

ORIGINAL ARTICLE

New species of *Allorhogas* Gahan (Hymenoptera: Braconidae) reared from galls on *Lycium cestroides* Schldl. (Solanaceae) in ArgentinaJuan José MARTÍNEZ¹, Alejandra ALTAMIRANO² and Adriana SALVO²

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Abstract

Allorhogas cordobensis sp. nov. (Hymenoptera: Braconidae: Doryctinae) is described from the province of Córdoba, Argentina. Its representatives can be distinguished from all other known species of the genus by the unusual morphology of the ovipositor tip and the expanded clypeus apically. Remarkably, this species is also characterized by having a tridentate mandible, a feature known only in exodont braconids, mostly of the subfamily Alysiinae. The new species was reared from stem galls on *Lycium cestroides*, which constitutes the second record of an *Allorhogas* species associated with galls on representatives of the plant family Solanaceae.

Key words: Chaco Serrano, Doryctinae, Neotropical Region, taxonomy.

INTRODUCTION

Allorhogas Gahan is a very diverse doryctine genus in the New World, although many of its species are yet to be described (Marsh 2002; Chavarría *et al.* 2009). It was erected by Gahan (1912) to include one species, *Allorhogas gallicola* Gahan, originally reared from cynipid galls on North American oaks. The concept of *Allorhogas* was redefined by Marsh (1993) who restricted the composition of the genus to species associated with seeds or galls, and segregated some parasitic species in the genus *Parallorhogas* Marsh. Recently, Yu *et al.* (2005) catalogued 28 species in the genus, mostly from the New World. Since then, five species have been described or reclassified in *Allorhogas* (Martínez *et al.* 2008; Pentead-Dias & Carvalho 2008; Chavarría *et al.* 2009; Centrella & Shaw 2010), raising the number of

described species to 32, excluding *Heterospilus desantisi* (Monetti) (Aquino *et al.* 2010).

The biology of most species of *Allorhogas* is largely unknown. Almost 80 years after the original description of the genus, phytophagy was demonstrated for one Brazilian species, *Allorhogas dyspistus* Marsh, constituting the first evidence of phytophagy in the hyperdiverse family Braconidae (Macêdo & Monteiro 1989; Marsh 1991). *Allorhogas dyspistus* induces simple galls in immature seed tissues of *Pithecellobium tortum* Mart. (Fabaceae) (Macêdo *et al.* 1998). Similarly, *A. brasiliensis* Marsh and *A. spermaphagus* Marsh induce galls on seeds of *Balizia pedicellaris* (DC.) Barneby & J. C. Grimes and *Stryphnodendrum polyphyllum* Mart. (Fabaceae) (Marsh *et al.* 2000). Recently, an unidentified species of *Allorhogas* was reported as a potential natural enemy of *Miconia calvescens* DC. (Melastomataceae), an American species which has become an important weed in several Pacific islands (Badenes-Perez & Johnson 2007), and *Allorhogas minimus* Centrella & Shaw was reported associated to *Miconia longifolia* (Albl.) DC. fruit galls in Costa Rica (Centrella & Shaw 2010). The biology of many species of *Allorhogas* associated with galls on vegetative plant tissues is uncertain and they are usually considered inquiline *sensu lato*.

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In the subfamily Doryctinae, phytophagy was also demonstrated in the genus *Monitoriella* Hedkvist, which induces leaf gall on *Philodendron radiatum* Schott (Araceae) in Costa Rica (Infante *et al.* 1995). The doryctine genera *Mononeuron* Fischer, *Labania* Hedkvist, *Psenobolus* Reinhard and *Donquickeia* Marsh are probably phytophagous as well (Chavarría *et al.* 2009). In a recent phylogenetic analysis based on molecular evidence, all these genera, together with the gall associated genus *Percnobracon* Kieffer & Jörgensen were recovered in a single clade, suggesting that phytophagy evolved once in the subfamily Doryctinae (Zaldivar-Riverón *et al.* 2007). Among other braconids, phytophagy is known in the subfamilies Mesostoinae (Austin & Dangerfield 1998) and Braconinae (Flores *et al.* 2005).

