FIRST RECORD OF *Numia terebintharia* GUÉNÉE (LEPIDOPTERA: GEOMETRIDAE) IN *Ziziphus joazeiro* MART. (RHAMNACEAE) IN BRAZIL

ROZILEUDO DA SILVA GUEDES*, TEOTÔNIO LUCAS SABINO FERNANDES², FERNANDO CÉSAR VIEIRA ZANELLA³

**ABSTRACT** - Geometridae is one of the most diverse Lepidoptera families; however, little information about Geometridae species is found, even regarding their distribution and basic biology, which are in general restricted to type locality. Lists of species and their host plants are not found for the Semiarid region of the Northeast of Brazil. The present note reports the occurrence of caterpillars of the species *Numia terebintharia* Guenée consuming leaves of evergreen trees of *Ziziphus joazeiro* Mart. in a site with xerophilous deciduous Caatinga vegetation in that region. Some trees had approximately 90% of their leaves with injuries. This is the first record of *N. terebintharia* caterpillars occurring in Brazil and the first record of *Z. joazeiro* as their host plant.

**Keywords**: Ennominae. Caatinga. Herbivory. Folivory. Juazeiro.

---

PRIMEIRO RELATO DE *Numia terebintharia* (LEPIDOPTERA: GEOMETRIDAE) EM *Ziziphus joazeiro* MART. (RHAMNACEAE) NO BRASIL

**RESUMO** – Geometridae é uma das famílias mais diversificadas de Lepidoptera e o conhecimento sobre a distribuição e biologia básica de suas espécies é muito limitado, restringindo-se em muitos casos à localidade-tipo. Não há nenhum inventário das espécies ocorrentes no semiárido do Nordeste do Brasil e das suas plantas hospedeiras. Neste trabalho é registrada a ocorrência da espécie *Numia terebintharia* Guenée em uma área de caatinga dessa região, avaliada a importância desse registro no quadro do conhecimento da distribuição das espécies do gênero e documentada a planta hospedeira de suas lagartas e as injúrias às suas folhas. Algumas árvores de *Ziziphus joazeiro* Mart. apresentavam cerca de 90% de suas folhas com injúrias. Esse é o primeiro registro da *N. terebintharia* para o Brasil e o primeiro de sua planta hospedeira.

**Palavras-chave**: Ennominae. Caatinga. Folivoria. Herbivoria. Juazeiro.
INTRODUCTION

Lepidoptera is one of the most diverse insect orders, which encompasses moths and butterflies; Geometridae stands out as one of the three most diverse among its 71 families, with more than 23 thousand described species (VAN NIEUKERKEN et al., 2011; DUARTE et al., 2012). About 5,000 of these species occur in Brazil, which are within one of the following five subfamilies: Ennominae, Geometrinae, Larentiinae, Oenochrominae, and Sterrhinae (DUARTE et al., 2012). Almost half of the species of the family Geometridae in the world belong to the subfamily Ennominae (PITKIN, 2002), which has a worldwide distribution but greater diversity in neotropical regions (BREHM et al., 2016). According to Vargas et al. (2010), most neotropical species of Geometridae are known only for the type material and original descriptions, thus, little information is found about their immature stage, host plants, and even geographic distribution.

Geometridae caterpillars can be involved in several interactions, whether in natural or anthropogenic environments, and are commonly recognized for their herbivory; they may be highly abundant in some plants (BODNER et al., 2010; VARGAS, 2014). Some species of Geometridae in Brazil are studied as insect pests that use forest species, such as eucalyptus crops, as hosts, e.g. Thyrinteina arnobia Stoll, Glena spp., Sabulodes caberata Guenée, Oxylia apidania (Cramer), and O. vesulia (Cramer) (ZANUNCIO et al., 2014). However, only 79 records of this family in Brazil were found in the World Lepidopteran Hostplants database (Natural History Museum London, accessed on 03/04/2020), with 35 nominal species cited. In addition, some inventories for local faunas had been carried out in Brazil, among them: Januário et al. (2013), who reported 25 species collected in northern Mato Grosso state in the Amazon rainforest; Diniz, Morais and Camargo (2001), who cited 22 caterpillar species in the Cerrado biome in the Federal District; and Marconato, Dias and Penteado-Dias (2008), who recorded 22 caterpillar species associated with plants of the species Erythroxyllum microphyllum A. St.-Hil. (Erythroxylaceae) in the Cerrado biome in the state of São Paulo. Thus, information on diversity of species of the family Geometridae in Brazil is limited, as well as records of their distribution and host plants, and such information is largely concentrated on species of agricultural importance.

