

# Arctiini Leach, [1815] (Lepidoptera, Erebidae, Arctiinae) of the Amazônia National Park, Pará, Brazil

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## Resumo

**Arctiini Leach, [1815] (Lepidoptera, Erebidae, Arctiinae) do Parque Nacional da Amazônia, Pará, Brasil.** Este estudo avaliou a fauna Arctiini do Parque Nacional da Amazônia (Pará, Brasil), coletada em quatro expedições, entre 11 a 15 de julho e 02 a 06 de outubro de 2013 (estação seca), e entre 01 a 05 de março e 25 a 29 de junho de 2014 (estação chuvosa). Armadilhas luminosas foram usadas uma noite em cada local de amostragem (SS) das 18h às 6h do dia seguinte. Os parâmetros avaliados foram: riqueza (S), abundância (N), índices de diversidade ( $H'$ ) e uniformidade ( $E'$ ) de Shannon e, dominância de Berger-Parker (BP). A riqueza foi estimada usando os métodos não paramétricos “Chao1, Chao2, ACE, ICE, Jackknife1, Jackknife2 e Bootstrap”. Foram capturados 804 espécimes pertencentes a 190 espécies de Arctiini; 22 dessas são novos registros para o estado do Pará e, destes, quatro são novos para a Amazônia brasileira. Os estimadores de riqueza e a curva de acumulação de espécies indicaram a necessidade de maiores esforços de amostragem na área.

**Palavras-chave:** Mariposas-tigre; Mariposas-vespa; Noctuoidea

## Abstract

This study evaluated the Arctiini fauna of the Amazônia National Park (Pará, Brazil) collected in four expeditions between July 11 to 15 and October 02 to 06, 2013 (dry season), and March 01 to 05 and June 25 to 29, 2014 (rainy season). Light traps were left one night in each sampling site (SS) from 6pm to 6am of the following day. The following parameters were evaluated: richness (S), abundance (N), diversity index ( $H'$ ), Shannon evenness ( $E'$ ) index, and Berger-Parker dominance (BP). Richness was estimated using the non-parametric methods “Chao1, Chao2, ACE, ICE, Jackknife1, Jackknife2 and Bootstrap”. A total of 804 specimens were captured, belonging to 190 Arctiini taxa; 22 of these are new records for the state of Pará and, of these, four are new records for the Brazilian Amazon. The richness estimators and accumulation curve indicated the need for increased sampling efforts in the area.

**Key words:** Noctuoidea; Tiger moths; Wasp Moths



## Introduction

There are many articles that highlight the Amazonian biodiversity and its mega-diversity in species, landscapes, and ecosystems, as well as its fundamental importance in global climate regulation. In fact, the Amazon is the largest rainforest in the world, covering an area of approximately 6,000,000 km<sup>2</sup> and stands out for having the highest diversity of animals and plants on the planet (BOUBLI; HRBEK, 2012).

The Protected Areas (PAs) have been key to the preservation in situ of nature. PAs have slowed down deforestation, which is more intense along the southern and eastern borders of the Amazon region and have mitigated land-use pressures such as illegal deforestation and the irregular occupation of land (BERNARD et al., 2014).

According to Carvalho et al. (2016), the municipality of Itaituba, where most of the Amazônia National Park (AMZNP) is located, is one of four municipalities in the state of Pará with the highest deforestation rates.

Lepidopterans are one of the main insect orders, and are particularly useful in studies of biodiversity owing to their species richness and economic importance. Due to the phytophagous eating habits of their larvae, they can be used as bioindicators of vegetation quality in a specific area (KITCHING et al., 2000; TESTON et al., 2006). Adults are easily collected with light traps and there are many different models (TESTON et al., 2006; CAMARGO, 2001).

Nocturnal Arctiini are one of the most used Lepidoptera groups for ecosystem monitoring, and many studies have documented its importance (DELFINA; TESTON, 2013; TESTON; CORREA, 2015). Furthermore, some inventories evaluating the Arctiini fauna in protected areas (PAs) have already been made in the main biomes in Brazil (e. g. Amazon, Cerrado and Atlantic Forest) (FERRO; DINIZ, 2007; TESTON; CORREA, 2015; MORENO; FERRO, 2016).

In the Neotropical region, there are 4,761 species of Arctiini (HEPPNER, 1991), and Brown Jr. and Freitas (1999) estimate the occurrence of at least two thousand species in Brazil. The state of Pará alone has

536 recorded species (TESTON et al., 2019). Recently the first study on the Arctiini fauna was carried out in a protected area in the Amazon rainforest in Brazil (TESTON; CORREA, 2015).

