

## *Leucospis leucotelus* (Hymenoptera: Leucospidae) as a parasitoid of the large carpenter bee *Xylocopa lateralis* (Hymenoptera: Apidae, Xylocopinae) in Colombia

LUCIA, Mariano<sup>1,\*</sup>, WOLFGANG, Hoffmann<sup>2</sup> & GONZALEZ, Victor H.<sup>3</sup>

<sup>1</sup> División Entomología, Laboratorios Anexo Museo de La Plata, Universidad Nacional de La Plata. La Plata, Argentina. CONICET, Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.

\* E-mail: mlucia@fcnym.unlp.edu.ar

<sup>2</sup> Grupo de Biocalorimetría, Facultad de Ciencias Básicas, Universidad de Pamplona. Pamplona, Colombia.

<sup>3</sup> Undergraduate Biology Program and Department of Ecology & Evolutionary Biology, University of Kansas. Lawrence, Kansas, 66045, USA.

Received 08 - II - 2019 | Accepted 01 - IV - 2019 | Published 27 - VI - 2019

<https://doi.org/10.25085/rsea.780203>

### ***Leucospis leucotelus* (Hymenoptera: Leucospidae) parasitoide de la abeja carpintera grande *Xylocopa lateralis* (Hymenoptera: Apidae, Xylocopinae) en Colombia**

**RESUMEN.** Registramos a *Leucospis leucotelus* Walker parasitando nidos de *Xylocopa* (*Schonnherria*) *lateralis* Say en Colombia. Además, recopilamos todos los registros previos citados en la bibliografía de especies de *Leucospis* asociados a especies de *Xylocopa*.

**PALABRAS CLAVE.** Abejas silvestres. Enemigos naturales. *Passiflora*. Polinizadores.

**ABSTRACT.** We report *Leucospis leucotelus* Walker parasitizing nests of *Xylocopa* (*Schonnherria*) *lateralis* Say in Colombia. Previous literature records of species of *Leucospis* associated with species of *Xylocopa* are summarized.

**KEYWORDS.** Natural enemies. *Passiflora*. Pollinators. Wild bees.

Wild bees play a key role as pollinators in both natural and agricultural ecosystems. Among bees, species of the large carpenter bees in the genus *Xylocopa* Latreille (Apidae: Xylocopini) are economically important around the world because they are effective pollinators on diverse crops, including passion fruit (*Passiflora* L., Passifloraceae), sunflowers (*Helianthus* L., Asteraceae), squash (*Cucurbita* L., Cucurbitaceae), and tomato (*Solanum* L., Solanaceae) (e.g.: Gerling et al., 1989; Hogendoorn et al., 2000; Aguiar-Menezes et al., 2002; Sadeh et al., 2007; Keasar, 2010). Due to their large body size and their foraging behavior, including their ability to buzz pollinate, carpenter bees are the most efficient pollinators of many plants of the genus *Passiflora* across the Neotropical region, including Colombia (Caicedo et al., 1993; Camillo, 2003; González

et al., 2009; Silva & Freitas, 2018). As for other bees, various stages of the life cycle of carpenter bees are target of numerous attacks by predators, parasites, and parasitoids of diverse insect families (e.g.: Hurd, 1978; Lucia et al., 2010; Avalos-Hernández et al., 2011; Lucia, 2016).

Chalcid wasps (Hymenoptera: Chalcidoidea) in the family Leucospidae Fabricius are common ectoparasitoids of bees. This family consists of 141 species worldwide of medium to large size wasps (4-17 mm in body length) grouped in four genera: *Leucospis* Fabricius, *Micrapion* Kriechbaumer, *Neleucospis* Bouček, and *Polistomorpha* Westwood. Only species of *Leucospis* and *Polistomorpha* occur in South America (Lima & Dias, 2018). Of these two genera, species of *Leucospis* are common parasitoids of aculeate

