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Inventory

Butterflies (Lepidoptera: Papilionoidea) of Iguaçu National Park and surrounding areas in southern Brazil: a long-term survey, with six new records for the Brazilian fauna

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Abstract: Iguaçu National Park is the second largest (1852.62 km²) protected area in the Atlantic Forest domain and harbors the largest area of semideciduous seasonal forest in Brazil. In this study, we present 795 subspecies and 787 species of butterflies that occur in this protected area and its surrounding areas, collected over 15 years and ten months using different non-standardized sampling methods. We also searched for additional records in the literature, entomological collections, and citizen science platforms on the internet. Among the sampled taxa, six are recorded for the first time in Brazil: *Emesis orichalceus* Stichel, 1916, *Theope p. pakitza* Hall & Harvey, 1998 (Riodinidae), *Elbella v. viriditas* (Skinner, 1920), *Apaustus gracilis* ssp. n. (Hesperiidae), *Deltaya* sp. n. (Nymphalidae), and *Symbiopsis* sp. n. (Lycaenidae). Another six are listed as endangered in lists of butterflies of conservation concern. The records for some species significantly increase previously documented distributions.
Keywords: *Atlantic Forest; biodiversity; conservation; endangered species; Neotropical region.*

As Borboletas (Lepidoptera: Papilionoidea) do Parque Nacional do Iguaçu e arredores no Sul do Brasil: um inventário de longo prazo, com seis novos registros para a fauna brasileira

Resumo: O Parque Nacional do Iguaçu é a segunda maior Unidade de Conservação (1.852,62 km²) no domínio Mata Atlântica, abrigando a maior área de Floresta Estacional Semidecídua no Brasil. Neste estudo apresentamos uma lista com 795 subespécies e 787 espécies de borboletas que ocorrem nesta Unidade de Conservação e seus arredores, coligida ao longo de 15 anos e dez meses através do uso de diferentes métodos de amostragem não padronizados. Nós também procuramos por registros adicionais na literatura, coleções entomológicas e plataformas de ciência cidadã na internet. Dentre os táxons amostrados, seis são registrados pela primeira vez para o Brasil: *Emesis orichalceus* Stichel, 1916, *Theope p. pakitza* Hall & Harvey, 1998 (Riodinidae), *Elbella v. viriditas* (Skinner, 1920), *Apaustus gracilis* ssp. n. (Hesperiidae), *Deltaya* sp. n. (Nymphalidae) e *Symbiopsis* sp. n. (Lycaenidae). Outras seis espécies são consideradas ameaçadas de extinção em listas de borboletas de interesse para a conservação. Os registros de algumas espécies aumentam significativamente as suas distribuições previamente documentadas.
Palavras-chave: *biodiversidade; conservação; espécies ameaçadas; Mata Atlântica; região Neotropical.*

Introduction

Species inventories document biodiversity by contributing to taxonomic, ecological, and biogeographical studies, and by providing foundational data for management plans and other conservation actions (Brown Jr. & Freitas 1999, Lewinsohn et al. 2005, Santos et al. 2008). Inventory data help document distributions of species and decrease the Wallacean shortfall (Lomolino 2004, Whittaker et al. 2005). They provide data for studies in community ecology and biogeography (e.g., Robbins et al. 1996, Brown Jr. & Freitas 2000, Gonçalves-Souza et al. 2014, Zellweger et al. 2017). Scientifically undescribed taxa may be discovered (e.g., Biezanko & Mielke 1973, Núñez-Bustos 2008, Dolibaina et al. 2011, Lamas et al. 2021), thus decreasing the Linnean shortfall (Brown & Lomolino 1998). Additionally, since butterflies are good bioindicators, responding quickly to environmental changes, well-documented inventories provide the base data that allow early detection of such changes through monitoring (Freitas et al. 2003, Freitas et al. 2006, Santos et al. 2016).

The Atlantic Forest is one of the most important hotspots of biodiversity in the world, and one of the most threatened Brazilian domains, with only ~11.7% of its original vegetation cover (Ribeiro et al. 2009). Its geographic extent in latitude (3°S to 31°S), longitude (35°W to 60°W) and elevation (0 to 3000 m) (Ribeiro et al. 2009) makes it a diverse domain, with a wide range of climate regimes and environmental heterogeneity. Among all Brazilian domains, the Atlantic Forest has the most representative butterfly inventories (Santos et al. 2008, Shirai et al. 2019), and its regional richness exceeds 2100 species (Brown Jr. & Freitas 2000). Despite these results, more information to better understand patterns of butterfly geographic distributions is needed (Francini et al. 2011, Iserhard et al. 2017).

Iguaçu National Park (hereafter Iguaçu NP) is a protected area in the Atlantic Forest domain that harbors the largest preserved area of semideciduous seasonal forest in Brazil (Urban 2002). Mielke (1968) was the first to publish a butterfly list for the region, with emphasis on Hesperiidae, and recorded 106 species in the municipality of Foz do Iguaçu. Decades later, a Rapid Ecological Assessment (REA), conducted to develop a management plan in this protected area, recorded 257 species of six families of butterflies (Mielke 1998). After that, Graciotim & Morais (2016) published a list with 69 fruit-feeding nymphalid species for this region. The authors sampled using Van Someren-Rydon traps placed along two trails, which represented the two principal phytophysiognomies in the park (Urban 2002, ICMBio 2018b). With further sampling, Santos et al. (2018) updated this list to 104 fruit-feeding nymphalid species. Considering the estimated richness of 700 butterfly species for Iguaçu NP (IBAMA 1999) and the 653 species recorded in Argentina's Iguazú National Park (Núñez-Bustos 2009), it appeared that Iguaçu NP was still under sampled. The purpose of this paper is to remedy this undersampling by producing an exhaustive list resulting from more than 15 years of sampling at Iguaçu NP and its surrounding areas, supplemented by records from the literature and from entomological collections. Our data are intended to contribute both to the taxonomy and ecology of Brazilian butterflies and to be used for conservation decisions in this emblematic National Park of the Atlantic Forest in Brazil.

Material and Methods

1. Study area

Iguaçu NP is a Brazilian protected area located in the state of Paraná, between the geographic coordinates of 25º05' and 25º41'S and 53º40' and 54º38'W (*Datum* WGS84) (Figure 1). The park area is 1852.62 km² with a 420 km perimeter. It encompasses six municipalities in the state of Paraná (Céu Azul, Capanema, Matelândia, Serranópolis do Iguaçu, São Miguel do Iguaçu and Foz do Iguaçu) and borders another four (Capitão Leônidas Marques, Lindoeste, Santa Tereza do Oeste and Santa Terezinha de Itaipu). The Iguaçu River separates Iguaçu NP in Brazil from its sister park in Argentina (Iguazú National Park). Five rivers, with their sources outside of the park, flow across the park to the Iguaçu River: Gonçalves Dias, São João, Represa Grande, Silva Jardim and Benjamin Constant. A sixth river, the Floriano River, is the only one situated almost entirely in the park. Geologically, Iguaçu NP is located on the third Paraná plateau, in the Paraná Basin.

The climate in the region is classified as humid subtropical (Cfa) according to Köppen, with mean temperatures below 18°C during the coldest month and above 22°C during the hottest month (Alvares et al. 2013). Annual precipitation varies from 1600 to 1800 mm, and the rains are concentrated mainly during hot months. The dry season is not well defined, and the frequency of frosts is low (Nitsche et al. 2019). According to Google Earth (http://earth.google.com), the elevation of the park varies from 120 m, at the Iguaçu River, to over 700 m at its northeastern extremity. The park is located in the Atlantic Forest domain and is composed of four phytophysiognomies (ICMBio 2018b): 1) the seasonal semideciduous forest (hereafter SSF), 2) the mixed ombrophilous forest (hereafter MOF), 3) the floodplain (hereafter FP), and 4) the open formations (hereafter OF). The SSF occupies 85% of the park area and has two subformations, the submontane (up to 400 m), and the montane (between 400 and 600 m). The MOF has a single subformation, the montane (above 600 m). The FP occurs in small areas, subject to extreme flooding conditions for long periods, and is generally occupied by herbaceous-shrub vegetation. The OF comprises all open vegetation formations of anthropogenic or natural origin (Urban 2002, ICMBio 2018b) (Figure 2). The surrounding areas of the park exhibit a heterogeneous landscape, characterized by forest fragments, extensive areas dedicated to agriculture and raising livestock, and urban areas (ICMBio 2018b).

2. Sampling

The faunal list is primarily the result of 15 years and ten months of sampling (September 2007 to July 2023) of adult butterflies by the first author, mainly using entomological nets, but in some situations, also using Van Someren-Rydon (hereafter VSR) traps and the Ahrenholz technique, which was especially useful for sampling Hesperiidae butterflies (Freitas et al. 2021b). A digital camera was also used to record some species. Some immature stages were found, which were then raised in the laboratory until emergence.

In the collection with entomological net, many trails and environments were sampled, in all four phytophysiognomies and throughout the altitudinal range (Table 1). Following Brown Jr. & Freitas (2000), special emphasis was given to sites with resources that attract butterflies, like flowering plants, plant exudates, sunny areas in

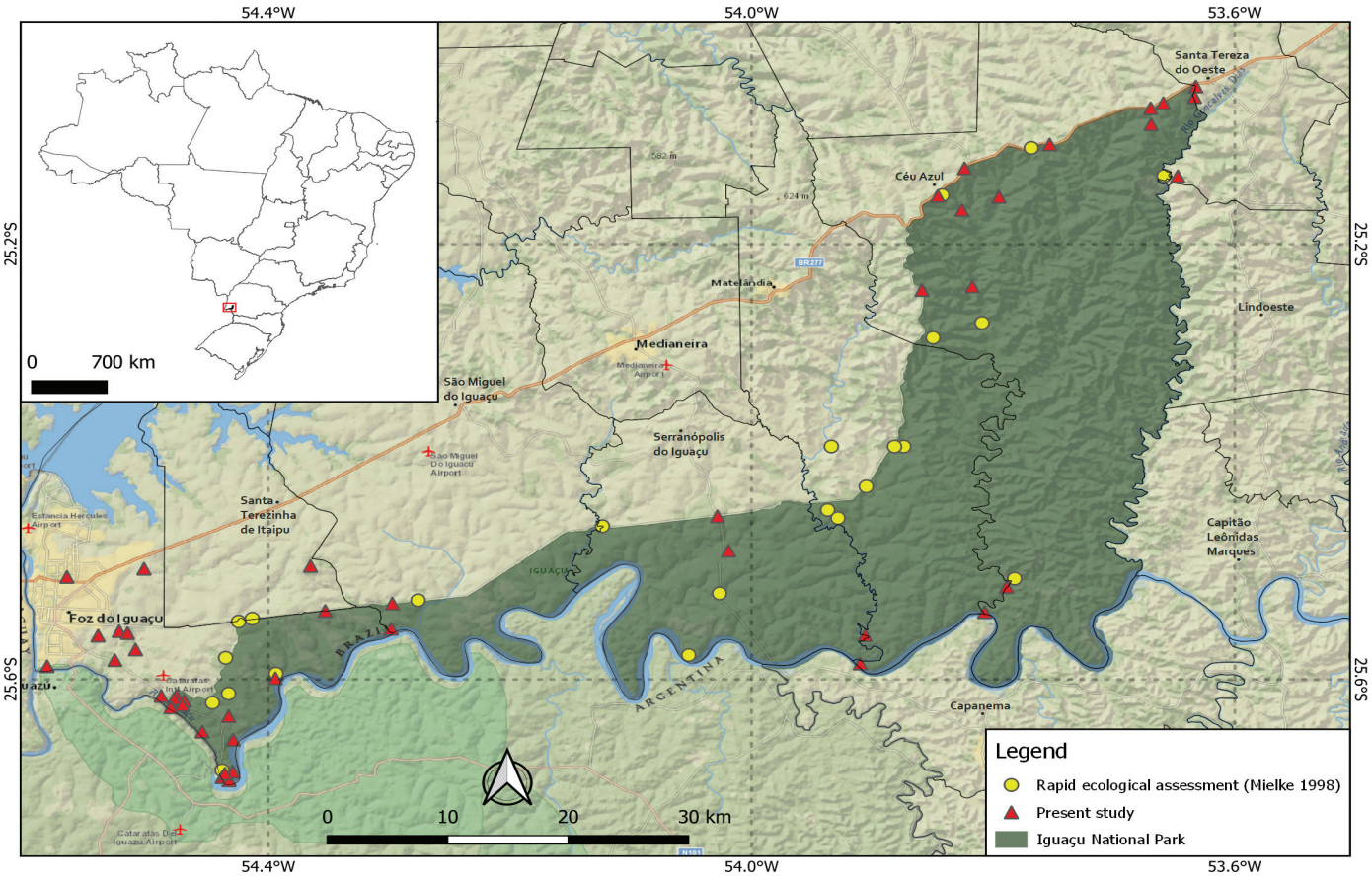

Figure 1. Map of Iguaçu National Park (in dark green) and its location in Brazil, with the main sampling sites; yellow circles = previous surveys by Mielke (1998); red triangles = sites surveyed in the present study.

the interior of the forest, mud puddles, fermented fruits, wet sand along trails or river margins, feces or urine from carnivores, and carcasses. Some sites were more intensively sampled, especially those in the municipality of Foz do Iguaçu. Field sampling was carried out at all seasons, at different times of the day, from 9:00 a.m. to 7:00 p.m., and in all microclimates or habitats within the park and in surrounding areas.

In March 2013, VSR traps baited with a mixture of fermented banana and sugarcane juice were installed on two trails in the Iguaçu NP to sample fruit-feeding butterflies, following a protocol adapted from Uehara-Prado et al. (2005). These trails represent the two principal phytophysiognomies present in the park: 1) an area of SSF, located in the municipality of Foz do Iguaçu, and 2) an area of MOF, located in the municipality of Céu Azul. On each trail, ten traps were placed in line (starting at least 50 m from the forest edge) and with about 20 m between adjacent traps, alternating understory (~1.5 m above the ground) and canopy (~10 m above the ground). The traps remained suspended for two consecutive days on each trail (10 hours of effective sampling per day), resulting in a total sampling effort of 400 trap/hours.

Most Hesperiidae were deposited at the Entomological Collection Padre Jesus Santiago Moure in the Federal University of Paraná (DZUP/UFPR), and specimens of the other families were deposited at the Zoological Collection of the Museu de Diversidade Biológica in the University of Campinas (ZUEC/Unicamp). Some specimens of the genus *Actinote* were deposited at the Entomological Collection of the Museu de Zoologia e Paleontologia in the Federal University of Recôncavo da Bahia (MURB/UFRB).

3. *Species list*

We identified the specimens using taxonomic keys and species guides (e.g., Brown Jr. 1992, Canals 2003, D'Abrera 1984, 1987, 1989, 1994, 1995, Tyler et al. 1994, Klimaitis et al. 2018). We also compared specimens to images of type specimens of American butterflies, available in the *Butterflies of America* database, on internet (Warren et al. 2016), and to species maintained in reference collections (DZUP/UFPR and ZUEC/Unicamp). For some individuals, we examined the genitalia and, more rarely, we used barcoding sequences to determine the species. We also consulted specialists to help us determine specific groups of butterflies (see "Acknowledgements"). For recorded subspecies with sympatric distribution, we use an "x" to indicate that two phenotypes (and sometimes the putative hybrids) are present.

Besides sampling, we compiled data from the literature (Mielke 1968, Jenkins 1990, Casagrande & Mielke 1992, Anken 1994, D'Abrera 1995, Mielke 1998, Hall & Harvey 2002, Callaghan 2010, Lourido 2011, Graciotim & Morais 2016) for any of the ten municipalities in the study area, updating the nomenclature when necessary. We also examined scientific collections, where we found species from the study area that were not previously recorded for the park. These include DZUP at UFPR; two local collections in Foz do Iguaçu, the

Figure 2. Landscapes and environments at Iguaçu National Park: A) semideciduous seasonal forest, 200 m; B) mixed ombrophilous forest, over 700 m, with the presence of several individuals of Brazilian pine *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae); C) stony beach on the banks of the Iguaçu River; D) Blue River; E) a dense patch of tree ferns (Cyatheaceae spp.); F) close view of forest understory with young juçara palm *Euterpe edulis* Mart. (Arecaceae).

