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SHORT NOTE

Parasitoids of *Polistes myersi* Bequaert, 1934 (Vespidae, Polistinae)

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Abstracts

Information about parasitoids of neotropical vespids is scarce. Parasitoids collected from 43 colonies of *Polistes myersi* Bequaert, 1934 and one of *Polistes erythrocephalus* Latreille, 1813 are reported from an Andean region of Colombia. Colony parasitism rates in *P. myersi* ranged from 35 % to 57 %, being higher in colonies with more cells; however, the number of parasitized colonies did not differ when considering the mean number of adult wasps (8.2 vs. 8.1 respectively). Parasitoidism ranged from one up to four species per colony. *P. myersi* parasitoids were: *Seminota laeviceps* (Cresson, 1879) (Trigonalidae); *Signiphora polistomyiella* Richards, 1935 (Signiphoridae); *Elasmus polistis* Burks, 1971 (Eulophidae, Elasmidae); and a new species of *Xenos* (Strepsiptera, Xenidae). The latter three are first records for Colombia. *P. myersi* and *P. erythrocephalus* are the first host reports for the trigonalid *S. laeviceps*. We also report an unknown Tachinid fly species of the tribe Blondeliini attacking *P. myersi*.

Social wasps are excellent predators (Elisei et al., 2010; Raveret Richter, 2000), however, are prey of other insects too as considerable resources are stored in their nests. There are many parasitoids of *Polistes* species, including Lepidoptera (Gelechiidae, Crambidae, Cosmopterigidae, Tineidae, and Pyralidae (Strassmann, 1981; Yamane, 1996)), Strepsiptera (Xenidae), Diptera (Phoridae, Sarcophagidae, and Tachinidae (Somavilla et al., 2015; Zeegers et al., 2014; Benadé et al., 2014)), and Hymenoptera (Pteromalidae, Chalcididae, Eulophidae, Torymidae, Ichneumonidae, Trigonalidae, Mutillidae, and even Vespidae itself (Benadé et al., 2014; Somavilla et al., 2015; Hodges, 2003; Whiteman & Landwer, 2000; Gumovsky 2007; Silva-Filho 2007; Kozyra et al., 2014; Kudo et al., 2014; Madden et al., 2010; de Souza Tavares et al. 2013)).

Polistes myersi Bequaert, 1934 is found from Panamá to Venezuela (Richards, 1978). Their nests, of up to 100 cells, are found in perturbed habitats (Cubillos & Sarmiento, 1996; London & Jeanne, 2000), however, little is known about its biology and its relationships with predators and parasitoids. Here we report several parasitoid species of this wasp.

A total of 43 colonies with either late instar wasp larvae or pupae were collected from Fusagasugá, Cundinamarca, Colombia (4°18'996" N, 74°26'475" W, 1309 m) in May and October 2017, and in August 2019. Each colony was established in transparent PVC cages (25 x 16 x 16 cm) and stored in a rearing chamber (28 °C, 44% RH, 12/12 h photoperiod). Colonies had access to water and a mixture of water, honey, and pollen *ad libitum*. Depending on the colony size either one or two late instar larvae of *Galleria mellonella* Linnaeus, 1758 (Pyralidae) were offered every other day. Colonies increased their size and their larvae reached adulthood or even started new colonies.

Colonies were checked daily and emergent parasitoids were preserved in ethanol 96%; these were identified using appropriate keys and help from specialists: For Hymenoptera the following references: Fernandez and Sharkey (2006), Burks (2019), Subba Rao (1974), Carmean and Kimsey (1998), and the following contacted specialists: D. Carmean, R. Burks, J. Wooley, and A. Dal Molin. For Strepsiptera the specialist Jerry Cook, (Sam Houston Natural History Collections). And



for Diptera the specialist Juan Manuel Perilla (Wright State University). Parasitoids of a single incidental colony of *Polistes erythrocephalus* Latreille, 1813 are also reported. Specimens were deposited in the Instituto de Ciencias Naturales (ICN), Universidad Nacional de Colombia, Bogotá (Catalogue numbers Table 1).

A total of 19 colonies were infected by parasitoids; parasitism ranged from 35 % to 57 %. Parasitized nests were larger than non-parasitized ones (average cell number 64 vs 38 respectively, Table 1). However, the mean number of adult

females did not differ between parasitized and non-parasitized colonies (8.2 vs. 8.1 respectively, Table 1).