Species of <i>Leucospis</i>	Species of <i>Xylocopa</i>	Country	Reference
<i>L. vallicaucaensis</i> Pujade-Villar & Caicedo	<i>X. (Neoxylocopa)</i> <i>frontalis</i> Oliver <i>X. (N.) fimbriata</i> Fabricius	Colombia	Pujade-Villar & Caicedo, 2010
<i>L. anthidioides</i> Westwood	<i>X. (N.) submordax</i> Cockerell	Brazil, Trinidad	Bouček, 1974; De Santis, 1980; Westwood, 1874
<i>L. xylocopae</i> Burks	<i>X. (Stenoxylocopa)</i> <i>nogueirai</i> Hurd & Moure	Brazil, Bolivia, and Paraguay	Burks, 1961; Bouček, 1974; De Santis, 1979, 1981; Fidalgo, 1980.
<i>L. reversa</i> Bouček	Unknown species	Ivory Coast, Liberia, and Zaire	Bouček, 1974; Rasplus, 1987.
<i>L. leucotelus</i> Walker	<i>X. lateralis</i> Say	Colombia	This paper
<i>L. klugii</i> Westwood	<i>X. brasilianorum</i> (L.)	Costa Rica, Mexico	Daly, 1977; De Santis, 1979

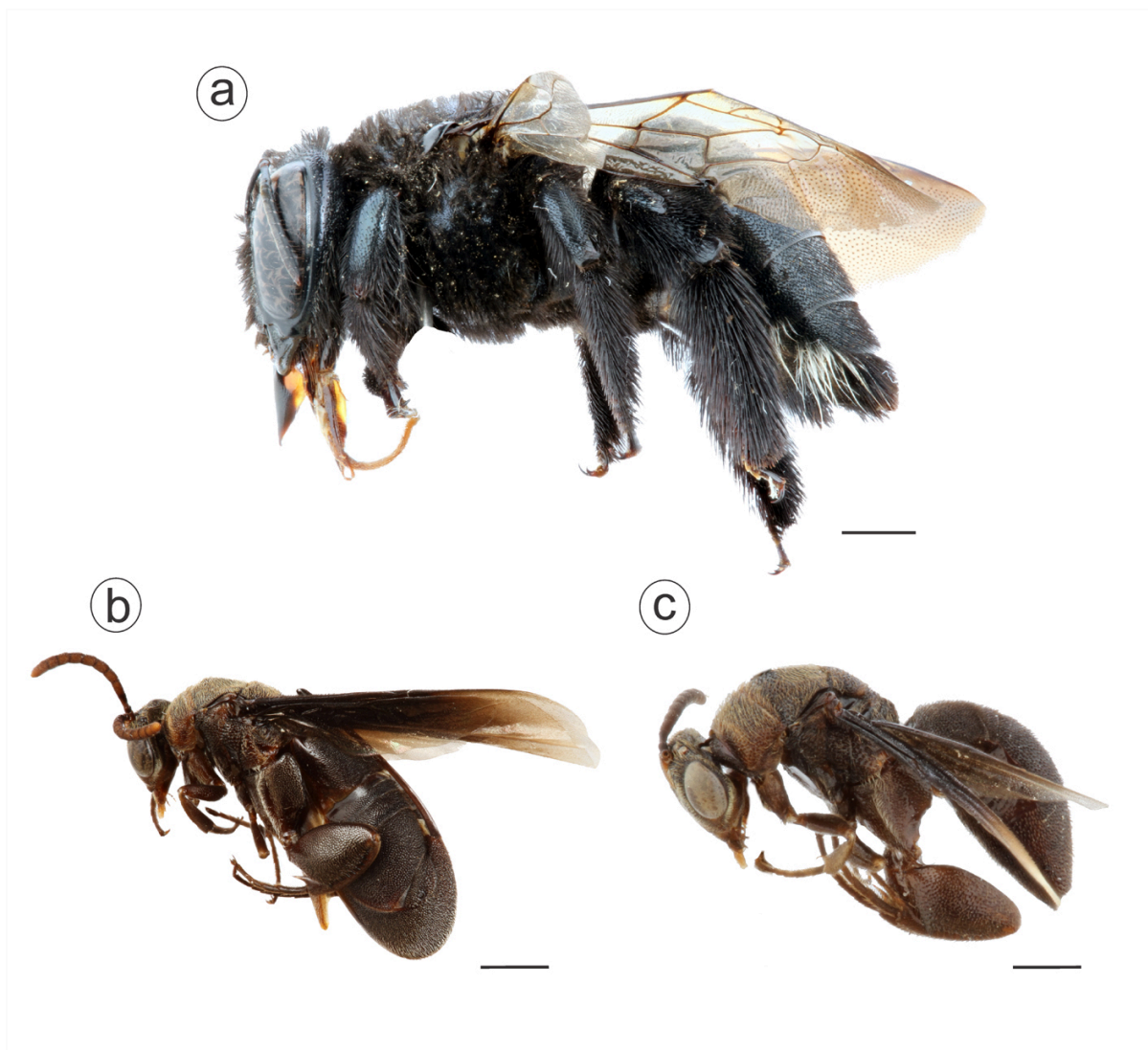
**Table I. Summary of host records of species of *Leucospis* parasitizing species of large carpenter bees.**

