



SHORT NOTE

Presence of Strepsiptera Parasites in the Independent-founding Wasp, *Polistes satan*

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Abstract

Although the paper wasp genus, *Polistes*, has been examined extensively, little is known about the occurrence of parasitism in this group. We detected the obligate parasitic insect group, Strepsiptera in the gaster of *Polistes satan* Bequaert adult females. By dissecting 161 adult females from 24 colonies, we identified a total of four styloplized wasps in three colonies during the wet season.

Parasites represent a significant proportion of the total biomass in natural ecosystems, particularly in insect societies (Hughes et al., 2008). Therefore, they are of great ecological significance. Manipulative parasites are known to have the ability to redirect host relationships and extend the range of their habitats (Lefevre et al., 2009). However, little is known about the abundance of parasites and pressures imposed through parasitism.

Although our understanding of social behavior has benefited greatly from the use of *Polistes* wasps (Reeve, 1991), the incidence of parasitism in this group has yet to be elucidated in detail. Studies on parasitism in *Polistes* wasps have mainly focused on the incidence and probable effects of parasitoids belonging to Hymenoptera, Lepidoptera and less common Diptera (Makino, 1985; Yamane, 1996). These ectoparasitoids, which oviposit on cell walls, typically attach to pupal hosts and consume them, after which they pupate and leave. Although the parasitoids of *Polistes* wasps have received less attention in the last few decades, the abundance and ecological impact of the obligatory endoparasites, Strepsiptera have been investigated at length in paper wasps (de Oliveira & Kogan, 1962; Hughes et al., 2003; Hughes et al., 2004; Vannini et al., 2008; Kathirithamby, 2009; Manfredini

et al., 2010; Móczár & Sziráki, 2011; Beani et al., 2011; Manfredini et al., 2013). Cervo et al. (2000) hypothesized that the rapid spread of the introduced species *P. dominulus* Christ in North America may be due to the lack of parasitization by strepsipterans. Hughes et al. (2003, 2004) reported the prevalence of the parasite Strepsiptera in some adult and immature *Polistes* wasps. Manfredini et al. (2013) recently examined susceptibility towards the parasite Strepsiptera at both the individual (immune defense) and colony level, i.e. hygienic behavior (removal of diseased individuals by nestmates) in *P. dominula* Christ.

In the present study, we investigated the occurrence of parasitism by the Strepsiptera in the Neotropical paper wasp, *P. satan*. This species is an independent-founding wasp that is found in southeastern Brazil (Carpenter, 1996) and builds abundant nests in dark and sheltered places, such as inhabited human houses, stables, and the hollows of termite nests (Richards, 1978). We recently determined the incidence of the hymenopterous parasitoid, *Pachysomoides* sp. (Ichneumonidae, Cryptinae), in this species (Kudô et al., 2013).

In late July 2009 (dry season) and late March 2011 (wet season), 8 and 16 *P. satan* colonies, respectively, were collected at a farm near Cajuru (47°15'S, 21°26'W) in São



Paulo state, Brazil. A total of 63 and 98 adult females were collected from the dry (7.88 ± 2.61 wasps/colony, mean \pm SE) and wet colonies (6.13 ± 1.71 wasps/colony). The gaster of all wasps collected was dissected under a binocular microscope to determine the existence of the parasite Strepsiptera.

We detected a total of four stylopized wasps in three colonies during the wet season. The number of strepsipterans was in one each of the three stylopized wasps, but two in the remaining stylopized wasp. Although the overall percentage of stylopized wasps was only 2.5% (4 out of 161 wasps), we should have screened adults not only from nests, but also from foraging sites, as described by Hughes et al. (2003, 2004). In addition, the dissection of all colony members including immature wasps is needed to evaluate the levels of parasitism by the Strepsiptera in more detail in future studies.

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