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Scientific Note

New record of the genus *Probethylus* Ashmead, 1902 (Hymenoptera: Sclerogibbidae) for Argentina

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Abstract. Sclerogibbid wasps conform a small group of chrysidoids and parasitoids of embiopterans especially found in arid and semiarid habitats. Although its distribution in America is fairly well known, information about sclerogibbid wasps from Argentina is scarce. The first record of a species belonging to the family Sclerogibbidae (Hymenoptera) for the province of San Juan, Argentina is reported. It is a female individual collected by pitfall trap in the Multiple Use Reserve of Valle Fértil and identified as *Probethylus callani* Richards, 1939. This new and atypical record encourages to expand the taxonomic research in the region, given that Valle Fértil was characterized as an area of high prevalence of endemisms.

Keywords: Chrysidoidea, Embioptera, South American, Valle Fértil, San Juan.

Sclerogibbidae Ashmead, 1902 is a small chrysidoid family comprising 33 described species in 11 genera, eight of them described only from fossil records (Olmi 2008; Olmi et al. 2016; Martins et al. 2020; Perkovsky et al. 2020). Members of the family can be found in tropical and subtropical regions of the world, especially in arid and semiarid habitats (Penteado-Dias & van Achterberg 2002; Fernandes et al. 2017) and are strict ectoparasitoids of nymphal or adult webspinners (Embioptera). Hence the geographic distribution of sclerogibbid wasps reflects that of their hosts.

Extant female sclerogibbid wasps are all apterous, in opposition to extant winged males and to females belonging to five of the fossil genera (Olmi 2005; Olmi et al. 2016; Perkovsky et al. 2020). Two extant genera are represented in the Neotropical region, *Probethylus* Ashmead, 1902 and *Sclerogibba* Riggio & De Stefani-Pérez, 1888 (Olmi 2008; Fernandes et al. 2017). Females of these genera are identifiable by the tibial spurs formula, which is 1-1-2 in *Probethylus* versus 1-2-2 in *Sclerogibba*, and by the length ratio between the first antennal segment and the anterior flat surface of the hypostomal bridge, which is at least twice as large in *Sclerogibba* (Olmi 2005; 2008). This last feature is also the most relevant diagnostic character for the identification at species-level of females belonging to the genus *Probethylus* (Olmi 2005; 2008).

Besides a record of *Sclerogibba talpiformis* Benoit, 1950 from Brazil, *Probethylus* is the predominant genus of Sclerogibbidae known to occur in the Neotropics, its distribution ranging from Mexico to Argentina (Olmi 2005; Fernandes et al. 2017). Even though there is a fairly complete knowledge of the taxonomic richness in the Neotropical region, both from direct collection and from rearing of parasitized embiopterans, information on the sclerogibbid fauna of Argentina is limited due to the scarcity of sampling in vast areas of the country (Olmi 2008). Two species have records in Argentina: *Probethylus callani* Richards, 1939 and *Probethylus schwarzi* Ashmead, 1902 (Olmi 2008). Olmi (2005) lists the collection sites of both species for the country, as well as those of the hosts in which individuals have been reared. There are records of *P. callani* in six provinces: Jujuy, Salta, Tucumán, La Rioja, Mendoza and Entre Ríos (Fig. 1), while only two provinces have records of *P. schwarzi*: Tucumán and Salta (Olmi 2005; 2008). Notably, there is not biogeographic nor ecological research regarding sclerogibbid wasps in the country (Olmi 2008).

The Multiple Use Reserve of Valle Fértil is located in San Juan province, in Western Argentina. It was declared a natural park by provincial law in order to protect a large segment of xeric environments, typical of the Monte biogeographic province, an extensive strip of land exclusive of Argentina with distinctive biological features (Roig et al. 2009). The reserve is placed in a valley where rivers descend from the hills creating a relatively humid patch in a mostly dry environment, turning it into a remarkable biodiversity hotspot of the province (Ávila et al. 1998; Camperi & Darrieu 2004). Valle Fértil is characterized by a semi-arid temperate climate, with an average annual temperature of 18.3°C and an average maximum temperature of 32.3°C in summer months. It has the highest values of rainfall throughout San Juan, between 250-400 mm annually, almost exclusively restricted to the summer months (January to March).

