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Scientific Note

First record of the association of a species of Lycaenidae (Lepidoptera) with *Zornia latifolia* Sm. (Fabaceae), and its parasitoid (Hymenoptera: Chalcididae) in Brazil

Suianne Oliveira dos Santos Cajé[1], Jefferson Duarte de Melo[1], Erlande Lins da Silva[2] & Iracilda Maria de Moura Lima[1]

1. Laboratório de Bioecologia de Insetos, Instituto de Ciências Biológicas e da Saúde, Universidade Federal de Alagoas, Brazil. 2. Herbário MAC, Instituto do Meio Ambiente do Estado de Alagoas (IMA-AL), Brazil.

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Corresponding author:
Suianne Oliveira dos Santos Cajé
cajesuianne@gmail.com

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Abstract. The family Lycaenidae (Lepidoptera) comprises over 6,000 described and widely distributed species. However, studies on interactions with other insects such as ants, parasitoids, and with food plants in the Neotropical region, are still scarce, even though such information are fundamental for better understanding the natural history of this taxonomic group. This study reports a new food plant to larvae of Lycaenidae species in the neotropics, as well as its parasitoid. Lycaenidae larva (n = 1) was found and collected for immature stage observation under laboratory conditions. The larva fed on petals and seeds of *Zornia latifolia* Sm. (Fabaceae). Nineteen days after pupation in laboratory one larvipupal parasitoid of the genus *Conura* (Chalcididae) had egressed. This is the first report of tritrophic relationship amongst *Z. latifolia*, a Lycaenidae larva and its larvipupal parasitoid of the genus *Conura* in a periurban area near remnants of the Atlantic Forest in Northeastern Brazil.

Keywords: Bioecology; Insect-plant interactions; Neotropical region; Parasitoidism.

Natural history knowledge of phytophagous insects is an important source of information about bioecological interaction network (Del-Claro *et al*. 2013). Nevertheless, studies on this topic remain scarce in the Neotropical region, and, moreover, tritrophic interactions amongst plants, herbivores and their parasitoids are fundamental to understand terrestrial ecosystems.

In the case of Lycaenidae, a Lepidopteran family distributed worldwide with over 6,000 described species, the lack of inventories and information about immature and adults stages has been impeding advances in resolving taxonomic and evolutionary issues for this group, as well as limiting bioecological information regarding associations among other insects such as ants and parasitoids, mainly in the Neotropics (Pierce *et al.* 2002; Duarte 2007). In Brazil, there are about 426 valid species (Duarte & Robbins 2015). Although the literature is scarce, it is known that most larvae of neotropical species feed on the reproductive organs of phanerogams, for example Malpighiaceae, Malvaceae and Oxalidaceae (Kaminski & Freitas 2010; Silva *et al*. 2016; Vargas *et al.* 2016).

Lycaenid populations are naturally controlled by predators (*e.g.*, birds, spiders, wasps, and ants), and parasitoids of the eggs, larvae and pupae (Sourakov 2013; Pinheiro & Cintra 2017). This study reports a new food plant to larvae of Lycaenidae species in the neotropics, as well as a biological control agent.

Larva (n = 1) and plant were found and collected at *Campus* A. C. Simões, Federal University of Alagoas (9°33'20" S 35°46'37" W) (Figure 1A), and the observations were carried out in the Bioecology Insect Laboratory at the Institute of Biological and Health Sciences, during April 2019. The phytophagy test for confirmation of the food plant was performed using as a rearing container an acrylic pot (39.25 mL) with a paper towel covering its inner base, moistened with a drop of water (~0.05 mL) on which the plant part and larva were placed. The rearing system was cleaned daily, by replacing the paper towel, as well as the plant, until feeding stopped (prepupa). When it reached the pupal stage, was transferred to the cage (Lima & Carvalho 2017). The minimum and maximum values of temperature (°C) and relative humidity (%) were recorded daily (averages, respectively, 25.3 °C to 27 °C; and 74.7% to 56.3%).

The Lycaenidae was labelled using the identification keys available (Dias 2006) and the field guide (Diniz *et al*. 2013), and the parasitoid based on specialized literature (Tavares & Brotto 2019). The plant species was identified by researchers from the MAC Herbarium, Instituto do Meio Ambiente do Estado de Alagoas (IMA/AL), Brasil, where the exsiccate was prepared and deposited under the registration number MAC 65040. The pupal exuviae and parasitoid were preserved in 70% ethanol for further species identification. The voucher specimens will be deposited in the Coleção Entomológica Padre Jesus Santiago Moure, Departamento de Zoologia, Universidade Federal do Paraná, Brasil (DZUP).

The larva developed and reached the pupal stage, and *Zornia latifolia* Sm. (Fabaceae) was confirmed as the observed food plant. The genus *Zornia* consists of about 80 species, mainly distributed in tropical and subtropical regions of the world (Klitgaard & Lavin 2005). *Zornia latifolia* is one of 36 Brazilian species and is found in all regions of the country (Fortuna-

Perez *et al*. 2015), occurring in Cerrado, rupestrian fields, forest boundaries and in sandbanks; it has excellent forage capability and is also used in traditional medicine (Lorenzi 2000; Ferreira *et al*. 2015). In this study, Lycaenidae larva, with the color pattern uniformly light green and tegument covered with translucent short setae, attacked petals and green seeds (Figures 1B and 1C). Species of *Zornia* were recorded as food plants for Lycaenidae larvae: (1) *Zornia diphylla* (L.) Pers. for *Freyeria putli* (Kollar), *Freyeria trochylus* (Freyer) in India; to *Zizeeria karsandra* (Moore) in West Malaysia; and for *Zizina otis* (Fabricius) in Hong Kong (Robinson *et al*. 2010); and *Zornia gibbosa* Span., for *Zizeeria karsandara* (Moore) in India (Kanagaraj & Kathirvelu 2018). In addition, *Zornia latifolia* was also recorded for *Eurema elathea* (Cramer) (Pieridae) in Brazil (Fontes *et al.* 2007).

