




Social wasps captured by the spider *Trichonephila clavipes* (L.) in anthropogenic environments associated with Atlantic Forest fragments in southern Minas Gerais, Brazil

Igor Henrique da Silva ^a, Glauco Cássio de Sousa Oliveira ^b, Marcos Magalhães de Souza ^{a*}

^a Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Inconfidentes, 37576-000, Minas Gerais, Brasil.
* glaucomlds@hotmail.co

^b Programa de Pós-Graduação em Botânica Aplicada, Universidade Federal de Lavras, Lavras, 37203-202, Minas Gerais, Brasil.

Received: September 2, 2023 / Accepted: December 17, 2023 / Published online: April 29, 2024

Abstract

Spiders are found in diverse natural ecosystems and urban environments, exhibiting a broad variety of morphological characteristics and prey-capture strategies. These arthropods play important functions in trophic chains, acting as both predators and prey, which is of great relevance for ecosystem management and biological control in agricultural systems. This study aimed to identify social wasps captured by *Trichonephila clavipes* (L., 1767) in anthropogenic areas associated with semideciduous seasonal forest fragments. The study was conducted in 2023 in anthropogenic areas associated with Atlantic Forest fragments in southern Minas Gerais, Brazil. Two individuals of *Protopolybia sedula* (de Saussure, 1854) were recorded. The specimens were captured in suspended webs of *T. clavipes*. Given the paucity of information on this interaction, further research is needed to better understand the frequency and impact of the relationship on social wasp populations.

Keywords: Feeding; Golden silk; Araneae; Vespidae.

Vespas sociais capturadas pela aranha *Trichonephila clavipes* (L.) em ambientes antropizados associados a fragmentos de Mata Atlântica no sul de Minas Gerais, Brasil

Resumo

Aranhas são encontradas em diversos ecossistemas naturais e ambientes urbanos, e exibem uma ampla variedade de características morfológicas e estratégias de captura de presas. Desempenham importantes funções nas cadeias tróficas, seja como predadores e presas, o que tem relevância para o manejo de ecossistemas e o controle biológico em sistemas agrícolas, portanto, o objetivo deste trabalho é relatar vespas sociais capturadas por *Trichonephila clavipes* (L., 1767) em áreas antropizadas associadas a fragmentos de floresta estacional semidecidual. O estudo foi conduzido em 2023 em áreas antrópicas associadas a fragmentos de Mata Atlântica no sul de Minas Gerais, Brasil. Foram registrados dois indivíduos de *Protopolybia sedula* (de Saussure, 1854), presos em teias suspensas dessa aranha. Dada a escassez de informações sobre essa interação, ressalta-se a necessidade de pesquisas adicionais para compreender melhor a frequência e o impacto dessa relação sobre as populações de vespas sociais.

Palavras-chave: Alimentação; Fio-de-Ouro; Araneae; Vespídeo.

With about 50 thousand described species, spiders (Araneae) represent the richest order of the class Arachnida (World Spider Catalog 2021). Brazil hosts the greatest diversity of spiders in the Neotropical realm (Brescovit, Oliveira & Santos, 2011). These arachnids have a wide variety of prey-capture strategies, such as morphological adaptations and the ability to produce different types of silk (Jäger et al., 2021). Spiders inhabit several terrestrial ecosystems (Castanheira et al., 2016; Nogueira et al., 2021), including anthropogenic environments, such as agricultural and

urbanized areas (Dias, Brescovit, Couto & Martins, 2016; Rosa, Santos, Brescovit, Mafra & Baretta, 2018).

These arthropods play important functions in trophic chains by serving as predators for several taxa, mostly insects (Robinson & Mirick, 1971; Nyffeler & Birkhofer, 2017) and, in some cases, even vertebrates (Moura et al., 2022). Additionally, spiders participate in trophic chains as prey (Wilson, Mullen & Holway, 2009). It is crucial to gain a deep understanding of the trophic relationships of these organisms, as they contribute to maintaining the balance of

natural ecosystems and perform biological control functions in agricultural systems (Young & Edwards, 1990; Pereira & Pires, 2020; Campbell, Milne, Dinh, Daniels & Ellis, 2020).

Trichonephila clavipes (L., 1767), commonly known as the golden silk spider, is a species belonging to the family Araneidae. It is widely distributed on the American continent and occurs in various Brazilian ecosystems and biomes (Bartoleti, Peres, Fontes, Silva & Solferini, 2018). Predation by this spider typically involves small winged insects that get trapped in its web. The prey is quickly enveloped by silk threads and consumed, commonly after inoculation of digestive fluids (Díaz, 2005).