With the aim of contributing to a greater understanding of Arctiini diversity in the Brazilian Amazon, primarily in PAs, a survey of the species of this lepidopteran subfamily was undertaken in the Amazônia National Park (AMZNP), Pará, Brazil. Until the present study, there were no records of the occurrence of Arctiini species in the AMZNP. Recently, political pressure has been put on the AMZNP and other federal conservation units to reduce their coverage, their degree of protection, and even their conservation status (BRASIL, 2012; BERNARD et al., 2014).

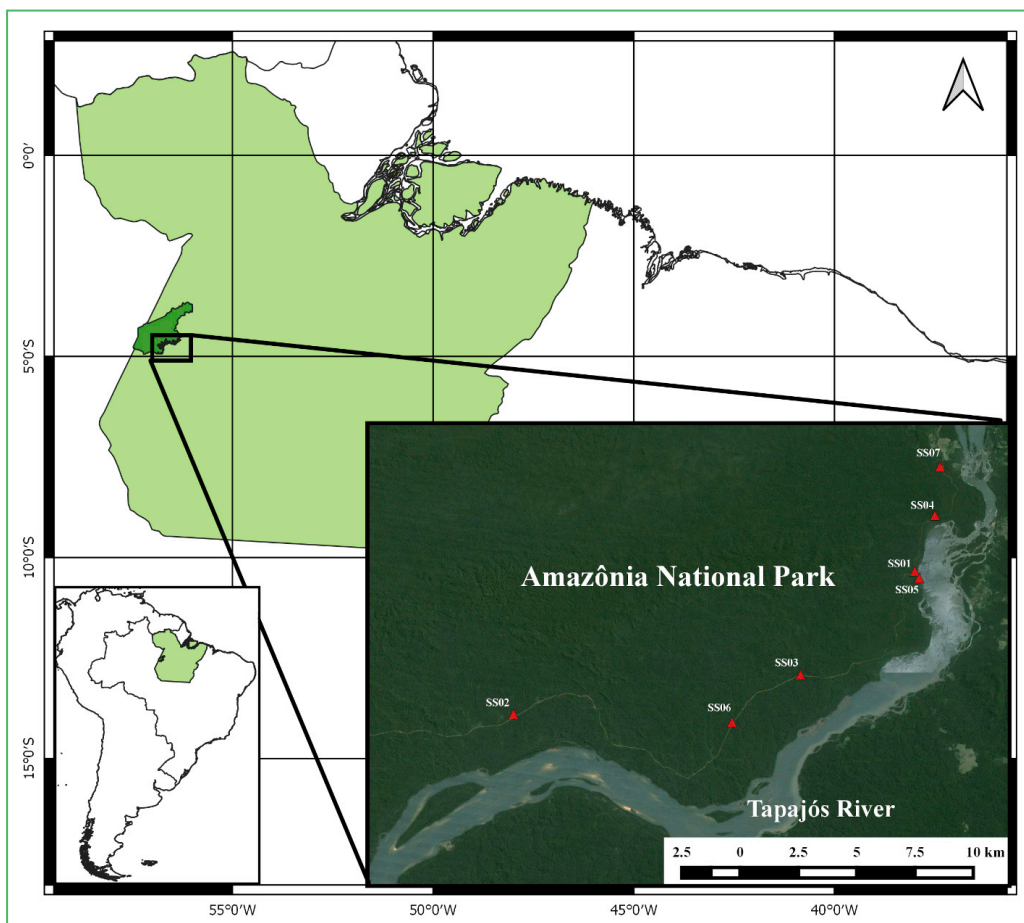
## Material and Methods

The Amazonia National Park (AMZNP), a conservation unit maintained by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), was created by the Decree of February 19, 1974. With an area of 1,070,736 ha, it is nested in the municipalities of Aveiro and Itaituba, in the state of Pará, and Maués in the state of Amazonas (Figure 1). It is limited to the north by the Andirá-Marau Indigenous Land, to the south by the Amanã National Forest, to the east by the Maués State Forest and the Pau-Rosa National Forest, and to the west by the Tapajós River. The park presents a mosaic of 14 different vegetation types, with the dense lowland rainforest occupying the largest portion, interspersed with a small portion of open rainforest (IBDF, 1978; KASECKER; SILVA, 2011; BRASIL, 2012).

In this region the rainy season extends from December to May, the dry from June to November (MORAES et al., 2005).

Collections were made in four expeditions, with four nights in length each, two during the rainy season and two during the dry season, totaling 16 samples. During the dry season, samples were collected July 11 to 15 and October 02 to 06, 2013, and during the rainy season, March 01 to 05 and June 25 to 29, 2014 (Figure 1; Table 1). To that end, L-shaped light traps (2.0 m in width

FIGURE 1: Location of the Amazônia National Park and respective sampling sites (SS), geographic positions according to Table 1 and satellite image by Google Earth Pro.



and 2.0 m length) were made with two white cloths. The moths were captured with killing jars containing Ethyl acetate. Two mixed lamps (250 watts) powered by a portable electric generator (TESTON; CORREA, 2015), one on each cloth, were used to attract the moths. These lights were left on all night, from 6pm to 6am of the following day, in a total sampling effort of 12h in every sampling site (SS).