Table 1. Sampled sites in the present study and in Mielke (1998), ordered from North to South. Nearby points were treated as a single point. In the case of trails, the altitude presented is the simple arithmetic mean between its highest and lowest point. SSFs = Seasonal Semideciduous Forest, subformation submontana; SSFm = Seasonal Semideciduous Forest, subformation montana; MOF = Mixed Ombrophilous Forest; FP = Floodplain; OF = Open formations.

Name	Phytophysiognomy	Present study	Mielke 1998	Municipality	Coordinates	Altitude
Pousada Eco Vine	MOF, OF	X		Santa Tereza do Oeste	25°03'S; 53°38'W	730 m
Research trail	MOF	X		Céu Azul	25°04'S; 53°39'W	750 m
Fazenda Rio Butu trail	MOF, FP	X		Céu Azul	25°05'S; 53°40'W	710 m
Linha Gonçalves Dias	MOF, OF	X		Santa Tereza do Oeste	25°06'S; 53°38'W	640 m
Abandoned quarry	SSFm	X		Céu Azul	25°06'S; 53°45'W	670 m
North of the municipality of Céu Azul	SSFm		X	Céu Azul	25°06'S; 53°46'W	680 m
Near the Gonçalves Dias River	MOF		X	Céu Azul	25°08'S; 53°39'W	600 m
Boa Vista trail	SSFm	X		Céu Azul	25°09'S; 53°47'W	650 m
Manoel Gomes trail	SSFm, FP	X	X	Céu Azul	25°10'S; 53°49'W	590 m
Jacutinga trail	SSFm	X		Céu Azul	25°14'S; 53°50'W	500 m
Middle course of the Floriano River	SSFm, FP		X	Céu Azul	25°17'S; 53°51'W	540 m
Benjamin Constant River	SSFs		X	Matelândia	25°23'S; 53°53'W	340 m
Bridge over the Silva Jardim River	OF		X	Matelândia	25°23'S; 53°56'W	280 m
Along the Pinheirinho River	SSFs		X	Matelândia	25°25'S; 53°54'W	290 m
Tributary of the Silva Jardim River	SSFs		X	Matelândia	25°26'S; 53°56'W	310 m
Along the Represa Grande River	SSFs		X	Serranópolis do Iguaçu	25°27'S; 54°07'W	220 m
Itaipu Binacional	SSFs, OF	X		Foz do Iguaçu	25°27'S; 54°36'W	120 m
Santa Maria Farm	SSFs, OF	X		Santa Terezinha de Itaipu	25°29'S; 54°22'W	330 m
Near the mouth of the Floriano River	SSFs	X	X	Céu Azul	25°30'S; 53°47'W	280 m
Estrada do Colono	SSFs	X	X	Serranópolis do Iguaçu	25°30'S; 54°01'W	270 m
Aparecidinha neighborhood	OF	X		Foz do Iguaçu	25°30'S; 54°30'W	270 m
Vietnã trail	SSFs, OF	X		Foz do Iguaçu	25°30'S; 54°34'W	200 m
Índio River	SSFs		X	São Miguel do Iguaçu	25°31'S; 54°16'W	210 m
Mouth of the Floriano River	SSFs	X		Capanema	25°32'S; 53°48'W	230 m
Linha Martins	SSFs	X		São Miguel do Iguaçu	25°32'S; 54°18'W	230 m
Estrada Velha de Guarapuava	SSFs, OF	X		São Miguel do Iguaçu	25°32'S; 54°21'W	270 m
Benjamin Constant River Waterfall	SSFs	X		Serranópolis do Iguaçu	25°33'S; 53°54'W	240 m
Cognópolis neighborhood	SSFs, OF	X		Foz do Iguaçu	25°33'S; 54°31'W	210 m
CITI Tênis	SSFs, OF	X		Foz do Iguaçu	25°33'S; 54°32'W	220 m
Iguaçu River lagoon	FP		X	Serranópolis do Iguaçu	25°34'S; 54°03'W	230 m
São João River basin	SSFs		X	Foz do Iguaçu	25°34'S; 54°25'W	220 m
Flora Éden	OF	X		Foz do Iguaçu	25°34'S; 54°30'W	200 m
Poço Preto	SSFs, FP	X	X	Foz do Iguaçu	25°35'S; 54°23'W	190 m
Cataratas Highway near Aquamania	OF	X		Foz do Iguaçu	25°35'S; 54°31'W	190 m
Marco das Três Fronteiras	SSFs, OF	X		Foz do Iguaçu	25°35'S; 54°35'W	140 m
Poço Preto trail	SSFs	X	X	Foz do Iguaçu	25°36'S; 54°26'W	240 m
Escola Parque trail	SSFs	X		Foz do Iguaçu	25°37'S; 54°28'W	210 m
Campinho trail	SSFs, OF	X		Foz do Iguaçu	25°37'S; 54°28'W	190 m
Represa trail	SSFs, FP	X		Foz do Iguaçu	25°37'S; 54°28'W	180 m
Canafístula trail	SSFs	X		Foz do Iguaçu	25°37'S; 54°28'W	190 m
Canzi Hotel trail	SSFs	X		Foz do Iguaçu	25°37'S; 54°29'W	170 m
Old power plant	SSFs	X		Foz do Iguaçu	25°37'S; 54°29'W	150 m
Monitoring trail	SSFs	X		Foz do Iguaçu	25°38'S; 54°26'W	250 m
Bananeiras trail	SSFs, OF	X		Foz do Iguaçu	25°39'S; 54°26'W	210 m
Macuco trail	SSFs	X		Foz do Iguaçu	25°39'S; 54°27'W	180 m
Higrômetro trail	SSFs	X		Foz do Iguaçu	25°41'S; 54°25'W	190 m
Cataratas trail	SSFs	X	X	Foz do Iguaçu	25°41'S; 54°26'W	180 m
Behind the Belmont Hotel	SSFs	X		Foz do Iguaçu	25°41'S; 54°26'W	220 m

Ecomuseum of Itaipu and the Museum of Zoology in the Uniamérica Universitary Center; and two private collections, D.R. Dolibaina and A.D. Warren. We did not include species that could not be identified, as well as literature records for which we did not find voucher material or which may represent species misidentification. In addition, we searched for pictures of butterflies from any of the ten municipalities within and bordering Iguaçu NP on the citizen science platform iNaturalist (https://www.inaturalist.org), Google Images (https://www.google.com/imghp?hl=EN) and Flickr (https://www.flickr.com), but no additional records were obtained.

Pareuptychia summandosa (Gosse, 1880) was considered a junior synonym of *P. ocirrhoe* (Fabricius, 1776) (M.A. Marín, pers. comm.). In the case of *Junonia*, a species complex that has not yet been unveiled, the different sampled phenotypes were grouped under the single taxon *Junonia e. evarete* (Cramer, 1779). Following Freitas et al. (2014), we consider as fruit-feeding species only the nymphalids belonging to the subfamilies Biblidinae (except Eubagini and *Mestra*), Charaxinae, Satyrinae (except non-feeding *Brassolis* and *Dynastor*), and Nymphalinae (including only *Colobura*, *Historis* and *Smyrna*).

We recognized seven butterfly families, including Hedylidae, following recent phylogenetic studies (Kawahara & Breinholt 2014, Breinholt et al. 2018, Espeland et al. 2018). For higher taxonomy within families, we followed Lamas (2004), updated for Nymphalidae (Wahlberg et al. 2009), Riodinidae (Seraphim et al. 2018, Seraphim 2019), and Hesperiidae (Li et al. 2019, Zhang et al. 2019, Cong et al. 2019, Zhang et al. 2022). For generic names, we followed Mielke et al. (2022) and Brockmann et al. (2022) for the subfamily Pyrrhopyginae, Robbins et al. (2022) for the tribe Eumaeini and Espeland et al. (2023) for the subtribe Euptychiina. Taxonomy was also updated for the genera *Morpho* (Blandin 2007, Pablos et al. 2021), *Eryphanis* (Penz 2008), *Zaretis* (Dias et al. 2018), *Phoebis* (Murillo-Ramos et al. 2018), *Agraulis* and *Dryas* (Núñez et al. 2022).

Results

We recorded 787 species (totalling 795 taxa including subspecies) from seven families of Papilionoidea at Iguaçu NP and its surrounding areas (Table 2), consisting of 339 (43.1%) Hesperiidae, 214 (27.2%) Nymphalidae, 115 (14.6%) Lycaenidae, 77 (9.8%) Riodinidae, 24 (3.0%) Pieridae, 17 (2.2%) Papilionidae, and 1 (0.1%) Hedylidae (Figure 3). Of these 795 taxa, 729 were sampled by the first author (including seven only by taking pictures of live specimens), 27 were obtained from the literature and 39 from scientific collections (see "Data Availability" for more details). From the guild of fruit-feeding nymphalids, we recorded a total of 112 species, representing 52.3% of Nymphalidae richness.

The eight species that had more than one recorded subspecies were: 1) *Heliconius ethilla* (Godart, 1819), 2) *Hypothyris euclea* (Godart, 1819), 3) *Tithorea harmonia* (Cramer, 1777) (Nymphalidae), 4) *Ascia monuste* (Linnaeus, 1764) (Pieridae), 5) *Melanis aegates* (Hewitson, 1874), 6) *Rhetus periander* (Cramer, 1777) (Riodinidae), 7) *Saturnus reticulata* (Plötz, 1883), and 8) *Tisias lesueur* (Latreille, [1824]) (Hesperiidae).

We also recorded several taxa that are typical from other domains, such as Amazon and Cerrado. Among typical Amazonian taxa (Díaz

Table 2. List of the butterflies and moth-butterflies (Lepidoptera: Papilionoidea) of Iguaçu National Park and surrounding areas. Species richness for each major taxa are provided within parentheses. * Taxa recorded by the first author solely through photographs of live specimens; ** records from collections or literature (see "Data Availability" for more details); # new records for Brazil; the "x" indicates that phenotypes of two subspecies are present; superscript letters a = the first subspecies correspond to the predominant phenotype; b = very few specimens were collected to determine predominant phenotype; c = there is evidence suggesting that the two subspecies could in fact be two valid species; F = strictly fruit-feeding species (sensu Freitas et al. 2014).

PAPILIONOIDEA (787)
PAPILIONIDAE (17)
Papilioninae (17)
Leptocircini (6)
Mimoides lysithous rurik (Eschscholtz, 1821)
Mimoides protodamas (Godart, 1819)
Neographium asius (Fabricius, 1781)
Protesilaus helios (Rothschild & Jordan, 1906)
Protesilaus protesilaus nigricornis (Staudinger, 1884)**
Protesilaus stenodesmus (Rothschild & Jordan, 1906)
Papilionini (5)
Heraclides anchisiades capys (Hübner, [1809])
Heraclides androgeus laodocus (Fabricius, 1793)
Heraclides astyalus astyalus (Godart, 1819)
Heraclides hectorides (Esper, 1794)
Heraclides thoas brasiliensis (Rothschild & Jordan, 1906)
Troidini (6)
Battus polydamas polydamas (Linnaeus, 1758)
Battus polystictus polystictus (Butler, 1874)
Parides agavus (Drury, 1782)
Parides anchises nephalion (Godart, 1819)
Parides bunichus perrhebus (Boisduval, 1836)**
Parides neophilus eurybates (Gray, [1853])
LYCAENIDAE (115)
Polyommatinae (3)
Hemiargus hanno (Stoll, [1790])
Leptotes cassius (Cramer, [1775])
Zizula cyna (Edwards, 1881)
Theclinae (112)
Eumaeini (112)
Allosmaitia strophius (Godart, [1824])
Arawacus dolylas (Cramer, [1777])
Arawacus ellida (Hewitson, 1867)
Arawacus meliboeus (Fabricius, 1793)
Arawacus separata (Lathy, 1926)
Arcas imperialis (Cramer, 1775)
Arzecla arza (Hewitson, 1874)
Arzecla ceromia (Hewitson, 1877)
Arzecla nubilum (Druce, 1907)**
Arzecla tucumanensis (Johnson & Kroenlein, 1993)
Atlides misma D'Abrera, 1995
Atlides polybe (Linnaeus, 1763)
Aubergina vanessoides (Prittwitz, 1865)
Badecla badaca (Hewitson, 1868)
Brangas getus (Fabricius, 1787)
Brangas moserorum Bálint & Faynel, 2008

Continue...

Table 2. Continuation

Brangas neora (Hewitson, 1867)
Brevianta celelata (Hewitson, 1874)**
Caerofethra carnica (Hewitson, 1873)
Caerofethra eumorpha (Hayward, 1949)
Calycopis bellera (Hewitson, 1877)
Calycopis caulonia (Hewitson, 1877)
Calycopis gentilla (Schaus, 1902)
Calycopis sp.**
Camissecla vesper (Druce, 1909)
Celmia celmus (Cramer, [1775])
Chalybs chloris (Hewitson, 1877)
Chalybs hassan (Stoll, [1790])
Chlorostrymon simaethis (Drury, [1773])
Chlorostrymon telea (Hewitson, 1868)
Contrafacia catharina (Draudt, 1920)
Cupathecla cupentus (Stoll, [1781])
Cyanophrys acaste (Prittwitz, 1865)
Cyanophrys herodotus (Fabricius, 1793)
Cyanophrys pseudolongula (Clench, 1944)**
Cyanophrys remus (Hewitson, 1868)
Decussata empusa (Hewitson, 1867)
Denivia chaluma (Schaus, 1902)
Denivia deniva (Hewitson, 1874)**
Denivia hemon (Cramer, [1775])
Denivia lisus (Stoll, [1790])
Dicya dicaea (Hewitson, 1874)
Electrostrymon endymion (Fabricius, 1775)
Enos thara (Hewitson, 1867)
Erora biblia (Hewitson, 1868)
Erora sp.
Evenus latreillii (Hewitson, 1865)
Evenus regalis (Cramer, [1775])
Gargina gnosia (Hewitson, 1868)
Heterosmaitia marius (Lucas, 1857)
Heterosmaitia palegon (Cramer, [1780])
Heterosmaitia stagira (Hewitson, 1867)
Ignata brasiliensis (Talbot, 1928)
Ignata norax (Godman & Salvin, [1887])*
Ipidecla crepundia (Druce, 1909)
Ipidecla schausi (Godman & Salvin, [1887])
Janthecla aurora (Druce, 1907)
Janthecla rocena (Hewitson, 1867)
Kisutam syllis (Godman & Salvin, 1887)
Kolana chlamys (Druce, 1907)
Kolana ergina (Hewitson, 1867)
Kolana ligurina (Hewitson, 1874)
Laothus phydela (Hewitson, 1867)**
Lathecla mimula (Draudt, 1920)
Magnastigma hirsuta (Prittwitz, 1865)
Marachina asa (Hewitson, 1868)
Mercedes calus (Godart, [1824])
Michaelus ira (Hewitson, 1867)
Michaelus jebus (Godart, [1824])
Michaelus thordesa (Hewitson, 1867)

Continue...

