

## Gasteroid mycobiota (*Basidiomycota*) from *Polylepis australis* woodlands of central Argentina

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**ABSTRACT** —Gasteroid fungi associated with *Polylepis australis* forests from Córdoba Mountain range, central Argentina, were studied. Samples were collected during April–May 2007. Twenty-nine species were identified among which *Bovista pila*, *Geastrum morganii* and *Tulostoma xerophilum* are new records for Argentina and the distribution range of *Bovista nigrescens*, *Cyathus olla*, *Geastrum fornicatum* and *Lycoperdon pyriforme* are expanded to high altitude woodlands from Córdoba.

**KEY WORDS** — earthstars, fungal diversity, phalloids, puffballs, stinkhorns.

### Introduction

*Polylepis* Ruiz & Pav. (*Rosaceae*, *Sanguisorbeae*) species can be found in small patches of woodlands in South American high-mountain ecosystems at elevations between 1300 and 5200 m above sea level (a.s.l.). This genus includes approximately 26–28 species that are distributed along the Andes from Venezuela to Chile with an extra-tropical distribution in the northwest and central regions from Argentina (Simpson 1979; Kessler 2006, Kessler & Schmidt-Lebuhn 2005). *Polylepis australis* Bitter grows in the Argentinean Puna, Yungas and Chaquean phytogeographic regions where it forms woodlands at elevations between 1300 and 2600 m a.s.l. (Cabrera 1994). The distribution of *Polylepis australis* has been drastically reduced to deep canyons and ravines along water courses where it forms isolated patches (Simpson 1979, Cingolani et al. 2004, Enrico et al. 2004, Renison et al. 2006, 2013).

Several diversity studies carried out in *P. australis* woodlands in Córdoba Mountain range, central Argentina, have shown that these habitats are islands of endemic biodiversity that harbor diverse communities of birds, arachnids and plants (Bellis et al. 2009, Ceballos 2008, Cingolani et al. 2004, García et al. 2008). Mycologists have also found some new and endemic species of wood-decaying fungi (Urcelay et al. 2000, Robledo et al. 2003, Rajchenberg & Robledo 2005, Robledo et al. 2006, Robledo & Renison 2010) while many

other fungi remain poorly known. In particular, the community of aboveground sequestrate fungi (known as puffballs, stinkhorns, bird's nest fungi and earthstars) has remained mostly unstudied until recently (Hernández Caffot et al. 2011).

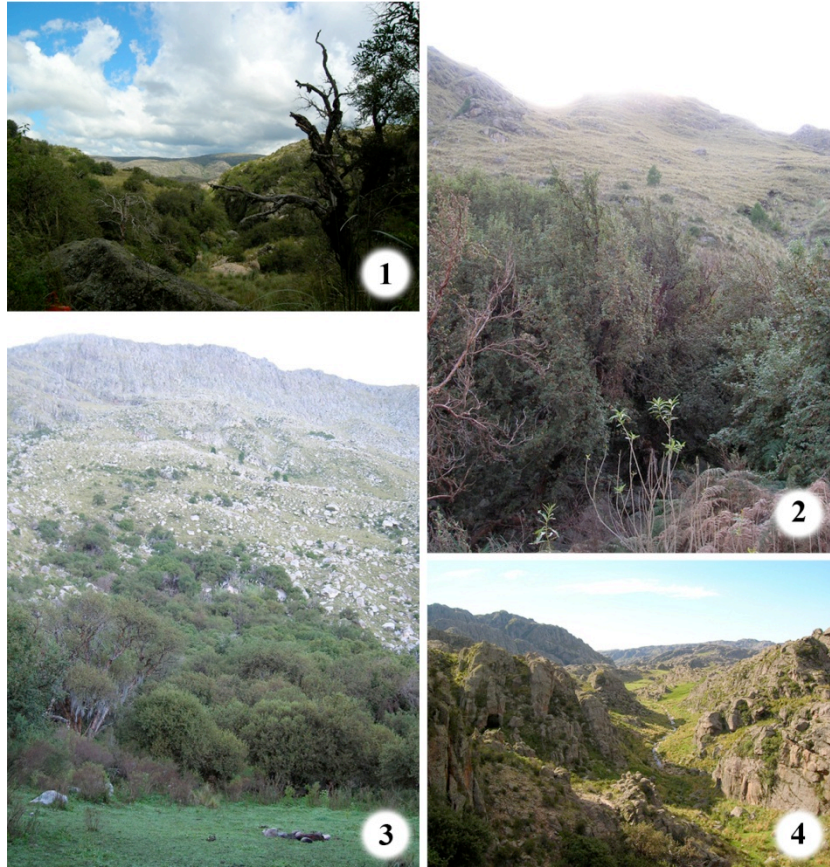
The aim of this work is to characterize the gasteroid fungal community of *Polylepis australis* woodlands from Córdoba Mountain range, central Argentina. A list of species, their distribution in Argentina and photographs of fresh macroscopic features are provided to facilitate accurate species identification.