The captured Arctiini were separated, counted, and recorded in specific worksheets for every location in the Laboratório de Estudos de Lepidópteros Neotropicais (LELN) of the Universidade Federal do Oeste do Pará (UFOPA). Representative samples of every species

(voucher) were prepared following the traditional method for Lepidoptera, and subsequently incorporated into the laboratory collection (LELN).

Species identification was carried out using reference works (HAMPSON, 1898; 1901; 1914; 1920; DRAUDT, 1914-1919; SEITZ, 1919-1925; HERING, 1925; WATSON, 1971; 1973; 1975; 1980) and by comparison with specimens deposited in the collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Museu Paraense Emílio Goeldi (MPEG), and Laboratório de Estudos de Lepidópteros Neotropicais (LELN).

TABLE 1: Sampling site (SS), dates (night from 6pm to 6am), season (Dry and Rainy), geographic coordinates and altitude for Arctiini (Lepidoptera, Erebidae, Arctiinae) captured with light traps during the expeditions to the Amazônia National Park, Pará, Brazil.

Sampling site (SS)	Date (night)	Season	Geographic Coordinates		Altitude (m.s.l.)
			Latitude	Longitude	
SS01	11-12/VII/2013	Dry	04°32'52.9"S	56°18'11.8"W	80
	02-03/X/2013	Dry			
	05-06/X/2013	Dry			
	01-02/III/2014	Rainy			
	02-03/III/2014	Rainy			
	04-05/III/2014	Rainy			
	25-26/VI/2014	Rainy			
	28-29/VI/2014	Rainy			
SS02	12-13/VII/2013	Dry	04°39'15"S	56°36'10.7"W	57
	03-04/X/2013	Dry			
	03-04/III/2014	Rainy			
SS03	13-14/VII/2013	Dry	04°37'30"S	56°23'18.9"W	56
SS04	14-15/VII/2013	Dry	04°30'23.7"S	56°17'17.5"W	30
SS05	04-05/X/2013	Dry	04°33'11.5"S	56°17'59.9"W	41
SS06	26-27/VI/2014	Rainy	04°39'37.1"S	56°26'23"W	61
SS07	27-28/VI/2014	Rainy	04°28'13.2"S	56°17'3.7"W	14

The taxonomic classification adopted and allocation of species to genera follows Vincent and Laguerre (2014) for the subtribes Arctiina, Callimorphina, Phaegopterina, Pericopina, and Spilosomina, and Hampson (1898); Watson et al. (1995) and Weller et al. (2000) for Ctenuchina and Euchromiina.

In order to compare among rainy and dry seasons, a list of the occurrence and abundance (N) of Arctiini was organized in alphabetical order by subtribe, genus, and species. Richness (S), diversity ( $H'$ ) and evenness ( $E'$ ) Shannon indexes, Berger-Parker dominance (BP) (MAGURRAN, 2011), and estimate of species richness by the non-parametric methods Chao1, Chao2, ACE, ICE, Jackknife1, Jackknife2 and Bootstrap, using the program EstimateS (version 9.1.0) (COLWELL, 2013), are presented for rainy and dry seasons and total.

## Results

In total, 804 specimens (N) were captured, distributed in 190 species (S) and representing all seven Arctiini subtribes, with N = 520 and S = 161 for dry season; and N = 284 and S = 102 for rainy season (Tables 2 and 3).

Of the 190 species sampled, 158 were identified to the species level (83%) and 32 at the genus level (17%) (Table 2). The subtribe with the highest number of species was Phaegopterina (132 species, 69.5% of the total), followed by Ctenuchina (27, 14.2%), Euchromiina (23, 12.1%), Pericopina (4, 2.1%), Arctiina and Spilosomina (both with 2 species, 1.05%).

TABLE 2: Number of Arctiini (Lepidoptera, Erebidae, Arctiinae) specimens captured with light traps during the expeditions to the Amazônia National Park, Pará, Brazil. Species marked with \* indicate a first-time record for the state of Pará.

