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Nota

First record of parasitism by *Lespesia archippivora* (Diptera: Tachinidae) on *Gonodonta fulvangula* (Lepidoptera: Noctuidae)

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Abstract

This study reports the parasitism of *Gonodonta fulvangula* Geyer, 1832 by *Lespesia archippivora* (Riley, 1871) in Cerro Ancón, Panamá, representing a new host record. Two *G. fulvangula* larvae were observed infested with eggs from a tachinid fly, one of which was taken to the laboratory for further observation. The identification conclusively confirmed that the adults were *L. archippivora.*

Additional keywords: Biological control, biodiversity, insect parasites, neotropical ecosystems

Introduction

Gonodonta fulvangula Geyer, 1832 (Lepidoptera: Erebidae) is primarily distributed in Neotropical regions, from Mexico to Central and South America, where warm and humid climates favor its establishment and development (Torres-Soto et al. 2015). From an economic standpoint, this species is significant as a frugivorous pest, since larvae and adults can perforate fruits and feed on the pulp, allowing the entry of pathogens and reducing the commercial quality of tropical crops (Delgado and González 2012). These injuries result in direct losses due to lower yields and market rejection—both domestically and internationally—as well as increased production costs, partly due to the intensive use of pesticides (Méndez-Ruiz et al. 2014). Moreover, parasitoids from the orders Hymenoptera (mainly in the families Braconidae and Ichneumonidae) and Diptera (family Tachinidae) have been recorded, which could contribute to the biological control of *G. fulvangula* by limiting its population density and impact on crops (Johnson y Freedman 1998, Méndez-Ruiz et al. 2014).

Parasitism is an ecological interaction in which one organism, the parasite, lives at the expense of another, the host, causing harm to the latter. In tropical ecosystems, parasitoid insects play a crucial role in regulating insect populations, acting as natural biological control agents (Godfray 1994). The family Tachinidae, which includes *Lespesia archippivora* (Riley, 1871), is one of the most diverse and successful groups among dipteran parasitoids, with over 8,000 described species that primarily parasitize lepidopteran larvae (Stireman et al. 2006). Previous studies have identified *L. archippivora* as a generalist parasitoid of various lepidopteran species, including economically important pests such as *Spodoptera exigua* (Hübner, 1808) and *Heliothis virescens* (Fabricius, 1777), as well as ecologically significant species like the monarch butterfly (*Danaus plexippus*) (Linnaeus, 1758) (Stireman et al. 2006, Stapel et al. 1997, Oberhauser et al. 2007).

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In this context, the observation of parasitism by a tachinid flies in the larvae of *G. fulvangula* in Cerro Ancón, Panamá, offers a valuable opportunity to provide evidence specific interactions between these organisms in a natural environment. This study also broadens the known host range of *L. archippivora*.

Materials and methods

The study was conducted at Cerro Ancón, located in Panama City, Panama (lat 8°57'35.41" N, long 79°32'51.68" W). This site is a protected area that supports a variety of tropical flora and fauna, with predominant vegetation consisting of secondary tropical moist forest. Field observations were conducted on July 21, 2024, at 10:00 am, under stable weather conditions, with an average temperature of 28 °C and relative humidity of approximately 80%. During the field survey, two larvae of the lepidopteran *Gonodonta fulvangula* were observed infested with parasitoid fly eggs (Fig. 1). Of the two individuals, one larva was taken to the laboratory at the Museo de Artrópodos Venenosos del Museo de Invertebrados G. B. Fairchild at the University of Panama for further observation, while the other was lost during sampling.

The collected larva was kept under controlled laboratory conditions at a temperature of 25 ± 2°C, with a photoperiod of 12 hours of light and 12 hours of darkness. It was fed fresh leaves from a plant in the Annonaceae family, presumed to be its host plant. Daily observations were conducted, detailing morphological changes and significant events, such as the onset of the prepupal stage on July 22nd and the completion of pupation on July 24th. The parasitoid fly eggs hatched two to three days after oviposition (Fig. 2A). The emerging larvae penetrated the body of the *Gonodonta fulvangula* larva and continued developing internally. On July 28th, three parasitoid fly larvae emerged from the pupa of *Gonodonta fulvangula* and pupated in the substrate (Fig. 2B). The adult flies emerged on August 9th, at which point a preliminary identification was made, confirming the specimens belonged to the family Tachinidae (Fig. 3). The identification of the parasitoid fly was carried out by comparing an extensive series of specimens previously identified by specialists, which are deposited in different reference collections of which we made use; such as the G.B. Invertebrate Museum Fairchild, from the University of Panama, Reference Collection of the Smithsonian

Figure 1. Larvae of the lepidopteran *Gonodonta fulvangula* were observed infested with parasitoid fly eggs.

