ADDITIONS AND UPDATE TO THE KNOWLEDGE OF THE GENUS *HYSTEROGRAPHIUM* (ASCOMYCOTA, HYSTERIACEAE) IN SOUTHERN SOUTH AMERICA

Laura E. Lorenzo[1] & María I. Messuti[2]

[1]*Departamento de Botánica, Centro Regional Universitario Bariloche, Universidad Nacional del Comahue, Quintral 1250, 8400 San Carlos de Bariloche, Provincia de Río Negro, Argentina; llorenzo@crub.uncoma.edu.ar* (author for correspondence).
[2]*Instituto de Investigaciones en Biodiversidad y Medioambiente (INIBIOMA), CONICET - Universidad Nacional del Comahue, Quintral 1250, 8400 San Carlos de Bariloche, Provincia de Río Negro, Argentina.*

Abstract. L. E. Lorenzo & M. I. Messuti. 2009. Additions and update to the knowledge of the genus *Hysterographium* (Ascomycota, Hysteriaceae) in southern South America. *Darwiniana* 47 (2): 289-296.

The present contribution is the second part of the taxonomic studies about the genus *Hysterographium* from South America. During the revision of Spegazzini´s type specimens, three valid species (*H. andicola*, *H. australe* and *H. praeandinum*), two doubtful species (*H. cumingii* and *H. cuyanum*), and one synonym of *H. mori* (*H. bonaerense)* were confirmed. *Hysterographium subfuscum* is not a valid species. Lectotypes for *H. andicola* and *H. praeandinum* were designated. A key to species of *Hysterographium* recorded from Argentina, Chile and Paraguay is presented.

Keywords. Argentina, Chile, Dothideomycetes, *Hysterographium*, Paraguay.

Resumen. L. E. Lorenzo & M. I. Messuti. 2009. Adiciones y actualización al conocimiento del género *Hysterographium* (Ascomycota, Hysteriaceae) en el sur de Sudamérica. *Darwiniana* 47(2): 289-296.

La presente contribución es la segunda parte de los estudios taxonómicos sobre el género *Hysterographium* para Sudamérica. Durante la revisión de los especímenes tipo de Spegazzini, se estableció la validez de tres especies (*H. andicola*, *H. australe* y *H. praeandinum*), dos especies se consideraron dudosas (*H. cumingii* y *H. cuyanum*) y se propuso a *H. bonaerense* como sinónimo de *H. mori*. *Hysterographium subfuscum* no es una especie válida. Se designaron lectotipos para *H. andicola* y *H. praeandinum*. Se presenta una clave de las especies de *Hysterographium* registradas para Argentina, Chile y Paraguay.

Palabras clave. Argentina, Chile, Dothideomycetes, *Hysterographium*, Paraguay.

INTRODUCTION

The genus *Hysterographium* Corda belongs to the family Hysteriaceae (Dothideomycetes, Ascomycota). It is characterized by its muriform, brown to reddish brown or yellowish or yellowish brown ascospores, with one to several longitudinal septa, ovoid to ellipsoid-fusoid, usually constricted at the first-formed septa. Zogg (1962) and Kirk et al. (2001) recognized four species in the genus, meanwhile Linde (1992) six. Since then, an additional three species have been described (Boehm et al., 2009). The species of *Hysterographium* are widespread, mostly lignicolous, corticolous, saprobic or hemibiotrophic (Barr, 1990).

Previous reports on the taxonomy of this genus in southern South America are found in Spegazzini (1887, 1910), Rehm (1899), Mujica Richatt & Vergara Castillo (1980), and Messuti & Lorenzo (2003). Many species of *Hysterographium* described from Argentina and Chile by Spegazzini and Rehm were listed as doubtful species in Zogg (1962). However, we found the type material of

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the doubtful species of this genus was accessible and in well conditions at LPS.

The central theme of this revision was the examination of Spegazzini´s types that was needed to resolve some taxonomical problems regarding uncertain species cited by Zogg (1962). The objective of this study was to evaluate some taxonomic aspects that still had not been treated sufficiently in previous studies including some reports from Paraguay.