There is scarce information about the presence of social wasps in the diet of *T. clavipes* (Litte, 1977). It is known that spiders can use abandoned wasp nests as shelter (Araújo & Maria, 2008). However, few studies investigated spider predation on social wasps (Hymenoptera: Vespidae) (Mendes, Netto, Barbieri, Guarda & Braga, 2010). It should be noted that social wasps perform important ecosystem services, such as biological control (Prezoto, Maciel, Detoni, Mayorquin & Barbosa 2019) and pollination, and can be used for biomonitoring (Brock, Cini & Sumner, 2021),

In view of the foregoing, this study aimed to report the capture of social wasps by *Trichonephila clavipes* in anthropogenic areas associated with fragments of semideciduous seasonal forests, a vegetation physiognomy found in the Atlantic Forest. The records were made at the Farm School of the Federal Institute of Education, Sciences and Technology of Southern Minas Gerais (IFSULDEMINAS), Inconfidentes (22°18'32.7"S 46°19'46.1"W), Minas Gerais State, Brazil, between February and July 2023. Weekly surveys for social wasps were carried out on suspended webs of *T. clavipes* close to houses, agricultural areas, forest edges in anthropogenic areas, and areas close to artificial lakes associated with semideciduous seasonal forest fragments. Each inspection lasted from 1 to 2 h, totaling 14:30 h of sampling effort.

The biological material was immersed in 70% alcohol and later stored and deposited in the Biological Collection of Social Wasps (CBVS) of the Zoology Laboratory of IFSULDEMINAS, Inconfidentes Campus, and the zoological collection of the Federal University of Minas Gerais (UFMG). Spiders were identified by Professor Dr. Adalberto J. Santos from UFMG, and social wasps were identified by Dr. Marcos Magalhães de Souza. Identification was achieved by using dichotomous keys and comparison with species deposited in CBVS.

Two specimens of *Protopolybia sedula* (de Saussure, 1854) were collected from two different webs of *T. clavipes* (Figure 1) located on the edges of forest fragments in anthropogenic environments. The individuals were trapped and entangled in the webs and partially consumed by *T. clavipes* females, but no colonies of the vespidae species were observed within a 50 m radius.

Predation of social wasps by *T. clavipes* is probably facilitated by the presence of toxins in the silk threads of webs, which can stun captured prey and reduce their movements (MARQUES et al., 2005; Salles et al., 2005). These web

characteristics may explain the diversity of insects composing the diet of *T. clavipes*, including mainly lepidopterans, coleopterans, dipterans, and bee species (Higgins 1987; Hénaut, Machkour-M'Rabet, Winterton & Calmé, 2010). Litte (1977), in a study conducted in North America, observed the predation of *Mischocyttarus mexicanus* de Saussure, 1854, by *T. clavipes*. The spiders built their webs close to wasp colonies (approximately 30 cm apart), favoring the eventual capture of these social wasps during foraging.



Figure 1. Representative images of species involved in the interaction. A. *Trichonephila clavipes* female; B. *Protopolybia sedula* (dorsal view); C. *P. sedula* (side view). Source: the authors.

There are also reports of *T. clavipes* predation on wasps, but prey were not identified at the family or species level (Robinson & Mirick, 1971). These findings suggest that these spiders, given their opportunistic nature, feed on unusual prey, such as social wasps, which are eventually intercepted and become trapped in webs.

This type of trophic interaction has been observed in other spider species, such as in the predation of *Polistes apachus* de Saussure, 1857, by *Latrodectus mactans* Fabricius (Araneae: Theridiidae) in North America (Gibo & Metcalf, 1978) and that of *Polistes jadvigae* von Dalla Torre, 1904, by an unidentified spider species (Yoshikawa, 1963). Spiders are believed to be one of the main predators of *Mischocyttarus mexicanus* in the United States (Litte, 1977) and of *M. drewseni* de Saussure, 1857, in the Brazilian Amazon (Jeanne, 1972). Jeanne (1972) also reported the predation of *Polistes canadensis* (Linnaeus, 1758), which was captured in flight by a tarantula. Laboratory experiments demonstrated the predation capacity of the spider *Nephilingis cruentata* (Fabricius, 1775) on *Mischocyttarus cerberus* (Richards, 1940), *Polybia paulista* (von Ihering, 1896), and *Polistes lanio* (Fabricius, 1775) (Mendes et al., 2010).

Predation of social wasps by *T. clavipes* is likely occasional. However, given the paucity of information, further studies are needed to determine the frequency of this interaction and its consequences on social wasp populations.

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