The aim of this work is to describe a new species of *Allorhogas* recently collected as a part of a study of the gall-associated insects from the Chaco Serrano in the province of Córdoba, Argentina.

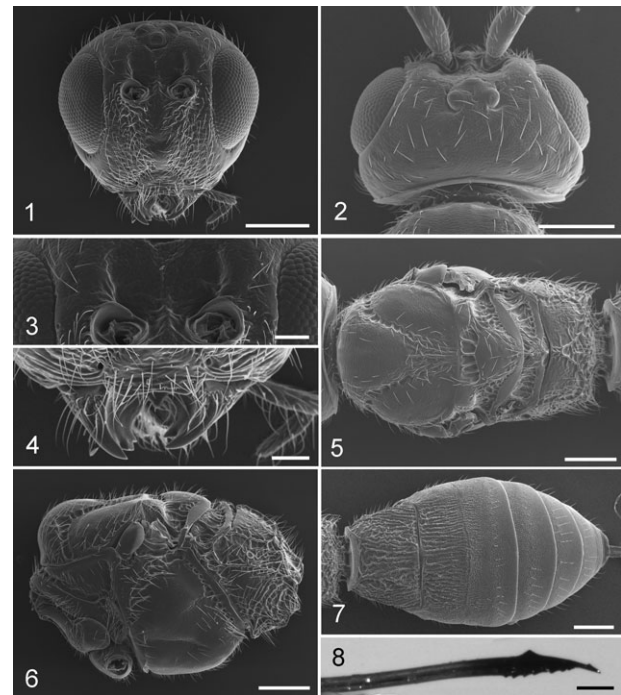
MATERIALS AND METHODS

The specimens were obtained from stem galls on *Lycium cestroides* Schltdl. (Solanaceae) from areas of natural woods in the Chaco Serrano District (31°10'–31°13' S, 64°12'–64°17' W). The area is characterized by an open tree stratum up to 15 m high, 1–3-m-high shrubs covering 10–80% of the ground, a herbaceous layer (up to 95% cover) and many vines and epiphytes (Cabido *et al.* 1991). Galls were cut and kept in plastic bags at room temperature until insects emerged. Galls were collected in January 2007 and adults emerged in the laboratory during the following two weeks.

Insect measurements were taken with a stereomicroscope (Olympus SZX16). Scanning electron microscope (SEM) images were taken (Philips XL-30). Specimens to be studied by SEM were placed in an ultrasonic cleaner for short pulses of about 20 s and then coated with gold–palladium.

Morphological terminology follows Sharkey and Wharton (1997), surface sculpture terminology follows Harris (1979), biological terminology referring to the gall inducers, inquilines and cleptoparasites follows the definitions that Morris *et al.* (2002) proposed for the gall-associated Australian *Acacia* thrips.

The specimens are deposited at the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina (MACN), Museo de La Plata, La Plata, Argentina (MLP) and Instituto y Fundación Miguel Lillo, San Miguel de Tucumán, Argentina (IML).



Figures 1–8 *Allorhogas cordobensis* sp. nov. 1 Head in frontal view; 2 head in dorsal view; 3 frons excavation; 4 apex of clypeus and mandibles; 5 mesosoma in dorsal view; 6 mesosoma in lateral view; 7 metasoma in dorsal view; 8 apex of ovipositor. Scale bars, 1, 2 and 5–7, 200 μ m; 3, 4, 8, 50 μ m.

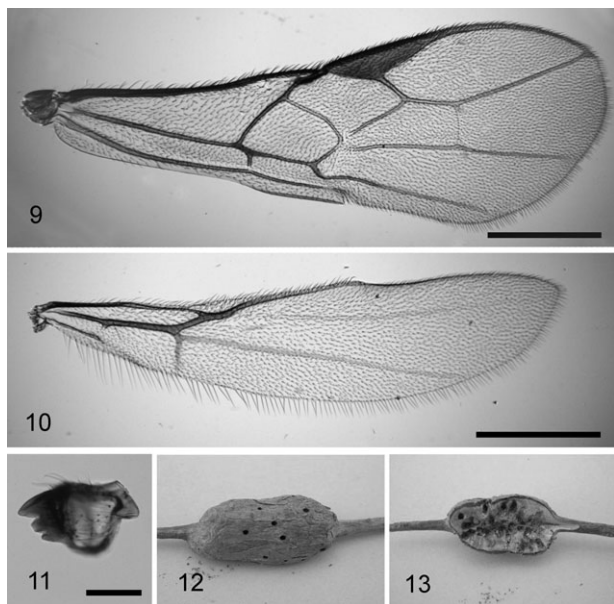
RESULTS

Allorhogas cordobensis sp. nov.