## Materials and methods

**Study area** — This study was carried out in the Parque Nacional Quebrada del Condorito y Reserva Hídrica Provincial Pampa de Achala. This reserve is located in the upper portion of Córdoba Mountain range, which runs in a North-South orientation in central Argentina. Mean temperatures of the coldest and warmest month are 5.0°C and 11.4°C, respectively, and there is no frost-free period. Mean annual precipitation is 840 mm, with most rainfall concentrated between October and April (Cabido 1985). Vegetation consists of a mosaic of tussock grasslands, grazing lawns, outcrop communities, *P. australis* woodlands and eroded areas with exposed rock surfaces (Cingolani et al. 2004, 2008).

We selected four basins with *P. australis* woodlands at elevations between 1500–2100 m a.s.l. (FIGS. 1–4). Twelve woodland patches (30 × 30 m) were sampled in each site. Site locations are: Locality 1, Río Yuspe (31°23'58.5"S 64°48'17.4"W); Locality 2, Parque Nacional Quebrada del Condorito (31°39'13.7"S 64°42'06.6"W); Locality 3, Los Molles (31°58'33"S 64°57'42"W) and Locality 4, Quebrada El Tigre (32°00'39.3"S 64°57'33.3"W).

**Processing and examination of specimens** — Specimens were dried and then deposited at the herbarium Museo Botánico de Córdoba (CORD), Universidad Nacional de Córdoba. Fungal names and author name abbreviations are arranged according to the Index Fungorum and Mycobank websites (accessed in November 2012). Vouchers with collection numbers and locality data are available at the Instituto de Botánica Darwinion website ([www.darwin.edu.ar](http://www.darwin.edu.ar)). Morphological features were studied in the laboratory under a stereoscope (Nikon C-PS) and a light microscope (Nikon SMZ745T). Spores and capillitium hyphae were mounted in 3% KOH, phloxine, and Melzer's reagent for microscopic examinations. From each collection, thirty spores and the thickest capillitial threads were measured. Specimens were identified to species level according to relevant literature (i.e. Brodie 1975, Domínguez de Toledo 1989, 1993, 1995, Homrich & Wright 1988, Kreisel 1967, Martínez 1956, Soto & Wright 2000, Sunhede 1989, and Wright 1987).



FIGS. 1–4: 1. Paque Nacional Quebrada del Condorito. 2. Quebrada El Tigre. 3. Los Molles. 4. Los Gigantes.

## Results

We examined 209 collections of gasteroid fungi collected within *P. australis* woodlands. Twenty-nine species were identified, among which three species are new records for Argentina: *Bovista pila* Berk. & M.A. Curtis, *Geastrum morganii* Lloyd, and *Tulostoma xerophilum* Long. This study also extends the distribution ranges of *Bovista nigrescens* Pers., *Cyathus olla* (Batsch) Pers., *Geastrum fornicatum* (Huds.) Hook. and *Lycoperdon pyriforme* Schaeff. to *P. australis* high altitude woodlands in Córdoba Province, Argentina. One specimen of *Geastrum* sp. could not be

identified at the species level and corresponds to a new species as confirmed by molecular analysis (Hernández Caffot et al., unpublished data).

**Checklist of the gasteroid mycobiota from *P. australis* forest in Córdoba, Argentina.**

*Arachnion album* Schwein. FIG. 5

DISTRIBUTION – Buenos Aires (Spegazzini 1881a, b); Córdoba (Domínguez de Toledo 1989); Misiones (Wright & Wright 2005); Patagonia (Spegazzini 1887b).

