

Butterflies (Lepidoptera: Papilionoidea and Hesperioidea) of the Parque Ecológico João Vasconcelos Sobrinho, Caruaru, Pernambuco, Brazil

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Abstract: Comprising a natural reserve with 359 ha of “montane forest” inserted on the Brazilian semi-arid, the Parque Ecológico João Vasconcelos Sobrinho (PEJVS), locally known as “Brejo dos Cavalos” is currently under high anthropogenic pressure. A list of 197 species of butterflies belonging to six families is presented, being 59 species of Hesperidae, 4 of Papilionidae, 18 of Pieridae, 17 of Lycaenidae, 12 of Riodinidae and 87 of Nymphalidae. The butterfly community was composed mainly by widespread species commonly found in open habitats. There were also many species typical of forested areas such as *Scada karschina delicata* Talbot, 1932 (Danainae: Ithomiini), which is an endangered butterfly.

Keywords: inventory, conservation, species richness, semi-arid vegetation.

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Resumo: O Parque Ecológico João Vasconcelos Sobrinho (PEJVS), conhecido localmente como Brejo dos Cavalos, é um fragmento de “mata serrana” de 359 ha inserido no semi-árido brasileiro, e que atualmente encontra-se sobre alta pressão antrópica. Uma lista com 197 espécies de borboletas pertencentes a seis famílias é apresentada, sendo 59 espécies de Hesperidae, 4 de Papilionidae, 18 de Pieridae, 17 de Lycaenidae, 12 de Riodinidae e 87 de Nymphalidae. A fauna é composta principalmente de espécies de áreas abertas e com ampla distribuição geográfica. Entretanto, diversas espécies típicas de áreas florestadas também estão presentes, uma delas, *Scada karschina delicata* Talbot, 1932 (Danainae: Ithomiini), é uma espécie de borboleta criticamente ameaçada de extinção.

Palavras-chave: inventário, conservação, riqueza de espécies, semi-árido.

Introduction

The butterfly fauna of Northeastern Brazil remains largely unknown (Santos et al. 2008), and except for some recent published inventories (Garcia et al. 1990, Nobre et al. 2008, Vasconcelos et al. 2009), most available lists are quite old (Bates 1867, Rocha 1908, 1936, 1954, May 1924, D'Almeida 1935, Cardoso 1949, Alvarenga 1962, Kesselring & Ebert 1982). Of the above papers, three of them are complete enough to provide a reasonable picture of the butterfly assemblages of Northeastern Brazil. Two of these inventories were carried out in humid areas of Atlantic Forest for more than five years. Cardoso (1949) reported 218 species of butterflies in urban areas of Maceió, state of Alagoas. Additionally, Kesselring & Ebert (1982) surveyed an urban fragment in João Pessoa, state of Paraíba, and recorded 291 species. The first published inventory on the butterfly community of the northeastern semi-arid revealed a richness of 121 species from the Parque Nacional do Catimbau (PNC), state of Pernambuco, Brazil (Nobre et al. 2008).

The semi-arid region of Brazil is one of the poorest known biomes concerning butterflies (Santos et al. 2008). It includes several sites of humid forests, locally known as “brejos”, along the windward slopes of some plateaus and mountains above 500 m, receiving more than 1200 mm of annual rainfall (Andrade-Lima 1982, Prado 2003). These humid forests are of extreme biological relevance and are considered priority for conservation (Tabarelli & Santos 2004). For example, some of these “brejos” harbor the last known populations of threatened butterfly species from Northeastern Brazil: the endangered *Morpho (Grasseia) menelaus eberti* Fischer, 1962 and *Morpho (Pessonnia) epistrophus nikolajewna* Weber, 1951 (Nymphalidae: Satyrinae: Morphini), and the critically endangered *Scada karschina delicata* Talbot, 1932 (Nymphalidae: Danainae: Ithomiini) (Machado et al. 2008, Freitas & Marini-Filho 2011).

