



Taxonomy and Systematic

Historical record on the Brazilian hawkmoths (Lepidoptera: Sphingidae) deposited in the Entomological Collection of the Museu de História Natural da Bahia (MHNBA) in Salvador, Bahia, Brazil

Ramon Lima Ramos^{1,2,3}, Daniele Santos Lopes¹, Caroline Tito Garcia^{1,3}, Matheus Eduardo Trindade-Santos^{1,3,4} & Favízia Freitas de Oliveira^{1,3,4}

1. Universidade Federal da Bahia (UFBA), Instituto de Biologia (IBIO), Laboratório de Bionomia, Biogeografia e Sistemática de Insetos (BIOSIS), Bahia, Brazil. 2. Programa da Pós-Graduação em Biodiversidade e Evolução (PPGBioEvo), IBIO, UFBA, Bahia, Brazil. 3. Programa de Pós-Graduação em Ecologia: Teoria, Aplicações e Valores (IBIO), UFBA, Bahia, Brazil. 4. Universidade Estadual de Feira de Santana, Núcleo de Estudo em Agroecologia – Trilhas, Bahia, Brazil.

EntomoBrasilis 14: e951 (2021)

Edited by:

Thamara Zacca

Article History:

Received: 25.vi.2021

Accepted: 16.viii.2021

Published: 19.viii.2021

Corresponding author:

Ramon Lima Ramos

✉ ramon.lima02@hotmail.com

Funding agencies:

↪ Without funding declared

Abstract. In this article we present the historical records of the Brazilian hawkmoths deposited in the Entomological Collection of the Museu de História Natural da Bahia (MHNBA-UFBA), including the historical Lepidoptera collection donated by Dr. Pedro de Araújo to the MHNBA-UFBA. The Sphingidae collection is composed of 243 specimens and represents 24 genera and 66 species. The historical collection consists of specimens captured between the years 1924 and 1934, and we also included to the collection specimens that were captured more recently, between 1982 and 2014. The subfamily Macroglossinae presented the greatest species richness and Smerinthinae the presented the least species richness. Of all of specimens in the collection, 151 came from São Paulo State (Brazil), 41 from Santa Catarina State, 50 from Bahia State and only one from Pernambuco State. Three topotypes were identified in the collection, namely: *Eumorpha translineatus* (Rothschild, 1895), *Xylophanes crenulata* Vaglia & Haxaire, 2009 and *Xylophanes alinea* Haxaire & Mielke, 2018.

Keywords: Biodiversity; Checklist; Geographical Distribution; Insecta; Moths.

The Entomological Collection of the Museu de História Natural da Bahia (MHNBA-MZUFBA) holds an important collection of insects from all regions of Brazil, including extinct, rare, type specimens and topotypes species, with the Lepidoptera Collection being one of the most important and olden from northeast of Brazil. The collection was started in 1943, with the incorporation of the specimens collected by the autonomous researcher Dr. Pedro de Araújo who donated part of it (specimens collected from 1924 to 1934) to the Universidade Federal da Bahia (UFBA) (NAPOLI 2010). The collection represents an important record of the Brazilian hawkmoth fauna and is composed of specimens that were captured over nearly 100 years in an age where anthropic modifications and/or pressures were not as severe as they are currently. In addition, specimens that were collected more recently between the years 1982 and 2014 are also included into the collection.

The moths of the family Sphingidae (Insecta: Lepidoptera) have a cosmopolitan distribution, but their greatest diversity is concentrated in the tropics. This family includes more than 1.200 species that are distributed on all continents. Based on recent data, there are record of 312 species occurring in the Neotropical region, and 191 species occurring in Brazil (HEPPNER 1991; KITCHING & CADIOU 2000; MARTIN 2021). The hawkmoths are robust insects of medium to large size that have fusiform bodies and the apical region of their abdomen is conical. Generally, their antennae are filiform and have a pronounced hook at the apex of the last flagellomere. Another important fact is that several species have extremely

long proboscises that sometimes exceed the size of their bodies (TUTTLE 2007; SPECHT *et al.* 2008; KRENN 2010).

They are considered important pollinators of several tree species, shrubs and creepers that typically have white or pale-coloured tubular flowers with nocturnal antheses and strong aromas at night. Because of insect-plant interactions, they can be used as biological indicators of the state of conservation of plant communities (VOGEL 1954; FAEGRI & VAN DER PIJL 1979; HABER & FRANKIE 1989; MOTTA 1993; KITCHING & CADIOU 2000; MOTTA & XAVIER-FILHO 2005). Although the hawkmoths have a reasonable taxonomic resolution, they are widely distributed throughout the world and easily recognized, being well represented in entomological collections around the world. In Brazil, the largest collections are deposited in the main natural history museums in the north, south and southeast regions. Despite the importance and accumulated knowledge about this insect group, data on the geographic distribution and composition of Brazilian hawkmoth fauna are still incipient (KITCHING & CADIOU 2000; DARRAULT & SCHLINDWEIN 2002; DUARTE & SCHLINDWEIN 2005; DUARTE *et al.* 2008), mainly lacking data from collections located in the midwest and northeast of Brazil.

Although checklists are not regarded with the importance they deserve, recent publications have emphasized their value and applicability (CRANSTON 2005; SILVEIRA & UEZU 2011; MELLO-PATIU *et al.* 2017). Checklists generate knowledge about the geographic distributions of species, pointing out priority areas for conservation, characterizing environmental impacts,

and supporting taxonomic and several other studies. Review lists of taxonomic groups are a way of establishing their state of the art as well as creating a solid starting point for future scientific research. Therefore, the present work aims to report information about the Sphingidae collection deposited in the MHNBA-MZUFBA to contribute to our knowledge on the geographic distribution of Brazilian hawkmoths, making available the data from the Entomological Collection of the MHNBA-MZUFBA, an important collection for the northeast of Brazil.

MATERIAL AND METHODS

The hawkmoths deposited in the Entomological Collection of the MHNBA-MZUFBA were studied under a stereomicroscope Leica Ez4. For all studied material, the original (historical) label was maintained and a new label (typed) was added with more detailed information. The entire collection was digitized, where each specimen received a voucher number and the tag data was entered into the MHNBA-MZUFBA database.

The specimens were identified with the aid of the guides of D'ABRERA (1986), Guia dos Sphingidae da Serra dos Órgãos (MARTIN et al. 2011) and catalogue online Hawkmoths of Brazil (MARTIN 2021). We followed the nomenclature that was proposed by Haxaire & C. Mielke (2020). A checklist was prepared containing the subfamilies and their respective tribes, genera, species and number of specimens, as well as the location and date of collection. The topotypes (ICZN 1999) is indicated by an asterisk.

