

LISTS OF SPECIES

Light-attracted hawkmoths (Lepidoptera: Sphingidae) of Boracéia, municipality of Salesópolis, state of São Paulo, Brazil.

Marcelo Duarte¹
Luciane F. Carlin¹
Gláucia Marconato^{1,2}

¹ Museu de Zoologia da Universidade de São Paulo.
Avenida Nazaré 481, Ipiranga, CEP 04263-000, São Paulo, SP, Brazil. E-mail: mduartes@usp.br

² Curso de Pós-Graduação em Ciências Biológicas (Zoologia), Instituto de Biociências, Departamento de Zoologia, Universidade de São Paulo. Rua do Matão, travessa 14, número 321. CEP 05508-900, São Paulo, SP, Brazil.

Abstract: The light-attracted hawkmoths (Lepidoptera: Sphingidae) of the *Estação Biológica de Boracéia*, municipality of Salesópolis, state of São Paulo, Brazil were sampled during a period of 64 years (1940-2004). A total of 2,064 individuals belonging to 3 subfamilies, 6 tribes, 23 genera and 75 species were identified. Macroglossinae was the most abundant and richest subfamily in the study area, being followed by Sphinginae and Smerinthinae. About 66 % of the sampled individuals were assorted to the macroglossine tribes Dilophonotini and Macroglossini. Dilophonotini (Macroglossinae) was the richest tribe with 26 species, followed by Sphingini (Sphinginae) with 18 species, Macroglossini (Macroglossinae) with 16 species, Ambulycini (Smerinthinae) and Philampelini (Macroglossinae) with seven species each one, and Acherontiini (Sphinginae) with only one species. *Manduca* Hübner (Sphinginae) and *Xylophanes* Hübner (Macroglossinae) were the dominant genera in number of species. Only *Xylophanes thyelia thyelia* (Linnaeus) and *Adhemarius eurysthene* (R. Felder) were recorded year round

Introduction

Hawkmoths (Lepidoptera: Sphingidae) comprise about 200 genera and 1300 species (Kitching and Cadiou 2000). They are distributed throughout the world, except Antarctica and Greenland (Moré et al. 2005). Approximately one third of these moths belong to the Neotropical fauna (Heppner 1991; 1998). In Brazil, they are represented by 29 genera and 210 species (compilation of Rothschild and Jordan 1910; Moss 1920; Hambleton and Forbes 1935; Oiticica 1939; 1942; Zikán and Zikán 1968; Laroca and Mielke 1975; Schreiber 1978; Biezanko 1981; Ferreira et al. 1986; Laroca et al. 1989; Motta et al. 1991; 1998; Carcasson and Heppner 1996; Motta and Soares 1997; Marinoni et al. 1999; Oliveira et al. 1999; Brown and Freitas 2000; Corseuil et al. 2001; Duarte Jr. et al. 2001; Motta and Andreatze 2001; 2002; Becker 2001; Soares and Motta 2002; Darrault and Schlindwein 2002; Gusmão et al. 2003; Gusmão and Creão-Duarte 2004a; b; Duarte Jr. and Schlindwein 2005; Motta and Xavier-Filho 2005).

Hawkmoths have long been recognized as major pollinators of flowering plants (Baker 1961; Gregory 1963; Silberbauer-Gottsberger and Gottsberger 1975; Janzen 1984; Haber and Frankie 1989; Darrault and Schlindwein 2002;

Kitching 2002). Because of their capability to fly far away, these moths are potential long distance pollen dispersers (Linhart and Mendenhall 1977; Nilsson et al. 1992; Chase et al. 1996). They may be diurnal, crepuscular or nocturnal. In South America, however, most species are more active at night, when they may be easily observed visiting flowers with white or pale corollas, very long tubes or spurs and copious amounts of nectar (Silberbauer-Gottsberger and Gottsberger 1975; Baker and Baker 1983; Haber and Frankie 1989).

According to some authors (e.g. Minet 1994; Carcasson and Heppner 1996; Lemaire and Minet 1998; Kitching and Cadiou 2000), the hawkmoths are classified in three subfamilies each with at least one genus occurring in Brazil. Smerinthinae has three tribes (*sensu* Kitching and Cadiou 2000), but only Ambulycini is represented in Brazil, comprising the genera *Adhemarius* Oiticica, 1939, *Orecta* Rothschild & Jordan, 1903 and *Protambulyx* Rothschild & Jordan, 1903. Sphinginae includes the tribes Acherontiini and Sphingini. *Agrius cingulata* (Fabricius, 1775), a very common and recognizable species, is the only acherontine hawkmoth recorded to the New World (Kitching 2002). In the same region, the

LISTS OF SPECIES

Sphingini are represented by the genera *Amphimoea* Rothschild & Jordan, 1903, *Cocytius* Hübner, [1819], *Manduca* Hübner, [1807], *Neococytius* Hodges, 1971, *Neogene* Rothschild & Jordan, 1903, and *Sphinx* Linnaeus, 1758. Macroglossinae is considered here according to Kitching and Cadiou (2000) after Derzhavets (1984), who recognized the tribes Dilophonotini, Philampelini and Macroglossini. The monophyly of none of these tribes is yet clearly supported. In Brazil they are represented by at least one genus. Dilophonotini includes the highest number of genera (16). Philampelini is represented exclusively by the genus *Eumorpha* Hübner, [1807], while Macroglossini has two genera, *Hyles* Hübner, [1819] and *Xylophanes* Hübner, [1819].

Since sphingids can easily be recorded by light-trapping and are taxonomically well known (Kitching and Cadiou 2000), they have served as model organisms in a number of diversity studies (e.g. León-Cortés et al. 1998). Considering that the sphingids of the state of São Paulo are still poorly known, the purpose of this work is to document the composition, relative abundance, and phenology of the sphingid fauna of a natural reserve at Boracéia, municipality of Salesópolis, which is well preserved and located approximately 80 km east of the city of São Paulo. A long-term survey with a smaller and better known group of macrolepidopterans, viz. Saturniinae (Saturniidae), has revealed how important this reserve may be to the maintenance of the lepidopterofauna of São Paulo (as well as for other organisms, see Heyer et al. 1990). Of the 11 saturniine species hitherto recorded in the state of São Paulo (data gathered from Lemaire 1978), 10 have been sampled in Boracéia (M. Duarte and collaborators, in progress).

Materials and methods

Study Site

The survey of the hawkmoths (Sphingidae) of Boracéia was conducted at the *Estação Biológica de Boracéia* (EBB), municipality of Salesópolis, state of São Paulo, Brazil (23°38'S, 45°52'W; 900 m a.s.l.; see map in Heyer et al. 1990). This station has been supported and administrated by the *Museu de Zoologia, Universidade de São Paulo* (details on the site <http://www.mz.usp.br>).

The EBB is in a 16,450 ha reserve of the *Companhia de Saneamento Básico do Estado de São Paulo*. Even before its establishment in March of 1954, the reserve has been a reference site for anyone interested in moths and butterflies of Atlantic Rainforest (Travassos and Camargo 1958). According to Setzer (1946), Boracéia is among the wettest areas in Brazil; average annual rainfall is usually above 1,500 mm (Leemans and Cramer 1991). The vegetation is relatively continuous except for the gaps formed by the narrow dirt access road, the aqueduct line, several small rivers and the small man-made clearings around the station itself (Heyer et al. 1990). The forest has a low canopy, averaging ca. 5-10m. Palm trees (especially *Euterpe edulis*), tree ferns and giant bamboos (*Merostachys*) are common. The understory is relatively open in most parts of the forest, being more dense along streams, where the presence of the plant genus *Heliconia* is characteristic (Bertoluci and Rodrigues 2002). There are 240 species of trees, 130 shrubs, 115 epiphytes, 90 lianas, and 89 herbs in the area (Wilms 1995 *apud* Bertoluci and Rodrigues 2002).

