

Some new hysteriaceous Fungi from Costa Rica

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Abstract: Four new lignicolous species of the family Hysteriaceae (*Gloniella gracilis*, *Graphyllum panduratum*, *Hysterium asymmetricum* and *Hysterographium pulchrum*) are described from Costa Rica based in their macroscopic and microscopic characters.

Key words: *Gloniella gracilis*, *Graphyllum panduratum*, *Hysterium asymmetricum*, *Hysterographium pulchrum*, systematics

INTRODUCTION

The family Hysteriaceae is characterized by ellipsoid ascomata that open by a long sulcus, bitunicate asci and interthecial hyphae, which are apically free paraphyses or, in some instances, pseudoparaphyses. The family was presented in monograph by Zogg (1962), studied by Teng (1933) in China, Linde (1992) in South Africa and by Checa (1997) in the Iberian Peninsula. In South America the first contributions to the Hysteriaceae were published by Spegazzini (1902, 1908, 1909, 1910, 1921). Species have been added recently by Lorenzo and Messuti (1998) and Messuti and Lorenzo (1997, 2003). No comprehensive study has been published for Central America or Costa Rica in particular.

The monograph by Zogg (1962) included the genera *Farlowiella* Sacc., *Gloniella* Sacc., *Gloniopsis* de Not., *Glonium* Mühlenb.:Fr., *Hysterium* Tode, *Hysterocharina* Zogg and *Hysterographium* Corda, all with terete ascospores. Shoemaker and Babcock (1992) added the genus *Graphyllum* Clements with applanate dictyospores.

Four new species are described from Costa Rica, one each in *Gloniella*, *Graphyllum*, *Hysterium* and *Hysterographium*. The lack of a genuinely comprehensive monograph is apparent. The basis for the

distinction of each new species is given compared to its nearest ally as found in the literature.

MATERIALS AND METHODS

The collections are deposited in INBio herbarium (INB) (National Institute of biodiversity, Santo Domingo, Heredia, Costa Rica). Isotypes and syntypes are in AH (Departamento Biología vegetal, Universidad Alcalá de Henares) and DAOM (Agriculture and Agri-Food Canada, Ottawa). Isolations were attempted from single ascospores dissected from a few asci on water agar containing small autoclaved stems of alfalfa. The measurements of ascospores and asci have been based at least on 30 observations for all species.