Female

Body length 2.3–3.0 mm; forewing length 2.3–2.5 mm. *Head*. Head is 1.2–1.4 times wider than high (Fig. 1) and 1.6–1.9 times wider than median length (Fig. 2). Occipital carina complete and reaching hypostomal carina. Posterior ocellar line (POL) 1.0–1.5 times ocellar diameter (OD), 0.3–0.5 times ocello–ocular line (OOL). Frons excavation well defined (Fig. 3), although its margins are not sharp. Eye 1.2–1.3 times longer than wide; eye width 1.8–2.1 longer than temple in dorsal view. Malar space 0.4–0.5 times eye height, 0.8–0.9 times basal width of mandible. Width of hypoclypeal depression 0.6–0.8 times distance from edge of depression to eye. Apex of clypeus projected as a small but distinct flange (Fig. 4). Mandibles 3-dentate (Figs 4, 11). Antenna filiform, with 25 antennomeres. First flagellar segment 3.9–4.5 times longer than wide, 1.1–1.3 times longer than second segment.

Mesosoma. Mesosoma is 1.5–1.6 times longer than high, and 1.5–1.7 times longer than wide. Mesoscutum 0.7–0.8 times as long as wide (Fig. 5). Median lobe of



Figures 9–13 9–11, *Allorhogas cordobensis* sp. nov. 9 Forewing; 10 hind wing; 11 mandible. 12,13 Stem galls on *Lycium cestroides*. Scale bars, 9,10, 500 µm; 11, 50 µm; 12,13 no scale bar available.

mesoscutum slightly swollen on lateral view (Fig. 6). Sternaulus 0.5–0.6 times as long as mesopleuron.

Wings. Forewing 2.7–2.8 times longer than wide (Fig. 9). Pterostigma 3.6–4.0 times as long as wide and 0.8–0.9 times as long as R. Vein r 0.7 times as long as 3RSa, 0.2–0.3 times as long as 3RSb, and 0.8 times as long as r-m. Vein 2RS usually meeting RS+M anterior to m-cu, sometimes almost interstitial, vein RS+Mb never distinguishable. Second submarginal cell 2.6–2.8 times longer than wide, discal cell 1.7–1.8 times longer than wide. Hind wing 4.3–4.5 times longer than wide (Fig. 10). Vein M + CU 0.7–0.8 times as long as 1 M, m-cu from almost straight to slightly and evenly curved towards wing apex.

Legs. Fore tibia with a row of spines along anterior margin. Hind coxa with distinct basoventral tooth. Hind femur 3.5–3.8 times longer than wide. Hind tibia 6.8–7.2 times longer than wide.

Metasoma. Metasoma 0.9–1.0 times as long as head and mesosoma combined. First tergite distinctly wider than long, 0.6–0.7 times as long as its apical width (Fig. 7). Median length of second tergite 0.3–0.4 times its maximum width, 0.8–1.1 times as long as third tergite. Ovipositor sheath 0.4–0.5 times as long as metasoma. Ovipositor widened apically, its tip with the basal node greatly developed, subapical node much smaller (Fig. 8); tip of ovipositor clearly darkened and slightly curved downwards.