The Parque Ecológico João Vasconcelos Sobrinho (PEJVS), also known as “Brejo dos Cavalos”, has one of the most important “brejos” areas in the semi-arid of Pernambuco (Braga et al. 2002). Although the PEJVS is a protected area, this park is nonetheless impacted by human activities, such as the replacement of forest areas for irrigated agriculture of *Sechium edule* (Jacq.) Sw (Cucurbitaceae) (the chayote) that increases the consumption of water resources, in addition to clay and silt exploitation (Braga et al. 2002, Cabral et al. 2004). In this context, the present paper provides the first list of butterflies recorded in the PEJVS. It is expected that this list may offer subsidies for future conservation strategies in a region with accelerated destruction.

Material and Methods

The study was conducted in the PEJVS, located in Serra dos Cavalos, municipality of Caruaru, State of Pernambuco (8° 22' 09" S, 36° 05' 00" W) (Figure 1). The PEJVS has 359 ha and is part of the altitude wetlands of the states of Pernambuco and Paraíba. It consists of scattered montane semideciduous forests in a semi-arid region comprised within the Brazilian Atlantic Forest domain (Braga et al. 2002, Cabral et al. 2004, Tabarelli & Santos 2004).

The PEJVS is an example of environmental protection in the region, representing one of the most significant remnants of Atlantic Forest in the state of Pernambuco. The area comprises three major reservoirs used for human consumption (Braga et al. 2002, Cabral et al. 2004). The locality chosen for the butterfly inventory is a well-preserved forest fragment with an altitude of approximately 840 m, and it is located between the two largest dams of the park (8° 21' 45.36" S, 36° 02' 11.31" W).

Butterflies were sampled between September to December 2007 and 2008 (dry season), and between February to May 2011 (wet season), totaling 12 field trips. Fieldwork was conducted from 9:00 AM to 3:00 PM, during three days per month, with a total sampling effort of 216 hours. The samplings were carried out by one or two person along all habitats. The butterflies were caught with entomological nets and 10 traps baited with a fermented mixture of banana and sugar cane juice placed in forest gaps.

The collected material is deposited at the entomological collections of the following institutions: Universidade Federal de Pernambuco, Recife, and Universidade Federal do Paraná, Curitiba, Brazil. Nomenclature follows Lamas (2004), except for the suprageneric categories of Nymphalidae modified after Wahlberg et al. (2009).

Results and Discussion

A total of 197 butterfly species were recorded in the PEJVS. Of these, 138 (70%) were in the Papilionoidea and 59 (30%) in the Hesperioidea, with the following distribution: Hesperioidea (59 spp., 30% of the total), Papilionidae (4 spp., 2%), Pieridae (18 spp., 9%), Lycaenidae (17 spp., 9%), Riodinidae (12 spp., 6%), and Nymphalidae (87 spp., 44%) (Appendix 1). The butterfly fauna was dominated by species commonly found in open areas and widely distributed in Brazil, but also includes species more frequent in humid forests.

The tribe Ithomiini (Danainae) was represented by 14 species, and includes some species typical of closed humid forests, such



Figure 1. Two views of the “Parque Ecológico João Vasconcelos Sobrinho”. Top, general view of the study area showing the different vegetal formations; bottom, close view of the habitats nearby an artificial lake (Açude Guilherme de Azevedo).

as the clearwings *Pseudoscada erruca* (Hewitson, 1855) and *Heterosais edessa* (Hewitson, [1855]), the yellow transparent *Napeogenes inachia* ssp. and the critically endangered *Scada karschina delicata* Talbot, 1932 (Freitas & Brown Junior 2008), abundant and locally common in February 2006 at the Frei Caneca Particular Reserve, Jaqueira, Pernambuco. Although the butterfly fauna of the PEJVS is dominated by widespread species of secondary habitats, the study site is one of the few places where the critically endangered ithomiine *S. karschina delicata* can be found. Four specimens were recorded between September and October 2007, with an additional specimen found in the collection of the Universidade Federal de Pernambuco. This subspecies is endemic to Pernambuco (*sensu* Brown Junior 1979, 1987), and until recently it was known only from a single locality near the border of the states of Pernambuco and Paraíba (Brown Junior 1979). With the present record, this increases to six the number of localities where this taxon is present (see also Freitas 2003, 2004, Freitas & Brown Junior 2005, 2008, Machado et al. 2008), increasing the opportunities for conservation of this butterfly.