Data Collection

The first and most extensive collections of Lepidoptera from Boracéia were made by the entomologists Romualdo Ferreira D'Almeida and Lauro Travassos Filho in the 1940's and 1950's (Travassos and Camargo 1958). However, only in 1948 and 1949, the hawkmoths were monthly sampled, with 78 and 85 days of field work, respectively (Travassos and Camargo 1958; M. Duarte and collaborators, in progress). Moth sampling extended through the following decades until 2004 (Table 1). The hawkmoths were attracted with mixed mercury vapor bulbs and manually collected on the walls of the scientist's residence (one of the EBB's buildings; for details see Travassos and Camargo 1958). They were killed by direct injection of aqueous ammonia solution in the thorax (specimens collected before 2004 may have been killed with different techniques – see Winter Jr. 2000). All specimens sampled from September of 1940 to April of 2004 were sorted and identified, and their records were included in a digitized database, which is intended to be of free public access through the World Wide Web.

LISTS OF SPECIES

Table 1. Years and months of hawkmoth sampling (Lepidoptera: Sphingidae) at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil.

	January	February	March	April	May	June	July	August	September	October	November	December
1940									X		X	
1941										X	X	
1942		X		X					X		X	
1943										X		X
1946							X					
1947						X			X		X	
1948	X	X	X	X	X	X	X	X	X	X	X	X
1949	X	X	X	X	X	X	X	X	X	X	X	X
1950	X	X	X						X			
1951											X	
1952	X				X							
1953									X		X	
1954								X	X	X		
1955	X											
1957	X		X	X						X	X	
1958	X		X								X	X
1959		X				X	X				X	
1961	X									X		
1962							X				X	
1963										X		
1964	X										X	X
1965		X		X		X	X	X	X	X	X	X
1966	X					X		X	X	X		
1967	X		X				X	X	X	X	X	X
1968	X	X	X	X	X			X	X	X		X
1969	X							X		X		
1970										X		
1983										X		
1985										X		
1987										X		
1989										X		
1991										X		
1993												X
1995										X		
1997				X								
1999				X								
2004				X								

Species identification was based on literature (Rothschild 1903; D'Abrera 1986). Eitschberger (2006) has recently revalidated the genus *Amphonyx* Poey (type species: *A. duponchel* Poey, 1832) (Sphinginae: Sphingini), for which there is no evidence supporting its monophyly (Kitching 2002). Eitschberger (*op. cit.*) also erected the monotypic genus *Pseudococytius* for *Amphonyx beelzebuth* Boisduval, [1875], and the monotypic genus *Morcocytius* for *Cocytius mortuorum* Rothschild & Jordan, 1910. In the same paper, *Cocytius* Hübner is redefined as a monotypic genus (type species: *Sphinx antaeus* Drury, 1773). For practical reasons, the taxonomic arrangement adopted in Eitschberger (2006) will be addressed elsewhere. In the present paper, nomenclature follows Kitching and Cadiou (2000). Voucher specimens are deposited at the *Museu de Zoologia da Universidade de São Paulo*, Brazil.

Results and discussion

A total of 2,064 individuals (473 females and 1591 males) belonging to 3 subfamilies, 6 tribes, 23 genera, and 75 species were sampled in the EBB, from 1940 to 2004 (Tables 2 and 3). Macroglossinae is the most abundant subfamily with 66 % of the collected material, being followed by Sphinginae (23 %), and Smerinthinae (11 %).

In all localities surveyed in Brazil, macroglossines overcome other sphingids in number of individuals (e.g. Laroca and Mielke 1975; Ferreira et al. 1986; Laroca et al. 1989; Motta et al. 1991; 1998; Marinoni et al. 1999; Darrault and Schindwein 2002; Motta and Xavier-Filho 2005), and more than 50 % of these macroglossines belong to the tribes Dilophonotini and Macroglossini (Figure 1A).

LISTS OF SPECIES

Table 2. Number of species and individuals per each hawkmoth genus (Lepidoptera: Sphingidae) recorded at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil, from 1940 to 2004.

Subfamilies	Tribes	Genera	Number of species	Number of individuals			
				Female	Male	Total	
Smerinthinae	Ambulycini	<i>Adhemarius</i>	5	37	167	204	
		<i>Protambulyx</i>	2	10	14	24	
Sphinginae	Sphingini	<i>Amphimoea</i>	1	1	0	1	
		<i>Cocytius</i>	4	53	47	100	
		<i>Manduca</i>	11	45	226	271	
		<i>Neococytius</i>	1	27	21	48	
		<i>Sphinx</i>	1	1	18	19	
		Acherontiini	<i>Agrius</i>	1	10	24	34
			Macroglossinae	Dilophonotini	<i>Aellopos</i>	2	3
<i>Callionima</i>	3	8			67	75	
<i>Enyo</i>	2	21			28	49	
<i>Erinnyis</i>	6	75			176	251	
<i>Hemeroplanes</i>	2	0			4	4	
<i>Isognathus</i>	1	1			0	1	
<i>Madoryx</i>	1	0			1	1	
<i>Nyceryx</i>	3	4			38	42	
<i>Pachylia</i>	2	8			6	14	
<i>Pachylioides</i>	1	10			11	21	
<i>Perigonia</i>	2	3			55	58	
<i>Pseudosphinx</i>	1	20			22	42	
Philampelini	<i>Eumorpha</i>	7			46	155	201
	Macroglossini	<i>Hyles</i>			1	0	1
		<i>Xylophanes</i>			15	90	506
Total	6	23	75	473	1591	2064	

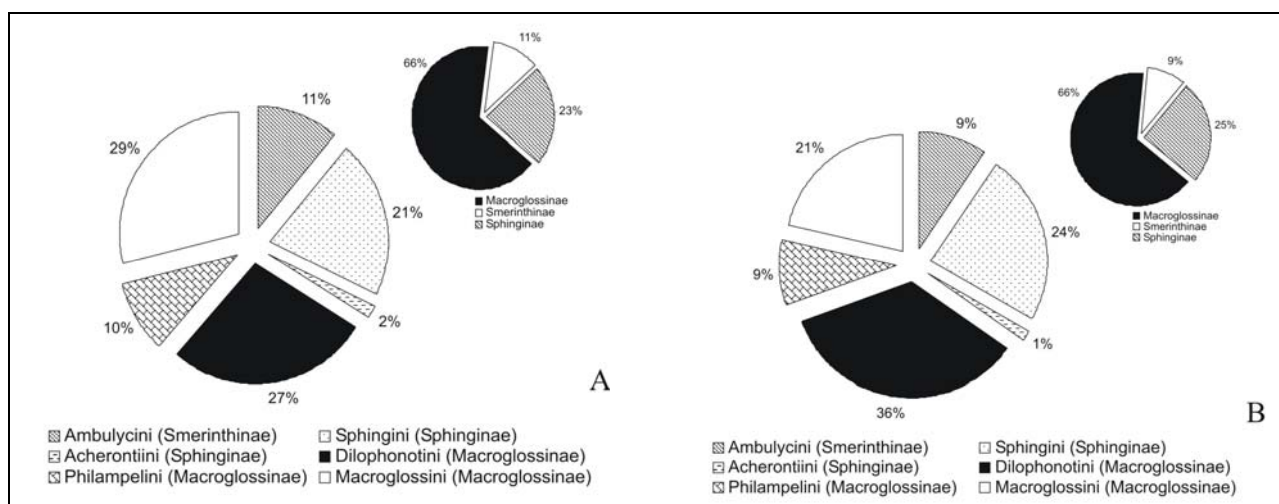


Figure 1. Relative proportions in the number of individuals and species collected per subfamilies and tribes at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil, from 1940 to 2004. A, relative abundance; B, species richness.

