

Ascomycetes of Sonora, Mexico. 1: The Ajos-Bavispe National Forest Reserve and Wildlife Refuge

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Abstract — Eight species of *Ascomycetes* from the Ajos-Bavispe National Forest Reserve and Wildlife Refuge, located in Sonora, Mexico are recorded for the first time in the Mexican mycobiota: *Cenangium yuccae*, *Diatrype standleyi*, *Eutypa koschkelovae*, *E. podanthei*, *Gloniopsis praelonga*, *Hypocrea scutelliformis*, *Hysterium insidens*, and *H. truncatulum*. Photomicrographs, descriptions, and some ecological observations are presented.

Key words — *Helotiales*, *Hypocreales*, *Xylariales*, *Hysteriales*

Introduction

The Ajos-Bavispe National Forest Reserve and Wildlife Refuge (ABNFR) is located in the northeastern part of the state of Sonora in Mexico, and has five mountain ranges. The vegetation is mainly pine forest, pine-oak forest, oak forest, gallery forest, and microphyllous desert scrub. The biological diversity catalogued for the ABNFR includes a little over 1,230 vascular plant species, along with 358 vertebrates and 92 diurnal butterflies (Guerra 1998).

There are some contributions to the taxonomy of *Ascomycetes* from Sonora (Esqueda et al. 1992, Pérez-Silva et al. 1996, San Martín et al. 1999a,b,c), but only three from ABNFR for *Aphylophorales* (Montaño et al. 2006) and *Myxomycetes* (Moreno et al. 2006, Lizárraga et al. 2007). Therefore, these are the first records of *Ascomycetes* from ABNFR and are new to the Mexican mycobiota.

The collections studied were obtained from seven types of vegetation in the ABNFR that were sampled seasonally from fall 2004 to summer 2005: pine-

Table 1. Sampling sites on the Ajos-Bavispe National Forest Reserve and Wildlife Refuge.

SITE	N	W	ALTITUDE	VEGETATION
MUNICIPALITY OF CANANEA				
1. El Campamento	30°58'22"	109°57'38"	1997 m	POF-GF
MUNICIPALITY OF FRONTERAS				
2. El Frijolito	30°56'35"	109°57'21"	2286 m	POF
3. La Valdeza	30°38'06"	109°47'22"	1546 m	OOF
MUNICIPALITY OF CUMPAS				
4. Km 8 Moctezuma to La Antena road	29°58'53"	109°39'52"	818 m	MDS
5. La Antena	30°00'02"	109°33'29"	1653 m	PF
6. La Selva	29°57'41"	109°36'55"	881 m	SS
7. El Mezquital	29°57'26"	109°38'23"	882 m	M

Vegetation types: pine-oak forest associated with gallery forest (POF-GF); pine forest (PF); pine-oak forest (POF); oak open forest (OOF); microphyllous desert scrub (MDS); mesquite (M); subtropical scrub (SS).

oak forest associated with gallery forest, pine forest, pine-oak forest, oak open forest, microphyllous desert scrub, mesquite, and subtropical scrub. The seven sites were geo-referenced with a GPS Garmin 12XL, using Datum NAD-27 for digital image processing.

The specimens were collected and conserved following the recommended mycological techniques for *Ascomycetes* (Dennis 1978, Breitenbach & Kranzlin 1981). Species identification was based on Ellis & Everhart (1892), Seaver (1978), Dennis (1978), and Sivanesan (1984); and specific literature as Rappaz (1987), Barr (1990), and Chacón (2004, 2005). The specimens have been deposited in the macromycetes collection of the Centro de Estudios Superiores del Estado de Sonora (CESUES), with some duplicates in the Herbarium of the Instituto de Ecología, A.C. (XAL) in Xalapa, Veracruz.

Species List

Cenangium yuccae Clem. & E.G. Clem. ex Seaver, N. Amer. Cup-fungi. Inoperc.: 303. 1951

Apothecia 0.8 to 2 mm, erumpent, hysterothecoid at first with involute margins; when mature open and cup-shaped; hymenium yellowish when fresh

to light brown when dry, with a darker brown exterior; sessile appearance but fixed to substrate by a short stalk, robust. Asci 90-115 × 7-11 µm, cylindrical, octosporate, base ending in a short stipe, apical pore amyloid. Ascospores 9-12 × 6-8 µm, ellipsoid, thin-walled, uniseriate in the ascus. Paraphyses 3-5 µm in diam., filiform, hyaline and septate.