Information on diversity of Lepidoptera in the Semiarid region of the Caatinga biome is even more limited when compared to that in other regions of Brazil, even when considering butterflies, which are the most studied species of Lepidoptera (ZACCA; BRAVO, 2012; LIMA; ZACCA, 2014). In the case of moths, the single local fauna inventory found refers to the family Sphingidae (DUARTE JR; SCHLINDWEIN, 2005), and no other work on species of Geometridae in the Caatinga biome appeared in searches in the Google Scholar or in journals in the database of the Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES) <https://www.periodicos.capes.gov.br>.

The present note reports the first record of occurrence of the species Numia terebintharia Guenée (1858) in an area with xerophilous Caatinga vegetation in the Semiarid region of the Northeast of Brazil, and its importance is assessed in the context of previous information on the distribution of species of the Numia genus. In addition, the first record of the host plant and the characterization of injuries caused by N. terebintharia caterpillars to the plant leaves is presented.

MATERIAL AND METHODS

Field observations were carried out from February to March 2020, corresponding to the beginning of the rainy season, at the Tamanduá Farm (7°1’30.3’’S, 37°24’22.5’’W), in the municipality of Santa Terezinha, Sertão region of the state of Paraíba, Brazil. The municipality is in the Sertaneja Northern Depression region, and the study area had a typical deciduous xerophilous Caatinga vegetation. The region's climate is BSh, a hot and semi-arid climate according to the Köppen classification (ÁLVARES et al., 2013).

During this observation period, caterpillars were found on leaves of five juazeiro (Ziziphus joazeiro Mart.) trees that were at the vegetative phenological stage, producing foliage. The caterpillars were reared in laboratory (Forest Entomology Laboratory of the Federal University of Campina Grande, Patos campus, Paraíba, Brazil) at room temperature and fed with leaves of the same plant species. Newly emerged adults were killed, fixed with entomological pins, and deposited at the entomological collection of the laboratory. Adult individuals were identified by a moth taxonomist specialist (see acknowledgments).

RESULTS AND DISCUSSION

The caterpillars found were of the inchworm-type, presenting two pairs of false abdominal legs (Figure 1A) and typical locomotion of species of the family Geometridae. The pupae were obect (Figure 1B). The adults had approximately 2.5 cm wingspan and both wing pairs were predominantly green. They
were identified as *Numia terebintharia*, subfamily Ennominae. Adult females usually had a large, well-defined apical spot on each of the anterior wings (Figure 1C); however, in some individuals, such spot was little or absent (Figure 1D). Males had bipectinate antennae (Figure 1E), and females had filiform antennae.

The genus *Numia* has traditionally been included in the tribe Caberini; however, taxonomic changes and changes in the concept of this tribe due to a recent phylogenetic study on Neotropical Geometridae species require to reevaluate its positioning (BREHM et al., 2019). *Numia* species are strictly Neotropical, occurring from southern USA and Caribbean to Argentina (PITKIN, 2002), but the records of distribution of the eight recognized species in the genus are limited and largely restricted to the type locality of the nominal species.

The only previous record of the genus in Brazil refers to the type locality of *N. lermia* Schaus (1901), which appears on the label [Bnito Prov./Pernambuco/Brasil] (see https://www.gbif.org/pt/occurrence/1319320953). This location probably refers to the municipality of Bonito, in the state of Pernambuco, Northeast region of Brazil (approximately 8°28'S, 35°43'W, and 443 m altitude, at 80 km from the Atlantic coast). This municipality is in the eastern slope of the Borborema plateau, which presents predominantly a semideciduous tropical forest vegetation (MARANGON et al., 2010), therefore, near the limits of the Caatinga domain.

The species *N. terebintharia* was described based on specimens from Haiti, later cited for other locations in the Caribbean, Florida (USA)
Rhamnaceae with 42 species are found in Brazil (Flora do Brasil, 2020), and preliminary information indicated the possibility of feed preference of Numia caterpillars for plants of this family, it is suggested that observations of leaf-eating insects should be undertaken for this species of Ziziphus in other regions and for other plant species of the family Rhamnaceae in the Caatinga and other biomes, thus facilitating the obtaining of data and minimizing the gap of information on the distribution of Numia species in South America and on their feed preference.