LISTS OF SPECIES

Table 3. List of the hawkmoths (Lepidoptera: Sphingidae) collected at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil, from 1940 to 2004.

	Genera	Species	Subspecies	Authorship
1	<i>Adhemarius</i>	<i>daphne</i>	<i>daphne</i>	(Boisduval, [1875])
2	<i>Adhemarius</i>	<i>eurysthenes</i>		(R. Felder, [1874])
3	<i>Adhemarius</i>	<i>gagarini</i>		(Zikán, 1935)
4	<i>Adhemarius</i>	<i>gannascus</i>		(Stoll, 1790)
5	<i>Adhemarius</i>	<i>palmeri</i>		(Boisduval, [1875])
6	<i>Aellopos</i>	<i>fadus</i>		(Cramer, 1775)
7	<i>Aellopos</i>	<i>titan</i>	<i>titan</i>	(Cramer, 1777)
8	<i>Agrius</i>	<i>cingulata</i>		(Fabricius, 1775)
9	<i>Amphimoea</i>	<i>walkeri</i>		(Boisduval, [1875])
10	<i>Callionima</i>	<i>inuus</i>		(Rothschild & Jordan, 1903)
11	<i>Callionima</i>	<i>nomius</i>		(Walker, 1856)
12	<i>Callionima</i>	<i>parce</i>		(Fabricius, 1775)
13	<i>Cocytius</i>	<i>antaeus</i>		(Drury, 1773)
14	<i>Cocytius</i>	<i>beelzebuth</i>		(Boisduval, [1875])
15	<i>Cocytius</i>	<i>duponchel</i>		(Poey, 1832)
16	<i>Cocytius</i>	<i>lucifer</i>		Rothschild & Jordan, 1903
17	<i>Enyo</i>	<i>lugubris</i>	<i>lugubris</i>	(Linnaeus, 1771)
18	<i>Enyo</i>	<i>ocypete</i>		(Linnaeus, 1758)
19	<i>Erinnyis</i>	<i>alope</i>	<i>alope</i>	(Drury, 1773)
20	<i>Erinnyis</i>	<i>crameri</i>		(Schaus, 1898)
21	<i>Erinnyis</i>	<i>ello</i>	<i>ello</i>	(Linnaeus, 1758)
22	<i>Erinnyis</i>	<i>lassauxii</i>		(Boisduval, 1859)
23	<i>Erinnyis</i>	<i>obscura</i>	<i>obscura</i>	(Fabricius, 1775)
24	<i>Erinnyis</i>	<i>oenotrus</i>		(Cramer, 1780)
25	<i>Eumorpha</i>	<i>analis</i>		(Rothschild & Jordan, 1903)
26	<i>Eumorpha</i>	<i>anchemolus</i>		(Cramer, 1779)
27	<i>Eumorpha</i>	<i>fasciatus</i>	<i>fasciatus</i>	(Sulzer, 1776)
28	<i>Eumorpha</i>	<i>labruscae</i>	<i>labruscae</i>	(Linnaeus, 1758)
29	<i>Eumorpha</i>	<i>megaecus</i>		(Hübner, [1819])
30	<i>Eumorpha</i>	<i>obliquus</i>	<i>obliquus</i>	(Rothschild & Jordan, 1903)
31	<i>Eumorpha</i>	<i>translineatus</i>		(Rothschild, 1895)
32	<i>Hemeroplanes</i>	<i>longistriga</i>		(Rothschild & Jordan, 1903)
33	<i>Hemeroplanes</i>	<i>ornatus</i>		Rothschild, 1894
34	<i>Hyles</i>	<i>euphorbiarum</i>		(Guérin-Méneville & Percheron, 1835)
35	<i>Isognathus</i>	<i>caricae</i>	<i>caricae</i>	(Linnaeus, 1758)
36	<i>Madoryx</i>	<i>plutonius</i>	<i>plutonius</i>	(Hübner, [1819])
37	<i>Manduca</i>	<i>albiplaga</i>		(Walker, 1856)
38	<i>Manduca</i>	<i>brasiliensis</i>		(Jordan, 1911)
39	<i>Manduca</i>	<i>dalica</i>	<i>anthina</i>	(Jordan, 1911)
40	<i>Manduca</i>	<i>diffissa</i>	<i>petuniae</i>	(Boisduval, [1875])
41	<i>Manduca</i>	<i>florestan</i>		(Stoll, 1782)
42	<i>Manduca</i>	<i>hannibal</i>		(Cramer, 1779)
43	<i>Manduca</i>	<i>incisa</i>		(Walker, 1856)
44	<i>Manduca</i>	<i>lichenea</i>		(Burmeister, 1855)
45	<i>Manduca</i>	<i>lucetius</i>		(Cramer, 1780)
46	<i>Manduca</i>	<i>rustica</i>	<i>rustica</i>	(Fabricius, 1775)
47	<i>Manduca</i>	<i>sexta</i>	<i>paphus</i>	(Cramer, 1779)
48	<i>Neococytius</i>	<i>cluentius</i>		(Cramer, 1775)
49	<i>Nyceryx</i>	<i>coffaeae</i>		(Walker, 1856)
50	<i>Nyceryx</i>	<i>continua</i>	<i>continua</i>	(Walker, 1856)
51	<i>Nyceryx</i>	<i>nictitans</i>	<i>nictitans</i>	(Boisduval, [1875])
52	<i>Pachylia</i>	<i>ficus</i>		(Linnaeus, 1758)

LISTS OF SPECIES

Table 3. Continued.

	Genera	Species	Subspecies	Authorship
53	<i>Pachylia</i>	<i>syces</i>	<i>syces</i>	(Hübner, [1819])
54	<i>Pachylioides</i>	<i>resumens</i>		(Walker, 1856)
55	<i>Perigonia</i>	<i>passerina</i>		Boisduval, [1875]
56	<i>Perigonia</i>	<i>stulta</i>		Herrich-Schäffer, [1854]
57	<i>Protambulyx</i>	<i>eurycles</i>		(Herrich-Schäffer, [1854])
58	<i>Protambulyx</i>	<i>strigilis</i>		(Linnaeus, 1771)
59	<i>Pseudosphinx</i>	<i>tetrio</i>		(Linnaeus, 1771)
60	<i>Sphinx</i>	<i>justiciae</i>		Walker, 1856
61	<i>Xylophanes</i>	<i>aglaor</i>		(Boisduval, [1875])
62	<i>Xylophanes</i>	<i>ceratomioides</i>		(Grote & Robinson, 1867)
63	<i>Xylophanes</i>	<i>chiron</i>	<i>nechus</i>	(Cramer, 1777)
64	<i>Xylophanes</i>	<i>indistincta</i>		Closs, 1915
65	<i>Xylophanes</i>	<i>isaon</i>		(Boisduval, [1875])
66	<i>Xylophanes</i>	<i>loelia</i>		(Druce, 1878)
67	<i>Xylophanes</i>	<i>marginalis</i>		Clark, 1917
68	<i>Xylophanes</i>	<i>pistacina</i>		(Boisduval, [1875])
69	<i>Xylophanes</i>	<i>pluto</i>		(Fabricius, 1777)
70	<i>Xylophanes</i>	<i>porcus</i>	<i>continentalis</i>	Rothschild & Jordan, 1903
71	<i>Xylophanes</i>	<i>schausi</i>	<i>schausi</i>	(Rothschild, 1894)
72	<i>Xylophanes</i>	<i>tersa</i>	<i>tersa</i>	(Linnaeus, 1771)
73	<i>Xylophanes</i>	<i>thyelia</i>	<i>thyelia</i>	(Linnaeus, 1758)
74	<i>Xylophanes</i>	<i>titana</i>		(Druce, 1878)
75	<i>Xylophanes</i>	<i>xylobotes</i>		(Burmeister, 1878)

