

Colobura dirce dirce (Lepidoptera: Nymphalidae) Larvae Damaging Cecropia hololeuca (Rosales: Urticaceae) in the Zona da Mata, Minas Gerais, Brazil

Authors: Tavares, Wagner de Souza, Júnior, Sebastião Lourenço de Assis, Soares, Marcus Alvarenga, and Zanuncio, José Cola

Source: Florida Entomologist, 98(2) : 792-795

Published By: Florida Entomological Society

URL: <https://doi.org/10.1653/024.098.0262>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Colobura dirce dirce (Lepidoptera: Nymphalidae) larvae damaging *Cecropia hololeuca* (Rosales: Urticaceae) in the Zona da Mata, Minas Gerais, Brazil

Wagner de Souza Tavares¹, Sebastião Lourenço de Assis Júnior^{2,*}, Marcus Alvarenga Soares³, and José Cola Zanuncio⁴

“Zona da Mata” is 1 of the 12 mesoregions of the Brazilian state of Minas Gerais, which consists of 142 municipalities grouped into 7 microregions. One of these microregions is Viçosa, located in the middle region of the “Zona da Mata” (MRZM). The MRZM, located in the southeast of Minas Gerais, has 36,058 km², and represents 6.2% of the area of this State (Resende et al. 2009). The native vegetation consists of tropical rain forest with dense trees and an expansion of the Atlantic Forest (Portugal et al. 2010). However, most of these native forests have been replaced by agricultural crops (banana, coffee, and sugarcane), pastures (*Brachiaria* spp.; Poales: Poaceae) and forages, and reforestation (*Eucalyptus* spp.; Myrtales: Myrtaceae) (Souza et al. 2009; Tavares et al. 2011). The terrain of MRZM is irregular, with hills, narrow valleys, and ancient crystalline rocks forming mountains. However, some cities, such as Viçosa, have flat terrain. The altitude of the MRZM ranges from 100 m in the valleys of the “Rio Pomba” and “Paraíba do Sul” to 1,889 m in the “Pico do Brigadeiro” (Nunes et al. 2009). The climate is montane subtropical with warm summers and cool winters featuring cold breezes and dense fog and with temperatures averaging 19 to 25 °C that are lowest at the higher altitude regions (Santana et al. 2010). Precipitation is greatest in summer and varies from 1,200 to 1,400 mm (Reis et al. 2007).

Cecropia hololeuca Miq. (Rosales: Urticaceae) is an arboreal plant endemic to Brazil, and it reaches 15 m in height in the Atlantic Forest (Godoy & Takaki 2004). Its fruits are the favorite food of the sloth (Vaughan et al. 2007), and it is attractive to many bird and mammal species (Grelle & Garcia 1999). This plant has soft wood, it is undemanding in soil fertility, is commonly found in deforested areas, and is used in restoration and landscaping (Sposito & Santos 2001a). The hollow stems of *C. hololeuca* are colonized by ants, especially *Azteca* spp. (Hymenoptera: Formicidae), which protect the plant against herbivores in a symbiotic relationship (Sposito & Santos 2001b). Tea brewed from leaves of *C. hololeuca* has anti-diabetic, antispasmodic, anthelmintic, decongestant, diuretic, expectorant, hypotensive, and wound-healing actions (Souccar et al. 2008; Aragon et al. 2010).

Species of *Colobura* Billberg (Lepidoptera: Nymphalidae) are common in forested habitats in the Neotropical Region (Muyshondt & Muyshondt 1976), and their range of distribution includes west-

ern Mexico, Ecuador west of the Andes, Venezuela to Bolivia east of the Andes, northern Paraguay, Argentina, southeastern Brazil, the Amazon basin in Guyana, and Trinidad (Hayward 1964; Willmott et al. 2001). Adults of *Colobura* spp. are common throughout the year in forests and secondary habitats from sea level to 1,600 m. Males are common in areas of human habitation and primary forests, and they are attracted to decomposing organic material (Willmott et al. 2001). Before this study, damage to *C. hololeuca* in the MRZM by larvae of *Colobura dirce dirce* L. (Lepidoptera: Nymphalidae) was unknown. Thus, the objectives of this study were to report on damage by larvae of *C. dirce dirce* on plants of *C. hololeuca* in the MRZM and to assemble published information concerning the hosts of *Colobura* spp.