Table 2. Continuation

Ministrymon azia (Hewitson, 1873)
Ministrymon cruenta (Gosse, 1880)
Nesiostrymon calchinia (Hewitson, 1868)
Nesiostrymon tristis (Lathy, 1926)
Nicolaea torris (Druce, 1907)
Ocaria ocrisia (Hewitson, 1868)
Ocaria thales (Fabricius, 1793)
Ostrinotes sophocles (Fabricius, 1793)
Paiwarria aphaca (Hewitson, 1867)
Paiwarria venulius (Cramer, [1779])
Panthiades hebraeus (Hewitson, 1867)
Panthiades phaleros (Linnaeus, 1767)
Paraspiculatus orobia (Hewitson, 1867)
Parrhasius orgia (Hewitson, 1867)
Parrhasius polibetes (Stoll, [1781])
Pseudolycaena marsyas (Linnaeus, 1758)
Rekoa malina (Hewitson, 1867)
Rekoa meton (Cramer, [1779])
Semonina ares (Godman & Salvin, [1887])
Siderus eliatha (Hewitson, 1867)
Strephonota ambrax (Westwood, 1852)
Strephonota elika (Hewitson, 1867)*
Strephonota jactator (Druce, 1907)**
Strephonota tephraeus (Geyer, 1837)
Strymon astiocha (Prittwitz, 1865)
Strymon bazochii (Godart, [1824])
Strymon bubastus (Stoll, 1780)
Strymon cestri (Reakirt, 1867)
Strymon eurytulus (Hübner, [1819])
Strymon megarus (Godart, [1824])
Strymon mulucha (Hewitson, 1867)
Strymon rufofusca (Hewitson, 1877)
Strymon ziba (Hewitson, 1868)
Symbiopsis sp. n.#
Symbiopsis lenitas (Druce, 1907)
Symbiopsis strenua (Hewitson, 1877)
Theclopsis gargara (Hewitson, 1868)
Thepytus thyrea (Hewitson, 1867)
Theritas triquetra (Hewitson, 1865)*
Tmolus cydrara (Hewitson, 1868)
Tmolus echion (Linnaeus, 1767)
Ziegleria hesperitis (Butler & Druce, 1872)

RIODINIDAE (77)
Nemeobiinae (6)
Euselasiini (6)
Euselasia eucerus (Hewitson, 1872)
Euselasia eusepus (Hewitson, 1853)
Euselasia hygenius occulta Stichel, 1919
Euselasia marica Stichel, 1919
Euselasia satyroides Lathy, 1926
Euselasia zara (Westwood, 1851)
Riodininae (71)
Eurybiini (11)
Alesa prema (Godart, [1824])

Continue...

Table 2. Continuation

Eurybia halimede passercula Stichel, 1915
Eurybia pergaea (Geyer, 1832)
Hyphilaria thasus (Stoll, 1780)
Ionotus alector (Geyer, 1837)
Leucochimona icare matatha (Hewitson, 1873)
Mesosemia friburguensis Schaus, 1902**
Mesosemia odice (Godart, [1824])
Mesosemia rhodia (Godart, [1824])
Napaea eucharila (Bates, 1867)
Perophthalma tullius (Fabricius, 1787)
Helicopini (1)
Anteros formosus (Cramer, [1777])
Emesidini (9)
Emesis cerea cerea (Linnaeus, 1767)
Emesis diogenia Prittwitz, 1865
Emesis fastidiosa Ménétriés, 1855
Emesis mandana (Cramer, 1780)
Emesis melancholica Stichel, 1916
Emesis neemias neemias Hewitson, 1872
Emesis ocypore ocypore (Geyer, 1837)
Emesis orichalceus Stichel, 1916#
Emesis russula Stichel, 1910
Nymphidiini (22)
Adelotypa bolena (Butler, 1867)
Ariconias glaphyra (Westwood, 1851)
Aricoris indistincta (Lathy, 1932)**
Aricoris monotona (Stichel, 1910)**
Aricoris signata (Stichel, 1910)
Catocyclotis malca (Schaus, 1902)
Catocyclotis sejuncta (Stichel, 1910)
Joiceya praeclarus Talbot, 1928
Juditha azan azan (Westwood, [1851])
Juditha molpe (Hübner, [1808])
Juditha odites praeclarum (Bates, 1866)
Nymphidium lisimon (Stoll, 1790)
Pseudolivendula hemileuca hemileuca (Bates, 1868)
Synargis calyce (Felder & Felder, 1862)
Synargis ethelinda (Hewitson, 1870)**
Synargis paulistina (Stichel, 1910)
Synargis aff. *regulus* (Fabricius, 1793)
Synargis regulus (Fabricius, 1793)
Teenie argiella (Bates, 1868)
Theope pakitza pakitza Hall & Harvey, 1998#
Theope terambus (Godart, [1824])
Theope thestias Hewitson, 1860
Riodinini (23)
Ancyluris rubrofilum Stichel, 1909
Barbicornis basilis mona Westwood, 1851
Calephelis aymaran McAlpine, 1971
Caria marsyas Godman, 1903
Caria plutargus plutargus (Fabricius, 1793)
Chalodeta theodora (Felder & Felder, 1862)
Chamaelimnas briola doryphora Stichel, 1910
Chorinea amazon amazon (Saunders, 1859)

Continue...

Table 2. Continuation

Detritivora brasilia (Harvey & Hall, 2002)
Inkana incoides (Schaus, 1902)
Lasaia agesilas agesilas (Latreille, [1809])
Lasaia arsis Staudinger, 1888
Lasaia oileus Godman, 1903
Melanis aegates albugo (Stichel, 1910) x *Melanis aegates limbata* (Stichel, 1925)[b]
Melanis marathon charon (Butler, 1874)
Melanis xenia xenia (Hewitson, 1853)
Notheme erota angellus Stichel, 1910
Parcella amarynthina (Felder & Felder, [1865])
Pheles atricolor atricolor (Butler, 1871)
Rhetus periander arthuriana (Sharpe, 1890) x *Rhetus periander eleusinus* Stichel, 1910[a]
Riodina lycisca lycisca (Hewitson, [1853])
Riodina lysippoides Berg, 1882
Syrmatia nyx (Hübner, [1817])
Symmachiini (5)
Mesene aff. *cyneus* (Hewitson, 1874)
Mesene aff. *simplex* Bates, 1868
Mesene monostigma monostigma (Erichson, [1849])
Mesene pyrippe sanguilenta Stichel, 1910**
Pirascca sagaris satnius (Dalman, 1823)
NYMPHALIDAE (214)
Apaturinae (5)
Doxocopa agathina vacuna (Godart, [1824])
Doxocopa kallina (Staudinger, 1886)
Doxocopa laurentia laurentia (Godart, [1824])
Doxocopa linda mileta (Boisduval, 1870)
Doxocopa zunilda zunilda (Godart, [1824])
Biblidinae (40)
Ageroniini (7)
Ectima thecla thecla (Fabricius, 1796)[F]
Hamadryas amphinome amphinome (Linnaeus, 1767)[F]
Hamadryas arete (Doubleday, 1847)*[F]
Hamadryas epinome (Felder & Felder, 1867)[F]
Hamadryas februa februa (Hübner, [1823])[F]
Hamadryas feronia feronia (Linnaeus, 1758)[F]
Hamadryas fornax fornax (Hübner, [1823])[F]
Biblidini (2)
Biblis hyperia nectanabis (Frühstorfer, 1909)[F]
Mestra hersilia apicalis (Staudinger, 1886)**
Callicorini (8)
Callicore hydaspes (Drury, 1782)[F]
Callicore sorana sorana (Godart, [1824])[F]
Catagramma pygas thamyras Ménétriés, 1857[F]
Catagramma pyracmon pyracmon (Godart, [1824])[F]
Diaethria candrena candrena (Godart, [1824])[F]
Diaethria clymena janeira (C. Felder, 1862)[F]
Diaethria eluina eluina (Hewitson, [1855])[F]
Haematera pyrame pyrame Hübner, [1819][F]
Catonephelini (9)
Catonephele acontius caeruleus Jenkins, 1985[F]
Catonephele numilia penthia (Hewitson, 1852)[F]

Continue...

Table 2. Continuation

Cybdelis phaesyla (Hübner, [1831])**[F]
Eunica eburnea Frühstorfer, 1907[F]
Eunica eurota dolores (Prittwitz, 1871)**[F]
Eunica malvina malvina Bates, 1864[F]
Eunica margarita (Godart, [1824])[F]
Eunica tatila bellaria Frühstorfer, 1908[F]
Myscelia orsis (Drury, [1782])[F]

Epiphilini (5)

Epiphile hubneri Hewitson, 1861[F]
Epiphile orea orea (Hübner, [1823])[F]
Nica flavilla flavilla (Godart, [1824])[F]
Pyrrhogyra neaerea arge Gosse, 1880[F]
Temenis laothoe meridionalis Ebert, 1965[F]

Eubagini (9)

Dynamine aerata (Butler, 1877)
Dynamine agacles agacles (Dalman, 1823)
Dynamine artemisia artemisia (Fabricius, 1793)
Dynamine athemon athemaena (Hübner, [1824])
Dynamine coenus coenus (Fabricius, 1793)
Dynamine meridionalis Röber, 1915
Dynamine myrrhina (Doubleday, 1849)
Dynamine postverta postverta (Cramer, 1779)
Dynamine tithia tithia (Hübner, 1823)

Charaxinae (13)

Anaeini (8)

Consul fabius drurii (Butler, 1874)[F]
Fountainea glycerium cratais (Hewitson, 1874)[F]
Fountainea ryphea phidile (Geyer, 1837)[F]
Hypna clytemnestra huebneri Butler, 1866[F]
Memphis acidalia victoria (Druce, 1877)[F]
Memphis moruus stheno (Prittwitz, 1865)[F]
Zaretis hurin Dias, 2018[F]
Zaretis strigosus (Gmelin, [1790])[F]

Preponini (5)

Archaeoprepona chalciope (Hübner, [1823])[F]
Archaeoprepona demophon thalpius (Hübner, [1814])[F]
Archaeoprepona demophoon demophoon (Hübner, [1814])[F]
Prepona laertes (Hübner, [1811])[F]
Prepona pylene laertides Staudinger, 1898[F]

Cyrestinae (3)

Cyrestini (3)

Marpesia chiron marius (Cramer, [1779])
Marpesia petreus petreus (Cramer, [1776])
Marpesia zerynthia zerynthia Hübner, [1823]**

Danainae (24)

Danaini (5)

Danaus eresimus plexaure (Godart, 1819)*
Danaus erippus (Cramer, [1775])
Danaus gilippus gilippus (Cramer, [1775])
Lycorea halia discreta Haensch, 1909
Lycorea ilione ilione (Cramer, [1775])

Ithomiini (19)

Aeria olena olena Weymer, 1875
Brevioleria seba emyra (Haensch, 1905)

Continue...

Table 2. Continuation

Callithomia lenea methonella (Weymer, 1875)
Dircenna dero celtina Burmeister, 1878
Episcada carcinia Schaus, 1902
Episcada hymenaea hymenaea (Prittwitz, 1865)
Epityches eupompe (Geyer, [1832])
Hypothyris euclea laphria (Doubleday, 1847) x *Hypothyris euclea nina* (Haensch, 1905)[a]
Ithomia agnosia zikani d'Almeida, 1940
Ithomia lichyi lichyi d'Almeida, 1939**
Mcclungia cymo salonina (Hewitson, 1855)
Mechanitis lysimnia lysimnia (Fabricius, 1793)
Methona themisto themisto (Hübner, 1818)
Placidina euryanassa (Felder & Felder, 1860)
Pseudoscada erruca (Hewitson, 1855)
Pteronymia carlia Schaus, 1902
Sais rosalia rosalinde Weymer, 1890
Thyridia psidii cetoides (Rosenberg & Talbot, 1914)
Tithorea harmonia pseudethra Butler, 1873 x *Tithorea harmonia pseudonyma* Staudinger, 1894[a]

Heliconiinae (20)

Acraeini (7)

Actinote carycina Jordan, 1913
Actinote discrepans d'Almeida, 1958
Actinote genitrix genitrix d'Almeida, 1922**
Actinote melanisans Oberthür, 1917
Actinote pellenea pellenea Hübner, [1821]
Actinote pyrrha pyrrha (Fabricius, 1775)
Actinote sp.

Argynnini (2)

Euptoieta hegesia meridiania Stichel, 1938
Euptoieta hortensia (Blanchard, 1852)

Heliconiini (11)

Agraulis maculosa (Stichel, [1908])
Dione juno juno (Cramer, 1779)
Dione moneta moneta Hübner, [1825]
Dryadula phaetusa (Linnaeus, 1758)
Dryas alcionea (Cramer, 1779)
Eueides aliphera aliphera (Godart, 1819)
Eueides isabella dianasa (Hübner, [1806])
Heliconius besckei (Ménétriés, 1857)
Heliconius erato phyllis (Fabricius, 1775)
Heliconius ethilla polychrous Felder & Felder, 1865 x *Heliconius ethilla narcaea* (Godart, 1819)[a]
Philaethria wernickei (Röber, 1906)**

Libytheinae (1)

Libytheana carinenta carinenta (Cramer, [1777])

Limenitidinae (18)

Limenitidini (18)

Adelpha abia (Hewitson, 1850)
Adelpha calliphane Frühstorfer, 1915
Adelpha epizygis epizygis Frühstorfer, 1915
Adelpha falcipennis Frühstorfer, 1915
Adelpha gavina Frühstorfer, 1915**
Adelpha iphicleola leucates Frühstorfer, 1915

Continue...

Table 2. Continuation

Adelpha iphiclus iphiclus (Linnaeus, 1758)**
Adelpha lycorias lycorias (Godart, [1824])
Adelpha malea goyama Schaus, 1902
Adelpha melona pseudarete Frühstorfer, 1915
Adelpha mythra (Godart, [1824])
Adelpha plesaure phliassa (Godart, [1824])
Adelpha serpa serpa (Boisduval, [1836])
Adelpha syma (Godart, [1824])
Adelpha thesprotia (Felder & Felder, [1867])
Adelpha thessalia indefecta Frühstorfer, 1913
Adelpha thoasa gerona (Hewitson, 1867)
Adelpha zea (Hewitson, 1850)
Nymphalinae (22)
Coeini (1)
Historis odius dious Lamas, 1995[F]
Junoniini (1)
Junonia evarete evarete (Cramer, 1779)
Melitaeini (9)
Anthanassa hermas hermas (Hewitson, 1864)
Chlosyne lacinia saundersi (Doubleday, [1847])
Eresia lansdorfi (Godart, 1819)
Ortilia dicoma (Hewitson, 1864)
Ortilia ithra (Kirby, 1900)
Ortilia orthia (Hewitson, 1864)
Ortilia velica durnfordi (Godman & Salvin, 1878)
Tegosa claudina (Eschscholtz, 1821)
Telenassa teletusa teletusa (Godart, [1824])**
Nymphalini (7)
Colobura dirce dirce (Linnaeus, 1758)[F]
Hypanartia bella (Fabricius, 1793)
Hypanartia lethe (Fabricius, 1793)
Smyrna blomfildia blomfildia (Fabricius, 1781)[F]
Vanessa braziliensis (Moore, 1883)
Vanessa carye (Hübner, [1812])
Vanessa myrinna (Doubleday, 1849)
Victorinini (4)
Anartia amathea roeselia (Eschscholtz, 1821)
Anartia jatrophae jatrophae (Linnaeus, 1763)
Siproeta epaphus trayja Hübner, [1823]
Siproeta stelenes meridionalis (Frühstorfer, 1909)
Satyrinae (68)
Brassolini (17)
Blepolenis batea batea (Hübner, [1821])[F]
Brassolis sophorae vulpeculus Stichel, 1902
Caligo beltrao (Illiger, 1801)[F]
Caligo illioneus pampeiro Frühstorfer, 1904[F]
Catoblepia amphirhoe (Hübner, [1825])**[F]
Catoblepia berecynthia unditaenia (Frühstorfer, 1907)[F]
Dynastor darius ictericus Stichel, 1904
Eryphanis automedon automedon (Cramer, [1775])[F]
Eryphanis reevesii reevesii (Doubleday, [1849])[F]
Narope cyllarus Westwood, 1851**[F]
Narope cyllastros Doubleday, [1849][F]
Narope panniculus Stichel, 1904[F]

