basidiospores, of 4.5–6.5 (–7) × 3.5–4.5 µm, presence of typical chrysocystidia, cylindrical or subutriform cheilocystidia, and gelatinized subhymenium.

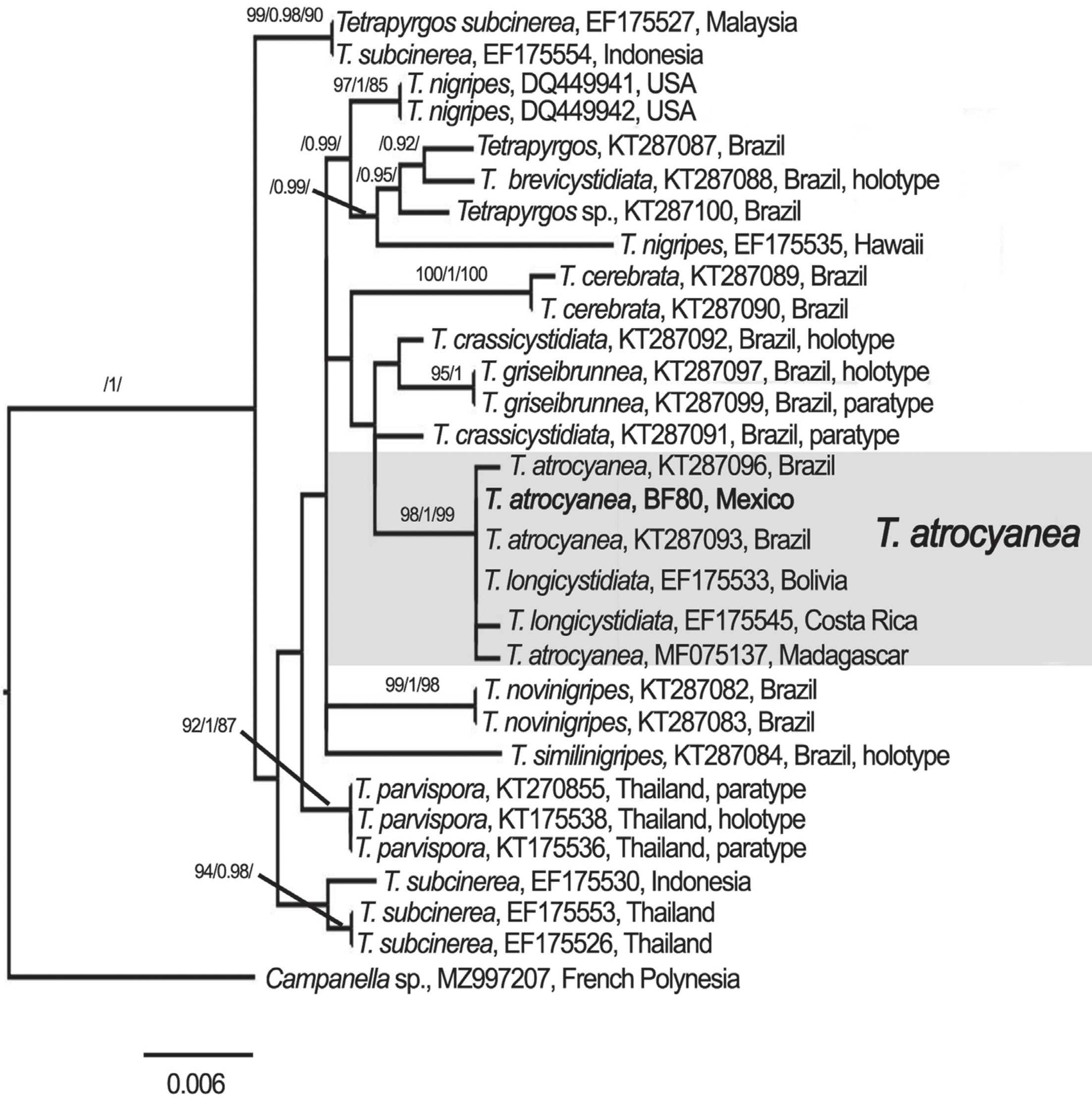

Fig. 13. Maximum Likelihood (ML) tree of *Tetrapyrgos* based on rDNA ITS sequences. Branch support values are shown as BS/PP/MP above the branches. The new sequence obtained in this work is indicated in boldface.

Fig. 13. Árbol de Máxima Verosimilitud (MV) de *Tetrapyrgos* basado en secuencias ITS de rDNA. Los valores de soporte de las ramas se muestran como BS/PP/MP sobre las mismas. La nueva secuencia obtenida en este trabajo se indica en negrita.

Strobilurus conigenoides (Ellis) Singer, Persoonia 2 (3): 409 (1962)
≡ *Agaricus conigenoides* Ellis, Bull. Torrey Bot. Club 6: 76 (1876)
Figs. 1G, 5F–K, 12

Pileus 2–6 mm diam., conic expanding to campanulate or convex, pruinose or finely velutinous, white (6A1), disc pale brown (6D5), transparently striate toward the margin, edge of margin entire to crenulate, decurved. Lamellae adnexed, subventricose, subdistant (13–15), with 2–3 series of lamellulae, white, margin entire. Stipe 10–75 × 0.5–1 mm, central, compressed, pruinose to finely pubescent, apex yellow (4A6) or deep orange (6A8), base with pseudorrhiza and yellowish basal strigose mycelium.

Basidiospores (4–) 4.8–6.4 (–7.2) × 2.4–3.2 (–4) μm, Q = 1.25–2 (–2.25), ellipsoid to oblong, some widely ellipsoid and cylindrical, without germ pore, thin-walled, smooth, hyaline. Basidia 17.5–21 × 4–4.5 μm, 4–spored, cylindric with a median constriction, thin-walled, hyaline. Pleurocystidia metuloid, 44–55 × 9–23 μm, utriform, apex obtuse or mucronate, apex covered with a layer of crystals, thick-walled (0.8–4 μm thick), hyaline. Cheilocystidia 33–55 (–85.5) × 8–11 (–13) μm, cylindrical or utriform, apex capitate, obtuse or mucronate, thick-walled (0.8–3.2 μm thick), hyaline. Hymenophoral trama regular, hyphae 3.2–8 μm diam., thin-walled, hyaline. Pileus trama interwoven, hyphae 1.8–6 μm diam., thin-walled, hyaline. Pileipellis a hymeniderm with two types of cystidia 1) 12–35 × 6.5–19 μm, clavate or spheropedunculate, few cylindrical, thin-walled, hyaline; 2) 24–93 × 8–21.5 μm, narrowly lageniform or lageniform, apex capitate, thick-walled (0.8–2.4 μm thick), hyaline. Caulocystidia 40–96 × 8–12.8 μm, setiform, narrowly lageniform, apex capitate or obtuse, thick-walled (1.6–2.4 μm thick), hyaline. Without clamp connections.

Habit and habitat.— Gregarious on fruits of *Magnolia iltisiana* A. Vázquez, in cloud forest.

Specimens studied.— MEXICO. Jalisco, Municipality of Cuautitlán de García Barragán, Sierra de Manantlán, Estación Científica Las Joyas, near El Zarzamoro, 19°35’13”N, 104°16’07”W, 1830–1987 m a.s.l., 14–VII–1984, *L. Guzmán-Dávalos 1555* (IBUG); 15–VII–1984, *L. Guzmán-Dávalos 1587* (IBUG); 29–V–1984, *H. Arreola s.n.* (IBUG); 19–IX–2021, *A. Cortés-Pérez 2156* (IBUG; DNA-My52).

Remarks.— *Strobilurus conigenoides* is a species well characterized by its unique substrate, *Magnolia* seed pods; it also has a whitish pileus with ochraceous buff central portion, cylindrical to lacrymoid basidiospores, presence of metuloids, and hymeniform pileipellis (Singer, 1962; Redhead, 1980; Qin *et al*., 2018). Some differences found in our specimens are the larger pleurocystidia and cheilocystidia; Singer (1962) cited cystidia 25–42 × 8–12 μm. We only observed one very long stipe, with strigose base, and attached to the inner walls of the dehiscent follicles of the fruit of *Magnolia*.

