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Host records of *Physocephala wulpi* Camras, with a description of the puparium (Diptera: Conopidae)

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Abstract

Physocephala wulpi Camras was reared from *Xylocopa artifex* Smith, *Xylocopa augusti* Lepeletier, and *Xylocapa splendidula* Lepeletier. The puparium is described. An overview of conopid host records from the Neotropic Region, and records from Conopidae that develop in *Xylocopa*, is provided.

Key words: Diptera, Conopidae, *Physocephala*, puparium, cephalopharyngeal skeleton, Hymenoptera, Apidae, *Xylocopa*, Neotropics, Argentina

Introduction

The knowledge concerning the neotropical Conopidae is, compared with other Diptera families, good: in all, there are about 200 valid conopid species described from the Neotropical region. Skevington *et al.* (2010) announce a "Conspectus of the Neotropical Conopidae" which includes a key to the genera, a species list and a bibliography (Thompson *et al.* in press). Nevertheless, the biology of most species is unknown, although there are a few host records from the Neotropical region arising as a result of recent research into the ecology of Apidae (Table 1). All of these records relate to the conopid genus *Physocephala*.

Lucia *et al.* (2010) published a host record of a *Physocephala* spec. from *Xylocopa augusti* in Argentina. The conopid species could not be identified at that time because only the puparium was found. Recently adults were reared and were identified as *Physocephala wulpi*. This paper will give information concerning the biology of the species and presents a description of the puparium.

Material and methods

The adults of *Physocephala wulpi* were obtained from pupae found within the metasoma of dead female carpenter bees. These bees were found in or near the entrance of the nest. Each of the metasoma was placed individually in acrylic containers and kept in the laboratory until the emergence of the adult conopid. *Physocephala wulpi* was identified with the key of Camras (1996) and the illustrated key of Stuke & Skevington (2007). Material has been compared with specimens from Costa Rica. Reared specimens are illustrated at figure 1. Additional puparia were found in the metasoma of dead *Xylocopa* females in their nests (table 1). These puparia were identified as *Physocephala* using the key of Smith & Peterson (1987). However, the absence of adults made the species identification impossible. The preparation of the puparium is described in Stuke (2000). The description of the puparium employs the terminology of Stuke (2000).

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TABLE 1. Summary of Host Records of Conopidae from the Neotropical Region.

Conopidae	Host	Country	
Physocephala aurifrons (Walker, 1849)	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala bennetti Camras, 1996	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala bennetti Camras, 1996	*Xylocopa submordax* Cockerell, 1935	Trinidad	Camras (1996)
Physocephala bennetti Camras, 1996	*Xylocopa frontalis* (Olivier, 1789)	Trinidad	Camras (1996)
Physocephala bipunctata (Macquart, 1843)	*Euglossa anodorhynchi* Nemésio, 2006	Brazil	Melo *et al.* (2008)
Physocephala bipunctata (Macquart, 1843)	*Epicharis bicolor* Smith, 1854	Brazil	Rocha-Filho *et al.* (2008)
Physocephala bipunctata (Macquart, 1843)	*Epicharis bicolor* Smith, 1854	Brazil	Santos *et al.* (2008)
Physocephala bipunctata (Macquart, 1843)	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala bipunctata (Macquart, 1843)	*Centris tarsata* Smith, 1874	Brazil	Dos Santos Mesquita (2009)
Physocephala bipunctata (Macquart, 1843)	*Centris analis* (Fabricius, 1804)	Brazil	Dos Santos Mesquita (2009)
Physocephala bipunctata (Macquart, 1843)	*Centris vittata* Lepeletier, 1841	Brazil	Dos Santos Mesquita (2009)
Physocephala bipunctata (Macquart, 1843)	*Euglossa anodorhynchi* Nemésio, 2005	Brazil	Marchi (2008)
Physocephala cayensis (Macquart, 1843)	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala inhabilis (Walker, 1849)	*Centris vittata* Lepeletier, 1841	Brazil	Santos *et al.* (2008)
Physocephala inhabilis (Walker, 1849)	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala nervosa Kröber, 1915	*Bombus atratus* Franklin, 1913	Argentina	De Santis & Abrahamovich (1989)
Physocephala rufithorax Kröber, 1915	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala rufithorax Kröber, 1915	*Eulaema* spec.	Peru	Rasmusen & Cameron (2004)
Physocephala soror Kröber, 1915	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala spheniformis Camras, 1957	*Centris analis* (Fabricius, 1804)	Brazil	Santos *et al.* (2008)
Physocephala wulpi Camras, 1996	*Xylocapa augusti* Lepeletier, 1841 (female)	Argentina	this paper
Physocephala wulpi Camras, 1996	*Xylocapa splendidula* Lepeletier, 1841 (female)	Argentina	this paper
Physocephala wulpi Camras, 1996	*Xylocopa artifex* Smith, 1874 (female)	Argentina	this paper
Physocephala spec.	*Bombus pullatus* Franklin, 1913	Costa Rica	Hines *et al.* (2007)
Physocephala spec.	*Centris analis* (Fabricius, 1804)	Brazil	Caldano *et al.* (2008)
Physocephala spec.	*Euglossa intersecta* Latreille, 1838	Brazil	Melo *et al.* (2008)
Physocephala spec.	*Xylocopa augusti* Lepeletier, 1841	Argentina	Lucia *et al.* 2010
Physocephala spec.	*Centris tarsata* Smith, 1874	Brazil	Marchi (2008)
Physocephala spec.	*Xylocopa ciliata* Burmeister, 1876 (female)	Argentina	this paper
Physocephala spec.	*Xylocopa viridis* Smith, 1874 (female)	Argentina	this paper
Physocephala spec.	*Xylocopa eximia* Pérez, 1901 (female)	Argentina	this paper

