

REVISION OF THE SPECIES OF RHYTISMATACEAE REPORTED BY SPEGAZZINI FROM SOUTH AMERICA*

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Summary: Spegazzini reported 20 species and subspecies of Rhytismataceae from South America. In addition, a species he described in the genus *Linospora* was later also referred to this family. All 21 of these species are treated in this paper, following examination of type specimens and other specimens collected and identified by Spegazzini where possible. Comments are given on a modern interpretation of the names, and in some cases brief descriptions and illustrations are provided, based on Spegazzini's collections as well as additional recent collections. Two new species are described – *Coccomyces australis*, for a fungus referred by Spegazzini to *Coccomyces dentatus*, and *Lophodermium gamundiae*, for a fungus referred by Spegazzini to *Lophodermium hysterooides*. *L. gamundiae* is morphologically similar to *L. eucalypti* from Australasia, the two species being genetically distinct. There is some geographic structure to genetic diversity within *C. australis*, two collections from near Ushuaia characterised by a 214 bp insert within the ITS1 primer binding site. The «universal» ITS1 primer will hence not amplify the ITS region of some *C. australis* isolates. *Pureke zelandicum* (known also from New Zealand and Australia) is newly recorded for South America, although no genetic comparison has been made between collections from the 2 regions.

Key words: *Coccomyces*, *Hypoderma*, *Lophodermium*, *Pureke*, new species, new records, ITS sequences, *Chlorociboria argentinensis*.

Resumen: Revisión de las especies de Rhytismataceae registradas por Spegazzini para Sudamérica. Spegazzini registró 20 especies y subespecies de Rhytismataceae en Sudamérica. Una especie del género *Linospora* descrita por él, posteriormente fue remitida a esta familia. Estas 21 especies son tratadas en este trabajo, examinando los materiales tipos y otros coleccionados e identificados por Spegazzini. Se hacen comentarios sobre la interpretación moderna de los nombres, y en algunos casos se hacen descripciones breves e ilustraciones de colecciones de Spegazzini y a partir de colecciones recientes. Se describen dos especies nuevas – *Coccomyces australis*, un hongo identificado por Spegazzini como *Coccomyces dentatus*, y *Lophodermium gamundiae*, identificado previamente por Spegazzini como *Lophodermium hysterooides*. *L. gamundiae* es similar morfológicamente a *L. eucalypti* de Australasia, siendo las dos especies genéticamente diferentes. Hay alguna estructura geográfica en la diversidad genética dentro de *C. australis*, dos colecciones cerca de Ushuaia se caracterizaron por tener 214 bp insertados dentro del sitio ITS1. El ITS1 «universal», en consecuencia, no amplificará la región ITS de algunas cepas de *C. australis*. *Pureke zelandicum* (conocido también en Nueva Zelanda y Australia) es registrado por primera vez para Sudamérica, aunque no se han realizado comparaciones genéticas entre colecciones de las 2 regiones.

Palabras Clave: *Coccomyces*, *Hypoderma*, *Lophodermium*, *Pureke*, nuevas especies, nuevos registros, ITS sequences, *Chlorociboria argentinensis*.

INTRODUCTION

Through support from the Flora Crytogámica de Tierra del Fuego project, Dr Irma Gamundi invited the first author to spend several weeks in southern South America during 1996 to carry out collecting of

*Trabajo publicado en homenaje a la Dra Irma J. Gamundi en conmemoración de su 80° aniversario.

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Rhytismataceae. Known to be highly diverse in other parts of the Southern Hemisphere (Johnston 2001a), the family had not been systematically targeted for temperate South America. Spegazzini (1887, 1896, 1909, 1910, 1923, 1924) described or reported 19 species in the family (together with another species he placed in *Linospora* which has since been redetermined as a member of the Rhytismataceae), mostly from Tierra del Fuego. Several other species have subsequently been reported from southern South America by

various authors from a range of native and exotic plants. This diversity was summarised by Gamundí *et al.* (2004).

As a first step toward clarifying the relationships of the collections made during 1996, this paper reports a study of the types and other collections cited by Spegazzini in the literature or deposited by Spegazzini in LPS. The species reported by other authors are not treated.

METHODS

Macroscopic appearance was described from dried herbarium material, and microscopic features described following rehydration in 3% KOH with Melzer's reagent added. Apothecia were sectioned at about 10 µm thickness using a freezing microtome, and the sections were mounted in lactic acid. Cultures were obtained from some collections on the day of collecting. Ascospores were shot from naturally discharging asci onto Difco cornmeal agar plates. Germinating ascospores were transferred to agar slopes and later grown on a variety of media and stored as agar plugs in 10% glycerol under liquid N. All specimens collected during the 1996 field work have been deposited in LPS or PDD, and cultures have been deposited in the ICMP culture collection (Landcare Research, Auckland). ITS sequences were obtained for a few collections from DNA extracted from cultures following the method of Johnston & Park (2005), except that both the ITS1 (White *et al.* 1990) and ITS1-F (Gardes & Bruns 1993) forward primers were used for amplification. Sequences were compared with those presented by Ortiz-García *et al.* (2003), following alignment using Clustal-W. Phylogenetic analyses were performed with PAUP* 4.0b10 (Swofford 2002) using parsimony. Support for branches was tested using 1000 bootstrap replicates. Divergence between sequences was calculated using the PairDiff command in PAUP*. Genbank numbers for ITS sequences generated in this study are provided in the caption of Fig. 1.

RESULTS AND DISCUSSION

During the 1996 visit more than 130 collections of Rhytismataceae were made. These represented more than 30 species, several of which are undescribed. Some of the species recorded are found also in Australasia, including *Pureke zelandicum* P.R.Johnst., and an undescribed *Hypoderma* species on *Eucryphia*, found also on *Eucryphia* in Australia

(unpubl. data).

Table 1 summarises the species of Rhytismataceae reported by Spegazzini from South America, the names accepted for these species in this paper, and their host relationships. Each species is treated alphabetically by Spegazzini's name. Brief descriptions and illustrations, or references to descriptions and illustrations, are provided, together with notes on a modern interpretation of the name used by Spegazzini.

Collections of the South American species newly described below as *Coccomyces australis* and *Lophodermium gamundiae* were compared genetically with *Lophodermium eucalypti* (Rodway) P.R.Johnst. collections from Australia and New Zealand, and with the rhytismataceous species in the tree presented by Ortiz-García *et al.* (2003). The new South American species plus *L. eucalypti* formed a strongly supported monophyletic clade sister to *Lophodermium agathidis* Minter & Hettige, represented in the analysis by collections from New Zealand (Fig. 1). The significance of this relationship is uncertain, as taxon sampling is heavily biased to species from Pinaceae and from the Northern Hemisphere. However, *C. australis*, *L. eucalypti*, and *L. gamundiae* are similar in ascus and ascospore morphology and in the general anatomy of their ascomatal walls. *Coccomyces australis* differs from the other 2 species in the shape of the ascomatal opening slit and by the lack of lip cells. Phylogenetic relationships within the Rhytismataceae, both from South America and the rest of the world, will remain poorly understood until a much more comprehensive set of molecular data is accumulated.

Genetic variation within the *C. australis* population appears to be driven by geography rather than host. Three isolates from each of *Desfontainea*, *Embothrium*, and *Nothofagus* were genetically very close (Fig. 1). However, the 2 southern-most isolates sampled, both from *Nothofagus* from two sites in the vicinity of Ushuaia (54°47'S), formed a well-supported clade, and were distinct in having a 214 bp insert within the ITS-1 primer binding site (the insert was excluded from the phylogenetic analysis). The isolates from *Desfontainea* and *Embothrium* were collected much further north, around 41°S, while the collection from *Nothofagus* genetically similar to the 2 isolates from these other hosts, was collected in Tierra del Fuego, 100 km to the north of Ushuaia across the Garibaldi Pass. Whether this genetic variant is truly confined to the southern tip of Tierra del Fuego

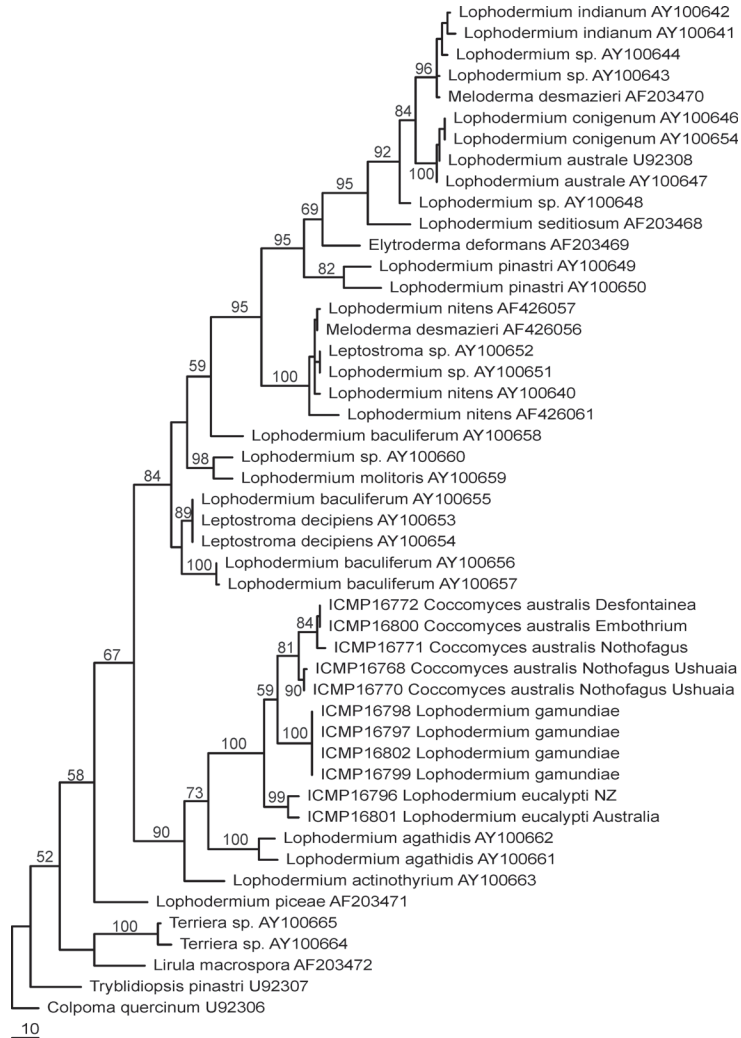


Fig. 1. – One of the 32 shortest trees from a parsimony analysis of ITS sequences, with bootstrap values indicated. *Coccomyces australis*, *Lophodermium gamundiae* and the morphologically similar *Lophodermium eucalypti* were compared with the taxa included in the study of Ortiz-Garcia *et al.* (2001). Genbank accession numbers for sequences generated in this study: *Coccomyces australis*, ICMP16772 = Genbank EF191241, ICMP16800 = Genbank EF191240, ICMP 16771 = Genbank EF191242, ICMP 16768 = Genbank EF191243, ICMP16770 = Genbank EF191244; *Lophodermium eucalypti*, ICMP16796 = Genbank EF191235, ICMP16801 = Genbank EF191234; *Lophodermium gamundiae*, ICMP16797 = Genbank EF191239, ICMP16798 = Genbank EF191237, ICMP16799 = Genbank EF191236, ICMP16802 = Genbank EF191238.

needs confirming with additional sampling. The insert within the ITS1 primer binding site means that this «universal» primer will not amplify the ITS region of some isolates of *C. australis*.

