

Scientific Note

New records of herbivory of *Leucothyreus* MacLeay, 1819 (Coleoptera: Scarabaeidae: Geniatini) on *Cecropia* Loefl. (Urticaceae)

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Edited by: Ivan C. F. Martins

Received: August 21, 2023. Accepted: December 26, 2023. Published: March 01, 2024.

Abstract. Species in the genus *Cecropia* Loefl. (Urticaceae) are important food sources for a handful of species belonging to the insect orders Orthoptera (grasshoppers), Lepidoptera (caterpillars), Hymenoptera (leafcutter ants), and Coleoptera (beetles). Among the leaf chafer beetles, specimens of the scarab genus *Leucothyreus* MacLeay, 1819 (Scarabaeidae: Geniatini) have been barely recorded as defoliators of *Cecropia* spp., and information about the identity of the involved plant and beetle species is scarce and imprecise. The present paper records for the first time the incidence of two species of *Leucothyreus* on four species of *Cecropia* in Central Amazon (Brazil), with short behavioral notes regarding their feeding habits.

Keywords: herbivory, embaúba, scarabs, Amazon.

The tree species in the genus *Cecropia* Loefl. (Urticaceae), which are popularly known as “embaúbas” in Brazil, are famous for their obligatory association with certain species of ants, especially those in the genus *Azteca* Forel, 1878 (Formicidae: Dolichoderinae) (Müller 1876; Davidson 2005). In this type of mutualism, the ants provide plants with defense against natural enemies (e.g., defoliating insects) in exchange for food and shelter (Harada 1989; Davidson & Fisher 1991; Ferguson et al. 1995; Oliveira et al. 2015; Gonçalves-Souza & Paiva 2016). Among the main insects feeding on leaves of *Cecropia* are the grasshoppers (Orthoptera) (Agrawal 1998), caterpillars (Lepidoptera) (Muyshondt Jr. & Muyshondt 1979; Beccaloni et al. 2008; Ramos et al. 2018), leafcutter ants (Hymenoptera: Formicidae) (Fiebrig 1909; Vasconcelos & Casimiro 1997), as well as the beetles in the genus *Coelomera* Chevrolat, 1844 (Coleoptera: Chrysomelidae: Galerucinae), all of which are recognized as the most voracious defoliators (Andrade 1984; Jolivet & Salinas 1993; Silveira et al. 2002). However, the leaf chafer scarabs in the subfamily Rutelinae (Coleoptera: Scarabaeidae) are also able to cause considerable damage to *Cecropia* leaves, despite being scarcely mentioned in the literature.

The genus *Leucothyreus* MacLeay, 1819 includes 164 species (Jameson & Hawkins 2005), whose ecology and biology are poorly known due in part to the lack of taxonomic foundation. Nevertheless, a few species have been reported as important pests of several plant species of economic interest in Brazil (Oliveira et al. 2001; Puker et al. 2011; Martínez et al. 2013), the larvae feeding on the roots and the adults as defoliators (Martínez et al. 2000; Gomes et al. 2014). Among these, aspects of the biology and life cycle are known for *Leucothyreus alvarengai* Frey, 1976 (Pereira et al. 2013), *Leucothyreus ambrosius* Ohaus, 1918 (Gomes et al. 2014), *Leucothyreus aff. conquistador* Ohaus, 1924 (Gomes & Rodrigues 2020), *Leucothyreus dorsalis* Blanchard, 1850 (synonym of *Leucothyreus marginaticollis* Blanchard, 1843) (Rodrigues et al. 2010), and *Leucothyreus femoratus* Burmeister, 1844 (Martínez et al. 2013). To our knowledge, the single record of *Leucothyreus* feeding on *Cecropia* was made by Schupp (1986), who observed the incidence of *Leucothyreus* sp. adults on leaves of *Cecropia* aff. *obtusifolia* Bertol in Ecuador.

In the present note, we record two species of *Leucothyreus* feeding on leaves of *Cecropia* in the Tarumã-Ponta Negra Environmental Protection Area (Manaus, Amazonas state, Brazil) (Fig. 1), which were collected manually and taken to the laboratory for identification. The plant species were identified based on the literature (Berg 1978; Berg & Rosselli 2005) and through comparison with specimens deposited in the herbarium of the Instituto Nacional de Pesquisas da Amazônia (INPA), whereas the identification of the two *Leucothyreus* was based on Jameson & Hawkins (2005) and did not reach the species level due to the absence of an available taxonomic revision for this complicated and highly diverse genus. However, both species (*Leucothyreus* sp.1 and *Leucothyreus* sp.2) are hereby illustrated, including high-quality pictures of male dorsal habitus and aedeagus, which will allow for posterior identification (Fig. 2). The pictures of alive specimens feeding on leaves of *Cecropia* spp. were taken using a mobile phone camera (iPhone SE 2020) with an external macro lens attached, and those of pin-mounted specimens were taken by a Leica M205A stereomicroscope with a Leica DMC4500 camera attached.



Figure 1. Location map of the records in Manaus.