RESULTS AND DISCUSSION

The hawkmoths collection from MHNBA-MZUFBA is composed of 243 specimens that are distributed in 66 species, representing approximately 34.5% of the Sphingidae species record for Brazil (MARTIN 2021). The studied species represent 24 genera, 6 tribes and 3 subfamilies from four Brazilian states that are in the northeast, south and southeast regions and were collected between the years 1924 and 2014. Of the total specimens, 151 individuals came from the state of São Paulo, 41 from Santa Catarina, 50 from Bahia and only 1 from Pernambuco. The specimens from São Paulo and Santa Catarina were acquired through the donation of Dr. Pedro de Araújo to the UFBA, and the specimens of Bahia and Pernambuco were collected and deposited in the MHNBA-MZUFBA by D. H. Smith, M. Cruz and R. L. Ramos.

In the historical collection donated to the UFBA by Dr. Pedro de Araújo studied in the present work, 192 specimens of Sphingidae were captured through sporadic collections carried out over 10 years (between 1924 and 1934), corresponding to 3 subfamilies, 24 genera and 65 species, which represents 79% of the Sphingidae deposited in the MHNBA-MZUFBA.

Three topotypes were identified in the collection, namely: *Eumorpha translineatus* (Rothschild, 1895) (Figure 7-9), *Xylophanes crenulata* Vaglia & Haxaire, 2009 (Figure 1-3) and *Xylophanes alineae* Haxaire & Mielke, 2018 (Figure 4-6). Among the total number of studied specimens, the Macroglossinae subfamily had the greatest richness, represented by 46 species, followed by Sphinginae with 15 species and Smerinthinae with only 5 species, which are listed below:

Subfamily Macroglossinae Harris, 1839

Tribe Dilophonotini Burmeister, 1878

1. *Aellopos ceculus* (Cramer, 1777)

Synonymy. *Macroglossum fasciatum* (Swainson, 1823); *Sesia*

gehleni (Closs, 1922).

Material examined (3 specimens). Amparo, São Paulo, ii.1928 [2 specimens]; Santa Catarina, 1927 [1 specimen].

Type locality. Surinam.

Distribution. Neotropical region (MARTIN et al. 2011; MARTIN 2021).

2. *Aellopos fadus* (Cramer, 1776)

Synonymy. *Macroglossum annulosum* (Swainson, 1823); *Macroglossa balteata* (Kirtland, 1851).

Material examined (1 specimen). Amparo, São Paulo, 1926 [1 specimen].

Type locality. Surinam.

Distribution. From Argentina to USA (HODGES 1971; MARTIN et al. 2011; MARTIN 2021).

3. *Aellopos titan titan* (Cramer, 1777)

Synonymy. *Aellopos titan aguacana* (Gehlen, 1944).

Material examined (2 specimens). Amparo, São Paulo, 1926 [2 specimens].

Type locality. Surinam.

Distribution. From South America, West Indies, to eastern United States and southern Canada (TUTTLE 2007; MARTIN et al. 2011; MARTIN 2021).

4. *Aleuron chloroptera* (Perty, [1833])

Synonymy. *Aleuron chloroptera* Boisduval, 1870; *Aleuron disis* Boisduval, [1875].

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil (Southeastern).

Distribution. Neotropical region (MARTIN et al. 2011; MARTIN 2021).

5. *Aleuron iphis* (Walker, 1856)

Synonymy. *Callionyma volatica* (Clemens, 1859); *Tylognathus scriptor* (R. Felder, [1874]).

Material examined (1 specimen). Amparo, São Paulo, xii.1925 [1 specimen].

Type locality. Brazil.

Distribution. Neotropical region (MARTIN et al. 2011; MARTIN 2021).

6. *Callionima nomius* (Walker, 1856)

Synonymy. *Eucheryx nomius* (Boisduval, [1875]).

Material examined (1 specimen). Santa Catarina, 1928 [1 specimen].

Type locality. Brazil.

Distribution. Neotropical region (MARTIN et al. 2011).

7. *Callionima parce* (Fabricius, 1775)

Synonymy. *Sphinx licastus* (Stoll, 1782); *Sphinx galianna* (Burmeister, 1855); *Hemeroplanes parce guiarti* (Debauche,

1934); *Hemeroplanes parthenope* (Zikan, 1935); *Hemeroplanes modesta* (Gehlen, 1950).

Material examined (7 specimens). Amparo, São Paulo, i.1928 [3 specimens]; Amparo, São Paulo, 2.ii.1933 [4 specimens].

Type locality. Brazil (Brasília).

Distribution. From Argentina to Mexico (MARTIN *et al.* 2011; MARTIN 2021).

8. *Enyo cavifer* (Rothschild & Jordan, 1903)

Synonymy. *Thyreus maris* (Herrich-Schäffer, 1854); *Enyo cavifer paganus* (Kernbach, 1957).

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Colombia.

Distribution. Neotropical region (MARTIN *et al.* 2011; MARTIN 2021).

9. *Enyo gorgon* (Cramer, 1777)

Synonymy. *Sphinx lyctus* (Cramer, 1779); *Epistor gorgon heinrichi* (Clark, 1932).

Material examined (2 specimens). Santa Catarina, 1927 [2 specimens].

Type locality. Surinam.

Distribution. Neotropical region (MARTIN *et al.* 2011; MARTIN 2021).

10. *Enyo lugubris lugubris* (Linnaeus, 1771)

Synonymy. *Sphinx fegeus* (Cramer, 1779); *Epistor luctuosus* (Boisduval, [1875]).

Material examined (10 specimens). Amparo, São Paulo, 1927 [6 specimens]; Itapira, São Paulo, 21.ii.1924 [1 specimen]; Itapira, São Paulo, 22.ii.1924 [1 specimen]; Salvador, Bahia, 6.iv.1985 [1 specimen]; Salvador, BA, 29.v.1985 [1 specimen].

Type locality. Antigua.

Distribution. From South America to USA (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

11. *Enyo ocypte* (Linnaeus, 1758)

Synonymy. *Sphinx camertus* (Cramer, 1779); *Sphinx danum* (Cramer, 1779).

Material examined (10 specimens). Amparo, São Paulo, xii.1926 [3 specimens]; Amparo, São Paulo, i.1928 [3 specimens]; Amparo, São Paulo, 5.i.1933 [2 specimens]; Salvador, BA, 7.vi.1984 [1 specimen]; Salvador, BA, 6.vi.1996 [1 specimen].

Type locality. Neotropical region.