Hymenoptera [Eumeninae (Vespidae), Pompilidae, Crabronidae and Sphecidae], in particular of solitary bees in the families Apidae and Megachilidae (Bouček, 1974; Gazola & Garófalo, 2003; Grissell, 2007; Madl & Schwarz, 2012; Torretta et al., 2017).

To date, only four records of species of *Leucospis* parasitizing nests of carpenter bees are available (Table I). Thus, the purpose of this work is to document for the first time the presence of *L. leucotelus* Walker on nests of *X. (Schonherria) lateralis* Say in Colombia. This report is noteworthy considering the scarcity of records documenting *Leucospis* as parasitoids of these bees and that the biology of most carpenter bees is unknown.

We found a dead wood trunk (8 cm in diameter, 118 cm in length) with 19 nest entrances of *X. lateralis* in Pamplonita, Norte de Santander, Colombia, from which we captured four adult bees for identification, three females (Fig. 1a) and one male. Each nest entrance was elliptical in shape, 9 mm wide and 12 mm long.

In several occasions, we observed leucospid wasps walking slowly over the tree trunk, drumming its surface with their antennae and attempting to introduce their ovipositor into the walls of the trunk. Using the keys of Bouček (1974) and Lima & Dias (2018), we identified these wasps (three females and one male; Figs. 1b, c) as *L. leucotelus* Walker, a species that occurs in Mexico, Guatemala, Panama, Peru, Colombia, Ecuador, Guayana, French Guiana, and Brazil (Bouček, 1974; De Santis, 1979). We did not dissect the bee nest to preserve the colony. Thus, we were unable to determine if *L. leucotelus* successfully parasitized the brood cells of *X. lateralis*. However, oviposition through the sidewall of the host nest is the usual pattern of attack displayed by species of *Leucospis* on twig-nesting host species (Gazola & Garófalo, 2003). Our brief behavioral observations of *L. leucotelus* at nests of *X. lateralis*, as well as records of leucospid wasps on nests of carpenter bees, reinforce the idea of *L. leucotelus* being a brood parasite in nests of *X. lateralis*.



**Fig. 1. Habitus of species of *Xylocopa* and *Leucopsis*. a. female of *Xylocopa* (*Schonherria*) *lateralis* Say; b-c. *Leucopsis leucotelus* Walker female and male respectively. Scale bars: 2 mm**

#### ***Leucospid leucotelus* Walker**

**Material examined:** 3♀, 1♂. COLOMBIA, Norte de Santander, Pamplonita, 7° 27' 8.64" N; 72° 38' 69" W; 1610 m, 13-III-2014 [March 13<sup>th</sup>, 2014], ex. W. Hoffmann. Parasitoid of nests of *Xylocopa* (*Schonherria*) *lateralis*.