Heliconiinae was represented by eight taxa of wide distribution in all Atlantic Forest, and by two endemic taxa to the forests of Northeastern Brazil, namely *Heliconius ethilla flavomaculatus* Weymer, 1894 (Heliconiini) and *Actinote pellenea aulodea* Oberthür, 1917 (Acraeini). The record of the latter is quite interesting since this taxon has not been reported after 1971, from the municipality of Paulista, Pernambuco (Paluch 2006). The present study recorded a vigorous population of *A. pellenea aulodea* in the study site, with the adults flying between October and November.

Only seven common species of the tribes Morphini and Brassolini were recorded in the study site. The endangered *Morpho menelaus eberti* was not found in PEJVS, but additional efforts are necessary, mainly in fall and winter, to confirm whether the species occur or not locally. The subspecies was very common in February 2006 at the RPPN Frei Caneca, Jaqueira, Pernambuco. It probably has only one generation each year (O. Mielke, pers. obs.). *Morpho (Morpho) helenor anakreon* Fruhstorfer, 1910 was common in the area between September and February.

All remaining Nymphalidae subfamilies were represented by species widely distributed in different Brazilian Biomes (from South Brazil to Amazonian borders). However, additional efforts may reveal a richer fauna of Nymphalidae, especially in the tribe Satyrini (Satyrinae), and in the genus *Adelpha* Hübner, [1819] (Limenitidinae).

Only four species of Papilionidae were recorded. Three of them were already expected for the area: *Heraclides anchisiades capys* (Hübner, [1809]), *Heraclides thoas brasiliensis* (Rothschild & Jordan, 1906) and *Battus polydamas polydamas* (Linnaeus, 1758), because they are very common and occur throughout the Brazilian coast (Tyler et al. 1994), and also in the Caatinga (Nobre et al. 2008). However, the occurrence of *Parides zacyanthus polymetus* (Godart, 1819) in the area was remarkable. In all its known distribution, *P. zacyanthus* (Fabricius, 1793) is restricted to the coastal plains (in the “restingas” and lowland forests), not being known to occur in the countryside forests (Tyler et al. 1994). The presence of this butterfly in the study site can be considered relictual, and shows the importance of monitoring populations of Atlantic Forest species in the interior of the semi-arid domain (about 100 km far from the coast). Similarly, in two other localities of northeastern Brazil, Lençóis, Bahia (300 km far from the coast) and Cruz do Espírito Santo, Paraíba (30 km far from the coast), *P. zacyanthus* may be moving towards countryside habitats (O. Mielke pers. obs.).

Of the 18 recorded Pieridae, most of them are typical of open secondary forests, grasslands and more disturbed areas (Brown Junior 1992). Only *Leucidia elvina* (Godart,

1819) (Coliadinae), *Dismorphia amphione astynome* (Dalman, 1823), and *Enantia lina versicolora* (Fruhstorfer, 1912) (Dismorphiinae) were collected in transects inside the forest. The presence of two sympatric subspecies of *Melete lycimnia* (Cramer, 1777) (Pierinae: Pierini) reveals an unusual taxonomic situation. The two subspecies were observed flying at the same time in the PEJVS (also observed by OHHM and MMC on 8-II-2006 at the same locality). The event can only be elucidated by a review on the status of all 16 subspecies (Lamas 2004).

The HesperIIDae and Lycaenidae were undersampled, and we predict that these two families could be represented by twice as many species as recorded here. Typically, HesperIIDae is the dominant family in most well sampled Brazilian sites (Mielke 1995, Brown Junior 2005, Morais et al. 2007, Francini et al. 2011). In the present study, Nymphalidae was the richest family, suggesting that additional efforts may reveal a different structure for the butterfly assemblage of this area. This apparently bias towards Nymphalidae could be easily noted by considering the low species richness for HesperIIDae in the list, much lower than the numbers reported for other forest sites in Northeastern Brazil (Cardoso 1949, Kesselring & Ebert 1982).

Considering Nymphalidae as a surrogate (25-29%) of the total butterfly fauna (Brown Junior & Freitas 2000), the total richness in the area could reach 290 to 350 species, which is higher than that recorded for Maceió (218 species), and equivalent to the total richness of João Pessoa (291) (Cardoso 1949, Kesselring & Ebert 1982, Brown Junior & Freitas 2000).

