

Scientific Note

Interaction between butterflies (Lepidoptera: Nymphalidae) and longhorn beetle (Coleoptera: Cerambycidae), with comments on the use of exudate as a food resource

Caique Dantas^{1✉}, Gabriel S. Ferreira², Thamara Zacca³

¹Universidade Estadual de Feira de Santana, Feira de Santana, BA, Brazil. ²Universidade Federal do Rio de Janeiro, RJ, Brazil. ³Museu Nacional, Universidade Federal do Rio de Janeiro, RJ, Brazil.

✉ Corresponding author: caidanvas@gmail.com

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Abstract. The interaction between the butterfly *Fountainea glycerium cratais* (Hewitson, 1874) (Nymphalidae: Charaxinae: Anaeni) and the longhorn beetle *Retrachydes thoracicus thoracicus* (Olivier, 1790) (Cerambycidae: Cerambycinae: Trachyderini), simultaneously feeding on the exudate of the *Schinus* tree (Anacardiaceae), is herein reported. We also revised the literature on this topic and compiled data on other species of butterflies and beetles performing the similar type of ecological interaction in Neotropical region. Although this type of interaction has been documented as commensalism in some literature, the paucity of observations limits this affirmation and the development of standardized studies considering the frequency of occurrences and the behavior of the species involved are on demand.

Keywords: Behavior, commensalism, ecology, exudate, opportunism.

Studies on the attraction of butterflies and other insects by plant exudates are scarce and occasionally discussed or illustrated in literature (Godfrey & Whitehead 2001; Salazar 2013). Butterflies (Lepidoptera: Papilionoidea) use different types of food sources and those that have a diet based on fermented fruits, excrements, decomposing animals, and exudates of plants are classified as frugivorous (DeVries 1997) which includes members of Satyrinae, Charaxinae, Biblidinae, and Nymphalinae (Coloburini) (Uehara-Prado et al. 2004). A great diversity of food preferences is also found in longhorn beetles (Coleoptera: Cerambycidae) (Bouchard et al. 2017; Haack 2017), although only a few studies investigate the feeding preferences in adults (Haack 2017). The Cerambycidae beetles are phytophagous; the larvae construct their galleries within the plant while most adult species feed on live or dead wood but also in leaves, flowers, pollen, nectar, fruits and plant exudate (Martins 1997; Meng et al. 2013; Svacha & Lawrence 2014).

Herein we reported the interaction between the butterfly *Fountainea glycerium cratais* (Hewitson, 1874) (Nymphalidae: Charaxinae: Anaeni) and the longhorn beetle *Retrachydes thoracicus thoracicus* (Olivier, 1790) (Cerambycidae: Cerambycinae: Trachyderini), simultaneously feeding on the exudate of the *Schinus* tree (Anacardiaceae) (Fig. 1A-B), on October 28, 2020. The tree is located in an anthropized area at the campus of the Universidade Estadual de Feira de Santana (UEFS), municipality of Feira de Santana, State of Bahia, Brazil (Fig. 2). The UEFS campus has an area of 1,096,741.67 m², and it is located in an area with mixed vegetation of Deciduous, Semideciduous, and Caatinga Forest remnants, with intense herbaceous-shrubby afforestation (Oliveira et al. 2008).

The identification of the species *R. thoracicus thoracicus* and *F. glycerium cratais* was carried out at the Laboratório de Sistemática de Insetos (LASIS) by comparing specimens deposited at the Prof. Johann Becker Entomological Collection from the Museu de Zoologia (MZFS) at UEFS. Photographs of the individuals *in situ* were taken using a Canon T6 digital camera (55-250 mm). Geographical coordinates were obtained from Google Maps (www.google.com.br/maps). The map was elaborated with Simplemapp (Shorthouse 2010).



Figure 1. A, B - *Schinus* sp. tree.



Figure 2. Map showing the area of the Universidade Estadual de Feira de Santana, Feira de Santana, Bahia, Brazil, highlighted in yellow dashed line.

Two males of *R. thoracicus thoracicus* were observed feeding on the exudate (Fig. 4A) from the fissures (about 1-3 mm long) of the trunk of *Schinus* sp. (Fig. 3). One of the individuals feed in more than one fissure, while the other stayed feeding on the same fissure for all the period of observation (approximately 10 minutes). Next to these two cerambycids, the butterfly *F. glycerium cratais* was perching near to the trunk fissures with its wings in a resting position (Fig. 4B). While one of the beetles moved to another area of the tree, probably in search of other fissures to keep feeding, the butterfly began to feed on the exudate in one of the fissures near to one of the cerambycids (Fig. 4C). Later, one of the beetles moving along the trunk dispel the butterfly with the movement of its long antennae, causing it to fly to another location.



Figure 3. Fissure about 1-3 mm width with the plant exudate.

Additionally, other species of frugivorous nymphalid butterflies (Biblidinae) were observed flying surrounding the fissures of the same *Schinus* tree, to cite: *Callicore sorana sorana* (Godart, [1824]) (Nymphalidae: Biblidinae: Biblidini), *Hamadryas feronia feronia* (Linnaeus, 1758) (Nymphalidae: Biblidinae: Biblidini) (Fig. 4D) and *Temenis laothoe bahiana* Fruhstorfer, 1907 (Nymphalidae: Biblidinae:

Biblidini). However, neither of them was observed directly feeding on the exudate. Similar interactions between butterflies and beetles have been documented in other studies. Hedström & Elmqvist (1984) reported an interaction between the butterfly *Prepona laertes* (Hübner, 1811) (Nymphalidae: Charaxinae: Preponini) and an unidentified species of *Hoplopyga* Thomson, 1880 (Cetoniidae) in Parque Nacional de Santa Rosa, Costa Rica, in which the beetle pierces the semi-woody stem of the vine *Gouania polygama* (Rhamnaceae) and the resulting exudation was used simultaneously by both insects. Another record was documented by Salazar (2013) between *Trachyderes succinctus succinctus* (Linnaeus, 1758) (Cerambycidae: Cerambycinae: Trachyderini) and *Fountainea glycerium comstocki* (Witt, 1972) (Nymphalidae: Charaxinae: Anaeini) in exudation from an unidentified tree in Colombia.