The following parasitoid species of *P. myersi* colonies are reported: *Xenos* n. sp. (Strepsiptera, Xenidae); *Elasmus polistis* Burks, 1971 (Hymenoptera, Eulophidae); *Signiphora polistomyiella* Richards, 1935 (Hymenoptera, Signiphoridae); *Seminota laeviceps* (Cresson, 1879) (Hymenoptera, Trigonalidae), and an unknown fly (Diptera, Tachinidae, Blondeliini) (Fig 1). Except for *Xenos* n. sp. all other parasitoids were collected during two or the three field trips.

Table 1. Characteristics of the parasitized nest of *Polistes myersi* where these parasitoids emerged (Mean \pm SD). *As some nests harbor more than one parasitoid species, the number of nests will not add up. ^Museum collection number.

Parasitoid species	Infected nests*	Nests characteristics	
		# Cells	# Females
<i>Signiphora polistomyiella</i> (ICN 101081)^	9	54.3 \pm 57.8	7.6 \pm 3.8
<i>Elasmus polistis</i> (ICN 101078)	8	71.3 \pm 57.0	9.1 \pm 9.2
Blondeliini sp. (ICN 101079)	7	45.1 \pm 16.3	6.0 \pm 3.7
<i>Seminota laeviceps</i> (ICN 101080)	3	60.3 \pm 51.9	11.3 \pm 16.3
<i>Xenos</i> n. sp. (ICN 101082)	1	72	13
Non-Parasitized	24	38.0 \pm 23.7	8.2 \pm 5.9