*Bovista cunninghamii* Kreisel FIG. 6

DISTRIBUTION – Córdoba and Santiago del Estero (Domínguez de Toledo 1989); La Rioja (Domínguez de Toledo 1989, Kuhar et al. 2012).

*Bovista delicata* Berk. & M.A. Curtis FIG. 7

DISTRIBUTION – Córdoba (Domínguez de Toledo 1989, 1993).

*Bovista nigrescens* Pers. FIG. 8

DISTRIBUTION – Buenos Aires (Wright & Albertó 2006). This constitutes a first report for Córdoba.

*Bovista pila* Berk. & M.A. Curtis FIG. 9

DISTRIBUTION – Córdoba. This constitutes a first report for Argentina.

*Bovista pusilliformis* (Kreisel) Kreisel FIG. 10

DISTRIBUTION – Córdoba (Domínguez de Toledo 1989).

*Cyathus olla* (Batsch) Pers.

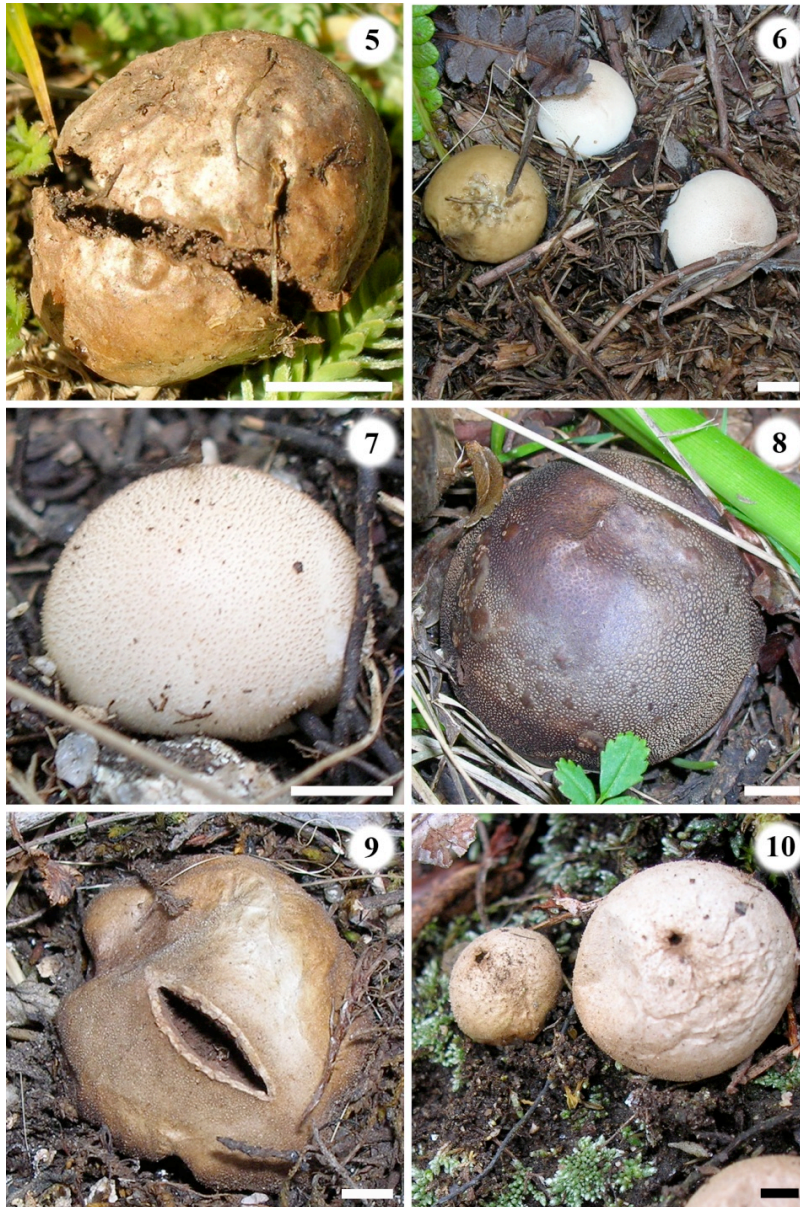
DISTRIBUTION – Buenos Aires (Martinez 1956, Spegazzini 1881b); Córdoba (Domínguez de Toledo 1989); Mendoza (Martinez 1956); Río Negro (Diehl 2000).