MATERIALS AND METHODS

Spegazzini´s specimens were loaned from LPS. The microscopic characteristics of the specimens were obtained from free-hand sections of hysterothecia mounted in tap water or in Lactophenol Cotton Blue (LCB) (Hawksworth, 1974).

RESULTS AND DISCUSSION

Until now, seven species have been recognized for the genus *Hysterographium* (Boehm et al., 2009). Three of them, *H. flexuosum*, *H. mori* and *H. subrugosum*, have been found in the study area. In this work, three species, *H. andicola*, *H. australe* and *H. praeandinum,* considered as doubtful ones by Zogg (1962) are confirmed as valid species, bringing the total number of species of the genus to ten according with the recent studies published (Boehm et al., 2009). Moreover, *H. cumingii* and *H. cuyanum,* are set as doubtful and *H. bonaerense* was proposed as a synonym of *H. mori*.

Valid and distinct species

Hysterographium andicola Speg., Anal. Mus. Nac. Bs. As. 23: 85. 1912. TYPE: Argentina, Mendoza, Potrerillos, on dead branches of *Tricycla spinosa*, 22-IV-1910, *C. Spegazzini s. n.* (lectotype LPS 1288-a!, here designated). Figs. 1A-B.

Hysterothecia gregarious, erumpent, superficial, straight to flexuous, irregular in shape especially when crowded, 0.47-1.80 x 0.28-0.57 mm, lips more or less open exposing a narrow red disc; pseudoparaphyses hyaline, abundant, filiform, branched, longer than asci; epithecium ferrugineous to red-brown, 3 % KOH staining purple; asci cylindrical-claviform, (4-)8-spored, 110-180 x 14-20 µm; ascospores reddish brown, uniseriate to biseriate, muriform, appearance not parenchymatic, with 4-6 transverse and 1 longitudinal septa, ellipsoid, constricted at the median septum, 16-26(-28) x 8-10 µm.

Geographical distribution and habitat. The species is only known for the type locality. *Hysterographium andicola* was collected from Argentina, Mendoza Province at Potrerillos, Andes Mountains at 1,469 m altitude (32°57´00´´S, 69°10´60´´W), a region where xerophytic vegetation is predominant. *Hysterographium andicola* was collected on branches of endemic shrubs *Condalia microphylla* Cav. (Rhamnaceae, V. n. "Piquillín negro") and *Bougainvillea spinosa* (Cav.) Heimerl (Nyctaginaceae, V. n. "Monte negro") [= *Condalia lineata* A. Gray and *Tricycla spinosa* Cav., respectively, "fide" Spegazzini (1912)].

Observations. The original collection of *Hysterographium andicola* includes two packets designated here as LPS 1288-a and -b. When Spegazzini (1912) published the species, he did not assign the holotype, thus the collection LPS 1288-a is selected here as lectotype.

The type material exists and the collections are in good condition, therefore, we see no reason to consider this species as doubtful as it was cited by Zogg (1962).

The species resembles *Hysterographium mori* (Schwein.) Rehm in the morphology of ascospores with a similar length/width ratio (l:w = 2:1), but *H. mori* has a variable number of transverse septa (3 to 7) and smaller ascospores. (Zogg, 1962; Linde, 1992). Furthermore, two other species of this genus besides *H. andicola* are cited as having a brick-red epithecium (Linde, 1992; Checa et al., 2007): *H. pulchrum* Checa, Shoemaker & Umaña and *H. spinicola* Doidge (as "*spinicolum*"), but Spegazzini´s species differs from those two in the size and shape of ascospores. Nevertheless, the taxonomic importance of the colour of the centrum of ascomata is not yet clear.

Specimens examined

ARGENTINA. **Mendoza.** Potrerillos, on dead branches of *Condalia lineata*, 24-III-1910, *C. Spegazzini s.n.* (LPS 1288-b).