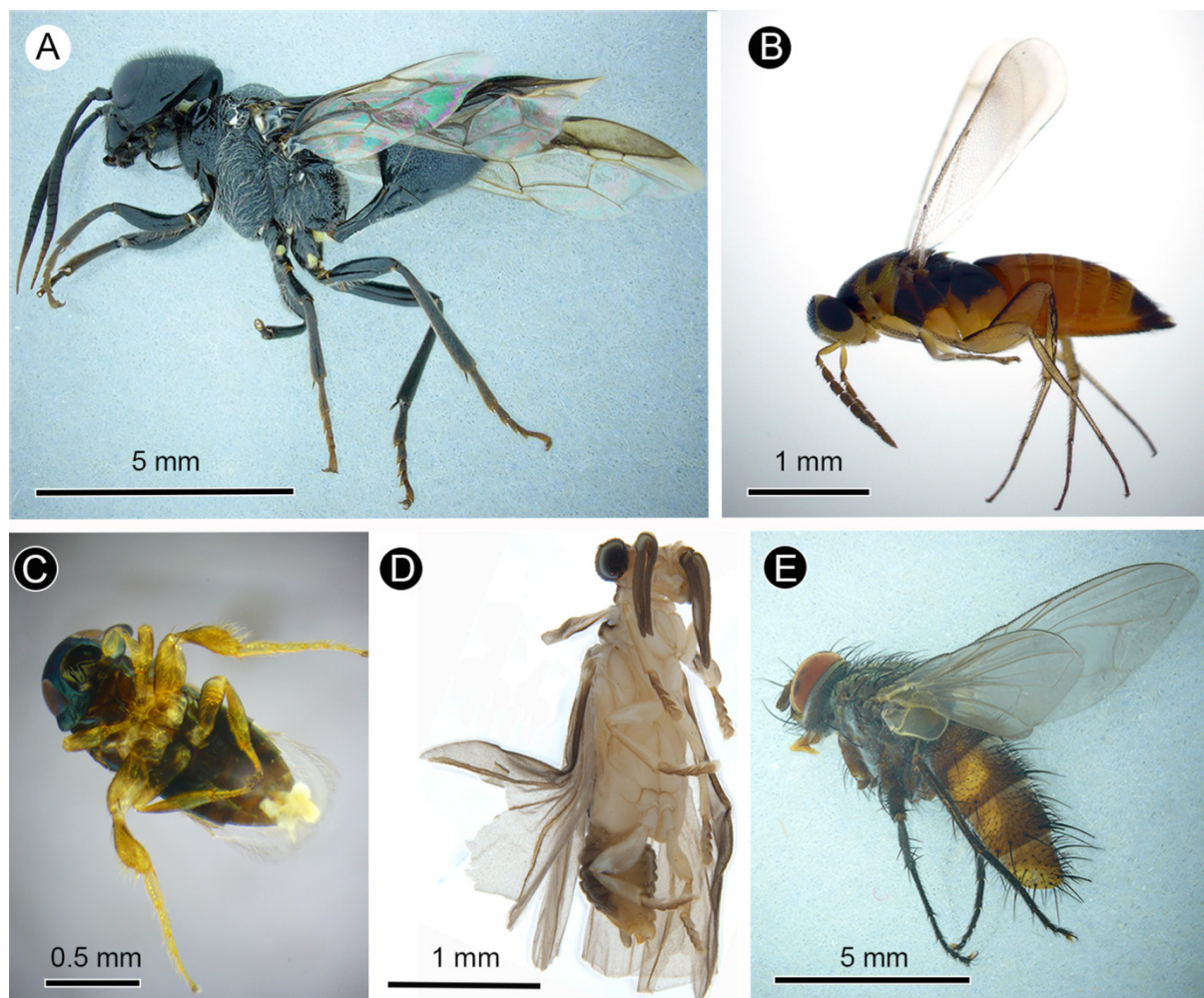


Fig 1. Habitus of the parasitoids reported in the colonies of *Polistes myersi* and *Polistes erythrocephalus*. (A) *Seminota laeviceps*, (B) *Elasmus polistis*, (C) *Signiphora polistomyiella*, (D) *Xenos* n. sp. and (E) Blondeliini.

From most of the colonies a single parasitoid species was obtained, with the following exceptions: two colonies with *S. polistomyiella* and *E. polistis*, one colony with *E. polistis* and a Blondeliini fly, and one colony with *S. polistomyiella* and a Blondeliini fly, one colony with *S. polistomyiella*, *E. polistis* and a Blondeliini fly, and one colony with *S. polistomyiella*, *E. polistis*, *Xenos* n. sp. and a Blondeliini fly. The number of parasitoids per colony could be higher as several of them are known hyperparasitoids. Below we give an account of the taxa recorded:

Elasmus (Eulophidae) is known as parasitoid of multiple taxa including Diptera, Lepidoptera and Hymenoptera families such as Braconidae, Ichneumonidae, and Vespidae (Askew et al., 1997; Gumovsky et al., 2007; Krombein, et al., 1951). It is also hyperparasitoid of Diptera (Noyes, 2019). *Elasmus polistis* is reported from Brazil, India, Germany, Mexico, U.S.A. and the Virgin Islands (Burks, 1971; Dorfey & Köhler, 2011; Noyes, 2019), this is the first report for Colombia.

Signiphora polistomyiella (Signiphoridae) is parasitoid of Blondeliini (Tachinidae, Diptera) (De Santis, 1981) and hyperparasitoid of Vespidae such as *Polistes pacificus* and *Mischocyttarus surinamensis* (Vesey-Fitzgerald 1938). Nine colonies of this study had *S. polistomyiella* parasitoids. *S. polistomyiella* is reported from Peru and Trinidad and Tobago (Subba Rao, 1974), this is the first report for Colombia.

Seminota (Trigonalidae) is a hyperparasitoid genus of several Vespidae genera (Carmean & Kimsey, 1998; Somavilla, 2015; Weinstein & Austin, 1991). However, Santos and Noll (2013) suggest that primary parasitoidism may also occur. The genus has been reported in several countries of the Neotropics (Carmean & Kimsey, 1998; Smith, 2012; Santos & Noll 2013) but this is the first report for Colombia. To our knowledge, this is the first record of hosts for *Seminota laeviceps*, which includes *P. myersi* and *Polistes erythrocephalus*.

Xenos, (Xenidae) as indicated by Cook's (2019) catalogue, is a widely distributed and known parasitoid of vespids (Kathirithamby, 2012; Cook, 2019). It was reported from Colombia as parasitoid of *Polistes erythrocephalus* (Girón, 2006). The specimen from our study belongs to a new species (Cook pers. comm.) under description.

The Tachinidae fly recorded belongs to the tribe Blondeliini. Unfortunately, there are no thorough taxonomic studies on this tribe for the neotropics. Consequently, no more accurate identification is possible. Blondeliini is a tribe with global distribution (Fuentes, unpub.). They are parasitoids of Lepidoptera, Coleoptera, and the Hymenoptera families Argidae Tenthredinidae, Braconidae and Vespidae (Zeegers, 2014; Guimaraes, 1977).

The number of parasitized colonies of *P. myersi* (average 44%) was very high compared to other *Polistes* species. Hodges et al. (2003) reported a parasitism rate of 23% out of 303 studied nests for *Polistes metricus* in the USA. Keeping and Crewe (1983) reported five colonies of *Belonogaster juncea* and *B. petiolata* parasitized out of 63 colonies sampled

in South Africa. The only higher record of parasitism rate than the present study was found in a small study with seven out of ten sampled colonies of *Polistes dorsalis*; these were parasitized by *Elasmus polistis* in the USA (Macom & Landolt, 1995). The location of *P. myersi* in a highly disturbed area could explain these numbers.

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Authors Contribution

Daniela Mayorga-Ch: Field work, data collection and analysis, writing paper. Carlos E. Sarmiento: Project design, field work, writing paper.

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