1. *Coccomyces brasiliensis* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 11: 593, 1889.

≡ *Coccomyces spegazzinii* Sacc., *Sylloge Fungorum* 8: 747, 1889 [non *Coccomyces brasiliensis* Karst., *Hedwigia* 28: 193, 1889].

Accepted name: *Coccomyces spegazzinii*.

See Sherwood (1980) for a description and illustrations. Described from Brazil, *C. spegazzinii* is similar to the common, widespread tropical species *C. leptosporus* Speg. (Sherwood 1980).

2. *Coccomyces dentatus* (J.C. Schmidt & Kunze) Sacc., *Michelia* 1: 59, 1877.

Accepted name: The fungus Spegazzini referred to this name is considered to represent an undescribed *Coccomyces* sp., described below as *C. australis*.

Spegazzini (1923) tentatively reported *C. dentatus*

Table 1. – Summary of rhytismataceous names reported from South America by Spegazzini, and names of those fungi as accepted in this paper.

Name used by Spegazzini	Accepted name	Host
<i>Coccomyces brasiliensis</i>	<i>Coccomyces spegazzinii</i>	dicotyledons
<i>Coccomyces dentatus</i>	<i>Coccomyces australis</i> sp. nov.	<i>Nothofagus</i> spp., and less commonly on other dicotyledons
<i>Coccomyces filicicola</i>	? <i>Coccomyces dentatus</i>	Fern (? <i>Pteridium</i> sp.)
<i>Coccomyces leptosporus</i>	<i>Coccomyces leptosporus</i>	dicotyledons
<i>Coccomyces pampeanus</i>	<i>Coccomyces pampeanus</i>	<i>Eryngium</i> sp.
<i>Coccomyces puiggarii</i>	<i>Coccomyces puiggarii</i>	Myrtaceae
<i>Coccomyces yerbae</i>	<i>Coccomyces yerbae</i>	<i>Ilex paraguayensis</i>
<i>Hypoderma andinum</i>	<i>Hypoderma andinum</i>	<i>Patagonium pinifolium</i>
<i>Hypoderma brachysporum</i>	<i>Hypoderma brachysporum</i>	<i>Berberis</i> spp.
<i>Hypoderma virgultorum</i>	? <i>Hypoderma rubi</i>	<i>Hebe elliptica</i> (as <i>Veronica decussa</i>)
<i>Linospora magellanica</i>	<i>Lophodermium alpinum</i>	<i>Festuca purpurascens</i>
<i>Lophodermium ambigua</i>	<i>Lophodermium alpinum</i>	grasses
<i>Lophodermium antarcticum</i>	<i>Duplicaria antarctica</i>	<i>Marsippospermum grandiflorum</i>
<i>Lophodermium clavuligerum</i>	<i>Lophodermium clavuligerum</i>	<i>Pernettya mucronata</i>
<i>Lophodermium fuegianum</i>	<i>Terriera fuegiana</i>	<i>Marsippospermum grandiflorum</i>
<i>Lophodermium hysterioides</i>	<i>Terriera</i> spp., <i>L. gamundiae</i> sp. nov., <i>Pureke zealandicum</i>	<i>Terriera</i> on several dicotyledons, <i>L. gamundiae</i> and <i>P. zealandicum</i> common on <i>Nothofagus</i> spp.
<i>Lophodermium leptothecium</i>	<i>Lophodermium leptothecium</i>	fallen lauraceous leaves
<i>Lophodermium oxyascum</i>	?	Grasses
<i>Lophodermium subtropicale</i>	<i>Lophodermium subtropicale</i>	<i>Psidium</i> twigs
<i>Lophodermopsis hysterioides</i>	? <i>Terriera</i> sp.	dicotyledons

from *Nothofagus betuloides* leaves from Tierra del Fuego, noting that the material he had available was sterile but looked macroscopically similar to his concept of this Northern Hemisphere species. Sherwood (1980) discussed confusion over use of the names *Coccomyces coronatus* and *C. dentatus*. It is likely that Spegazzini was using the name *C.*

dentatus in the wrong sense, and that the fungus he was referring to was a *Coccomyces* species very common on fallen leaves of *Nothofagus* spp. in Tierra del Fuego, which macroscopically resembles *C. coronatus* sensu Sherwood (1980).

The *Nothofagus*-inhabiting, South American fungus, described below as *Coccomyces australis*,

differs from *C. coronatus* in having circinate rather than swollen paraphyses, larger asci and ascospores, and an apothecial anatomy matching *C. tumidus* and *Lophodermium tumidulum* (see Sherwood 1980, Johnston 2001b). *Coccomyces australis* closely resembles *L. tumidulum* microscopically (Johnston 2001b), but is considered distinct because of biological and geographical differences. *Lophodermium tumidulum* is known only from monocotyledonous hosts in Europe. *Coccomyces australis*, common on *Nothofagus* in southern South America and found occasionally on other dicotyledonous hosts, has never been seen on monocotyledons in this region. Another *Nothofagus*-inhabiting species found in South America, *L. gamundiae* (see discussion under *L. hysteroioides*), is also similar microscopically but differs in having elliptic rather than rounded ascomata, and well-developed lip cells along the longitudinal opening slit.

Although particularly common on *Nothofagus* spp., *C. australis* has also been collected from several other hosts including *Desfontainea spinosa*, *Maytenus magellanica*, a *Blechnum* sp. and leaves tentatively identified as a *Ribes* sp. Usually, the leaves of these other hosts were intermixed in the litter with heavily infected *Nothofagus* leaves. For all hosts, the leaves on which the ascomata develop are typically partly decomposed, suggesting they may have a saprobic rather than endophytic biology.

Gamundí *et al.* (2004) reported *C. dentatus* from the exotic *Castanea sativa* from Chile, but this material has not been examined.

***Coccomyces australis* P.R. Johnst., sp. nov.**

Fig. 2.

Ab *C. tumido* ascosporis (50–)60–75(–85) ' 2.5–3 µm, paraphysibus circinatis differens. In foliis caducis *Nothofagus* spp.

Holotype: ARGENTINA. Tierra del Fuego: Ushuaia, Valle de Glaciar Martial, near base of skilift, on *Nothofagus antarctica*, fallen leaves, P. R. Johnston (SA6), L. Lorenzo, 16-III-1996 (LPS; PDD 89884 – isotype; ICMP 16768 – culture from type).

Ascomata developing on dead, partly decomposed leaves, not associated with paler areas of host tissue, zone lines, or anamorph conidiomata. Ascomata round in outline, 0.6–1 mm diam., black, central part highly arched above surface of substrate, with narrow, flat, shelf-like margin, opening by several, irregular radiate slits, no differentiated cells associated

with edge of opening. Ascomatal insertion subcuticular. Upper wall in vertical section up to 95 µm thick near opening, about 40–50 µm thick near base, comprising mostly globose cells, 5–10 µm diam., with walls thin, hyaline, irregularly encrusted with pale brown material, outermost 2–3 layers of cells brick-shaped, 3–4 µm diam., with walls slightly thickened and darkened, innermost layer of cells more or less free, short-cylindric, up to about 15 µm long, oriented at right angles to host surface. In ascomata which appear to have been open for some time a few cells bordering the opening slit become cylindrical, up to about 20 ' 4 µm, with walls hyaline, thin. Lower wall of ascoma in vertical section 20–30 µm thick, comprising several layers of globose to angular cells irregular in size, 2.5–5 µm diam., smaller towards outside of wall, with walls slightly thickened and dark. Paraphyses 2–2.5 µm diam., circinate and coiling. Asci 150–180 ' 14–16.5 µm, clavate, tapering to small, subtruncate apex, wall undifferentiated at apex, 8-spored, spores confined to upper 90–100 µm of ascus, with long basal stalk. Ascospores (50–)60–75(–85) ' 2.5–3 µm, tapering slightly towards base, straight when released, 0–septate, globose gelatinous cap at apex.

Additional specimens examined: ARGENTINA Patagonia: Río Negro, Parque Nacional Lanín, Lago Lacar, vic. Hua Hum, on *Nothofagus alpina* fallen leaves, P. R. Johnston (SA270), I. Gamundí, 12-IV-1996 (LPS). Río Negro, Parque Nacional Nahuel Huapi, Lago Espejo, on *Nothofagus antarctica* fallen leaves, P. R. Johnston (SA255), I. Gamundí, 10-IV-1996 (PDD 89887, ICMP 16773). Río Negro, Nahuel Huapi National Park, path from Puerto Blest to Los Cantaros, on *Desfontainea spinosa* fallen leaves, P. R. Johnston (SA191), I. Gamundí, C. Brion, 2-IV-1996 (PDD 89891, ICMP 16772). Tierra del Fuego: Ushuaia, Valle de Glaciar Martial, near stream across ridge to east of skilift, on *Nothofagus antarctica*, fallen leaves, P. R. Johnston (SA8), L. Lorenzo, 16-III-1996 (LPS). Ushuaia, Valle de Glaciar Martial, near skilift, on *Nothofagus antarctica* fallen leaves, P. R. Johnston (SA8.1), L. Lorenzo, 16-III-1996 (PDD 89885, ICMP 16769). Ushuaia, near CADIC, swamp near cemetery, on *Nothofagus antarctica* fallen leaves, P. R. Johnston (SA22), L. Lorenzo, 17-III-1996 (PDD 89886, ICMP 16770). Lapataia National Park, Laguna Negro, on *Nothofagus antarctica* fallen leaves, P. R. Johnston (SA30), L. Lorenzo, 18-III-1996 (LPS). Ushuaia, eastern side of town, on *Nothofagus antarctica* and *N. pumilio* fallen leaves, P. R. Johnston (SA25), L. Lorenzo, 17-III-1996 (LPS). Lago Fagnano, swamp

