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# Parasitism of *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae) by *Strongygaster brasiliensis* (Towsend) (Diptera: Tachinidae)

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**Abstract.** *Harmonia axyridis* (Pallas) is a Coccinellidae species originating from northeast Asia and used in biological control of aphids. As an exotic species is very important to know its natural enemies. Thus, this paper provides the first record of *Strongygaster brasiliensis* (Towsend) (Diptera: Tachinidae) parasitizing *H. axyridis* in Southern Brazil.

**Keywords:** Aphids; biological control; invasive species; natural enemy; parasitoid.

## Parasitismo de *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae) por *Strongygaster brasiliensis* (Towsend) (Diptera: Tachinidae)

**Resumo.** *Harmonia axyridis* (Pallas) é uma espécie de Coccinellidae originária do Nordeste da Ásia e utilizada como agente de controle biológico de afídeos. Como é uma espécie invasora é muito importante conhecer seus inimigos naturais. Dessa forma, este trabalho fornece o primeiro registro de *Strongygaster brasiliensis* (Towsend) (Diptera: Tachinidae) parasitando *H. axyridis* no sul do Brasil.

**Palavras-Chave:** Afídeos; controle Biológico; espécie invasora; inimigo natural; parasitoide.

*Harmonia axyridis* (Pallas) is a Coccinellidae species (Coleoptera) originating from northeast Asia (Hukusima & Kamei 1970), and used in biological control of aphids, which are considered pests of many economically important crops (Castro *et al.* 2011; Santos *et al.* 2014).

In Brazil, it was detected for the first time in 2002, in Curitiba, Paraná, feeding on *Tinocallis kahawaluokalani* (Kirkaldy) (Hemiptera: Aphididae) adults and nymphs, which were on *Lagerstroemia indica* Linnaeus, an ornamental plant cultivated in southern Brazil, and on *Pinus* spp. (Pinaceae) feeding on *Cinara atlantica* (Wilson) and *Cinara pinivora* (Wilson) (Hemiptera: Aphididae) (Almeida & Silva 2002).

One of the key factors for the establishment success of an invasive species is the absence of natural enemies (Torchin *et al.* 2003). According to the literature, little is known about the potential impact of natural enemies of *H. axyridis*. Some authors include the pathogens *Metarhizium anisopliae* (Metchnikoff) Sorokin (Deuteromycotina: Hyphomycetes), *Beauveria bassiana* (Balsamo) Vuillemin (Deuteromycotina: Hyphomycetes) and *Hesperomyces virescens* Thaxter (Laboulbeniales: Ascomycetes) as its most important natural enemies (Kenis *et al.* 2008).

Besides these, some birds species are mentioned, such as *Picus canus* Gmelin (Piciformes: Picidae) and *Sitta europaea* Linnaeus (Passeriformes: Sittidae), as well as the parasitoids *Dinocampus coccinellae* (Schrank) (Hymenoptera: Braconidae) (Kenis *et al.* 2008), *Oomyzus scaposus* (Thomson) (Hymenoptera: Eulophidae) (Kuznetsov 1997; Riddick *et al.* 2009). Other predators of *H. axyridis* are the nematodes *Heterorhabditis bacteriophora* Poinar (Rhabitida: Heterorhabditidae) and *Steinernema carpocapsae* (Weiser) (Rhabitida: Steinernematidae) (Kenis *et al.* 2008) and the parasitic mite *Coccipolipus hippodamiae* (McDaniel & Moril) (Actinedida: Podapolipidae) (Riddick *et al.* 2009; Rhule *et al.* 2010).

Parasitoids are probably the most important natural enemies of coccinellids, and the main species belong to the families Eulophidae, Encyrtidae and Braconidae (Hymenoptera). The Euphorinae (Braconidae) include endoparasitoids of Coleoptera adults, where the majority of species belong to the genus *Dinocampus* and parasitize mainly species of Coccinellidae and Curculionidae (Hodek 1973; Hodek *et al.* 2012).