SPECIMENS STUDIED: LOCALITY 2, leg. F. Méndez & S. Gómez, 23.VIII.2005, on dry *Yucca* sp. leaf, in ecotone with pine-oak forest, CESUES 5994, Chacón-5575 (XAL).

OBSERVATIONS The Mexican collection studied is consistent with *C. yuccae* as described by Seaver (1978) based on specimens from Colorado and California in the U.S.A. This author described the species as having slightly smaller apothecia (1 mm), and paraphyses (2 µm in diam.). Worldwide, this taxon has been recorded on rare occasions, and this is the first record in the Mexican mycobiota.

Hypocrea scutelliformis Berk. & Ravenel, in Ellis & Everhart,

N. Amer. Pyrenomyc.: 80. 1892

Stromata 3 mm in diam., discoidal with some dents in center, apparently sessile but short-stalked, robust, dark with brown-reddish powder. Surface dotted with perithecia ostioles; context whitish to light brown. Perithecia 100-150 × 6-120 µm, globose to subglobose, arranged in one layer (monostichous), on rare occasions polystichous; neck very short. Asci 60-80 × 4-6 µm, cylindrical-clavate, inamyloid. Ascospores 2-4 × 2.5-4.5 µm, globose to subellipsoidal, some narrower at one end, wall minutely warted, hyaline with greenish tones, octosporate at first, ending with 16 part-spores, each with an oil droplet at the center.

SPECIMENS STUDIED: LOCALITY 7, leg. A. Sánchez, 24.II.2005, solitary, on fallen branches in mesquite vegetation, CESUES 5994.

OBSERVATIONS: The Mexican collection agrees well with the description of *H. scutelliformis* given by Seaver (1910) and Ellis & Everhart (1892). Among its distinguishing characteristics are discoidal stromata and asci octosporate at first, but ending in 16 part-spores. Including this record, three species of *Hypocrea* are known for Mexico; the others are *H. citrina* var. *americana* Canham, cited for Morelos and Hidalgo (Chacón & Guzmán 1983) and *H. rufa* (Pers.: Fr.) Fr., recorded for Veracruz (Welden & Guzmán 1979).

Diatrype standleyi Fairm., Mycologia 10: 240. 1918

Stromata (1.5-) 2-2.5 mm in diam., erumpent, partially covered with remnants of host bark, dark, sometimes with slight purplish-reddish tones; surface dotted with perithecia ostioles; context brown to light brown. Perithecia (including neck) 550-620 × 190-290 µm, globose to piriform, mono- or polystichous. Ostioles with 3-4 apical openings radially arranged. Asci 60-100 ×

7-10 μm , cylindrical-clavate, base ending in a thin stipe, apical pore inamyloid. Ascospores 10-13 \times 3-4 μm , allantoid, pale yellowish to brownish-red in mass, irregularly biseriata in ascus.

SPECIMENS STUDIED: LOCALITY 1, leg. F. Méndez & S. Gómez, 21.I.2005. On fallen *Quercus* sp. leaves in pine-oak forest associated with gallery forest, CESUES 5400. *Ibidem*, 24.VIII.2005, CESUES 5841, Chacón-5613 (XAL).

OBSERVATIONS: The Mexican material fits with *D. standleyi*, as described by Rappaz (1987) based on specimens from New Mexico, U.S.A. Similar species include *D. praeandina* (Speg.) Rappaz, recorded for Argentina, but the latter has larger stromata (3-20 \times 1-2 mm), while its asci (40-50 \times 5-6 μm), ascospores (9-12 \times 2.2-2.8 μm), and perithecia (200-400 μm) are smaller.

Eutypa koschkelovae Frolov, Nov. Sist. niz. Rast. 7: 194. 1970

Stromata irregular, spread out, 1-10.5 \times 1-2.5 mm, occasionally linear, appearance superficial to erumpent, dark, partially covered by bark remnants; context light yellowish-brown; surface dotted with perithecia ostioles. Perithecia 230-440 \times 160-340 μm , globose to subglobose. Ostioles 180-295 \times 90-160 μm , prominent, with 3-4 radially arranged, linear openings at the apex. Asci (32-) 35-45 \times 5-9 μm , cylindrical-clavate, base ending in a long, thin stipe, apical pore inamyloid. Ascospores 6.5-10 \times 1.5-2.5 μm , allantoid, hyaline to pale yellowish, ochraceous color in mass.