Macroglossinae is also the richest subfamily in the EBB with 49 species (66 %). Sphinginae and Smerinthinae appear in second and third positions, respectively, with 19 (25 %) and 7 species (9 %) (Figure 1B). The tribe Dilophonotini (Macroglossinae) comprises 36 % of all species. Sphingini (Sphinginae) consists of 18 species (24 %), and is followed by Macroglossini (Macroglossinae) with 16 species (21%), Ambulycini (Smerinthinae) and Philampelini (Macroglossinae) with 7 species each one (9 %), and Acherontiini (Sphinginae) with only one species (1 %) (Figure 1B). These species richness distributions are rather similar to other localities hitherto surveyed in Central and South America (Laroca and Mielke 1975). In America North of Mexico, however, these moths are distinctly distributed. Most species belong to the tribe Sphingini, and the species richnesses of Dilophonotini and Macroglossini tend to be considerably lower (Hodges 1971; Laroca and Mielke 1975). On a world scale, Macroglossini represents the richest tribe, followed by Ambulycini, Sphingini, Philampelini, and Acherontiini (modified from Hodges 1971).

The genera *Manduca* Hübner, [1807] (Sphinginae: Sphingini) and *Xylophanes* Hübner, [1819] (Macroglossinae: Macroglossini) are dominant in EBB. They are represented by 11 and 15 species, respectively. Among all other localities in Brazil, where the sphingid fauna has been studied, only in Piracicaba, state of São Paulo, there is a genus, *Erinnyis* Hübner, [1819] (Macroglossinae: Dilophonotini), that surpasses in number of species both *Manduca* and *Xylophanes* (see Coelho et al. 1979).

Xylophanes is currently the largest genus in the family and comprises 97 valid species restricted to the New World (Kitching and Cadiou 2000; Cadiou 2000; Eitschberger 2001a; 2001b; Alvarez Corral 2001; Soares and Motta 2002; Vaglia and Haxaire 2003; Haxaire 2003; Haxaire and Eitschberger 2003; Haxaire and Vaglia 2004; Haxaire and Eitschberger 2007). Its dominance in number of species has been considered typical of the sphingid communities in very humid tropical and subtropical forests (Laroca and Mielke 1975).

LISTS OF SPECIES

The species frequency distributions are shown in Figure 2 (see also Table 4). As is noted, the number of rare species is much higher than that of common species. This is typical of organism communities in a complex and relatively stable ecosystem (Preston 1948; 1960). Fourteen species are represented by only one individual in the collection: Smerinthinae: *Adhemarius daphne* (Boisduval, [1875]), *Adhemarius gagarini* (Zikán, 1935), *Adhemarius palmeri* (Boisduval, [1875]); Sphinginae: *Amphimoea walkeri*

(Boisduval, [1875]), *Manduca hannibal* (Cramer, 1779), *Manduca incisa* (Walker, 1856); Macroglossinae: *Hemeroplanes ornatus* Rothschild, 1894, *Hyles euphorbiarum* (Guérin-Ménéville & Percheron, 1835), *Isognathus caricae caricae* (Linnaeus, 1758), *Madoryx plutonius plutonius* (Hübner, [1819]), *Pachylia syces syces* (Hübner, [1819]), *Xylophanes indistincta* Closs, 1915, *Xylophanes loelia* (Druce, 1878), and *Xylophanes schausi schausi* (Rothschild, 1894).

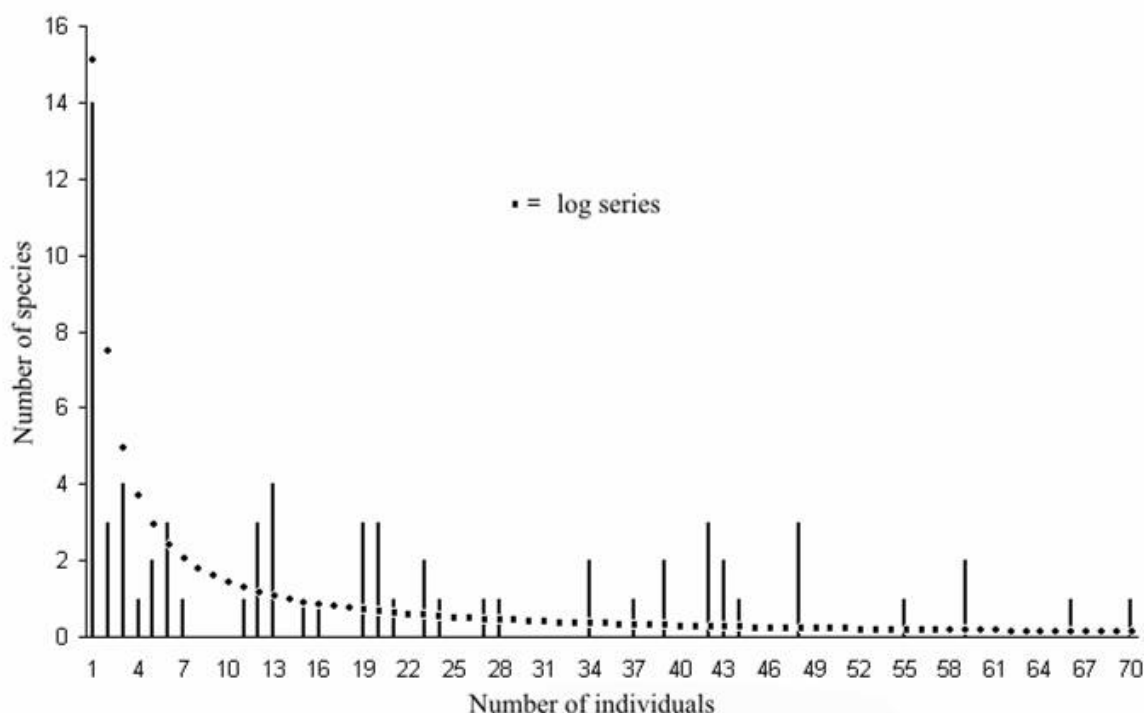


Figure 2. Species frequency distributions (observed and calculated by means of Fisher's log series) of hawkmoths (Lepidoptera: Sphingidae) with different number of individuals collected at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil.