Subtribes/Species	Dry	Rainy	Total
<b>Arctiina</b>			
<i>Pseudalus salmonaceus</i> (Rothschild, 1909) *	1		1
<i>Virbia subapicalis</i> (Walker, 1854)	1		1
<b>Ctenuchina</b>			
<i>Aclytia heber</i> (Cramer, [1780])	3	1	4
<i>Aclytia</i> sp.	1		1
<i>Correbidia calopteridia</i> (Butler, 1878)	8	3	11
<i>Delphyre flaviceps</i> (Druce, 1905)	1	2	3
<i>Delphyre roseiceps</i> Dognin, 1909	3	2	5
<i>Epidesma aurimacula</i> (Schaus, 1905)	1		1
<i>Epidesma parva</i> (Rothschild, 1912)	1		1
<i>Epidesma perplexa</i> (Rothschild, 1912) *	2		2
<i>Episcepsis lamia</i> (Butler, 1877)		2	2
<i>Episcepsis venata</i> Butler, 1877	1		1
<i>Episcepsis</i> sp.1	2	1	3
<i>Episcepsis</i> sp.2	1	1	2
<i>Eucereon aoris</i> Möschler, 1877	2		2
<i>Eucereon marmoratum</i> Butler, 1877	1		1
<i>Eucereon obscura</i> (Möschler, 1872)	1		1
<i>Eucereon simile</i> Draudt, 1915	1		1
<i>Eucereon varia</i> (Walker, 1854)	3		3
<i>Heliura perexcavatum</i> (Rothschild, 1912)	5		5
<i>Heliura zonata</i> Druce, 1905	1	1	2
<i>Hyalaucerea erythrotela</i> (Walker, 1854)	1		1
<i>Hyalaucerea</i> sp.	1		1
<i>Patrelia capys</i> (Cramer, 1775)	1		1
<i>Sciopsyche tropica</i> (Walker, 1854)		1	1
<i>Telioneura glaucopis</i> R. Felder, 1869	1		1
<i>Theages leucophaea</i> Walker, 1855		1	1
<i>Timalus leucomela</i> (Walker, 1856)	1		1
<i>Uranophora walkeri</i> (Druce, 1889)	3	1	4
<b>Euchromiina</b>			
<i>Calonotos aequimaculatus</i> Zerny, 1931	4		4
<i>Cosmosoma consolata</i> (Walker, 1856)	1		1
<i>Cosmosoma metallescens</i> (Ménétriés, 1857)	5		5
<i>Cosmosoma</i> sp.	1	3	4
<i>Hypocharis</i> sp.	3		3
<i>Isanthrene porphyria</i> (Walker, 1854)		1	1
<i>Leucotmemis torrida</i> (Walker, 1854)		6	6
<i>Leucotmemis varipes</i> (Walker, 1854)	2	1	3

<i>Loxophlebia pyrgion</i> (Druce, 1884)	2		2
<i>Macrocneme lades</i> (Cramer, [1775])	2	2	4
<i>Macrocneme</i> sp.		1	1
<i>Nyridela chalciope</i> (Hübner, 1827)	1		1
<i>Pheia albisigna</i> (Walker, 1854)	1		1
<i>Poliopastea</i> sp.		1	1
<i>Pompilodes aliena</i> (Walker, 1854)	1	1	2
<i>Pseudomya</i> sp.	1		1
<i>Psoloptera leucosticta</i> (Hübner, 1827)	2	2	4
<i>Sarosa acutior</i> (R. Felder, 1869)	3	2	5
<i>Saurita cassandra</i> (Linnaeus, 1758)		1	1
<i>Saurita lasiphlebia</i> Dognin, 1906	1	2	3
<i>Saurita pebasa</i> (Kaye, 1918)	13	2	15
<i>Saurita vindonissa</i> (Druce, 1883) *	1	1	2
<i>Saurita</i> sp.	2		2
<b>Pericopina</b>			
<i>Calodesma dioptis</i> (C. Felder & R. Felder, 1874)	1		1
<i>Chetone catilina</i> (Cramer, [1776])	1		1
<i>Hyalurga lauronoides</i> Hering, 1925 *	1	5	6
<i>Hyalurga leucophlebia</i> Hering, 1925	2		2
<b>Phaegopterina</b>			
<i>Agaraea semivitrea</i> (Rothschild, 1909)	1		1
<i>Amaxia beata</i> (Dognin, 1909)		1	1
<i>Amaxia bella</i> (Schaus, 1905)	1	7	8
<i>Amaxia chaon</i> (Druce, 1883)	4		4
<i>Amaxia consistens</i> Schaus, 1905	1	4	5
<i>Amaxia erythrophleps</i> Hampson, 1901	4		4
<i>Amaxia flavicollis</i> (Rothschild, 1909)	1		1
<i>Amaxia lepida</i> (Schaus, 1912)	6	1	7
<i>Amaxia pandama</i> (Druce, 1893)	1	2	3
<i>Amaxia pseudodyuna</i> Rothschild, 1922	2		2
<i>Amaxia rufobasalis</i> Rothschild, 1909 *	2	3	5
<i>Amaxia</i> sp.1		1	1
<i>Amaxia</i> sp.2	3		3
<i>Amaxia</i> sp.3	2		2
<i>Ammalo helops</i> (Cramer, [1776])	1		1
<i>Ammalo</i> sp.	9		9
<i>Aphyle cuneata</i> Hampson, 1905	1		1
<i>Apiconoma opposita</i> (Walker, 1854)	7	1	8
<i>Apyre separata</i> Walker, 1854	4		4
<i>Araeomolis albipicta</i> (Dognin, 1909) *	2	1	3
<i>Araeomolis propinqua</i> Toulgoët, 1998	4	1	5
<i>Araeomolis rhodographa</i> Hampson, 1901	3	2	5