1. Conservation perspectives

The area of the PEJVS is important not only for being part of a system of vanishing wet forests of the semi-arid region, but also because it is one of the few remnants of Atlantic Forest in Northeastern Brazil, a region with more than 95% of its original vegetation destroyed by human activities (Galindo-Leal & Câmara 2003, Tabarelli et al. 2005). Different approaches for conservation of the “brejos” ecosystems (e.g. PEJVS) have been proposed/presented in recent publications, including public policies and local economy (Braga 2004, Theulen 2004, Tabarelli & Santos 2004). Conservation strategies should be developed in conjunction with public entities, such as the Environment Secretariat of Caruaru, and non-governmental organizations responsible by the PEJVS. Priority actions for the PEJVS should include the proposition of a sustainable management plan focused on rehabilitation of degraded areas, including ecological monitoring and management of the surrounding environments so the area can keep sustaining health forests in the next decades.

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Appendix

Appendix I. Butterflies (Papilionoidea and Hesperioidea) from the “Parque Ecológico João Vasconcelos Sobrinho”, Caruaru, Pernambuco, Brazil. Number of species are provided within parenthesis for each major taxon.

PAPILIONOIDEA(138)

Papilionidae(4)

Papilioninae (4)

Troidini (2)

Battus polydamas polydamas (Linnaeus, 1758)

Parides zacynthus polymetus (Godart, 1819)

Papilionini (2)

Heraclides anchisiades capys (Hübner, [1809])

Heraclides thoas brasiliensis (Rothschild & Jordan, 1906)

Pieridae (18)

Dismorphiinae (2)

Dismorphia amphione astynome (Dalman, 1823)

Enantia lina versicolora (Fruhstorfer, 1912)

Coliadinae (11)

Anteos clorinde (Godart, [1824])

Anteos menippe (Hübner, [1818])

Aphrissa statira statira (Cramer, 1777)

Eurema agave pallida (Chavannes, 1850)

Eurema albula albula (Cramer, 1775)

Eurema elathea flavescens (Chavannes, 1850)

Eurema phiale paula (Röber, 1909)

Leucidia elvina (Godart, 1819)

Phoebis sennae marcellina (Cramer, 1777)

Phoebis philea philea (Linnaeus, 1763)

Pyrisitia nise tenella (Boisduval, 1836)

Pierinae (5)

Ascia monuste orseis (Godart, 1819)

Hesperocharis anguitia anguitia (Godart, 1819)

Itaballia demophile nimietes (Fruhstorfer, 1907)

Melete lycimnia flippantha (Fabricius, 1793)

Melete lycimnia phazania Frustorfer, 1907

Lycaenidae (17)

Polyommatainae (3)

Hemiargus hanno hanno (Stoll, 1790)

Leptotes cassius cassius (Cramer, 1775)

Zizula cyna (Edwards, 1881)

Theclinae (14)

Allosmaitia strophius (Godart, [1824])

Arawacus euptychia (Draudt, 1920)

Calycopis caulonia (Hewitson, 1877)

Electrostrymon endymion (Fabricius, 1775)

Appendix I. Continued...

Parrhasius polibetes (Stoll, 1781)
Rekoa palegon (Cramer, 1780)
Strymon astiocha (Prittwitz, 1865)
Strymon bubastus (Stoll, 1780)
Strymon crambusa (Hewitson, 1874)
Strymon mulucha (Hewitson, 1867)
Strymon rufofusca (Hewitson, 1877)
Strymon ziba (Hewitson, 1868)
Theritas hemon (Cramer, 1775)
Ziegleria syllis (Godman & Salvin, 1887)

Riodinidae (12)

Mesosemiini (3)

Ionotus alector (Geyer, 1837)
Peropthalma tullius (Fabricius, 1787)
Voltinia sp.

Eurybiini (1)

Eurybia pergaea (Geyer, 1832)

Riodinini (5)

Baeotis hisbon (Cramer, 1775)
Calephelis braziliensis McAlpine, 1971
Melanis smithiae (Westwood, 1851)
Melanis xenia xenia (Hewitson, [1853])
Parcella amarynthina (C. Felder & R. Felder, 1865)

Nymphidiini (2)

Aricoris campestris (H.W. Bates, 1868)
Synargis calyce (C. Felder & R. Felder, 1862)
 Incertae sedis (1)
Emesis diogenia Prittwitz, 1865

Nymphalidae (87)

Danainae (18)

Danaini (4)

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

Ithomiini (14)

Callithomia lenea (Cramer, 1779)
Dircenna dero celtina Burmeister, 1878
Episcada clausina (Hewitson, 1876)
Episcada hymenaea (Prittwitz, 1865)
Heterosais edessa (Hewitson, [1855])
Hypothyris ninonia daetina (Weymer, 1899)
Ithomia agnosia Hewitson, [1855]
Ithomia drymo Hübner, 1816

Appendix I. Continued...