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Table 2. Continuation

Opoptera aorsa aorsa (Godart, [1824])[F]
Opsiphanes cassiae crameri Felder & Felder, 1862[F]
Opsiphanes invirae remoliatus Frühstorfer, 1907[F]
Opsiphanes quiteria meridionalis Staudinger, 1887[F]
Selenophanes cassiope guarany Casagrande, 1992[F]
Melanitini (1)
Manataria hercyna hercyna (Hübner, [1821])[F]
Morphini (6)
Antirrhea archaea Hübner, [1822][F]
Morpho aega (Hübner, [1822])[F]
Morpho anaxibia (Esper, [1801])[F]
Morpho epistrophus titei (Le Moult & Réal, 1962)[F]
Morpho helenor achillides Felder & Felder, 1867[F]
Morpho portis thamyris (Felder & Felder, 1867)**[F]
Satyrini (44)
Amphidecta pignerator simplicia Weymer, 1910[F]
Amphidecta reynoldsi Sharpe, 1890[F]
Argentaria hygina (Butler, 1877)[F]
Argentaria libitina (Butler, 1870)[F]
Argentaria pagyris (Godart, [1824])[F]
Caeruleuptychia helena (Anken, 1994)**[F]
Capronnieria galesus (Godart, [1824])[F]
Carminda griseldis (Weymer, 1911)[F]
Carminda paeon (Godart, [1824])[F]
Cisandina lea (Cramer, 1777)[F]
Cissia eous (Butler, 1867)[F]
Cissia phronius (Godart, [1824])[F]
Deltaya ocypete (Fabricius, 1776)[F]
Deltaya pallema (Schaus, 1902)[F]
Deltaya sp. n.#[F]
Eteona tisiphone (Boisduval, [1836])[F]
Forsterinaria necys (Godart, [1824])[F]
Forsterinaria quantius (Godart, [1824])[F]
Godartiana muscosa (Butler, 1870)[F]
Hermeuptychia atalanta (Butler, 1867)[F]
Hermeuptychia gisella (Hayward, 1957)[F]
Malaveria affinis (Butler, 1867)[F]
Malaveria grimon (Godart, [1824])**[F]
Malaveria mimula (Hayward, 1954)[F]
Modestia sylvina (Felder & Felder, 1867)[F]
Moneuptychia castrensis (Schaus, 1902)[F]
Moneuptychia soter (Butler, 1877)[F]
Pareuptychia ocirrhoe interjecta (d'Almeida, 1952)[F]
Paryphthimoides poltys poltys (Prittwitz, 1865)[F]
Paryphthimoides terrestris grevei Zacca, Casagrande & Mielke 2020
"Pharneuptychia" innocentia (Felder & Felder, 1867)**[F]
Posttaygetis penelea (Cramer, [1777])[F]
Praepedaliodes phanias (Hewitson, 1862)[F]
Pseudodebis euptychidia (Butler, 1868)[F]
Taguaiba ypthima (Hübner, [1821])[F]
Taygetina kerea (Butler, 1869)[F]
Taygetis acuta Weymer, 1910**[F]
Taygetis laches (Fabricius, 1793)[F]

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Table 2. Continuation

Taygetis rufomarginata rufomarginata Staudinger, 1888[F]
Taygetis tripunctata Weymer, 1907[F]
Yphthimoides celmis (Godart, [1824])[F]
Yphthimoides ordinaria Freitas, Kaminski & Mielke, 2012[F]
Yphthimoides yphthima (Felder & Felder, [1867])[F]
Zischkaia pacarus (Godart, [1824])[F]

PIERIDAE (24)

Coliadinae (14)

Anteos clorinde (Godart, [1824])
Anteos menippe (Godart, [1818])
Eurema albula sinoe (Godart, 1819)
Eurema deva deva (Doubleday, 1847)
Eurema elathea flavescens (Chavannes, 1850)
Phoebis argante argante (Fabricius, 1775)
Phoebis marcellina (Cramer, [1779])
Phoebis neocypris neocypris (Hübner, [1823])
Phoebis philea philea (Linnaeus, 1763)
Phoebis statira statira (Cramer, [1777])
Phoebis trite banksi (Breyer, 1939)
Phoebis wallacei wallacei (Felder & Felder, 1862)
Pyrisitia leuce leuce (Boisduval, 1836)
Pyrisitia nise tenella (Boisduval, 1836)

Dismorphiinae (5)

Dismorphia amphione astynome (Dalman, 1823)
Dismorphia astyocha Hübner, [1831]
Dismorphia thermesia thermesia (Godart, 1819)
Enantia lina psamathe (Fabricius, 1793)
Pseudopieris nehemia nehemia (Boisduval, 1836)

Pierinae (5)

Pierini (5)

Ascia monuste orseis (Godart, 1819) x *Ascia monuste automate* (Burmeister, 1878)[a]
Glutophrissa drusilla drusilla (Cramer, 1777)
Itaballia demophile ssp.*
Leptophobia aripa balidia (Boisduval, 1836)
Melete lycimnia paulista Frühstorfer, 1908

HESPERIIDAE (339)

Eudaminae (68)

Entheini (1)

Phanus australis Miller, 1965

Phocidini (11)

Bungalotis astylos (Cramer, 1780)
Bungalotis midas (Cramer, 1775)
Dyscophellus damias (Plötz, 1882)**
Nascus broteas (Cramer, 1780)
Nascus paulliniae (Sepp, [1842])
Nascus phocus (Cramer, [1777])
Phocides charon (Felder & Felder, 1859)
Phocides metrodorus metron Evans, 1952**
Phocides pigmalion hewitsonius (Mabille, 1883)
Phocides polybius phanias (Burmeister, 1880)
Phocides thermus valgus (Mabille, 1883)

Eudamini (54)

Aguna asander asander (Hewitson, 1867)

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Table 2. Continuation

Aguna glaphyrus (Mabille, 1888)
Aguna megaeles megaeles (Mabille, 1888)
Aguna metophis (Latreille, [1824])
Aguna squamalba Austin & Mielke, 1998
Astraptes aulus (Plötz, 1881)
Astraptes enotrus (Stoll, [1781])
Astraptes janeira (Schaus, 1902)
Autochton neis (Geyer, 1832)*
Autochton reflexus (Mabille & Boullet, 1912)
Cecropterus dorantes (Stoll, [1790])
Cecropterus doryssus albicuspis (Herrich-Schäffer, 1869)
Cecropterus rica (Evans, 1952)
Cecropterus virescens (Mabille, 1877)
Cecropterus zarex (Hübner, 1818)
Cephise cephise (Herrich-Schäffer, 1869)
Chioides catillus catillus (Cramer, 1779)
Codatractus aminias (Hewitson, 1867)
Ectomis caunus (Herrich-Schäffer, 1869)
Ectomis octomaculata (Sepp, [1844])
Ectomis perniciosus (Herrich-Schäffer, 1869)
Epargyreus clavicornis clavicornis (Herrich-Schäffer, 1869)
Epargyreus exadeus (Cramer, [1780])
Epargyreus pseudexadeus Westwood, 1852
Epargyreus socus socus (Hübner, [1825])
Narcosius parisi (Williams, 1927)
Polygonus leo pallida Röber, 1925
Polygonus savigny savigny (Latreille, [1824])
Proteides mercurius mercurius (Fabricius, 1787)
Spathilepia clonius (Cramer, 1775)
Spicauda procne (Plötz, 1880)
Spicauda simplicius (Stoll, [1790])
Spicauda teleus (Hübner, 1821)
Telegonus alardus alardus (Stoll, 1790)
Telegonus anaphus anaphus (Cramer, [1777])
Telegonus chalco (Hübner, 1823)
Telegonus cretatus adoba (Evans, 1952)
Telegonus creteus siges (Mabille, 1903)
Telegonus elorus (Hewitson, 1867)**
Telegonus fulgor (Hayward, 1939)
Telegonus sp.
Telegonus talus (Cramer, [1777])
Telemiades aff. *squanda* Evans, 1953
Telemiades amphion (Geyer, 1832)
Telemiades antiope (Plötz, 1882)
Telemiades atlantiope Siewert, Mielke & Casagrande 2020
Telemiades brazus Bell, 1949
Telemiades laogonus (Hewitson, 1876)
Telemiades marpesus (Hewitson, 1876)
Urbanus esma Evans, 1952**
Urbanus esmeraldus (Butler, 1877)
Urbanus esta Evans, 1952
Urbanus pronta Evans, 1952
Urbanus proteus proteus (Linnaeus, 1758)

Continue...

Table 2. Continuation

Oileidini (2)
Cogia calchas (Herrich-Schäffer, 1869)
Cogia undulatus (Hewitson, 1867)
Tagiadinae (1)
Celaenorrhinini (1)
Celaenorrhinus similis Hayward, 1933
Hesperiinae (187)
Pericharini (8)
Lycas argentea (Hewitson, [1866])
Orses cynisca (Swainson, [1821])
Oz ozias (Hewitson, 1878)
Perichares adela (Hewitson, 1867)
Perichares aurina Evans, 1955
Perichares lotus (Butler, 1870)
Perichares metallica (Riley, 1921)
Perichares seneca seneca (Latreille, [1824])
Hesperiini (179)
Adlerodea mineira Mielke, 1968**
Adlerodea modesta Hayward, 1940
Adlerodea petrovna (Schaus, 1902)
Adlerodea subpunctata subpunctata (Hayward, 1940)
Aides duma duma Evans, 1955
Alerema simplex (Bell, 1930)
Anatrytone perfida (Möschler, 1879)
Anthoptus epictetus (Fabricius, 1793)
Anthoptus insignis (Plötz, 1882)**
Apaustus gracilis ssp. n.#
Artines aepitus (Geyer, [1832])
Artines aquilina (Plötz, 1882)
Artines liege Medeiros, Mielke & Casagrande 2019
Artonia artona (Hewitson, 1868)
Callimormus diaeses Schaus, 1902**
Callimormus rivera (Plötz, 1882)**
Callimormus saturnus (Herrich-Schäffer, 1869)
Callimormus simplicius Hayward, 1939**
Calpodes esperi esperi (Evans, 1955)
Calpodes ethlius (Stoll, [1782])
Calpodes longirostris (Sepp, [1840])
Calpodes saladin catha (Evans, 1955)**
Calpodes salius (Cramer, [1775])
Cantha roraimae (Bell, 1932)
Carystoides basoches (Latreille, [1824])
Carystus hylaspes (Stoll, 1781)
Carystus lota (Hewitson, 1877)
Cobalopsis catocala (Herrich-Schäffer, 1869)
Cobalopsis cocalus (Hayward, 1939)
Cobalopsis nero (Herrich-Schäffer, 1869)
Cobalopsis obscurior (Hayward, 1934)
Cobalopsis valerius (Möschler, 1879)
Cobalus virbius virbius (Cramer, [1777])
Conga chydaea (Butler, 1877)
Conga iheringii (Mabille, 1891)
Contrastia distigma (Plötz, 1882)**
Corticea corticea (Plötz, 1882)

Continue...

Table 2. Continuation

Corticea lysias potex Evans, 1955
Corticea sp.**
Cumbre meridionalis (Hayward, 1934)
Cyclosma altama (Schaus, 1902)
Cymaenes alumna (Butler, 1877)
Cymaenes cavalla Evans, 1955
Cymaenes gisca Evans, 1955
Cymaenes lepta (Hayward, 1939)
Cymaenes loxa Evans, 1955
Cymaenes tripunctata (Latreille, [1824])
Cynea bistrigula (Herrich-Schäffer, 1869)
Cynea cannae (Herrich-Schäffer, 1869)
Cynea diluta (Herrich-Schäffer, 1869)
Cynea irma (Möschler, 1879)
Cynea melius (Geyer, 1832)
Damas clavus (Herrich-Schäffer, 1869)
Decinea dama (Herrich-Schäffer, 1869)
Decinea denta pruda Evans, 1955
Dion uza uza (Hewitson, 1877)
Ebusus ebusus ebusus (Cramer, [1780])
Eprius obrepta (Kivirikko, 1936)
Eprius repens Evans, 1955
Euphyes leptosema (Mabille, 1891)
Euphyes subferrugineus subferrugineus (Hayward, 1934)
Eutocus vetulus matildae (Hayward, 1941)
Eutus mubevensis (Bell, 1932)
Eutychide olympia (Plötz, 1882)
Eutychide physcella (Hewitson, [1866])
Evansiella cordela (Plötz, 1882)
Gallio carasta (Schaus, 1902)
Gufa fusca (Hayward, 1940)
Haza hazarma (Hewitson, 1877)
Hedone vibex catilina (Plötz, 1886)
Hylephila phyleus phyleus (Drury, [1773])
Koria kora (Hewitson, 1877)
Lamponia elegantula (Herrich-Schäffer, 1869)
Lento krexoides (Hayward, 1940)
Lerema compta (Butler, 1877)
Lerema geisa (Möschler, 1879)
Lerodea eufala eufala (W. H. Edwards, 1869)
Lucida lucia (Capronnier, 1874)
Methionopsis cinnamomea (Herrich-Schäffer, 1869)
Methionopsis ina (Plötz, 1882)
Metrocles dejongi (Austin, 2008)
Metrocles hyboma (Plötz, 1886)
Metrocles sp.
Metron noctis (Kaye, 1914)
Metron oropa (Hewitson, 1877)
Mnaseas inca Bell, 1930
Mnasicles hicetaon Godman, [1901]**
Mnasicles remus (Fabricius, 1798)
Mnasitheus gemignanii (Hayward, 1940)
Mnasitheus submetallescens (Hayward, 1940)
Mnasitheus sucova (Schaus, 1902)**

Continue...

Table 2. Continuation

Mnestheus silvaticus Hayward, 1940**
Moeris striga (Geyer, 1832)
Mucia zygia (Plötz, 1886)
Naevolus orius (Mabille, 1883)
Nastra celeus vetus (Mielke, 1969)
Neoxeniades scipio scipio (Fabricius, 1793)
Niconiades caeso (Mabille, 1891)
Niconiades linga Evans, 1955**
Niconiades merenda (Mabille, 1878)
Niconiades nikko Hayward, 1948**
Niconiades xanthaphes Hübner, [1821]
Nyctelius nyctelius nyctelius (Latreille, [1824])
Oligoria aff. *locutia* (Hewitson, 1876)
Oligoria aff. *percosius* (Godman, 1900)
Oligoria lucifer (Hübner, [1831])
Onophas columbaria distigma (Bell, 1930)
Orthos hyalinus (Bell, 1930)
Oxynthes corusca (Herrich-Schäffer, 1869)
Panoquina fusina viola Evans, 1955
Panoquina hecebolus (Scudder, 1872)
Panoquina lucas lucas (Fabricius, 1793)
Panoquina ocola ocola (Edwards, 1863)
Papias phainis Godman, 1900
Paracarystus evansi Hayward, 1938
Paracarystus hypargyra (Herrich-Schäffer, 1869)
Parphorus decora (Herrich-Schäffer, 1869)
Parphorus pseudecorus (Hayward, 1934)
Peba verames (Schaus, 1902)
Phemiades pohli pohli (Bell, 1932)
Pheraeus fastus (Hayward, 1939)
Pheraeus perpulcher (Hayward, 1934)
Phlebodes fuldai (Bell, 1930)
Polites premnas (Wallengren, 1860)
Pompeius amblyspila (Mabille, 1897)
Pompeius pompeius (Latreille, [1824])
Propapias sipariana (Kaye, 1925)
Psoralis arva (Evans, 1955)
Psoralis stacara (Schaus, 1902)
Psoralis umbrata (Erschoff, 1876)
Pyrrhopygopsis socrates socrates (Ménétriés, 1855)
Quasimellana eulogius (Plötz, 1882)
Quasimellana meridiani (Hayward, 1934)
Saturnus reticulata reticulata (Plötz, 1883) x *Saturnus reticulata conspicuus* (Bell, 1941)[c]
Saturnus saturnus saturnus (Fabricius, 1787)
Sodalia coler (Schaus, 1902)
Sodalia dimassa (Hewitson, 1876)
Sodalia sodalis (Butler, 1877)**
Synapte aff. *silius* (Latreille, [1824])
Synapte malitiosa antistia (Plötz, 1882)
Talides riosa Evans, 1955
Thargella caura occulta (Schaus, 1902)
Thargella evansi Biezanko & Mielke, 1973
Thespieus aspernatus Draudt, 1923

Continue...