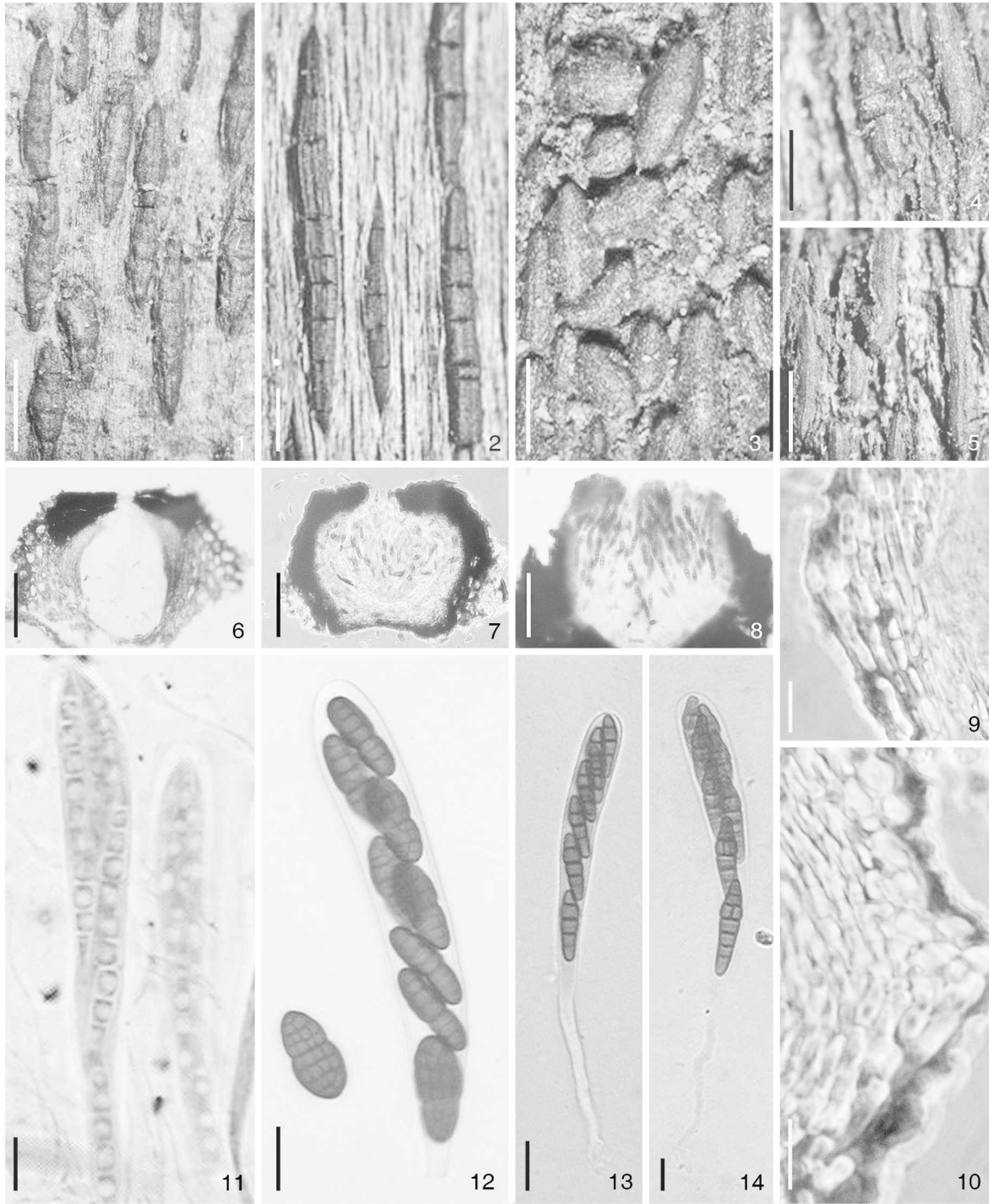
RESULTS

Gloniella gracilis Checa, Shoemaker & Umaña, sp. nov. FIGS. 1, 6, 11, 15–19

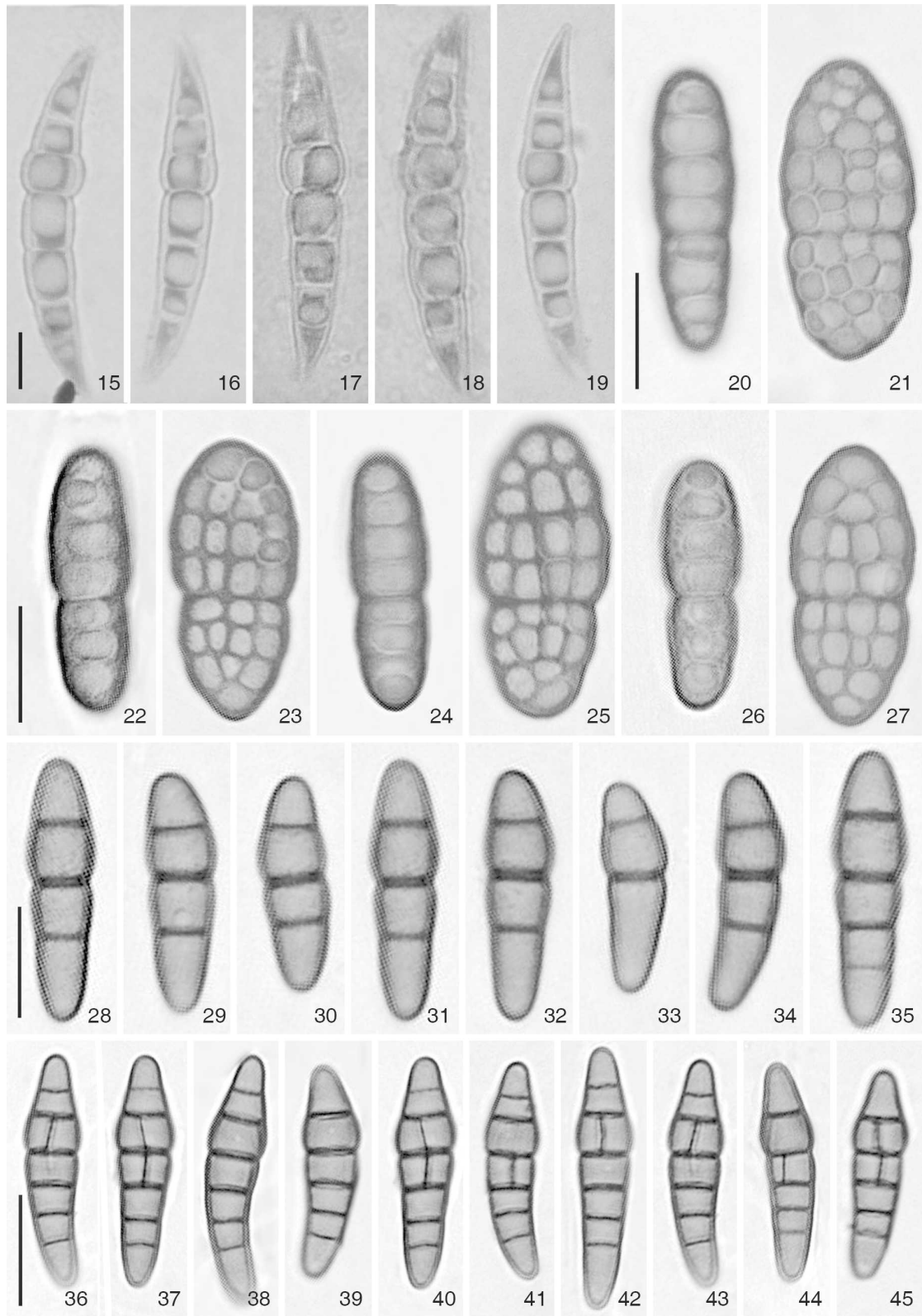
Ascomata hysteriformia. Asci bitunicati, ellipsoidei vel clavati, 120–180 × 10–14 μm, longistipitati (ca. 60 μm), octospori. Ascosporae tetraseriatae, teres, ellipticae, tenues, L/W 6.1, curvatae vel rectae, hyalinae vel luteae, guttulateae, glabrae, 32–37(–40) × 4–6 μm, 6–7 transseptatae, in ordine (4):3:2:1:3:2:3; septum primum suprasedianum (0.40), constrictum; septa crassa; cellula antepenultima inflata, globosa; stratum mucosum nullum.