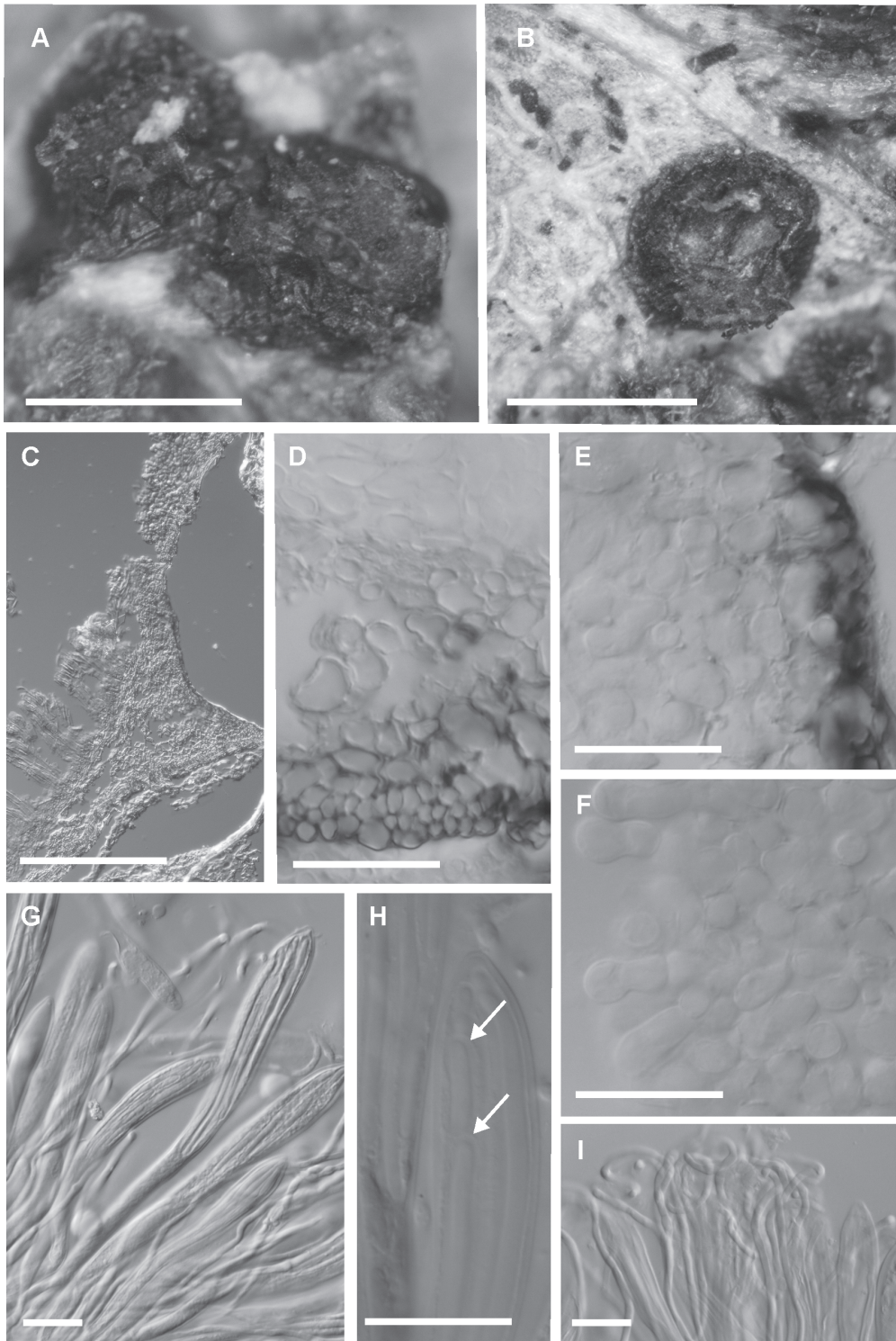


Fig. 2. – *Coccomyces australis*. **A–B:** Ascomata (PRJ SA30, LPS), **C:** one side of ascoma in vertical section (PDD 89884), **D:** detail of lower wall of ascoma in vertical section (PDD 89884), **E:** detail of outside edge of upper wall of ascoma in vertical section (PDD 89884), **F:** detail of inside edge of upper wall of ascoma in vertical section (PDD 89884), **G:** asci (PDD 89884), **H:** asci with ascospores, gelatinous sheath showing as faint halo at apex of spore (arrowed) (PDD 89884), **I:** circinate paraphyses (PRJ SA9, LPS). Scale bars: **A–B** = 1 mm; **C** = 50 μ m; **D–I** = 20 μ m.

about 2km north of Tolhuin, on *Nothofagus antarctica* and *N. pumilio* fallen leaves, P. R. Johnston (SA49), L. Lorenzo, 20-III-1996 (PDD 89888, ICMP 16771). Ushuaia-Moat road, vic. Estancia Moat, on *Nothofagus betuloides* partly decomposed leaves, P.R. Johnston (SA128), L. Lorenzo, 25-III-1996 (LPS). Lapataia, Lago Negra, on *Nothofagus pumilio* fallen leaves, I. Gamundí, 19-II-1982 (LPS 41964). Lago Fagnano, vic. Kosobo, road to hot springs, on *Nothofagus pumilio* fallen leaves, P. R. Johnston (SA 87), L. Lorenzo, 22-III-1996 (PDD 89889). vic. Ushuaia, Mt Olivia, on *Blechnum* sp. dead leaves, P. R. Johnston (SA 163), L. Lorenzo, 28-III-1996 (LPS). vic. Ushuaia, Mt Olivia, on *Nothofagus pumilio* fallen leaves, P.R. Johnston (SA162), L. Lorenzo, 28-III-1996 (LPS, PDD 89890). Ushuaia-Fagnano road, Lago Escondido, on *Nothofagus pumilio* fallen leaves, P. R. Johnston (SA 79), L. Lorenzo, 22-III-1996 (LPS). vic. Ushuaia, Mt Olivia, on ?*Ribes* sp. dead leaves, P. R. Johnston (SA 164), L. Lorenzo, 28-III-1996 (LPS). Ushuaia-Moat road, vic. Estancia Moat, on *Maytenus magellanica* partly decomposed leaves, P. R. Johnston (SA 129), L. Lorenzo, 25-III-1996 (LPS). CHILE. Los Lagos, Palena, Lago Yelcho, track to ventisquero Yelcho, on *Embothrium* sp. fallen leaves, coll. P. R. Johnston (SA203), M. Rajchenberg, 5-IV-1996 (PDD 89039, ICMP 16800).

3. *Coccomyces filicicola* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 23: 152, 1919.

Sherwood (1980) found the type specimen to be immature, and tentatively considered this species a synonym of *Coccomyces dentatus*. However, the pteridicolous substrate is unusual for *C. dentatus*.

4. *Coccomyces leptosporus* Speg., *Anales de la Sociedad Científica Argentina* 19: 188, 1885.

Accepted name: *Coccomyces leptosporus*.

See Sherwood (1980) for a description and illustrations.

Originally described from Brazil, Sherwood (1980) lists several tropical American collections in this species with a note that most appear to be on the same, unidentified host plant.

5. *Coccomyces pampeanus* Speg., *Contribución al estudio de la flora de la Sierra de la Ventana* p. 85, 1896.

= *Coccomyces pampeanus* var. *chilensis* Speg., *Revista de la Facultad de Agronomía, Universidad*

Nacional de La Plata, series 2 6: 132, 1910.

Accepted name: *Coccomyces pampeanus*.

See Sherwood (1980) for a description and illustrations.

Originally described from Argentina and Chile on *Eryngium* (Apiaceae), Sherwood (1980) accepts also tropical American collections from other hosts in this species.

6. *Coccomyces pampeanus* var. *chilensis* Speg., *Revista de la Facultad de Agronomía, Universidad Nacional de La Plata, series 2* 6: 132, 1910.

= *Coccomyces pampeanus* Speg., *Contribución al estudio de la flora de la Sierra de la Ventana* p. 85, 1896.

Accepted name: *Coccomyces pampeanus*.

Sherwood (1980) regarded the macroscopic differences between *C. pampeanus* and *C. pampeanus* var. *chilensis* (also described from *Eryngium*) to reflect differences in maturity between the respective type collections.

7. *Coccomyces puiggarii* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 23: 152, 1919.

Accepted name: *Coccomyces puiggarii*.

See Sherwood (1980) for a description and illustrations.

Described from Brazil on dead leaves of Myrtaceae, this species is unusual for *Coccomyces* species from tropical America in lacking a well-developed layer of periphysoids and excipular tissues around the hymenium.

8. *Coccomyces yerbae* Speg., *Anales del Museo Nacional de Buenos Aires* 17: 132, 1908.

Accepted name: *Coccomyces yerbae*.

Sherwood (1980) examined the tiny type specimen, noted that it appeared to be closely related to *C. spegazzinii*, but that more material from its host (*Ilex paraguayensis*) was needed for the species to be properly characterized. No collections of *Coccomyces* from *Ilex* were made during the 1996 field trips to southern Argentina.

9. *Hypoderma andinum* Speg., *Anales del Museo Nacional de Buenos Aires* 19: 435, 1909.

Fig. 3.

Accepted name: *Hypoderma andinum*.

Ascomata developing in the surface layers of the bark of dead twigs, appearing almost superficial.

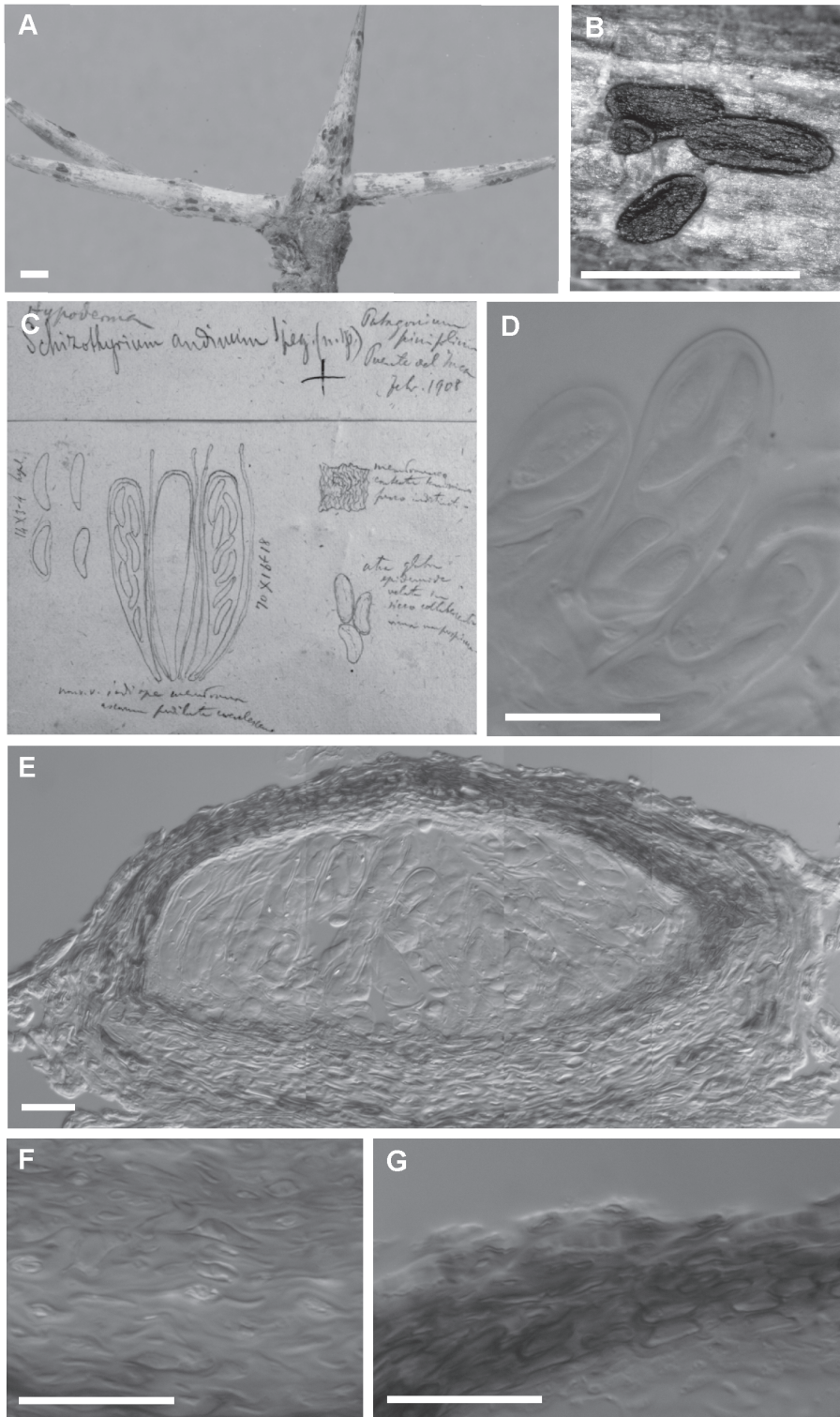


Fig. 3. – *Hypoderma andinum* (LPS 1254, holotype). **A:** infected twigs and thorns of host plant, **B:** detail of ascomata from **A**, **C:** Spegazzini illustration on type packet, **D:** ascospores within asci, **E:** ascoma in vertical section, **F:** detail of lower wall of ascoma in vertical section, showing gelatinous tissue, **G:** detail of upper wall of ascoma in vertical section, outer gelatinous tissue restricted to 1–2 layers of cells. Scale bars: **A–B** = 1 mm; **D** = 20 μ m; **E** = 50 μ m; **F–G** = 20 μ m.