The Monte desert has been characterized as an area of high endemism (Roig-Juñent et al. 2001), and human activities such as land use are a growing threat of this rich ecosystem (Villagra et al. 2009). Regarding insect diversity, San Juan in general and Valle Fértil in particular are poorly sampled, with most studies focusing on specific taxonomic groups or ecological guilds (Roig-Juñent et al. 2001; Aballay et al. 2008; Amatta et al. 2018). In an attempt to reduce this information gaps about entomological diversity, we coupled an ecological study of environmental heterogeneity in the reserve with a passive sampling in order to elaborate the first arthropods survey of this protected area. Collection and transit permits were properly issued by local authorities of Conservation Management and Protected Areas from San Juan (Exp. SADyS N°1300-000228).

A female sclerogibbid wasp (Fig. 2) was collected in March 2017 in a pitfall trap filled with propylene glycol in the Multiple Use Reserve of Valle Fértil (30°38'38.04'' S, 67°31'1.2'' W, 910 m a.s.l.) (Fig. 1). The reigning vegetation in the sampling area is an open ground steppe with relatively isolated shrubs, mainly species from *Larrea divaricata* Cav. 1800 (Zygophyllaceae), *Bulnesia retama* (Gillies ex Hook. & Arn.) Griseb. 1874 (Zygophyllaceae) and *Senegalia gilliesii* (Steud.) Seigler & Ebinger 2006 (Fabaceae), and a low density of small herbaceous plants.

The specimen was isolated, washed and conserved in ethanol 96° at -18°C. It was observed and photographed under a stereoscopic microscope (Leica M205 A), and final images were obtained via processing with Helicon Focus® software. Direct measures were taken over the final images using tpsUtil and tpsDIG2 software (SB

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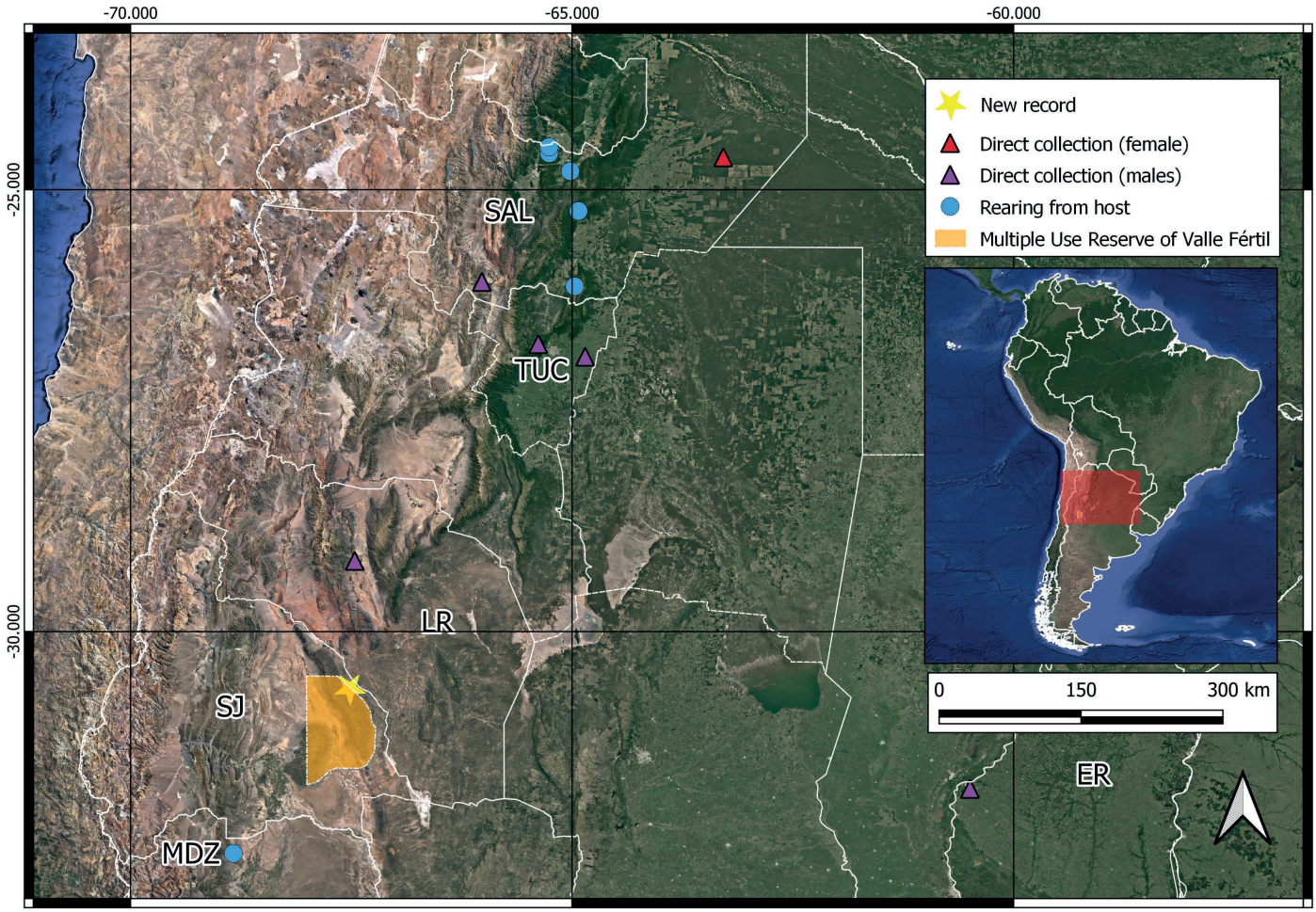