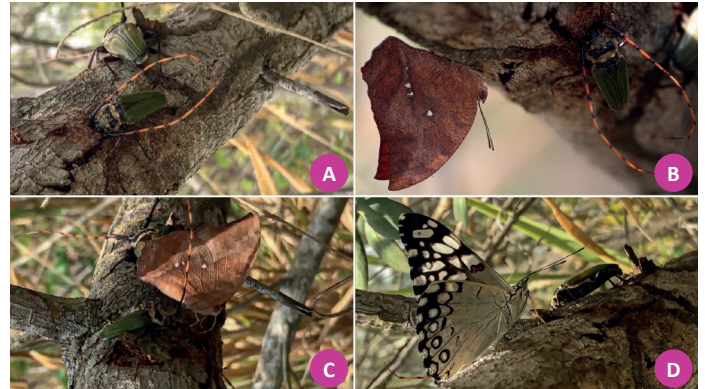


Figure 4. A - Two males of *Retrachydes thoracicus thoracicus* feeding on exudate present in cracks in the bark of the *Schinus* tree; B - *Fountainea glycerium cratais* near one of the cracks present in the bark of the tree; C - *F. glycerium cratais* feeding on the plant exudate in one of the fissures; D - *Hamadryas feronia feronia* close to *Retrachydes thoracicus thoracicus*. Photos: Caique Dantas.



Figure 5. Species of butterflies and beetles feeding on plant exudate. A - *Eunica* sp., *Diaethria candrena* (Nymphalidae) and *Smyrna blomfieldia blomfieldia* (Nymphalidae) and *Neocorvicoana reticulata* (Kirby, 1818) (Cetoniidae); B - *Archeoprepona demophon thalpius* (Nymphalidae) and *Aglaoschema* sp. (Cerambycidae), *Hoplopyga* sp., *Gymnetis* sp. and *Inca* sp. (Cetoniidae); C - *Memphis moruus stheno* (Nymphalidae) and *Gymnetis* spp. (Cetoniidae); D - *Catonephele numilia* (Nymphalidae) and *Hoplopyga* sp. (Cetoniidae). Photos: Gustavo Accacio.

We also found other records of similar interactions on the Facebook page “Borboletas e Mariposas Neotropicais”, a group aimed at lepidopteran specialists and non-academics to share photos and information about the species. Groups like this are a valuable

resource, as citizen science observation can significantly contribute to biodiversity research (Callaghan et al. 2021). From these records, we cite the occurrence of frugivorous butterflies *Eunica* sp., *Diathria candrena* (Godart, 1823) (Nymphalidae: Biblidinae: Biblidini) and *Smyrna blomfieldia blomfieldia* (Fabricius, 1782) (Nymphalidae: Nymphalini) with *Neocorvicoana reticulata* (Kirby, 1818) (Nymphalidae: Cetoniidae: Gymnetini) of the trunk of *Libidibia ferrea* var. *leiostachya* (Benth.) (Fabaceae) (Fig. 5A); *Archeoprepona demophon thalpius* (Nymphalidae: Charaxinae: Preponini) and *Aglaoschema* sp. (Cerambycidae), *Hoplopyga* sp., *Gymnetis* sp. and *Inca* sp. (Cetoniidae) of the trunk of *Schinus terebinthifolius* Raddi (Anacardiaceae) (Fig. 5B); *Memphis moruus stheno* (Nymphalidae: Charaxinae: Anaeni) and *Gymnetis* spp. (Cetoniidae) of the trunk of *Libidibia ferrea* var. *leiostachya* (Benth.) (Fabaceae) (Fig. 5C); *Catonephele numilia* (Cramer, 1775) (Nymphalidae: Biblidinae: Biblidini) with *Hoplopyga* sp. (Cetoniidae) of the trunk of *Libidibia ferrea* var. *leiostachya* (Benth.) (Fabaceae) (Fig. 5D).

Although some studies have documented this type of ecological interaction as commensalism (Hedström & Elmqvist 1984; Salazar 2013), the paucity of observations (in both present report and literature) limits this affirmation. By definition, commensalism is an interspecific interaction in which individuals of one species are benefited and individuals of a second species are not affected, although it is necessary to quantify the effects of interactions between the two species (Mathis & Bronstein 2020). An alternative explanation is that the butterflies are opportunistic, and feed on the exudate released after the consumption of the wood by the adult beetles, not necessarily depending on the relationship with the beetles. Other reports of opportunism of butterflies feeding on the exudate have also been recorded. In addition to beetles, by beavers (Rea & Lindgren 2009) and butterflies feeding on bird dung exudates (Hawkeswood et al. 2019).

The development of standardized studies considering the frequency of occurrences between butterflies and beetles near to plant exudate, as well as the record of photos and movies on the behavior of the species involved are essential to a better understanding of apparently common but few explored ecological interactions.

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Authors' Contribution

C. D. carried out the photographic records and field observations; T.Z. and G.S.F. identified the focus species of the study. All authors wrote the manuscript, discussed the results and contributed to its final version.

Conflict of Interest Statement

The authors declare no conflict of interest.

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