Table 2. Continuation

Thespieus dalman (Latreille, [1824])
Thespieus ethemides (Burmeister, 1878)
Thespieus lutetia (Hewitson, [1866])**
Thespieus xarippe xarippe (Butler, 1870)
Thracides cleanthes cleanthes (Latreille, [1824])
Tigasis arita (Schaus, 1902)
Tigasis perloides (Plötz, 1882)
Tigasis serra (Evans, 1955)
Tirynthia conflua (Herrich-Schäffer, 1869)
Tirynthoides virilis (Riley, 1929)
Tisias lesueur lesueur (Latreille, [1824])** x *Tisias lesueur canna* Evans, 1955[c]
Tricrista roppai (Mielke, 1980)**
Troyus diversa diversa (Herrich-Schäffer, 1869)
Troyus phyllides (Röber, 1925)
Turesis complanula (Herrich-Schäffer, 1869)
Vacerra bonfilius bonfilius (Latreille, [1824])
Vacerra caniola elva Evans, 1955
Vacerra evansi Hayward, 1938
Vehilius inca (Scudder, 1872)
Vehilius stictomenes stictomenes (Butler, 1877)
Vettius phyllus prona Evans, 1955**
Vidius similis Mielke, 1980
Vidius vidius (Mabille, 1891)
Vinius letis (Plötz, 1883)**
Vinius pulcherrimus Hayward, 1934
Vinius tryhana istria Evans, 1955
Virga austrinus (Hayward, 1934)
Virga silvanus (Hayward, 1947)
Vistigma bryanti (Weeks, 1906)
Vistigma xanthobasis (Hayward, 1939)
Xeniades chalestra corna Evans, 1955
Xeniades orchamus (Cramer, [1777])
Zariaspes mys (Hübner, [1808])
Zenis jebus jebus (Plötz, 1882)
Zenis minos (Latreille, [1824])**

Heteropterinae (1)

Heteropterini (1)

Dalla diraspes (Hewitson, 1877)

Pyrginae (62)

Achlyodini (10)

Achlyodes busirus rioja Evans, 1953
Aethilla echina coracina Butler, 1870
Eantis thraso (Hübner, [1807])
Milanion leucaspis (Mabille, 1878)
Ouleus fridericus riona Evans, 1953
Pythonides lancea (Hewitson, 1868)
Quadrus cerialis (Stoll, [1782])
Quadrus u-lucida mimus (Mabille & Boullet, 1917)
Zera hyacinthinus servius (Plötz, 1884)
Zera tetrastigma erisichthon (Plötz, 1884)

Carcharodini (20)

Bolla atahuallpai (Lindsey, 1925)
Bolla catharina (Bell, 1937)**

Continue...

Table 2. Continuation

Gorgopas petale (Mabille, 1888)
Incisus incisus (Mabille, 1878)
Nisoniades bipuncta (Schaus, 1902)
Nisoniades castolus (Hewitson, 1878)
Nisoniades macarius (Herrich-Schäffer, 1870)
Nisoniades maura (Mabille & Boullet, 1917)
Pachyneuria inops (Mabille, 1877)
Pellicia costimacula costimacula Herrich-Schäffer, 1870
Pellicia dimidiata zamia Plötz, 1882**
Pellicia ranta rancida Evans, 1953**
Perus minor (Schaus, 1902)
Polyctor polyctor polyctor (Prittwitz, 1868)
Staphylus ascalon (Staudinger, 1876)
Staphylus chlorocephala (Latreille, [1824])
Staphylus insignis Mielke, 1980
Staphylus melangon melangon (Mabille, 1883)
Viola minor (Hayward, 1933)
Xispia satyrus (Jörgensen, 1935)
Erynnini (16)
Camptopleura auxo (Möschler, 1879)
Chiomara mithrax (Möschler, 1879)
Chiothion asychis autander (Mabille, 1891)
Cycloglypha thrasibulus thrasibulus (Fabricius, 1793)
Ebrietas anacreon anacreon (Staudinger, 1876)
Echelatus sempiternus simplicior (Möschler, 1877)
Festivia cronion (Felder & Felder, 1867)
Gesta gesta (Herrich-Schäffer, 1863)
Gorgythion begga begga (Prittwitz, 1868)
Gorgythion beggina escalophoides Evans, 1953
Grais stigmaticus stigmaticus (Mabille, 1883)
Helias phalaenoides palpalis (Latreille, [1824])
Hoodus pelopidas (Fabricius, 1793)
Mylon maimon (Fabricius, 1775)
Sostrata bifasciata bifasciata (Ménétriés, 1829)
Timochares trifasciata trifasciata (Hewitson, 1868)
Pyrgini (16)
Anisochoria sublimbata Mabille, 1883
Antigonus erosus (Hübner, [1812])
Antigonus nearchus (Latreille, [1817])
Burnsius orcus (Stoll, [1780])
Burnsius orcynoides (Giacomelli, 1928)
Canesia canescens pallida (Röber, 1925)
Heliopetes alana (Reakirt, 1868)

Continue...

Table 2. Continuation

Heliopetes arsalte (Linnaeus, 1758)
Heliopetes libra Evans, 1944
Heliopetes ochroleuca Zikán, 1938
Heliopetes omrina (Butler, 1870)
Heliopetes petrus (Hübner, [1819])**
Paches liborius areta (Evans, 1953)
Spioniades artemides (Stoll, [1782])
Trina geometrina geometrina (Felder & Felder, [1867])
Xenophanes tryxus (Stoll, [1780])
Pyrrhopyginae (20)
Zoniini (1)
Zonia zonia diabo Mielke & Casagrande, 1998**
Passovini (6)
Agara epimachia edix (Evans, 1951)
Agara pardalina yacutinga (Mielke & Casagrande, 2011)
Granila paseas (Hewitson, 1857)**
Myscelus epigona Herrich-Schäffer, 1869
Passova passova practa Evans, 1951
Passova polemon (Hopffer, 1874)
Pyrrhopygini (13)
Blubella adonis (Bell, 1931)
Blubella azeta giffordi (Mielke, 1995)
Elbella intersecta losca Evans, 1951
Elbella lamprus lamprus (Hopffer, 1874)
Elbella viriditas viriditas (Skinner, 1920)#
Jematus gnetus brevipennis (Schaus, 1902)
Mysoria barcastus barta Evans, 1951
Ochropyge ruficauda (Hayward, 1932)**
Parelbella ahira extrema (Röber, 1925)
Pyrrhopyge attis subnubilus Hayward, 1935
Pyrrhopyge charybdis charybdis Westwood, 1852**
Pyrrhopyge pelota Plötz, 1879**
Santea antias (Felder & Felder, 1859)**
HEDYLIDAE (1)
Hedylinae (1)
Macrosoma zikani (Prout, 1932)**

et al. 2014, Busby et al. 2017, Hall 2018) are *Sais rosalia rosalinde* Weymer, 1890 (Nymphalidae), *Paraspiculatus orobia* (Hewitson, 1867) (Lycaenidae), and *Pseudolivendula h. hemileuca* (Bates, 1868) (Riodinidae). Among those typical from Cerrado (Mielke et al. 2008, Pinheiro et al. 2010, Freitas et al. 2021a) are *Aguna squamalba* Austin & Mielke, 1998, *Blubella azeta giffordi* (Mielke, 1995), *Elbella intersecta losca* (Evans, 1951), *Staphylus melangon epicaste* Mabile, 1903 (Hesperiidae), *Amphidecta reynoldsi* Sharpe, 1890, *Brevioleria seba emyra* (Haensch, 1905), *Callicore s. sorana* (Godart, [1824]), *Fountainea glycerium cratais* (Hewitson, 1874), *Malaveria mimula* (Hayward, 1954), *Paryphthimoides p. poltys* (Prittwitz, 1865), *"Pharneuptychia" innocentia* (Felder & Felder, 1867), *Yphthimoides celmis* (Godart, [1824]) (Nymphalidae), *Symbiopsis lenitas* (Druce, 1907) (Lycaenidae), and *Rhetus periander arthuriana* (Sharpe, 1890) (Riodinidae).

The records of six species at Iguaçu NP represent the southernmost point of their respective previously documented distributions. These are: 1) *Camissecla vesper* (Druce, 1909), 2) *Ipidecla crepundia* (Druce, 1909), 3) *Nesiostrymon tristis* (Lathy, 1926) (Lycaenidae), 4) *Joiceya praeclarus* Talbot, 1928 (for more details see Greve et al. 2013), 5) *Theope p. pakitza* Hall & Harvey, 1998 (Riodinidae), and 6) *Eunica m. malvina* Bates, 1864 (Nymphalidae).

Among the sampled taxa, six were recorded for the first time in Brazil (Figure 4), namely: 1) *Apaustus gracilis* ssp. n., 2) *Elbella v. viriditas* (Skinner, 1920) (Hesperiidae), 3) *Deltaya* sp. n. (Nymphalidae), 4) *Symbiopsis* sp. n. (Lycaenidae), 5) *Emesis orichalceus* Stichel, 1916 and 6) *Theope p. pakitza* (Riodinidae). The new taxa of *Apaustus*, *Deltaya* and *Symbopsis* were discovered in this study.

Figure 3. Sample of representative species present at Iguaçu National Park and surrounding areas representing six butterfly families (only Hedylidae is not illustrated): A) *Pyrrhopygopsis s. socrates* (Ménétriés, 1855); B) *Dalla diraspes* (Hewitson, 1877); C) *Festivia cronion* (Felder & Felder, 1867); D) *Mysoria barcastus barta* Evans, 1951 (Hesperiidae); E) *Myscelia orsis* (Drury, [1782]); F) *Epityches eupompe* (Geyer, [1832]); G) *Argentaria libitina* (Butler, 1870); H) *Catagramma pygas thamyras* Ménétriés, 1857 (Nymphalidae); I) *Zizula cyna* (Edwards, 1881); J) *Cyanophrys herodotus* (Fabricius, 1793); K) *Heterosmaitia palegon* (Cramer, [1780]); L) *Evenus regalis* (Cramer, [1775]) (Lycaenidae); M) *Rhetus periander arthuriana* (Sharpe, 1890); N) *Alesa prema* (Godart, [1824]); O) *Caria p. plutargus* (Fabricius, 1793); P) *Ariconias glaphyra* (Westwood, 1851) (Riodinidae); Q) *Anteos clorinde* (Godart, [1824]); R) *Pyrisitia l. leuce* (Boisduval, 1836); S) *Itaballia demophile* ssp.; T) *Dismorphia amphione astynome* (Dalman, 1823) (Pieridae); U) *Heraclides hectorides* (Esper, 1794); V) *Protesilaus stenodesmus* (Rothschild & Jordan, 1906); W) *Mimoides protodamas* (Godart, 1819); X) *Parides agavus* (Drury, 1782) (Papilionidae).

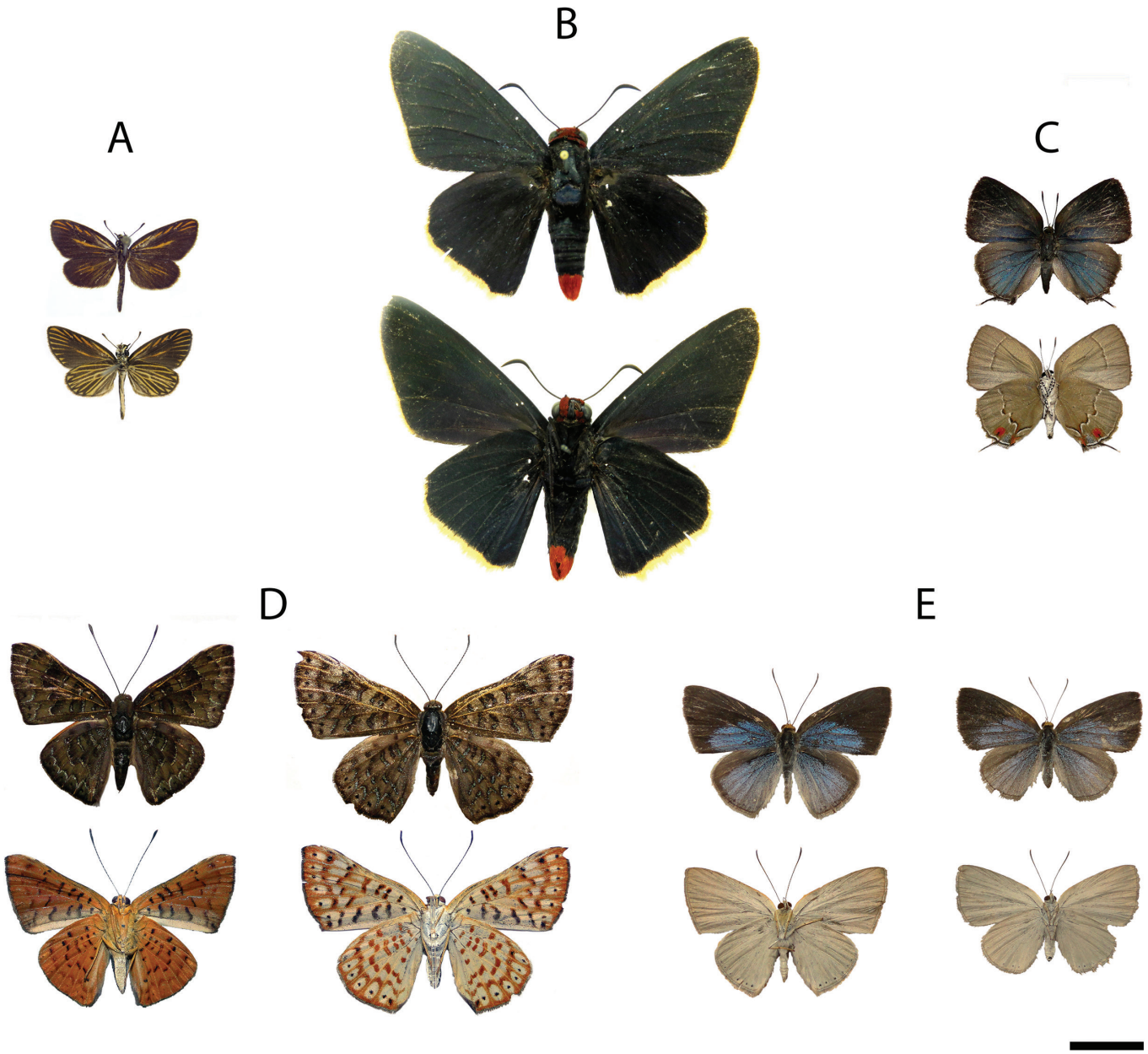

Figure 4. Taxa recorded for the first time in Brazil (except for the undescribed species of *Deltaya*): A) an undescribed subspecies of *Apaustus gracilis*, male; B) *Elbella v. viriditas* (Skinner, 1920), female (Hesperiidae); C) an undescribed species of *Symbiopsis*, female (Lycaenidae); D) *Emesis orichalceus* Stichel, 1916, male (left) and female (right); E) *Theope p. pakitza* Hall & Harvey, 1998, male (left) and hitherto unknown female (right) (Riodinidae). Scale bar = 1 cm.

Six taxa were included in at least one endangered faunal list (Mielke & Casagrande 2004, ICMBio 2018a): 1) *Zonia zonia diabo* Mielke & Casagrande, 1998, 2) *Ochropyge ruficauda* (Hayward, 1932), 3) *Passova passova practa* Evans, 1951 (Hesperiidae), 4) *Narope cyllarus* Westwood, 1851 (Nymphalidae), 5) *Alesa prema* (Godart, [1824]), and 6) *Joiceya praeclarus* (Riodinidae).

Discussion

1. Species richness

The 787 species recorded at Iguaçu NP and its surrounding areas represent 22.2% of the 3549 butterfly species known in Brazil (Casagrande & Duarte 2022). Except for the family Hedylidae, which was not included in previous Papilionoidea inventories in the Atlantic Forest, the other 786 species make Iguaçu NP the richest known site in butterfly species among areas with Semideciduous Forest. The park is also among the three richest sites in butterfly species of Atlantic Forest domain, together with the municipality of Linhares, in the state of Espírito Santo (835 species) (Brown Jr. & Freitas 2000), and Itatiaia National Park, in the states of Rio de Janeiro and Minas Gerais (914 species) (Zikán & Zikán 1968).

Among the records that may be added in the future to Iguaçu NP are the taxa that have been recorded exclusively at Iguazú National Park (hereafter Iguazú NP), Yacutinga Private Reserve (hereafter Yacutinga PR) and Surucuá Private Reserve (hereafter Surucuá PR),

Table 3. Species that are likely to occur in Iguaçu NP and may be included in future lists, based on records from neighboring protected areas in Argentina (Iguazú NP, Yacutinga PR and Surucuá PR) (Núñez-Bustos 2008, 2009, 2019, Klimaitis et al. 2018, Núñez-Bustos & Penco 2020, Rosa et al. 2021, Núñez-Bustos in preparation). Species richness for each family are provided within parenthesis.