Ascomata 0.3–0.7 x 0.2 µm, broad-elliptic in outline, ends broadly rounded, wall black, often with narrow, longitudinal fold extending the length of the ascoma, presumably an incipient opening slit, but no open ascomata seen. Ascomata sometimes branched, or confluent. In vertical section ascomatal wall 20–50 µm thick, comprising 2 layers, an inner layer of brown-walled cells, an outer layer of hyaline cells with thick, gelatinous walls. At base of ascoma inner layer poorly developed, 10–20 µm thick, comprising 2–3 µm diam. cells with walls thin, pale brown, outer layer comprising cylindric, hyaline to pale brown cells with walls thick and gelatinous. Wall continuous to top of ascoma, but outer layer becomes reduced to 1–2 cells wide. At top of wall cells of inner layer become shorter and walls slightly thicker and slightly darker. Along the central line of the ascoma (presumed to be the future line of opening), the cells in the inner half of the wall have hyaline walls. Hymenium partly distorted in rehydrated preparation from herbarium specimen. Paraphyses 1.5 µm, undifferentiated or swollen up to 3.5 µm at apex, about same length as asci. Asci broad-clavate, wall undifferentiated at apex, nonamyloid, 8-spored. Ascospore walls appear to be quite elastic, spore shape variable, dependent upon pressure from adjacent hymenial elements. Ascospores more or less elliptic to oblong-elliptic, about 17–19 x 6–6.5 µm, spores widely spaced within the ascus as though surrounded by a broad gelatinous sheath. Some asci contained ascospores that had started to germinate, and these spores often with 1–2 transverse septa.

Notes: Although the hymenial elements are difficult to interpret confidently from the rehydrated herbarium material, the above observations are supported by the beautiful illustrations and notes provided by Spegazzini on the type packet (Fig. 3C). He illustrated the broad cylindric to subclavate asci as having an undifferentiated apex, and spores surrounded by a gelatinous sheath. His spore sizes (14 x 3–4 µm) are smaller than I observed. Spegazzini (1909) illustrated an open ascoma in section, with no differentiated cells along the opening slit, and he also noted that the ascus was faintly amyloid (this was not illustrated by Spegazzini, and was not observed from the dried specimen).

Hypoderma andinum macroscopically resembles the Rhytismataceae and has several microscopic features typical of the family (true paraphyses, asci with undifferentiated, apparently nonamyloid apex, ascospores with gelatinous sheath, ascoma with preformed line of dehiscence). Atypical is the lack of

any excipular tissue, and the ascomatal wall appearing to be continuous, rather than having the separate upper and lower walls characteristic of the family (Johnston 2001b). Its phylogenetic position remains uncertain. If it does belong in the Rhytismataceae, it is unlikely to be closely related to the type of *Hypoderma*, *H. rubi*. Until phylogenetic relationships within the Rhytismataceae are better understood, no recombination is proposed.

Powell (1974) considered *H. andinum* to be a previously undescribed *Phacidium* sp., but the lack of an amyloid ring at the ascus apex and having ascospores surrounded by a gelatinous sheath are features not found in *Phacidium* sensu Di Cosmo *et al.* (1984).

Specimen examined: ARGENTINA. Mendoza: Puente del Inca, on *Patagonium pinifolium*, C. Spegazzini, II-1908 (LPS 1254 – holotype).

10. *Hypoderma brachysporum* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 11: 248, 1887.

Fig. 4.

Accepted name: *Hypodermabrachysporum*.

Ascomata and anamorph conidiomata developing in slightly pale areas of fallen leaves. Ascomata 1–1.5 x 0.4–0.7 mm, broad elliptic in outline, walls shiny black, margin sharply defined, no pale zone along future line of opening, longitudinal opening slit lined with well-developed lips, lip cells yellowish to reddish brown. Ascomata subcuticular. Paraphyses 1–1.5 µm diam., coiling and circinate near apex, not swollen. Asci 140–170 x 12–15 µm, clavate-stipitate, wall undifferentiated at apex, 8-spored, spores confined to uppermost 50–55 µm of ascus. Ascospores 17–23.5 x 3.5–5 µm, cylindric, widest point slightly towards one end, tapering gradually to each broadly rounded end, slightly flattened one side, straight or slightly curved. Conidiomata 0.2 mm diam., round in outline, pustulate, pale brown (dark brown when overmature), conidiogenous cells lining lower wall, solitary, short-cylindric, sympodial often with 2 conidia held at the apex, conidia 5–7.5 x 1–1.5 µm, short-cylindric, straight, ends rounded.

Notes: Ascospore sizes provided above (based on observations from recent collections) are larger than that cited for the type specimen by Spegazzini (1887), but do match a later specimen identified by Spegazzini as this species (LPS 1249), the packet of which he annotated with spore sizes 18–20 x 5 µm.

Hypoderma brachysporum is common on

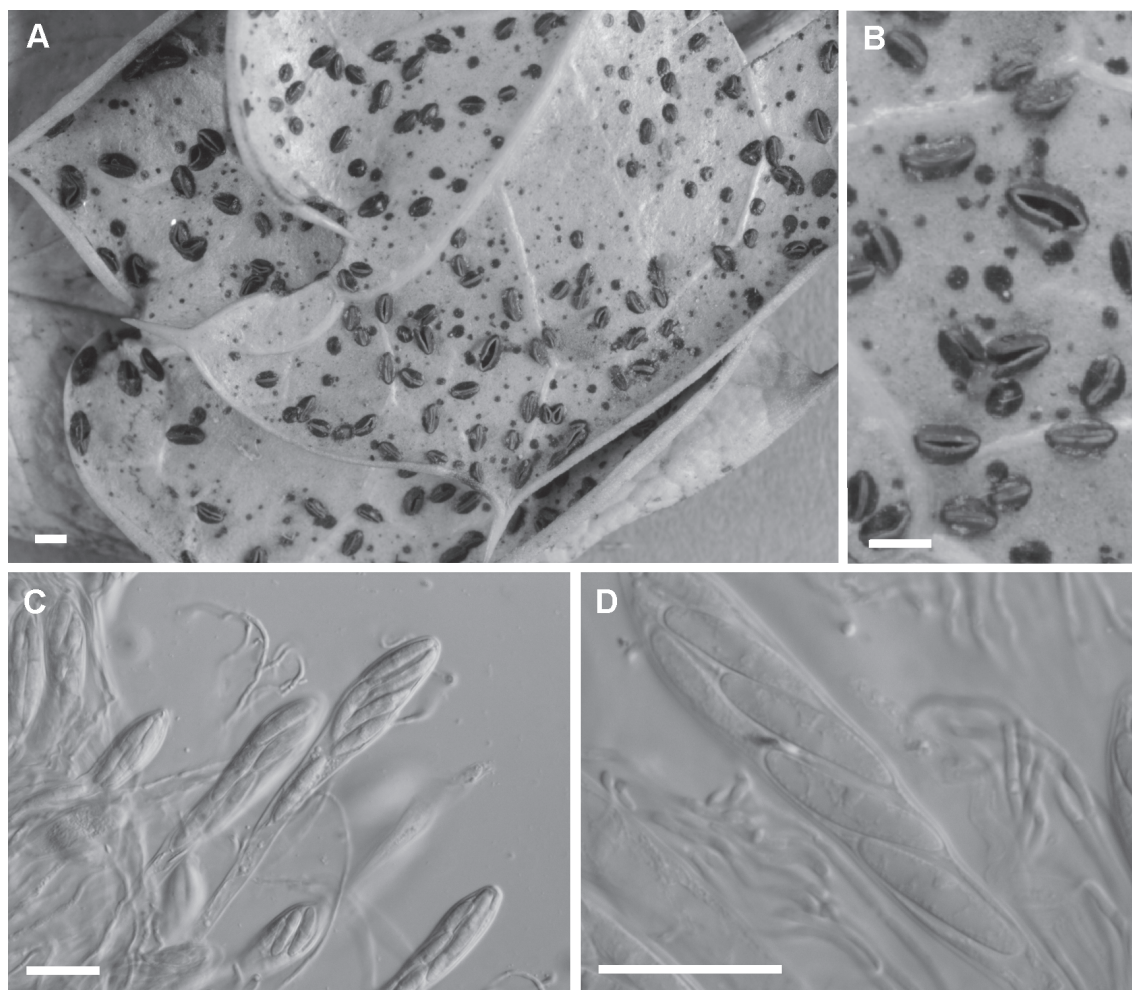


Fig. 4. – *Hypoderma brachysporum*. **A–B.** ascomata on leaves (PDD 89896), **C.** asci (PRJ SA34, LPS), **D.** ascospores within ascus (PRJ SA34, LPS). Scale bars: **A–B** = 1 mm; **C–D** = 20 µm.

Berberis ilicifolius, and seen rarely on *B. buxifolia*. There may be a distinct, probably undescribed, *Hypoderma* species on *Berberis serrato-dentata*. Two collections from this host (ARGENTINA. Patagonia: vic. Bariloche, Cerro Otto, on *Berberis serrato-dentata* fallen leaves, P. R. Johnston (SA197), A. Giaiotti, M. Messuti, 3-IV-1996, (LPS, PDD 89894); CHILE. Puyehue National Park, on *Berberis serrato-dentata* fallen leaves, P. R. Johnston (SA251), I. Gamundi, 9-IV-1996 (LPS, PDD 89895) had slightly narrower ascospores than *H. brachysporum*, 20.5–23 x 3–3.5 µm. Johnston (1990) noted subtle, apparently host-related, differences in ascospore size for collections from New Zealand identified as *Hypoderma rubi*, and future molecular studies may show these host-defined populations to be genetically distinct.

Specimens examined: Argentina: Tierra del Fuego: Staten Island, on *Berberis ilicifolius* fallen leaves, C. Spegazzini, 1882 (LPS 1248 – holotype). Sholl Bay, on *Berberis ilicifolius* fallen leaves, C. Spegazzini, 13-I-1924 (LPS 1249). Lapataia National Park, Lago Rosa, on *Berberis ilicifolius* fallen leaves, P. R. Johnston (SA34), L. Lorenzo, 18-III-1996 (LPS). Ushuaia – Moat road, Punto Brown, on *Berberis ilicifolius* fallen leaves, P. R. Johnston (SA123), L. Lorenzo, 25-III-1996 (LPS, PDD 89896). Lapataia National Park, Bahia Ensenada, on *Berberis ilicifolius* fallen leaves, P. R. Johnston (SA143, SA137), L. Lorenzo, 27-III-1996 (LPS). Lapataia National Park, Bahia Ensenada, on *Berberis buxifolia* fallen leaves, P. R. Johnston (SA138), L. Lorenzo, 27-III-1996 (LPS).

