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Nymphalidae, Papilionidae and Pieridae (Insecta: Lepidoptera: Rhopalocera) from the Acaraguá River basin, Misiones, Argentina.

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Abstract

Avigliano E., Schenone NF. 2015. Nymphalidae, Papilionidae and Pieridae (Insecta: Lepidoptera: Rhopalocera) from the Acaraguá River basin, Misiones, Argentina. Entomotropica 30(9): 84-91.

A checklist of Lepidoptera (families Nymphalidae, Papilionidae and Pieridae) was made in the subtropical mountainous forest within the Acaraguá River basin, situated in the southeastern part of Misiones province, in Argentina. In this area, a reforestation program with native tree species is currently underway, thus a biodiversity survey is of high importance. The specimens were captured with entomological nets and baited traps during seven campaigns; February, July, and November, 2011; January, April-May and August, 2012; and January, 2013. A total of 83 species (65 Nymphalidae, 9 Papilionidae, 9 Pieridae) from 54 genera (43 Nymphalidae, 6 Pieridae, 5 Papilionidae) were found.

Additional key words: Checklist, Lepidoptera, Misiones, subtropical forest.

Resumen

Avigliano E., Schenone NF. 2015. Nymphalidae, Papilionidae and Pieridae (Insecta: Lepidoptera: Rhopalocera) from the Acaraguá River basin, Misiones, Argentina. Entomotropica 30(9): 84-91.

Se presenta una lista de las especies de lepidópteros (Familias Nymphalidae, Papilionidae y Pieridae) de la selva subtropical montañosa de la cuenca del río Acaraguá, situada al sudeste de la provincia de Misiones, Argentina. En esta zona, actualmente está en curso un programa de reforestación con especies nativas de árboles por lo cual resulta de gran importancia un análisis de la biodiversidad. Los especímenes fueron capturados con redes y trampas entomológicas durante siete campañas de muestreo; febrero, julio y noviembre de 2011; enero, abril-mayo y agosto de 2012 y enero de 2013. Un total de 83 especies (65 Nymphalidae, 9 Papilionidae, 9 Pieridae) de 54 géneros (43 Nymphalidae, 6 Pieridae, 5 Papilionidae) fueron colectados.

Palabras clave adicionales: Lepidóptera, lista de especies, Misiones, selva subtropical.

Introduction

Over 150,000 species of lepidopterans have been recorded to date, making them one of the most diverse groups of insects (Canals 2003). Due to their specific relationship with the flora and the environmental variables, butterflies are excellent diversity indicators and a highly valuable parameter for conservation and environmental

monitoring (Sparrow et al. 1994, Lazzeri et al. 2011).

An emerging issue of global importance is the loss of biodiversity due to ecological modifications of natural habitats caused by anthropogenic perturbations. To preserve, and understand biodiversity it is essential to focus research on species richness and diversity in a delimited area (Morrone and Coscarón 1998). Many investigations showed that butterfly richness decreases as urban areas increase (Blair 2001, Brown and Freitas 2002, Lazzeri et al. 2011). Buildings and road constructions reduce natural areas and have an effect on the surroundings (Hardy and Dennis 1999).

In Argentina there are approximately 1 300 described species of Lepidoptera, and Misiones province harbors the highest species richness of about 800 species (Hayward 1973). However, in the southern forest of the Misiones province, an area exposed to an intense deforestation activity during the last decades, information about Lepidoptera species richness is scarce. Here we analyzed Lepidoptera species richness focusing on the Nympahidae, Papilionidae and Pieridae families in a fragmented forest area in the Acaraguá River basin, where is carried out a reforestation project with native plants, situated in the southeastern part of the Misiones province.

Materials and Methods

Study Site

The Misiones province is located in the Northeastern extreme of Argentina, and shares more geographic, edaphic, and climatological aspects with the south of Brazil than with its neighbor province, Corrientes. According to Chiozza (1981), the climate of Misiones is subtropical without marked dry periods. However, in the last three years dry summer seasons have been recorded. Along the central part of the province a mountain range with a south-north direction (180 km long and 700-800 m) regulates the hydrography of the region. Several rivers and streams emerge from the mountain and flow through a subtropical rain forest before joining the Paraná River to the west and the Uruguay River to the east. The study area is located among these central highlands surrounded by fragmented subtropical forests where thermal seasonality is evident but hydrological variation is not as predictable as temperature. The Ramos stream is a small mountain first order tributary of the Acaraguá River. Thirty-eight km downstream from its confluence with the Acaraguá chico stream, the Acaraguá River tributes its waters to the Uruguay River (Figure 1).