Regarding to the distribution, the species has been cited from Florida, Mississippi, New Jersey, North Caroline, and Tennessee in the USA (Singer, 1962; Redhead, 1980). Then, recently its distribution was expanded to Panama (Qin *et al*., 2018) and now is recorded for the first time to Mexico. Their phylogenetic position is shown in Figure 12, where it formed a supported clade (70% ML-BS, 1 PP, 69% MP-BS) with other sequences of *S. conigenoides* from the USA and Panama.

Tetrapyrgos atrocyanea (Métrod) E. Horak, Sydowia 39: 102 (1987)
≡ *Pterospora atrocyanea* Métrod, Prodr. Fl. Mycol. Madag. 3
(Mycénes Madag.): 129 (1949)
Figs. 1H, 5A–E, 13

Pileus 2–6 mm diam., hemispheric expanding to convex or plano-convex, margin even or striate, inflexed, somewhat crenulate in age; surface dull, dry, minutely pruinose, disc dark greyish blue (20E4) to pale brown greyish (5F2), elsewhere greyish white (5B1) to pale brownish (5C3, 5C4) in age, margin whitish. Context, thin, whitish. Lamellae adnate, broad, subdistant, whitish to greyish (20B1), edge serrulate, pale. Stipe 5–25 × 0.8–1.5 mm, central or excentrical, cylindrical, hollow, pruinose, apex whitish, fading to dark greyish (20F3), with the base greyish black (20F5).

Basidiospores (7.6–) 8–11.2 × 7.2–9.6 (–10.4) μm, Q =1–1.33, tetrahedral, thin-walled, hyaline, inamyloid. Basidia 39–45 × 9–9.5 μm, 4–spored, sterigmata up 4 μm long, narrowly clavate, thin-walled, hyaline, inamyloid. Pleurocystidia absent. Cheilocystidia 28–60 × 4–5.6 μm, cylindrical, irregularly sparsely to densely diverticulate, apex subcapitate, obtuse or subacute, often branching, thin-walled, hyaline, inamyloid, diverticula 1.6–12 × 1.6–4.8 μm, cylindrical or rounded, occasionally branched. Subhymenium ramose, hyaline, inamyloid. Lamellar trama subregular, hyphae 2–5 μm diam., cylindrical, thin-walled, hyaline, inamyloid. Pileipellis a cutis, rameales-structure, hyphae 1.5–7 μm diam., diverticulate, with encrusted pigment, interwoven; terminal hyphae 12–43.2 × 4–6.4 μm, suberect to erect, similar in shape to cheilocystidia, hyaline, inamyloid, diverticula 1.6–12 × 1.6–3 μm, cylindrical or rounded. Pileus trama with hyphae 1.5–7 μm diam., thin-walled, hyaline, inamyloid. Stipitipellis hyphae 1.6–5.6 μm diam., thin-walled, hyaline, inamyloid. Caulocystidia 16–59.2 × 3.2–5.6 μm, similar in shape to cheilocystidia, diverticula 3–11.2 × 2–3 μm, cylindrical or rounded, simple or branched. Clamp connections present.

Habit and habitat.— Gregarious, on woody debris of *Quercus xalapensis* Humb. & Bonpl., in coffee plantations.

Specimen studied.— MEXICO. Veracruz, Municipality of Coatepec, west of Coatepec, 19°27'11.12"N, 95°58'49.70"W, 1230 m a.s.l., 2–VII–2021, *A. Cortés-Pérez 2101* (IBUG, DNA-BF80).

Remarks.— The Mexican specimen is micro and macromorphological similar to *Tetrapyrgos atrocyanea*, which is distinguished by a pruinose pileus with a grey disc and white margin, and a black or bluish black stipe covered with a white pruina, tetrahedral basidiospores, 8–11 × 7–10 μm, and diverticulate cystidial elements with bulbous apices (Desjardin *et al*., 2017; Komura *et al*., 2020). A morphologically similar species is *T. nigripes*, differencing in the whitish pruinose pileus and shorter cheilocystidia, 23–44 × 2.8–6.4 μm (Honan *et al*., 2015).

In the ITS phylogeny (Fig. 13) the Mexican sequence formed a well-supported clade with sequences from Brazil and Madagascar (98% ML-BS, 1 PP, 99% MP-BS). This species was recorded from Argentina, Brazil, Bolivia, British Virgin Islands, Costa Rica, Madagascar, and Puerto Rico (Honan *et al*., 2015; Komura *et al*., 2020); the collection from Veracruz state is the first record of this species for Mexico.

CONCLUSION

As a result of this work, we provided 11 new records and confirm two already cited of lignicolous Agaricales from Mexico. With the species included here, we confirm that Mexico is a convergence zone in which fungal taxa from both regions, Nearctic and Neotropical, are present, following the general distribution patterns described for some plants and animals. Only *Mycena rebaudengoi* was the exception because this taxon seems to have a broader distribution, shared for now with Europe and Mexico.

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Supplementary Table 1. Sequences of *Anthracophyllum* used in this study. New rDNA ITS sequences obtained in this work are in boldface. *Omphalotus japonicus* was used as outgroup.

Tabla suplementaria 1. Secuencias de *Anthracophyllum* utilizadas en este estudio. Las nuevas secuencias ITS de ADNr obtenidas en este trabajo están en negrita. *Omphalotus japonicus* se utilizó como grupo externo.

Species	Herbarium & voucher	Collector & number	Collection date	Country	GenBank Accession	Reference
Anthracophyllum archeri (Brek.) Pegler	TENN–F–50049, TFB3511	B. Rees 3511	14 May 1991	Australia	DQ444308	Mata *et al.* 2007
A. archeri	AFTOL-ID 973	PBM2201	—	—	DQ404387	Unpublished
A. lateritium (Berk. & M.A. Curtis) Singer	TENN–F–50256, TFB4043	R.H. Petersen 4043	16 Jun 1991	USA	DQ444309	Mata *et al.* 2007
A. lateritium	TENN–F–62043	E.B. Lickey & M.C. Aime 13516	29 Jun 2007	USA	FJ596892	Hughes *et al.* 2009
A. lateritium	UOC-DAMIA-D26	—	3 Aug 2012	Sri Lanka	KP757737	Fernando *et al.* 2015
A. lateritium	**IBUG, BF71**	**O. Castro-Jauregui 1824**	**3 Oct 2020**	**Mexico**	**OP546336**	**This work**
A. lateritium	**IBUG, BF72**	**O. Castro-Jauregui 1835**	**3 Oct 2020**	**Mexico**	**OP546337**	**This work**
Anthracophyllum sp.	TYY2021–6–1	—	—	—	OK586733	Unpublished
Anthracophyllum sp.	biocode09–407	T. Osmundson, R. Taputuarai, S. Bergemann	22 Jul 2009	French Polynesia	MZ996997	Osmundson *et al.* 2022
Anthracophyllum sp. (as *Entoloma* sp.)	TBY2021–8–1	—	—	China?	OM060662	Unpublished
Omphalotus japonicus (Kawam.) Kirchm. & O.K. Mill.	xsd08134	Y. Sun	Sep 2008	China	FJ481045	Unpublished

Supplementary Table 2 (part 1 of 2). Sequences of *Collybiopsis* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Parmycetinis* was used as outgroup.

Tabla complementaria 2 (parte 1 de 2). Secuencias de *Collybiopsis* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenida en este trabajo está en negrita. *Parmycetinis* se utilizó como grupo externo.