Family	Species
Papilionidae (1)	*Protesilaus telesilaus vitellus* (Frühstorfer, 1907)
Lycaenidae (9)	*Contrafacia imma* (Prittwitz, 1865) *Cyanophrys bertha* (Jones, 1912) *Kolana* sp. n. *Ministrymon una* (Hewitson, 1873) *Nicolaea cupa* (Druce, 1907) *Nicolaea opaliana* (Hayward, 1967) *Olynthus ophelia* (Hewitson, 1867) *Paraspiculatus hannelore* (Bálint & Moser, 2001) *Strephonota dindymus* (Cramer, 1775) (cited as *Strephonota sphinx* (Fabricius, 1775))
Riodinidae (8)	*Baeotis hisbon* (Cramer, 1775) *Chadia cadytis* (Hewitson, 1866) *Emesis fatimella fatimella* Westwood, 1851 *Eurybia misellivestis* Stichel, 1910 *Exoplisia aphanis* (Stichel, 1910) *Ithomiola orpheus* (Westwood, 1851) *Melanis smithiae smithiae* (Westwood, 1851) *Theope cmielkei* Jauffret & Jauffret, 2009
Nymphalidae (15)	*Actinote brylla* Oberthür, 1917 *Adelpha cytherea aea* (Felder & Felder, 1867) *Caligo martia* (Godart, [1824]) *Heterosais edessa* (Hewitson, [1855]) *Ithomia drymo* Hübner, 1816 *Memphis appias* (Hübner, [1825]) *Memphis otrere* (Hübner, [1825]) *Morpho hercules diadema* Frühstorfer, 1905 *Morpho menelaus coeruleus* (Perry, 1810) *Penetes pamphanis* Doubleday, [1849] *Pharneuptychia phares* (Godart, [1824]) *Phystis simois variegata* (Hewitson, 1864) *Splendeuptychia ambra* (Weymer, [1911]) *Splendeuptychia tupinamba* Freitas, Huertas & Rosa 2021 *Taygetis virgilia* (Cramer, 1776)
Pieridae (8)	*Colias lesbia lesbia* (Fabricius, 1775) *Enantia clarissa* (Weymer, 1895) *Eurema phiale paula* (Röber, 1909) *Ganyra phaloe endeis* (Godart, 1819) *Glennia pylotis* (Godart, 1819) *Hesperocharis paranensis paranensis* Schaus, 1898 *Perrhybris pamela eieidias* Hübner, [1821] *Pieriballia viardi molione* (Frühstorfer, 1908)
Hesperiidae (35)	*Anatrytone mella* (Godman, 1900) *Blubella blanda* (Evans, 1951) *Callimormus radiola pusillus* Hayward, 1934 *Carystus phorcus claudianus* (Latreille, [1824]) *Conga urqua* (Schaus, 1902) *Corticea noctis* (Plötz, 1882) *Cycloglypha caeruleonigra* Mabille, 1903 *Cynea popla* Evans, 1955

Continue...

Continuation

Family	Species
	Cynea robba nippa Evans, 1955 *Diaeus variegata* (Plötz, 1884) *Dyscophellus porcius doriscus* (Hewitson, 1867) *Ectomis orphne* (Plötz, 1881) *Epargyreus tmolis* (Burmeister, 1875) *Jember menechmus menechmus* (Mabille, 1878) *Justinia maculata* (Bell, 1930) *Libra aligula decia* (Hayward, 1948) *Lindra brasus brasus* (Mielke, 1968) *Mahotis versicolor* (Latreille, [1824]) *Mimadia fallax fida* (Evans, 1951) *Nastra ethologus* (Hayward, 1934) *Nicephellus nicephorus* (Hewitson, 1876) *Nyctelius paranensis* (Schaus, 1902) *Olafia roscius roscius* (Hopffer, 1874) *Pellicia hersilia* Hayward, 1939 *Pellicia najoides* Hayward, 1933 *Phanes rezia* (Plötz, 1882) *Pheraeus odilia odilia* (Plötz, 1884) *Phlebodes campo campo* (Bell, 1947) (misidentified as *Thoon taxes* Godman, 1900) *Porphyrogenes vulpecula vulpecula* (Plötz, 1882) *Pseudosarbia phoenicicola* Berg, 1897 *Pythonides jovianus fabricii* Kirby, 1871 *Salatis salatis* (Stoll, 1782) *Staphylus melaina* (Hayward, 1947) *Staphylus musculus* (Burmeister, 1875) *Talides sergestus* (Cramer, [1775])
Hedylidae (1)	*Macrosoma hedylaria* (Warren, 1894)

three neighboring protected areas in Argentina (Núñez-Bustos 2008, 2009, 2019, Klimaitis et al. 2018, Núñez-Bustos & Penco 2020, Núñez-Bustos in preparation). Together, these protected areas in Argentina and the Iguaçu NP in Brazil, form a practically continuous forest, composed by the same vegetal formation (except by MOF, which does not occur in the Argentinian parks), separated by the Iguaçu River. As such, it is reasonable to expect that these areas share a similar fauna. At least 77 species have been recorded only in the Argentinian parks, but all are likely to occur at Iguaçu NP. These records include 1 Papilionidae, 9 Lycaenidae, 8 Riodinidae, 15 Nymphalidae, 8 Pieridae, 35 Hesperiidae and 1 Hedylidae (Table 3), resulting in a list with 864 species of butterflies. Relevantly, D'Abrera (1987) mentioned that a tourist recorded *Prepona claudina annetta* (Gray, 1832) (at the time, *Agrias claudina claudianus* Staudinger, [1885]) in February 1987 at the Argentinian Falls, so it is possible that this species occurs in the Brazilian park as well. Among other species with possible occurrence in Iguaçu NP, we cite the Papilionidae *Pterourus cleotas* (Gray, 1832) and the Nymphalidae *Splendeuptychia tupinamba* Freitas, Huertas & Rosa 2021. *P. cleotas* has specimens deposited in DZUP/UFPR from Cascavel, a municipality with approximately the same elevation and a few kilometers from Santa Tereza do Oeste, in the Northern border of Iguaçu NP. The species *S. tupinamba* was recently described and recorded at Yacutinga PR (Misiones, Argentina) (Rosa et al. 2021).

2. Taxonomic composition

Brown Jr. & Freitas (2000) suggested that Nymphalidae generally represent 25% to 29% of the total species in a well-sampled inventory in the Neotropical region. At Iguaçu NP, the Nymphalidae make up 27.2% of the butterfly fauna, in full accord with predictions. Since the Nymphalidae can be satisfactorily documented with low sampling effort and their proportion in the butterfly fauna is relatively consistent, the richness of this family is an accurate surrogate for the total butterfly species richness. Alternatively, Robbins et al. (1996) suggested that Neotropical faunas consist of approximately a third Papilionidae + Pieridae + Nymphalidae (255 species at Iguaçu NP), a third Lycaenidae + Riodinidae (192 species at Iguaçu NP), and a third Hesperiidae (339 species at Iguaçu NP). This prediction was not especially accurate at Iguaçu NP. Further, even though the proportional richness of Hesperiidae greatly exceeded a third, we consider it likely that most species to be discovered in the future will belong to this family. The reason is that they are mostly inconspicuous, small-sized and fast-flying species that make them difficult to sample (Brown Jr. 1992, Brown Jr. & Freitas 1999).

At greater detail, the higher species richness of Hesperiidae (43.1%) than Nymphalidae (27.2%) is consistent in well-detailed Neotropical inventories (Brown Jr. & Freitas 2000) and may be a good indicator of "representativity" of butterfly sampling in the region (Francini et al. 2011). Furthermore, the predominance of Lycaenidae over Riodinidae is another expected pattern in butterfly assemblages in the southern Atlantic Forest (Francini et al. 2011) and seems to be related to a positive association between Riodinidae richness and local mean temperature (Brown Jr. 2005). Assemblages in northern locations of the Atlantic Forest and in the Amazon Basin, accordingly, show greater riodinid species richness.

So far, there are no long-term butterfly inventories carried out in locations in the Atlantic Forest that include Hedylidae. Thus, we do not know the representativeness of this family in the total butterfly fauna in this domain. In the Brazilian butterfly fauna, Hedylidae represents 0.6% of the total (Lourido & Duarte 2023). Assuming that the same proportion applies to the Atlantic Forest, we could expect the occurrence of up to four additional species of this family in Iguaçu NP, suggesting that it may be underrepresented in the present inventory.

By using VSR traps, 27 species of fruit-feeding nymphalids were sampled (out of a total of 112 sampled from this guild), of which four were sampled exclusively by this method: *Amphidecta pignerator simplicia* Weymer, 1910, *A. reynoldsi*, *Moneuptychia castrensis* (Schaus, 1902), and *Yphthimoides yphthima* (Felder & Felder, [1867]). In the present study, VSR traps were used in a complementary way, and despite the low sampling effort employed in this method, it was effective in recording species that were not found in the active sampling with entomological nets. This may be related to the habits of these species (Freitas et al. 2021b). For example, among the species that were sampled exclusively by traps, *A. pignerator simplicia* and *A. reynoldsi* have crepuscular habits, while *Y. yphthima* was sampled in a canopy trap.

Active searching for immature stages (especially on cold or rainy days, unfavorable for sampling adults) has also proven useful in adding species to the list. Whenever possible, the collected immatures were raised in the laboratory until the emergence of the adult for secure identification. The adults of some of these reared species were never seen in the field, such as the hesperid *Thracides c. cleanthes* (Latreille, [1824]), with eggs found on *Syagrus romanzoffiana* (Cham.) Glassman (Arecaceae); the nymphalid *Opsiphanes cassiae crameri* Felder & Felder, 1862, with a pupa found on exotic *Heliconia rostrata* Ruiz & Pav. (Heliconiaceae); the nymphalid *Dynastor darius ictericus* Stichel, 1904, whose pupa with signs of parasitoidism was found on *Ananas bracteatus* (Lindl.) Schult. & Schult.f. (Bromeliaceae); the riodinid *Napaea eucharila* (Bates, 1867), with larvae found on several Bromeliaceae species; and the riodinid *Hyphilaria thasus* (Stoll, 1780), with larvae found on several native and exotic Orchidaceae species, similar to that reported by Núñez-Bustos (2008), who raised a larva found on *Octomeria pinicola* Barb. Rodr. A remarkable case was that of the nymphalid *Selenophanes cassiope guarany* Casagrande, 1992, whose immature stages were previously unknown and could then be described (Shirai et al. 2016) after a female was observed ovipositing on leaves of *S. romanzoffiana* at dusk. Certain species may be more likely to be found in their immature stages for several reasons. Some spend most of their life cycle as immatures, especially those whose adults do not feed (e.g., Urich & Emmel 1991). Others have adults that fly mostly in the canopy or are active for a restricted time of day (DeVries 1997, Hall & Willmott 2010). *D. darius* fits into more than one of these explanations. In the adult stage, this is a crepuscular species that lives relatively little time and does not feed, which is also why it is not sampled in VSR traps. In a study conducted in the Cerrado domain (Silva et al. 2011), a survey focused on immature stages of Lycaenidae resulted in six new species records for a heavily sampled locality such as the Federal District (central Brazil), suggesting that this methodology has been underestimated in butterfly inventories.

Some taxa were only recorded above 500 meters elevation, where the montane subformation of SSF and its ecotone with MOF occur. These taxa include *Amphidecta reynoldsi*, *Archaeoprepona chalciope* (Hübner, [1823]), *Diaethria e. eluina* (Hewitson, [1855]), *Dynamine meridionalis* Röber, 1915, *Eteona tisiphone* (Boisduval, 1836), *Heliconius besckei* (Ménétriés, 1857), *Cisandina lea* (Cramer, 1777), *Morpho aega* (Hübner, [1822]), *Opoptera a. aorsa* (Godart, [1824]) (Nymphalidae), *Mimoides protodamas* (Godart, 1819), *Neographium asius* (Fabricius, 1781) (Papilionidae), *Catocyclotis malca* (Schaus, 1902), *Emesis fastidiosa* Ménétriés, 1855, *Euselasia eusepus* (Hewitson, [1853]), *Euselasia zara* (Westwood, 1851), *Rhetus periander eleusinus* Stichel, 1910 (Riodinidae), *Gorgopas petale* (Mabille, 1888), and *Thespieus x. xarippe* (Butler, 1870) (Hesperiidae). Although subspecies *R. periander eleusinus* and *R. periander arthuriana* fly together in other regions, in Iguaçu NP they were recorded separately – one individual of *R. periander eleusinus* in the highest part of the park whereas *R. periander arthuriana* was very common in low areas.

Among the recorded species, six were included in the Brazil Red Book of Threatened Species of Fauna (ICMBio 2018a) and/or in the Paraná State Red Book of Threatened Species of Fauna (Mielke & Casagrande 2004). These species are *Zonia zonia diabo*, *Ochropyge ruficauda*, *Passova passova practa* (Hesperiidae), *Narope cyllarus* (Nymphalidae), *Alesa prema* and *Joiceya praeclarus* (Riodinidae). Greve et al. (2013) suggested changing the conservation status of *J. praeclarus* to DD ("Data Deficient") due to the new record for Foz do Iguaçu during the inventory. This record increased the species geographic distribution, which was previously known only from the type locality, in Mato Grosso, Brazil. In the case of *Passova passova practa*, Dolibaina et al. (2010) suggested removing the species from the Red List

of Paraná, because new records of it in the study area and the abundance of larvae on host plant suggest that the rarity of this species is an adult sampling artifact. *Z. zonia diabo* and *J. praeclarus* were recorded only in surrounding areas of Iguaçu NP, in small patches of secondary forest, which suggests that these species may be more environmentally tolerant than previously thought. However, even though these species have not yet been detected inside the Iguaçu NP, they certainly also occur there, reinforcing the importance of this protected area for its conservation, because populations that occur in small forest fragments tend to be much more unstable and subject to local extinctions by stochastic factors or anthropogenic disturbances (Brown Jr. 1992).

Six species had their known distribution significantly increased after the present study: *Camissecla vesper*, *Ipidecla crepundia*, *Nesiostrymon tristis* (Lycaenidae), *Joiceya praeclarus*, *Theope p. pakitza* (Riodinidae), and *Eunica m. malvina* (Nymphalidae). The three species of Lycaenidae had previously been recorded in Rio de Janeiro state (Duarte et al. 2010). *Theope p. pakitza* had been known only from a Peruvian male (Hall 1998), and its female is illustrated here for the first time (Figure 4E). In the case of *Eunica m. malvina*, we recorded a female in March 2016 landed on a high leaf of *Luehea divaricata* Mart. & Zucc. (Malvaceae) at the margin of the Iguaçu River. Otherwise, in the Atlantic Forest this species occurs in the states of Bahia, Espírito Santo, Rio de Janeiro, Minas Gerais and São Paulo Paulo (Jenkins 1990, Santos et al. 2018). In the case of the distributions previously documented for the riodinids *J. praeclarus* and *T. p. pakitza*, the increase was over 1000 km, showing that even in a well-studied group like butterflies, the Wallacean shortfall is still present.

Among the pairs of subspecies with sympatric distribution sampled, some produce intermediate forms, natural hybrids, such as the pairs nymphalids *Heliconius ethilla polychrous* Felder & Felder, 1865 x *H. ethilla narcaea* (Godart, 1819), *Hypothyris euclea laphria* (Doubleday, 1847) x *H. euclea nina* (Haensch, 1905), and *Tithorea harmonia pseudethra* Butler, 1873 x *T. harmonia pseudonyma* Staudinger, 1894. Such phenomenon is common where endemism zones meet, as shown by Brown Jr. (1982). However, other two pairs of subspecies, the hesperids *Saturnus reticulata reticulata* (Plötz, 1883) x *S. reticulata conspicuus* (Bell, 1941) and 8) *Tisias lesueur lesueur* (Latreille, [1824]) x *T. lesueur canna* Evans, 1955, actually correspond to distinct species (Mielke et al. in preparation). In other cases, such as the pairs riodinids *Melanis aegates albugo* (Stichel, 1910) x *M. aegates limbata* (Stichel, 1925) and *Rhetus periander arthuriana* (Sharpe, 1890) x *R. periander eleusinus* Stichel, 1910, further studies are needed to define the real status of these taxa. These pairs of sympatric subspecies recorded, as well as several taxa typical of other domains, is remarkable. Biogeographically, Iguaçu NP is situated in a transitional area between endemism zones (Brown Jr.& Mielke 1968, Brown Jr. 1982), which may help explain these findings. In addition, the riparian forest of the Paraná basin functions as an ecological corridor for species with a more northerly distribution, facilitating their dispersal to the region, which seems to be the southern limit of distribution for many butterfly species.