Data collection

Data was collected in several instances over the period of three years; February, July, and November 2011; January, April, May, and August 2012 and January 2013. The specimens were captured with entomological nets and with suspended traps (Figure 2) for lepidopterans using baits (fruit, sugar solutions, salt, urea).

Specimens were sacrificed and preserved according to standard procedures (Marques Luna 2005). After the preservation period, the specimens were hydrated in a humid chamber and mounted for determination at species level using specialized bibliography (Crespo et al. 1999, Brown and Freitas 2000, Canals 2003). The vouchers were deposited in the Fundación Bosques Nativos Argentinos Collection (CIAR).

Results and Discussion

For the three families under study, Nymphalidae, Palilionidae, and Pieridae, 83 species were found (Table 1).

At the species level, the Nymphalidae family was the one with the highest species richness with 41 genera, coinciding with other studies

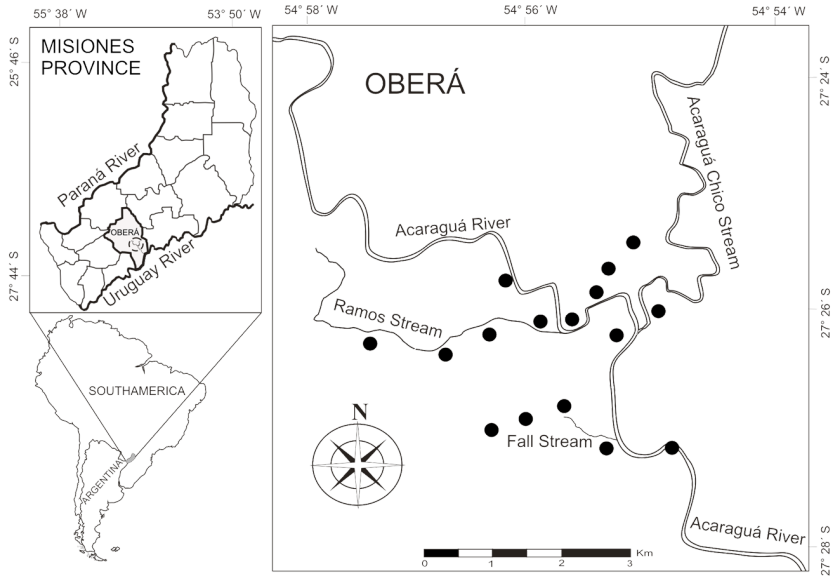

Figure 1. Study area. The black spots indicate the sampling sites.

Figure 2. Upper panel: Images of the sides of the Acaraguá River. Lower panel: Lepidoptera assemblage, Papilionidae and Pierdidae families (left). Lepidoptera trap (right).

Table 1. List of the collected species of Nymphalidae, Papilionidae and Pieridae families, in the Acaraguá basin.