<i>Arctiarpia melanopasta</i> (Dognin, 1907)	1	5	6
<i>Astralarctia pulverosa</i> (Schaus, 1905)	2	1	3
<i>Azatrepthes discalis</i> (Walker, 1856)	10	3	13
<i>Azatrepthes fuliginosa</i> Rothschild, 1909 *		1	1
<i>Baritius eleutheroides</i> Rothschild, 1909	2	4	6
<i>Baritius sannionis</i> (Rothschild, 1909)	5	2	7
<i>Carales astur</i> (Cramer, [1777])	1		1
<i>Carathis</i> sp.		1	1
<i>Chrysolallos fulvescens</i> (Rothschild, 1909)	5		5
<i>Coiffaitarctia basalis</i> (Rothschild, 1909) *	1	8	9
<i>Cratoplastis diluta</i> Felder & Rogenhofer, 1874	2		2
<i>Cratoplastis rectiradia</i> (Hampson, 1901)	3	1	4
<i>Cresera affinis</i> (Rothschild, 1909)		1	1
<i>Cresera hieroglyphica</i> (Schaus, 1905)	3		3
<i>Cresera ilioides</i> (Schaus, 1905)	5	3	8
<i>Cresera ilus</i> (Cramer, [1776])	2		2
<i>Cresera optimus</i> (Butler, 1877)		1	1
<i>Cresera similis</i> (Rothschild, 1909)	8	1	9
<i>Diaphanophora albiscripta</i> (Schaus, 1905)	2		2
<i>Echeta semirosea</i> (Walker, [1865])	9		9
<i>Echeta trinotata</i> (Reich, 1933) *	1	1	2
<i>Echeta</i> sp.		2	2
<i>Emurena fernandezi</i> Watson, 1975	1		1
<i>Ernassa cruenta</i> (Rothschild, 1909)	2		2
<i>Eucyrta albicollis</i> Felder & Rogenhofer, 1874	1		1
<i>Euplesia sphingidea</i> (Perty, [1833])	3	1	4
<i>Eupseudosoma larissa</i> (Druce, 1890)	3		3
<i>Evius albicoxae</i> (Schaus, 1905)	11	5	16
<i>Evius hippia</i> (Stoll, [1790])	4		4
<i>Evius</i> sp.	1	1	2
<i>Glaucostola flavida</i> Schaus, 1905	2	2	4
<i>Glaucostola guttipalpis</i> (Walker, 1856) *	1		1
<i>Glaucostola maroniensis</i> Joicey & Talbot, 1918 *		1	1
<i>Gorgonidia buckleyi</i> (Druce, 1883)	1	1	2
<i>Haemanota holophaea</i> (Hampson, 1905)	4	1	5
<i>Haemaphlebiella formona</i> (Schaus, 1905) *	1		1
<i>Haemaphlebiella strigata</i> Jones, 1914	1		1
<i>Himerarctia griseipennis</i> (Rothschild, 1909)	1		1
<i>Himerarctia laeta</i> Watson, 1975	3		3
<i>Hyperandra appendiculata</i> (Herrich-Schäffer, [1856])	2		2
<i>Hyperandra novata</i> (Dognin, 1924)	2	2	4
<i>Hypidalia sanguirena</i> Schaus, 1905 *		2	2
<i>Hyponerita persimilis</i> Rothschild, 1909 *	3	1	4