For those species that were only found as literature records or without vouchers, these records were not included. For example, there is a citation of *Caligo b. brasiliensis* (C. Felder, 1862) in an unpublished study, which was mentioned in a former version of the management plan of Iguaçu NP (IBAMA 1999), but the species was not listed in the present study because the voucher specimen was not located. Also, all records for this species from iNaturalist were rejected because the available pictures did not correspond to natural observations in Foz do Iguaçu, but to individuals raised in captivity in the butterfly center of "Parque das Aves", a private institution neighboring Iguaçu NP. Furthermore, the record of *Taygetis virgilia* (Cramer, 1776) (Nymphalidae) cited in IBAMA (1999) was rejected because the voucher specimen could not be located at DZUP. However, there are records for this species in Iguazú National Park (Misiones, Argentina) (Núñez-Bustos 2009), so it is likely that future studies may record it in the Brazilian Park as well. Finally, four species of fruit-feeding nymphalids reported in Graciotim & Morais (2016) were also not included, because: 1) the records of *Taygetis sylvia* Bates, 1866 and *Yphthimoides ochracea* (Butler, 1867) are possible misidentifications; and 2) based on nomenclatural updates (Espeland et al. 2023), *Hermeuptychia hermes* (Fabricius, 1775) and *H. fallax* (Felder & Felder, 1862) probably refer to *H. atalanta* (Butler, 1867) and *H. gisella* (Hayward, 1957), respectively.

Conclusion

Iguaçu NP and surrounding areas exhibit a heterogenous butterfly fauna with elements from different regions. Its species richness is high for a subtropical zone distant from the coast. Besides the three undescribed taxa recorded in this study, the number of other taxa originally described from specimens collected in the region, both in the Brazilian and Argentinian parks, is remarkable. Some examples are *Ochropyge ruficauda*, *Atlides misma* D'Abrera, 1995, *Caeruleuptychia helena* (Anken, 1994), and *Agara pardalina yacutinga* (Mielke & Casagrande, 2011). Furthermore, several unexpected records suggest that Iguaçu NP is a fertile field for new findings, such as the rediscoveries of *Joiceya praeclarus* and *T. p. pakitza*. The new records of these species represent a significant expansion in their geographic distributions, since *J. praeclarus* was known only from state of Mato Grosso in Brazil (over 1000 km) and had not been observed for 80 years, while *T. p. pakitza* was known only from Manú National Park in Peru (over 2000 km).

We recommend that future studies focus sampling efforts in MOF areas and their ecotone with SSF, which are the most preserved and least explored areas due to difficult accessibility. Considering the groups with high potential to represent new records for the park and its surroundings, we suggest that further studies aim at extensive collections using VSR traps for fruit-feeding Nymphalidae, the Ahrenholz technique for Hesperiidae, and light traps for mostly nocturnal Hedylidae. Due to the seasonality and short flight period of adults of certain species, some univoltine, these samplings must cover all months of the year, including during winter, in order to increase the chance of their detection.

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Author Contributions

Roberto R. Greve: substantial contribution in the concept and design of the study, contribution to data collection, contribution to data analysis and interpretation, and contribution to manuscript preparation.

Eduardo Carneiro: contribution to data collection, contribution to data analysis and interpretation, and contribution to critical revision, adding intellectual content.

Olaf H.H. Mielke: contribution to data collection, contribution to data analysis and interpretation, and contribution to critical revision, adding intellectual content.

Robert K. Robbins: contribution to data analysis and interpretation, and contribution to critical revision, adding intellectual content.

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Conflicts of Interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

Ethics

This study did not involve human beings and/or clinical trials that should be approved by one Institutional Committee.

Data availability

A MS Excel file containing additional information on the taxa recorded from the literature and from entomological collections is available at: https://doi.org/10.48331/scielodata.NPDRGN

References

ALVARES, C.A., STAPE, J.L., SENTELHAS, P.C., GONÇALVES, J.L.M & SPAROVEK, G. 2013. Köppen's climate classification map for Brazil. Meteorol. Z. 22(6):711–728;

ANKEN, R.H. 1994. Neue taxa des genus *Hermeuptychia* Forster aus Brasilien (Lepidoptera, Satyridae). Entomol. Z. 104(14):283–291.

BIEZANKO, C.M. & MIELKE O.H.H. 1973. Contribuição ao estudo faunístico dos Hesperiidae americanos. IV. Espécies do Rio Grande do Sul, Brasil, com notas taxonômicas e descrições de espécies novas. (Lepidoptera). Acta Biol. Parana. 2(1–4):51–102.

BLANDIN, P. 2007. The systematics of the genus *Morpho* Fabricius, 1807 (Lepidoptera Nymphalidae, Morphinae). Hillside Books, Canterbury.

BREINHOLT, J.W., EARL, C., LEMMON, A.R., LEMMON, E.M., XIAO, L. & KAWAHARA, A.Y. 2018. Resolving relationships among the megadiverse butterflies and moths with a novel pipeline for Anchored Phylogenomics. Syst. Biol. 67(1):78–93.

BROCKMANN, E., MIELKE, C.G.C. & MIELKE, O.H.H. 2022. Butterflies of the World 50. Hesperiidae III. New World Pyrrhopyginae, short text and plates. Goecke & Evers, Keltern.

BROWN, J.R., K.S. 1982. Historical and ecological factors in the biogeography of aposematic Neotropical butterflies. Am. Zool. 22:453–471.

BROWN, J.R., K.S. 1992. Borboletas da Serra do Japi: Diversidade, habitats, recursos alimentares e variação temporal. In História natural da Serra do Japi: Ecologia e preservação de uma área florestal no sudeste do Brasil (L.P.C. Morellato, org.). Editora da Unicamp/FAPESP, Campinas, p.142–187.

BROWN, J.R., K.S. 2005. Geological, evolutionary and ecological bases of the diversification of Neotropical butterflies: implications for conservation. In Tropical rainforests: Past, present and future (E. Bermingham, C.W. Dick & C. Moritz, eds.). University of Chicago Press, Chicago, p.166–201.

BROWN, J.R., K.S. & FREITAS, A.V.L. 1999. Lepidoptera. In Biodiversidade do Estado de São Paulo: síntese do conhecimento ao final do século XX, invertebrados terrestres (C.R.F. Brandão & E.M. Cancello, eds.). USP, São Paulo, p.226–243.

BROWN, J.R., K.S. & FREITAS, A.V.L. 2000. Atlantic Forest butterflies: indicators for landscape conservation. Biotropica 32(4b):934–956.

BROWN, J.R., K.S. & MIELKE, O.H.H. 1968. Lepidoptera of the central Brazil plateau. III. partial list for the Belo Horizonte area, showing the character of the southeastern "blend zone". J. Lepid. Soc. 22(3):147–157.

BROWN, J.H. & LOMOLINO, M.V. 1998. Biogeography 2 ed. Sinauer Associates, Sunderland.

BUSBY, R.C., FAYNEL, C., MOSER, A. & ROBBINS, R.K. 2017. Sympatric diversification in the upper Amazon: a revision of the Eumaeine genus *Paraspiculatus* (Lepidoptera: Lycaenidae). Smithson. Contrib. Zool. 649:1–65.

CALLAGHAN, C.J. 2010. A re-evaluation of the *Aricoris constantius* group with the recognition of three species (Lepidoptera: Riodinidae). Zoologia 27(3):395–401.

CANALS, G.R. 2003. Mariposas de Misiones. L.O.L.A., Buenos Aires.

CASAGRANDE, M.M. & DUARTE, M. 2022. Lepidoptera. In Catálogo Taxonômico da Fauna do Brasil. PNUD. http://fauna.jbrj.gov.br/fauna/faunadobrasil/84 (last access on 29/07/2023)

CASAGRANDE, M.M. & MIELKE, O.H.H. 1992. Borboletas (Lepidoptera) Ameaçadas de Extinção no Paraná. Rev. Bras. Zool. 9(1/2):75–92.

CONG, Q., ZHANG, J., SHEN, J. & GRISHIN, N.V. 2019. Fifty new genera of Hesperiidae (Lepidoptera). Insecta Mundi 0731:1–56.

D'ABRERA, B.L. 1984. Butterflies of the Neotropical Region. Part. II. Danaidae, Ithomiidae Heliconidae and Morphidae. Hill House, Victoria.

D'ABRERA, B.L. 1987. Butterflies of the Neotropical Region. Part. IV. Nymphalidae (Partim). Hill House, Victoria.

D'ABRERA, B.L. 1989. Butterflies of the Neotropical Region. Part. V. Nymphalidae (Conc.) and Satyridae. Hill House, Victoria.

D'ABRERA, B.L. 1994. Butterflies of the Neotropical Region. Part. VI. Riodinidae. Hill House, Victoria.

D'ABRERA, B.L. 1995. Butterflies of the Neotropical Region. Part. VII. Lycaenidae. Hill House, Victoria.

DEVRIES, P.J. 1997. The butterflies of Costa Rica. Vol. 2. Riodinidae. Princeton University Press, Princeton.

DIAS, F.M.S., JANZEN, D., HALLWACHS, W., CHACÓN, I., WILLMOTT, K., ORTIZ-ACEVEDO, E., MIELKE, O.H.H. & CASAGRANDE, M.M. 2018. DNA barcodes uncover hidden taxonomic diversity behind the variable wing patterns in the Neotropical butterfly genus *Zaretis* (Lepidoptera: Nymphalidae: Charaxinae). Zool. J. Linn. Soc.-Lond. XX:1–61.

DÍAZ, S.D.R., DIAS, F.M.S., CASAGRANDE, M.M., MIELKE, O.H.H. & LAMAS, G. 2014. Notes on the geografic distribution and subspecific taxonomy of *Sais rosalia* (Cramer) (Lepidoptera, Nymphalidae, Ithomiini), including the first records in Paraguay. Rev. Bras. Entomol. 58(1):11–18.

DOLIBAINA, D.R., CARNEIRO, E., DIAS, F.M.S., MIELKE, O.H.H. & CASAGRANDE, M.M. 2010. Registros inéditos de borboletas (Papilionoidea e Hesperioidea) ameaçadas de extinção para o Estado do Paraná, Brasil: novos subsídios para reavaliação dos critérios de ameaça. Biota Neotrop. 10(3):75–81 https://www.biotaneotropica.org.br/v10n3/pt/abstract?article+bn01210032010 (last access on 12/08/2021)

DOLIBAINA, D.R., MIELKE, O.H.H. & CASAGRANDE, M.M. 2011. Borboletas (Papilionoidea e Hesperioidea) de Guarapuava e arredores, Paraná, Brasil: um inventário com base em 63 anos de registros. Biota Neotrop. 11(1):341–354. https://www.biotaneotropica.org.br/v11n1/en/abstract?inventory+bn00211012011 (last access on 12/08/2021)

DUARTE, M., ROBBINS, R.K., FREITAS, A.V.L., BROWN JR., K.S., MONTEIRO, R.F., CASAGRANDE, M.M. MIELKE, O.H.H., NASCIMENTO, M.S. & ALVES, T.G. 2010. Borboletas da Mata Atlântica do Estado do Rio de Janeiro: Lycaenidae (Lepidoptera). Arq. Mus. Nac. 67(3-4):291–302.

ESPELAND, M., BREINHOLT, J., WILLMOTT, K.R., WARREN, A.D., VILA, R., TOUSSAINT, E.F.A., MAUNSELL, S.C., ADUSE-POKU, K., TALAVERA, G., EASTWOOD, R., JARZYNA, M.A., GURALNICK, R., LOHMAN, D.J., PIERCE, N.E. & KAWAHARA, A.Y. 2018. A comprehensive and dated phylogenomic analysis of butterflies. Curr. Biol. 28(5):770–778.

ESPELAND, M., NAKAHARA, S., ZACCA, T., BARBOSA, E.P., HUERTAS, B., MARÍN, M.A., LAMAS, G., BENMESBAH, M., BRÉVIGNON, C., CASAGRANDE, M.M., FÅHRAEUS, C., GRISHIN, N., KAWAHARA, A.Y., MIELKE, O.H.H., MILLER, J.Y., NAKAMURA, I., NAVAS, V., PATRUSKY, B., PYRCZ, T.W., RICHARDS, L., TAN, D., TYLER, S., VILORIA, Á., WARREN, A.D., XIAO, L., FREITAS, A.V.L. & WILLMOTT, K.R. 2023. Combining target enrichment and Sanger sequencing data to clarify the systematics of the diverse Neotropical butterfly subtribe Euptychiina (Nymphalidae, Satyrinae). Syst. Biol. 1–73.

FLICKR. https://www.flickr.com (last access on 27/09/2022)

FRANCINI, R.B., DUARTE, M., MIELKE, O.H.H., CALDAS, A. & FREITAS, A.V.L. 2011. Butterflies (Lepidoptera, Papilionoidea e Hesperioidea) of the "Baixada Santista" region, coastal São Paulo, southeastern Brazil. Rev. Bras. Entomol. 55(1):55–68.

FREITAS, A.V.L., FRANCINI, R.B. & BROWN JR, K.S. 2003. Insetos como indicadores ambientais. In Métodos de estudo em Biologia da Conservação e manejo da vida silvestre (L. Cullen Jr., R. Rudran & C. Valladares-Pádua, orgs.). Fundação Boticário e Editora da UFPR, Curitiba, p.125–151.

FREITAS, A.V.L., ISERHARD, C.A., SANTOS, J.P., CARREIRA, J.Y.O., RIBEIRO, D.B., MELO, D.H.A., ROSA, A.H.B., MARINI-FILHO, O.J., ACCACIO, G.M. & UEHARA-PRADO, M. 2014. Studies with butterfly bait traps: an overview. Rev. Colomb. Entomol. 40(2):209–218.

FREITAS, A.V.L., LEAL, I.R., UEHARA-PRADO, M. & IANNUZZI, L. 2006. Insetos como indicadores de conservação da paisagem. In Biologia da Conservação: Essências (C.F.D. Rocha, H.G. Bergallo, M.V. Sluys & M.A.S. Alves, eds.). Rima, São Carlos, p.357–384.

FREITAS, A.V.L., MUNIZ, D.G., CARREIRA, J.Y.O. & OLIVEIRA, P.S. 2021a. Fruit-feeding butterfly assemblages in a Neotropical Savanna: Assessing phenological patterns using baited traps. J. Lepid. Soc. 75(2):88–103.

FREITAS, A.V.L., SANTOS, J.P., ROSA, A.H., ISERHARD, C.A., RICHTER, A., SIEWERT, R.R., GUERATTO, P.E., CARREIRA, J.Y.O. & LOURENÇO, G.M. 2021b. Sampling methods for butterflies (Lepidoptera). In Measuring arthropod biodiversity: a handbook of sampling methods (J.C. Santos & G.W. Fernandes, eds.). Springer International Publishing, Cham, p.101–123.

GONÇALVES-SOUZA, T., ROMERO, G.Q. & COTTENIE, K. 2014. Metacommunity versus biogeography: a case study of two groups of Neotropical vegetation dwelling arthropods. PLoS ONE 9(12):1–20.

GOOGLE EARTH. http://earth.google.com (last access on 13/06/2023)

GOOGLE IMAGES. https://www.google.com/imghp?hl=EN (last access on 27/09/2022)

GRACIOTIM, C. & MORAIS, A.B.B. 2016. Borboletas frugívoras em florestas de mata atlântica do Parque Nacional do Iguaçu, Paraná, Brasil (Lepidoptera: Nymphalidae). SHILAP-Rev. Lepidopt. 44(173):115–128.

GREVE, R.R., CALLAGHAN, C.J., KAMINSKI, L.A. & FREITAS, A.V.L. 2013. The rediscovery of *Joiceya praeclarus* Talbot 1928 (Lepidoptera: Riodinidae), more than 80 years after its description. J. Lepid. Soc. 67(1):56–57.