Material examined. *Physocephala wulpi*: 1 ♂, Argentina, Buenos Aires, La Plata (34°55'S 57°56'W), emerged 15.i.2009 ex *Xylocopa artifex* (female), coll. M. Lucia; 1 ♀, 1 puparium ditto but emerged 15.x.2009; 1 ♂,

ditto but 5.ii.2010; 1 ♂, 1 puparium Argentina, Buenos Aires, Berisso (34°53'S 57°53'W), emerged 30.x.2009 ex *Xylocapa augusti* (female), coll. L. Álvarez; 1 ♀, Argentina, Buenos Aires, Berisso (34°53'S 57°53'W), emerged 12.xii.2009 ex *Xylocapa splendidula* (female), coll. L. Álvarez; 1 ♂, 1 puparium Argentina, Santiago del Estero, Dpto. Atamisqui (28°38'54"S 64°04'58"W), 120 mts, emerged 19.iii.2009 ex *Xylocapa splendidula* (female) coll. M. Lucia & L. Álvarez. *Physocephala spec:* 1 puparium, Argentina, Buenos Aires, Ignacio Correas, (35°01'S 57°51'W), 14.viii.2009, ex *Xylocopa ciliata* (female), coll. M. Lucia; 1 puparium, Argentina, Tucumán, Horco Molle 720 msnm (26°47' S, 65°19'), 8.x.2008, ex *Xylocopa eximia*, coll. M. Lucia & B. Defea; 1 puparium, Argentina, Misiones, Loreto, 162 msnm (55º31' O, 27º20' S), 23.x.2008, ex *Xylocopa viridis* coll. M. Lucia & L. Álvarez.

Biology of *Physocephala wulpi*

The *Xylocopa* species, parasitized with conopids, were collected in different habitats. Most nests were found in an urban environment in a northwest Buenos Aires province. The plants visited by these *Xylocopa* species comprise trees, shrubs, cultivated plants (mostly ornamentals) and spontaneous vegetation. The climate is temperate humid with rainfall throughout the year. One nest of *Xylocopa splendidula* was found in an alfalfa (*Medicago sativa* L.) seed production field in a peri-saline area in southern Santiago del Estero province. Natural vegetation here consists of shrubs, herbs and abundant columnar cacti. The climate in this region is semi-arid. Several species of *Physocephala* are well known parasites of *Xylocopa* (table 2) and therefore it was not surprising to find these hosts for *Physocephala wulpi*. There is no other conopid genus known to parasitize *Xylocopa*.

TABLE 2. Summary of Host Records of Conopidae from *Xylocopa*.