Two hundred fifty-two larvae were found on 5 Apr 2013 damaging by defoliation 20 *C. hololeuca* plants at 50 cm height on the campus of the “Universidade Federal de Viçosa (UFV)” in Viçosa, Minas Gerais, Brazil (20°45'S, 42°52'W; 651 m asl). These larvae were brought to the “Laboratório de Controle Biológico de Insetos (LCBI)” and placed in cages (26 cm high × 16 cm wide × 16.8 cm long) with *C. hololeuca* branches exchanged daily until pupation. The stems of these branches were placed in glass tubes with water to reduce wilting of leaves. The adults from these larvae were fed—until they were killed and mounted—with nutrient solution (10.5 g honey, 1.05 L distilled water, 350 mL beer, 60 g sucrose, 1.05 g ascorbic acid, and 1.05 g nipagin) moistened on cotton swabs according to the method proposed for *Anticarsia gemmatilis* Hübner (Lepidoptera: Noctuidae) (Ferreira et al. 2008). After development, adult insects were killed in a killing chamber, mounted, and deposited at the LCBI at UFV. Some adults were sent to the “Departamento de Zoologia” of the “Universidade Federal do Paraná (UFPR)” in Curitiba, Paraná, Brazil, for identification. For this study, we also assembled published information concerning host plants of *Colobura* spp.

Larvae pupated 8 d after collection and adults emerged 15 d after pupation. These insects were identified as *C. dirce dirce* by Dr. Olaf Hermann Hendrik Mielke. The collection of this species in the MRZM increases the number of regions from which it is known to occur. Seventeen species from 6 plant families have been reported as hosts of *C. dirce dirce* (Table 1).

¹Departamento de Fitotecnia, Universidade Federal de Viçosa, 36570-900, Viçosa, Minas Gerais, Brazil

²Departamento de Engenharia Florestal, Universidade Federal dos Vales do Jequitinhonha e Mucuri, 39100-000, Diamantina, Minas Gerais, Brazil

³Departamento de Agronomia, Universidade Federal dos Vales do Jequitinhonha e Mucuri, 39100-000, Diamantina, Minas Gerais, Brazil

⁴Departamento de Biologia Animal, Universidade Federal de Viçosa, 36570-900, Viçosa, Minas Gerais, Brazil

*Corresponding author; E-mail: assisjr_ento@yahoo.com.br

Table 1. Host plants of *Colobura* spp. (Lepidoptera: Nymphalidae) reported from the literature.

Family	Species	Location: Reference
Caricaceae	<i>Carica microcarpa</i> <i>C. papaya</i>	Suriname: Sepp 1848
Euphorbiaceae	<i>Cassava</i> spp.	Suriname: Merian 1705; Stoll 1786
Fabaceae	<i>Cassia fistulosa</i> <i>Inga</i> sp.	Puerto Rico: Martorell 1976 Brazil: Hayward 1969
Urticaceae	<i>Cecropia eximia</i> <i>C. longipes</i> <i>C. virgusa</i> <i>C. hololeuca</i> <i>C. mexicana</i> <i>C. obtusa</i> <i>C. pachystachia</i> <i>C. peltata</i> <i>Cecropia</i> spp.	Colombia: Constantino 1998 Brazil: Hoffmann 1930 El Salvador: Muyschondt & Muyschondt 1976 French Guiana: Remillet 1988 Brazil: Müller 1886 Colombia: Willmott et al. 2001 Cuba: Dewitz 1879; Bruner et al. 1975; Beebe 1952 El Salvador: Muyschondt & Muyschondt 1976 Puerto Rico: Martorell 1976 Trinidad: Barcant 1970 Argentina: Hayward 1940 Brazil: Hoffmann 1936; Zikán & Zikán 1968; Bönninghausen 1896; Otero & Mari-go 1990; Brown Junior 1992; Elias et al. 2007 Costa Rica: Mallet & Longino 1982; DeVries 1986, 1987 Guyana: Mallet & Longino 1982 West Indies: Riley 1975; Smith et al. 1994 Jamaica: Brown & Heineman 1972
Myrtaceae	<i>Eucalyptus</i> sp.	Brazil: Biezanko 1949
Rubiaceae	<i>Coffea</i> sp. <i>Cassia</i> sp. ?	Guyana: Bodkin 1915 Neotropics: Seitz 1914

Doubtful records are followed by a “?”

