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BUTTERFLIES FROM THE UBERLÂNDIA REGION, CENTRAL BRAZIL: SPECIES LIST AND BIOLOGICAL COMMENTS

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ABSTRACT

A total of 251 butterfly species were recorded in Uberlândia region, with collecting concentrated mainly in forest areas. Aspects of geographic distribution of some Ithomiinae, as well as interactions of both adults and immatures with plants, and reproduction periods for the more abundant species are discussed. Collections in open, riverside, and wetland areas, as well as the use of bait, should substantially increase the number of species.

Key words: butterfly, Lepidoptera, Ithomiinae, diversity, cerrado, mesophytic forest.

RESUMO

Borboletas da região de Uberlândia, Brasil Central: lista de espécies e comentários biológicos

Foram registradas 251 espécies de borboletas em Uberlândia, sendo a ênfase da coleta em áreas de mata. São abordados aspectos da distribuição geográfica de alguns Ithomiinae, bem como as interações de adultos e imaturos com plantas e períodos de reprodução das espécies mais abundantes. Coletas em ambientes abertos, beira de rio, brejos e a utilização de iscas aumentarão substancialmente o número de espécies.

Palavras-chave: borboleta, Lepidoptera, Ithomiinae, diversidade, cerrado, mata mesófila

INTRODUCTION

Butterflies are considered to be the most beautiful insects and represent archetypes of feelings such as renewal or rebirth. These insects are members of one of the largest animal orders (Lepidoptera), and maintain close relationships with plants: caterpillars are herbivores, and adults of most species are potential pollinators. “Disgusting” caterpillars become butterflies. Beautiful and fluttering, they are also exposed and static, like souvenirs. They are attractive, but also toxic, as predators like birds and spiders know well. They are light, but their majestic flight disguises an inebriate state induced by nectar or fermented fruits. Butterflies are, therefore, ambiguous beings and objects of investigation in a wide range of ecological and evolutionary studies. Mimicry and camouflage,

insect-plant interactions (herbivory, pollination, coevolution, and the chemical components involved), migration, speciation, extinction, population genetic variability, and biogeographic patterns are examples of subjects concerning which relevant work has involved butterflies.

In the final decades of the twentieth century, there has been a strong interest in conservation of natural habitats. One of the criteria used for inventory of environmental preservation areas is taxonomic biodiversity (number of species), and butterflies help to quantify the environmental quality of a determined area, since they are excellent indicators for the choice of conservation units (see Brown & Brown, 1992; Brown, 1996a,b,c, 1997; New *et al.*, 1995; Solis & Pogue, 1999).

The importance of a regional species list, in the case of butterflies, is that it provides, explicitly

or not, information about genetic and ecological diversity as well as taxonomic diversity.

Around 3300 butterfly species occur in Brazil (Brown, 1996b). Six hundred twenty-eight butterfly species have been collected from the Brazilian Central Plateau (Brown & Mielke, 1967a,b). However, the present total number known is around one thousand (K. Brown, pers. comm.).

From the list compiled by Brown & Mielke (1967a,b), only 2 species from Uberlândia are included, plus 1 collected in Uberlândia and Araguari and 42 in Araguari, a city approximately 30 km to the north of Uberlândia. All of them were collected at the beginning of the 1930s by Roberto Spitz and deposited in German and Austrian museums, with some taxa represented by specimens in Brazilian museums (Mielke & Casagrande, 1988).

The objective of this study was to make a preliminary inventory, through field collections and bibliographic review, of the butterfly species occurring in the Uberlândia region. Ecological and biogeographic aspects for the more abundant forest species are discussed.

MATERIALS AND METHODS

Study area

The city of Uberlândia (18°57'S, 48°12'W, altitude around 800 m) is located in the cerrado region, at the southern limits of the Brazilian Central Plateau, in southwestern Minas Gerais, near the northern border of the Paraná River sedimentary basin.

The hydrographic basins of the Uberabinha and Araguari rivers contribute to the River Plate watershed (Brown & Mielke, 1967a). The climate, following the classification system of Köppen, is Aw (Rosa *et al.*, 1991), characterized more by precipitation than temperature, with a dry season from mid-May until mid-September, and a rainy season during the rest of the year.