<i>Hyponerita similis</i> Rothschild, 1909	7		7
<i>Idalus admirabilis</i> (Cramer, [1777])	1	1	2
<i>Idalus aleteria</i> (Schaus, 1905)	8	9	17
<i>Idalus critheis</i> Druce, 1884	12	4	16
<i>Idalus fasciipuncta</i> (Rothschild, 1909)	1		1
<i>Idalus intermedia</i> (Rothschild, 1909)		3	3
<i>Idalus vitrea vitrea</i> (Cramer, [1780])	1		1
<i>Idalus</i> sp.	1	1	2
<i>Ischnognatha semiopalina</i> Felder & Rogenhofer, 1874		5	5
<i>Lepidokirbyia venigera</i> Toulgoët, [1983]	3		3
<i>Leucanopsis</i> sp.1	1		1
<i>Leucanopsis</i> sp.2		1	1
<i>Lophocampa albescens</i> (Rothschild, 1909) *	1	1	2
<i>Lophocampa citrina</i> (Sepp, [1852])	16	8	24
<i>Lophocampa modesta</i> (Kirby, 1892)	1		1
<i>Lophocampa</i> sp.1	4		4
<i>Lophocampa</i> sp.2	1	1	2
<i>Melese drucei</i> Rothschild, 1909	53	40	93
<i>Melese incertus</i> (Walker, 1855)	32	24	56
<i>Melese ocellata</i> Hampson, 1901	1	1	2
<i>Neonerita dorsipuncta</i> Hampson, 1901	2		2
<i>Nyearctia leucoptera</i> (Hampson, 1920)	1		1
<i>Ordishia klagesi</i> (Rothschild, 1909)		1	1
<i>Ordishia</i> sp.	1		1
<i>Ormetica packardi</i> (Butler, 1876)	5		5
<i>Ormetica stenotis</i> (Dognin, 1908) *		1	1
<i>Ormetica sypilus</i> (Cramer, [1777])	3		3
<i>Ormetica zenzeroides</i> (Butler, 1877) *	2		2
<i>Ormetica</i> sp.	1		1
<i>Pachydota albiceps</i> (Walker, 1856)	4		4
<i>Parathyris cedonulli</i> (Stoll, [1781])	1	2	3
<i>Phaeomolis polystria</i> (Schaus, 1905)	8		8
<i>Premolis semirufa</i> (Walker, 1856)		2	2
<i>Pryteria alboatra</i> (Rothschild, 1909)		1	1
<i>Pseudepimolis flavonotata</i> (Rothschild, 1909)	3	1	4
<i>Pseudepimolis incisa</i> (Rothschild, 1909) *	3	5	8
<i>Psycophasma erosa</i> (Herrich-Schäffer, [1858])	2	3	5
<i>Rhipha albiplaga</i> (Schaus, 1905)	2	1	3
<i>Robinsonia klagesi</i> Rothschild, 1910 *		1	1
<i>Robinsonia mossi</i> (Rothschild, 1922)	2	3	5
<i>Scaptius asteroides</i> (Schaus, 1905)	3	1	4
<i>Scaptius chrysopera</i> (Schaus, 1905)	3	1	4
<i>Selenarctia elissa</i> (Schaus, 1892)	2		2



<i>Stidzaeras strigifera</i> Druce, 1905	1		1
<i>Sutonocrea reducta</i> (Walker, 1856)	2		2
<i>Symphlebia</i> sp.		3	3
<i>Thyromolis pythia</i> (Druce, 1900) *	1		1
<i>Toulgoetarctia nigripuncta</i> (Joicey & Talbot, 1918)	7		7
<i>Toulgoetarctia sanguinea</i> (Hampson, 1905)	2		2
<i>Trichromia albicollis</i> (Hampson, 1905)	1		1
<i>Trichromia declivis</i> (Schaus, 1905)	2	5	7
<i>Trichromia gaudialis</i> (Schaus, 1905)	2		2
<i>Trichromia leucoplaga</i> (Hampson, 1905)	1		1
<i>Trichromia lophosticta</i> (Schaus, 1911) *		1	1
<i>Trichromia metachryseis</i> (Hampson, 1905)	3		3
<i>Trichromia onytes</i> (Cramer, [1777])	1	1	2
<i>Trichromia patara</i> (Druce, 1896)	2		2
<i>Trichromia rosacea</i> (Rothschild, 1909) *	1		1
<i>Trichromia</i> sp.1	2	5	7
<i>Trichromia</i> sp.3	2	1	3
<i>Trichromia</i> sp.4	1		1
<i>Trichromia</i> sp.5	2	3	5
<i>Viviennea moma</i> (Schaus, 1905)	6	1	7
<i>Viviennea superba</i> (Druce, 1883)	2	1	3
<i>Zatrephes trailii</i> Butler, 1877	1	1	2
<i>Zatrephes</i> sp.1	2	8	10
<i>Zatrephes</i> sp.2		2	2
<b>Spilosomina</b>			
<i>Paracles laboulbeni</i> (Bar, 1873)		1	1
<i>Paracles</i> sp.	17	6	23
<b>Total</b>	<b>520</b>	<b>284</b>	<b>804</b>

*Melese drucei* Rothschild, 1909, and *Melese incertus* (Walker, 1855) were the most abundant Arctiini collected, with 93 and 56 specimens, respectively.

