SCIENTIFIC NOTE

First Record of Phorid Parasitoids (Diptera: Phoridae) of the Leaf-Cutting Ant *Atta bisphaerica* Forel (Hymenoptera: Formicidae)

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Primeiro Registro de Forídeos Parasitóides (Diptera: Phoridae) da Saúva *Atta bisphaerica* Forel (Hymenoptera: Formicidae)

RESUMO - Moscas da família Phoridae parasitam várias espécies de formigas, inclusive diversas saúvas (*Atta* spp.). Nesta nota são relatados ataques de três espécies de forídeos (*Myrmosicarius grandicornis* Borgmeier, *Apocephalus attophilus* Borgmeier e *Neodohrniphora bragancai* Brown) contra operárias de *Atta bisphaerica* Forel em uma área de pastagem localizada em Viçosa, Minas Gerais. As duas primeiras espécies já são conhecidas como parasitóides de outras saúvas, mas *N. bragancai* foi recentemente descrita e encontrada somente ao redor de ninhos de *A. bisphaerica*. Cada uma dessas espécies de forídeos seleciona operárias que realizam diferentes tarefas e oviposita em partes específicas do corpo do hospedeiro.

PALAVRAS-CHAVE: Parasitismo, comportamento de oviposição

ABSTRACT - Phoridae flies parasitize several ant species, including many *Atta* leaf-cutting ants. In this note, the attacks of three coexisting phorid species *(Myrmosicarius grandicornis* Borgmeier, *Apocephalus attophilus* Borgmeier and *Neodorhniphora bragancai* Brown) against *Atta bisphaerica* Forel workers in a pasture located in Viçosa County, Minas Gerais State, Brazil, are reported. The first two species of phorids are known to parasitize other leaf-cutting ants. *N. bragancai*, however, has been found only around *A. bisphaerica* nests. Each of these phorid species selects ants engaged in different tasks and oviposits in specific sites of the ant body.

KEY WORDS: Parasitism, oviposition behavior

The leaf-cutting ant *Atta bisphaerica* Forel is a grass specialist (Fowler *et al.* 1989) and an increasingly important pest of pasture and sugarcane in Brazil (Della Lucia 1999). Despite the relevance of *A. bisphaerica*, its ecology is poorly understood. Other *Atta* species are hosts of several phorid (Diptera) parasitoids (Borgmeier 1928, 1931; Feener & Moss 1990; Disney 1994, 1996), but there are no records of phorid species attacking *A. bisphaerica* (B.V. Brown and H. Disney, personal communication). The purpose of this research was to find phorid parasitoids associated with *A. bisphaerica* and to determine their biological and behavioral characteristics.

In July 1999, three field trips were made to a pasture containing several *A. bisphaerica* adult nests (at least three-year old) in Viçosa County, Minas Gerais State, Brazil. Trips were made after 3:00 PM, when foraging ants have begun their activity. At each visit, trails and foraging areas were inspected for approximately 2h while ants were active during late afternoon, and phorid presence and oviposition behavior were recorded. Three phorid species were found: *Apocephalus attophilus* Borgmeier, *Myrmosicarius grandicornis* Borgmeier and *Neodohrniphora bragancai* Brown. The first species is a parasitoid of *Atta cephalotes* (L.), *Atta colombica* Guérin, *Atta laevigata* (F. Smith) and *Atta sexdens* (L.) (Borgmeier 1928, 1931; Feener & Moss 1990) while *M. grandicornis* parasitizes *A. sexdens* (Feener & Moss 1990) and *A. laevigata* (M. Bragança, personal observation). *N. bragancai* however, is a recently described species (Brown 2001) that has been reared from *A. bisphaerica* by the senior author. Voucher specimens of the three species of phoris were deposited at the Museum of Entomology at the Universidade Federal de Viçosa.

The oviposition behavior of *A. attophilus* against *A. bisphaerica* is similar to that described for *A. laevigata* (Erthal & Tonhasca 2000): a fly walks rapidly among ants in the foraging area, selecting individuals that are cutting the vegetation. The fly lands on the mandible that anchors the ant's head during the cutting process, and lays its egg inside the ant's mouth. *M. grandicornis* and *N. bragancai* attack *A. bisphaerica* workers walking along foraging trails near the entrance of the nests holes. Oviposition behavior of *M. grandicornis* against *A. bisphaerica* is similar to that found for *A. sexdens* (Tonhasca *et al.* 2001). The fly hovers above the target ant before landing on it and inserting an egg in the side of the host's head. As for *N. bragancai*, it pursues *A. bisphaerica* and apparently swiftly inserts its ovipositor in the host's anus, similarly to what was observed for *Neodorhniphora erthali* Brown, which parasitizes *A. laevigata* (Bragança *et al.* 2002). These oviposition patterns were determined during at least 15 individual observations.

Because *N. bragancai* was the most abundant phorid species in the field and because its biology was unknown, some additional observations were made in the laboratory. In early August 1999, 12 female *N. bragancai* were collected in the field along with 150 randomly selected *A. bisphaerica* workers. Three groups of 50 ants and four phorids were released in an acrylic observation chamber (100 cm long x 45 cm wide x 40 cm high) where they remained for 4h. Afterwards groups of five workers were placed in petri dishes, which were then taken to environmental chambers (26.5 ± 0.5ºC temperature; 85 ± 5% RH). Ants were daily fed a 10% honey-water solution. Parasitized workers, recognized by the presence of a phorid puparium between the mandibles of dead ants (Tonhasca 1996), were transferred singly to glass vials (8.2 cm x 2.3 cm), where they were kept until the flies emerged. To evaluate the possible influence of host size on the sex of emerging flies (Morrison & Gilbert 1998), the greatest width of the ants' head capsule was measured under a stereomicroscope equipped with an ocular micrometer (0.1 mm precision).

The oviposition behavior of *N. bragancai* under laboratory conditions was similar to that observed in the field. Attacks resulted in a single puparium for about half of the exposed ants (79 out of 150), and subsequently 50 flies emerged from the puparia. The time period between oviposition and fly emergence was 26 ± 1.2 days (mean ± standard deviation, n = 50). The average head capsule width of ants producing female flies (3.5 ± 0.8 mm, n = 26) was significantly larger ($t = 2.21$, $P = 0.03$, d.f. = 36) than the head width of those ants from which male flies emerged (2.9 ± 0.6 mm, n = 24). Female flies were significantly larger ($t = 5.11$, $P < 0.001$, d.f. = 37) than male flies, with wing length of 2.1 ± 0.1 mm (n = 20) and 1.9 ± 0.1mm (n = 20), respectively. Larger body and host sizes for female flies are likely associated with their greater need of resources for offspring production (Morrison *et al.* 1999).

Studies of phorid parasitism against *Atta* leaf-cutting ants have demonstrated that these flies restrict their attacks to specific host sizes, ants performing specific tasks and certain body parts (Orr 1992; Feener & Brown 1993; Brown 1997, 1999; Erthal & Tonhasca 2000; Tonhasca *et al.* 2001). In fact, *A. attophilus*, *M. grandicornis* and *N. bragancai* coexist in the same place (also location) and attack the same host, but apparently select workers at different sites (foraging area or along foraging trails) and target particular body parts during oviposition.

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