Hysterographium australe Speg., Anal. Soc. Cient. Arg. 12: 189. 1881. TYPE: Argentina, Buenos Aires, Las Conchas, on wood of *Erythrina crista-galli*, I-V-1881, *C. Spegazzini s. n.* (holotype LPS 1291!). Fig. 1C.

Hysterothecia gregarious, superficial, straight or flexuous, 0.57-2.28 x 0.19-0.38 mm; pseudoparaphyses hyaline, abundant, filiform, longer than asci; asci cylindrical-claviform, 4-5(-6-8)-spored, 100-105 x 18-20 µm; ascospores brown, muriform, not parenchymatic, with 6-8 transverse and 1 longitudinal septa, broadly ellipsoid, tapered to the lower part, constricted at the median septum, slightly inequilateral, 22-28 x 6-10 µm.

Geographical distribution and habitat. The species was recorded solely to Argentina. The type material of *H. australe* was collected on decorticated wood of *Erythrina crista-galli* L. (Fabaceae, V. n. "Ceibo"), from Las Conchas, Buenos Aires Province (at present the locality name corresponds to Tigre). Another collection of this species was obtained by Spegazzini (1912) growing on branches of an unknown species of shrubs in Catamarca Province.

Observations. At first sight the ascospores of *H. australe* resemble those of *Hysterographium* subrugosum (Cooke & Ellis) Sacc. in size, with similar ratios of length to width (l:w = 3-3.5:1). However, we find that ascospores of *H. australe* differ in their form, being broadly ellipsoid rather than fusiform, and in their smaller size (Spegazzini, 1881; Zogg, 1962; Linde, 1992). Zogg (1962) included this species in his list of doubtful ones, but gave no reason for this placement. Spegazzini (1881) described this species as "aparaphysati". However, when the type material (LPS 1291) was observed, the presence of abundant pseudoparaphyses was clear.

Hysterographium flexuosum (Schwein.) Sacc., Syll. Fung. (Abellini) 2: 781. 1883. *Hysterium flexuosum* Schwein., Schriften Naturf. Ges. Leipzig 1: 49. 1833 [Syst. Mycol. 2: 585. 1823 fide Barr (2009)]. TYPE: not located [fide Bisby (1932) the co-type is deposited in K]. Figs. 1F y 3A.

References. For description, comments and synonymy see Zogg (1962), Messuti & Lorenzo (2003) and Barr (2009).

Geographical distribution and habitat. Cosmopolitan (Barr, 1990). The species was described from Argentina, in the Patagonian Provinces of Neuquén, Río Negro and Tierra del Fuego, mainly found on wood and bark of *Nothofagus* Blume species (Messuti & Lorenzo, 2003). In this contribution, the known distribution of *H. flexuosum* is expanded to Santa Cruz Province, Los Glaciares National Park, growing on fallen branches of *Nothofagus pumilio* (Poepp. & Endl.) Krasser (Fagaceae, V. n. "Lenga").

Specimens examined

ARGENTINA. **Santa Cruz.** Parque Nacional Los Glaciares, entrance to the drift, ca. 1 km on the right side of the road at the base of Cerro Mitre, 50°27´39´´S, 72°47´10´´W, on fallen branches of *Nothofagus pumilio*, 10-XII-2003, *M. I. Messuti s.n.* (BCRU 4811).

Hysterographium mori (Schwein.) Rehm, Ascom. 26. Bericht d. Nat. hist. Vereins Augsburg: 90. 1881 [Ascomyceten: no. 363 (1876) fide Index Fungorum]. *Hysterium mori* Schwein., Syn. Fung. Amer. bor.: no. 2087. 1834. [1832 fide Index Fungorum]. TYPE: sine data (K) ["fide" Bisby (1932)]. Figs. 2A-B.

Hysterographium porteñum Speg., Anal. Soc. Cient. Arg. 9: 185. 1880. [as "portenum" "fide" Index Fungorum]. TYPE: Argentina, Buenos Aires, Flores, on *Melia azedarach*, sine data, *C. Spegazzini s.n.* (holotype LPS 1284!).