The presence of *C. dirce dirce* on 20 *C. hololeuca* plants at 50 cm height confirms the information of Mallet & Longino (1982) and DeVries et al. (1999) that larvae of this insect feed on plants in primary forests or in areas near to urbanization, and of Carneiro et al. (2008) that this subspecies occurs in the central-south region of Brazil. Furthermore, it confirms the polyphagous nature of this species and suggests that because of the lack of a preferred host species, *C. dirce dirce* might feed on other plants of different botanical families, which are abundant in the MRZM. Plants of agronomic importance, such as *Eucalyptus* spp. and *Coffea* spp. (Gentianales: Rubiaceae), are included as hosts of *C. dirce dirce* (Seitz 1914; Bodkin 1915; Biezanko 1949), suggesting that the devastation of the Atlantic Forest biome could cause this species to become a potential pest of crops.

Larvae were found in small groups, or even as lone individuals, and were clustered together on the adaxial part of the leaf. They preferred young leaves and left the leaf ribs intact. Solitary habits or occurrence of small groups of larvae on young trees or seedlings have also been reported by Willmott et al. (2001), who stated that larvae avoid mature leaves and large trees due to the high concentrations of toxic compounds, such as tannins. Natural enemies were not observed in larvae of *C. dirce dirce*.

Colobura dirce dirce has potential to damage and to complete its life cycle on *C. hololeuca* under natural conditions. Despite the large number of hosts of *C. dirce dirce*, more studies should be conducted to evaluate the effect of defoliation of this plant, which is important for feeding of sloths, birds, and mammals and in folk medicine used by the regional population.

We thank the “Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)”, “the Coordenação de Aperfeiçoamento de Pesso-

al de Nível Superior (CAPES)” and the “Fundação de Amparo a Pesquisa do Estado de Minas Gerais (FAPEMIG)” for financial support.

Summary

The Atlantic Forest biome includes the middle region of the Zona da Mata (MRZM) in southeastern Minas Gerais, Brazil. *Cecropia hololeuca* Miq. (Rosales: Urticaceae) is an arboreal plant endemic to Brazil. Species of *Colobura* Billberg (Lepidoptera: Nymphalidae) are common in forested habitats in the Neotropical Region. The aims of this study were to report damage by *C. dirce dirce* L. larvae on *C. hololeuca* in the MRZM, and to review host plants of *Colobura* spp. Two hundred fifty-two larvae were found damaging twenty 50 cm tall *C. hololeuca* plants on the campus of the “Universidade Federal de Viçosa” in Viçosa, Minas Gerais, Brazil, and brought to the “Laboratório de Controle Biológico de Insetos (LCBI).” Adults and exuviae of these larvae were deposited at the LCBI and identified in the “Departamento de Zoologia” of the “Universidade Federal do Paraná” in Curitiba, Paraná, Brazil, as *C. dirce dirce*. This is the first report of this lepidopteran on *C. hololeuca* in the MRZM. Seventeen species from 6 plant families have been reported as hosts for *C. dirce dirce*.

Key Words: Nymphalinae; Nymphalini; *Papilio dirce*; Papilionoidea

Sumário

O bioma Mata Atlântica inclui a região média da Zona da Mata, na parte sudeste de Minas Gerais, Brasil. *Cecropia hololeuca* Miq. (Rosales: Urticaceae) é uma planta arbórea endêmica ao Bra-

sil. Espécies de *Colobura* Billberg (Lepidoptera: Nymphalidae) são comuns em habitats florestais na região Neotropical. Os objetivos deste estudo foram relatar danos causados por lagartas de *C. dirce* L. sobre *C. hololeuca* na região média da Zona da Mata e revisar as plantas hospedeiras de *Colobura* spp. Duzentas e cinquenta e duas lagartas foram encontradas danificando vinte plantas de 50 cm de altura de *C. hololeuca* no campus da Universidade Federal de Viçosa, em Viçosa, Minas Gerais, Brasil, e trazidas para o LCBI. Adultos e exúvias dessas lagartas foram depositadas no Laboratório de Controle Biológico de Insetos (LCBI) e identificados no Departamento de Zoologia da Universidade Federal do Paraná, em Curitiba, Paraná, Brasil, como *C. dirce dirce*. Este é o primeiro relato deste Lepidoptera sobre *C. hololeuca* na região média da Zona da Mata. Dezessete espécies de seis famílias de plantas têm sido relatadas como hospedeiras de *C. dirce dirce*.