Species	Herbarium & Voucher	Collector & number	Collection date	Country	GenBank Accesion	Reference
Collybiopsis californica (Desjardin) R.H. Petersen	SFSU–F–024539	G. Wright 866	12 Jan 1978	USA	MN413336	Petersen & Hughes 2021
C. californica	SFSU–F–024526	D.E. Desjardin 8372	11 Nov 2008	USA	MN413337	Petersen & Hughes 2021
C. confluens (Pers.) R.H. Petersen	TENN–F–067865, TFB14115	R.H. Petersen	27 Aug 2012	Germany	KP710292	Hughes & Petersen 2015
C. confluens	TENN–F–067864, TFB14114	J. Kleine	26 Aug 2012	Germany	KP710296	Hughes & Petersen 2015
C. dichroa (Berk. & M.A. Curtis) R.H. Petersen	TENN–F–056584	J.L. Mata	29 May 1998	USA	MW396865	Petersen & Hughes 2021
C. dichroa	TENN–F–048680, TFB9623	R.H. Petersen & K. Hughes	—	USA	MW396869	Petersen & Hughes 2021
C. disjuncta (R.H. Petersen & K.W. Hughes) R.H. Petersen & K.W. Hughes	TENN–F–068136, TFB14281	R.H. Petersen	—	USA	KJ416253	Petersen & Hughes 2014
C. disjuncta	TENN–F–069172, TFB14339, holotype	P. De Santo	1 Sep 2013	USA	NR137865	Petersen & Hughes 2014
C. eneficola (R.H. Petersen) R.H. Petersen	MICH–F–139600/Wells-Kempton Herb. no. 6975	P. Kempton	8 Sep 1995	Alaska	KP710270	Hughes & Petersen 2015
C. eneficola	TENN–F–069122, 100921AV04	A. Voitk	21 Oct 2010	Canada	KJ128265	Hughes & Petersen 2015
C. filamentipes R.H. Petersen	TENN–F–065861, TFB13962, holotype	R.H. Petersen & K. Hughes	22 Aug 2011	USA	MN897832	Petersen & Hughes 2021
C. furtiva R.H. Petersen	TENN–F–051097, TFB4796	S.A. Gordon	15 Jun 1992	USA	MN413343	Petersen & Hughes 2021
C. furtiva	SFSU–F–024540, DED–4425, holotype	D.E. Desjardin 4425	10 Aug 1987	USA	DQ450031	Mata *et al.* 2007
C. gibbosa (Corner) R.H. Petersen	URM–90012	—	—	Brazil	KY061202	Coimbra 2017
C. gibbosa	MEL–2382838	T. Lebel, G.M. Bonito, M.D. Barrett & C.N. Barrett	22 Jan 2014	Australia	KP012713	Petersen & Hughes 2021
C. hasanskyensis R.H. Petersen	TENN–F–060730, TFB11846, holotype	R.H. Petersen & A. Kovalenko	18 Aug 2005	Russia	MN897829	Petersen & Hughes 2021
C. hasanskyensis	TENN–F–060731, TFB11847	R.H. Petersen & TFB 11847	18 Aug 2005	Russia	MN897830	Petersen & Hughes 2021
C. juniperina (Murrill) R.H. Petersen	TENN–F–59540	M. Blackwell	4 Oct 2002	USA	AY256708	Mata *et al.* 2004
C. juniperina	TENN–F–58988, TFB10782	R.H. Petersen	—	Argentina	KY026661	Petersen & Hughes 2016
C. luxurians (Peck) R.H. Petersen	TENN–F–67806, TFB14060	K.W. Hughes	31 Jul 2012	USA	MW396871	Petersen & Hughes 2021
C. luxurians	TENN–F–55748, TFB9121	R.H. Petersen	—	USA	KY026649	Petersen & Hughes 2016
C. melanopus (Wilson, Desjardin & E. Horak) R.H. Petersen	SFSU–A.W. Wilson 54, paratype	A.W. Wilson 54	5 Jan 2000	Java	NR137539	Wilson *et al.* 2004
C. menehune (Desjardin, Halling & Hemmes) R.H. Petersen	CUH–AM074	A.K. Dutta	11 Jun 2011	India	KJ778753	Dutta *et al.* 2015
C. menehune	SFSU–DED–5866, holotype	D.E. Desjardin 5866	3 Aug 1993	Hawaii	AY263426	Wilson *et al.* 2004
C. mesoamericana (J.L. Mata) R.H. Petersen	TENN–F–058613, TFB11005, holotype	J.L. Mata & R.H. Petersen	23 Jun 2000	Costa Rica	NR119583	Schoch *et al.* 2014
C. mesoamericana	NYBG–REH–7379	R.E. Halling	17 Oct 1994	Costa Rica	AF505768	Mata *et al.* 2007
C. minor R.H. Petersen	TENN–F–051792, TFB5434	R.H. Petersen & K. Hughes	—	USA	MW396872	Petersen & Hughes 2021
C. minor	TENN–F–059993, TFB11930	R.H. Petersen	—	USA	MN413334	Petersen & Hughes 2021
C. nonnulla (Corner) R.H. Petersen	RAK–369.2	—	—	Cameroon	MN930621	Koch *et al.* 2020
C. nonnulla	SFSU–AWW55	Wilson	5 Jan 2001	Indonesia	AY263446	Wilson *et al.* 2004
C. obscuroides (Antonín & Legon) R.H. Petersen	GB–0150514	—	—	Norway	KX958399	Coimbra 2017
C. obscurioides	GB–0053811	—	—	Sweden	KX958398	Coimbra 2017

Supplementary Table 2 (**part 2 of 2**). Sequences of *Collybiopsis* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Parmycetinis* was used as outgroup.

Tabla complementaria 2 (**parte 2 de 2**). Secuencias de *Collybiopsis* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenida en este trabajo está en negrita. *Parmycetinis* se utilizó como grupo externo.

C. parvula (J.L. Mata, R.H. Petersen & K.W. Hughes) R.H. Petersen	TENN–F–58116, TFB10422	—	—	Costa Rica	AF505774	Mata *et al.* 2007
C. parvula	TENN–F–058113, TFB10419, holotype	J.L. Mata	21 Jun 1999	Costa Rica	NR119584	Schoch *et al.* 2014
C. peronata (Bolton) R.H. Petersen	No voucher	—	—	Russia	KY026755	Petersen & Hughes 2016
C. polygramma (Mont.) R.H. Petersen	URM–90016	V.R.M. Coimbra 94	6 Feb 2014	Brazil	KY074641	Coimbra 2017
C. polygramma	URM–90017	V.R.M. Coimbra 97	27 Mar 2014	Brazil	KY074642	Coimbra 2017
C. polygramma	HFJAU–0425	—	—	China	MN258643	Petersen & Hughes 2021
C. quercophila (Pouzar) R.H. Petersen	TENN–F–69321, TFB14616	T. Henkel	11 Nov 2015	USA	KY026737	Petersen & Hughes 2016
C. quercophila	SFSU–25220	—	—	USA	KY026761	Petersen & Hughes 2016
C. ramealis (Bull.) Millsp.	TENN–F–050509, TFB3772	S.A. Gordon	13 Sep 1991	United Kingdom	MN413350	Petersen & Hughes 2021
C. ramealis	TENN–F–055908	R.H. Petersen & T.F.B.	2 Sep 1997	United Kingdom	MN413372	Petersen & Hughes 2021
C. readiae (G. Stev.) R.H. Petersen	TENN–F–053687, TFB–7571	Methven	27 May 1994	New Zealand	DQ450034	Mata et al. 2007
C. readiae	TENN–F–061061, TFB6989	—	—	New Zealand	KJ416244	Petersen & Hughes 2014
C. subcyathiformis (Murrill) R.H. Petersen	URM–90022	V.R.M. Coimbra 60	16 Jan 2014	Brazil	KY404983	Coimbra 2017
C. subcyathiformis	URM–90023	V.R.M. Coimbra 61	16 Jan 2014	Brazil	KY404982	Coimbra 2017
C. subnuda (Ellis ex Peck) R.H. Petersen	WRW–08–462	—	—	USA	KY026765	Petersen & Hughes 2016
C. subnuda	TENN–F–065985, TFB14043	K.W. Hughes	30 Jul 2012	USA	MW396876	Petersen & Hughes 2021
C. subpruinosa (Murrill) R.H. Petersen	No voucher	M. Kulanthaisamy	17 Oct 2019	India	OK165603	Unpublished
C. subpruinosa	No voucher	—	—	Madeira	MK646034	Unpublished
C. subpruinosa	TENN–F–59474, TFB–11063/	R.H. Petersen & K.W. Hughes	13 Jan 2002	USA	DQ450025	Mata *et al.* 2007
C. subpruinosa	No voucher	M. Kulanthaisamy	17 Oct 2019	India	OK165581	Unpublished
C. subpruinosa	TENN–F–59477, TFB–11066	R.H. Petersen & K.W. Hughes	13 Jan 2002	USA	DQ450027	Mata *et al.* 2007
C. subpruinosa	**IBUG, BF90**	**G. Guzmán 40742**	**4 Feb 2015**	**Mexico**	**OP546344**	**This work**
“C. utriformis”	TENN–F–68185	—	—	USA	KY026707	Petersen & Hughes 2016
C. villosipes (Cleland) R.H. Petersen	TENN–F–60951	—	—	New Zealand	KJ416255	Petersen & Hughes 2016
C. villosipes	iNaturalist 2708886	—	22 Feb 2016	USA	MF163171	Petersen & Hughes 2021
Paramycetinis austrobrevipes R.H. Petersen	TENN–F–53149, TFB 3591	R.H. Petersen	—	Australia	KY026637	Petersen & Hughes 2020
P. caulocystidiatus R.H. Petersen	TENN–F–54050, TFB 7148	R.H. Petersen	27 May 1994	New Zealand	KY026645	Petersen & Hughes 2020