In Brazil, *Dinocampus coccinellae* is the only parasitoid previously reported as parasitizing adults of *H. axyridis*, at low levels (Castro-Guedes & Almeida 2016). Thus, this paper provides the first record of *Strongygaster brasiliensis* (Townsend) (Diptera: Tachinidae) (Figure 1) parasitizing *H. axyridis* in Southern Brazil.

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Twenty two *H. axyridis* adults were collected in the field, in citrus plants in Cerro Azul, Paraná state, in December 2015, feeding on *Aphis* sp. and *Toxoptera* sp. (Hemiptera: Aphididae). The specimens were taken to the laboratory, sorted according to sex, kept in couples in plastic containers of 300 mL in brood chambers at 25 ± 1 °C, 70 ± 10% RH and 12:12 h L:D and fed with frozen eggs of *Anagasta kuehniella* (Zeller) (Lepidoptera: Pyralidae). Emergence of parasitoids was monitored on all collected adults. Parasitoids pupae found at the bottom of the plastic containers were collected and placed in separate vials until the adult flies emerged. The emerged flies were preserved in 70% ethanol with each puparium.

Four parasitized *H. axyridis* adults, two females and two males were detected. From each adult, only one parasitoid fly emerged, the same reported for *Strongygaster triangulifera* (Loew) when the host was *H. axyridis* (Katsoyannos & Aliniazee 1998). The mean time from pupation to adult flies emergence was 28 days. A total of 4 females of *S. brasiliensis* emerged.

In its native range, *H. axyridis* is attacked by several parasitoid flies, including *Phalacrotophora philaxyridis* Disney, *P. berolinensis* Schmitz, and *P. fasciata* (Fallen) (Phoridae), *Strongygaster triangulifera*, *Medina luctuosa* (Meigen) and *Medina separata* (Meigen) (Tachinidae) (Roy *et al.* 2011).

Tachinidae is one of the most diverse families of Diptera, with approximately 8, 500 species described (O'Hara 2013) and is widespread in all biogeographical regions. Its species are parasitoids and act regulating the populations of herbivorous, and also structuring ecological communities, being very importants biological control agents of various agricultural pests (Stireman *et al.* 2006).

There are records for 8 genera of Tachinidae that parasitizes Coccinellidae in the Americas: *Lydinolydella* in Neotropical region, and *Aplomyiopsis*, *Chetogena*, *Chrysotachina*, *Lespesia*, *Myiopharus*, *Nemorilla* and *Strongygaster* in the Nearctic region (Guimarães 1977; Arnaud 1978).

Another species of the same genus, *S. triangulifera*, is reported parasitizing *H. axyridis* in the western North America (Katsoyannos & Aliniazee 1998). *Strongygaster triangulifera* is widely distributed in North America and it parasitizes several Coleoptera families and other insect orders as: Dermaptera, Hemiptera, Lepidoptera and Orthoptera (Arnaud 1978; Reeves & O'Hara 2004; Hodek *et al.* 2012). In South America, *S. brasiliensis* is recorded parasitizing Coleoptera (Chrysomelidae, Meloidae and Lagriidae) and Hemiptera (Coreidae) (Guimarães 1977, 1978). Both species, *S. triangulifera* and *S. brasiliensis*, are similar in many aspects, but after the examination of females of both species some differences of coloration and in the female terminalia were found.

Some species of *Strongygaster* (*S. triangulifera* and *S. brasiliensis*) are capable of parasiting non-native host species. For example, this was observed in *S. triangulifera*, with the same host species *H. axyridis* (Katsoyannos & Aliniazee 1998) and in *S. brasiliensis*, recorded from the invasive species *Lagria villosa* Fabricius (Coleoptera, Lagriidae) (Guimarães 1978) and a record for *H. axyridis* and *Cycloneda sanguinea* (L.) in Minas Gerais State (Togni *et al.* 2015).