Distribution. Neotropical region with punctual records to southern and north Florida (MARTIN *et al.* 2011; MARTIN 2021).

12. *Erinnyis alope alope* (Drury, 1770)

Synonymy. *Sphinx flavicans* (Goeze, 1780); *Sphinx fasciata* (Swainson, 1823); *Anceryx edwardsii* (Butler, 1881).

Material examined (5 specimens). Amparo, SP, xii.1925 [3 specimens]; Recife, PE, 10.viii.1985 [1 specimen]; Salvador,

BA, 16.ii.1934 [1 specimen].

Type locality. Jamaica.

Distribution. From Argentina, Caribbean to southern of the USA (MARTIN *et al.* 2011; MARTIN 2021).

13. *Erinnyis ello ello* (Linnaeus, 1758)

Synonymy. *Erinnyis cinifera* Zikán, 1934.

Material examined (17 specimens). Amparo, São Paulo, xi.1924 [1 specimen]; Amparo, São Paulo, i.1926 [3 specimens]; Salvador, Bahia, 1.v.1984 [1 specimen]; Salvador, Bahia, 27.v.1984 [1 specimen]; Salvador, Bahia, 25.xi.1984 [1 specimen]; Salvador, Bahia, 21.i.1985 [1 specimen]; Salvador, Bahia, 22.i.1985 [1 specimen]; Salvador, Bahia, 27.iii.1985 [1 specimen]; Salvador, Bahia, 12.iv.1985 [1 specimen]; Salvador, Bahia, 13.vi.1985 [2 specimens]; Salvador, Bahia, 29.vi.1985 [1 specimen]; Salvador, Bahia, 30.v.1986 [1 specimen]; Salvador, Bahia, 18.iv.2014 [1 specimen]; Salvador, Bahia, 2.vi.2014 [1 specimen].

Type locality. America (West Indies).

Distribution. From Argentina, Caribbean to southern of the USA and Canada (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

14. *Erinnyis obscura obscura* (Fabricius, 1775)

Synonymy. *Sphinx rustica* (Schaller, 1788); *Sphinx picta* (Sepp, [1848]); *Erinnyis cinerosa* Grote, 1865; *Anceryx rhaebus* (Boisduval, 1870); *Dilophonota domingonis* (Butler, 1875) [= *Erinnyis domingonis*]; *Dilophonota festa* (Edwards, 1882); *Erinnyis obscura jamaicensis* Clark, 1935; *Erinnyis domingonis pallescens* Clark, 1936.

Material examined (8 specimens). Amparo, São Paulo, xii.1925 [3 specimens]; Amparo, São Paulo, i.1927 [3 specimens]; Salvador, Bahia, 14.iii.1985 [1 specimen]; Salvador, Bahia, 18.ix.1985 [1 specimen].

Type locality. America.

Distribution. From Argentina to southern of the USA (MARTIN *et al.* 2011; MARTIN 2021).

15. *Erinnyis oenotrus* (Cramer, 1782)

Synonymy. *Sphinx penaeus* (Fabricius, 1787); *Erinnyis melancholica* Grote, 1865; *Anceryx piperis* (Boisduval, 1875); *Dilophonota hippothoon* (Burmeister, 1878).

Material examined (3 specimens). Amparo, São Paulo, xii.1925 [1 specimen]; Amparo, SP, xii.1927 [2 specimens].

Type locality. Surinam.

Distribution. From Argentina, West Indies to southern of the USA (MARTIN *et al.* 2011; MARTIN 2021).

16. *Eupyrrhoglossum sagra* (Poey, 1832)

Synonymy. *Macroglossa sagra* (Walker, 1856); *Macroglossa harpyia* (Schaufuss, 1870).

Material examined (2 specimens). Amparo, São Paulo, ii.1928 [2 specimens].

Type locality. Cuba.

Distribution. Neotropical region, Caribbean Islands, and also southern USA (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

17. *Hemeroplanes longistriga* (Rothschild & Jordan, 1903)

Synonymy. None.

Material examined (1 specimen). Amparo, SP, ii.1928 [1 specimen].

Type locality. Brazil (Santa Catarina).

Distribution. South America (MARTIN *et al.* 2011; MARTIN 2021).

18. *Isognathus caricae* (Linnaeus, 1758)

Synonymy. *Sphinx cacus* (Cramer, 1775).

Material examined (1 specimen). Amparo, São Paulo, 1927 [1 specimen].

Type locality. Venezuela.

Distribution. From Southeastern South America to Mexico (MARTIN *et al.* 2011; MARTIN 2021).

19. *Madoryx oiclus oiclus* (Cramer, 1780)

Synonymy. *Madoryx faunus* (Boisduval, [1875]).

Material examined (1 specimen). Amparo, São Paulo, 12.v.1934 [1 specimen].

Type locality. Surinam.

Distribution. From southeastern Brazil to Mexico (MARTIN *et al.* 2011; MARTIN 2021).

20. *Pachylia ficus* (Linnaeus, 1758)

Synonymy. *Chaerocampa crameri* (Menetries, 1857); *Pachylia lyncea* Clemens, 1859; *Pachylia ficus venezuelensis* Schaufuss, 1870; *Pachylia undatifascia* Butler, 1876.

Material examined (2 specimens). Amparo, São Paulo, 1925 [2 specimens].

Type locality. America (Florida).

Distribution. From South America to North America (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

21. *Pachylia syces syces* (Hübner, 1819)

Synonymy. *Pachylia inornata* Clemens, 1859; *Pachylia syces cubensis* Closs, 1911; *Pachylia syces septentrionalis* Gehlen, 1944.

Material examined (5 specimens). Amparo, São Paulo, 1925 [3 specimens]; Salvador, Bahia, 1992 [2 specimens].

Type locality. Surinam.

Distribution. From southern Brazil and Uruguay to Mexico (MARTIN *et al.* 2011; MARTIN 2021).

22. *Pachylioides resumens* (Walker, 1856)

Synonymy. *Pachylia inconspicua* (Walker, 1856); *Chaerocampa versuta* (Clemens, 1859); *Pachylia tristis* (Boisduval, [1875]).

Material examined (6 specimens). Amparo, São Paulo, 1926 [5 specimens]; Amparo, São Paulo, xii.1927 [1 specimen].

Type locality. Brazil (Rio de Janeiro) and Dominican Republic (Honduras and St Domingo).

Distribution. Neotropical region and the Caribbean Islands, and punctual records as far north as Florida and Texas in the USA (MARTIN *et al.* 2011; MARTIN 2021).