Supplementary Table 3. Sequences of *Hohenbuehelia* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Resupinatus* was used as outgroup.

Tabla complementaria 3. Secuencias de *Hohenbuehelia* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenida en este trabajo está en negrita. *Resupinatus* se utilizó como grupo externo.

Species	Herbarium & Voucher	Collector & number	Collection date	Country	GenBank Accesion	Reference
Hohenbuehelia algonquinensis Consiglio, Setti & Thorn	UWO, GT–870601/12	R. G. Thorn	1 Jun 1987	Canada	KU355341	Consiglio *et al*. 2018
H. angustata (Berk.) Singer	WU–4120	A. Hausknecht	27 Jul 1984	Austria	KT388016	Mentrida 2016
H. angustata	HMJAU4149	—	—	China	GQ142027	Unpublished
H. angustata	UWO, RGT–010802/04	R. G. Thorn	2 Aug 2001	Costa Rica	EF409719	Koziak *et al*. 2007
H. atrocoerulea (Fr.) Singer	WU–2364	A. Mader & K. Mader	6 Oct 1982	Austria	KT388029	Mentrida 2016
H. auriscalpium (Maire) Singer	K(M)–120317	—	2003	United Kingdom	KX064449	Aisnworth *et al*. 2016
H. auriscalpium	K(M)–135753	—	2005	United Kingdom	KX064448	Aisnworth *et al*. 2016
H. auriscalpium	K(M)–180120	—	2010	United Kingdom	KX064446	Aisnworth *et al*. 2016
H. bonii A.M. Ainsw.	K(M)–142995	—	2006	United Kingdom	KX064442	Aisnworth *et al*. 2016
H. bonii	K(M)–27444	—	1994	United Kingdom	KX064441	Aisnworth *et al*. 2016
H. canadensis Consiglio, Setti & Thorn	DAOM–46785	—	—	Canada	NR166219	Unpublished
H. canadensis	UWO, RGT–940206/01	—	—	Canada	AF139960	Koziak *et al*. 2007
H. carlothornii A.M. Ainsw.	UWO, RGT–040611/01	R.G. Thorn and A.T.E. Koziak	1 Jul 2004	Costa Rica	EF409756	Consiglio *et al*. 2018
H. carlothornii	AMB, RGT–990707/02	R.G. Thorn	7 Jul 1999	Costa Rica	KY698012	Consiglio *et al*. 2018
H. cyphelliformis (Berk.) O.K. Mill.	WU–27185	G. Koller	18 Dec 2006	Austria	KT388041	Mentrida 2016
H. chevalieri (Pat.) Pegler	WU–6528	A. Hausknecht	26 Oct 1987	Austria	KT388040	Mentrida 2016
H. culmicola Bon	LIP–1034	—	—	—	NR154081	Consiglio *et al*. 2018
H. culmicola	K(M)–102683	—	1987	United Kingdom	KX064451	Ainsworth *et al*. 2016
H. culmicola	K(M)–118261	—	2003	United Kingdom	KX064452	Ainsworth *et al*. 2016
H. fluxilis (Fr.) P.D. Orton	WU–29608	H. Voglmayr	23 May 2009	Austria	KU355326	Consiglio *et al*. 2018
H. grisea (Peck) Singer	DAOM, RGT–840713/01	G.L. Barron	—	Canada	AF139952	Koziak *et al*. 2007
H. grisea	UWO, RGT–010805/02	R.G. Thorn	5 Aug 2002	Costa Rica	EF409760	Consiglio *et al*. 2018
H. grisea	CBS, CCRC–36224	—	—	Republic of Korea	AY265835	Unpublished
H. mastrucata (Fr.) Singer	WU–2187	R. Schütz & I. Krisai-Greilhuber	8 Aug 1982	Austria	KT388034	Mentrida 2016
H. mastrucata	WU–2381	A. Hausknecht et al	5 Nov 1982	Austria	KT388027	Mentrida 2016
H. mastrucata	TRTC–152314	—	—	—	NR154082	Unpublished
H. mastrucata	F, RGT–820902/12	R.G. Thorn		Canada	EF409737	Koziak *et al*. 2007
H. nimueae Consiglio, Setti & Thorn	UWO, RGT–871128/01	R.G. Thorn, T.A. Dickinson, et al.	28 Nov 1987	Canada	KY679144	Consiglio *et al*. 2018
H. nimueae	UWO, RGT–970530/01	R.G. Thorn & L.J. Hutchison	30 May 1997	USA	KY679145	Consiglio *et al*. 2018
H. petaloides (Bull.) Schulzer	WU–1283	A. Hausknecht & W. Egle	10 Oct 1981	Austria	KT388020	Mentrida 2016
H. petaloides	UBC, F16282	—	—	Canada	EU486437	Unpublished
H. petaloides	Fungi Suecici 4656	R. Morander	25 Sep 1983	Sweden	AF139956	Koziak *et al*. 2007
H. petaloides	AMB–18091	—	—	France	NR173155	Consiglio *et al*. 2018
H. portegna (Speg.) Singer	BAFC, J.E. Wright1136	J.E. Wright	1968	Argentina	AF139959	Koziak *et al*. 2007
H. portegna	WU–21083	A. Hausknecht & G. Kovacs	15 Feb 2000	Reunion (France)	KT388039	Mentrida 2016
H. portegna	Laboratory of biological collections of the Universidad del Mar, V01831	J. Villarruel Ordaz 1831	22 Aug 2019	Mexico	MT939281	Villarruel-Ordaz *et al*. 2021
H. portegna	—	HE2904	—	—	KC505559	Unpublished
H. portegna	**IBUG, BF30**	**V. Ramírez Cruz 3498**	**30 Sep 2017**	**Mexico**	**OP546343**	**This work**
Resupinatus applicatus (Batsch) Gray	AMB–18075 Scandurra	—	—	Italy	KU355368	Consiglio *et al*. 2018
R. niger (Schwein.) Murrill	HMJAU–2887	—	—	—	GQ142025	—

Supplementary Table 4 (**part 1 of 2**). Sequences of *Mycena* used in this study. New rDNA ITS sequences obtained in this work are in boldface. *Infundibulicybe gibba* was used as outgroup.

Tabla complementaria 4 (**parte 1 de 2**). Secuencias de *Mycena* utilizadas en este estudio. Las nuevas secuencias ITS de ADNr obtenidas en este trabajo están en negrita. *Infundibulicybe gibba* se utilizó como grupo externo.