Family	Subfamily:Tribe	Scientific name	ID
Nimphalidae	Apaturinae	*Doxocopa agathina vacuna* (Godart 1824)	CIAR-117
	Apaturinae	*Doxocopa laurentia laurentia* (Godart 1824)	CIAR-44
	Apaturinae	*Doxocopa zunilda zunilda* (Dodart 1824)	CIAR-41
	Biblidinae:Biblidini	*Biblis hyperia nectanabis* (Fruhstorfer 1909)	CIAR-2
	Biblidinae:Biblidini	*Callicore hydaspes* (Drury 1782)	CIAR-59
	Biblidinae:Biblidini	*Callicore pygas thamyras* (Menetries 1857)	CIAR-60
	Biblidinae:Biblidini	*Diaethria candrena candrena* (Godart 1824)	CIAR-63
	Biblidinae:Biblidini	*Diaethria clymena janeira* (Felder 1862)	CIAR-62
	Biblidinae:Biblidini	*Dynamine agacles agacles* (Dalman 1823)	CIAR-125
	Biblidinae:Biblidini	*Dynamine artemisia artemisia* (Fabricius 1793)	CIAR-103
	Biblidinae:Biblidini	*Dynamine coenus coenus* (Fabricius 1793)	CIAR-131
	Biblidinae:Biblidini	*Dynamine myrrhina* (Doubleday 1849)	CIAR-19
	Biblidinae:Biblidini	*Dynamine postverta postverta* (Cramer 1779)	CIAR-48
	Biblidinae:Biblidini	*Dynamine tithia tithia* (Hübner 1823)	CIAR-104
	Biblidinae:Biblidini	*Ectima thecla thecla* (Fabricius 1796)	CIAR-23
	Biblidinae:Biblidini	*Epiphile hubneri* (Hewitson 1861)	CIAR-6
	Biblidinae:Biblidini	*Eunica eburnea* (Fruhstofer 1907)	CIAR-18
	Biblidinae:Biblidini	*Haematera pyrame pyrame* (Hübner 1819)	CIAR-33
	Biblidinae:Biblidini	*Hamadryas amphione amphione* (Linnaeus 1758)	CIAR-11
	Biblidinae:Biblidini	*Hamadryas epinome* (Brown & Mielke 1992)	CIAR-10
	Biblidinae:Biblidini	*Hamadryas februa februa* (Hübner 1823)	CIAR-12
	Biblidinae:Biblidini	*Hamadryas feronia feronia* (Linnaeus 1758)	CIAR-35
	Biblidinae:Biblidini	*Paulogramma pyracmon pyracmon* (Godart 1824)	CIAR-61
	Biblidinae:Coeini	*Smyrna blomfildia blomfildia* (Fabricius 1781)	CIAR-45
	Biblidinae:Cyrestidini	*Marpesia petreus petreus* (Cramer 1776)	CIAR-107
	Biblidinae:Epiphilini	*Temenis laothoe santina* (Fruhstorfer 1907)	CIAR-40
	Biblidinae:Limenitidini	*Adelpha abia* (Hewiston 1850)	CIAR-100
	Biblidinae:Limenitidini	*Adelpha falcipennis* (Fruhstofer 1915)	CIAR-47
	Charaxinae	*Archaeoprepona demophoon demophoon* (Hübner 1814)	CIAR-127
	Charaxinae:Anaeini	*Memphis moruus coerulescens* (Prittwitz 1865)	CIAR-34
	Danainae:Danaini	*Danaus gilippus gilippus* (Cramer 1775)	CIAR-101
	Helicoiinae:Acraeini	*Actinote melanisans* (Oberthür 1917)	CIAR-5
	Helicoiinae:Heliconiini	*Agraulis vanillae maculosa* (Stichel 1908)	CIAR-46
	Helicoiinae:Heliconiini	*Dione juno suffumata* (Mielke 1992)	CIAR-9
	Helicoiinae:Heliconiini	*Dione moneta moneta* (Hübner 1825)	CIAR-102
	Helicoiinae:Heliconiini	*Dryas iulia alcionea* (Cramer 1779)	CIAR-8
	Helicoiinae:Heliconiini	*Euptoieta claudia hortensia* (Blanchard 1852)	CIAR-65
	Helicoiinae:Heliconiini	*Heliconius erato phyllis* (Fabricius 1775)	CIAR-43
	Helicoiinae:Heliconiini	*Manataria hercyna hercyna* (Hübner 1822)	CIAR-42
	Ithomiinae:Dicennini	*Dircenna dero celtina* (Burmeister 1878)	CIAR-3
	Ithomiinae:Mechanitini	*Mechanitis lysimnia lysimnia* (Fabricius 1793)	CIAR-67

Continue.....

Continue. Table 1. List of the collected species of Nymphalidae, Papilionidae and Pieridae families, in the Acaraguá basin.