*Cyathus stercoreus* (Schwein.) De Toni

DISTRIBUTION – Buenos Aires (Martinez 1956, Spegazzini 1880, 1898, Wright & Albertó 2006); Córdoba (Domínguez de Toledo 1989, 1993, Martinez 1956); Jujuy (Fries 1909, Martinez 1956); Mendoza (Martinez 1956); Salta (Martinez 1956); Tucumán (Martinez 1956).

*Disciseda candida* (Schwein.) Lloyd

DISTRIBUTION – Buenos Aires (Wright & Albertó 2006); Córdoba (Domínguez de Toledo 1989).



FIGS. 5–10: 5. *Arachnion album*. 6. *Bovista cunninghamii*. 7. *B. delicata*. 8. *B. nigrescens*. 9. *B. pila*. 10. *B. pusilliformis*. Bars = 0.5 cm.

***Disciseda cervina*** (Berk.) G. Cunn.

DISTRIBUTION – Buenos Aires (Spegazzini 1927); Córdoba (Domínguez de Toledo 1989); Patagonia (Spegazzini 1887b, 1912).

***Geastrum fimbriatum*** Fr.

FIG. 11

DISTRIBUTION – Buenos Aires (Soto & Wright 2000, Wright & Albertó 2006); Santiago del Estero (Spegazzini 1927). This constitutes a first report for Córdoba.

***Geastrum fornicatum*** (Huds.) Hook.

FIG. 12

DISTRIBUTION – Catamarca (Dios et al. 2011); La Rioja (Kuhar et al. 2012); this constitutes a first report for Córdoba.

***Geastrum indicum*** (Klotzsch) Rauschert

DISTRIBUTION – Córdoba (Domínguez de Toledo 1989, 1993); Misiones (Spegazzini 1927).

***Geastrum lageniforme*** Vittad.

DISTRIBUTION – Buenos Aires (Soto & Wright 2000, Wright & Albertó 2006). This constitutes a first report for Córdoba.

***Geastrum morganii*** Lloyd

FIG. 13

DISTRIBUTION – Córdoba. This constitutes a first report for Argentina.

***Geastrum pectinatum*** Pers.

FIG. 14

DISTRIBUTION – Buenos Aires (Soto & Wright 2000); Córdoba (Domínguez de Toledo 1989, 1993, Spegazzini 1927).

***Geastrum saccatum*** Fr.

FIG. 15

DISTRIBUTION – Buenos Aires (Soto & Wright 2000, Wright & Albertó 2006); Córdoba (Domínguez de Toledo 1989, Spegazzini 1926); Misiones (Wright & Wright 2005).

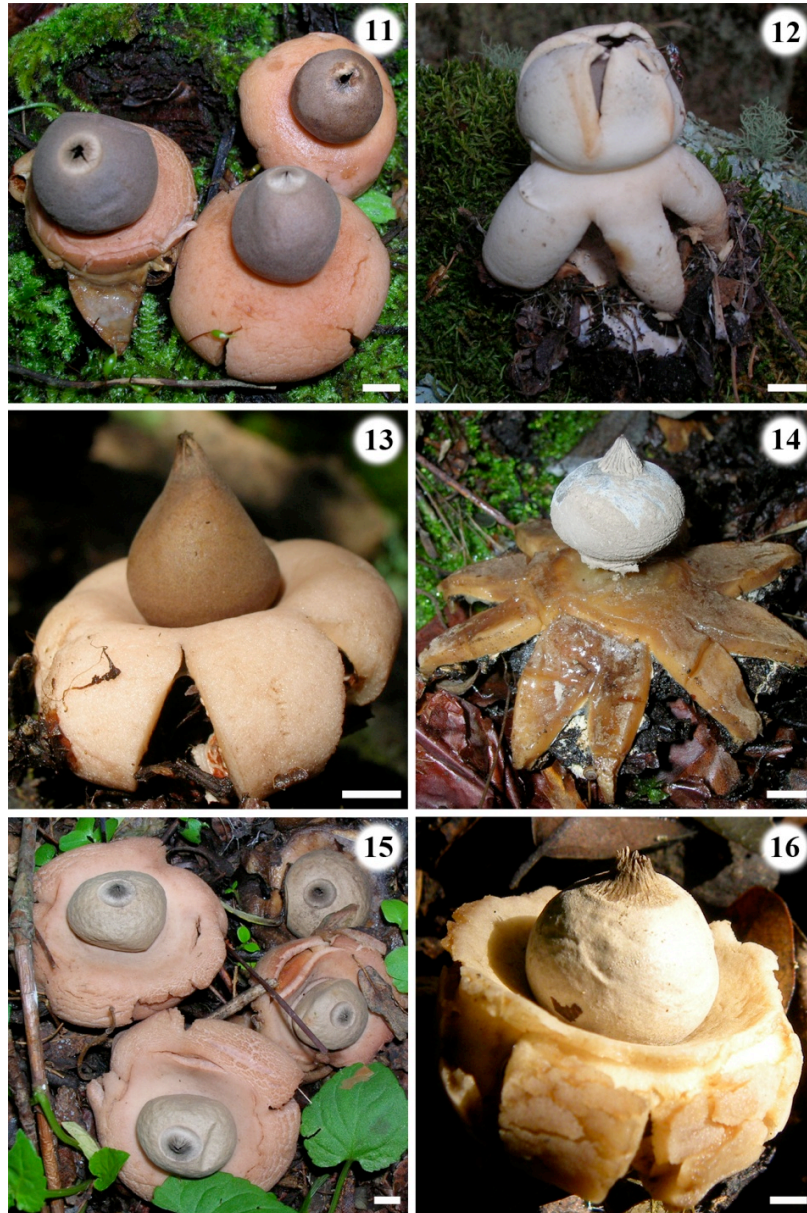
***Geastrum schmidelii*** Vittad.