23. *Perigonia lusca* (Fabricius, 1777)

Synonymy. *Perigonia restituta* Walker, [1865] [=*Panacra restituta*]; *Perigonia interrupta* Walker, [1865]; *Macroglossa doto* (Schaufuss, 1870); *Macroglossa doto affinis* (Schaufuss, 1870); *Stenolophia tenebrosa* (R. Felder, [1874]); *Perigonia lusca bahamensis* Clark, 1919; *Perigonia lusca major* Clark, 1928.

Material examined (6 specimens). Salvador, Bahia, 21.v.1984 [1 specimen]; Salvador, Bahia, 14.iv.1985 [1 specimen]; Salvador, Bahia, 19.vi.1985 [1 specimen]; Salvador, Bahia, 23.vii.1985 [1 specimen]; Salvador, Bahia, 1.ix.1985 [1 specimen]; Salvador, Bahia, 27.iv.1986 [1 specimen].

Type locality. Meridian America.

Distribution. From Brazil to Mexico, and parts of Florida (USA) (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

24. *Perigonia pallida* Rothschild & Jordan, 1903

Synonymy. *Perigonia pallida rufescens* Daniel, 1949.

Material examined (1 specimen). Amparo, São Paulo, ii.1928 [1 specimen].

Type locality. Venezuela.

Distribution. South America (MARTIN *et al.* 2011; MARTIN 2021).

25. *Perigonia passerina* Boisduval, [1875]

Synonymy. None.

Material examined (1 specimen). Amparo, São Paulo, iii.1928 [1 specimen].

Type locality. Unknown.

Distribution. South America (MARTIN 2021).

26. *Perigonia stulta* Herrich-Schäffer, [1854]

Synonymy. None.

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Surinam.

Distribution. Neotropical region (MARTIN *et al.* 2011; MARTIN 2021).

27. *Pseudosphinx tetrio* (Linnaeus, 1771)

Synonymy. *Sphinx hasdrubal* (Cramer, 1779); *Sphinx plumieriae* Fabricius, 1793; *Pseudosphinx obscura* (Butler, 1876); *Pseudosphinx tetrio albina* Gehlen, 1941; *Pseudosphinx tetrio lucia* Moosburg, 1996; *Pseudosphinx tetrio suelli* Moosburg, 1996.

Material examined (1 specimen). Amparo, São Paulo, 1925 [1 specimen].

Type locality. Meridian America.

Distribution. Neotropical region and punctual records in the USA (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

28. *Unzela japix discrepans* Walker, 1856

Synonymy. *Cornipalpus succinctus* (R. Felder, [1874]).

Material examined (1 specimen). Amparo, SP, i.1928 [1 specimen].

Type locality. Brazil (Rio de Janeiro).

Distribution. Argentina and Southern Brazil (MARTIN *et al.*

2011; MARTIN 2021).

Tribe Macroglossini Harris, 1839

29. *Hyles euphorbiarum* (Guérin-Méneville & Percheron, 1835)

Synonymy. *Dielephila celeno* (Boisduval, [1875]); *Dielephila spinifascia* (Butler, 1881).

Material examined (2 specimens). Amparo, São Paulo, iii.1928 [1 specimen]; Salvador, BA, 15.v.1984 [1 specimen].

Type locality. South America.

Distribution. South America (MARTIN *et al.* 2011; MARTIN 2021).

30. *Xylophanes anubus* (Cramer, 1777)

Synonymy. *Choerocampa nitidula* (Clemens, 1859); *Choerocampa laevis* (Gröte & Robinson, 1867); *Choerocampa alcides* (Boisduval, [1875]); *Xylophanes alegrensis* Closs, 1915; *Xylophanes anubus paraguayensis* Gehlen, 1933.

Material examined (3 specimens). Amparo, São Paulo, 1927 [3 specimens].

Type locality. Surinam.

Distribution. From Argentina to Mexico (MARTIN *et al.* 2011; MARTIN 2021).

31. *Xylophanes crenulata* Vaglia & Haxaire, 2009* (Figure 1-3)

Synonymy. None.

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil (Holotype - Santa Catarina; Paratypes - Santa Catarina and Minas Gerais), Paraguay (Paratypes - Canindeyu) and Argentina (Paratypes - Misiones).

Distribution. From southeast and south Brazil (Santa Catarina and Minas Gerais), Paraguay and northern Argentina, but also specimens have been identified from French Guiana, Venezuela, eastern Ecuador, Bolivia and eastern Peru (VAGLIA & HAXAIRE 2009; MARTIN *et al.* 2011).

32. *Xylophanes chiron nechus* (Cramer, 1777)

Synonymy. *Choerocampa haitensis* (Butler, 1875).

Material examined (3 specimens). Amparo, São Paulo, 1926 [2 specimens]; Amparo, SP, 1927 [1 specimen].

Type locality. Dominican Republic (West Indies).

Distribution. Across most of South and Central America (MARTIN *et al.* 2011; MARTIN 2021).

33. *Xylophanes isaon* (Boisduval, [1875])

Synonymy. *Theretra olivacea* (Rothschild, 1894).

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil.

Distribution. From Argentina, Brazil, and Paraguay (MARTIN *et al.* 2011; MARTIN 2021).

34. *Xylophanes pistacina* (Boisduval, [1875])

Synonymy. *Calliomma diogenes* (Maassen, 1880);

Choerocampa jocasta (Druce, 1888).

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil (Minas Gerais).

Distribution. From southern Brazil to Mexico (Neotropical region) (MARTIN *et al.* 2011; MARTIN 2021).

35. *Xylophanes pluto* (Fabricius, 1777)

Synonymy. *Sphinx croesus* (Dalman, 1823); *Oreus thorates* (Hübner, [1827]-[1831]); *Calliomma ochracea* (Walker, 1856).

Material examined (2 specimens). Amparo, São Paulo, i.1928 [2 specimens].

Type locality. Central America [Meridian America].

Distribution. From Argentina to Mexico, the West Indies and into southern Texas and Florida (MARTIN *et al.* 2011; MARTIN 2021).

36. *Xylophanes alineae* Haxaire & Mielke, 2018*

(Figure 4-6)

Synonymy. None.

Material examined (2 specimens). Santa Catarina, 1927 [2 specimens].

Type locality. Brazil (Holotype - Paraná; Paratypes - Santa Catarina, Paraná, São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo).

Distribution. From South and Southeastern Brazil (Paraná, Santa Catarina, São Paulo and Rio de Janeiro) (HAXAIRE & MIELKE 2018; MARTIN 2021).

37. *Xylophanes schausi schausi* (Rothschild, 1894)

Synonymy. *Theretra arpi* (Schaus, 1898).

Material examined (2 specimens). Santa Catarina, 1927 [2 specimens].