Family	Subfamily:Tribe	Scientific name	ID
Nimphalidae	Libytheinae	*Libytheana carinenta carinenta* (Cramer 1777)	CIAR-106
	Morphinae:Brassolini	*Caligo illioneus pampeiro* (Fruhstofer 1904)	CIAR-30
	Morphinae:Brassolini	*Dynastor darius ictericus* (Stichel 1904)	CIAR-105
	Morphinae:Brassolini	*Eryphanis reevesii* (Doubleday 1849)	CIAR-69
	Morphinae:Brassolini	*Opsiphanes invirae amplificatus* (Stichel 1904)	CIAR-66
	Morphinae:Morphini	*Morpho achilles achilles* (Felder & Felder 1867)	CIAR-29
	Morphinae:Morphini	*Morpho aega aega* (Hübner 1822)	CIAR-108
	Nymphalinae:Kallimini	*Anartia amathea roeselia* (Eschscholtz 1821)	CIAR-50
	Nymphalinae:Kallimini	*Anartia jatrophae jatrophae* (Linnaeus 1763)	CIAR-129
	Nymphalinae:Kallimini	*Junonia evarete* (Cramer 1779)	CIAR-64
	Nymphalinae:Kallimini	*Siproeta epaphus trayja*(Hübner 1823)	CIAR-39
	Nymphalinae:Kallimini	*Siproeta stelenes meridionalis* (Linnaeus 1758)	CIAR-1
	Nymphalinae:Melitaeini	*Chlosyne lacinia saundersi* (Doubleday 1847)	CIAR-130
	Nymphalinae:Melitaeini	*Eresia lansdorfi* (Godart 1819)	CIAR-32
	Nymphalinae:Melitaeini	*Ortilia ithra* (Kirby 1900)	CIAR-110
	Nymphalinae:Melitaeini	*Ortilia orthia* (Hewitson 1864)	CIAR-27
	Nymphalinae:Melitaeini	*Ortilia velica durnfordi* (Hewitson 1864)	CIAR-109
	Nymphalinae:Melitaeini	*Tegosa claudina* (Eschscholtz 1821)	CIAR-111
	Nymphalinae:Melitaeini	*Tegosa orobia orobia* (Hewitson 1864)	CIAR-112
	Nymphalinae:Nymphalini	*Hypanartia lethe* (Fabricius 1793)	CIAR-7
	Nymphalinae:Nymphalini	*Vanessa myrinna* (Doubleday 1849)	CIAR-49
	Satyrinae:Euptychiini	*Hermeuptychia hermes* (Fabricius 1775)	CIAR-20
	Satyrinae:Euptychiini	*Pareuptychia summandosa* (Gosse 1880)	CIAR-28
	Satyrinae:Euptychiini	*Taygetis sylvia* (Bates 1866)	CIAR-51
Papilionidae	Papilioninae:Graphiini	*Protesilaus stenodesmus* (Rothschild & Jordan 1906)	CIAR-114
	Papilioninae:Papilionini	*Heraclides anchisiades capys* (Hübner 1809)	CIAR-17
	Papilioninae:Papilionini	*Heraclides androgeus laodocus* (Fabricius 1793)	CIAR-31
	Papilioninae:Papilionini	*Heraclides astyalus astyalus* (Godart 1819)	CIAR-54
	Papilioninae:Papilionini	*Heraclides hectorides* (Esper 1794)	CIAR-52
	Papilioninae:Papilionini	*Heraclides thoas brasiliensis* (Rothschild & Jordan 1906)	CIAR-53
	Papilioninae:Papilionini	*Pterourus menatius cleotas* (Gray 1832)	CIAR-36
	Papilioninae:Troidini	*Battus polydamas polydamas* (Linnaeus 1758)	CIAR-55
	Papilioninae:Troidini	*Parides bunichus perrhebus* (Boisduval 1836)	CIAR-113
Pieridae	Coliadinae	*Aphrissa statira statira* (Cramer 1777)	CIAR-115
	Coliadinae	*Eurema deva deva* (Doubleday 1847)	CIAR-131
	Coliadinae	*Phoebis argante argante* (Fabricius 1777)	CIAR-57
	Coliadinae	*Phoebis neocypris neocypris* (Hübner 1823)	CIAR-38
	Coliadinae	*Phoebis philea philea* (Linnaeus 1763)	CIAR-58
	Coliadinae	*Phoebis sennae marcellina* (Cramer 1777)	CIAR-116
	Coliadinae	*Rhabdodryas trite banksi* (Breyer 1939)	CIAR-120
	Dismorphiinae	*Pseudopieris nehemia nehemia* (Lamas 1979)	CIAR-37
	Pierinae	*Pieriballia viardi molione* (Fruhstofer 1908)	CIAR-56

in South America (Iserhard and Romanowski 2004, Bar et al. 2008, Lazzeri et al. 2011; Table 2).