CONCLUSION

This is the first record of caterpillars of the species Numia terebintharia occurring in the Semiarid region of the Northeast of Brazil and the first record of Ziziphus joazeiro as their host plant.

ACKNOWLEDGEMENTS

The authors thank Mr. Pierre Landolt, owner of the Tamanduá Farm, for granting access to the area; and Dr. Vitor Osmar Becker for the identification of the moth species.

REFERENCES

ÁLVARES, C. A. et al. Köppen’s climate classification map for Brazil. Meteorologische Zeitschrift, 22: 711–728, 2013.

ARA, H.; HASSAN, M. A.; KHANAM, M. Taxonomic study of the genus Ziziphus Mill. (Rhamnaceae) of Bangladesh. Bangladesh Journal of Plant Taxonomy, 15: 47-61, 2008.

BREHM, G. et al. Turning up the heat at a hotspot: DNA barcodes reveal 80% more species of geometrid moths along an Andean elevational gradient. PlosOne, 11: e0150327, 2016.

BREHM, G. Diversity of geometrid moths in a montane rainforest in Ecuador. 2002. 196 p. Ph.D. thesis, University of Bayreuth, Germany. 2002.

BREHM, G. et al. New World geometrid moths (Lepidoptera: Geometridae): Molecular phylogeny, biogeography, taxonomic updates and description of 11 new tribes. Arthropod Systematics and Phylogeny, 77: 457-486, 2019.

BODNER, F. et al. Caterpillars and host plant records for 59 species of Geometridae (Lepidoptera) from a montane rainforest in southern Ecuador.
Journal Insect Science, 10: 1-22, 2010.

CARRANO-MOREIRA, A. F. Manejo Integrado de pragas florestais: fundamentos ecológicos, conceitos e táticas de controle. 1. ed. Rio de Janeiro, RJ: Technical Books, 2014. 349 p.

DANTAS, F. C. P. et al. Ziziphus joazeiro Mart. - Rhamnaceae; características biogeocquímicas e importância no bioma Caatinga. Revista Principia, 2: 51-57, 2014.

DINIZ, I. R.; MORAIS, H. C.; CAMARGO, A. J. A. Host plants of lepidopteran caterpillars in the cerrado of the Distrito Federal, Brazil. Revista Brasileira de Entomologia, 45: 107–122, 2001.

DUARTE, M. et al. Lepidoptera. In: RAFAEL, J. A. et al. (Eds.). Insectos do Brasil: diversidade e taxonomia. Ribeirão Preto, SP: Holos Editora, 2012. cap. 37, p. 625-682.

DUARTE JR., J. A.; SCHLINDWEIN, C. The highly seasonal hawkmoth fauna (Lepidoptera: Sphingidae) of the Caatinga of northeast Brazil: a case study in the state of Rio Grande do Norte. Journal of the Lepidopterists’ Society, 59: 212-218. 2005.

FERNANDES, D. R. R.; ARAÚJO, E. L. Ocorrência de Zaprinus indians Gupt (Diptera: Drosophilidae) em frutos de jucá Ziziphus joazeiro Mart. (Rhamnaceae) no estado do Rio Grande do Norte. Revista Brasileira de Fruticultura, 33: 1356-1358, 2011.

FERNANDES, E. C. et al. Insetos visitantes de flores de Ziziphus joazeiro Mart. (Rhamnaceae) em uma região de Caatinga em Minas Gerais. Revista Caatinga, 26: 16-20, 2013.

FLORA DO BRASIL. Rhamnaceae. Jardim Botânico do Rio de Janeiro. 2020. Disponível em: <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB20671>. Acesso em: 05 ago 2020.

HEPPNER, J. B. Lepidoptera of Florida: Introduction and catalog. Arthropods of Florida and neighboring land areas. vol. 17. Florida Department of Agriculture & Consumer Services. Division of plant industry. 2003. 670 p.

JANUÁRIO, A. B. S. et al. Caracterização da família Geometridae (Insecta: Lepidoptera) associada a diferentes fragmentos florestais, em Cotriguaçu, MT. Pesquisa Florestal Brasileira, 33: 393-402, 2013.