Hysterographium bonaerense Speg., Anal. Soc. Cient. Arg. 12: 208. 1881, syn. nov. [as "bonariense" "fide" Index Fungorum]. TYPE: Argentina, Buenos Aires, Palermo, on *Salix humboldtiana*, V-1881, *S. Ambrosetti s.n.* (holotype LPS 1283!).

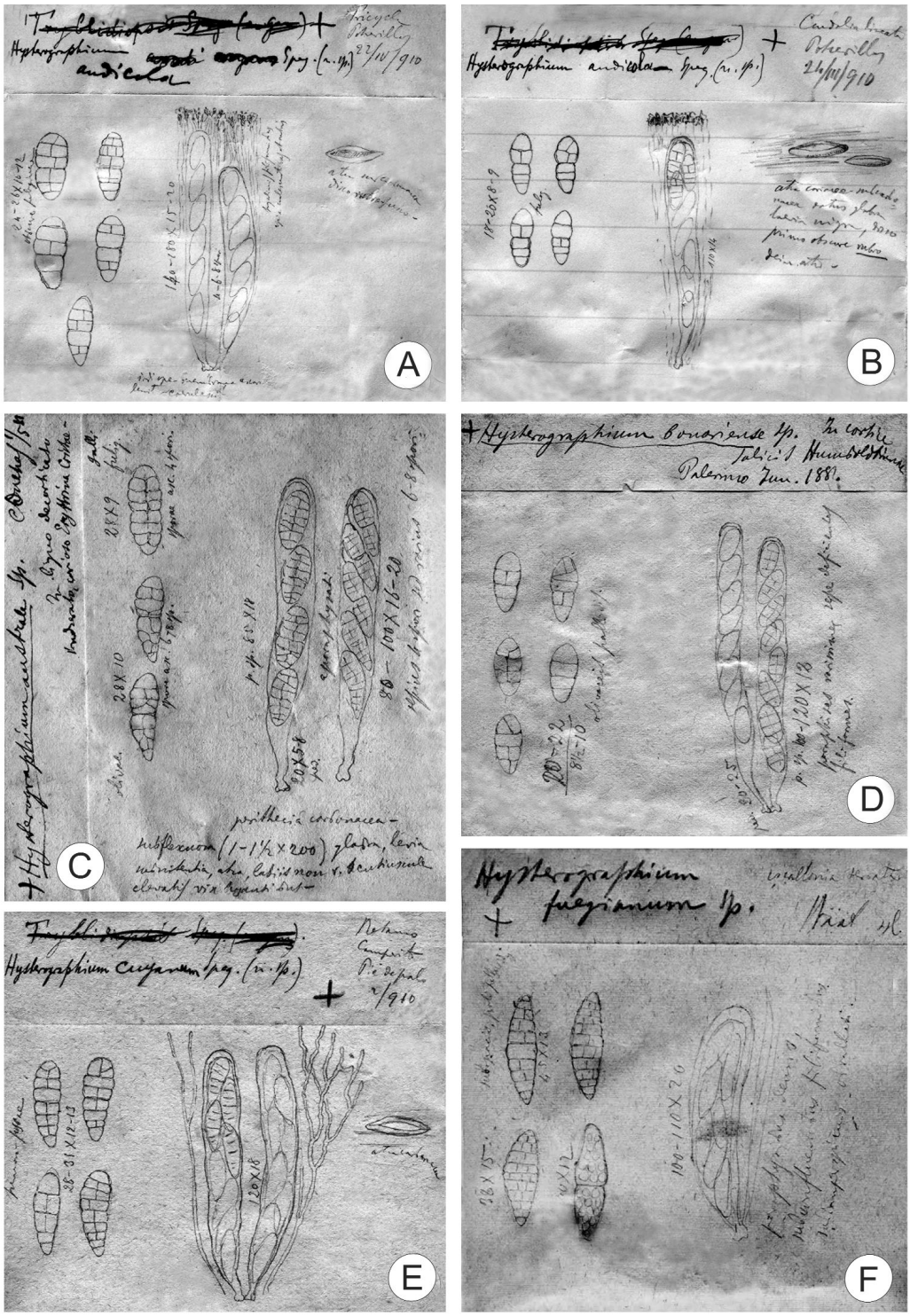

Fig. 1. Herbarium packets of Spegazzini´s type specimens of *Hysterographium*. **A,** *H. andicola* (lectotype LPS 1288-a). **B,** *H. andicola* (LPS 1288-b). **C,** *H. australe* (holotype LPS 1291). **D,** *H. mori* [= *H. bonaerense* (holotype LPS 1283)]. **E,** *H. cuyanum* (holotype LPS 1286). **F,** *H. flexuosum* [= *H. fuegianum* (holotype LPS 1296)].

Hysterographium guaraniticum Speg., Anal. Soc. Cient. Arg. 26: 56. 1888. TYPE: Paraguay, Guarapí, on decomposed wood, VIII-1883, *B. Balansa 3953* (holotype LPS 1273!).

References. For additional synonymy see Zogg (1962), Rosato (2007) and Barr (2009).

Hysterothecia single or gregarious, erumpent, superficial, straight to flexuous, surface usually striate, 0.4-2 x 0.2-0.4 mm; pseudoparaphyses hyaline, abundant, filiform, branched, longer than asci; epithecium compact; asci clavate to cylindrical, 8-spored, (55-)70-170 x 10-18 µm; ascospores yellow-brown to reddish brown, uniseriate to partially biseriate, muriform, not parenchymatic, with [3-5(-7)] transverse and 1 longitudinal septa, ellipsoid to obovoid, sometimes slightly inequilateral, constricted at the median septum, (12-)15-24(-26) x (5-)6-10(-11) µm.