Diagnosis. A *Gloniella fusispora* Sacc. & Paol. similis sed distinct; ascosporae gracilae cum cellula dilatata.

Ascomata in lines on woody stems, semi-immersed, hysteriform, 1–2 × 0.3–0.5 mm, up to 0.5 mm high, smooth, lacking longitudinal ridges, glabrous (FIG. 1). Sulcus central, 20–30 μm wide, lined with hyaline, thin-walled, rarely septate periphyses 10–15 × 1–1.5 μm. Upper wall thick, about 100 μm wide near sulcus, to 50–60 μm near upper margin, of melanized, solid, carbonaceous material obscuring earlier cellular structure; lateral wall externally of mycelium and wood fibers, 50–70 μm wide; internally of many layers of hyaline, thin-walled cells 10–15 × 2–5 μm, forming a layer about 30 μm wide (FIG. 6). Paraphyses numerous, 1 μm wide, sparingly septate, without slime coating, without guttules, exceeding the asci. Asci bitunicate, numerous, in a basal cluster from thick, hyaline, basal pseudoparenchyma layer, narrowly ellipsoid to clavate, 120–180 × 10–14 μm including long stalk; stalk ca. 60 μm long; asci containing eight overlapping, linearly tetraseriate ascospores (FIG. 11). Ascospores terete, fusiform, slender, L/W 6.1, slightly curved to straight, 32–37 (–40) × 4–6 μm, transversely 6- or 7-septate, in sequence (4):3:2:1:3:2:3, first-formed septum suprasedian (0.40), constricted at



FIGS. 1-5. Ascoma habit. 1. *Gloniella gracilis*. AH 34501. 2. *Graphyllum panduratum*. AH 34502. 3. *Hysterium asymmetricum*. AH 34503. 4, 5. *Hysterographium pulchrum*. AH 34504. FIGS. 6-10. Ascoma wall structure. 6. *Gl. gracilis*. DAOM 234540. 7. *Gr. panduratum*. DAOM 234346. 8. *Hysterium asymmetricum*. DAOM 234344. 9, 10. *Hysterographium pulchrum*. DAOM 234345. FIGS. 11-14. Asci. 11. *Gl. gracilis*. AH 34501. 12. *Gr. panduratum*. AH 34502. 13. *Hysterium asymmetricum*. AH 34503. 14. *Hysterographium pulchrum*. AH 34504. Bars: 1-5 = 1 mm; 6, 7 = 145 μ m; 8 = 65 μ m; 9-14 = 10 μ m.