HALL, J.P.W. 1998. Six new species in the "*foliorum* group" of *Theope* (Lepidoptera: Riodinidae). Lambillionea 98(4):562–573.

HALL, J.P.W. 2018. A monograph of the Nymphidiina (Lepidoptera: Riodinidae: Nymphidiini): Phylogeny, Taxonomy, Biology, and Biogeography. Entomological Society of Washington, Washington, D.C.

HALL, J.P.W. & HARVEY, D.J. 2002. Basal subtribes of the Nymphidiini (Lepidoptera: Riodinidae): Phylogeny and myrmecophily. Cladistics 18(6):539–569.

HALL, J.P.W. & K.R. WILLMOTT. 2010. Description of a new *Lucillella* species Riodinidae: Symmachiini) discovered in the eastern Andes of Ecuador using the single rope canopy access technique. J. Lepid. Soc. 64:139–146.

IBAMA 1999. Plano de manejo do Parque Nacional do Iguaçu. Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis, Brasília, D.F.

ICMBIO 2018a. Livro vermelho da fauna brasileira ameaçada de extinção: Volume VII – Invertebrados 1 ed. Instituto Chico Mendes de Conservação da Biodiversidade, Brasília, D.F.

ICMBIO 2018b. Plano de Manejo do Parque Nacional do Iguaçu. https://www.icmbio.gov.br/portal/images/stories/plano-de-manejo/plano_de_manejo_do_parna_do_iguacu_fevereiro_2018.pdf (last access on 16/09/2021)

INATURALIST. https://www.inaturalist.org (last access on 27/09/2022)

ISERHARD, C.A., UEHARA-PRADO, M., MARINI-FILHO, O.J., DUARTE, M. & FREITAS, A.V.L. 2017. Fauna da Mata Atlântica: Lepidoptera – Borboletas. In Revisões em Zoologia: Mata Atlântica (E.L. de A. Monteiro-Filho & C.E. Conte, eds.). Editora da UFPR, Curitiba, p.57–102.

JENKINS, D.W. 1990. Neotropical Nymphalidae. VIII. Revision of Eunica. Bulletin of the Allyn Museum, Florida.

KAWAHARA, A.Y. & BREINHOLT, J.W. 2014. Phylogenomics provides strong evidence for relationships of butterflies and moths. Proc. R. Soc. London, Ser. B 281(1788):1–8.

KLIMAITIS, J.F., NÚÑEZ-BUSTOS, E., KLIMAITIS, C.L. & GULLER, R.M. 2018. Mariposas de Argentina: Guía de identificación. Vazquez Mazzini Editores, Buenos Aires.

LAMAS, G., MCINNIS, M.L., BUSBY, R.C. & ROBBINS, R.K. 2021. The lycaenid butterfly fauna (Lepidoptera) of Cosñipata, Peru: annotated checklist, elevational patterns, and rarity. Insecta Mundi 0861:1–34.

LAMAS, G. 2004. Checklist: Part 4A. Hesperioidea – Papilionoidea. In Atlas of Neotropical Lepidoptera (J.B. Heppner, org.). vol. 5A. Association of Tropical Lepidoptera, Gainesville.

LEWINSOHN, T.M., FREITAS, A.V.L. & PRADO, P.I. 2005. Conservação de Invertebrados terrestres e seus hábitats no brasil. Megadiversidade 1(1):62–69.

LI, W., CONG, Q., SHEN, J., ZHANG, J., HALLWACHS, W., JANZEN, D.H. & GRISHIN, N.V. 2019. Genomes of skipper butterflies reveal extensive convergence of wing patterns. Proc. Natl. Acad. Sci. U.S.A. 116:6232–6237.

LOMOLINO, M.V. 2004. Conservation Biogeography. In Frontiers of Biogeography: new directions in the Geography of Nature (M.V. Lomolino & L.R. Heaney, eds.). Sinauer Associates, Sunderland, p.293–296.

LOURIDO, G.M. 2011. Revisão taxonômica e análise filogenética da família Neotropical Hedylidae (Lepidoptera, Hedyloidea). Tese de doutorado, Instituto Nacional de Pesquisas da Amazônia, Manaus.

LOURIDO, G.M. & DUARTE, M. 2023. Hedylidae. in Catálogo Taxonômico da Fauna do Brasil. PNUD. http://fauna.jbrj.gov.br/fauna/faunadobrasil/1735 (last access on 25/05/2023)

MIELKE, O.H.H. 1968. Contribuição ao estudo faunístico dos "Hesperiidae" brasileiros I. Resultados de uma excursão à Foz do Iguaçu, Paraná, Brasil, com notas taxonômicas (Lepidoptera). Atas Soc. Biol. Rio J. 12(2):73–78.

MIELKE, O.H.H. 1998. Plano de Manejo do Parque Nacional do Iguaçu. Avaliação Ecológica Rápida. Caracterização da Entomofauna. Versão Revisada. IBAMA/FUPEF, Curitiba.

MIELKE, O.H.H. & CASAGRANDE, M.M. 2004. Borboletas. In Livro vermelho da fauna ameaçada no Estado do Paraná (S.B. Mikich & R.S. Bérnils, orgs.). Instituto Ambiental do Paraná, Curitiba, p.713–739.

MIELKE, O.H.H., BROCKMANN, E. & MIELKE, C.G.C. 2022. Butterflies of the World 49. Hesperiidae II. New World Pyrrhopyginae, detailed text. Goecke & Evers, Keltern.

MIELKE, O.H.H., EMERY, E.O. & PINHEIRO, C.E.G. 2008. As borboletas Hesperiidae (Lepidoptera, Hesperioidea) do Distrito Federal, Brasil. Rev. Bras. Entomol. 52(2):283–288.

MURILLO-RAMOS, L., TORRES, R.H., NÚÑEZ, R. & AYAZO, R. 2018. New insights on the taxonomy and phylogenetic relationships of the Neotropical genus *Phoebis* (Pieridae: Coliadinae) revealed by molecular and morphological data. Zootaxa 4457(1):179–188.

NITSCHE, P.R., CARAMORI, P.H., RICCE, W.S. & PINTO, L.F.D. 2019. Atlas climático do Estado do Paraná. Instituto Agronômico do Paraná, Londrina.

NÚÑEZ, R., WILLMOTT, K.R., ÁLVAREZ, Y., GENARO, J.A., PÉREZ-ASSO, A.R., QUEJERETA, M., TURNER, T., MILLER, J.Y., BRÉVIGNON, C., LAMAS, G. & HAUSMANN, A. 2022. Integrative taxonomy clarifies species limits in the hitherto monotypic passion-vine butterfly genera *Agraulis* and *Dryas* (Lepidoptera, Nymphalidae, Heliconiinae). Syst. Entomol. 47:152–178.

NÚÑEZ-BUSTOS, E. 2008. Diversidad de mariposas diurnas en la Reserva Privada Yacutinga, Provincia de Misiones, Argentina (Lepidoptera: Hesperioidea y Papilionoidea). Trop. Lepid. Res. 18(2):78–87.

NÚÑEZ-BUSTOS, E. 2009. Mariposas diurnas (Lepidoptera: Papilionoidea y Hesperioidea) del Parque Nacional Iguazú, Provincia de Misiones, Argentina. Trop. Lepid. Res. 19(2):71–81.

NÚÑEZ-BUSTOS, E. 2019. Nuevos registros de mariposas diurnas para Misiones, Argentina (Lepidoptera: Papilionoidea), con notas toxonómicas. Historia Natural (Tercera Serie) 9(1):105–113.

NÚÑEZ-BUSTOS, E. & PENCO, F.C. 2020. *Macrosoma hedylaria* (Warren, 1894): Un Nuevo Registro de Hedylidae Guenée, 1858 de Misiones, Argentina (Lepidoptera: Papilionoidea). Historia Natural (Tercera Serie) 10(2):199–203.

PABLOS, J.L., SILVA, A.K., SERAPHIM, N., MAGALDI, L.M., SOUZA, A.P., FREITAS, A.V.L. & SILVA-BRANDÃO, K.L. 2021. North-south and climate-landscape-associated pattern of population structure for the Atlantic Forest White *Morpho* butterflies. Mol. Phylogenet. Evol. 161(10):1–18.

PENZ, C.M. 2008. Phylogenetic revision of *Eryphanis* Boisduval, with a description of a new species from Ecuador (Lepidoptera, Nymphalidae). Insecta Mundi 35:1–25.

PINHEIRO, C.E.G., MALINOV, I.K., EMERY, E.O. & SCHMIDT, K. 2010. Endemismos e conservação de borboletas (Lepidoptera: Papilionoidea e Hesperioidea) no bioma Cerrado. In Cerrado: Conhecimento científico quantitativo como subsídio para ações de conservação (I.R. Diniz, J. Marinho-Filho, R.B. Machado & R.B. Cavalcanti, eds.). Editora da UNB, Brasília, D.F., p.225–238.

RIBEIRO, M.C., METZGER, J.P., MARTENSEN, A.C., PONZONI, F.J. & HIROTA, M.M. 2009. The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. Biol. Conserv. 142:1144–1156.

ROBBINS, R.K., CONG, Q., ZHANG, J., SHEN, J., BUSBY, R.C., FAYNEL, C., DUARTE, M., MARTINS, A.R.P., PRIETO, C., LAMAS, G. & GRISHIN, N.V. 2022. Genomics-based higher classification of the species-rich hairstreaks (Lepidoptera: Lycaenidae: Eumaeini). Syst. Entomol. 47(3):445–469.

ROBBINS, R.K., LAMAS, G., MIELKE, O.H.H., HARVEY, D.J. & CASAGRANDE, M.M. 1996. Taxonomic composition and ecological structure of the species-rich butterfly community at Pakitza, Parque Nacional del Manu, Perú. In Manu: The biodiversity of Southeastern Perú (D.E. Wilson & A. Sandoval, eds.). Smithsonian Institution Press, Washington, D.C., p.217–252.

ROSA, A.H.B., HUERTAS, B., WILLMOTT, K.R., BARBOSA, E.P., MACHADO, P.A., MIELKE, O.H.H., CANAAN, C.H.P. & FREITAS, A.V.L. 2021. Fifty years without a name: a new species of *Splendeuptychia* Forster (Lepidoptera: Nymphalidae: Satyrinae). Zootaxa 5061(1):95–114.

SANTOS, E.C., MIELKE, O.H.H., & CASAGRANDE, M.M. 2008. Inventários de borboletas no Brasil: estado da arte e modelo de áreas prioritárias para pesquisa com vistas à conservação. Nat. Conserv. 6(2):68–90.

SANTOS, J.P., FREITAS, A.V.L., BROWN JR., K.S., CARREIRA, J.Y.O, GUERATTO, P.E., ROSA, A.H.B., LOURENÇO, G.M., ACCACIO, G.M., UEHARA-PRADO, M., ISERHARD, C.A., RICHTER, A.G.K., ROMANOWSKI, H.P., MEGA, N.O., TEIXEIRA, M.O., MOSER, A., RIBEIRO, D.B., ARAUJO, P.F., FILGUEIRAS, B.K.C., MELO, D.H.A., LEAL, I.R., BEIRÃO, M.V., RIBEIRO, S.P., CAMBUÍ, E.C.B., VASCONCELOS, R.N., CARDOSO, M.Z., PALUCH, M., GREVE, R.R., VOLTOLINI, J.C., GALETTI, M., REGOLIN, A.L., SOUZA, T.S. & RIBEIRO, M.C. 2018. Atlantic butterflies: a data set of fruit feeding butterfly communities from the Atlantic forests. Ecology 99(12):2875.

SANTOS, J.P., MARINI-FILHO, O.J., FREITAS, A.V.L. & UEHARA-PRADO, M. 2016. Monitoramento de borboletas: o papel de um indicador biológico na gestão de unidades de conservação. Biodivers. Bras. 6(1):87–99.

SERAPHIM, N. 2019. Riodinidae Species Checklist: a preliminary species checklist for the Riodinidae. https://www2.ib.unicamp.br/labor/site/?page_id=805 (last access on 06/02/2022)

SERAPHIM, N., KAMINSKI, L.A., DEVRIES, P.J., PENZ, C., CALLAGHAN, C.J., WAHLBERG, N., SILVA-BRANDÃO, K.L. & FREITAS, A.V.L. 2018. Molecular phylogeny and higher systematics of the metalmark butterflies (Lepidoptera: Riodinidae). Syst. Entomol. 43(2):407–425.

SHIRAI, L.T., BARBOSA, E.P., GREVE. R.R., MAGALDI, L.M., NASCIMENTO, A.R. & FREITAS, A.V.L. 2016. Natural history of *Selenophanes cassiope guarany* (Lepidoptera: Nymphalidae: Brassolini): an integrative approach, from molecules to ecology. Ann. Entomol. Soc. Am. 110(2):145–159.

SHIRAI, L.T., MACHADO, P.A., MOTA, L.L., ROSA, A.H.B. & FREITAS, A.V.L. 2019. DnB, the database of nymphalids in Brazil, with a checklist for standardized species lists. J. Lepid. Soc. 73(2):93–108.

SILVA, N.A.P., DUARTE, M., DINIZ, I.R. & MORAIS, H.C. 2011. Host plants of Lycaenidae on inflorescences in the central Brazilian Cerrado. J. Res. Lepid. 44:95–105.

TYLER, H.A., BROWN JR., K.S. & WILSON, K.H. 1994. Swallowtail butterflies of the Americas. A study in biological dynamics, ecological diversity, biossystematics and conservation. Scientific Publishers, Gainesville.

UEHARA-PRADO, M., BROWN JR., K.S. & FREITAS, A.V.L. 2005. Biological traits of frugivorous butterflies in a fragmented and a continuous landscape in the South Brazilian Atlantic Forest. J. Lepid. Soc. 59(2):96–106.

URBAN, T. 2002. Parque Nacional do Iguaçu: Caminho Aberto para a Vida. Rede Nacional Pró-Unidades de Conservação, Rede Verde de Informações Ambientais, Curitiba.

URICH, F.C. & EMMEL, T.C. 1991. Life histories of Neotropical butterflies from Trinidad 5. *Dynastor darius darius* (Lepidoptera: Nymphalidae: Brassolinae). Trop. Lep. 2(2):145–149.

WAHLBERG, N., LENEVEU, J., KODANDARAMAIAH, U., PEÑA, C., NYLIN, S., FREITAS, A.V.L., & BROWER, A.V.Z. 2009. Nymphalid butterflies diversify following near demise at the Cretaceous/Tertiary boundary. Proc. R. Soc. London, Ser. B 276(1677):4295–4302.

WARREN, A.D., DAVIS, K.J., STANGELAND, E.M., PELHAM, J.P., WILLMOTT, K.R. & GRISHIN, N.V. 2016. Illustrated Lists of American Butterflies. http://www.butterfliesofamerica.com (last access on 12/05/2022)

WHITTAKER, R.J., ARAÚJO, M.B., JEPSON, P.R., LADLE, R.J., WATSON, J.E.M. & WILLIS, K.J. 2005. Conservation Biogeography: assessment and prospect. Divers. Distrib. 11(1):3–23.

ZELLWEGER, F., ROTH, T., BUGMANN H. & BOLLMANN, K. 2017. Beta diversity of plants, birds and butterflies is close ly associated with climate and habitat structure. Global Ecol. Biogeogr. 26(8):898–906.

ZHANG, J., CONG, Q., SHEN, J. & GRISHIN, N.V. 2022. Taxonomic changes suggested by the genomic analysis of Hesperiidae (Lepidoptera). Insecta Mundi 921:1–135.

ZHANG, J., CONG, Q., SHEN, J., BROCKMANN, E. & GRISHIN, N.V. 2019. Genomes reveal drastic and recurrent phenotypic divergence in firetip skipper butterflies (Hesperiidae: Pyrrhopyginae). Proc. R. Soc. London, Ser. B. 286(1903):20190609.

ZIKÁN, J.F. & ZIKÁN, W. 1968. Inseto-fauna do Itatiaia e da Mantiqueira. III. Lepidoptera. Pesq. Agropec. Bras. 3:45–109.

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