Geographical distribution and habitat. Cosmopolitan (Barr, 1990). The specimens examined of this species were the type material of *H. guaraniticum*, *H. bonaerense* and *H. porteñum*. In Argentina, *H. mori* was reported from Buenos Aires Province, Buenos Aires City, San José de Flores as *H. porteñum* (Spegazzini, 1880) and Palermo as *H. bonaerense* (Spegazzini, 1881); in San Luis Province, Alto Grande as *Tryblidaria argentinensis* Speg. (Rosato, 2007), and in Tucumán and Catamarca Provinces (Catania, 2009). From Paraguay the species was registered in Pacú Cuá (Spegazzini, 1921) and in Asunción (Spegazzini, 1922) as *H. porteñum* and in Guarapí as *H. guaraniticum* (Farr, 1973). *Hysterographium bonaerense* was found growing on old bark of *Salix humboldtiana* Willd. (Salicaceae, V. n. "Sauce criollo"). *Hysterographium guaraniticum* was detected on decaying decorticated logs of unidentified plants. *Hysterographium* porteñum was collected on sticks of *Melia azedarach* L. (Meliaceae, V. n. "Arbol de paraíso"), on wood of *Brosimum gaudichaudii* Trécul (Moraceae, V. n. "Mama-cadela" or "Sweet cotton") and on decorticated trunk of *Citrus bigaradia* Risso (Rutaceae, V. n. "Naranjo amargo"). Catania (2009) cited *H. mori* growing on bark and wood of *Podocarpus parlatorei* Pilg. (Podocarpaceae, V. n. "Pino del cerro"). For more substrates for *Hysterographium mori*, see Zogg (1962).