FIGS. 15–45. Ascospores. 15–19. *Gloniella gracilis*. AH 34501. FIGS. 20–27. *Graphyllum panduratum*. side or face view. AH 34502. FIGS. 28–35. *Hysterium asymmetricum*. AH 34503. FIGS. 36–45. *Hystero-graphium pulchrum*. AH 34504. Bars = 10 μ m.

first-formed septum, without dots at ends of septa, septa thick, third cell from apex enlarged, globose, hyaline, pale yellow, with one guttule in each central cell, smooth, without sheath (FIGS. 15–19).

Ascospores did not germinate in Mar 2005, 3 y after collection.

Etymology. *gracile* L. referring to the slender ascospores.

HOLOTYPE. COSTA RICA. GUANACASTE: Tempisque, National Park Palo Verde, Palo Verde, 10:21:26.5245 N 85:19:10.0313 W, elev. 0–100 m, on branch, 2 Feb 2002, *M. Oses 2370* (INB0003466468; ISOTYPES: AH 34501, DAOM 234540).

Additional specimens examined. Collecting data as for holotype except: 8 May 2002, *M. Oses-2720* (INB0003484155); 7 May 2003, *M. Oses-2721* (INB0003484156), *M. Oses-3958* (INB0003722205); 12 May 2003, *M. Oses-3959* (INB0003722206), *M. Oses-4065* (INB0003722291).

Commentary. Dissected ascospores from DAOM 234540 did not germinate, when tested, 3 y after collection. *Gloniella fusispora* Saccardo & Paoletti (1888) most closely resembles *G. gracilis*. Their original illustrations indicate that the ascospores measure 35–40 × 8–10 μm, L/W 4.2 and lack an inflated cell. The substratum was a “large culm”, indicative of a grass. The type was not sought but the woody host, the narrower ascospores with a prominently inflated cell distinguish *G. gracilis* from *G. fusispora*.

Graphyllum panduratum Checa, Shoemaker & Umaña, sp. nov. FIGS. 2, 7, 12, 20–27

Ascomata hysteriformia. Asci bitunicate, clavati, 110–130 × 20–22 μm, brevi-stipitati, octispori. Ascospores biseriatae, applanatae, obpyriformes aut ellipticae, rectae, castaneae, eguttulatae, verruculosae, 30–38 × 10–13 × 7–8 μm, lg./lat. 3.0, lg./alt. 4.3, transversim 7-septatae, in ordine 3:2:3:1:3:2:3, longistrossum 0-, 1-, 2-, 3-septatae, septo primo submedio (0.58), septa tenuia; strato mucoso nullum.

Ascomata in lines on woody stems, semi-immersed, hysteriform, 2–6 × 0.3–0.5 mm, to 0.3 mm high, smooth, glabrous, transversely segmented (FIG. 2). Sulcus central. Upper wall thick, 30–40 μm wide near sulcus, 50–60 μm near marginal shoulders, of thick-walled, dark brown, isodiametric cells 5–8 μm diam; lateral wall externally of 2–4 layers of dark brown, thick-walled, isodiametric cells, 8–10 μm diam; internally of many layers of hyaline, thin-walled cells forming a layer about 30 μm wide, with wood fibers incorporated into both layers (FIG. 7). Paraphyses numerous, 2 μm wide, sparingly septate, without slime coating, without guttules, exceeding the asci. Asci bitunicate, numerous, in a basal cluster from thick, hyaline, basal pseudoparenchyma layer, clavate, 110–130 × 20–22 μm, short-stalked with eight overlapping linearly biseriatae ascospores (FIG. 12). Ascospores

applanate, obpyriform in face view, L/W 3.0, L/D 4.3, straight, 30–38 × 10–13 × 7–8 μm, transversely 7-septate, in sequence 3:2:3:1:3:2:3, with three vertical septa in central cells, one or two in penultimate cells and none in terminal cells, first-formed septum submedian (0.58), constricted at first-formed septum and slightly so at others, without dots at ends of septa, septa thin, widest at 0.30, reddish brown, without guttules, wall densely verruculose, without sheath (FIGS. 20–27).

Etymology. *pandurata* L., alluding to the fiddle shape of ascospores.