JANZEN, D. H.; HALLWACHS, W. Philosophy, navigation and use of a dynamic database (ACG Caterpillars SRNP) for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of the Area of Conservation Guanacaste (ACG), northwestern Costa Rica. 2001. Disponível em: <http://janzen.sas.upenn.edu>. Acesso em: 25 mar. 2020.

LIMA, J. N. R.; ZACCA, T. Borboletas (Lepidoptera: Hesperioidea e Papilionoidea) de uma Área de Semiárido no Região Nordeste do Brasil. EntomoBrasilis, 7: 33-40, 2014.

MARCONATO, G.; DIAS, M. M.; PENTEADO-DIAS, A. M. Larvas de Geometridae (Lepidoptera) e seus parasitóides, associadas a Erythroxylum microphyllum St.- Hilaire (Erythroxylaceae). Revista Brasileira de Entomologia, 52: 296-299, 2008.

MARANGON, G. P. et al. Dispersão de sementes de uma comunidade arbórea em um remanescente de Mata Atlântica, Município de Bonito, PE. Revista Verde, 5: 80-87, 2010.

MARQUES, C. A.; NASCIMENTO, A. M.; TORRES, J. C. Caracterização morfo-anatômica e testes fitóquímicos em amostras comerciais de Ziziphus joazeiro Mart. (Rhamnaceae). Revista Fitos, 10: 417-432, 2017.

NADIA, T. L.; MACHADO, I. C.; LOPES, A. V. Polinização de Spondias tuberosa Arruda (Anacardiaceae) e análise da partilha de polinizadores com Ziziphus joazeiro Mart. (Rhamnaceae), espécies frutíferas e endêmicas da caatinga. Revista Brasileira de Botânica, 30: 89–100, 2007.

PITKIN, L. M. Neotropical ennomine moths: a review of the genera (Lepidoptera: Geometridae). Zoological Journal of the Linnean Society, 135: 121-401, 2002.

PITKIN, L. M.; MORA, R. A.; SCOBLE, M. J. A checklist to the Ennominae (Geometridae) of Costa Rica: taxonomy for a national biodiversity inventory. Gayana Zoologia, 60: 21–155, 1996.

SILVA, T. C. L. et al. Atividades antioxidante e antimicrobiana de Spondias tuberosa Arruda (Anacardiaceae) e análise da partilha de polinizadores com Ziziphus joazeiro Mart. (Rhamnaceae); avaliação comparativa entre cascas e folhas. Revista de Ciências Farmacêuticas Básica e Aplicada, 32: 193-199, 2011.

SOUZA, I. J. O. et al. Estudo fitoquímico, avaliação da capacidade hemolítica e antimicrobiana de um extrato bruto da casca do caule de Ziziphus joaseiro Mart. (Rhamnaceae). Journal of Biology & Pharmacy and Agricultural Management, 14: 208-225, 2018.
FIRST RECORD OF *Numia terebintharia* GUÉNÉE (LEPIDOPTERA: GEOMETRIDAE) IN *Ziziphus joazeiro* MART. (RHAMNACEAE) IN BRAZIL

R. S. GUEDES et al.

VAN NIEUKERKEN, E. J. et al. Order Lepidoptera Linnaeus, 1758. *Zootaxa*, 3148: 212–221, 2011.

VARGAS, H. A. First host plant records for *Iridopsis haussmanni* Vargas (Lepidoptera, Geometridae) in the coastal valleys of northern Chile. *Revista Brasileira de Entomologia*, 58: 95-97, 2014.

VARGAS, H. A. et al. Imaturos de *Chromopteryx undularia* (Blanchard) (Lepidoptera, Geometridae). *Revista Brasileira de Entomologia*, 54: 519–528, 2010.

ZACCA, T.; BRAVO, F. Borboletas (Lepidoptera: Papilionoidea e Hesperioidea) da porção norte da Chapada Diamantina, Bahia, Brasil. *Biota Neotropica*, 12: 117-126, 2012.

ZANUNCIO, J. C. et al. Lepidoptera desfolhadores de eucalipto. In: CANTARELLI, E. B.; COSTA, E. C. (Eds.). *Entomologia Florestal Aplicada*. Santa Maria, RS: Ed. da UFSM, 2014. cap. 5, p. 101-122.

This work is licensed under a Creative Commons Attribution-CC-BY https://creativecommons.org/licenses/by/4.0/.