The Shannon diversity index (Table 3) calculated for the entire sample was  $H' = 4.56$ , with evenness  $E' = 0.869$ . As expected, this high value is accompanied by a very low Berger-Parker dominance index (BP = 0.116). Between seasons, the dry season showed higher values ( $H' = 4.49$ ,  $E' = 0.884$  and BP = 0.102).

The richness estimators (Table 4) point to an increase in the number of Arctiini species in the AMZNP. In this study, between 84.8% (Bootstrap) to 65.7% (Jackknife2) of the total expected species were captured; and between 83% (Bootstrap) to 59% (ICE) for dry season and, between 80.3% (Bootstrap) to 44% (ICE) for rainy season. The accumulation curve of species (Figure 2) has not stabilized.

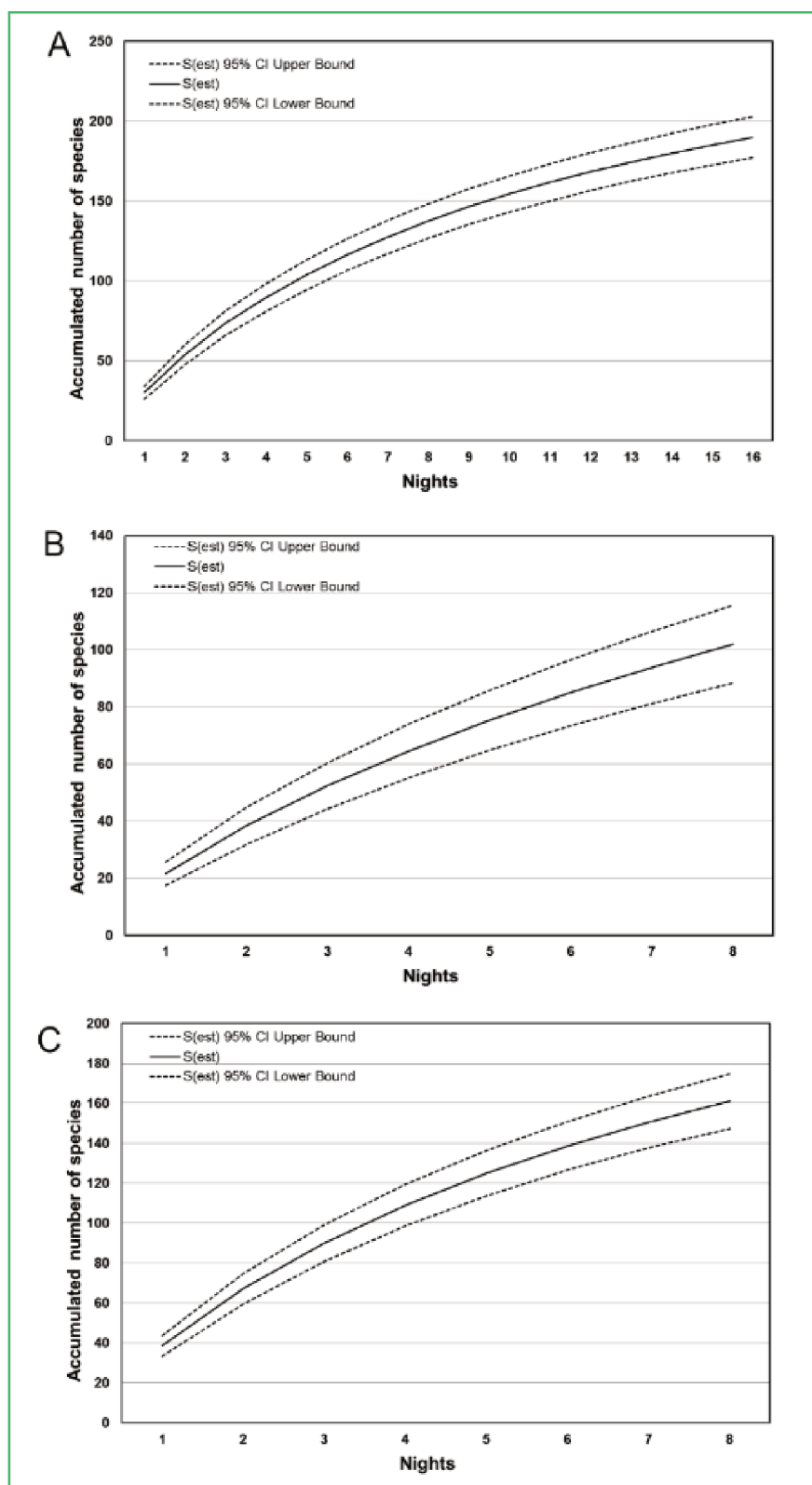
TABLE 3: Richness (S), abundance (N), diversity ( $H'$ ) and evenness ( $E'$ ) of Shannon, Berger-Parker dominance (BP), and sampling nights (SN) by season (Dry and Rainy) for Arctiini (Lepidoptera, Erebidae, Arctiinae) captured with light traps during the expeditions to the Amazônia National Park, Pará, Brazil.