These specimens, as well as the two adult females of *X. lateralis*, are deposited in the Snow Entomological Collection, University of Kansas Natural History Museum, Lawrence, Kansas, U.S.A. The remaining adult bee female and male specimens are in the insect collection of the Universidad de Pamplona, Pamplona, Colombia.

#### **ACKNOWLEDGEMENTS**

We thank Amy Comfort and two anonymous reviewers for comments and suggestions that improved this manuscript. M. L. was supported by Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina (CONICET), W. F. by the Universidad de Pamplona, Vicerrectoría de Investigaciones, and V. H. G. by National Science Foundation's REU program (DBI-1560389).

#### **LITERATURE CITED**

Aguar-Menezes, E.L., Menezes, E.B., Cassino, P.C.R., & Soares, M.A. (2002) Passion fruit. *Passion Fruit in Tropical Fruit, Pests and Pollinators* (ed. Peña, J.E., Sharp, J.L., & Wisoki, M.), pp. 361-390. CAB International, Orlando, Florida.

- Avalos-Hernández, O., Lucia, M., Álvarez, L.J., & Abrahamovich, A.H. (2011) *Walkeromya plumipes* (Philippi) (Diptera: Bombyliidae), a parasitoid associated with carpenter bees (Hymenoptera: Apidae: Xylocopini) in Argentina. *Zootaxa*, **2935**, 41-46.
- Bouček, Z. (1974) A revision of the Leucospidae (Hymenoptera: Chalcidoidea) of the world. *Bulletin of the British Museum (Natural History)*, *Entomology*, **23**, 1-241.
- Burks, B.D. (1961) A new Brazilian *Leucospis* parasitic on *Xylocopa*, with a brief review of the South American species of *Leucospis* (Hym., Leucospidae). *Studia Entomologica*, **4(1-4)**, 537-541.
- Caicedo, G., Vargas, H., & Gaviria, J. (1993) Evaluación de *Xylocopa* spp. (Hymenoptera: Anthophoridae) como polinizadores en el cultivo del maracuyá (*Passiflora edulis* var. *flavicarpa* Degener). *Revista Colombiana de Entomología*, **19(3)**, 107-110.
- Camillo, E. (2003) *Polinização do maracujá [Pollination of passion fruit]*. Holos Editora, Ribeirão Preto, Brazil.
- Daly, H.V. (1977) *Leucospis klugii* (Hymenoptera, Chalcidoidea) reared from *Xylocopa brasiliatorum* (Hymenoptera, Apoidea) in Costa Rica. *The Pan-Pacific Entomologist*, **52(4)**, 271.
- De Santis, L. (1979) *Catálogo de los himenópteros calcidoideos de América al sur de los Estados Unidos*. Comisión de Investigaciones Científicas Provincia de Buenos Aires, Argentina.
- De Santis, L. (1980) *Catálogo de los Himenópteros Brasileños de la Serie Parasítica incluyendo Bethyloidea*. Ed. da Universidade Federal do Paraná, Curitiba, Brazil.
- De Santis, L. (1981) Catálogo de los himenópteros calcidoideos de América al sur de los Estados Unidos – Primer Suplemento. *Revista Peruana de Entomología*, **24(1)**, 1-38.
- Fidalgo, A.P. (1980) Nuevas citas de Calcidoideos para Argentina, Bolivia y Perú (Hymenoptera). *Neotropica*, **26(76)**, 193-196.
- Gazola, A.L., & Garófalo, C.A. (2003) Parasitic behavior of *Leucospis cayennensis* Westwood (Hymenoptera: Leucospidae) and rates of parasitism in populations of *Centris (Heterocentris) analis* (Fabricius) (Hymenoptera: Apidae: Centridini). *Journal of the Kansas Entomological Society*, **76(2)**, 131-142.
- Gerling, D.W., Velthuis, H.D., & Hefetz, A. (1989) Bionomics of the large carpenter bee of the genus *Xylocopa*. *Annual Review of Entomology*, **34**, 163-190.