Type locality. Brazil (Petrópolis, Rio de Janeiro).

Distribution. Southeastern Brazil (MARTIN *et al.* 2011).

38. *Xylophanes tersa tersa* (Linnaeus, 1771)

Synonymy. *Xylophanes tristis* Closs, 1918; *Xylophanes tersa cubensis* Gehlen, 1941.

Material examined (10 specimens). Amparo, São Paulo, 1927 [2 specimens]; Amparo, São Paulo, 1928 [4 specimens]; Salvador, Bahia, 13.v.1984 [1 specimen]; Salvador, Bahia, 23.vii.1984 [1 specimen]; Salvador, Bahia, 2.vi.2014 [1 specimen]; Santa Catarina, 1927 [1 specimen].

Type locality. Maryland, Jamaica, Antigua.

Distribution. From Argentina to southern Canada (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

39. *Xylophanes thyelia thyelia* (Linnaeus, 1758)

Synonymy. None.

Material examined (4 specimens). Santa Catarina, 1927 [3 specimens]; Serra da Cantareira, SP, ii.1928 [1 specimen].

Type locality. South America.

Distribution. Across most of South America (MARTIN et al. 2011; MARTIN 2021).

40. *Xylophanes xylobotes* (Burmeister, 1878)

Synonymy. None.

Material examined (1 specimen). Amparo, São Paulo, 1927 [1 specimen].

Type locality. Chile (Arica).

Distribution. Restricted range in South and Southeastern Brazil and Paraguay (MARTIN et al. 2011; MARTIN 2021).

Tribe Philampelini Burmeister, 1878

41. *Eumorpha anchemolus* (Cramer, 1780)

Synonymy. *Philampelus satellitia major* (Burmeister, 1878).

Material examined (4 specimens). Amparo, São Paulo, i.1925 [2 specimens]; Amparo, SP, xii.1927 [2 specimens].

Type locality. Surinam.

Distribution. From northern Argentina to southern Mexico, and punctual record in USA (Texas) (TUTTLE 2007; MARTIN et al. 2011; MARTIN 2021).

42. *Eumorpha fasciatus fasciatus* (Sulzer, 1776)

Synonymy. *Eumorpha jussieuae* Hübner, [1816]; *Sphinx strigilis* (Vogel, 1822).

Material examined (2 specimens). Amparo, São Paulo, 1925 [2 specimens].

Type locality. America.

Distribution. From Argentina to USA, and also the Caribbean Islands (TUTTLE 2007; MARTIN et al. 2011; MARTIN 2021).

43. *Eumorpha labruscae labruscae* (Linnaeus, 1758)

Synonymy. *Sphinx clotho* (Fabricius, 1775).

Material examined (3 specimens). Amparo, São Paulo, ii.1928 [2 specimens]; Salvador, BA, 5.v.1985 [1 specimen].

Type locality. America.

Distribution. From Argentina to Nearctic region (TUTTLE 2007; MARTIN et al. 2011; MARTIN 2021).

44. *Eumorpha megaeacus* (Cramer, 1780)

Synonymy. *Sphinx eacus* (Cramer, 1780).

Material examined (1 specimen). Amparo, São Paulo, 1925 [1 specimen].

Type locality. Surinam.

Distribution. From Brazil to Mexico, and one record in the USA (Texas) (HODGES 1971; MARTIN et al. 2011; MARTIN 2021).

45. *Eumorpha translineatus* (Rothschild, 1894)*

(Figure 7-9)

Synonymy. *Eumorpha translineatus extinctus* (Gehlen, 1926).

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil (Santa Catarina).

Distribution. Restricted range in the Argentina, South and Southeast Brazil, and Bolivia (MARTIN et al. 2011; MARTIN 2021).

46. *Eumorpha vitis vitis* (Linnaeus, 1758)

Synonymy. *Philampelus hornbeckiana* (Harris, 1839); *Philampelus linnei* (Grote & Robinson, 1865).

Material examined (5 specimens). Amparo, São Paulo, 1925 [1 specimen]; Amparo, São Paulo, ii.1927 [1 specimen]; Amparo, São Paulo, 8.xii.1931 [2 specimens]; Amparo, São Paulo, 17.ii.1933 [1 specimen].

Type locality. Neotropical Region.

Distribution. From Argentina to USA (MARTIN et al. 2011; MARTIN 2021).

Subfamily Smerinthinae Grote & Robinson, 1865

Tribe Ambulycini Butler, 1876

47. *Adhemarius daphne daphne* (Boisduval, 1875)

Synonymy. None.

Material examined (4 specimens). Amparo, SP, 1927 [2 specimens]; Santa Catarina, 1927 [2 specimens].

Type locality. Brazil.

Distribution. Occurs widely in South America (MARTIN et al. 2011).

48. *Adhemarius eurysthenes* (C. & R. Felder, 1874)

Synonymy. *Ambulyx crethon* (Boisduval, [1875]); *Ambulyx schausi* (Rothschild, 1894).

Material examined (7 specimens). Amparo, SP, 1925 [1 specimen]; Amparo, SP, 1927 [6 specimens].

Type locality. Venezuela.

Distribution. Only found in South America (MARTIN et al. 2011).

49. *Adhemarius gannascus* (Stoll, 1790)

Synonymy. *Ambulyx rostralis* (Boisduval, 1870); *Ambulyx janus* (Boisduval, [1875]); *Amplypterus germanus* (Zikan, 1934).

Material examined (1 specimen). Amparo, SP, 1927 [1 specimen].

Type locality. America, Surinam.

Distribution. From Argentina (north), Brazil (extreme southeast), Paraguay to Mexico (MARTIN et al. 2011; MARTIN 2021).

50. *Adhemarius palmeri* (Boisduval, [1875])

Synonymy. *Ambulyx marginata* (Butler, 1875); *Amplypterus palmeri brasiliensis* (Clark, 1916); *Amplypterus palmeri flavellus* (Gehlen, 1926); *Amplypterus palmeri rubrimargo* (Gehlen, 1926).

Material examined (4 specimens). Amparo, SP, 1926 [1 specimen]; Santa Catarina, 1927 [2 specimens]; Santa Catarina, 1928 [1 specimen].

Type locality. Brazil.

Distribution. Across South America but has also been in Panama and Costa Rica (MARTIN et al. 2011; MARTIN 2021).

51. *Protambulyx strigilis* (Linnaeus, 1771)

Synonymy. *Ambulyx strigilis rubripennis* (Butler, 1876); *Protambulyx strigilis portoricensis* Clark, 1931; *Protambulyx strigilis turarem* Lichy, 1943.