HOLOTYPE. COSTA RICA SAN JOSÉ: La Amistad Pacífico, National Park Chirripó. Chirripó to Vall of Los Conejos, 3400–3500 m, 9:27:59.0000 N 83:29:58.0001 W, on *Chusquea subtessellata*, 16 Mar 2002, *M. Oses-2572* (INB0003478247; ISOTYPES: AH 34502, DAOM 234346)

Commentary. Ascospores from DAOM 234346 did not germinate, when tested in Mar 2005, 3 y after collection. Among the three species of *Graphyllum* treated by Shoemaker and Babcock (1992), *Graphyllum manitobense* Dearn. & Bisby with transversely 7-septate ascospores, bears the closest resemblance to *Graphyllum panduratum*. *G. panduratum* differs in having ascospores with the first-formed septum submedian, three longitudinal septa in central cells, and verruculose surface (not shown in median focus).

Hysterium asymmetricum Checa, Shoemaker & Umaña, sp. nov. FIGS. 3, 8, 13, 28–35

Ascomata hysteriformia. Paraphyses ad extremum carmesinae. Asci bitunicati, cylindrici vel clavati, octospori, 80–90 × 10–12 μm, (pars sporif.), tandem pedicellati (ca. 100 μm long). Ascospores teres, ellipsoideae, rubrobrunneae, eguttulatae, leviae, lg./lat. 3.2, inaequilatae vel leniter curvae, (14–)15–18(–20) × 5–7 μm, transversim 3(4)-septatae, in ordine 2:1:2(3), septo medio supramedio (0.44), septa tenuia cum poris, cellulae penultimaetae curvae, inflatae, cellulae basales longissimis; strato muco nullum.

Diagnosis. a *Hysterium angustatum* Alb. & Schwein. affinis sed ascospores vix minore, asymmetricae.

Ascomata semi-immersed, hysteriform, 0.5–1.5 mm long, 250–300 μm wide, 250–300 μm high, smooth, glabrous (FIG. 3). Sulcus central. Wall in longitudinal section laterally uniformly 40–60 μm thick of 10–12 layers of rectangular, brick-like, 12–14 × 2–3 μm pseudoparenchyma cells, compressed near centrum (FIG. 8). Paraphyses numerous, 1 μm wide, aseptate, without guttules, without slime coating, outermost centrum tissue red. Asci bitunicate, numerous, in a basal cluster, cylindrical to slightly clavate, 80–90 × 10–12 μm (pars sporif.), later with narrow stalk about 100 μm long, with eight, overlapping linearly biseriatae ascospores to uniseriate near stalk (FIG. 13). Asco-

spores terete, ellipsoidal, L/W 3.2, inequilateral to slightly curved, (14–)15–18(–20) \times 5–7 μm , transversely (2)3(4)-septate, in sequence 2:1:2(3), without vertical septa, first-formed septum suprmedian (0.44), constricted at first-formed septum, without dots at ends of septa, septa thin with central pore, widest at short second cell from apex, basal cell longest, uniformly pale reddish brown, without guttules, smooth, without sheath (FIGS. 28–35).

Etymology. *asymmetricum* L. refers to the unequally divided ascospores with a short upper part and a longer, tapered, basal part.

HOLOTYPE. COSTA RICA. GUANACASTE: Tempisque, National Park Palo Verde. Palo Verde way to La Venada, 10:20:53.7920 N 85:19:59.4020 W, elev. 0–100 m, on branch, 15 Jan. 2001, *M. Oses-1340*. (INB0003477168; ISOTYPES: AH 34503, DAOM 234344)

Additional specimens examined. Collecting data as for holotype except: 12 Jun 2000, *M. Oses-906* (INB 0003476481); 15 Nov 2001, *M. Oses 2151* (INB0003466398); 8 May 2002, *M. Oses-2722* (INB0003484157); 11 Sep 2002, *M. Oses-3233* (INB0003538605); 10 Feb 2003, *M. Oses-3712* (INB0003577669); 6 Nov 2003, *M. Oses-4674* (INB 0003793627); 8 Nov 2003, *M. Oses-4708* (INB0003793700).

Commentary. In section the red layer at the upper end of the hamathecium and just within the wall is prominent. This pigment and the spore morphology; asymmetric with 3(4) transverse septa are the main characteristics of this species.

Ascospores of *H. andinense* Messuti and Lorenzo, recently described from Argentina (Messuti and Lorenzo 1997), ascospores have 3–7(–9) transverse septa. It is similar to *H. insidens* Schwein.