Figure 1. Collection sites of *Probethylus callani* Richards, 1939 according to Olmi (2005) and new record (this work). ER: Entre Ríos, LR: La Rioja, MZA: Mendoza, SAL: Salta, SJ: San Juan, TUC: Tucumán.

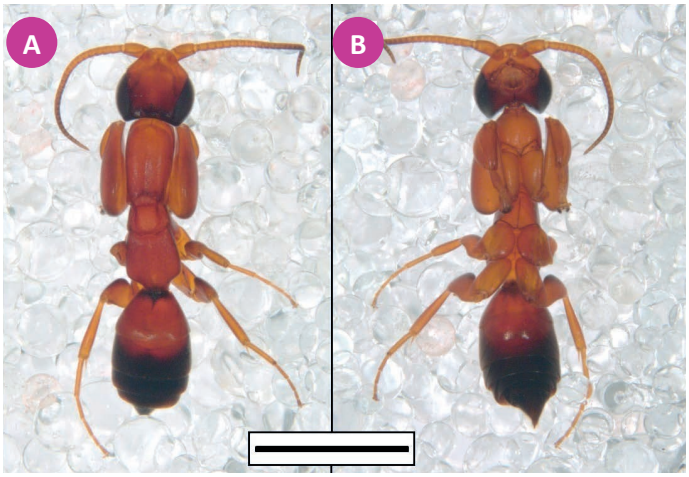

Figure 2. *Probethylus callani* Richards, 1939, female. Habitus dorsal (a) and ventral (b). Scale bar: 2 mm.