Species	Herbarium & voucher	Collector & number	Collection date	Country	GenBank Accession	Reference
Mycena abramsii (Murrill) Murrill	HMJAU–43282	–	14 Sep 2016	China	MK629326	Unpublished
M. abramsii	HMJAU–43606	–	26 Jul 2017	China	MH396629	Unpublished
M. adscendens Maas Geest.	Orstadius 329–05	–	–	Sweden	KT900141	Aronssen & Larsson 2015
M. adscendens	Aronsen 061119	–	19 Nov 2006	Norway	KT900142	Aronssen & Larsson 2015
M. arcangeliana Bres.	252b	G. Robich	30 Oct 1990	Italy	JF908401	Osmundson *et al.* 2013
M. arcangeliana	252f	G. Sgualdini /M. Zugna	29 Oct 1995	Italy	JF908402	Osmundson *et al.* 2013
M. bicystidiata T. Bau & Q. Na	HMJAU–43589	Q. Na	19 Jul 2017	China	MK309774	Na & Bau 2019
M. bicystidiata	HMJAU–43593	Q. Na	20 Jul 2017	China	MK309775	Na & Bau 2019
M. castaneicola T. Bau & Q. Na (as *Mycena* sp.)	HMJAU–43578, NX0571, holotype	T. Bau & Q. Na	16 Jul 2017	China	MH136826	Na & Bau 2019
M. castaneicola	HMJAU–43581, NX0574	Q. Na	17 Jul 2017	China	MH136827	Na y Bau 2019
M. citrinomarginata Gillet	HMJAU–43563, NX0556	Q. Na	8 Jul 2018	China	MG654739	Na & Bau 2018
M. citrinomarginata	317h	G. Robich	3 Oct 1996	Italy	JF908416	Osmundson *et al.* 2013
M. diosma Krieglst. & Schwöbel	320f	G. Robich	19 Sep 1997	Italy	JF908417	Osmundson *et al.* 2013
M. heteracantha (Singer) Desjardin	HMJAU–43709	–	–	China	MK309785	Na & Bau 2019
M. heteracantha	HMJAU–43716	–	–	China	MK309787	Na & Bau 2019
M. hyalinostipitata T. Bau & Q. Na	HMJAU–43693, holotype	T. Bau & Q. Na	23 Aug 2017	China	MH136828	Na & Bau 2019
M. hyalinostipitata	HMJAU–43701, NX069	Q. Na	27 Aug 2017	China	MH136829	Na & Bau 2019
M. hygrophoroides T. Bau & Q. Na	HMJAU–43417, holotype	Q. Na	8 May 2017	China	MK309780	Na & Bau 2019
M. hygrophoroides	HMJAU–43421	Q. Na	7 May 2017	China	MK309781	Na & Bau 2019
***Mycena luxarboricola* Desjardin, B.A. Perry & Stevani**	**XAL, My26**	**A. Cortés-Pérez 1640**	**23 Aug 2016**	**Mexico**	**OP546338**	**This work**
M. luxarboricola	**XAL, My23**	**A. Cortés-Pérez 1677**	**26 Aug 2016**	**Mexico**	**OP546339**	**This work**
M. luxarboricola	**XAL, My24**	**A. Cortés-Pérez 1812**	**5 Sep 2016**	**Mexico**	**OP546340**	**This work**
M. meliigena (Berk. & Cooke) Sacc.	39	G. Robich	2 Nov 1992	Italy	JF908423	Osmundson *et al.* 2013
M. meliigena	39d	G. Robich	2 Nov 1992	Italy	JF908429	Osmundson *et al.* 2013
M. miscanthi T. Bau & Q. Na	HMJAU–43584, holotype	Q. Na & T. Bau	16 Jul 2017	China	MK309777	Na & Bau 2019
M. miscanthi	HMJAU–43582	Q. Na & T. Bau	17 Jul 2017	China	MK309778	Na & Bau 2019
M. oculisnymphae Desjardin, B. A. Perry & Stevani	DED–8734	J. Heenan & J. Mendes	24 Mar 2014	Brazil	KX010910	Desjardin *et al.* 2016
M. oculisnymphae	DED–8742, SP–446002, holotype	J. Heenan, C. Stevani & J. Mendes	26 Mar 2014	Brazil	KX010909	Desjardin *et al.* 2016
M. pearsoniana Dennis ex Singer	FCME–25817, epitype	J. Cifuentes 2005/344	10 Oct 2005	USA	JN182198	Harder *et al.* 2012
M. pearsoniana	TENN–F–61384	–	–	USA	JN182200	Harder *et al.* 2012
M. pelianthina (Fr.) Quél.	108f	–	–	Italy	JF908380	Osmundson *et al.* 2013

Supplementary Table 4 (part 2 of 2). Sequences of *Mycena* used in this study. New rDNA ITS sequences obtained in this work are in boldface. *Infundibulicybe gibba* was used as outgroup.

Tabla complementaria 4 (parte 2 de 2). Secuencias de *Mycena* utilizadas en este estudio. Las nuevas secuencias ITS de ADNr obtenidas en este trabajo están en negrita. *Infundibulicybe gibba* se utilizó como grupo externo.

M. pelianthina	CBH–164	C.B. Harder	Oct 2006	Denmark	FN394548	Harder *et al.* 2012
M. pura (Pers.) P. Kumm.	HMJAU–43121	–	–	China	MK309793	Na & Bau 2019
M. pura	TENN–F–65043	D.J. Lodge & K. Hughes	30 Sep 2006	USA	JN182202	Harder *et al.* 2012
M. rebaudengoi Robich	95907241	–	–	USA	ON175855	Unpublished
M. rebaudengoi	CBHHK–068	C.B. Harder	–	Norway	MT153144	Thoen *et al.* 2020
M. rebaudengoi	F–073581	E. Rantakallio & A. Kestilae	18 Oct 2005	Finland	MW540725	Unpublished
M. rebaudengoi	861	G. Robich	9 Oct 2003	Italy	JF908477	Osmundson *et al.* 2013
M. rebaudengoi	**IBUG, My97**	**A. Cortés-Pérez 2041**	**8 Oct 2019**	**Mexico**	**OP546341**	**This work**
M. rosea Gramberg	CBH–409	S. Garnica	6 Oct 2005	Germany	FN394551	Harder *et al.* 2010
M. rosea	TL–12409	T. Laessoe	2005	Denmark	FN394557	Harder *et al.* 2010
M. seminau Chew & Desjardin	KLU–M–1223, ACL136, holotype	A. Chew	28 Aug 2010	Malaysia	KF537250	Chew *et al.* 2014
M. seminau	KLU–M–1226, ACL–308, paratype	A. Chew	19 Aug 2012	Malaysia	KF537252	Chew *et al.* 2014
M. semivestipes (Peck) A.H. Sm.	Mushroom Observer 303090	D. Grootmyers	18 Nov 2015	USA	MK607569	Unpublished
M. semivestipes	HMJAU–43825	–	–	China	MK733308	Unpublished
M. semivestipes	HMJAU–43830	–	–	China	MK733309	Unpublished
M. semivestipes	TENN–F–61770	E.B. Lickey & C. Boyles 13507	7 Nov 2006	USA	FJ596888	Hughes *et al.* 2009
M. semivestipes	**IBUG, My74**	**A. Cortés-Pérez 2154**	**19 Sep 2021**	**Mexico**	**OP546342**	**This work**
M. silvae-nigrae Maas Geest. & Schwöbel	515	G. Robich	2 May 2000	Italy	JF908452	Osmundson *et al.* 2013
M. silvae-nigrae	CC13–12	M. Alexander	5 Oct 2006	USA	KF359604	Baird *et al.* 2014
M. substylobates T. Bau & Q. Na	HMJAU–43418, NX–0571, holotype	T. Bau & Q. Na	7 May 2017	China	MH216189	Na & Bau 2019
M. substylobates	HMJAU–43444, NX–0574	Q. Na	16 May 2017	China	MH216190	Na & Bau 2019
M. supina (Fr.) P. Kumm.	128a	G. Robich	9 Oct 1991	Italy	JF908388	Osmundson *et al.* 2013
M. zephirus (Fr.) P. Kumm.	CBS–270.48	–	–	France	MH856339	Vu *et al.* 2019
M. zephirus	CBS–273.48	–	–	France	MH856341	Vu *et al.* 2019
Infundibulicybe gibba (Pers.) Harmaja	FLAS–F–60947	M.E. Smith, B. Kaminsky & D. Borland	–	USA	MH016906	Unpublished

Supplementary Table 5. Sequences of *Omphalotus* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Neonothopanus nambi* was used as outgroup.