Sculpture and pubescence. Head mostly coriaceous; face acinose-coriaceous, turning smooth and slightly swollen medially. Pronotum very weakly coriaceous to smooth, pronotal furrow scrobiculate medially turning smooth laterally. Mesoscutum weakly coriaceous; notauli complete and scrobiculate, meeting in a striate-rugose area posteriorly. Scutellum very weakly coriaceous, almost smooth. Mesopleuron weakly coriaceous; subalar groove with a few oblique ridges; sternaulus sculptured as the rest of the mesopleuron. Metapleuron almost smooth anteriorly, turning rugose posteriorly. Basolateral areas of propodeum irregularly granulate; remaining areas of propodeum rugose. First metasomal tergite longitudinally striate-rugose dorsally, anterior surface smooth and well defined by carinae; second tergite longitudinally striate, striae gradually diminishing towards apex; third tergite coriaceous-lacunose to smooth apically; remaining terga coriaceous-lacunose basally to smooth apically. Head except eyes covered by erect setae, more dense on face; mesoscutum, and pronotum covered by short, erect setae; mesopleuron glabrous medially; propodeum and metapleuron sparsely setose. Metasoma with first and second terga with sparsely and uniformly distributed short setae, remaining terga mostly glabrous, only with a transverse row of sparse setae subapically. Ovipositor sheaths covered by erect setae.

Color. Mostly honey yellow, with antennae, mesoscutum, scutellum, propodeum and dorsal surface of metasomal terga darker, brown or black; sometimes upper edge of pronotum and upper edge of mesopleuron are also darkened. Ovipositor sheaths dark brown to black. Wings hyaline, veins light brown, pterostigma brown.

Male

Body length 2.5–2.6 mm. Forewing length 1.9–2.2 mm. Similar to female except by having the hind femur swollen, 2.1–2.2 times longer than its maximum width. **Biology.** Reared from stem galls on *Lycium cestroides* (Figs 12–13). The galls are multilocular, ovoid abnormal growths of 2–3 cm long on the young stems of *L. cestroides*.

Etymology. The specific epithet refers to the known distribution of this species, in the province of Córdoba, Argentina.

Material examined. Holotype female: Argentina, Córdoba, Pajas Blancas, I-2007, Altamirano col. From stem galls on *Lycium cestroides* (MACN). Paratypes: eleven females and three males, same data as holotype (MACN, MLP, IML). Two females were coated for SEM images.

Remarks. Only two specimens, one female and one male, retained complete antennae; thus the variation of

this character could not be asserted. Following the key to species from Costa Rica proposed by Marsh (2002), the new species could be related to the Costa Rican species *Allorhogas gauldi* Marsh because of the relative position of the veins 2RS and m-cu, the sculpture on the mesoscutum, and the body color. Nevertheless, the unusual morphology of the ovipositor tip (with an enlarged basal node), the apex of the clypeus and the association with stem galls on *Lycium cestroides*, easily distinguish this species from *A. gauldi* and from all other known species of the genus. The 3-toothed mandibles of *A. cordobensis* constitute the first report of this condition for a non exodont braconid. However, it is unknown whether this is a unique character of this species or if it has been overlooked in other species of the genus. Interestingly, species of the gall-inducing doryctine genus *Monitoriella* have a bidentate mandible with the basal margin inflected inwardly and with a set of denticles basad ventral tooth (Infante *et al.* 1995).

DISCUSSION

This is the second record for the genus of a species associated with galls on representatives of the plant family Solanaceae, after the recent rediscovery of *Allorhogas mendocinus* (Kieffer & Jörgensen) (originally described as *Bracon mendocinus*) from galls on *Lycium chilense* Bert. (Martínez *et al.* 2008). In both cases, *Allorhogas* was the only species reared from the galls, and no remains of other species were observed inside the gall chambers. This suggests that *Allorhogas* is the gall-inducing species, although additional observations are required to confirm this hypothesis in the species of *Allorhogas* associated with *Lycium*. Currently the only detailed biological studies about the species of *Allorhogas* are those of the seed-associated species. In all these cases the species of *Allorhogas* are primary phytophagous species by inducing abnormal growths in the seed tissues. Up to now there are no studies regarding the large number of species associated with galls on other plant tissues or organs, and their interactions with other members of the gall community is still uncertain. Many of the species of *Allorhogas* are clearly not gall-inducing species, but it is not clear whether they behave as inquiline *sensu stricto*, cleptoparasites or parasitoids.

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