- González, V.H., González, M.M., & Cuellas, Y. (2009). Notas biológicas y taxonómicas sobre los abejorros del maracuyá del género *Xylocopa* (Hymenoptera: Apidae, Xylocopini) en Colombia. *Acta Biológica Colombiana*, **14(2)**, 31-40.
- Grissell, E.E. (2007) Torymidae (Hymenoptera: Chalcidoidea) associated with bees (Apoidea), with a list of chalcidoid bee parasitoids. *Journal of Hymenoptera Research*, **16**, 234-265.
- Hogendoorn, K., Steen, Z., & Schwarz, M.P. (2000) Native Australian carpenter bees as a potential alternative to introducing bumblebees for tomato pollination in greenhouses. *Journal of Apicultural Research*, **39**, 67-74.
- Hurd Jr., P.D. (1978) *An annotated catalog of the carpenter bees (genus Xylocopa Latreille) of the Western Hemisphere*. Smithsonian Institution Press, Washington, D.C.
- Keasar, T. (2010) Large carpenter bees as agricultural pollinators. *Psyche*, **2010**, 1-7.
- Lima, A.R., & Dias, P.G. (2018) The New World species of *Leucospis* Fabricius, 1775 (Hymenoptera, Chalcidoidea, Leucospidae): an update of Bouček's revision with description of two new species from Brazil. *Zootaxa*, **4441(1)**, 1-45.
- Lucia, M. (2016) First record of *Huarpea wagneriella* (Hymenoptera: Sapygidae) as a cleptoparasite of large carpenter bees (Hymenoptera: Apidae, Xylocopinae). *Studies on Neotropical Fauna and Environment*, **51(1)**, 7-9.
- Lucia, M., Aquino, D.A., Hansson, C., & Abrahamovich, A.H. (2010) The first record of conopid flies (Diptera: Conopidae) and eulophid wasps (Hymenoptera: Eulophidae) as parasitoids and hyperparasitoids associated with carpenter bees (Apidae: Xylocopinae) in Argentina. *Journal of Apicultural Research*, **49(2)**, 208-211.
- Madl, M., & Schwarz, M. (2012) Catalogue and faunistics of the family Leucospidae (Hymenoptera: Chalcidoidea) of the Ethiopian region excluding Malagasy subregion. *Linzer biologische Beiträge*, **44(2)**, 1221-1235
- Pujade-Villar, J., & Caicedo, G. (2010) Description of a new Colombian species of Leucospidae: *Leucospis vallicaucaensis* n. sp. (Hymenoptera: Chalcidoidea [sic]). *Dugesiana*, **17(2)**, 138-142.
- Rasplus, J.Y. (1987) Leucospidae collected in Lamto, Ivory Coast. Descriptions of males of *Leucospis reversa* Bouček and *Naleucospis musculina* Bouček (Hymenoptera). *Revue Française d'Entomologie (nouvelle série)*, **9**, 172-175.
- Sadeh, A., Shmida, A., & Keasar, T. (2007) The carpenter bee *Xylocopa pubescens* as an agricultural pollinator in greenhouses. *Apidologie*, **38**, 508-517.
- Silva, C., & Freitas, B. (2018) Rearing carpenter bees (*Xylocopa* spp.) for crop pollination: a case study with Passion fruit (*Passiflora edulis*). *The Pollination of cultivated plants: A compendium for practitioners. Vol 2.* (ed. Roubik, D.W.). Food and Agriculture Organization of the United Nations, Rome, Italy.
- Torretta, J.P., Molina, G.A.R., & Aquino, D.A. (2017) Life cycles and host-parasitoid relationships of five species of *Leucospis* wasps in Argentina (Hymenoptera: Leucospidae). *Journal of Natural History*, **51(29-30)**, 1727-1742.
- Westwood, J.O. (1874) *Thesaurus entomologicus Oxoniensis; or, illustrations of new, rare, and interesting insects, for the most part contained in the collection presented to the University of Oxford by the Rev. F.W. Hope*. Clarendon Press, Oxford, UK.