Xylophanes t. thyelia (Linnaeus, 1758) (Macroglossinae: Macroglossini) was the most collected hawkmoth in the EBB (Figure 3). This species occurs year-round with *Adhemarius eurysthenes* (R. Felder, [1874]) (Smerinthinae: Ambulycini) (Table 5). Six other species appear to be constant in the EBB, although they have not been recorded

in only one month during the 64 years of sampling (Table 3): Smerinthinae: *Adhemarius gannascus* (Stoll, 1790); Sphinginae: *Cocytius duponchel* (Poey, 1832); Macroglossinae: *Erinnyis crameri* (Schaus, 1898), *Xylophanes aglaor* (Boisduval, [1875]), *X. chiron nechus* (Cramer, 1777), and *X. xylobastes* (Burmeister, 1878).

LISTS OF SPECIES

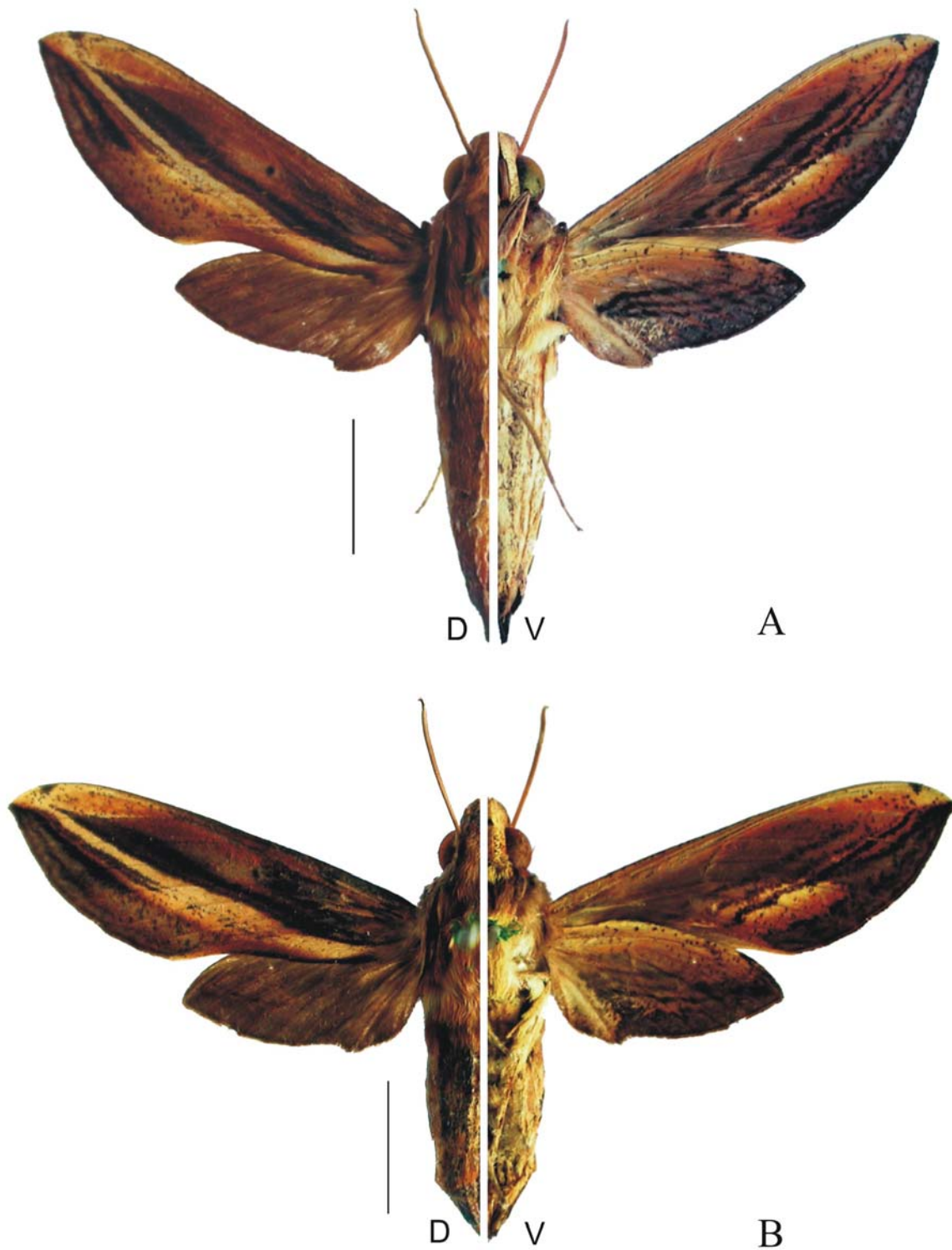


Figure 3. *Xylophanes t. thyelia* (Linnaeus, 1758) (Macroglossinae: Macroglossini). Abundant species collected year-round at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil. A, male; B, female. (D, dorsal; V, ventral). Scale bar = 10 mm.

LISTS OF SPECIES

Table 4. Species frequency distributions of hawkmoths (Lepidoptera: Sphingidae) with different number of individuals collected at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil.

Individuals per species	Number of species		Individuals per species	Number of species	
	Observed	Log series		Observed	Log series
1	14	15.1085	39	2	0.2930
2	3	7.4989	40	-	0.2836
3	4	4.9627	41	-	0.2747
4	1	3.6948	42	3	0.2662
5	2	2.9342	43	2	0.2581
6	3	2.4273	44	1	0.2504
7	1	2.0653	45	-	0.2430
8	-	1.7939	46	-	0.2360
9	-	1.5829	47	-	0.2293
10	-	1.4142	48	3	0.2229
11	1	1.2762	49	-	0.2167
12	3	1.1613	50	-	0.2108
13	4	1.0641	51	-	0.2052
14	-	0.9809	52	-	0.1998
15	1	0.9088	53	-	0.1945
16	1	0.8457	54	-	0.1895
17	-	0.7902	55	1	0.1847
18	-	0.7408	56	-	0.1801
19	3	0.6967	57	-	0.1757
20	3	0.6570	58	-	0.1714
21	1	0.6211	59	2	0.1672
22	-	0.5886	60	-	0.1632
23	2	0.5589	61	-	0.1594
24	1	0.5316	62	-	0.1557
25	-	0.5066	63	-	0.1521
26	-	0.4836	64	-	0.1486
27	1	0.4623	65	-	0.1452
28	1	0.4425	66	1	0.1420
29	-	0.4241	67	-	0.1389
30	-	0.4070	68	-	0.1358
31	-	0.3910	69	-	0.1329
32	-	0.3760	70	1	0.1300
33	-	0.3619	and with 75, 77, 85, 128, 153 e 190.		
34	2	0.3487			
35	-	0.3363			
36	-	0.3245			
37	1	0.3134			
38	-	0.3030			
Total number of species		75			
Total number of individuals		2064			