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- Mechanitis lysimnia nesaea* Hübner, [1820]
Methona singularis (Staudinger, [1884])
Napeogenes inachia ssp.
Pseudoscada erruca (Hewitson, 1855)
Scada karschina delicata Talbot, 1932
Scada reckia reckia (Hübner, [1808])
- Satyrinae (23)
- Morphini (1)
- Morpho helenor anakreon* Fruhstorfer, 1910
- Brassolini (6)
- Caligo illioneus illioneus* (Cramer, 1775)
Caligo teucer ssp.
Eryphanis automedon (Cramer, 1775)
Eryphanis reevesii reevesii (Doubleday, [1849])
Opsiphanes cassiae crameri C. Felder & R. Felder, 1862
Opsiphanes invirae remoliatus Fruhstorfer, 1907
- Haeterini (1)
- Pierella lamia* ssp.
- Satyrini (15)
- Chloreuptychia arnaca* (Fabricius, 1776)
Cissia myncea (Cramer, 1780)
Hermeuptychia atalanta (Butler, 1867)
Magneuptychia libye (Linnaeus, 1767)
Pareuptychia ocirrhoe interjecta (D' Almeida, 1952)
Pareuptychia hesionides Forster, 1964
Paryphthimoides poltys (Prittowitz, 1865)
Pharneuptychia sp.
Taygetis laches laches (Fabricius, 1793)
Taygetis sosis Hopffer, 1874
Taygetis virgilia (Cramer, 1776)
Yphthimoides ochracea (Butler, 1867)
Yphthimoides renata (Stoll, 1780)
Yphthimoides affinis (Butler, 1867)
Yphthimoides manasses (C. Felder & R. Felder, 1867)
- Charaxinae (7)
- Aeini (4)
- Fountainea ryphea phidile* (Geyer, 1837)
Memphis acidalia (Hübner, [1819])
Memphis leonida editha (Comstock, 1961)
Zaretis sp.
- Preponini (3)
- Archaeoprepona amphimachus amphimachus* (Fabricius, 1775)
Archaeoprepona demophon thalpius (Hübner, [1814])
Archaeoprepona demophoon antimache (Hübner, [1819])
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Appendix I. Continued...

Bibliidinae (17)

- Biblis hyperia* (Cramer, 1779)
Callicore pygas cyllene (Doubleday, [1847])
Diaethria clymena janeira (C. Felder, 1862)
Dynamine agacles agacles (Dalman, 1823)
Dynamine athemon athemaena (Hübner, [1824])
Dynamine postverta postverta (Cramer, 1779)
Dynamine tithia tithia (Hübner, [1823])
Ectima thecla thecla (Fabricius, 1796)
Hamadryas amphinome amphinome (Linnaeus, 1767)
Hamadryas arete (Doubleday, 1847)
Hamadryas epinome (C. Felder & R. Felder, 1867)
Hamadryas februa februa (Hübner, [1823])
Hamadryas feronia feronia (Linnaeus, 1758)
Hamadryas iphthime iphthime (Bates, 1864)
Mestra dorcas hypermestra Hübner, [1825]
Myscelia orsis (Drury, 1782)
Pyrhogyra neaerea susarion Fruhstorfer, 1912

Cyrestinae (1)

- Marpesia chiron marius* (Cramer, 1779)

Nymphalinae (10)

Coeini (2)

- Colobura dirce dirce* (Linnaeus, 1758)
Historis odius dious Lamas, 1995

Nymphalini (1)

- Vanessa myrinna* (Doubleday, 1849)

Kallimini (5)

- Anartia amathea* ssp.
Anartia jatrophae jatrophae (Linnaeus, 1763)
Hypolimnas misippus (Linnaeus, 1764)
Junonia evarete evarete (Cramer, 1779)
Siproeta stelenes meridionalis (Fruhstorfer, 1909)