Conopidae	Host	
Physocephala bennetti Camras, 1996	*Xylocopa trasitoria* Pérez, 1901 [as *Xylocopa submordax* Cockerell, 1935]	Camras (1996)
Physocephala bennetti Camras, 1996	*Xylocopa frontalis* (Olivier, 1789)	Camras (1996)
Physocephala bimarginipennis Karsch, 1887	*Xylocopa flavorufa* (DeGeer, 1778)	Smith & Cunningham van Someren (1970)
Physocephala bimarginipennis Karsch, 1887	*Xylocopa carinata* Smith, 1874	Smith & Cunningham van Someren (1970)
Physocephala bimarginipennis Karsch, 1887 (?)	*Xylocopa flavicollis* (DeGeer, 1778)	Smith & Cunningham van Someren (1970)
Physocephala wulpi Camras, 1996	*Xylocapa augusti* Lepeletier, 1841	this paper
Physocephala wulpi Camras, 1996	*Xylocapa splendidula* Lepeletier, 1841	this paper
Physocephala wulpi Camras, 1996	*Xylocopa artifex* Smith, 1874	this paper
Physocephala spec. [as "*Physocephala testacea*"]	*Xylocopa macrops* Lepeletier, 1841	Hurd (1978)
Physocephala spec. [as "possibly *Physocephala testacea* (van der Wulp)"]	*Xylocopa nogueirai* Hurd & Moure, 1960	Hurd (1978)
Physocephala spec.	*Xylocopa olivacea* (Fabricius, 1778)	De Meijere (1904)
Physocephala spec.	*Xylocopa augusti* Lepeletier, 1841	Lucia *et al.* 2010
Physocephala spec.	*Xylocopa ciliata* Burmeister, 1876	this paper
Physocephala spec.	*Xylocopa viridis* Smith, 1874	this paper
Physocephala spec.	*Xylocopa eximia* Pérez, 1901	this paper

Description of the Puparium of *Physocephala wulpi*

Length (excluding dorsal flap and posterior spiracles) 7.5–10.3 mm. Maximum width 5.2–7.1 mm. Orange-brown, with posterior spiracles black (figure 2). Puparium, without dorsal flap, with seven segments recognisable. Anal segment with a longitudinal anal opening. Surface fine sculptured, covered with minute white hairs. The arrangement of obvious pits (these pits may represent sensillae on the larval surface) on the abdominal segments as in figure 4. The posterior spiracles are covered with about 800 irregular orange-brown spiracular openings on small protuberances. Posterior spiracles convex apically, not forming a plate (figure 3). The spiracular scar lies in a slight depression at the inner surface of the spiracular tube. Anterior spiracles could not be found, but there are deformations of the puparium surface that may represent scars of anterior spiracles without, or with slight, sclerotization. At the inner side of the head scar are two folded rings that indicate an elongated head of the larvae as illustrated by Smith & Cunningham van Someren (1970). Head skeleton as in figure 5: Longitudinal bar completely fused with basal sclerite. Left and right part of the basal sclerite not fused dorsally but with a ventral transverse bar. Left and right mandible completely separated.

FIGURE 1. Reared adult of *Physocephala wulpi* Camras, 1996.

FIGURE 2. Puparium of *Physocephala wulpi* Camras, 1996.