The areas visited include the Sabiá Park, Agricultural School, Sucupira Falls, Panga Ecological Park, Miranda Hydroelectric Unit, the Marileuza Farm, and the São José Farm.

The principal area visited was a fragment of mesophytic, semideciduous forest, of approximately 30 ha, on the Glória Farm, owned by the Universidade Federal de Uberlândia, 12 km from the center of Uberlândia (near the BR 050 highway, which connects São Paulo to Brasília).

The Glória forest fragment is in a swampy depression, with mild slopes. After a stretch of 3 km, the small streams formed by the confluence of waters seeping from the springs flow into the Uberabinha River (Paranaíba River basin and, later, the Paraná River).

Within this forest there is, at least in the herb-shrub stratum, a difference in species composition, probably related with the slope and soil humidity.

Rubiaceae predominates principally *Psychotria* spp. in the drier areas, and ferns in the more humid areas (for arboreal species, see Araújo & Haridasan, 1997).

Along with those in forest habitats (mesophytic or gallery) but less intensively, collections were made in cerrado (*stricto sensu*) and in urban habitats.

Data collection

Collections were made monthly, from March, 1990 to March, 1994. Butterflies were captured with entomological nets or, less frequently, with traps, using fermented sugarcane juice and bananas.

Additional information on species occurrence was obtained from Brown & Mielke (1967a,b), A. Ruzsczyk and collaborators (pers. comm.), and Ruzsczyk & Silva (1997).

All species were identified by Dr. Keith Brown Jr., of the Universidade Estadual de Campinas.

Specimens collected are now deposited in the Museu de Entomologia da Universidade de Brasília. Photographs of the principal species may be found in DeVries (1987) and Brown (1992). Sbordoni & Forestiero (1985) present a general illustrated view of lepidopterans.

The classification adopted for Nymphalidae follows Scott (1985) and Harvey (1991), and for Papilionidae, Tyler *et al.* (1994).

RESULTS AND DISCUSSION

Species list

One hundred fifty-eight species were collected that, when added to the 93 records cited in the literature, gave 251 butterfly species for the Uberlândia region (Table 1), with 110 species of Nymphalidae, 64 Lycaenidae, 52 Hesperidae, 17 Pieridae, and 8 Papilionidae.

Of the species recorded from the collecting areas, 75 were collected in urban environments, though not exclusively.

TABLE 1

List of butterflies collected in Uberlândia region (MG). Codes following the name of the species' author (between []) represent the collector or information source and the collection site. Collectors: 1 (P. C. Motta), 2 (Brown & Mielke, 1967a,b, Araguari/MG), 3 (Brown & Mielke, 1967a,b, Uberlândia/MG), 4 (Alexandre Ruzszyk, Elvis Souza Nascimento and Hamilton Garcia Jr., pers. comm., in forest areas), 5 (Ruzszyk & Silva, 1997, in urban environments), 6 (Araújo *et al.*, 1987, in Uberaba/MG, forest areas) and 7 (Mielke & Casagrande, 1988, Araguari/MG). Habitat (collector number 1): a (open area, grassland, cerrado, forest edge, wetland), m (mesophytic or gallery forest), u (urban area). The species marked with "*" are not included in the lists of Brown & Mielke (1967a,b) for the Central Plateau, and those marked with "+" or "#" are in the northwest or south distribution limit, respectively (K. Brown, pers. comm.).