Observations. Spegazzini (1881) described *Hysterographium bonaerense* (as " *H. bonariense*" on the label of type packet) as having the following characteristics: hysterothecia gregarious, superficial, straight to flexuous, 1-1.5 x 0.2-0.22 mm; pseudoparaphyses present; asci cylindrical, 8-spored, 100-120 x 12 µm in the sporogenus portion; ascospores pallid olivaceous, uniseriate to partially biseriate, with 3 transverse and 1 longitudinal septa, ellipsoid to ovate, 20-22 x 8-10 µm (Fig. 1D). The following differences were found between the original description of the species and our examination of the type material (LPS 1283): hysterothecia 0.5-2 x 0.3-0.4 µm, ascospores reddish brown, with 3-4 transverse septa. Zogg (1962) cited this species in his list of doubtful ones. Because we did not find significant differences in features between *H. mori* and Spegazzini´s species we regard both taxa as synonymous.

There are two other species of the genus *Hysterographium* described by Spegazzini, *H. guaraniticum* (Fig. 2A) and *H. porteñum* (Fig. 2B) that Zogg (1962) proposed as synonyms of *Hysterographium mori*. Our analyses of the type material (LPS 1284 and LPS 1273) allowed us to confirm those synonyms.

Hysterographium praeandinum Speg., Anal. Mus. Nac. Hist. Nat. Bs. As. 23: 87. 1912. TYPE: Argentina, Mendoza, Potrerillos, on *Tricycla spinosa*, 24-IV-1910, *C. Spegazzini s.n.* (lectotype LPS 1290-a!, here designated). Figs. 2C y 3B.

Hysterothecia gregarious, erumpent, superficial, straight, 0.21-0.56 x 0.12-0.16 mm; pseudoparaphyses hyaline, abundant, filiform, branched, longer than asci; epithecium ferrugineous to red-brown; asci cylindrical, 8-spored, 100-120 x 12-14 µm; ascospores reddish brown, uniseriate to partially biseriate, muriform, not parenchymatic, with (1-2-)3 transverse and 1 longitudinal septa (?), obovoid, constricted at the median septum, lower cell conical and lighter than the upper ones, 10-14 x 4-6 µm [18-20 x 8-10 µm, fide Spegazzini (1912)].

Geographical distribution and habitat. The species is only known in Argentina for the type

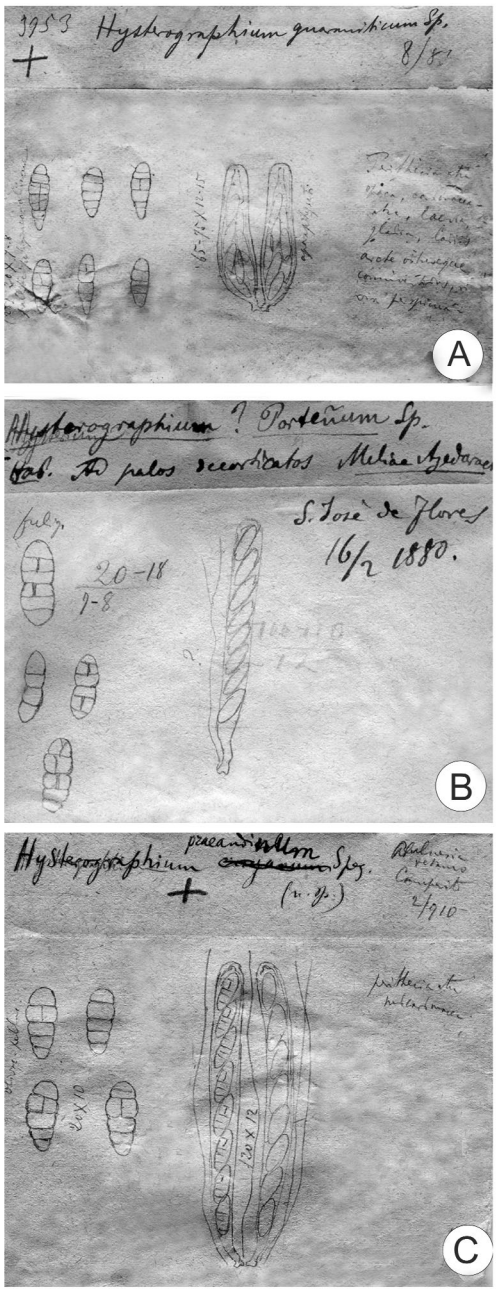

Fig. 2. Herbarium packets of Spegazzini´s type specimens of *Hysterographium*. **A,** *H. mori* [= *H. guaraniticum* (holotype LPS 1273)]. **B,** *H. mori* [= *H. porteñum* (holotype LPS 1284)]. **C,** *H. preandinum* (lectotype LPS 1290-a).