11. *Hypoderma virgultorum* DC., *Flore*

Française, Troisième Edition 6: 165, 1815.

Accepted name: possibly *Hypoderma rubi*.

Hypoderma virgultorum is an illegitimate name now referred to *H. rubi* (Pers.) DC. ex Chevall. (Cannon & Minter 1983). Although there are suggestions that there may be some host-specialised forms amongst collections referred to this name (Powell 1974, Johnston 1990), it is at present considered to be a cosmopolitan species with a broad host range. Spegazzini (1887) reported *H. rubi* from *Hebe elliptica* (as *Veronica decussa*) leaves from Tierra del Fuego. The only Spegazzini collections available from LPS are two from *Rubus* spp. from Chile. The hymenium has been lost from both collections, but they are macroscopically typical of this species, which is particularly common on *Rubus*, the host of the *H. rubi* type specimen.

Although *H. rubi* is common in New Zealand, it is interesting that no collections have been made from *Hebe* spp., also common and diverse in New Zealand. *Hebe* spp. appear to be poor hosts for Rhytismataceae. Whether the Spegazzini collections from Tierra del Fuego represent *H. rubi* or another species is unknown. No collections of *H. rubi* were made during the field trips of 1996.

Specimens examined: CHILE. Valdivia, on *Rubus sanctus*, C. Spegazzini, Jan 1909 (LPS 1250). Concepción, on *Rubus* sp., C. Spegazzini, 1-1909 (LPS 1251).

12. *Linospora magellanica* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 27: 378, 1924.

≡ *Lophodermium magellanicum*, (Speg.) J. Walker, *Mycotaxon* 11: 46 (1980).

= *Lophodermium alpinum* (Rehm) Wesse, *Mitteilungen aus dem Botanischen Laboratorium der Technischen Hochschule in Wien* 10: 80 (1933).

Accepted name: *Lophodermium alpinum*.

See Johnston (2001b) for a description and illustrations.

The type specimen of *Linospora magellanica* is typical of *Lophodermium alpinum* both macroscopically and microscopically. The ascomata are small (up to about 0.5 mm long), with a diffuse pale zone along the future line of opening, and lack lip cells. The asci are saccate (about 110–120 × 20–25 µm) with a small, foot-like base, the ascospores quite broad (about 55–60 × 2.5–3 µm).

Specimen examined: CHILE. Isla Capitán Aracena, Sholl Bay, on *Festuca purpurascens*, C. Spegazzini,

13-I-1924 (LPS 881 – holotype of *Linospora magellanica*).

13. *Lophodermium ambigua* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 27: 380, 1924.

= *Lophodermium alpinum* (Rehm) Wesse, *Mitteilungen aus dem Botanischen Laboratorium der Technischen Hochschule in Wien* 10: 80, 1933.

Accepted name: *Lophodermium alpinum*.

Lophodermium ambigua was described from dead leaves of *Poa fuegiana* from Sholl Bay, southern Chile. Spegazzini (1924) commented that although the opening of the fruiting body was somewhat *Phacidium*-like, the other features matched *Lophodermium*. He described the asci as 90–120 × 14–16 µm and the ascospores as 50 × 3 µm.

Although no type material of this species was found at LPS, and no other Spegazzini collections were seen which were given this name or which matched the collecting details, it is likely to represent *Lophodermium alpinum*. *Lophodermium alpinum* is common on grasses at this locality, has asci and ascospores within the size range of those described by Spegazzini for *L. ambigua*, and in some cases has a somewhat eroded, irregular appearance to the often short opening slit of the ascoma.

14. *Lophodermium antarcticum* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba* 11: 249, 1887.

≡ *Hypoderma antarcticum* (Speg.) Kuntze, *Revisio Generum Plantarum* 3(3): 487, 1898.

≡ *Lophodermina antarctica* (Speg.) Tehon, *Illinois Biological Monographs* 13: 87, 1935.

≡ *Duplicaria antarctica* (Speg.) P.R. Johnst., *Mycological Papers* 176: 89, 2001.

Accepted name: *Duplicaria antarctica*.

See Johnston (2001b) for a description and illustrations.

The type collection is in poor condition. Johnston (2001b) recombined this species in *Duplicaria* partly on the basis of other collections made on the same host. Recent collections from Tierra del Fuego showed this fungus to be common on *Marsippospermum grandiflorum* (= *Rostkovia grandiflora*), to which it seems to be restricted.

Terriera fuegiana (see under *Lophodermium fuegianum*) occurs on the same host, but is less common.

Specimens examined: ARGENTINA. Tierra del Fuego: Staten Island, on *Marsippospermum*

grandiflorum (as *Rostkovia grandiflora*), III-1882, C. Spegazzini (LPS 1010 - holotype of *L. antarctica*). Isla Desolación, Puerto Angusto, on *Marsippospermum*, P. Dusén, 1896 (BPI, in part). Isla de los Estados, between Puerto Cook and Puerto Vacas, on *Rostkovia*, I. Gamundí, 27-XI-1967 (LPS 39571, in part). Isla de los Estados, Puerto Cook, on *Rostkovia*, I. Gamundí, 3-XII-1975 (LPS 39569). Lapataia, Turbera, on *Rostkovia*, I. Gamundí, 21-II-1974 (LPS 39568). Lapataia, Turbera, on *Rostkovia*, I. Gamundí, 15-III-1975 (LPS 39561, 39572). Turbera, Laguna Negra, on *Marssipospermum*, I. Gamundí, 18-II-1974 (LPS 39560). Ushuaia, Valle de Glaciar Martial, near base of skilift, on *Marsippospermum grandiflorum*, P. R. Johnston SA 7 & L. Lorenzo, 16-III-1996 (PDD 70911). Ushuaia, near CADIC, swamp near cemetery, on *Marsippospermum grandiflorum*, P. R. Johnston SA 23 & L. Lorenzo, 17-III-1996 (PDD 70912). Lapataia National Park, Laguna Negro, on *Marsippospermum grandiflorum*, P. R. Johnston SA 32 & L. Lorenzo, 18-III-1996 (PDD 70913). Lapataia National Park, Senda de los Castores, on *Marsippospermum grandiflorum*, P. R. Johnston SA 33 & L. Lorenzo, 18-III-1996 (PDD 70914). Ushuaia, Valle de Glaciar Martial, ski trail below Casa de Té, on *Marsippospermum grandiflorum*, P. R. Johnston SA 104 & L. Lorenzo, 24-III-1996 (PDD 70915).

15. *Lophodermium clavuligerum* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba 11*: 250 (1887).

≡ *Hypoderma clavuligerum* (Speg.) Kunze, *Revisio Generum Plantarum 3(3)*: 487, 1898.

≡ *Lophodermia clavuligera* (Speg.) Tehon, *Illinois Biological Monographs 13*: 91, 1935.

≡ *Lophomerum clavuligerum* (Speg.) Darker, *Canadian Journal of Botany 45*: 1434, 1967.

Fig. 5.

Accepted name: *Lophodermium clavuligerum*.

Ascomata and structures resembling anamorph conidiomata of Rhytismataceae developing within paler areas on fallen leaves, sometimes associated with broad, diffuse, dark zone lines. Ascomata all immature, broad elliptic to ovate, walls uniformly dark grey. Ascomatal insertion subcuticular. In vertical section, upper wall of unopened ascoma appears to be uniform in structure, comprising angular, pale brown to brown cells with slightly thickened walls. Hymenium not seen. Conidiomata 0.2 mm diam., round in outline, pustulate, walls pale brown to concolorous with surrounding host tissue with dark line around

edge. Conidia and conidiogenous cells not seen.

Notes: The type, and only known specimen of this species, comprises immature ascomata only and is in poor condition. Spegazzini's illustration on the type packet (Fig. 5A) shows asci 100–110 x 7 µm, cylindric, tapering to small rounded apex; paraphyses swollen, clavate at apex, and ascospores filiform, 7-septate. Resolving relationships between this and other Ericaceae-inhabiting species requires additional material.

Specimen examined: ARGENTINA. Tierra del Fuego, Staten Island, on *Pernettya mucronata*, C. Spegazzini, III-1882 (LPS 1006 - holotype).

16. *Lophodermium fuegianum* Speg., *Boletín de la Academia Nacional de Ciencias, Córdoba 11*: 250, 1887.

≡ *Hypoderma fuegiana* (Speg.) Kuntze, *Revisio Generum Plantarum 3(3)*: 487, 1898.

≡ *Terriera fuegiana* (Speg.) P.R. Johnst., *Mycological Papers 176*: 127, 2001.

Accepted name: *Terriera fuegiana*.

See Johnston (2001b) for a description and illustrations.

The type collection is small and in poor condition, and the description provided by Johnston (2001b) combines data from the type with that from a collection made by Dusén (BPI) from the same host and same general locality.

Duplicaria antarctica (see under *Lophodermium antarcticum*) occurs on the same host, but differs in having larger ascomata and in being associated with anamorph pycnidia. *Terriera fuegiana* is far less common.

Specimens examined: ARGENTINA. Tierra del Fuego: Isla de los Estados, Agaia, on *Rostkovia grandiflora* (as *Marsippospermum grandiflorum*), C. Spegazzini, VI-1882 (LPS 1007 – holotype). Isla de los Estados, between Puerto Cook and Puerto Vacas, on *Rostkovia*, I. Gamundí, 27-XI-1967 (LPS 39571, in part). Isla Desolación, Puerto Angusto, on *Rostkovia grandiflora* (as *Marsippospermum*), P. Dusén, 1896 (BPI, as *Lophodermium antarcticum*).

17. *Lophodermium hysteroioides* (Pers.) Sacc., *Sylloge Fungorum 2*: 791 (1883).

Accepted name: The *Nothofagus*-inhabiting fungus Spegazzini referred to this name is considered to be a new *Lophodermium* sp., described below as *Lophodermium gamundiae*. The fungi on other hosts that Spegazzini referred to this name are considered

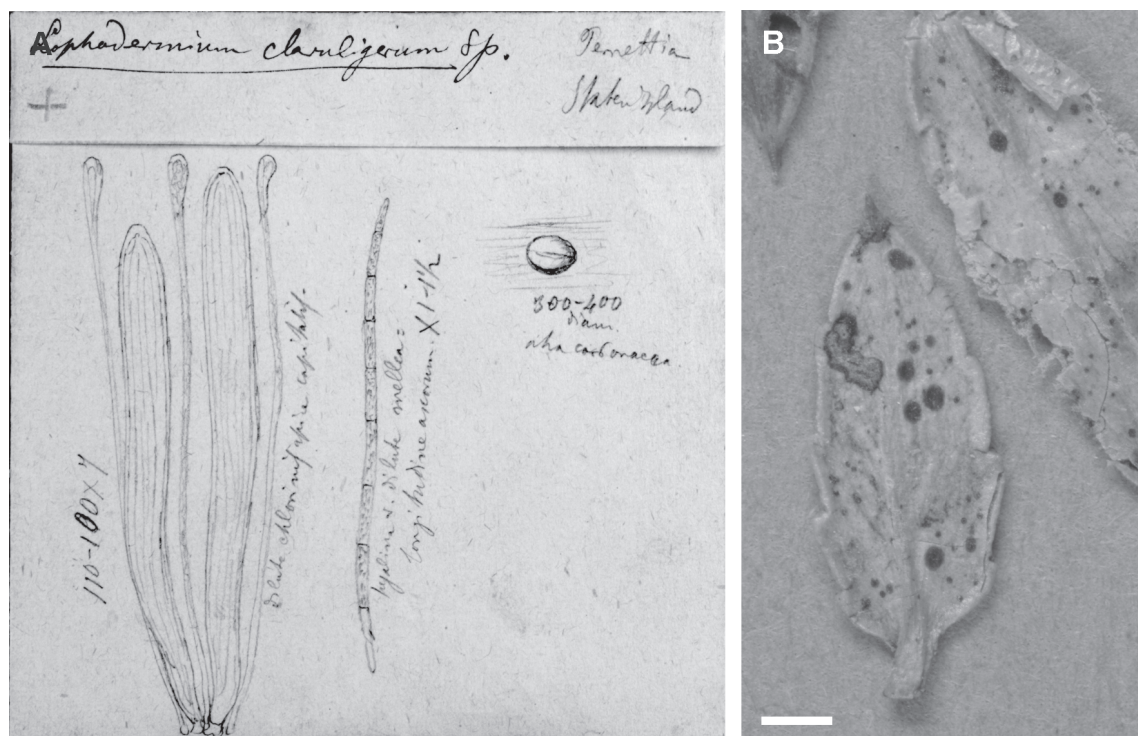


Fig. 5. – *Lophodermium clavuligerum*. A: Spegazzini illustration on the type packet, B: immature ascomata on leaves of type specimen. Scale bar = 1 mm.

to represent one or more *Terriera* spp.