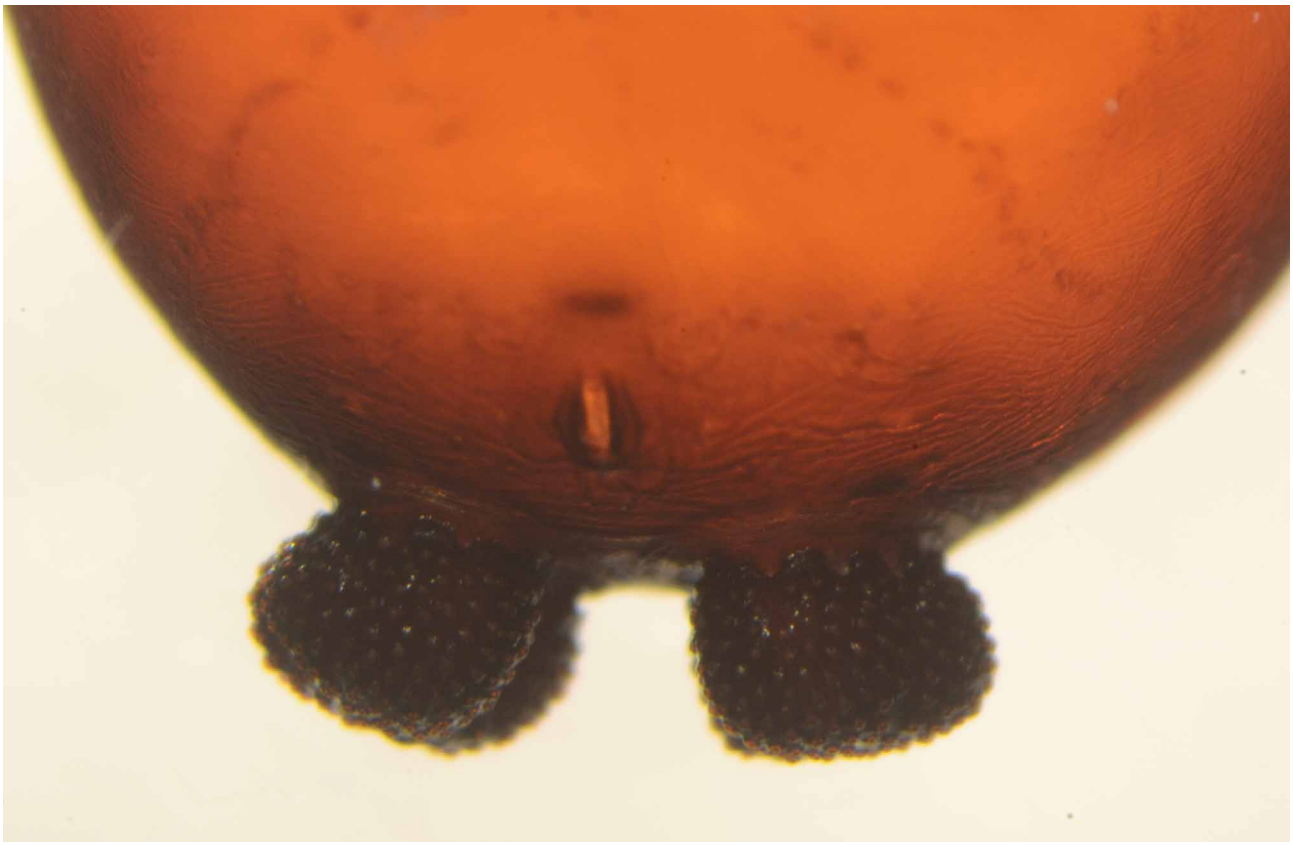

FIGURE 3. Posterior spiracles of *Physocephala wulpi* Camras, 1996.