Nineteen days after pupation in laboratory, one parasitoid of the genus *Conura* egressed from a lycaenid through a circular opening in the lateral part of the thorax (Figures 1D and 1E). Larvae of the *Cyanophrys bertha* (Jones) and *Strymon crambusa* (Hewitson) collected in the field and reared in laboratory were also parasitized, and after pupation one *Conura* species egressed after 18 and 20 days, respectively (Kaminski *et al*. 2010; Silva *et al*. 2016). Lycaenidae species have the pupal period between 5 and 13 days (Silva *et al*. 2016; Kumar *et al*. 2017; Sontakke 2018). *Conura* parasitoid species here recorded extended about 1,5 times this development stage of its host lycaenid.

This study reports, for the first time, the tritrophic relationship amongst *Z. latifolia*, a Lycaenidae larva and its larvipupal parasitoid of the genus *Conura* in a periurban area near remnants of the Atlantic Forest, in Northeastern Brazil. This also contributes with important basic information for understanding the dynamics of ecological interaction networks including this lepidopteran family.

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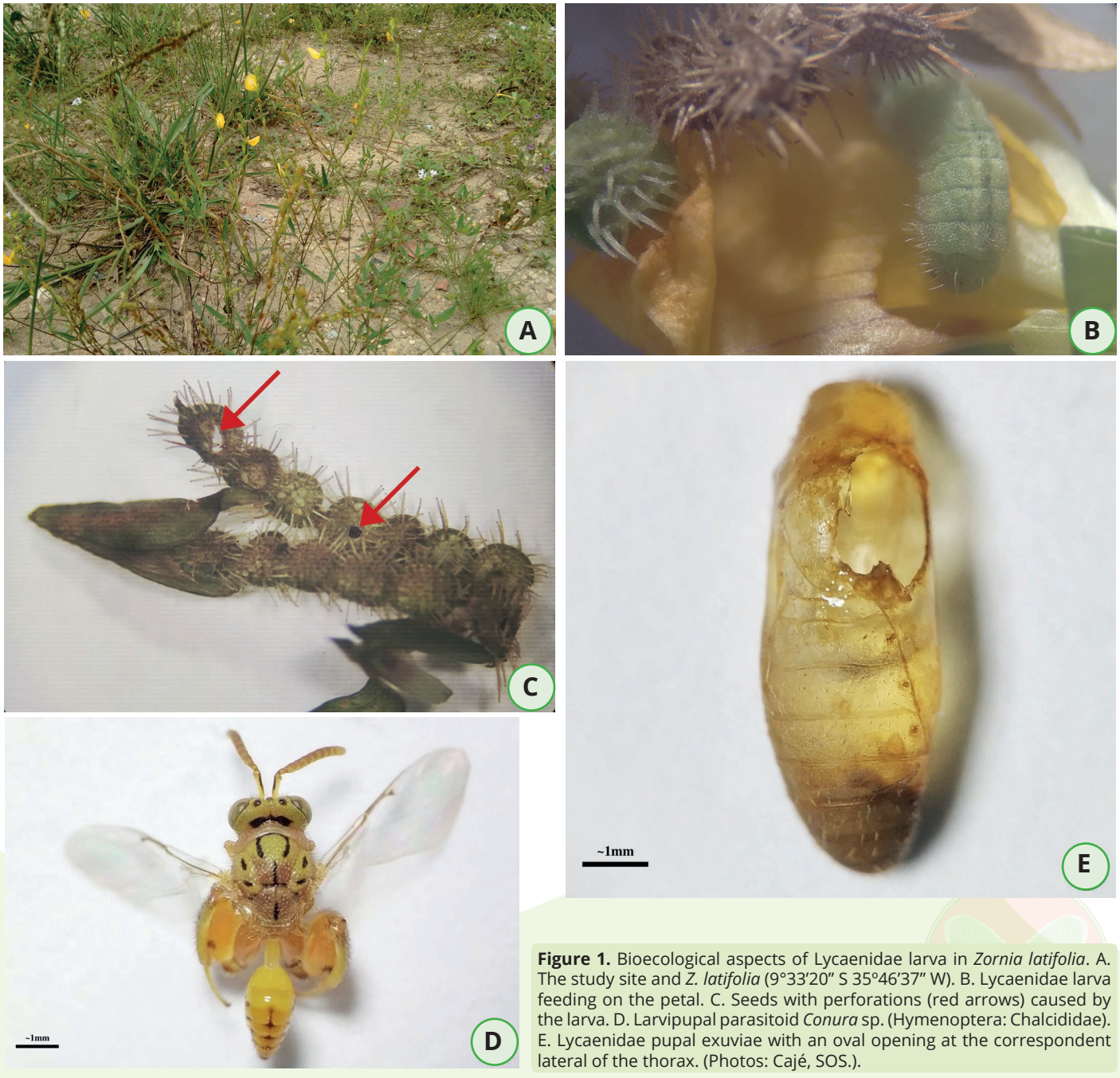

Figure 1. Bioecological aspects of Lycaenidae larva in *Zornia latifolia*. A. The study site and *Z. latifolia* (9°33'20" S 35°46'37" W). B. Lycaenidae larva feeding on the petal. C. Seeds with perforations (red arrows) caused by the larva. D. Larvipupal parasitoid *Conura* sp. (Hymenoptera: Chalcididae). E. Lycaenidae pupal exuviae with an oval opening at the correspondent lateral of the thorax. (Photos: Cajé, SOS.).

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