locality and San Juan Province. *Hysterographium preandinum* was recorded only from Argentina in arid areas of Mendoza and San Juan Provinces, growing on decorticated wood of xeromorphic schrubs.

Observations. The type collection LPS 1290, contains two packets, one of them on wood of *Tricycla spinosa* (LPS 1290-a) and other on *Bulnesia retama* (Gill. ex Hook.) Griseb. (Zygophyllaceae, V. n. "Retamo") (LPS 1290-b). Because Spegazzini (1912) did not assign the holotype, the material LPS 1290-a, is selected here as lectotype. Spegazzini (1912) noted that the ascospores are longitudinally 1-septate and transversally (4-5)3-septate, which was not found by us in either collection (LPS 1290 a, b) with one exception where we detected only one longitudinal septum. The size of ascospores that we registered from the type specimens was remarkably smaller than the one published in the original description. Therefore, it can be presumed that we observed material that was not completely mature.

Specimens examined

ARGENTINA. **San Juan.** Pie de Palo, on fallen branches of *Bulnesia retama*, II-1910, *C. Spegazzini s.n.* (LPS 1290-b).

Hysterographium subrugosum (Cooke & Ellis) Sacc., Syll. Fung. 2: 780. 1883. *Hysterium subrugosum* Cooke & Ellis, Grevillea 5: 54. 1876. TYPE: sine data (K) ["fide" Bisby (1932)].

References. For description, comments and synonymy see Zogg (1962), Messuti & Lorenzo (2003) and Barr (2009).

Geographical distribution and habitat. This species grows in northern as well as in southern temperate areas of the world (Barr, 1990; Messuti & Lorenzo, 2003). *Hysterographium subrugosum* is additionally reported from Argentina, Neuquén Province, near Pichi Traful River, and also in Paso Córdoba, Road 63, growing on unidentified dead twigs. Previously, the species was recorded from Río Negro Province and Tierra del Fuego Province (Argentina), growing on *Nothofagus* species and on *Drimys winteri* J.R. Forst. & G. Forst.

(Winteraceae, V. n. "Canelo") (Messuti & Lorenzo, 2003).

Specimens examined

ARGENTINA. **Neuquén.** Río Pichi Traful, Sec. Guardaparques, on decorticated twigs, 27.IV.2001, *L. E. Lorenzo s.n.* (BCRU 5015); "ibid.", on decorticated twigs, 27-IV-2001, *L. E. Lorenzo s.n.* (BCRU 5018); Paso Córdoba, Ruta 63 in direction to San Martín de los Andes, 23 km after Limay-Traful confluence, *Nothofagus pumilio* forest, on decorticated wood, 24-IV-2001, *L. E. Lorenzo s.n.* (BCRU 5019).

Uncertain species

Hysterographium cumingii Speg., Rev. Fac. Agron. Vet. La Plata 6: 119. 1910. TYPE: Not located.

Observations. This species was described and reported by Spegazzini (1910) to be found in Chile, Valparaíso, Cerro Alegre, growing on rotten culms of bamboo, *Chusquea cumingii* Nees (Poaceae, V. n. "Quila chica"). The species has not been reported on any other occasion. In agreement with Zogg (1962) this species must be considered as a doubtful one, because the type material is missing and it is not registered in the database of type specimens in LPS (Rosato, pers. com.) and no information about it could be found in other herbaria.

Hysterographium cuyanum Speg., Anal. Mus. Hist. Nat. Bs. As. 23: 86. 1912. TYPE: Argentina. San Juan, Pie de Palo, on bare wood of *Bulnesia retama*, II-1910, *C. Spegazzini s.n.* (holotype LPS 1286!). Fig. 1E.