Material examined (7 specimens). Alagoinhas, BA, 20.xi.1993 [1 specimen]; Amparo, SP, 1928 [6 specimens].

Type locality. America.

Distribution. From Argentina to USA, but is also in West Indies and Cuba (TUTTLE 2007; MARTIN *et al.* 2011; MARTIN 2021).

Subfamily Sphinginae Latreille, [1802]

Tribe Acherontiini Boisduval, [1875]

52. *Agrius cingulata* (Fabricius, 1775)

Synonymy. *Sphinx affinis* (Goeze, 1780); *Sphinx druræi* (Donovan, 1810); *Sphinx pungens* (Eschscholtz, 1821).

Material examined (15 specimens). Amparo, São Paulo, i.1927 [1 specimen]; Paulo Afonso, Bahia, 5.viii.1982 [1 specimen]; Salvador, Bahia, 13.v.1984 [2 specimens]; Salvador, Bahia, 27.v.1984 [1 specimen]; Salvador, Bahia, 2.vi.1984 [2 specimens]; Salvador, Bahia, 17.i.1985 [1 specimen]; Salvador, Bahia, 8.vi.1985 [1 specimen]; Salvador, Bahia, 14.viii.1985 [1 specimen]; Salvador, Bahia, 25.ix.1985 [1 specimen]; Salvador, Bahia, 22.v.1986 [1 specimen]; Santa Catarina, 1927 [3 specimens].

Type locality. America.

Distribution. From across Neotropical region, but also been recorded in the southern of the USA and as far north as eastern Canada and even in Western Europe (MARTIN *et al.* 2011; MARTIN 2021).

Tribe Sphingini Latreille, [1802]

53. *Cocytius antaeus* (Drury, 1773)

Synonymy. *Sphinx iatrophæ* (Fabricius, 1775); *Sphinx hydaspus* (Cramer, 1777); *Sphinx medor* (Stoll, 1782); *Sphinx annonæ* (Shaw, 1802); *Amphonyx tapayusa* (Moore, 1883); *Cocytius henrici* Pinchon, 1969.

Material examined (2 specimens). Amparo, São Paulo, ii.1925 [1 specimen]; Salvador, BA, 13.iii.1985 [1 specimen].

Type locality. Jamaica.

Distribution. Occurs throughout the Neotropical region and also punctual occurs in USA (MARTIN *et al.* 2011; MARTIN 2021).

54. *Cocytius beelzebuth* (Boisduval, [1875])

Synonymy. None.

Material examined (1 specimen). Santa Catarina, 1927 [1 specimen].

Type locality. Brazil.

Distribution. Neotropical region (MARTIN *et al.* 2011; MARTIN 2021).

55. *Cocytius duponchel* (Poey, 1832)

Synonymy. *Amphonyx godartii* (Boisduval, [1875]); *Amphonyx rivularis* (Butler, 1875); *Cocytius affinis* Rothschild, 1894.

Material examined (4 specimens). Santa Catarina, 1927 [4 specimens].

Type locality. Cuba.

Distribution. Occurs South and Central America (MARTIN *et al.* 2011; MARTIN 2021).

56. *Cocytius lucifer* Rothschild & Jordan, 1903

Synonymy. *Cocytius macasensis* Clark, 1922; *Cocytius lucifer lindneri* Gehlen, 1944.

Material examined (3 specimens). Santa Catarina, 1927 [3 specimens].

Type locality. Mexico.

Distribution. Occurs across South and Central America (MARTIN *et al.* 2011; MARTIN 2021).

57. *Lintneria justitiae* (Walker, 1856)

Synonymy. *Sphinx anteros* Menetries, 1857.

Material examined (1 specimen). Amparo, São Paulo, xii.1925 [1 specimen].

Type locality. Brazil (Rio de Janeiro).

Distribution. Occurs only in Argentina (north), Uruguay and Brazil (east) (MARTIN *et al.* 2011; MARTIN 2021).

58. *Manduca brasiliensis* (Jordan, 1911)

Synonymy. None.

Material examined (3 specimens). Santa Catarina, 1927 [2 specimens]; São Paulo, SP, ii.1928 [1 specimen].

Type locality. Brazil.

Distribution. Only occurs in South and Southeast Brazil (MARTIN *et al.* 2011; MARTIN 2021).

59. *Manduca contracta* (Butler, 1875)

Synonymy. *Sphinx panaguire* (Berg, 1885); *Protoparce lucetius nubila* (Rothschild & Jordan, 1903); *Protoparce lucetius argentina* (Clark, 1926); *Protoparce lucetius exiguus* (Gehlen, 1942).

Material examined (3 specimens). Amparo, São Paulo, 1927 [3 specimens].

Type locality. Brazil (Rio de Janeiro).

Distribution. Occurs ranges from Argentina, Paraguay, Brazil and Bolivia (MARTIN *et al.* 2011; MARTIN 2021).

60. *Manduca diffissa petuniae* (Boisduval, [1875])

Synonymy. None.

Material examined (4 specimens). Amparo, São Paulo, xii.1925 [4 specimens].

Type locality. Brazil (Rio de Janeiro).

Distribution. Occurs in south and southeast Brazil (MARTIN *et al.* 2011; MARTIN 2021).

61. *Manduca florestan* (Cramer, 1782)

Synonymy. *Diludia brevimargo* (Butler, 1875); *Protoparce florestan cabnal* (Schaus, 1932); *Protoparce maricina* (Schaus, [1941]); *Protoparce florestan vogli* (Daniel, 1949); *Protoparce florestan argentinica* (Daniel, 1949).

Material examined (5 specimens). Amparo, São Paulo, 1925 [2 specimens]; Santa Catarina, 1927 [3 specimens].

Type locality. Surinam.

Distribution. From northern Argentina to USA (MARTIN et al. 2011; MARTIN 2021).

Synonymy. *Protoparce hannibal mayi* (Clark, 1917).

Material examined (2 specimens). Amparo, São Paulo, i.1925 [1 specimen]; Santa Catarina, 1928 [1 specimen].