As *H. axyridis* is increasing its coverage areas, it is very important to know details of the parasitoid-host dynamics of these species in invaded areas. It is also important to study the life history of the parasitoid and its impact in the host populations, as well

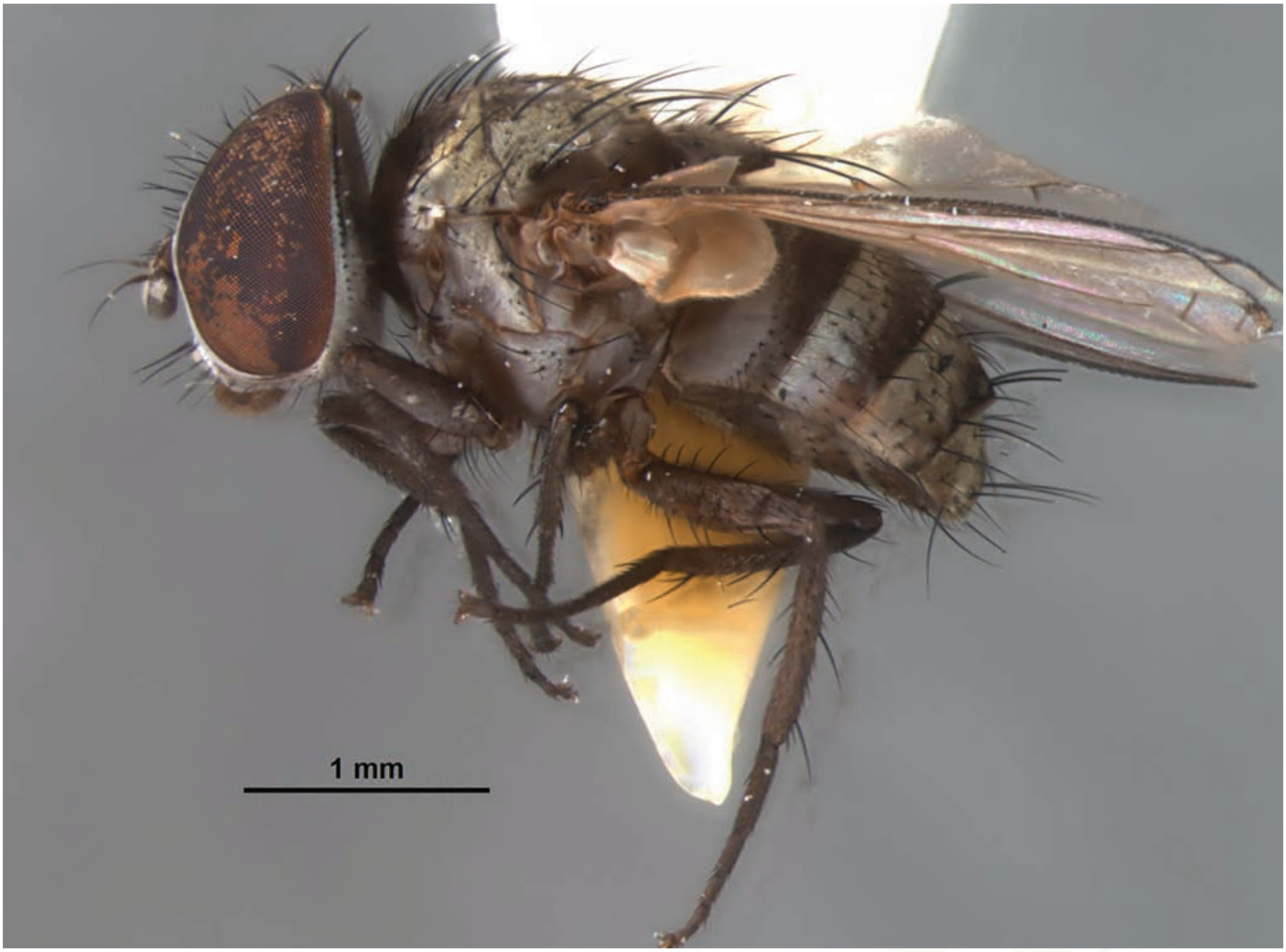


Figure 1. *Strongygaster brasiliensis* (Townsend) (Diptera: Tachinidae) (Image: R.V.P. Dios).


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as other hosts, aiming for possible future strategies of biological control.

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