At the genus level, the Nymphalidae family showed highest species richness with 43 genera. For the Papilionidae and Pieridae families, 5 and 6 genera were registered, respectively (Table 2). The genera with more species were *Heraclides* (6), *Dynamine* (6), *Hamadryas* (4) y *Phoebis* (4).

This is the first study of butterflies diversity in the mountains of the central area of Misiones province. The number of species found for the Nymphalidae, Palilionidae and Pieridae families represent about 35 % of the species of the same families reported in the Iguazú National Park, located in the northeastern part of Misiones. This park has the highest Lepidoptera diversity and species richness of Argentina (Nuñes Bustos 2009). However, all species found in this study were previously reported for the Iguazú National Park (Nuñes Bustos 2009).

In Iguazú park were reported several species which are consider good indicators of pristine environments (not strongly altered by human activity) as *Glennia pylotis* (Godart), *Alesa prema* (Godart), *Narope cyllarus* (Westwood), *Manataria hercyna* (Hübner), *Taygetis acuta* (Weymer), *Hamadryas fornax* (Hübner), *Diaethria eluina* (Hewitson), *Adelpha lycorias* (Godart), *Passova passova practa* (Evans) and *Ochropyge ruficauda* (Hayward) (Nuñes Bustos 2009). We have not captured or observed any of the species mentioned above in the Acaraguá basin. This results shows clearly the fragmentation and partial degradation study site.

In this work, the number of species of the families Pieridae and Palilionidae was similar. However, it has been reported that the number of species in the family Pieridae is greater than Palilionidae elsewhere in the same ecoregion as in Yacutinga (Misiones, Argentina), Curitiba (Paraná, Brazil), Santa Teresa (Holy Spirit , Brazil), Morro do Diabo (São Paulo, Brazil) and Joinville (Santa Catharina, Brazil) (see Nuñes Bustos 2009). This could be due to the altitude and complex topography of the study area as it was already reported by Brown and Freitas (2000b) which found a strong correlation between the riches of the family Pieridae. Furthermore, it is likely that richness was underestimated due to the inaccessibility to some areas, the thick forest, and the geography.

The geographical divisions of the butterfly fauna correspond to vegetation and climatic subunits (Brown and Freitas 2000b). In the study area, a reforestation with native plants it is being done since 2010. Currently, about 100,000 seedlings of different species as *Apuleia leiocarpa* (Grapia), *Ateleia glazioveana* (Timboó), *Cordia americana* (Guayubira), *Diospyros inconstans* (Cocú), *Surinam cherry* (Pitanga), *Eugenia involucrata* (Cerela), *Handroanthus heptaphyllus* (Lapacho rosa), *Peltophorum dubium* (Cañafistola), have been planted among others, spreaded over 650 hectares of mountainous rainforest.

In the Atlantic forest from southeastern Brazil, the families Papilionidae and Pieridae are strongly correlated with connectivity, while some Nymphalidae as Brassolinae are correlated with the vegetation natural mosaic (e.g. patches of bamboo, typical in the region of study), and Morphinae with vegetation category. Ithomiinae and Satyrinae (Nymphalidae), are good indicators of intact heterogeneous forest systems. Some Nymphalidae as Ithomiinae, Satyrinae and Charaxinae are very sensitive to disturbance and pollution, and their disappearance may be among the best indicators of these effects in natural systems (Brown and Freitas 2000b). The use of any of these groups in monitoring natural environments would provide rapid information on directional changes in the vegetation (Brown and Freitas 2000b).

In this sense, considering the reforestation project and an increased connectivity between patches of vegetation, we expect a change in

Table 2. Number of genera and species per family.

	Genera	Species	Specific percentage
Nymphalidae	43	65	78 %
Palilionidae	5	9	11 %
Pieridae	6	9	11 %

the riches of the studied families. In particular, an increase in the riches of Papilionidae and Pieridae and some Nymphalidae. On the other hand, it is possible a decrease of the riches of some groups associated with intact heterogeneous environments, as Ithomiinae and Satyrinae.

Conclusions

A high diversity of Lepidoptera was found in the Acaraguá River basin. A total of 83 species from 54 genera that represent about 35 % of the species of the most diverse region of Argentina. This shows the importance of the preservation of the Acaraguá basin Lepidoptera diversity. The current reforestation project should increase connectivity of patches of vegetation, resulting in an increase in the wealth of Lepidoptera.

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