DISTRIBUTION – Córdoba (Domínguez de Toledo 1989, 1993).

***Geastrum* sp. nov. ined.**

DISTRIBUTION – Córdoba (Hernández Caffot et al., unpublished data).

Basidioma up to 25 mm diam., exoperidium saccate to planar, non-hygroscopic to sub-hygroscopic; endoperidium globose to subglobose, sessile, greyish brown; peristome silky fibrillose, lighter or darker than the



FIGS. 11–16: 11. *Geastrum fimbriatum*. 12. *G. fornicatum*. 13. *G. morganii*. 14. *G. pectinatum*. 15. *G. saccatum*. 16. *G. triplex*. Bars. = 0.5 cm.

endoperidium; basidiospores globose, slightly asperulate, (2–)2.5(–3)  $\mu\text{m}$  in diam., with a short apiculum up to 1.5  $\mu\text{m}$  long.

*Geastrum triplex* Jungh. FIG. 16  
DISTRIBUTION – Buenos Aires (Soto & Wright 2000, Wright & Albertó 2006). This constitutes a first report for Córdoba.

*Lycoperdon lambinonii* Demoulin FIG. 17  
DISTRIBUTION – Córdoba (Domínguez de Toledo 1989, 1993).

*Lycoperdon marginatum* Vittad. FIG. 18  
DISTRIBUTION – Córdoba (Domínguez de Toledo 1989); Entre Ríos (Spegazzini 1927); Tucumán (Spegazzini 1916).

*Lycoperdon pyriforme* Schaeff. FIG. 19  
DISTRIBUTION – Misiones (Wright et al. 2008). This constitutes a first report for Córdoba.

*Lysurus cruciatus* (Lepr. & Mont.) Henn. FIG. 20  
DISTRIBUTION – Buenos Aires (Molfino 1929, Müller 1873, Spegazzini 1902, 1927); Chaco (Spegazzini 1887a); Córdoba (Domínguez de Toledo 1989, 1993, 1995, Spegazzini 1926); Misiones (Spegazzini 1902).