LISTS OF SPECIES

Table 5. Phenology of the hawkmoths (Lepidoptera: Sphingidae) collected at the *Estação Biológica de Boracéia*, Salesópolis, São Paulo, Brazil.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Macroglossinae : Dilophonotini												
<i>Aellopos</i> <i>factus</i>	X											
<i>Aellopos</i> <i>titan titan</i>	X									X	X	X
<i>Callionima</i> <i>inuus</i>	X	X	X	X			X	X	X			
<i>Callionima</i> <i>nomius</i>	X	X	X	X	X		X	X		X	X	X
<i>Callionima</i> <i>parce</i>	X	X	X	X			X	X	X			X
<i>Eryso</i> <i>lugubris lugubris</i>	X	X			X		X	X	X	X	X	X
<i>Eryso</i> <i>ocypete</i>	X							X	X	X	X	
<i>Erinnyis</i> <i>alope alope</i>	X	X	X	X		X	X	X	X		X	X
<i>Erinnyis</i> <i>cramerii</i>	X	X	X	X	X	X	X	X	X	X	X	
<i>Erinnyis</i> <i>ello ello</i>	X	X		X			X	X		X	X	X
<i>Erinnyis</i> <i>lassauxii</i>						X	X	X	X		X	
<i>Erinnyis</i> <i>obscura obscura</i>				X		X			X	X	X	X
<i>Erinnyis</i> <i>oenotrus</i>	X	X	X	X			X	X	X	X	X	X
<i>Hemeroplanes</i> <i>longistriga</i>	X		X				X					
<i>Hemeroplanes</i> <i>ornatus</i>												X
<i>Isognathus</i> <i>caricae caricae</i>									X			
<i>Madoryx</i> <i>plutonius plutonius</i>			X									
<i>Nyceryx</i> <i>coffaeae</i>			X									X
<i>Nyceryx</i> <i>continua continua</i>	X	X	X	X				X	X	X		
<i>Nyceryx</i> <i>nictitans nictitans</i>	X	X			X			X		X	X	X
<i>Pachylia</i> <i>ficus</i>			X					X	X	X		X
<i>Pachylia</i> <i>syces syces</i>								X				
<i>Pachylioides</i> <i>resumens</i>	X							X	X	X	X	X
<i>Perigonia</i> <i>passerina</i>	X							X				
<i>Perigonia</i> <i>stulta</i>	X	X	X	X	X		X	X		X	X	X
<i>Pseudosphinx</i> <i>tetrio</i>	X			X			X	X	X	X		
Macroglossinae : Philampelini												
<i>Eumorpha</i> <i>anclis</i>	X	X	X	X								X
<i>Eumorpha</i> <i>anchemolus</i>	X	X		X			X		X	X	X	X
<i>Eumorpha</i> <i>fasciatus fasciatus</i>	X	X			X					X	X	X
<i>Eumorpha</i> <i>labruscae labruscae</i>							X	X	X			X
<i>Eumorpha</i> <i>megaeacus</i>		X	X								X	
<i>Eumorpha</i> <i>obliquus obliquus</i>	X	X						X	X	X	X	X
<i>Eumorpha</i> <i>translineatus</i>	X	X										X
Macroglossinae : Macroglossini												
<i>Hyles</i> <i>euphorbianum</i>									X			
<i>Xylophanes</i> <i>aglaor</i>	X	X	X	X		X	X	X	X	X	X	X
<i>Xylophanes</i> <i>ceratomioides</i>	X	X	X	X						X	X	X
<i>Xylophanes</i> <i>chiron nechus</i>	X	X	X	X		X	X	X	X	X	X	X
<i>Xylophanes</i> <i>indistincta</i>							X					
<i>Xylophanes</i> <i>isaon</i>	X	X	X					X	X	X	X	

LISTS OF SPECIES

Table 5. Continued.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Macroglossinae : Macroglossini												
<i>Xylophanes loelia</i>				X								
<i>Xylophanes marginalis</i>									X	X		
<i>Xylophanes pistacina</i>											X	X
<i>Xylophanes pluto</i>	X					X	X	X	X	X	X	
<i>Xylophanes porcus continentalis</i>	X	X	X	X				X	X	X		X
<i>Xylophanes schausi schausi</i>			X									
<i>Xylophanes tersa tersa</i>	X	X	X	X			X	X	X	X	X	X
<i>Xylophanes thyelia thyelia</i>	X	X	X	X	X	X	X	X	X	X	X	X
<i>Xylophanes titana</i>	X	X		X				X	X	X	X	
<i>Xylophanes xylobotes</i>	X	X	X	X	X	X	X	X	X	X		X
Smerinthinae : Ambulycini												
<i>Adhemarius daphne daphne</i>				X								
<i>Adhemarius eurysthenes</i>	X	X	X	X	X	X	X	X	X	X	X	X
<i>Adhemarius gagarini</i>		X										
<i>Adhemarius ganrascus</i>	X	X	X	X		X	X	X	X	X	X	X
<i>Adhemarius palmeri</i>				X								
<i>Protambulyx eurycles</i>	X	X						X		X		X
<i>Protambulyx strigilis</i>	X	X	X	X	X		X	X		X	X	X
Sphinginae : Sphingini												
<i>Amphimoea walkeri</i>		X										
<i>Cocytius antaeus</i>						X		X	X			
<i>Cocytius beelzebuth</i>	X							X				X
<i>Cocytius duponchel</i>	X	X	X	X	X	X	X	X	X	X	X	
<i>Cocytius lucifer</i>		X		X			X	X		X		
<i>Manduca albipлага</i>	X	X										
<i>Manduca brasiliensis</i>	X	X	X	X				X	X	X	X	X
<i>Manduca dalica anthina</i>	X	X	X								X	X
<i>Manduca diffissa petuniae</i>	X	X		X	X				X	X	X	X
<i>Manduca florestan</i>	X	X		X	X		X	X		X	X	X
<i>Manduca hannibal</i>							X					
<i>Manduca incisa</i>										X		
<i>Manduca lichenea</i>								X	X	X		
<i>Manduca lucetius</i>	X	X							X	X		
<i>Manduca rustica rustica</i>	X		X					X		X	X	
<i>Manduca sexta paphus</i>	X	X	X						X		X	
<i>Neococytius cluentius</i>	X	X				X	X	X	X	X	X	X
<i>Sphinx justiciae</i>		X	X	X							X	X
Sphinginae : Acherontini												
<i>Agrius cingulata</i>	X	X					X	X	X	X	X	X

Acknowledgements

The authors thank André Victor Lucci Freitas, Lívia Pinheiro, and Olaf H. H. Mielke for important comments and corrections on the manuscript. This paper is part of the project "Systematics, Bionomy and Evolution of Neotropical Lepidoptera" supported by *Fundação de Amparo à Pesquisa do Estado de São Paulo* (FAPESP process # 2002/13898-0). LFC has been supported with a technician fellowship (FAPESP process # 2006/01144-2), and GM with a doctoral fellowship by *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq process # 142226/2004-1). Complementary grants were provided by *Pró-Reitoria de Pesquisa/USP/Projeto 1* (process # 2004.1.8047.1.0, 2006.1.147.38.6, and 2007.1.61.38.5).