Palavras Chave: Nymphalinae; Nymphalini; *Papilio dirce*; Papilionoidea

References Cited

- Aragon DMO, Guarize L, Lanini J, Costa JC, Garcia RMG, Scio E. 2010. Hypoglycemic effects of *Cecropia pachystachya* in normal and all oxan-induced diabetic rats. *Journal of Ethnopharmacology* 128(3): 629-633.
- Barcant M. 1970. Butterflies of Trinidad and Tobago. Collins, London, United Kingdom.
- Beebe CW. 1952. A contribution to the life history of *Colobura* (*Gynaecia* auct.) *dirce dirce* (Linnaeus) (butterfly). *Zoologica* 27(1): 32-40.
- Biezanko CM. 1949. II. Acraeidae, Heliconiidae et Nymphalidae de Pelotas e seus arredores (Contribuição ao conhecimento da fisiografia do Rio Grande do Sul). *Livraria Globo, Pelotas, Brazil*.
- Bodkin GE. 1915. Appendix III. Report of the economic biologist. Reports of the Department of Science and Agriculture (Georgetown) 1913/1914: 11 pp.
- Bönnigghausen V. 1896. Beitrag zur Kenntnis der Lepidopteren-Fauna von Rio de Janeiro. *Verhandlungen des Vereins für Naturwissenschaftliche Unterhaltung zu Hamburg* 9(1): 19-41.
- Brown FM, Heineman B. 1972. Jamaica and its Butterflies. E.W. Classey Ltd., London, United Kingdom.
- Brown Junior KS. 1992. Borboletas da Serra do Japi: diversidade, habitats, recursos alimentares e variação temporal, pp. 142-187 *In* Morellata LPC [ed.], *História Natural da Serra do Japi. Ecologia e Preservação de uma Área Florestal no Sudeste do Brasil*. Editoria da Unicamp/FAPESP, Campinas, Brazil.
- Bruner SC, Scaramuzza LC, Otero AR. 1975. Catálogo de los Insectos que Atacan a las Plantas Económicas de Cuba. Segunda Edición. Academia de Ciencias de Cuba, Instituto de Zoología, La Habana, Cuba.
- Carneiro E, Mielke OHH, Casagrande MM. 2008. Butterflies of southern Santa Catarina Island, Florianópolis, Santa Catarina, Brasil (Lepidoptera: Hesperioidea and Papilionoidea). *SHILAP- Revista de Lepidopterologia* 36(142): 261-271.
- Constantino LM. 1998. Butterfly life history studies, diversity, ranching and conservation in the Chocó rain forests of western Colombia (Insecta: Lepidoptera). *SHILAP- Revista de Lepidopterologia* 26(115): 19-39.
- DeVries PJ. 1986. Host plant records and natural history notes on Costa Rican butterflies (Papilionidae, Pieridae and Nymphalidae). *Journal of Research on the Lepidoptera* 24(4): 290-333.
- DeVries PJ. 1987. The butterflies of Costa Rica and their Natural History. Papilionidae, Pieridae, Nymphalidae. Princeton University Press, Princeton, New Jersey.
- DeVries PJ, Lande R, Murray D. 1999. Associations of co-mimetic ithomiine butterflies on small spatial and temporal scales in a neotropical rainforest. *Biological Journal of the Linnean Society* 67(1): 73-85.
- Dewitz H. 1879. Naturgeschichte cubanischer Schmetterlinge. Nach Beobachtungen des Herrn Dr. Gundlach bearbeitet. *Zeitschrift für die gesamten Naturwissenschaften* 52(2): 155-174.
- Elias M, Joron M, Wilmott K, Kaiser V, Silva-Brandão KL, Freitas AVL, Mejia CA, Pineres LMG, Brower AVZ, Jiggins C. 2007. Phylogenetic hypothesis, pattern of speciation and evolution of wing pattern in neotropical *Napeogenes* butterflies (Lepidoptera: Nymphalidae). *Journal of Insect Science* 7(29): 13-14.
- Ferreira JAM, Zanuncio JC, Torres JB, Molina-Rugama AJ. 2008. Predatory behaviour of *Podisus nigrispinus* (Heteroptera: Pentatomidae) on different densities of *Anticarsia gemmatilis* (Lepidoptera: Noctuidae) larvae. *Biocontrol Science and Technology* 18(7): 711-719.
- Godoy S, Takaki M. 2004. Effects of light and temperature on seed germination in *Cecropia hololeuca* Miq. (Cecropiaceae). *Brazilian Archives of Biology and Technology* 47(2): 185-191.
- Grelle CED, Garcia QS. 1999. Potential dispersal of *Cecropia hololeuca* by the common opossum (*Didelphis aurita*) in Atlantic forest, southeastern Brazil. *Revue d'Ecologie la Terre et la Vie* 54(1): 327-332.
- Hayward KJ. 1940. Ninfálidos argentinos. Notas adicionales. *Anales de la Sociedad Científica Argentina* 129(4): 43-47.
- Hayward KJ. 1964. Insecta, Lepidoptera (Rhopalocera). Familiae Nymphalidae arumet Heliconiidae arumet 3, pp. 14721-14726 *In* Descole HR [ed.], *Genera et Species Animalium Argentinae*. Guillermo Kraft, Buenos Aires, Argentina.