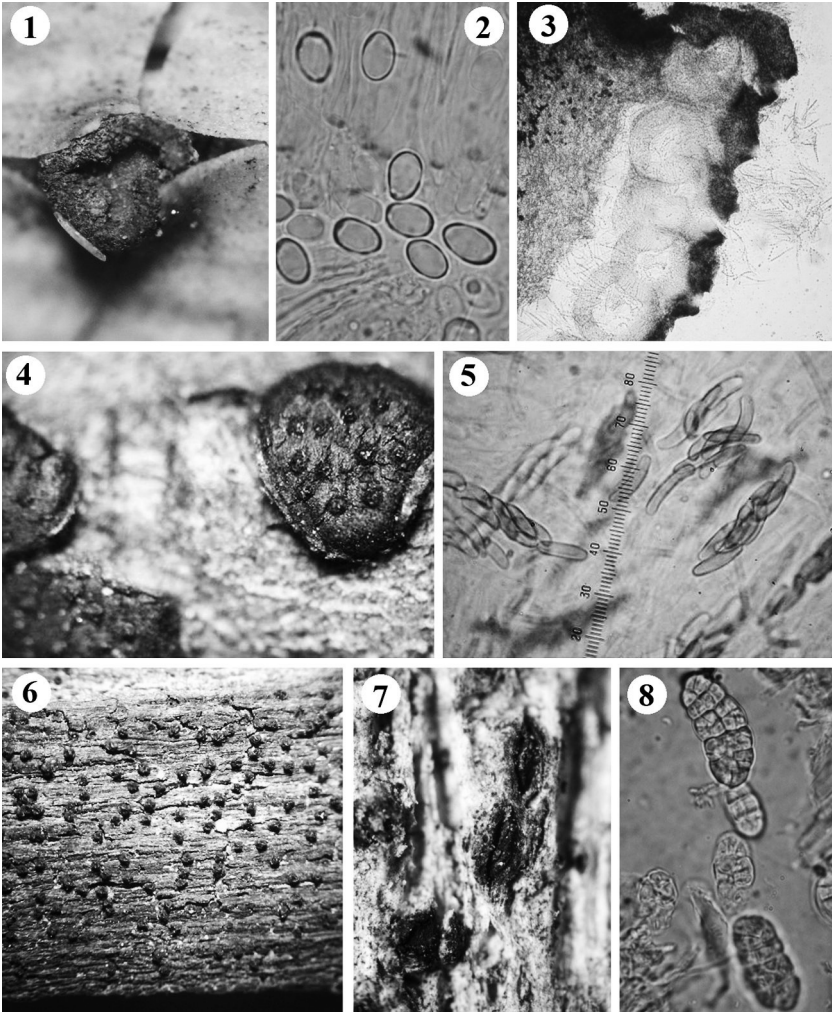
SPECIMENS STUDIED: LOCALITY 4, leg. F. Méndez & S. Gómez, 25.VIII.2005, on bark and fallen trees in microphyllous desert scrub, CESUES 6167, Chacón-6631 (XAL).

OBSERVATIONS: All macro- and microscopic characteristics fit with *E. koschkelovae*, as cited by Rappaz (1987) based on a Russian collection from *Calligonum* sp. (*Polygonaceae*). The host was not identified in the Sonoran collection. According to this author, the species was previously only known from its type locality (Russia). This is the second documentation of this species for the rest of the world and the first for the Americas.

Eutypa podanthi Speg., Bol. Acad. Nac. Ci. Cordoba 25: 47. 1921

Stromata one to several cm long, flat, spread out, dark gray with blackish dots from the perithecia ostioles; context minute or absent. Perithecia 440-500 \times 430-500 μm , globose, embedded in wood. Ostioles 200-450 \times 210-260 μm , having 3-4 apical openings radially arranged. Asci 50-65 \times 6-8 μm , cylindrical-clavate, base ending in a thin stalk, apical pore inamyloid. Ascospores 9-12(-14) \times (2.8-)3(-3.5) μm , allantoid, yellowish to brown in mass, irregularly biseriata in the ascus.