Leucothyreus sp.1 was observed feeding on the leaves of *Cecropia purpurascens* C.C. Berg (Fig. 3A) and *Cecropia ulei* Snethl. (Fig. 3B), as well as other plants like *Zoysia japonica* Steud. (Poaceae), *Muntingia calabura* L. (Muntingiaceae), and *Cynometra bahiniifolia* Benth. (Fabaceae). This finding suggests *Leucothyreus* sp.1 is a wide generalist species, unlike its congener *L. femoratus*, which was considered apparently monophagous by Martínez et al. (2013) once it has been only recorded feeding on palm species (Arecaceae). In addition, *Leucothyreus* sp.2 was observed feeding on the leaves of *Cecropia concolor* Willd. (Fig. 3C) and *Cecropia palmata* Willd. (Fig. 3D) in a more conserved fragment of the same locality in which *Leucothyreus* sp.1 was recorded.



Figure 2. Male dorsal view and aedeagus of *Leucothyreus* sp.1 (A, B) and *Leucothyreus* sp.2 (C, D) from Manaus, Brazil recorded in this paper on leaves of *Cecropia* spp. Scales: A, C = 2 mm; B, D = 0.5 mm.

Both species of *Leucothyreus* recorded in this paper were found in large numbers in the rainy season, which agrees with information on the reproduction period for other species of the genus (Rodrigues et al. 2010; Pereira et al. 2013; Gomes et al. 2014; Gomes & Rodrigues 2020). The feeding habits of these beetles were perceived invariably at night (Schupp 1986; Pardo-Locarno et al. 2006; Martínez et al. 2013) and occurred predominantly in young plants that had not yet been colonized by any *Azteca* species. However, *Leucothyreus* sp.1 was observed a single time feeding on a *C. ulei* plant housing a small colony of *Azteca alfari* Emery, 1893 (Hymenoptera: Formicidae), which were not recruited even after disturbance.

The shape of the incision caused by the chafers on the leaves of *Cecropia* spp. was subrectangular, as described in other cases by Martínez et al. (2000) and Martínez et al. (2013). Nocturnal feeding habit is another important strategy regarding avoiding competition with other insects (e.g., *Coelomera* spp; Jolivet 1987) as well as ant attacks, whose activity decreases throughout the day (Barnwell 1967).

This paper presents the first report of herbivory of *Leucothyreus* geniatine scarabs feeding on *Cecropia* spp. in Brazil. Despite being a biologically and taxonomically scarcely known genus, related species of *Leucothyreus* are likely to feed on the leaves of *Cecropia* spp., and most of their interesting feeding strategies, as well as their relationship with host ants, remain to be checked with additional observations.

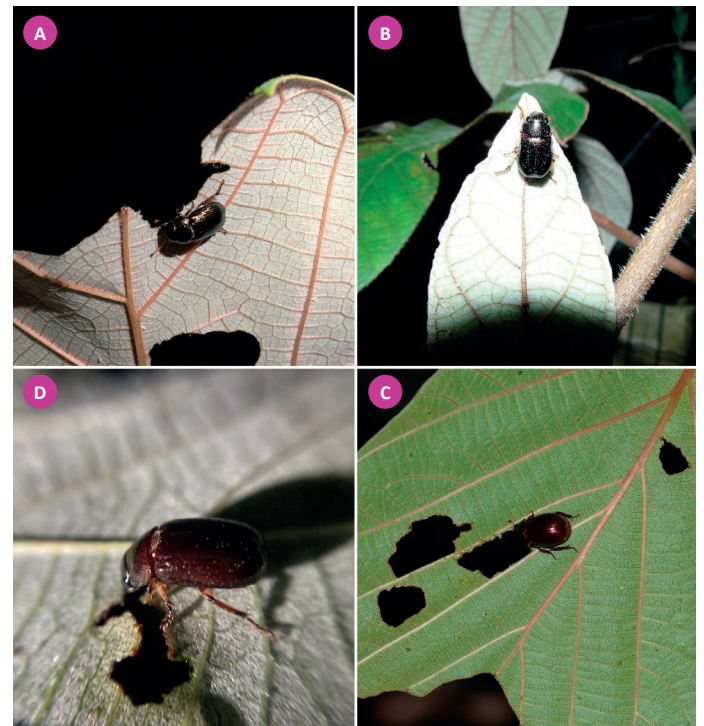


Figure 3. *Leucothyreus* species feeding on *Cecropia* leaves in Manaus. *Leucothyreus* sp. 1 at *C. purpurascens* (A) and *C. ulei* (B); *Leucothyreus* sp. 2 at *C. concolor* (C) and *C. palmata* (D).

Acknowledgments

We thank the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA) for allowing the use of the photographic equipment, and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), which financed this study in part (finance code 001). We also thank Aline Sampaio for obtaining images of the beetles that were useful to our analyses.

Funding Information

Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES), Finance Code 001.

Authors' Contributions

DPPA: Conceptualization, Methodology, Investigation, Writing - original draft; MB: Investigation, Validation, Writing - review & editing.

Conflict of Interest Statement

The authors declare no conflict of interest.

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