Hysteroglyphium pulchrum Checa, Shoemaker & Umaña, sp. nov. Figs. 4, 5, 9, 10, 14, 36–45

Ascomata hysteriformia. Physes ad extremum carmesinae. Asci bitunicati, nonnihil clavati, octospori, 80–90 \times 13–15 μm , (pars sporif.) tendem pedicellati (ca. 50 μm lg.). Ascospores tetraseriatae vel uniseriatae, teres, ellipsoideae, rectae vel inaequilateral, rubrobrunneae, eguttulatae, leviae, 22–25(–27) \times 5–6 μm , lg/lat. 3.7, transversim (5)6-septate, in ordine (4) :3:2:1:2:3:(4), longistrorsum 0– vel plerumque 1-septatae in duo cellulae prope septum primum; septo primo suprmedio (0.40), constricto; cellulae antepenultimae inflatae; septa tenuia; sine strato mucoso.

Diagnosis. *Hysteroglyphium mori* (Schwein.) Rehm similis sed distinct; ascospores pluriseptatae, asymmetricae.

Ascomata in bark, semi-immersed, hysteriform, 0.5–2 mm long, 250 μm wide, 250 μm high, smooth, glabrous (FIGS. 4, 5). Sulcus central. Ascocarp wall in section mostly 20–30 μm thick, of about seven layers of rectangular, brick-like, thin-walled cells 8–20

\times 2–4 μm , with occasional lateral excrescences of 20–25 layers of similar cells and 50 μm wide (FIGS. 9, 10). Paraphyses numerous, 1 μm wide, aseptate, without guttules, without slime coating, outermost centrum tissue red. Asci bitunicate, numerous, in a basal cluster, somewhat clavate, 80–90 \times 13–15 μm (pars sporif.), long-stalked (ca. 50 μm) with eight, overlapping linearly tetraseriata ascospores above to uniseriata below (FIG. 14). Ascospores terete, ellipsoid, L/W 3.7, straight to inequilateral, 22–25(–27) \times 5–6 μm , transversely (5)6-septate, in centrifugal sequence (4):3:2:1:2:3:(4), mostly with one vertical septum in both cells next primary septum (absent in some spores), first-formed septum suprmedian (0.40), constricted at first-formed septum and slightly so at others, without dots at ends of septa, septa thin, widest at third cell from apex, pale reddish brown, without guttules, smooth, without sheath (FIGS. 36–45).

Etymology. *pulchrum* L. beautiful, referring to the ascospores.

HOLOTYPE. COSTA RICA. GUANACASTE: Tempisque, National Park Palo Verde. Palo Verde, 10:21:26.5245 N 85:19:10.0313 W, elev. 0–100 m, on branch, 15 Nov. 2001, *M. Oses-2150* (INB0003466397; ISOTYPES: AH 34504, DAOM 234345).

Additional specimens examined. Collecting data as for holotype except: 31 Jul 2001, *M. Oses-1842* (INB 0003465052); 9 Feb 2002, *M. Oses-2488* (INB0003466543); 27 Jul 2002, *M. Oses-1803* (INB0003465013); 11 Nov 2002, *M. Oses-3411* (INB0003577577); 9 May 2003, *M. Oses-4031* (INB0003722266).

Commentary. Ascospores germinated on water agar bearing a piece of alfalfa stem by producing hyaline hyphae laterally from any central cell, rarely axial from basal cell. Germination from apical cell was not observed. Colony from one ascospore on 2% malt agar at 20 C exposed to daylight reaching 8 cm diam in 2 mo. Central portion 5 cm diam of homogeneous, low, dark gray mycelium; margin 1.5 cm wide of coarse, radiating, somewhat dichotomous, yellowish, hyphal strands. No anamorph was observed.

An 18S-ITS sequence from culture DAOM 234345 was entered in GenBank under accession No. DQ402184. Dr Conrad Schoch kindly compared the sequence with those to appear in a phylogeny of the Dothideomycetes (Schoch et al 2006). *Hysteroglyphium pulchrum* did not fall in the clade including *Hysterium pulicare* the type of *Hysterium* on which generic name the family Hysteriaceae is based. The position of *Hysteroglyphium pulchrum* is not clearly defined at present; the molecular evidence indicates that it might be misplaced in Hysteriaceae.

This species has the red pigment of the hamathecium as found also in *Hysterium asymmetricum*.

Hysterographium pulchrum differs from *H. mori* in having six transverse septa and usually one vertical septum in one or both cells next to the suprmedian primary septum.

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