62. *Manduca hannibal hamilcar* (Boisduval, [1875])

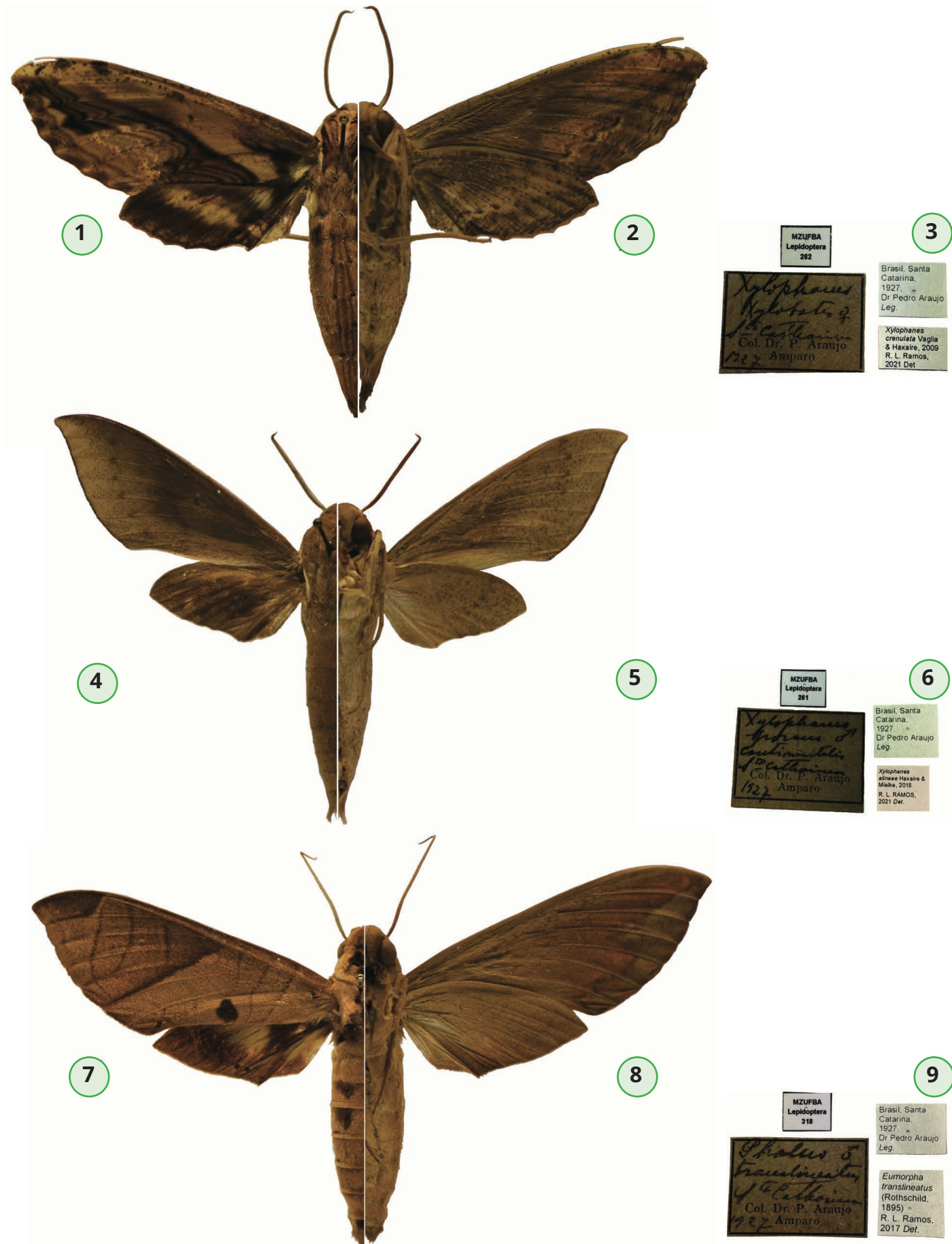


Figure 1-9. Sphingidae topotypes deposited in the Entomological Collection of the Museu de História Natural da Bahia (MHNBA-MZUFBA). 1-3 - *Xylophanes crenulata* Vaglia & Haxaire, 2009; 4-6 - *Xylophanes alineae* Haxaire & Mielke, 2018; 7-9 - *Eumorpha translineatus* (Rothschild, 1895). 1, 4, 7 - habitus in dorsal view; 2, 5, 8 - habitus in ventral view; 3, 6, 9 - labels.

Type locality. Brazil (Nova Friburgo, Rio de Janeiro).

Distribution. Occurs in southern, southeast and northeast Brazil (MARTIN *et al.* 2011; MARTIN 2021).

63. *Manduca incisa* (Walker, 1856)

Synonymy. None.

Material examined (2 specimens). Amparo, SP, 1927 [2 specimens].

Type locality. Brazil (Rio de Janeiro).

Distribution. Occurs in South America (MARTIN *et al.* 2011; MARTIN 2021).

64. *Manduca rustica rustica* (Fabricius, 1775)

Synonymy. *Sphinx chionanthi* (J. E. Smith, 1797).

Material examined (13 specimens). Amparo, São Paulo, 1925 [13 specimens].

Type locality. America.

Distribution. Has a broad distribution across South America and northwards to the mid-atlantic states of the USA (MARTIN *et al.* 2011; MARTIN 2021).

65. *Manduca paphus* (Cramer, 1779)

Synonymy. *Protoparce griseata* (Butler, 1875); *Sphinx nicotianae* (Boisduval, [1875]); *Sphinx tabaci* (Boisduval, [1875]); *Manduca sexta peruviana* (Bryk, 1953).

Material examined (8 specimens). Alagoinhas, Bahia, 17.x.1993 [1 specimen]; Alagoinhas, Bahia, 31.x.1993 [1 specimen]; Amparo, São Paulo, i.1925 [1 specimen]; Amparo, São Paulo, ii.1925 [2 specimens]; Amparo São Paulo, xii.1925 [1 specimen]; Salvador, Bahia, 23.iii.1985 [1 specimen]; Salvador, Bahia, 7.vi.1985 [1 specimen].

Type locality. Surinam.

Distribution. From Argentina to Venezuela (MARTIN *et al.* 2011; MARTIN 2021).

66. *Neococytius cluentius* (Cramer, 1775)

Synonymy. None.

Material examined (5 specimens). Amparo, São Paulo, ii.1925 [1 specimen]; Amparo, São Paulo, ii.1927 [3 specimens]; Amparo, SP, 17.vi.1934 [1 specimen].

Type locality. West Indies (Neotropical Region).

Distribution. From South America, West Indies, Cuba to USA (MARTIN *et al.* 2011; MARTIN 2021).

Analysis of data on the historically important hawkmoths collection of Dr. Pedro de Araújo, emphasizes the importance of retrieving, digitizing and disseminating data from Entomological Collections to fill huge gaps in our understanding of the rich Brazilian biodiversity, as for example about the family Sphingidae on MHNBA-MZUFBA. Papers that report historical data on scientific collections kept in natural history museums, such as this, should be encouraged once these data are extremely important to knowledge of the past species distribution compared to the current distribution in the face of environmental changes (biogeography records), contributing significantly to research on conservation, as well as for proposition of public policies for conservation and sustainable use of biodiversity, including pollinators. These data representing also, as mentioned by ZAHER & YOUNG (2003),

a very important scientific-cultural heritage for the country's history.