Tabla complementaria 5. Secuencias de *Omphalotus* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenidas en este trabajo está en negrita. *Neonothopanus nambi* se utilizó como grupo externo.

Species	Herbarium & voucher	Collector & number	Collection date	Country	GenBank Accession	Reference
Omphalotus illudens (Schwein.) Bresinsky & Besl	MICH–340496	A.C. Dirks	14 Apr 2018	USA	MT913620	Unpublished
O. illudens	TENN–F–54507	–	–	USA	AY313271	Mata *et al.* 2007
O. mexicanus	TENN–F–51283	K.W. Hughes 4866	2 Jul 1992	Guatemala	AY313274	Mata *et al.* 2007
O. olearius (DC.) Singer	culture 9061b	–	–	France	AY313277	Mata *et al.* 2007
O. olearius	–	–	–	Hungary	MH857427	Vu *et al.* 2019
O. olivascens H.E. Bigelow, O.K. Miller & Thiers	DED–6450	–	–	USA	AY313280	Mata *et al.* 2007
O. olivascens	TENN–F–55337	D.L. Largent 8284	9 Mar 1996	USA	AY313281	Mata *et al.* 2007
O. olivascens	GKVK–14	–	–	India	MF403068	Unpublished
O. subilludens (Murrill) H.E. Bigelow	HHB11125	–	–	USA	AY313285	Mata *et al.* 2007
O. cf. *subilludens*	TENN–F–59518	R. Lyon 10992	17 Nov 2002		AY313284	Mata *et al.* 2007
O. subilludens	**IBUG, BF67**	**O. Castro-Jauregui 2463**	**1 Nov 2021**	**Mexico**	**OP546335**	**This work**
Neonothopanus nambi (Speg.) R.H. Petersen & Krisai (as *N. eugrammus*)	DUKE–3980	R. Vilgalys	5 Jun 1997	Puerto Rico	AF525074	Kirchmair *et al.* 2004
Neonothopanus nambi (as *N. eugrammus*)	DUKE–2581	R. Vilgalys	9 Feb 1995	Australia	AF525075	Kirchmair *et al.* 2004

Supplementary Table 6 (part 1 of 2). Sequences of *Pholiota* used in this study. New rDNA ITS sequences obtained in this work are in boldface. *Hypholoma* was used as outgroup.

Tabla complementaria 6 (parte 1 de 2). Secuencias de *Pholiota* utilizadas en este estudio. Las nuevas secuencias ITS de ADNr obtenidas en este trabajo están en negrita. *Hypholoma* se utilizó como grupo externo.

Species	Herbarium & voucher	Collector & number	Collection date	Country	GenBank Accession	Reference
Pholiota baeosperma Singer	TENN–F–054431	R.H. Petersen	13 Apr 1995	Chile	MG735312	Matheny *et al.* 2018
P. baeosperma	TENN–F–054993	R.H. Petersen	7 May 1996	Argentina	KY559332	Matheny *et al.* 2018
P. brunnescens A.H. Sm. & Hesler	TENN–F–052897	K.W. Hughes	12 Jul 1993	Mexico	KF871789	Matheny *et al.* 2018
P. brunnescens	MICH–11657 /AHS3525, holotype	A.H. Smith	18 Nov 1935	USA	MG735292	Matheny *et al.* 2018
P. caespitosa A.H. Sm. & Hesler	TENN–F–015908, holotype	L.R. Hesler	31 Oct 1943	USA	NR_119908	Tian & Matheny 2020
P. castanea A.H. Sm. & Hesler	TENN–F–020269, holotype	A.J. Sharp	11 Dec 1951	USA	HQ222025	Matheny *et al.* 2018
P. castanea	**IBUG, BF96**	**A.G. Naranjo-López 9**	**16 Jul 2000**	**Mexico**	**OP546332**	**This work**
P. chocenensis Holec & M. Kolařík	PRM895066, holotype	P. Miřejovský	12 Jun 2001	Czech Republic	NR_155622	Holec *et al.* 2014
P. decorata (Murrill) A.H. Sm. & Hesler	AHS54770, paratype	A.H. Smith	15 Oct 1956	USA	MN209734	Unpublished
P. decorata	Mushroom Observer # 299088	D. Henderson	14 Nov 2017	USA	MH511100	Unpublished
P. ferrugineolutescens A.H. Sm. & Hesler	TENN–F–028897, isotype	A.H. Smith	4 Dec 1937	USA	HQ222026	Matheny *et al.* 2018
P. gallica Holec & Kolařík	PRM933234	—	—	France	LN889969	Holec *et al.* 2016
P. gallica (≡ *P. lubrica* var. *obscura* Bon & Chevassut)	MPU: Herb.Chevassut 3478, holotype	—	—	France	HG007988	Holec *et al.* 2014
P. highlandensis (Peck) A.H. Sm. & Hesler	TENN–F–072234	A. Miller	17 Oct 2017	USA	MH348872	Matheny *et al.* 2018
P. highlandensis (as *P. mixta* (Fr.) Kuyper & Tjall.-Beuk.)	—	—	—	Mexico	EU715686	Matheny *et al.* 2018
P. kodiakensis A.H. Sm. & Hesler	WTU–F–073124/iNat67633759	S.A. Trudell	24 Aug 2017	USA (Alaska)	MZ054344	Unpublished
P. kodiakensis	TENN–F–028804, isotype	Wells-Kempton	27 Jul 1964	USA (Alaska)	MN149360	Unpublished
P. lenta (Pers.) Singer	—	—	—	Japan	LC198701	Unpublished
P. lenta	—	R. Tuomikoski	22 Oct 1974	Finland	AY281022	Guzmán-Dávalos *et al.* 2003
P. lubrica (Pers.) Singer	PRM–899117	—	—	Czech Republic	HG007986	Holec *et al.* 2014
P. lundbergii Jacobsson	MQ21–HRL3296–QFB32873	R. Lebeuf	15 Sep 2020	Canada	MW845262	Unpublished
P. lundbergii	MQ18R025–HRL2663–QFB30108	A. Paul	28 Aug 2018	Canada	MN992244	Unpublished
P. melliodora A.H. Sm. & Hesler	TENN–F–028861, paratype, isolate AHS68780	A.H. Smith	15 Oct 1956	USA	MN209758	Tian & Matheny 2020
P. molesta A.H. Sm. & Hesler	TENN–F–028830, isotype	A.H. Smith	22 Jun 1962	USA	MG735296	Matheny *et al.* 2018
P. molesta (as *P. highlandensis*)	UC–1998624	N. Nguyen	29 May 2010	USA	KC122891	Matheny *et al.* 2018
P. multicingulata E. Horak	CUHAM763	J. Tamang	27 May 2018	India	OM428169	Unpublished
P. multicingulata	—	—	—	South Korea	MK842061	Unpublished
P. occidentalis A.H. Sm. & Hesler	TENN–F–028874/AHS58470, paratype	A.H. Smith	1 Jul 1958	USA	MN209765	Unpublished
P. occidentalis	JLF9146	J. Frank	4 Nov 2020	USA	MW554702	Unpublished
P. olivaceodisca A.H. Sm. & Hesler	TENN–F–017778, holotype	L.R. Hesler	10 Nov 1946	USA	NR_119909/ HQ222027	Unpublished
P. rufodisca A.H. Sm. & Hesler	Mushroom Observer 293100	T.A. Clements	11 Aug 2017	USA	MT424867	Unpublished
P. rufodisca	**XAL, BF57**	**V.M. Bandala-Muñoz 34**	**28 Mar 1985**	**Mexico**	**OP546333**	**This work**

Supplementary Table 6 (part 2 of 2). Sequences of *Pholiota* used in this study. New rDNA ITS sequences obtained in this work are in boldface. *Hypholoma* was used as outgroup.