SPECIMENS STUDIED: LOCALITY 7, leg. F. Méndez & S. Gómez, 27.VIII.2005, on dead *Prosopis velutina* wood in mesquite vegetation, CESUES 6352, Chacón-5673, 5676 (XAL).



Figs. 1-8. Ascomycetes of Sonora, Mexico. 1-2: *Cenangium yuccae*, 1: apothecium, 2: ascospores. 3: *Hypocrea scutellaeformis*, longitudinal section of the stroma showing perithecia. 4-5: *Diatrype standleyi*, 4: stroma, 5: asci and ascospores. 6: *Eutypa podanthi*, stromatic surface showing ostioles. 7-8: *Gloniopsis praelonga*, 7: hysterothecia, 8: ascospores.

OBSERVATIONS: The Mexican collection agrees with *E. podanthi*, as described by Rappaz (1987) based on material collected by Spegazzini in Chile on *Podanthus mitiqui*, but the host was different, and the spore size was smaller ($9\text{-}13.8 \times 2.2\text{-}2.5 \mu\text{m}$) in the Chilean material. The Spegazzini collection dates from 1918 and,

according to Dr. C. Carmaran (Researcher at the University of Buenos Aires, Argentina, pers. com.) the Chilean material only has two perithecia that are in very poor condition. This opens the possibility for the Mexican material to be proposed here as the epitype. This species, together with *E. koschkelovae*, was only known for the type locality.

Gloniopsis praelonga (Schwein.) Underw. & Earle, Bull. Alabama Agric. Exp. Sta. 80: 196. 1897

Hysterothecia 0.8-1.2 × 0.4-0.7 mm, erumpent to superficial, ellipsoid to fusoid tips, open or partially closed in dehydrated specimens; exterior dark, hymenium same color or lighter. Smooth margin or with fine longitudinal sulcations. Asci 65 × 12 µm, cylindrical-clavate, short-stipitate, apical pore inamyloid. Ascospores 16-29 × 8-13 µm, muriform, hyaline to pale yellow, elliptical to ovoid with obtuse tips.

SPECIMENS STUDIED: LOCALITY 5, leg. F. Méndez & S. Gómez, 26.VIII.2005, solitary to gregarious, on bark of fallen trees in pine-oak forest, CESUES 6239, Chacón-6658 (XAL).

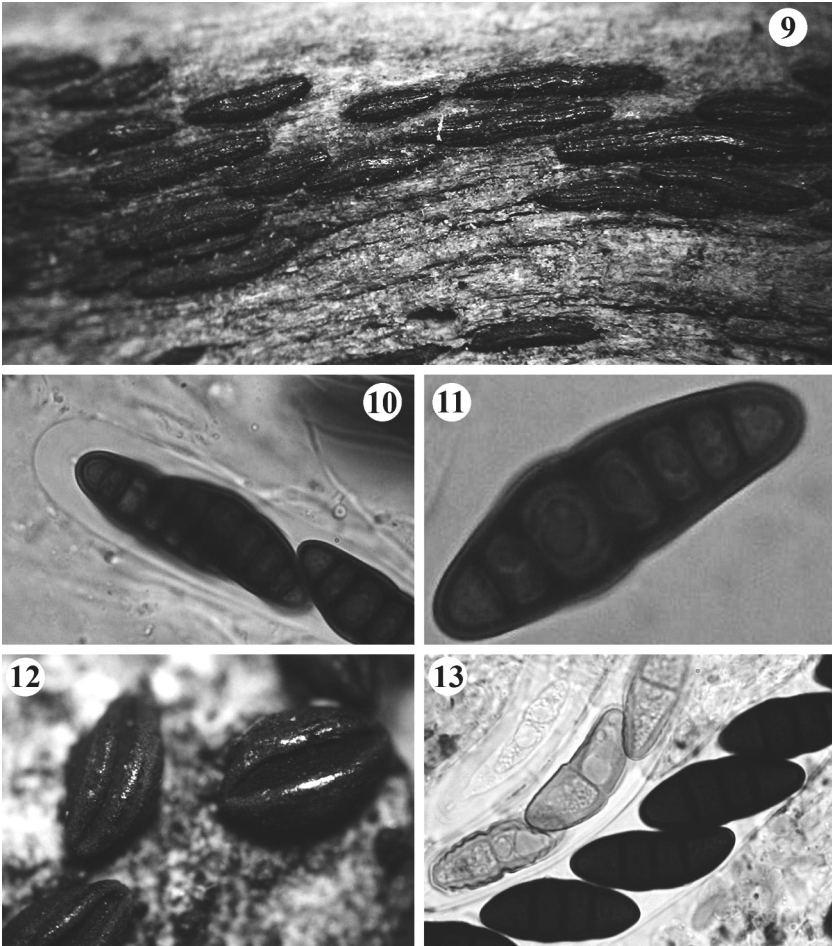
OBSERVATIONS: The Sonoran collection fits with *G. praelonga*, as described by Barr (1990) based on specimens from Italy and the United States of America, but ascus size was larger (60-120 × 15-25 µm) in those countries. Barr (1990) recorded high morphological variability for the macro- and microscopic characters of this species, resulting in the same species having been cited several times as a new species and thus increasing its list of synonyms. Kirk et al. (2001) recognized two species for the genus: *G. praelonga* and *G. smilacis* (Schwein. : Fr.) Underw. & Earle; both taxa were studied by Barr (1990).