Lophodermium hysteroioides was considered a synonym of *Lophodermium foliicola* (Fr.) P. Cannon & Minter by Cannon & Minter (1986), and this north-temperate, Rosaceae-inhabiting species is not accepted from Argentina. *Lophodermium hysteroioides* was reported on fallen leaves of *Nothofagus betuloides* from Tierra del Fuego (Spegazzini 1887), and later from Chile on *Boldoa fragrens*, *Guevina avellana*, *Cryptocarya* sp., and *Lardizabala biternata* (Spegazzini 1910). Several LPS specimens identified by Spegazzini as *L. hysteroioides*, from a range of hosts similar to those reported by him for this species, have been examined. His collections from Chile all represent *Terriera* species. Although all the collections are in poor condition, the characteristic ascomatal macro-morphology of *Terriera* is clearly visible, the longitudinal opening slit being bordered by black, flattened, shelf-like areas (Johnston 2001b).

The single collection from *Nothofagus* leaves from Tierra del Fuego is a different fungus. Although the hymenium of the Spegazzini material has been lost during storage, several recent collections from *Nothofagus* leaves have been examined which are macroscopically similar. They represent an

undescribed *Lophodermium* species macroscopically and microscopically similar to *L. eucalypti*. This latter species has been reported from a wide range of hosts from New Zealand, Australia, and western North America (Johnston 2001b), has slightly shorter ascospores, and differs in ITS sequences. The new South American species is described below as *L. gamundiae*. It is common on fallen leaves of *Nothofagus* spp. A single collection on *Pernettya mucronata* leaves appears to represent the same species, although this collection is not available in culture and has not been compared genetically.

Fallen *Nothofagus* leaves in southern Argentina are also infected with two other species of Rhytismataceae, *Pureke zelandicum* and the newly described *Coccomyces australis* (see description under *Coccomyces dentatus*). *Pureke zelandicum*, known also from New Zealand on *Nothofagus menziesii* (Johnston 1991) and Australia on *Nothofagus moorei* (unpubl. data), is macromorphologically similar to *Lophodermium gamundiae*, both species having ascomata more or less elliptic in outline, with the single opening slit lined with brightly coloured lip cells. The 2 species are easily distinguished microscopically, *P.*

zelandicum having subepidermal ascomata, bifusiform ascospores about 45–55 x 3 µm, and paraphyses swollen and knob-like at the apex. Although there are no clear morphological differences between the South American and Australasian collections of *P. zelandicum*, a genetic comparison has not been possible as no cultures are available from South America. There are other examples where morphological similarity between Australasian and South American ascomycetes has not been reflected genetically. Examples include *L. gamundiae* and *L. eucalypti* in this paper, and *Chlorociboria argentinensis*. Originally described from South America, *C. argentinensis* was accepted for New Zealand by Johnston & Park (2005) on the basis of a shared morphology. However, recently obtained ITS sequences for South American collections (Genbank numbers EF520123 and EF520124) has shown them to be genetically distinct from the New Zealand collections.

Coccomyces australis has ascospores and paraphyses similar to *L. gamundiae*, but its ascomata are more or less round in outline, with several irregular opening slits not lined with lip cells.

Lophodermium gamundiae P.R. Johnst., *sp. nov.*
Fig. 6.

Ab L. eucalypto ascosporis 60–80 x 2–2.5 µm, ITS differens. In foliis caducis *Nothofagus* spp.

Holotype: ARGENTINA. Patagonia: Río Negro, Nahuel Huapi National Park, Puerto Blest, along road to Puerto Frias, on *Nothofagus dombeyi* fallen leaves, P. R. Johnston (SA176), I. Gamundí, C. Brion, 1-IV-1996 (LPS); PDD 89040 – isotype; ICMP 16802 – culture from type).

Ascomata developing on fallen leaves, often associated with paler areas of host tissue, no zone lines or anamorph conidiomata. Ascomata broad elliptic in outline, 0.8–1.3 x 0.7–0.8 mm, black, in unopened ascomata with no paler zone along future line of opening, opening by a single longitudinal slit, opening slit lined with pale orange to yellow lip cells. Ascomatal insertion subcuticular. Upper wall in vertical section up to 100 µm thick near opening, about 40 µm thick near base, uniform in structure, comprising globose to angular to short-cylindric cells, 5–7 µm diam., with walls thin, hyaline, irregularly encrusted with pale brown material, cells adjacent to cuticle more thickly encrusted, unbranched lip cells up to 35 x 3 µm lining opening slit. Excipular layer 10–15 µm wide, comprising barely differentiated

paraphyses. Lower wall of ascoma in vertical section 20–30 µm thick, comprising 4–5 layers of angular to cylindric cells similar in appearance to cells of upper wall, lowermost 1–2 layers of cell longer, somewhat tangled, with an incomplete layer of meandering hyphae with slightly thickened, dark walls across base of wall. Paraphyses 1.5–2 µm diam., circinate and coiling. Asci (145-)160–190 x 10.5–14 µm, clavate, tapering to small, subtruncate apex, wall undifferentiated at apex, tapering gradually to base, 8-spored, spores confined to upper 75–110 µm of ascus, with long basal stalk. Ascospores 60–80 x 2–2.5 µm, tapering slightly towards base, more or less straight when released, 0–septate, apical gelatinous cap 3.5 µm diam., basal gelatinous cap 2–2.5 µm diam., entire spore surrounded by an additional looser sheath 5–6 µm wide.

Additional specimens examined:

Lophodermium gamundiae: ARGENTINA. Tierra del Fuego: Isla de los Estados, on *Nothofagus betuloides*, C. Spegazzini (LPS 1232). Lapataia National Park, vic. Lago Rosa, on *Pernettya mucronata* fallen leaves, P. R. Johnston (SA36) & L. Lorenzo, 18-III-1996 (PDD 70923). Ushuaia, Valle de Glaciar Martial, near skilift, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA9, 10, 11), L. Lorenzo, 16-III-1996 (LPS). vic. Ushuaia, Valle de Glaciar Martial, ski trail below Casa de Te, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA109), L. Lorenzo, 24-III-1996 (PDD 89041, LPS, ICMP 16799). vic. Ushuaia, Valle de Glaciar Martial, ski trail below Casa de Te, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA115.1), L. Lorenzo, 24-III-1996 (PDD 89043). Ushuaia-Moat road, vic. Estancia Moat, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA130), L. Lorenzo, 25-III-1996 (PDD 89042, LPS, ICMP 16798). Patagonia: Río Negro, Nahuel Huapi National Park, path from Puerto Blest to Los Cantaros, on *Nothofagus dombeyi* fallen leaves, P. R. Johnston (SA192), I. Gamundí, C. Brion, 2-IV-1996 (PDD 89044, ICMP 16797). Río Negro, Lago Nahuel Huapi, Brago Tristaza, on *Nothofagus dombeyi* fallen leaves, I. Gamundí, M. I. Messuti, 3-V-1994 (BCRU 406).

Lophodermium eucalypti: AUSTRALIA. Victoria: East Gippsland, Lind National Park, Euchre Valley Nature Drive, on *Acacia melanoxylon* fallen leaves, P. R. Johnston (Au96-88), 22-V-1996 (PDD 89897, MEL, ICMP 16801). NEW ZEALAND. Fiordland: Te Anau, golf course road, on *Leptospermum scoparium* bark on fallen branch, P. R. Johnston (R1007), R. Leschen, T. Lebel, R. E. Beever, S. R. Pennycook, 10-V-2000

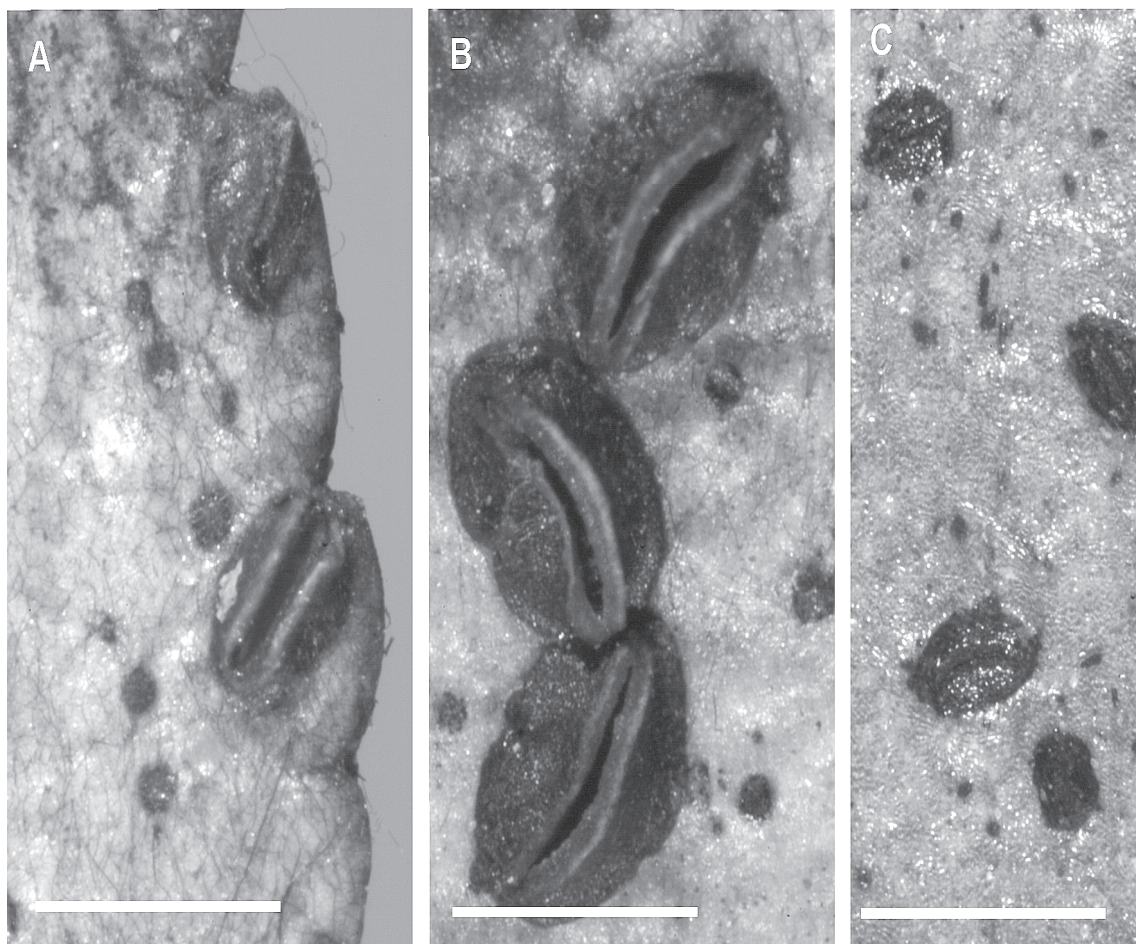


Fig. 6. – *Lophodermium gamundiae*. **A–B.** ascomata on leaves (PDD 89041), **C.** one side of ascoma in vertical section (PDD 89040), **D.** top of upper wall of ascoma with lip cells (PDD 89040), **E.** detail of upper wall of ascoma (PDD 89040), **F.** lower wall of ascoma in vertical section (PDD 89040), **G.** lower wall of ascoma, squash mount (PDD 89040), **H.** ascus (PDD 89041), **I.** ascospores, one end showing apical gelatinous cap and loose gelatinous sheath. Scale bars: **A–B** = 1 mm; **C** = 50 μ m; **D–I** = 20 μ m.