- Hayward KJ. 1969. Datos para el estudio de la ontogenia de lepidópteros argentinos. *Miscelánea. Instituto Miguel Lillo de la Universidad Nacional de Tucuman* 31(1): 1-142.
- Hoffmann F. 1930. *Gynaecia dirce* L. (Nymphal.). *International Journal of Entomology* 24(23): 251-252.
- Hoffmann F. 1936. Beiträge zur Lepidopteren Fauna von Sta. Catarina (Süd-Brasilien). *Entomologische Rundschau* 53: 221-224.
- Mallet JLB, Longino JT. 1982. Hostplant records and descriptions of juvenile stages for two rare species of *Eueides* (Nymphalidae). *Journal of the Lepidopterists' Society* 36(2): 136-144.
- Martorell LF. 1976. Annotated food plant catalog of the insects of Puerto Rico. Department of Entomology, Agricultural Experiment Station, University of Puerto Rico, Río Piedras, Puerto Rico.
- Merian MM. 1705. Metamorphosis insectorum surinamensium, *In* Qua eruae ac vermes surinamenses, cum omnibus suis transformationibus, ad vivum delineantur et describuntur, singulis eorum in plantas, flores et fructus collocatis, in quibus reperta sunt; tunc etiam generatio ranarum, bufonum rariorum, lacertarum, serpentum, araneorum et formicarum exhibetur; omnia in America ad vivum naturali magnitudine picta atque descripta. Gerard Valk, Amsterdam, The Netherlands.
- Müller W. 1886. Südamerikanische Nymphalidenraupen. Versuch eines natürlichen Systems der Nymphaliden. *Zoologische Jahrbücher Systematik* 1(1): 417-468.
- Muyshondt Junior A, Muyshondt A. 1976. Notes on the life cycle and natural history of butterflies of El Salvador. IC. *Colobura dirce* L. (Nymphalidae: Coloburinae). *Journal of the New York Entomological Society* 84(1): 23-33.
- Nunes LAPL, Dias LE, Jucksch I, Barros NF, Kasuya MCM, Correia MEF. 2009. Impact of monocultivation coffee on biological indicators of quality soil in the Zona da Mata (MG), Brazil. *Ciência Rural* 39(9): 2467-2474.
- Otero LS, Marigo LC. 1990. Butterflies. Beauty and Behavior of Brazilian Species. Marigo Comunicação Visual, Rio de Janeiro, Brazil.
- Portugal AF, Costa ODV, Costa LM. 2010. Physical and chemical properties of a soil under different production systems and forest in the Zona da Mata region of Minas Gerais State (Brazil). *Revista Brasileira de Ciência do Solo* 34(2): 575-585.
- Reis H, Scolforo JRS, Oliveira AD, Oliveira Filho AT, Mello JM. 2007. Floristic composition analysis, diversity and similarity of Atlantic forest fragments in Minas Gerais State, Brazil. *Cerne* 13(3): 280-290.
- Remillet M. 1988. Catalogue des Insectes Ravageurs des Cultures en Guyane Française. Orstom, Paris, France.
- Resende JLP, Pádua CTJ, Oliveira AD, Scolforo JRS, Coelho Junior LM. 2009. Characterization of a forest incentive program in Minas Gerais State. *Cerne* 15(3): 295-302.
- Riley ND. 1975. A field guide to the butterflies of the West Indies. Collins, London, United Kingdom.
- Santana SWJ, Barros R, Torres JB, Gondim MGC. 2010. Thermal requirements of the coconut pest *Atheloca subrufella* (Hulst) (Lepidoptera: Phycitidae). *Neotropical Entomology* 39(2): 181-186.
- Seitz A. 1914. 3. Gattung: *Morpheus* Hbn. - 34: Gattung: *Bolboneura* Salv., pp. 433-477 *In* Seitz A [ed.], *Die Gross-Schmetterlinge der Erde* 5. Alfred Kernen, Stuttgart, Germany.
- Sepp J. 1848-1852. Surinaamsche Vlinders. Naar het leven geteekend. Papillons de Surinam Dessinés d'après Nature, 3 volumes. pp. 101-152 and 225-328, Zoon, Amsterdam, The Netherlands.
- Smith DS, Miller LD, Miller JY. 1994. The Butterflies of the West Indies and South Florida. Oxford University Press, Oxford, United Kingdom.
- Soucar C, Cysneiros RM, Tanai MM, Torres LMB, Lima-Landman MT, Lapa AJ. 2008. Inhibition of gastric acid secretion by a standardized aqueous extract of *Cecropia glaziovii* Sneth and underlying mechanism. *Phytomedicine* 15(6-7): 462-469.
- Souza RM, Anjos N, Sorgato JC. 2009. Occurrence of *Naupactus cervinus* (Boheman) in coffee plantation in the region of Zona da Mata mineira. *Ciência e Agrotecnologia* 33(1): 1967-1971.
- Sposito TC, Santos FAM. 2001a. Architectural patterns of eight *Cecropia* (Cecropiaceae) species of Brazil. *Flora* 196(3): 215-226.
- Sposito TC, Santos FAM. 2001b. Scaling of stem and crown in eight *Cecropia* (Cecropiaceae) species of Brazil. *American Journal of Botany* 88(5): 939-949.