LISTS OF SPECIES

Literature cited

- Alvarez Corral, J. R. 2001. Descripción de un nuevo Sphingidae de Venezuela: *Xylophanes alvarezsierrai* n. sp. (Lepidoptera). Nouvelle Revue d'Entomologie 18(4): 313-315.
- Baker, H. G. 1961. The adaptation of flowering plants to nocturnal and crepuscular pollinators. Quarterly Review of Biology 36: 64-73.
- Baker, H. G. and I. Baker. 1983. Floral nectar sugar constituents in relation to pollinator type; p. 117-141 In C. E. Jones and R. J. Little (ed.). Handbook of experimental pollination biology. New York: Scientific and Academic Editions.
- Becker, V. O. 2001. A new *Nyceryx* Boisduval (Lepidoptera, Sphingidae) from Central Brasil. Revista Brasileira de Zoologia 18(1): 159-161.
- Bertoluci, J. and M. T. U. Rodrigues. 2002. Seasonal patterns of breeding activity of Atlantic Rainforest anurans at Boracéia, Southeastern Brazil. Amphibia-Reptilia 23(2): 161-167.
- Biezanko, C. M. 1981. Sphingidae da zona sueste do Rio Grande do Sul. Revista do Centro de Ciências Rurais 11: 59-75.
- Brown Jr., K. S. and A. V. L. Freitas. 2000. Diversidade de Lepidoptera em Santa Teresa, Espírito Santo. Boletim do Museu de Biologia Mello Leitão (n. ser.) 11/12: 71-116.
- Cadiou, J. M. 2000. A new *Xylophanes* from northern Peru. Lambillionea 100(4): 555-556.
- Carcasson, R. H. and J. B. Heppner. 1996. Sphingoidea, Sphingidae; p. 50-62 In J. B. Heppner (ed.). Atlas of Neotropical Lepidoptera. Checklist: Part 4B. Drepanoidea - Bombycoidea - Sphingoidea. Gainesville: Association for Tropical Lepidoptera.
- Chase, M. R., C. Moller, R. Kesseli, and K. S. Bawa. 1996. Distant gene flow in tropical trees. Nature 383: 398-399.
- Coelho, I. P., S. Silveira Neto, J. F. S. Dias, L. C. Forti, E. F. Chagas, and F. M. Lara. 1979. Fenologia e análise faunística da família Sphingidae (Lepidoptera), através de levantamentos com armadilha luminosa em Piracicaba-SP. Anais da Sociedade Entomológica do Brasil 8(2): 295-307.
- Corseuil, E., A. Specht, and C. Lang. 2001. Esfingídeos (Lepidoptera, Sphingidae) ocorrentes no Centro de Pesquisas e Conservação da Natureza Pró-Mata. Divulgação do Museu de Ciências Tecnológicas - UBEA/PUCRS 6: 95-108.
- D'Abrera, B. 1986. Sphingidae Mundi. Hawkmoths of the World. Faringdon. E. W. Classey. 226 p.
- Darrault, R. O. and C. Schlindwein. 2002. Esfingídeos (Lepidoptera, Sphingidae) no Tabuleiro Paraibano, nordeste do Brasil: abundância, riqueza e relação com plantas esfingófilas. Revista Brasileira de Zoologia 19(2): 429-443.
- Derzhavets, Y. A. 1984. Review of the classification of the Sphingidae (Lepidoptera) with a list of the species of the USSR. Entomologicheskoe Obozrenie 63: 346-349.
- Duarte Jr., J. A., C. S. Motta, and A. A. Varela-Freire. 2001. Sphingidae (Lepidoptera) da Estação Ecológica do Seridó, Serra Negra do Norte, Rio Grande do Norte, Brasil. Entomologia y Vectores 8(3): 341-347.
- Duarte Jr., J. A. and 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(4): 212-218.
- Eitschberger, U. 2001a. Die *Xylophanes ockendeni*-Gruppe mit der Beschreibung einer neuen art (Lepidoptera, Sphingidae). Atalanta 32(3-4): 419-433, 478-479.
- Eitschberger, U. 2001b. Die *Xylophanes rothschildi*-Gruppe mit Beschreibung einer neuen art (Lepidoptera, Sphingidae). Atalanta 32(3-4): 435-452, 480-481.
- Eitschberger, U. 2006. Revision der Gattungen *Amphimoea* Rothschild & Jordan, 1903, *Cocytius* auct. (nec Hübner, [1819]) und *Neococytius* Hodges, 1971 mit der Neugliederung der Gattung *Cocytius* auct. Neue Entomologische Nachrichten 59: 171-288.
- Ferreira, P. S. F., D. S. Martins, and N. Hübner. 1986. Levantamento, flutuação e análise entomofaunística em mata remanescente da Zona da Mata, Viçosa, Minas Gerais. I. Sphingidae: Lepidoptera. Revista Ceres 33(190): 516-527.
- Gregory, D. P. 1963. Hawkmoth pollination in the genus *Oenothera*. Aliso 5-6: 357-419.
- Gusmão, M. B., A. J. Creão-Duarte, and C. S. Motta. 2003. Sphingidae (Lepidoptera) em ecossistema de caatinga, estado da Paraíba, Brasil. Entomologia y Vectores 10(3): 367-377
- Gusmão, M. A. B. and A. J. Creão-Duarte. 2004a. Diversidade e análise faunística de Sphingidae (Lepidoptera) em área de brejo e Caatinga no estado da Paraíba, Brasil. Revista Brasileira de Zoologia 21(3): 491-498.
- Gusmão, M. A. B. and A. J. Creão-Duarte. 2004b. Diversidade e análise faunística de Sphingidae (Insecta, Lepidoptera) na Mata do Pau-Ferro, Areia, Paraíba, Brasil, com vista ao monitoramento; p. 179-199 In K. C. Pôrto, J. J. P. Cabral, and M. Tabarelli (org.). Brejos de altitude em Pernambuco e Paraíba: história natural, ecologia e conservação. Brasília: Ministério do Meio Ambiente.
- Haber, W. A. and G. W. Frankie. 1989. A tropical hawkmoth community: Costa Rican dry forest Sphingidae. Biotropica 21(2): 155-172.