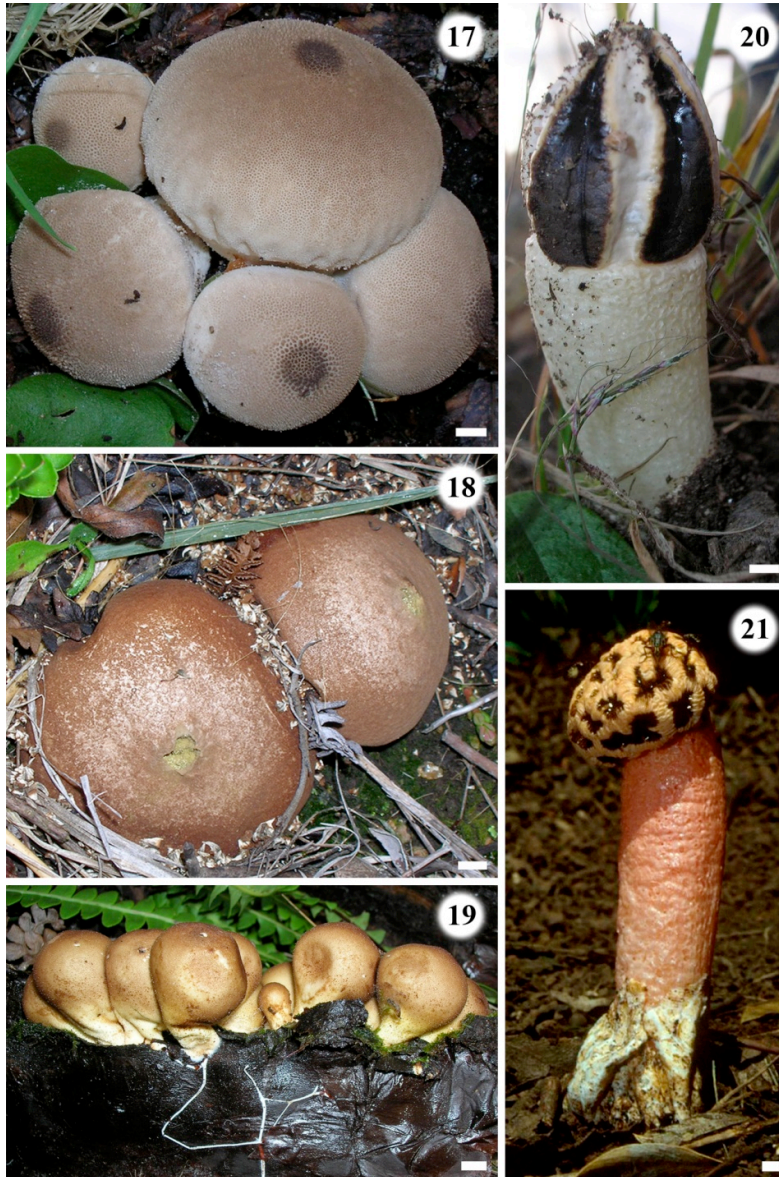
*Lysurus periphragmoides* (Klotzsch) Dring FIG. 21  
DISTRIBUTION – Buenos Aires (Spegazzini 1881, 1898); Córdoba (Domínguez de Toledo 1989, 1993, 1995, Nouhra & Domínguez de Toledo 1994, Spegazzini 1898); La Rioja (Kuhar et al. 2012); Salta (Spegazzini 1898); Santiago del Estero (Domínguez de Toledo 1989, 1995); Tucumán (Spegazzini 1898, 1916).

*Sphaerobolus stellatus* Tode  
DISTRIBUTION – Buenos Aires (Spegazzini 1927, Wright & Albertó 2006); Córdoba (Domínguez de Toledo 1989, 1993, Spegazzini 1926); Tierra del Fuego (Spegazzini 1887a, b).

*Tulostoma domingueziae* Hern. Caff.  
DISTRIBUTION – Córdoba (Hernández Caffot et al. 2011).

*Tulostoma xerophilum* Long  
DISTRIBUTION – Córdoba. This constitutes a first report for Argentina.





FIGS. 17–21: 17. *Lycoperdon lambinonii*. 18. *L. marginatum*. 19. *L. pyriforme*. 20. *Lysurus cruciatus*. 21. *L. periphragmoides*. Bars = 0.5 cm.

***Vascellum pampeanum* (Speg.) Homrich**

DISTRIBUTION – Buenos Aires (Homrich & Wright 1988, Spegazzini 1896, 1898, 1902, Wright & Albertó 2006); Chaco (Homrich & Wright 1988); Córdoba (Domínguez de Toledo 1989, 1993, Nouhra & Domínguez de Toledo 1994, Spegazzini 1912, Homrich & Wright 1988); Corrientes (Spegazzini 1912); Entre Ríos (Homrich & Wright 1988); Salta (Spegazzini 1898, Homrich & Wright 1988); Santa Cruz (Homrich & Wright 1988); Santa Fe (Homrich & Wright 1988); Santiago del Estero (Homrich & Wright 1988, Spegazzini 1927).

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