Tabla complementaria 6 (parte 2 de 2). Secuencias de *Pholiota* utilizadas en este estudio. Las nuevas secuencias ITS de ADNr obtenidas en este trabajo están en negrita. *Hypholoma* se utilizó como grupo externo.

P. rufodisca	Mushroom Observer 331442	T.A. Clements	5 Sep 2018	USA	MT340076	Unpublished
P. spumosa (Fr.) Singer	TENN–F–054603	S.C. McCleneghan	7 Oct 1993	USA	MG735323	Matheny *et al.* 2018
P. spumosa (as *P. flavida* (Schaeff.) Singer)	618	E.Bizio	18 Jul 2003	Italy	JF908576	Osmundson *et al.* (2013)
P. squarrosa (Vahl) P. Kumm.	—	—	Aug 2009	China	JN230706	Unpublished
P. squarrosa	iNAT—94871211	—	—	USA	ON176094	Unpublished
P. squarrosoides (Peck) Sacc.	—	—	—	China	JQ283961	Unpublished
P. stratosa A.H. Sm. & Hesler	TENN–F–028845/AHS64684, isotype	A.H. Smith	14 Oct 1961	USA	MN209779	Tian & Matheny 2020
P. tennesseensis A.H. Sm. & Hesler	TENN–F–018848, holotype	L.R. Hesler	27 Nov 1948	USA	NR_119910/ HQ222028	Unpublished
P. tennesseensis	**IBUG, BF97**	**M.L. Fierros 666**	**24 Aug 1994**	**Mexico**	**OP546331**	**This work**
P. terrestris Overh.	PSMS–1–2	Mariko	6 Jan 2019	USA	MW879310	Unpublished
P. terrestris	**IBUG, BF74**	**V. Ramírez-Cruz 3554**	**28 Jul 2019**	**Mexico**	**OP546334**	**This work**
P. velaglutinosa A.H. Sm. & Hesler	TENN–F–028851, isotype	A.H. Smith	1 Dec 1937	USA	MH016954	Unpublished
P. velaglutinosa	UC 1859567	Murray	10 Dec 2005	USA	KC122877	Unpublished
P. virgata A.H. Sm. & Hesler	TENN–F–028832	Barrows	15 Aug 1958	USA	MN209782	Unpublished
Pholiota sp.	—	K.-H. Chen	—	USA	MF943001	Unpublished
Pholiota sp.	—	K.-H. Chen	—	USA	MF943002	
Hypholoma australe (Murrill) Murrill	PBM3481/ PERTH08241856	P.B. Matheny & N.L. Bougher	8 Jun 2010	Australia	HQ832446	Matheny *et al.* 2018
H. subviride (Berk. & M.A. Curtis) Dennis	TJB10226	C Young	27 Aug 2007	Belize	HQ222023	Matheny *et al.* 2018

Supplementary Table 7. Sequences of *Strobilurus* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Xerula pudens* was used as outgroup.

Tabla complementaria 7. Secuencias de *Strobilurus* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenida en este trabajo está en negrita. *Xerula pudens* se utilizó como grupo externo.

Species	Herbarium & Voucher	Collector & number	Collection date	Country	GenBank Accesion	Reference
Strobilurus albipilatus (Peck) V.L. Wells & Kempton	UBC–F–13941	S. Redhead 35	21 Oct 1991	Canada	MF063159	Qin *et al.* 2018
S. albipilatus	TENN–F–52255	R.H. Petersen 5855	14 Oct 1992	USA	GQ892806	Petersen & Hughes 2010
S. albipilatus	TENN, TFB11910	—	—	USA	GQ892818	Petersen & Hughes 2010
S. conigenoides (Ellis) Singer	TENN–F–53370, TFB6456	S.C. McCleneghan & J.M. 5853	12 Sep 1993	USA	GQ892808	Petersen & Hughes 2010
S. conigenoides	MICH–139015	K.A. Harrison 10992	1 Sep 1991	USA	MF063150	Qin *et al.* 2018
S. conigenoides	TENN–F–57121	—	—	USA	GQ892814	Petersen & Hughes 2010
S. conigenoides	TENN–F–55458	I. Krisai-Greilhuber	19 Aug 1996	USA	GQ892811	Petersen & Hughes 2010
S. conigenoides	MB–306585	F. Popa 3981	19 Mar 2014	Panama	MF063188	Qin et al. 2018
S. conigenoides	TENN–F–60265	E.B. Lickey	21 Aug 2004	USA	GQ892819	Petersen & Hughes 2010
S. conigenoides	TENN–F–60266	E.B. Lickey	21 Aug 2004	USA	GQ892820	Petersen & Hughes 2010
S. conigenoides	TENN–F–57001	R.H. Petersen	11 Sep 1998	USA	GQ892813	Petersen & Hughes 2010
S. conigenoides	TENN–F–52944	R.H. Petersen	22 Aug 1993	USA	GQ892807	Petersen & Hughes 2010
S. conigenoides	TENN–F–61318	R.H. Petersen	3 Oct 2006	USA	GQ892821	Petersen & Hughes 2010
S. conigenoides	**IBUG, My52**	**A. Cortés- Pérez 2156**	**19 Sep 2021**	**Mexico**	**OP546345**	**This work**
S. diminutivus Desjardin	SFSU, DED–6612	D.E. Desjardin *et al.*	4 Jun 1997	USA	MF958952	Qin *et al.* 2018
S. esculentus (Wulfen) Singer	—	—	—	Russia	GQ892822	Petersen & Hughes 2010
S. esculentus	HKAS–56525	Z.L. Yang 5027	30 Oct 2007	Germany	KF530549	Qin *et al.* 2018
S. esculentus	HKAS–49779	K.-H. Rexer 2008	—	Germany	MF063149	Qin *et al.* 2018
S. luchuensis Har. Takah., Taneyama & Pham	HKAS	B. Xiao	2014	China	MF063156	Qin *et al.* 2018
S. luchuensis	HKAS–81101	J. Qin 663	25 Dec 2012	China	MF063180	Qin *et al.* 2018
S. occidentalis V.L. Wells & Kempton	UBC–F–16171	P. Kroeger 3909	10 Sep 2005	Canada	MF063163	Qin *et al.* 2018
S. occidentalis	UBC–F–8496, BC–8	S. Redhead	3 Nov 1973	Canada	MF063153	Qin *et al.* 2018
S. occidentalis	HKAS–83270	X.-H. Wang 3339	—	USA	MF063174	Qin *et al.* 2018
S. orientalis Zhu L. Yang & J. Qin	HKAS–54514	Z.L. Yang 5218	17 Sep 2008	China	MF063168	Qin *et al.* 2018
S. orientalis	HKAS–56418	Y.C. Li 1585	28 Sep 2008	China	MF063169	Qin *et al.* 2018
S. orientalis	HKAS–73413	J. Qin 427	22 Oct 2011	China	MF063167	Qin *et al.* 2018
S. pachycystidiatus J. Qin & Zhu L. Yang	HKAS–83440	Q. Zhao	—	China	MF063187	Qin *et al.* 2018
S. pachycystidiatus	HKAS–68385	X.-T. Zhu 189	16 Aug 2010	China	MF063186	Qin *et al.* 2018
S. pachycystidiatus	HKAS–83378	J. Qin 961	23 May 2015	China	MF063160	Qin *et al.* 2018
S. stephanocystis (Kühner & Romagn. ex Hora) Singer	TENN–F–57952	R.H. Petersen	22 May 1999	Germany	GQ892815	Petersen & Hughes 2010
S. stephanocystis	ZT–1856	E. Horak	23 Apr 2014	Austria	MH014048	Qin *et al.* 2018
S. stephanocystis	12094	A. Pergolini	5 Apr 1990	Italy	JF908751	Osmundson *et al.* 2013
S. tenacellus (Pers.) Singer	TENN, TFB–9550	—	—	—	GQ892812	Petersen & Hughes 2010
S. tenacellus	HKAS–83271	X.-H. Wang	—	Sweden	MF063165	Qin *et al.* 2018
S. tenacellus	TENN–F–50651	—	—	United Kingdom	GQ892800	Petersen & Hughes 2010
S. tenacellus	TENN–F–59367	H. Voglmayr et al.	30 Apr 2000	Austria	GQ892817	Petersen & Hughes 2010
S. trullisatus (Murrill) Lennox	UBC–F–19744	—	—	—	HQ604789	Petersen & Hughes 2010
S. trullisatus	WTU–F–1797, SAT–06–290–01	S.A. Trudell	17 Oct 2006	USA	MF063175	Qin *et al.* 2018
S. trullisatus	SFSU, DED3074	—	—	USA	DQ097370	Binder *et al.* 2006
S. wyomingensis (A.H. Sm. & Arenb.) V.L. Wells & Kempton	MICH–139031	A.H. Smith 34311	22 Jun 1950	USA	MF063129	Qin *et al.* 2018
S. wyomingensis	MICH–139026	A.H. Smith 34353	26 Jun 1950	USA	MF063145	Qin *et al.* 2018
Strobilurus sp.	HT05	H. Takahashi	11 Nov 2013	Japan	AB968234	Unpublished
Strobilurus sp.	MB–103067	G. Kost & M. Karadelev 6605	27 Oct 2004	Macedonia	MF063136	Qin *et al.* 2018
Strobilurus sp.	MB–103062	G. Kost, M. Kardelev & K.-H. Rexer	20 Oct 2004	Macedonia	MF063134	Qin *et al.* 2018
Strobilurus sp.	MB–103068	G. Kost & M. Karadelev 6606	27 Oct 2004	Macedonia	MF063135	Qin *et al.* 2018
Xerula pudens (Pers.) Singer	MB-306475	F. Popa 1969	—	Germany	MF063189	Qin *et al.* 2018