- Stoll C. 1786. Aanhangel van het Werk, de Uitlandische Kapellen, Voorkomende in de Drie Waereld-Deelen Asia, Africa en America, door den Heere Pieter Cramer, Vervattende Naauwkeurige Afbeeldingen van Surinaamsche Rupsen en Poppen; als Mede van Veele Zeldzaame en Nieuwe Ontdekte Uitlandische Dag-en Nagt-Kapellen. 1-42 and 1-8. Nic. Th. Gravius, Amsterdam, The Netherlands.
- Tavares WS, Serrão JE, Barbosa RA, Zanuncio JC. 2011. *Lagerstroemia speciosa* (L.) Pers. (Lythraceae), a new host for the defoliator *Oiketicus kirbyi* Guiding [1827] (Lepidoptera: Psychidae). Tropical Lepidoptera Research 21(2): 100-104.
- Vaughan C, Ramírez O, Herrera G, Guries R. 2007. Spatial ecology and conservation of two sloth species in a cacao landscape in Limón, Costa Rica. Biodiversity and Conservation 16(8): 2293-2310.
- Willmott KR, Constantino LM, Hall JPH. 2001. A review of *Colobura* (Lepidoptera: Nymphalidae) with comments on larval and adult ecology and description of a sibling species. Annals of the Entomological Society of America 94(2): 185-196.
- Zikán JF, Zikán W. 1968. Inseto-fauna do Itatiaia e da Mantiqueira. III. Lepid. Pesquisa Agropecuária Brasileira 3(1): 45-109.