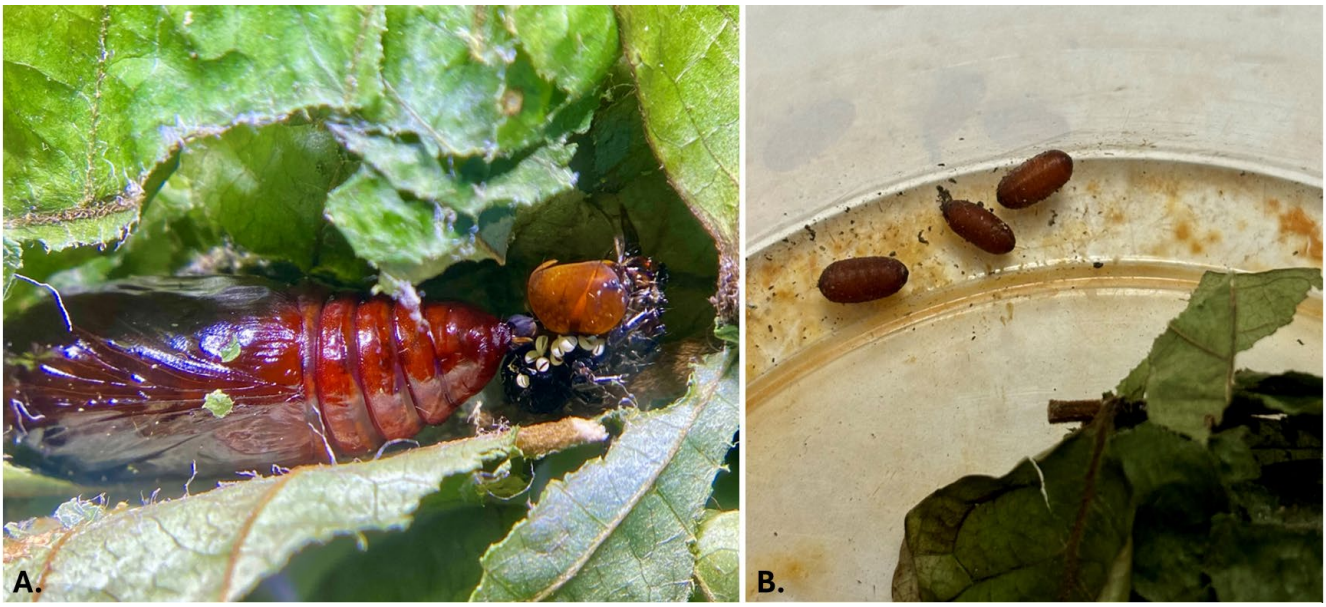

Figura 2. A. Parasitoid fly eggs hatched; B. three parasitoid fly larvae emerged from the pupa of *Gonodonta fulvangula* and pupated in the substrate.

Figura 3. Habitus of *Lespesia archippivora* (Riley, 1871) adult hatched.

Tropical Research Institute in Panama and the Reference Collection of the Entomology Master's Program, from the University of Panama. In addition to the review of specimens from the three collections, use was made of various literature (Beneway 1963, Santos-Murgas 2019, Santos-Murgas y Jaen 2020, Santos-Murgas et al. 2020, Toma 2010).

Results and discussion

During its development, the *Gonodonta fulvangula* larva entered the prepupal stage on July 22 and completed pupation on July 24, constructing a chamber from the leaves of its host plant. The 12 eggs of the parasitoid fly hatched two to three days after oviposition, with the fly larvae penetrating the lepidopteran's body. On July 28, three fly larvae emerged from the *G. fulvangula* pupa and successfully pupated in the laboratory. The adult flies emerged on August 9 and were identified as *Lespesia archippivora*.

Previous studies have reports of *Lespesia archippivora* as a parasitoid of various lepidopteran species, including economically important agricultural pests such as *Spodoptera frugiperda* (J.E. Smith, 1797) (fall armyworm) and *Heliothis virescens* (tobacco budworm), as well as ecologically significant species like the monarch butterfly (*Danaus plexippus*) (Smith et al. 2007, Stireman et al. 2006, Stapel et al. 1997, Oberhauser et al. 2007). This wide host range suggests significant adaptability in *L. archippivora*, reinforcing its ecological importance in regulating insect populations across various ecosystems. Furthermore, its ability to parasitize both agricultural pests and ecologically important species underscores its potential role as a biological control agent, although the efficacy of its parasitism in non-pest hosts remains under-studied. In Panama, L. archippivora has been reported as a parasitoid of *Quadrus cerialis* (Stoll, 1782) (Hesperiidae) (Santos 2019) and *Halysidota tessellaris* (J.E. Smith, 1797) (Erebidae) (Abrego y Santos 2019).

Given its known interactions with a variety of lepidopteran species, the observation of *L. archippivora* parasitizing *G. fulvangula* represents a novel host record. This finding is particularly significant within neotropical ecosystems, where parasitoid-host interactions play a critical role in maintaining biodiversity and regulating insect populations. Recording new parasitoid-host relationships in these ecosystems contributes to our understanding of ecological balance in regions with high biological diversity, which are often under pressure from human activities (Janzen 1981). Further research is needed to deepen our understanding of these interactions and their broader impact on lepidopteran and parasitoid communities.

Conclusions

This study reports the parasitism of *Gonodonta fulvangula* by *Lespesia archippivora* in Cerro Ancón, Panama, marking a new host record. This discovery underscores the adaptability of *L. archippivora* as a parasitoid in neotropical ecosystems. Further research is encouraged to investigate the broader impact of *L. archippivora* on the biodiversity of lepidopteran populations in these environments.

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