ACKNOWLEDGEMENTS

We thank Dr. Pedro Araújo (*In memoriam*) for donating part of his Lepidoptera collection to the Museu de História Natural da Universidade Federal da Bahia (MHNBA-MZUFBA), to Dr. Jorge Bizarro of the Reserva Ecológica de Guapiaçu (REGUA), for having donated the book "Guia dos Sphingidae da Serra dos Órgãos", which was one of the bibliographies used to identify the specimens, and to researcher Carlos GC Mielke for confirming *Xylophanes alineae* species.

REFERENCES

- Cranston, P, 2005. Biogeographic patterns in the evolution of Diptera, pp. 274-311. *In*: Yeates, DK & Wiegmann, BM (Eds.). The evolutionary biology of flies. New York, Columbia University Press.
- D'Abrera, B, 1986. Sphingidae Mundi. Hawkmoths of the World. Faringdon, E. W. Classey Ltd.
- Darrault, RO & C Schlindwein, 2002. Esfingídeos (Lepidoptera, Sphingidae) no Tabuleiro Paraibano, nordeste do Brasil: abundância, riqueza e relação com plantas esfingófilas. *Revista Brasileira de Zoologia*, 19: 429-443. DOI: <https://doi.org/10.1590/S0101-81752002000200009>
- Duarte, JA & C Schlindwein, 2005. The highly seasonal hawkmoth fauna (Sphingidae: Lepidoptera) of the Caatinga, northeast Brazil: a case study in the state of Rio Grande do Norte. *Journal of the Lepidopterists' Society*, 59: 212-218.
- Duarte, M, LF Carlin & G Marconato, 2008. Light-attracted hawkmoths (Lepidoptera: Sphingidae) of Boracéia, municipality of Salesópolis, state of São Paulo, Brazil. *Check List*, 4: 123-136. DOI: <https://doi.org/10.15560/4.2.123>
- Faegri, K & L van der Pijl, 1979. The Principles of Pollination Ecology. Oxford, Pergamon Press.
- Haber, WA & GW Frankie, 1989. A tropical hawkmoth community: Costa Rican dry forest Sphingidae. *Biotropica*, 21: 155-172. DOI: <https://doi.org/10.2307/2388706>
- Haxaire, J & CGC Mielke, 2018. Two new species of hawkmoth of the *Xylophanes porcus* (Hübner, [1823]) group from Brazil and Paraguay (Lepidoptera: Sphingidae). *European Entomologist*, 9: 61-76.
- Haxaire, J & CGC Mielke, 2020. A revised and annotated checklist of the Brazilian Sphingidae with new records, taxonomical notes, and description of one new species (Lepidoptera Sphingidae). *European Entomologist*, 11: 101-187.
- Heppner, JB, 1991. Faunal regions and Diversity of Lepidoptera. *Tropical Biology*, vol 2. Association of Tropical Lepidoptera, Gainesville, Fla.
- Hodges, RW, 1971. Sphingoidea. The Moths of America North of Mexico. London: E.W. Classey.
- ICZN (International Commission of Zoological Nomenclature) 1999. International code of zoological nomenclature. Fourth edition. The International Trust for Zoological Nomenclature, c/o Natural History Museum, London. Available in: <https://www.iczn.org/the-code/the-code-online/>. [Access: 11.viii.2021].
- Kitching, IJ & Cadiou JM, 2000. Hawkmoth of the world: an annotated and illustrated revisionary checklist (Lepidoptera: Sphingidae). Ithaca: Cornell University Press.
- Krenn, HW, 2010. Feeding mechanisms of adult Lepidoptera: Structure, function, and evolution of the mouthparts. *Annual Review of Entomology*, 55: 307-327. DOI: <https://doi.org/10.1146/annurev-ento-112408-085338>
- Martin, A, A Soares & J Bizarro, 2011. Guia dos Sphingidae da Serra dos Órgãos, Sudeste do Brasil. Oxford: REGUA Publications.
- Martin, A, 2021. Hawkmoths of Brazil. Available in: <http://>

- www.brazilhawkmoths.com/index.html>. [Access: 15.iii.2021].
- Mello-Patiu, CA, KP Silva & KP Vairo, 2017. Checklist dos Sarcophagidae (Insecta, Diptera) do estado do Mato Grosso do Sul, Brasil. Iheringia Série Zoologia, 107: 1-6. DOI: <https://doi.org/10.1590/1678-4766e2017142>
- Motta, CS, 1993. Mariposas esfingídeas (Lepidoptera, Sphingidae) da Amazônia Brasileira e o Meio Ambiente, pp. 141-146. In: Ferreira, EJG, GM Santos, ELM Leão & LA Oliveira (Eds.). Bases Científicas para Estratégias de Preservação e Desenvolvimento da Amazônia - Fatos e Perspectivas. Manaus, Editora INPA.
- Motta, CS & FF Xavier-Filho, 2005. Esfingídeos (Lepidoptera, Sphingidae) do município de Beruri, Amazonas, Brasil. Acta Amazônica, 35: 457-462. DOI: <https://doi.org/10.1590/S0044-59672005000400010>
- Napoli, MF, 2010. Museu de Zoologia da Universidade Federal da Bahia. Available in: <<http://www.mzufba.ufba.br>>. [Access: 17.xii.2020].
- Silveira, LF & A Uezu, 2011. Checklist das aves do Estado de São Paulo, Brasil. Biota Neotropica, 11: 83-110. Available in: <<https://www.biotaneotropica.org.br/v11n1a/pt/abstract?inventory+bn0061101a2011>>. [Access: 28.viii.2020].
- Specht, A, AJ Benedetti & E Corseuil, 2008. Esfingídeos (Lepidoptera, Sphingidae) registrados no Rio Grande do Sul, Brasil. Biociências, 16: 15-18.
- Tuttle, JP, 2007. The Hawk Moths of North America. A natural history study of the Sphingidae of the United States and Canada. The Wedge Entomological Research Foundation, Washington, DC.
- Vaglia, T & J Haxaire, 2009. Description d'un nouveau Sphingidae neotropical *Xylophanes crenulata*. The European Entomologist, 1: 95-102.
- Vogel, S, 1954. Blütenbiologische Typen als Elemente der Sippengliederung. Jena, Gustav Fischer Verlag.
- Zaher, H & PS Young, 2003. As Coleções Zoológicas Brasileiras: Panorama e Desafios. Ciência e Cultura, 55: 24-26.