Observations. Spegazzini (1912) characterized this species by: hysterothecia superficial, 0.4-1 x 0.2 -0.25 mm; pseudoparaphyses abundant, dichotomously branched; asci cylindrical, 120 x 17-18 µm; ascospores subclaviform, with (5-)7(-9) transverse and 1 longitudinal septa, light brown, 28-32 x 12-14 µm.

Hysterographyum cuyanum bears the closest resemblance to *H. subrugosum* mainly by its ascospore size and septal numbers. However, as the type material (LPS 1286) is scant and immature, Spegazzini´s observations cannot be confirmed. Therefore this taxon must be considered doubtful, as it was proposed by Zogg (1962).

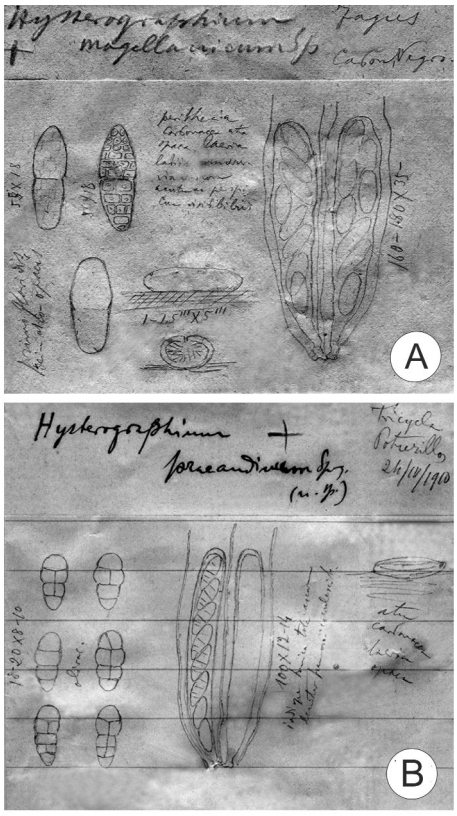

Fig. 3. Herbarium packets of Spegazzini´s type specimens of *Hysterographium*. **A,** *H. flexuosum* [= *H. magellanicum* (holotype LPS 1295)]. **B,** *H. praeandinum* (LPS 1290-b).

Invalid names

Hysterographium subfuscum Speg.

Apparently this taxon is an unpublished herbarium name (Farr, 1973). Zogg (1962), based on a specimen collected by Balansa in Paraguay, Guarapí, in August 1883 (deposited in B), proposed this species to be a synonym of *Hysterographium mori*. We asked for the loan of these specimens from B but they were not found there (Gerhardt,

pers. com.). The species is neither present at LPS (Rosato, pers. com.).

Key to species of *Hysterographium* recorded from Argentina, Chile and Paraguay

1. Ascospores muriform, parenchymatic . . . . . .
. . . . . .*H. flexuosum*
1. Ascospores muriform, not parenchymatic 2
2(1). Ascoma with a ferruginous to red-brown epithecium 3
2. Ascoma without a coloured epithecium 4
3(2). Ascospores with 4-6 transversal septa and 1 longitudinal septum 16-28 x 8-10 µm . . . . . *H. andicola*
3. Ascospores with (1-2-)3 transversal septa and 1 longitudinal septum 10-14 x 4-6 µm . . . . . .
. . . . . *H. praeandinum*
4(2). Ascospores with 3-5(-7) transversal septa and 1 longitudinal septum . . . . . *H. mori*
4. Ascospores with 6-11 transversal septa and 1-2 longitudinal septa 5
5(4). Ascospores fusiform, with 7-11 transversal septa and 1-2 longitudinal septa . . . . . *H. subrugosum*
5. Ascospores ellipsoid to broadly ellipsoid, with 6-8 transversal septa and 1 longitudinal septum . . . . . .
. . . . . *H. australe*

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