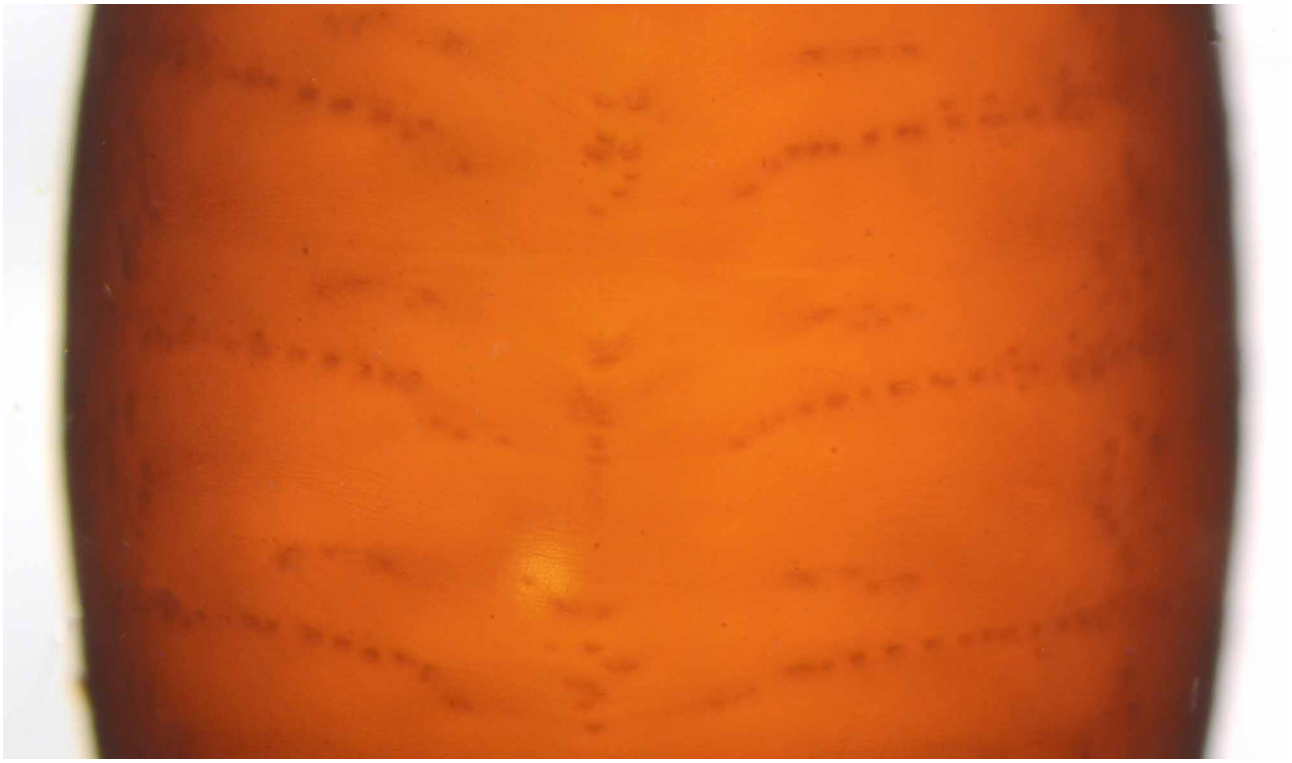

FIGURE 4. The arrangement of puparial pits on the abdominal segments of *Physocephala wulpi* Camras, 1996.

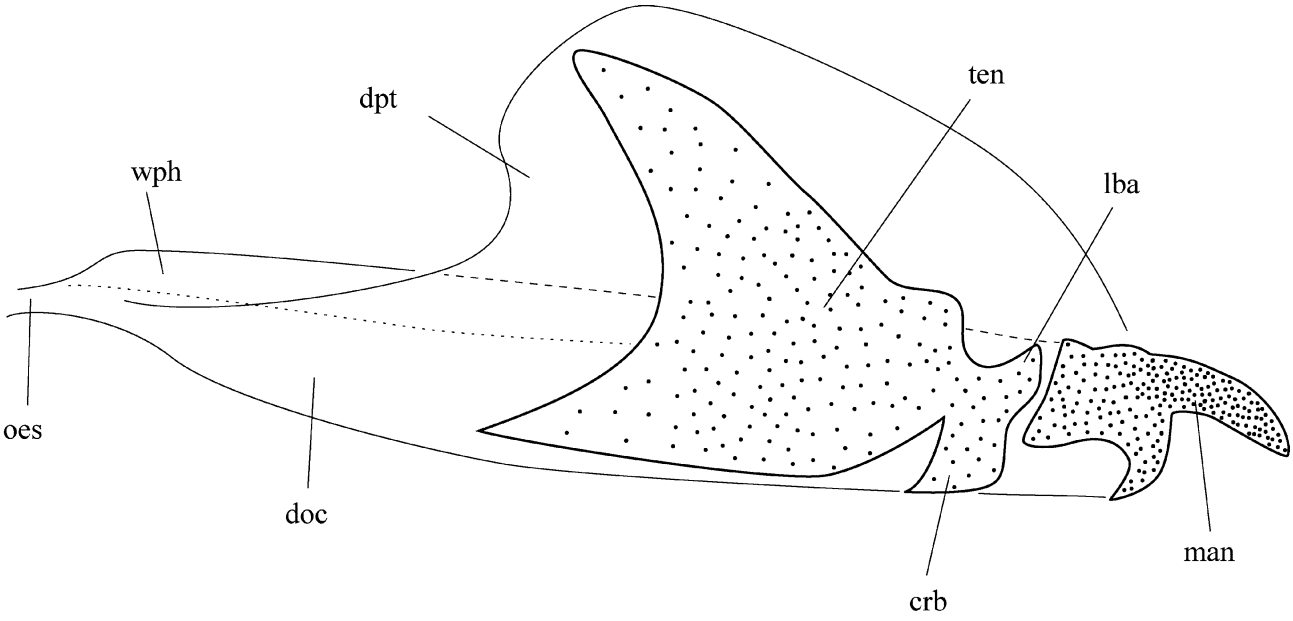

FIGURE 5. Cephalopharyngeal skeleton of *Physocephala wulpi* Camras, 1996 [lateral view; crb—crossbridge; doc—dorsal channel; dpt—dorsal phragma of tentorium; lba—longitudinal bar; man—mandible; oes—oesophagus; ten—tentorium; wph—wing of pharynx].

To date the available information concerning the immature morphology of *Physocephala wulpi* fit well with the descriptions of *Physocephala* immature stages given by de Meijere (1904), Townsend (1935) and Smith & Cunningham van Someren (1970). It is, however, still difficult to distinguish the few taxa described at species level using only morphological larval characters. The description of the larval head skeleton of *Physocephala bimagipennis* by Smith & Cunningham van Someren (1970) indicates a distinctly different form in the mandibular scler-

ite, which is about as long as high, and a distinct labial-sclerite (= dentate sclerite sensu Smith & Cunningham van Someren) which is not found in *Physocephala wulpi*.

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