(PDD 72103, ICMP 16796).

***Pureke zelandicum*:** ARGENTINA. Tierra del Fuego: Ushuaia-Moat road, vic. Estancia Moat, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA132), L. Lorenzo, 25-III-1996 (LPS). Lapataia National Park, Bahía Ensenada, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA150), L. Lorenzo, 27-III-1996 (LPS). vic. Ushuaia, Valle de Glaciar Martial, ski trail below Casa de Te, on *Nothofagus betuloides* fallen leaves, P. R. Johnston (SA115.2), L. Lorenzo, 24-III-1996 (PDD 89046). CHILE. Los Lagos, Parque Nacional Puyehue, road to hotel Antillanca, on *Nothofagus dombeyi* fallen leaves, P. R. Johnston (SA244), I. Gamundi, 9-IV-1996 (PDD 89045). AUSTRALIA. New South Wales: Barrington Tops National Park, Honeysuckle Walk, on fallen

leaves *Nothofagus moorei*, P. R. Johnston (AU96-154), 27-V-1996 (PDD 89059). Barrington Tops National Park, Gloucester Tops Rd., Antarctic Beech Forest Walk, on fallen leaves *Nothofagus moorei*, P. R. Johnston (AU96-188), 29-V-1996 (PDD 89060).

***Terriera* spp.:** CHILE. Victoria, on *Lomatia obliqua*, J. A. Campo, V-1918 (LPS 1231). Valdivia, on *Persea lingue*, C. Spegazzini, I-1909 (LPS 1224). Concepción, on *Boldoa fragrans*, C. Spegazzini, I-1909 (LPS 1225). Concepción, on *Lardizabala biternata*, C. Spegazzini, I-1909 (LPS 1230). Talcahuano, on *Boldoa fragrans*, C. Spegazzini, I-1909 (LPS 1229).

18. *Lophodermium leptothecium* Speg., *Anales de la Sociedad Científica Argentina* 19: 261, 1885.

≡ *Dermascia leptothecia* (Speg.) Tehon, *Illinois Biological Monographs* 13(4): 70, 1935 (nom. inval. ICBN Art. 34)

Accepted name: *Lophodermium leptothecium*.

Fig. 7.

Ascomata and structures resembling conidiomata of Rhytismataceae developing within paler areas of fallen leaves, paler areas not surrounded by zone lines. Ascomata oblong to oblong-elliptic in outline with rounded ends, 0.4–0.6 x 0.25 mm, straight or curved, rarely branched, walls pale to dark grey, in unopened ascomata with slightly paler zone along future line of opening, opening by single, longitudinal slit, no lip cells. Ascomatal insertion initially subepidermal, as ascomata mature epidermal cells becoming partially filled with fungal cells. Upper wall in vertical section up to 25 µm thick, comprising angular cells 5–7 µm diam. with walls slightly thickened, brown to pale brown. Near ascomatal opening upper wall lined with well-developed layer of periphysis-like cells, the top of this layer encrusted with dark brown material. Paraphyses 1.5–2.5 µm diam., irregularly and slightly swollen and tangled near apex, forming epithecium above asci. Asci 110–130 x 5–6 µm, cylindric, apex rounded, wall undifferentiated at apex, 8-spored, spores confined to upper 90–100 µm of ascus, with long basal stalk. Ascospores not seen released, about 65 µm long, about 2 µm wide. Conidiomata round in outline, wall concolorous with surrounding host tissue except for several black lines radiating from centre to edge, conidiogenous cells and conidia not seen.

Notes: Ascomatal structure matches the *Lophodermium* Group E species of Johnston (2001b).

The type specimen contains 3 species of Rhytismataceae. Along with *L. leptothecium*, there are numerous *Coccomyces leptosporus* ascomata and one piece of leaf has a few *Terriera* ascomata. Sherwood (1980) cited Balansa 3861 as the type specimen of *C. leptosporus*, so presumably the original collection was divided by Spegazzini. *Coccomyces leptosporus* differs in having ascomata round to angular in outline, being consistently associated with black zone lines, and having paraphyses knob-like and unbranched at the apex.

Specimen examined: PARAGUAY: Guarapí, on *Laurineae cujusdam*, B. Balansa, VI-1883 (LPS 1009 – holotype).

19. *Lophodermium oxyascum* Speg. *Boletín de la Academia Nacional de Ciencias, Córdoba* 11: 251,

1887.

≡ *Hypoderma oxyascum* (Speg.) Kuntze, *Revisio Generum Plantarum* 3(3): 487, 1898.

≡ *Dermascia oxyasca* (Speg.) Tehon, *Illinois Biological Monographs* 13(4): 70, 1935 (nom. inval. ICBN Art. 34)

Accepted name: The status of *L. oxyascum* cannot be resolved with the material available.

Spegazzini (1887) reported this species as common on a wide range of both Cyperaceae and Poaceae. Johnston (2001b) noted that the type specimen is a tiny collection in poor condition, and that neither macroscopic or microscopic features could be resolved. Spegazzini (1887) and Tehon (1935) described a species with small asci (45–60 x 5–6.5 µm) and Tehon gave ascospore sizes as 25–40 x 0.75–1 µm. Spegazzini also noted that the ascus apex was intensely blue in iodine, a feature not found in *Lophodermium*. However, other specimens deposited in LPS by Spegazzini under this name are typical of *Lophodermium*, and this observation is presumed to be incorrect.

Additional specimens in LPS which appear to have been collected or determined by Spegazzini include LPS 1005, LPS 1234, and LPS 1235. LPS 1005 contains a single, immature ascoma. Although the hymenium had been lost from the other 2 collections, they appear to represent 2 different *Lophodermium* species. Although both appear to belong to the actinothyrium-group of *Lophodermium* Group A (sensu Johnston 2001b), the lower wall of the ascoma of LPS 1235 is thinner and comprises larger cells than LPS 1234.

Specimens examined: ARGENTINA. Tierra del Fuego: Staten I., on grass, C. Spegazzini, 1882 (LPS 1004 – holotype). Sholl Bay, on *Hierochloe antarctica*, I-1924 (LPS 1235). Ushuaia, on *Poa controversa*, S. Pennington 8-II-1903 (LPS 1234). [no collecting details] (LPS 1005).

20. *Lophodermium subtropicale* Speg., *Anales del Museo Nacional de Buenos Aires* 23: 88, 1912.

≡ *Lophodermellina subtropicalis* (Speg.) Tehon, *Illinois Biological Monographs* 13(4): 82, 1935.

Fig. 8.

Accepted name: *Lophodermium subtropicale*.

Ascomata developing on dead twigs within pale areas surrounded by a complete, narrow, black zone line; anamorph conidiomata not seen. Ascomata 1–2 x 0.5–1 mm, broad-elliptic, ends rounded, margins diffuse, wall black, unopened ascomata with paler zone along future line of opening, single longitudinal

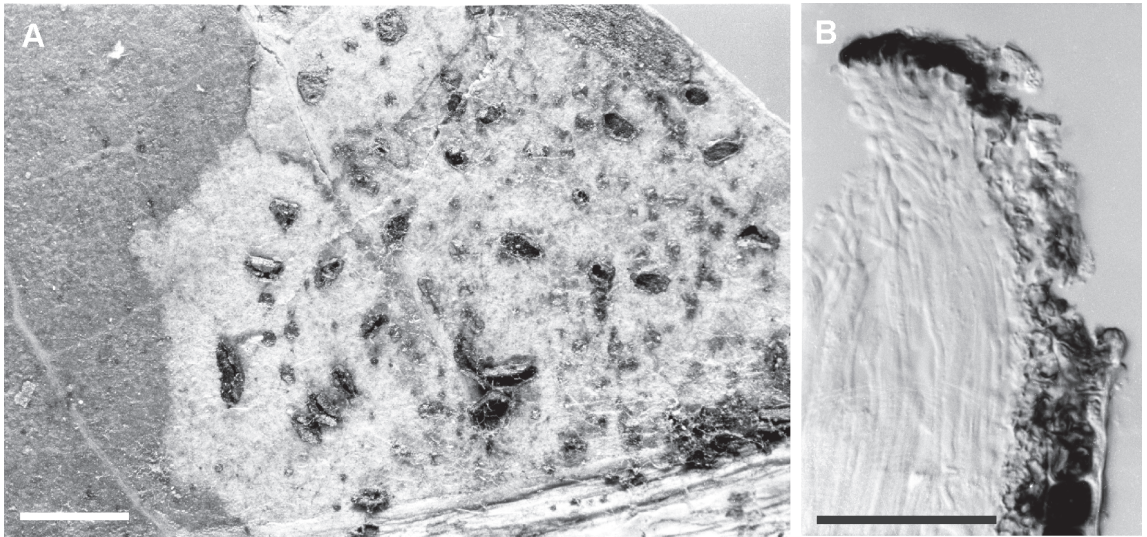


Fig. 7. – *Lophodermium leptothecium* (LPS 1009). **A.** ascomata on leaf, **B.** upper wall of ascoma in vertical section, showing well-developed layer of periphysoids capped with dark brown material. Scale bars: **A** = 1 mm; **B** = 20 μ m.