Hysterium insidens Schwein., Trans. Amer. Phil. Soc., N.S. 4(2): 244. 1832

Hysterothecia 0.7-4.8 mm long, subellipsoidal with tapered bases, linear and nearly parallel, erumpent to superficial; central part with straight longitudinal opening, dark with opaque to bright tones, external surface smooth, carbon-like appearance. Asci 155-195 × 18-22 µm, cylindrical-clavate, bitunicate, base ending in a short stipe, apical pore inamyloid. Ascospores 32-45 × 11-14 µm, elliptical to subfusoid, brown-olive tone, with 6-8 septi, central part of apical region a little wider than the rest, irregularly biseriolate in ascus.

SPECIMENS STUDIED: LOCALITY 3, leg. F. Méndez & S. Gómez, 25.VIII.2005, solitary or gregarious, on the bark of branches and fallen trunks in oak forest clearings, CESUES 5965, Chacón-6627 (XAL).

OBSERVATIONS: The Mexican collection fits with descriptions of Ellis & Everhart (1892), Dennis (1978), and Sivanesan (1984), who analyzed specimens from Africa, North America, and Europe, but ascus size was different. Ellis & Everhart (1892) observed asci measuring 75 × 15 µm, Dennis (1978): 90 × 17 µm, and



Figs. 9-13. Ascomycetes of Sonora, Mexico. 9-11: *Hysterium insidens*, 9: hysterothecia, 10: apical part of ascus with ascospores, 11: ascospore. 12-13: *Hysterium truncatulum*, 12: hysterothecia, 13: partial section of asci with ascospores.

Sivanesan (1984): $120 \times 10-18 \mu\text{m}$. As no further differences were noted, our specimens were identified as *H. insidens*.

Hysterium truncatulum Cooke & Peck, in Cooke, Bull. Buffalo Soc. Nat. Sci. 3: 33.
1875

Hysterothecia $1.5-2 \times 0.8-2.5 \text{ mm}$, erumpent, elongate to elliptical-fusoid, with obtuse, carbon-like tips, center dotted with longitudinal opening when closed,

dome-like appearance when open, external surface dark with radially striated margins and speckled with reddish dust. In open specimens, the hymenium is orangy red. Asci 220-345 × 15-20 μm, cylindrical-clavate, bitunicate, base with a short stipe, inamyloid. Ascospores 31-43 × 10-13 μm, cylindrical-ellipsoid with tips rounded to occasionally subapiculate, dark brown to reddish brown, triseptate, some with central cells darker and more compact at central septum level, uniseriate in the ascus.

SPECIMENS STUDIED: LOCALITY 6, leg. F. Méndez & S. Gómez, 27.VIII.2005, on the bark of branches and fallen trunks in subtropical scrub, CESUES 6334, Chacón-5692 (XAL).

OBSERVATIONS: The Sonoran collection agrees with the descriptions of Saccardo (1883) and Ellis & Everhart (1892). The distinguishing characteristics for this taxon are its dark brown, tri-septate ascospores, some with dark cells in the center and light ones at the tips. Guzmán (1983) recorded the first *Hysteriales* for Mexico: *Hysterium angustatum* Pers. for the Mexican state of Quintana Roo.

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