Supplementary Table 8. Sequences of *Tetrapyrgos* used in this study. New rDNA ITS sequence obtained in this work is in boldface. *Campanella* was used as outgroup.

Tabla complementaria 8. Secuencias de *Tetrapyrgos* utilizadas en este estudio. La nueva secuencia ITS de ADNr obtenida en este trabajo está en negrita. *Campanella* se utilizó como grupo externo.

Species	Herbarium & Voucher	Collector & number	Collection date	Country	GenBank Accesion	Reference
Tetrapyrgos atrocyanea (Métrod) E. Horak	INPA–259596	D.L. Komura & P.A. Pereira	23 Apr 2013	Brazil	KT287093	Komura *et al.* 2020
T. atrocyanea	SFSU, JES–216	D.S. Newman & J.E. Shay	8 Feb 2014	Madagascar	MF075137	Desjardin *et al.* 2017
T. atrocyanea	INPA–259597	D.L. Komura & T.S. Marinho	11 May 2012	Brazil	KT287096	Komura *et al.* 2020
T. atrocyanea	**IBUG, BF80**	**A. Cortés-Pérez 2101**	**2 Jul 2021**	**Mexico**	**OP546346**	**This work**
T. brevicystidiata D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259604, holotype	D.L. Komura, T.H.G. Oliveira & A. Melo	31 May 2013	Brazil	KT287088	Komura *et al.* 2020
T. cerebrata D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259594, holotype	D.L. Komura & P.A. Pereira	25 Apr 2013	Brazil	KT287090	Komura *et al.* 2020
T. cerebrata	INPA–259601	D.L. Komura & P.A. Pereira	24 Apr 2013	Brazil	KT287089	Komura *et al.* 2020
T. crassicystidiata D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259607, paratype	D.L.Komura & J.M.Moncalvo	25 Apr 2012	Brazil	KT287091	Komura *et al.* 2020
T. crassicystidiata	INPA–259606, holotype	D.L. Komura, J.M. Moncalvo & C.E. Zartman	19 Apr 2012	Brazil	KT287092	Komura *et al.* 2020
T. griseibrunnea D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259608, holotype	D.L. Komura & P.A. Pereira	24 Apr 2013	Brazil	KT287097	Komura *et al.* 2020
T. griseibrunnea	INPA–259609, paratype	D.L.Komura & P.A. Pereira	24 Apr 2013	Brazil	KT287099	Komura *et al.* 2020
T. longicystidiata A.H. Honan, Desjardin & T.J. Baroni	NY	R.E Halling 8396	18 Jun 2003	Costa Rica	EF175545	Honan *et al.* 2015
T. longicystidiata	NY	R.E Halling 6376	31 Mar 1990	Bolivia	EF175533	Honan *et al.* 2015
T. longicystidiata	CORT	T.J. Baroni 7902	19 Jun 1996	Puerto Rico	EF175542	Honan *et al.* 2015
T. nigripes (Fr.) E. Horak	SFSU	G. Wong 888	24 Nov 1990	Hawaii	EF175535	Honan *et al.* 2015
T. nigripes	TFB–12583	—	—	USA	DQ449942	Unpublished
T. nigripes	TENN–F–60065, TFB–12137	K.W. Hughes	8 Aug 2004	USA	DQ449941	Unpublished
T. novinigripes D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259603	O.F. Menezes & D.L. Komura	21 May 2013	Brazil	KT287083	Komura *et al.* 2020
T. novinigripes	INPA–259605	D.L. Komura, M.R. Pereira, D.S. Ferreira & L.S. Bento	21 Jun 2013	Brazil	KT287082	Komura *et al.* 2020
T. olivaceonigra (E. Horak) E. Horak	MEL–2220682	S.H. Lewis 950	24 Jun 2003	Australia	EF175541	Honan *et al.* 2015
T. parvispora A.H. Honan & Desjardin	SFSU, paratype	A.H. Honan 66	5 Jul 2004	Thailand	EF175536	Honan *et al.* 2015
T. parvispora	CMU, holotype	A.H. Honan 130	26 Jun 2005	Thailand	EF175538	Honan *et al.* 2015
T. parvispora	SFSU, paratype	D.E. Desjardin 7603	2 Jul 2003	Thailand	KT270855	Honan *et al.* 2015
T. similinigripes D.L. Komura, J.S. Oliveira & Moncalvo	INPA–259599, holotype	D.L. Komura & T. Marinho	10 May 2012	Brazil	KT287084	Komura *et al.* 2020
T. subcinerea (Berk. & Broome) E. Horak	SFSU	D.E. Desjardin 7448	3 Jul 2002	Thailand	EF175553	Honan *et al.* 2015
T. subcinerea	SFSU	A.H. Honan 129	26 Jun 2005	Thailand	EF175526	Honan *et al.* 2015
T. subcinerea	BO & SFSU	A. Retnowati 505	—	Indonesia	EF175530	Honan *et al.* 2015
T. subcinerea	BO & SFSU	A. Retnowati 138	16 Jan 1999	Indonesia	EF175554	Honan *et al.* 2015
T. subcinerea	SFSU	KUM 60051	Jan 2005	Malaysia	EF175527	Honan *et al.* 2015
T. subdendrophora (Redhead) E. Horak	SFSU	D.E. Desjardin 7338	11 Nov 2001	USA	EF175529	Honan *et al.* 2015
Tetrapyrgos sp.	DLK–1065	D.L. Komura & D. Cardoso	24 Mar 2013	Brazil	KT287087	Komura *et al.* 2020
Tetrapyrgos sp.	INPA–26527	D.L. Komura, J.J.S. Oliveira & J.R. Barbosa	5 Feb 2015	Brazil	KT287100	Komura *et al.* 2020
Campanella sp.	biocode–09–475	T. Osmundson & L. Smith	13 Aug 2009	French Polynesia	MZ997207	Osmundson *et al.* 2022

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