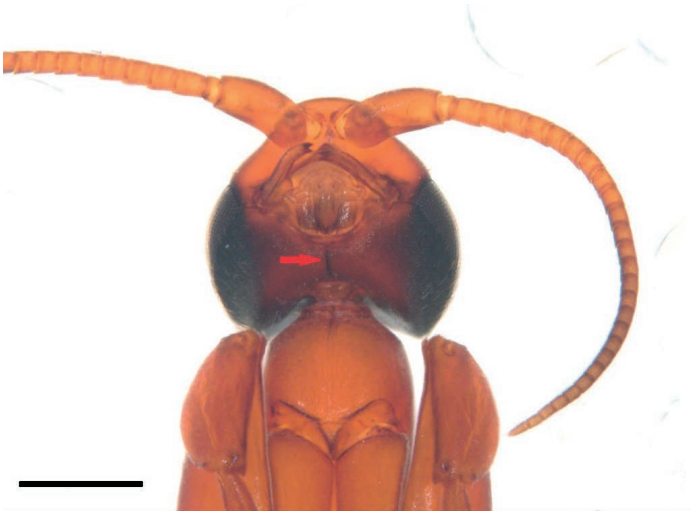

Figure 3. *Probethylus callani* Richards, 1939, head ventral. Red arrow indicates the anterior flat surface of the hypostomal bridge. Scale bar: 500 µm.

Morphometrics). The specimen was deposited in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (voucher MACN_En 35912).

Although the specimen was recovered with part of its left middle leg missing, identification was possible with the keys provided by Mason (1993), Finnamore & Brothers (1993) and Olmi (2005). The antennae with 28 flagellomeres, enlarged protibiae and apterous habitus allowed the identification as a female Sclerogibbidae (Fig. 2). The length of the anterior flat surface of the hypostomal bridge and the first antennal segment are 0.18 ± 0.01 mm and 0.37 ± 0.01 mm, respectively (Fig. 3). Considering error propagation, ratio between measures is 48.6% ± 3.0%, thus encompassing the lower limit of the described range of variability expected for females of *P. callani* (50%) (Olmi 2005).

This constitutes the first record of *P. callani* for San Juan (Fig. 1). Its geographical distribution, ranging from the USA to Argentina and some localities in Africa and Middle East (Olmi 2005; Fernandes et al. 2017), is generally described by collection of male specimens with Malaise traps or by rearing of parasitized hosts, so a direct collection of a female specimen in a passive sampling technique is rare. Sclerogibbid taxonomists should be aware of research groups that use pitfall traps, as their by-catch could contain some elusive although easily identifiable female sclerogibbid wasps that would enlarge the knowledge about the family, particularly in matching male and female individuals of the same species and populations. Remarkably, a Malaise trap was set during the same collection period on the premises of the collection site, but no sclerogibbid male specimen was caught.

Furthermore, this is a valuable addition to the exiguous collection of individuals of Sclerogibbidae in Argentina. The Fundación Miguel Lillo Institute in Tucumán houses the only collection of sclerogibbid wasps, mostly obtained by rearing of parasitized Embioptera specimens by one of the few experts on embiopterans of the country. The reported morphological variability of the species, the high endemism documented for Valle Fértil and the marginal value observed for the hypostomal bridge/first antennomere ratio encourages further taxonomic investigation of sclerogibbid species from Argentina.

As previously stated, there is a lack of information about entomological diversity of San Juan, remarkably about understudied orders as Embioptera. *Probethylus callani* is known to parasitize at least 25 different genera of Embioptera (Olmi 2005). There is no updated available data about embiopteran richness for the province, nor have they been sampled in our biodiversity studies in Valle Fértil so far. However, it is highly probable that *Pararhagadochir trachelia* (Navás, 1915) is present in the collection site, since it is included in the species' range, and could be a potential host of the sample individual (Szumik et al. 2008). Hopefully, this new record regarding two rarely studied arthropod groups sets the cornerstone of a much-needed intensification of insect diversity research in Argentina, especially in protected areas.

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Authors' Contributions

ASE and IMS designed and organized the collection campaign, and all the authors contributed to sampling procedures at collection site. MPP detected and isolated the specimen. ASE identified the specimen and wrote the original and revised draft of the manuscript. ASE and MPP elaborated the figures. All the authors read, approved and contributed significantly to the final draft of the manuscript.

Conflict of Interest Statement

The authors declare that there are no relevant financial or non-financial competing interests to report.

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