LISTS OF SPECIES

- Hambleton, E. J. and W. T. M. Forbes. 1935. Uma lista de Lepidoptera (Heterocera) do Estado de Minas Gerais. Arquivos do Instituto Biológico 6(2): 213-256.
- Haxaire, J. 2003. Un nouveau Sphingidae d'Equateur occidental: *Xylophanes vagliai* (Lepidoptera, Sphingidae). Lambillionea 103(4): 659-662.
- Haxaire, J. and U. Eitschberger. 2003. Description d'un nouveau Sphingidae d'Amerique Centrale, *Xylophanes monzoni* n. sp. (Lepidoptera, Sphingidae). Lepidopteres 1(2): 1-6.
- Haxaire, J. and T. Vaglia. 2004. Nouveaux Sphingidae equatoriens et boliviens du genre *Xylophanes* Hübner (1819) (Lepidoptera, Sphingidae). Lepidopteres 2(3): 27-33.
- Haxaire, J. and U. Eitschberger. 2007. Description d'un nouveau Sphingidae Neotropical: *Xylophanes barbuti* (Lepidoptera, Sphingidae). Lambillionea 107(3): 365-368.
- Heppner, J. B. 1991. Faunal regions and the diversity of Lepidoptera. Tropical Lepidoptera 2(suppl.1): 1-85.
- Heppner, J. B. 1998. Classification of Lepidoptera. Part 1. Introduction. Holartic Lepidoptera 5(suppl.1): 1-148.
- Heyer, W. R., A. S. Rand, C. A. G. Cruz, O. L. Peixoto, and C. E. Nelson. 1990. Frogs of Boracéia. Arquivos de Zoologia 31(4): 231-410.
- Hodges, R. W. 1971. Sphingoidea (Hawkmoths); In R. B. Dominick et al. (ed.), The Moths of America north of Mexico. Fascicle 21. London: E. W. Classey and R.B.D. Publications Inc. 158 p.
- Janzen, D. H. 1984. Two ways to be a tropical big moth: Santa Rosa saturniids and sphingids. Oxford Surveys in Evolutionary Biology 1: 85-140.
- Kitching, I. J. 2002. The phylogenetic relationships of Morgan's Sphinx, *Xanthopan morgani* (Walker), the tribe Acherontiini, and allied long-tongued hawkmoths (Lepidoptera: Sphingidae, Sphinginae). Zoological Journal of the Linnean Society 135(4): 471-527.
- Kitching, I. J. and J. M. Cadiou. 2000. Hawkmoths of the world: an annotated and illustrated revisionary checklist (Lepidoptera: Sphingidae). Ithaca: Cornell University Press. 226 p.
- Laroca, S. and O. H. H. Mielke. 1975. Ensaio sobre ecologia de comunidades em Sphingidae da Serra do Mar, Paraná, Brasil (Lepidoptera). Revista Brasileira de Biologia 35(1):1-9.
- Laroca, S., V. O. Becker, and F. C. V. Zanella. 1989. Diversidade, abundância relativa e fenologia em Sphingidae (Lepidoptera) na Serra do Mar (Quatro Barras, PR), sul do Brasil. Acta Biológica Paranaense 18(1-4): 13-53.
- Leemans, R. and W. P. Cramer. 1991. The IIASA Database of mean monthly values of temperature, precipitation, and cloudiness on a global terrestrial grid. Laxenburg: International Institute for Applied Systems Analysis.
- Lemaire, C. 1978. Les Attacidae américains. The Attacidae of America (= Saturniidae). Attacinae. Neuilly-sur-Seine. Edited by the author. 238 p.
- Lemaire, C. and J. Minet. 1998. The Bombycoidea and their relatives; p. 321-353 In N. P. Kristensen (ed.), Band/Volume IV. Arthropoda: Insecta. Lepidoptera, moths and butterflies: evolution, systematics, and biogeography. Vol. 1. In M. Fisher (ed.). Handbuch der Zoologie/Handbook of Zoology. Berlin: Walter de Gruyter.
- León-Cortés, J. L., J. Soberón-Mainero, and J. Llorente-Bousquets. 1998. Assessing completeness of Mexican sphinx moths inventories through species accumulation functions. Diversity Distribution 4: 37-44.
- Linhart, Y. B. and J. A. Mendenhall. 1977. Pollen dispersal by hawkmoths in a *Lindenia rivalis* Benth. population in Belize. Biotropica 9(2): 143-143.
- Marinoni, R. C., R. R. Dutra, and O. H. H. Mielke. 1999. Levantamento da fauna entomológica no estado do Paraná. IV. Sphingidae (Lepidoptera). Diversidade alfa e estrutura de comunidade. Revista Brasileira de Zoologia 16(supl. 2): 223-240.
- Minet, J. 1994. The Bombycoidea: phylogeny and higher classification (Lepidoptera: Glossata). Entomologica Scandinavica 25(1): 63-88.
- Moré, M., I. J. Kitching, and A. A. Cocucci. 2005. Sphingidae: Esfingídeos de Argentina. Hawkmoths of Argentina. Buenos Aires: L.O.L.A. (Literature of Latin America). 184 p.
- Moss, A. M. 1920. Sphingidae of Pará, Brazil; early stages, food plants, habitat, etc. Novitates Zoologicae 27: 333-424.
- Motta, C. S., R. L. M. Ferreira, and N. O. Aguiar. 1991. Sobre a esfingofauna da Ilha de Maracá e da Serra da Pacaraima, Roraima (Lepidoptera, Sphingidae). Acta Amazônica 21(4): 319-324.
- Motta, C. S. and A. Soares. 1997. *Baniwa yavitensis* Lichy, 1981 (Lepidoptera: Sphingidae) na Amazônia brasileira. Acta Amazônica 27(4): 303-308.
- Motta, C. S., F. J. Aguilera-Peralta, and R. Andreatze. 1998. Aspectos da esfingofauna (Lepidoptera, Sphingidae) em área de terra firme, no estado do Amazonas, Brasil. Acta Amazônica 28(1): 75-92.
- Motta, C. S. and R. Andreatze. 2001. Esfingofauna (Lepidoptera: Sphingidae) do Parque Nacional do Jaú e arredores, Amazonas, Brasil. Acta Amazônica 31(4): 643-654.
- Motta, C. S. and R. Andreatze. 2002. Sphingidae (Lepidoptera) de Querari, São Gabriel da Cachoeira, Amazonas, Brasil. Entomologia y Vectores 9(3): 329-337.
- Motta, C. S. and F. F. Xavier-Filho. 2005. Esfingídeos (Lepidoptera, Sphingidae) do município de Beruri, Amazonas, Brasil. Acta Amazônica 35(4): 457-462.

LISTS OF SPECIES

- Nilsson, L. A., E. Rabakonandrianina, and B. Petersson. 1992. Exact tracking of pollen transfer and mating in plants. *Nature* 360: 666-668.
- Oiticica Filho, J. 1939. Relatório da excursão científica do Instituto Oswaldo Cruz. XII. Sphingidae. *Boletim Biológico* (n. ser.) 4(2): 269-277.
- Oiticica Filho, J. 1942. Sphingidae capturados em Porto Cabral (margem paulista do rio Paraná), com notas sobre nomenclatura. *Papéis Avulsos de Zoologia* 2(5): 97-162.
- Oliveira, R. B., A. Specht, and E. Corseuil. 1999. Esfingídeos (Lepidoptera, Sphingidae) ocorrentes no Rio Grande do Sul, Brasil. *Biociências* 7(1): 167-177.
- Preston, F. W. 1948. The commonness and rarity of species. *Ecology* 29: 254-283.
- Preston, F. W. 1960. Time and space and the variation of species. *Ecology* 41: 611-627.
- Rothschild, L. W. and K. Jordan. 1903. A revision of the lepidopterous family Sphingidae. *Novitates Zoologicae* 9(suppl.1-2): 1-972.
- Rothschild, L.W. and K. Jordan. 1910. List of the Sphingidae collected by the late W. Hoffmanns at Allianca, Rio Madeira, Amazonas. *Novitates Zoologicae* 17(3): 447-455.
- Schreiber, H. 1978. Dispersal center of Sphingidae (Lepidoptera) in the Neotropical region. *Biogeographica* 10: 1-195.
- Setzer, J. 1946. Atlas climático e ecológico do Estado de São Paulo. Comissão Interestadual da Bacia Paraná-Uruguaí.
- Silberbauer-Gottsberger, I. S. and G. Gottsberger. 1975. Über sphingophile Angiospermen Brasiliens. *Plant Systematics and Evolution* 123: 157-184.
- Soares, A. and C. S. Motta. 2002. Um novo *Xylophanes* Hübner, [1819] da Bahia, Brasil (Lepidoptera, Sphingidae). *Entomología y Vectores* 9(1): 93-103.
- Travassos Filho, L. and H. F. A. Camargo. 1958. A Estação Biológica de Boracéia. *Arquivos de Zoologia* 11(1): 1-21.
- Vaglia, T. and J. Haxaire. 2003. Description d'un nouveau Sphingidae du Costa Rica *Xylophanes letiranti* (Lepidoptera, Sphingidae). *Lambillionea* 103(2): 287-290.
- Winter Jr., W. D. 2000. Basic techniques for observing and studying moths and butterflies. *Memoirs of the Lepidopterists' Society* 5: xviii + 444 p.
- Zikán, J. F. and W. Zikán. 1968. Inseto-fauna do Itatiaia e da Mantiqueira. III. Lepidoptera. *Pesquisa agropecuária brasileira* 3: 45-109.

Received October 2007

Accepted March 2008

Published online April 2008