



## SHORT NOTE

### Biological Notes on the Parasitism of *Apoica flavissima* Van der Vecht (Hymenoptera: Vespidae) by *Seminota marginata* (Westwood) (Hymenoptera: Trigonalidae): Are Social Paper Wasps Primary or Secondary Hosts of Trigonalidae?

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#### Abstract

Hosts of Trigonalidae include larvae of social paper wasps, which have been considered secondary hosts, supposedly following predation of the primary host (usually caterpillars) by adult wasps. This study provides observations on biological aspects of the parasitism of *Apoica flavissima* Van der Vecht by *Seminota marginata* (Westwood), and suggests that social wasps may be both primary and secondary hosts, whereas they extract and chew vegetable fiber.

Trigonalidae comprises species of diurnal parasitic wasps that lay their eggs on the foliage, depending on a herbivorous primary host to ingest their eggs together with plant material (Weinstein & Austin, 1991). Trigonalids may have a secondary host, such as wasps or tachinid fly larvae, which are predators or parasites of the primary host, and ingest eggs (Gauld & Bolton, 1988; Weinstein & Austin, 1991). Mechanical and chemical stimuli from the host mandibles lead to the eclosion of trigonalid egg (Clausen, 1931), and larvae at the first larval instar penetrates the gut lining into the primary host haemocoel (Weinstein & Austin, 1991). Although primary hosts are not known for social wasps, it is assumed that trigonalid larvae infect their larvae after ingestion of tissues of the primary host (usually caterpillars) by trophallaxis, or they may penetrate directly through the cuticle of the secondary host to gain access to the haemolymph (Weinstein & Austin, 1991).

Several Trigonalidae have been recorded as parasitoids of social paper wasps (Polistinae and Vespinae). Species of *Seminota* Spinola have been recorded as parasitoids of *Polistes* Latreille, *Mischocyttarus* de Saussure, *Apoica* Lepeletier, *Pseudopolybia* de Saussure, and *Parachartergus* R. von Ihering (Weinstein & Austin, 1991). *Seminota marginata* was recorded parasitizing *Polistes versicolor* (Olivier), *P. cinerascens* de Saussure, *P. melanosoma* de Saussure, *P. canadensis* (Linnaeus), *Pseudopolybia vespiceps* (de Saussure), and possibly *Apoica pallida* (Olivier) (Weinstein & Austin, 1991). *Apoica flavissima* Van der Vecht, like other species of *Apoica*, are nocturnal wasps that build their nest using plant material, more specifically plant hairs (Wenzel, 1998). Their nests are circular with only one comb, lacking an envelope (Wenzel, 1998). Foragers of *Apoica* are generalists, preying upon invertebrates, mainly lepidopteran larvae, regurgitating their crop contents to feed their own brood.

Specimens of *Seminota marginata* Westwood emerged or were taken off from nest cells of a *Apoica flavissima*.

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sima nest, which was collected in Indiaporã (19°58'54''S 50°17'48''W), São Paulo State, Brazil, on May 16<sup>th</sup> of 2010. *A. flavissima*, like other species of *Apoica*, are nocturnal wasps that build their nest using plant material, more specifically plant hairs (Wenzel, 1998). The nest was well developed and the eleven cells with parasitoids were at the center of the nest. We recovered one adult trigonalid male, one larva, two pupae in early development and two in late development from the *A. flavissima* nest on May 21<sup>th</sup>, while four males emerged on May 27<sup>th</sup>, and one male on June 9<sup>th</sup> of 2010. Two adults were deposited in the MZUSP's Hymenoptera collection, and four adults and three immatures, preserved in alcohol 70%, were deposited in the Hymenoptera collection of the Departamento de Botânica e Zoologia of the Instituto Biociências, Letras e Ciências Exatas da Universidade Estadual Paulista (IBILCE – UNE-SP). Parasitized cells were easily recognized because unlike regular *Apoica* larvae that spin their cocoons above the cell margin, *S. marginata* larvae spin their cocoons about one third the cell height below the margin.

Parasitism of *Apoica* species by Trigonalidae was recorded by Bertoni (1912), who found *S. marginata* parasitizing larvae of *A. pallida* Van der Vecht in a nest sampled in Puerto Bertoni, Paraguay. *A. pallida* is a valid name, but in the past the name was used for several other species of *Apoica*, among them *A. flavissima* and *Angiopolybia pallens* (Fabricius) (Pickett & Wenzel, 2007). Bertoni (1912) highlights the similarity among the specimens identified as *Apoica pallens* from Guyana and as *A. pallida* from Paraguay. Thus, possibly Bertoni's (1912) record is for *Angiopolybia pallens*.

Paper wasps have been considered the secondary host of Trigonalidae, although no primary host has been associated with the host wasp species (Weinstein & Austin, 1991). The first host, in this case, would be a lepidopteran larvae, one of the main preys of *Apoica* and other Epiponini. However, considering that polistines use plant material to build their nests, it is possible that species of *Apoica*, like other social paper wasps, could be facultative primary hosts of Seminota. Weinstein & Austin (1995) observed larvae of Perga Leach, which are herbivorous, as facultative primary hosts. Species of *Apoica* possess shorter and more ventrally curved mandibles with a higher ventral tooth, and a long and high dorsal tooth. Sarmiento (2004) suggests that mandibular structure is strongly adapted for a fine manipulation of plant fibers. Then, adults of Polistinae may ingest Trigonalidae eggs while collecting fibers to build their nests. Similarly to other primary hosts, the mechanical action of the mandible and digestive secretions, present in the adult oral cavity, would lead to egg hatch, and consequently larval emergence. According to Sarmiento (2004), short mandibles, like those found in *Apoica*, are efficient in fiber management and may be less effective in prey chewing. As in the secondary host condition, parasitoid larvae pass from adult to host

larvae by trophallaxis. If the adult ingests the parasitoid eggs collecting vegetable fibers, the parasitoid may be transferred to the host larvae indirectly by trophallaxis or directly by penetrating the cuticle of Polistinae larvae from the nest. In this regard, *Apoica* as well as other Polistinae and species of Vespinae may be facultative secondary hosts of Trigonalidae (Weinstein & Austin, 1991).

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