Season	SN	S	N	$H'$	E	BP
Dry	8	161	520	4.49	0.884	0.102
Rainy	8	102	284	4.03	0.872	0.141
<b>Total</b>	<b>16</b>	<b>190</b>	<b>804</b>	<b>4.56</b>	<b>0.869</b>	<b>0.116</b>

TABLE 4: Estimates for Arctiini (Lepidoptera, Erebidae, Arctiinae) captured with light traps during the expeditions to the Amazônia National Park, Pará, Brazil. For total and dry and rainy seasons. Samples, species, uniques, duplicates, singletons, doubletons and species richness by estimators Chao1, Chao2, ACE, ICE, Jackknife1, Jackknife2 and Bootstrap.

	Total		Dry		Rainy	
	Values	Percentage of richness observed in relation to the estimated	Values	Percentage of richness observed in relation to the estimated	Values	Percentage of richness observed in relation to the estimated
Samples	16	-	8	-	8	-
Species	190	-	161	-	102	-
Uniques	76	-	83	-	65	-
Duplicates	48	-	43	-	20	-
Singletons	64	-	68	-	55	-
Doubletons	38	-	38	-	18	-
Chao1	242	78.5	222	72.5	186	54.8
Chao2	245	77.6	231	69.7	194	52.6
ACE	243	78.2	233	69.1	184	55.4
ICE	262	72.5	273	59.0	232	44.0
Jackknife1	261	72.8	234	68.8	159	64.2
Jackknife2	289	65.7	268	60.1	195	52.3
Bootstrap	224	84.8	194	83.0	127	80.3

FIGURE 2: Accumulation curve of Arctiini species in relation to sampling effort employed in the Amazônia National Park. (A) Total; (B) Rainy and (C) Dry seasons.



## Discussion

The number of sampled species corresponds to 35.4% of the total known for the state, according to Teston et al. (2019). A total of 22 species are new records for the state of Pará (denoted by an asterisk in Table 2), bringing the number of recorded species to 558. Of these, four are new records for the Brazilian Amazon: *Glaucostola maroniensis* Joicey & Talbot, 1918, *Lophocampa albescens* (Rothschild, 1909), *Pseudalus salmonaceus* (Rothschild, 1909) and *Trichromia lophosticta* (Schaus, 1911).

Only seven species represented one third of the total abundance (30.5%). On the other hand, 64 species (33.6%) were represented only by one captured specimen. In previous research, including those conducted in the state of Pará, many Arctiini species were represented by only a few individuals (HAWES et al., 2009; TESTON; DELFINA, 2010; TESTON et al., 2012; DELFINA; TESTON, 2013; TESTON; CORREA, 2015; VALENTE et al., 2018). The same applies to the dry and rainy seasons. In the dry season, eight species represented 31.5% of the abundance and 68 species (42%) with one captured specimen and, in the rainy season, four species represented 28.9% of the abundance and 55 species (54%) with one captured specimen (TESTON; DELFINA, 2010; TESTON et al., 2012; DELFINA; TESTON, 2013; VALENTE et al., 2018).

The diversity, equitability and dominance indices follow the trend already observed in other studies in Pará, being more relevant in the dry season (TESTON; DELFINA, 2010; TESTON et al., 2012; DELFINA; TESTON, 2013).

When comparing the richness with other inventory in protected areas (PAs) of other Brazilian biomes (e. g. Cerrado and Atlantic Forest), we note the relevance of the richness found in this study, which was 61% higher than that found in the Emas National Park ( $S = 117$ ) in the cerrado (MORENO; FERRO, 2016); and only 19% fewer species than in the Boraceia Biological Station ( $S = 235$ ) in the Atlantic Forest, with greater sampling effort (410 nights) (FERRO; DINIZ, 2007).

The accumulation curve of species did not show an asymptote, indicating the need to enlarge the sampling effort. In the same manner, the estimators show that the observed richness varied from 65.7% (Jackknife2) to 84.8% (Bootstrap) in relation to the estimated richness, indicating that the inventory must be broadened, consistent with recent Arctiini study carried out in the Serra do Pardo National Park, an important Protected Area of Pará (TESTON; CORREA, 2015), which points to an increase in the observed richness as a function of increased sampling efforts.

Arctiini's continuous inventory in the Amazonia National Park will contribute to a better understanding of lepidoptera biodiversity in the Amazon biome, and will serve as basic knowledge for conservation strategies for the group in this protected area. Teston and Ferro (2019) suggest intensive collection efforts for tiger moths in this biome.

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