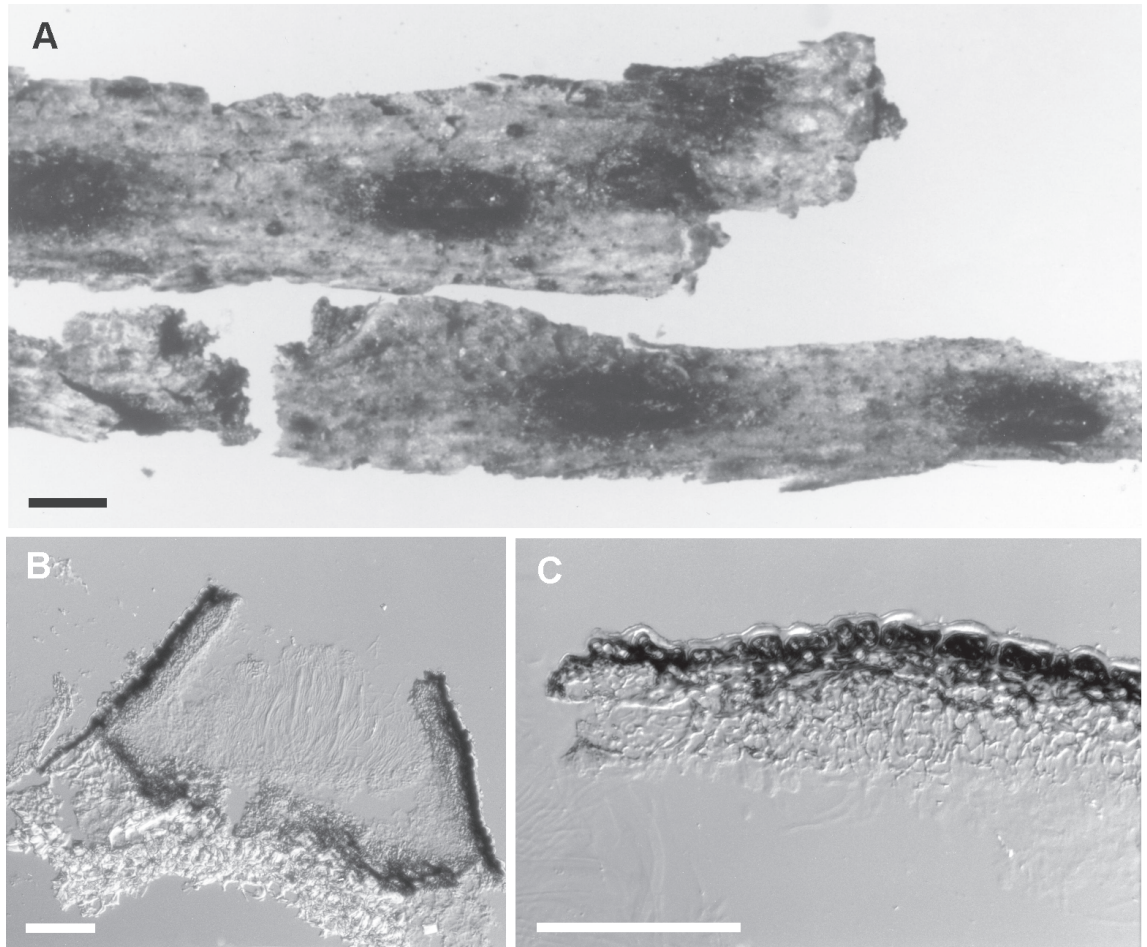


Fig. 8. – *Lophodermium subtropicale* (LPS 1008). **A.** ascomata on twigs, **B.** ascoma in vertical section, **C.** detail of upper wall of ascoma in vertical section, with poorly developed periphysoids. Scale bars: **A** = 1 mm; **B** = 50 μ m; **C** = 20 μ m.

opening slit with no obvious lip cells. Ascomatal insertion subepidermal, epidermal cells becoming packed with fungal cells as ascomata mature. Upper wall in vertical section 40–60 µm thick, uniform in structure and thickness from centre to edge of ascoma, comprising angular cells with walls slightly thickened, brown, darker towards outside of wall, inside of wall with poorly developed layer of short, hyaline, thin-walled periphysoids. Lower wall very poorly developed or lacking, a few dark-walled hyphae near sides of ascomata, otherwise subhymenium appears to rest directly on partially broken-down host tissue. Paraphyses swollen at apex, clavate, not tangled, extending 10–15 µm beyond asci. Asci not clearly seen, appear to be immature, cylindric, 8–10 µm wide, apex broadly rounded, wall undifferentiated at apex. Ascospores not seen.

Notes: Viégas (1947) reported and illustrated *L. subtropicale* from *Eugenia* from Brazil.

Specimen examined: ARGENTINA: Misiones, Puerto Leon, on *Psidium* sp., C. Spegazzini IX-1909 (LPS 1008 – holotype).

21. *Lophodermopsis hysterioides* Speg., *Revista de la Facultad de Agronomía, Universidad Nacional de La Plata, series 2 6: 175, 1910.*

Fig. 9.

Accepted name: *Lophodermopsis hysterioides* probably represents an undescribed species of *Terriera*.

Spegazzini (1910) described this species as the conidial state of *Lophodermium hysterioides*, placing it in his new genus *Lophodermopsis*. Petrak & Sydow (1936) found the type specimen to represent an immature rhytismataceous ascomycete. They considered the structure illustrated as conidial chains by Spegazzini (1910) to be paraphyses from the immature ascomata. The packet of LPS 1230 was annotated by Spegazzini with both names *Lophodermium hysterioides* and *Lophodermopsis hysterioides*. Illustrations on the packet are of asci and ascospores, as well as structures matching the conidia he illustrated in the original description of *Lophodermopsis*. LPS 1230 was collected from near the type locality of *Lophodermopsis*, and has the same host as the type. LPS 1230 is in poor condition, but clearly contains both mature and immature ascomata of a *Terriera* sp. *Terriera* species are common on a wide range of plants in southern Chile (unpubl. data). If future studies show the *Terriera* species of Chile to be host-specialised, it may be possible to select a suitable epitype to represent this



Fig. 9. – *Lophodermopsis hysterioides* (LPS 1230). A–B. macroscopic appearance, C. Spegazzini's drawing on herbarium packet, *Lophodermopsis* «conidia» on the right. Scale bars = 1 mm.

species.

Collection examined: CHILE. Concepción, on *Lardizabala biternata* leaves, C. Spegazzini, I-1909 (LPS 1230).

ACKNOWLEDGMENTS

The support and encouragement of Irma Gamundí was essential for the work reported in this paper. Laura Lorenzo and Cecile Brion (Centro Regional Universitario Bariloche), Andrea Romero (Universidad de Buenos Aires), Marta Cabello (Instituto Spegazzini, La Plata), and Mario Rajchenberg (CIEFAP, Esquel) and family, are all thanked for their hospitality and assistance in the field. The curator of the LPS Herbarium, Instituto Spegazzini, La Plata, kindly arranged the loans of the Spegazzini collections. Andrea Romero translated the summary into Spanish. This research was supported by the Flora Criptogámica Tierra del Fuego project, and the New Zealand Foundation for Research, Science and Technology through the Defining New Zealand's Land Biota OBI.

BIBLIOGRAPHY

- CANNON, P. F. & D. W. MINTER. 1983. The nomenclatural history and typification of *Hypoderma* and *Lophodermium*. *Taxon* 32: 572–583.
- CANNON, P. F. & D. W. MINTER. 1986. The Rhytismataceae of the Indian subcontinent. *Mycological Papers* 155: 1–123.
- DI COSMO, F., T. R. NAG RAJ & W. B. KENDRICK. 1984. A revision of the Phacidiaee and related anamorphs. *Mycotaxon* 21: 1–234.
- GAMUNDÍ, I. J., D. W. MINTER, A. I. ROMERO, V. A. BARRERA, A. L. GIAIOTTI, M. I. MESSUTI, & M. STECCONI. 2004. Checklist of the discomycetes (fungi) of Patagonia, Tierra del Fuego and adjacent Antarctic areas. *Darwiniana* 42: 63–164.
- GARDES, M. & T. D. BRUNS. 1993. ITS primers with enhanced specificity for basidiomycetes - application to the identification of mycorrhizae and rusts. *Molecular Ecology* 2: 113–118.
- JOHNSTON, P. R. 1989. Rhytismataceae in New Zealand 2. The genus *Lophodermium* on indigenous hosts. *New Zealand Journal of Botany* 27: 423–436.
- JOHNSTON, P. R. 1990. Rhytismataceae in New Zealand 3. The genus *Hypoderma*. *New Zealand Journal of Botany* 28: 159–183.
- JOHNSTON, P. R. 1991. Rhytismataceae in New Zealand 4. *Pureke zelandicum* gen. and sp. nov. plus additional species in *Hypoderma*, *Lophodermium*, and *Propolis*. *New Zealand Journal of Botany* 29: 395–404.
- JOHNSTON, P. R. 2001 a. Rhytismatales of Australasia. *Australian Systematic Botany* 14: 377–384.
- JOHNSTON, P. R. 2001 b. Monograph of the monocotyledon-inhabiting species of *Lophodermium*. *Mycological Papers* 176: 1–239.
- JOHNSTON, P. R. & D. PARK. 2005. *Chlorociboria* (Fungi, Helotiales) in New Zealand. *New Zealand Journal of Botany* 43: 679–719.
- ORTIZ-GARCIA, S., D. S. GERNANDT, J. K. STONE, J. K., P. R. JOHNSTON, I. H. CHAPPELLA, R. SALAS-LIZANA & E. ALVAREZ-BUYLLA. 2003. Phylogenetics of *Lophodermium* from pine. *Mycologia* 95: 846–859.
- PETRAK, F. & H. SYDOW. 1936. Kritisch-systematische Originaluntersuchungen über Pyrenomyceten, Sphaeropsideen und Melanconieen. *Annales Mycologici* 34: 11–52.
- POWELL, P. E. 1974. Taxonomic studies in the genus *Hypoderma*. Cornell University, PhD Thesis.
- SHERWOOD, M. A. 1980. Taxonomic studies in the Phacidiales: the genus *Coccomyces* (Rhytismataceae). *Occasional Papers of the Farlow Herbarium* 15: 1–120.
- SPEGAZZINI, C. 1887. Fungi Fuegiana. *Boletín de la Academia Nacional de Ciencias, Cordoba* 11: 135–308.
- SPEGAZZINI, C. 1896. Contribucion al estudio de la flora de la Sierra de la Ventana. Talleres de Publicaciones del Museo. La Plata.
- SPEGAZZINI, C. 1909. Mycetes Argentinensis (Series IV). *Annales del Museo Nacional de Buenos Aires* 19: 257–458.
- SPEGAZZINI, C. 1910. Contribucion al estudio de los hongos Chilenos. *Revista de la Facultad de Agronomía Universidad de La Plata ser. 2* 6: 1–205.
- SPEGAZZINI, C. 1923. Algunos hongos de Tierra del Fuego. *Revista de la Sociedad Argentina de Ciencias Naturales* 7 (23): 9–23.
- SPEGAZZINI, C. 1924. Relación de un paseo hasta el Cabo de Hoorn. *Boletín de la Academia Nacional de Ciencias, Córdoba* 27: 321–404.
- SWOFFORD, D. L. 2002. PAUP*. Phylogenetic analysis using parsimony (* and other methods). Version 4. Sutherland, Massachusetts, Sinauer Associates.
- TEHON, L. R. 1935. A monographic rearrangement of *Lophodermium*. *Illinois Biological Monographs* 13(4): 1–151.
- VIÉGAS, A. P. 1947. Alguns micetos brasileiros. *Bragantia* 7: 25–48.
- WHITE, T. J., T. BRUNS, S. LEE & J. W. TAYLOR. 1990. Amplification of direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: INNIS, M. A., D. H. GELFAND, J. J. SNINSKY & T. J. WHITE (eds.), PCR protocols: a guide to methods and applications, pp. 315–322. Academic Press, San Diego.

Recibido el 15 de Diciembre de 2006, aceptado el 29 de Marzo de 2007.