Melitaeini (2)

- Ortilia ithra* (W.F. Kirby, 1900)
Tegosa claudina (Eschscholtz, 1821)

Limenitidinae (1)

- Adelpha cytherea aea* (C.Felder & R.Felder, 1867)

Heliconiinae (10)

Argynnini (1)

- Euptoieta hegesia meridiania* Stichel, 1938

Acraeini (1)

- Actinote pellenea auloeda* Oberthür, 1917

Heliconiini (8)

- Agraulis vanillae maculosa* (Stichel, [1908])

Appendix I. Continued...

Dryadula phaetusa (Linnaeus, 1758)
Dryas iulia alcionea (Cramer, 1779)
Dione juno juno (Cramer, 1779)
Eueides isabella dianasa (Hübner, [1806])
Heliconius erato phyllis (Fabricius, 1775)
Heliconius ethilla flavomaculatus Weymer, 1894
Heliconius sara apseudes (Hübner, [1813])

HESPERIOIDEA- HesperIIDae (59)

Pyrginae (32)

Eudamini (17)

Aguna asander asander (Hewitson, 1867)
Astraptes anaphus anaphus (Cramer, 1777)
Astraptes fulgerator fulgerator (Walch, 1775)
Autochton neis (Geyer, 1832)
Autochton zarex (Hübner, 1818)
Celaenorrhinus sp.
Chioides catillus catillus (Cramer, 1779)
Phanus australis L. D. Miller, 1965
Urbanus dorantes dorantes (Stoll, 1790)
Urbanus doryssus doryssus (Swainson, 1831)
Urbanus procne (Plötz, 1880)
Urbanus pronta Evans, 1952
Urbanus proteus proteus (Linnaeus, 1758)
Urbanus simplicius (Stoll, 1790)
Urbanus tanna Evans, 1952
Urbanus teleus (Hübner, 1821)
Urbanus velinus (Plötz, 1880)

Pyrgini (15)

Anisochoria pedalioidina extincta Hayward, 1933
Cogia calchas (Herrich-Schäffer, 1869)
Ebrietas anacreon anacreon (Staudinger, 1876)
Gorgythion begga begga (Prittwitz, 1868)
Helias phalaenoides palpalis (Latreille, [1824])
Heliopetes alana (Reakirt, 1868)
Heliopetes arsalte (Linnaeus, 1758)
Heliopetes macaira orbiger (Mabille, 1888)
Heliopetes omrina (Butler, 1870)
Nisoniades macarius (Herrich-Schäffer, 1870)
Nisoniades sp.
Pyrgus orcus (Stoll, 1780)
Quadrus cerialis (Stoll, 1782)
Timochares trifasciata trifasciata (Hewitson, 1868)
Viola violella (Mabille, 1898)

Appendix I. Continued...

Hesperiinae (27)

- Arotis sirene* Mabille, 1904
Callimormus corus Bell, 1941
Calpodus ethlius (Stoll, 1782)
Corticea corticea (Plötz, 1882)
Cymaenes laureolus loxa Evans, 1955
Cynea diluta (Herrich-Schäffer, 1869)
Hylephila phyleus phyleus (Drury, 1773)
Lucida sp.
Mnasilus allubita (Butler, 1877)
Nastra chao (Mabille, 1898)
Neoxeniades braesia aqua Evans, 1955
Nyctelius nyctelius nyctelius (Latreille, [1824])
Panoquina lucas (Fabricius, 1793)
Perichares philetus adela (Hewitson, 1867)
Polites vibex catilina (Plötz, 1886)
Pompeius amblyspila (Mabille, 1898)
Pompeius pompeius (Latreille, [1824])
Quinta cannae (Herrich-Schäffer, 1869)
Saliana longirostris (Sepp, [1840])
Saliana triangularis (Kaye, 1914)
Synapte malitiosa equa Evans, 1955
Thracides phidon (Cramer, 1779)
Vehilius stictomenes stictomenes (Butler, 1877)
Vettius artona (Hewitson, 1868)
Vettius phyllus prona Evans, 1955
Wallengrenia otho ssp.
Wallengrenia premnas (Wallengren, 1860)
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