Hesperiidae (n = 52)
Pyrginae (n = 35)
<i>Achlyodes mithradates thraso</i> (Hübner, 1807) [5]
<i>Aguna albistria</i> (Plötz, 1881) [5]
<i>Aguna asander</i> (Hewitson, 1867) [1; a]
<i>Astraptes anaphus anaphus</i> (Cramer, 1777) [5; *]
<i>Astraptes fulgerator</i> (Walch, 1775) [1; m]
<i>Autochton neis</i> (Geyer, 1832) [1; m]
<i>Chionides catillus catillus</i> (Cramer, 1779) [5]
<i>Codatractus aminias</i> (Hewitson, 1867) [5]
<i>Cogia Abdul</i> Hayward, 1946 [2]
<i>Cogia calchas</i> (Herrich-Schäffer, 1869) [2]
<i>Cogia grandis</i> Riley, 1921 [2]
<i>Cycloglypha polax</i> Evans, 1953 [2]
<i>Entheus eumelus ninyas</i> Druce, 1912 [1; m; #]
<i>Epargyreus enispe</i> (Hewitson, 1867) [2]
<i>Gorgythion beggiana escalophoides</i> Hayward, 1941 [2]
<i>Gorgythion canda</i> Evans, 1953 [2]
<i>Heliopetes alana</i> (Reakirt, 1868) [1, 5; a, u]
<i>Heliopetes arsalte</i> (Linne, 1758) [1, 2; a]
<i>Heliopetes domicella willi</i> (Plötz, 1884) [2]
<i>Heliopetes omrina</i> (Butler, 1870) [1, 5; a]
<i>Phanus vitreus</i> (Stoll, 1781) [5]
<i>Polygonus leo leo</i> (Gmelin, 1790) [2]
<i>Proteides mercurius</i> (Fabricius, 1781) [5]
<i>Pyrgus oileus</i> (Stoll, 1780) [1, 5; a, u]
<i>Quadrus cerealis</i> (Stoll, 1782) [1; m]
<i>Quadrus u-lucida</i> Plotz, 1884 [1; m; *]
<i>Sophista latifasciata latifasciata</i> (Spitz, 1930) [2]
<i>Udranomia spitzzi</i> (Hayward, 1942) [2]
<i>Urbanus belli</i> Hayward, 1935 [2, 5; u; *?]
<i>Urbanus dorantes dorantes</i> (Stoll, 1790) [5]
<i>Urbanus procne</i> (Plötz, 1881) [5]
<i>Urbanus proteus</i> (Linne, 1758) [1, 5; m, u]
<i>Urbanus simplicius</i> (Stoll, 1790) [5]
<i>Urbanus teleus</i> (Hübner, 1821) [1, 5; u]
<i>Zopyrion evenor evenor</i> Godman & Salvin, 1901 [2]

TABLE 1 (Continued)

Pyrrhopyginae (n = 2)
<i>Microceris varicolor</i> (Ménétriés, 1855) [2]
<i>Pyrrhopyge pelota</i> Plötz, 1879 [2; +]
Hesperinae (n = 15)
<i>Callimormus saturnus</i> (Herrich-Schaffer, 1869) [5]
<i>Cobalopsis vorgia</i> (Schaw, 1902) [5; *]
<i>Corticea</i> sp. [5]
<i>Hylephila phylaeus</i> (Drury, 1770) [5]
<i>Morys subgrisea subgrisea</i> (Mabille, 1897) [2]
<i>Nyctelius nyctelius</i> (Latreille, 1824) [5]
<i>Orses cynisca</i> (Swairson, 1821) [1; m; *]
<i>Panoquina ocola</i> (Edwards, 1863) [2]
<i>Panoquina sylvicola</i> (Herrich-Schaffer, 1865) [2, 5]
<i>Perichares philetas</i> (Hewitson, 1867) [1; u]
<i>Polites vibex catilina</i> (Plötz, 1886) [5]
<i>Pompeius pompeius</i> (Latreille, 1824) [5]
<i>Vehilius inca</i> (Scudder, 1872) [1; u]
<i>Vehilius stictomenes</i> (Butler, 1877) [5]
<i>Vettius diversus</i> (Herrich-Schaffer, 1869) [1; m; *]
Papilionidae (n = 8)
<i>Battus crassus</i> (Cramer, 1777) [4]
<i>Battus polydamas</i> (Linne, 1758) [1, 5; m]
<i>Heraclides anchisiades capys</i> (Hübner, 1809) [1, 5; m]
<i>Heraclides astyalus</i> (Godart, 1819) [5]
<i>Heraclides thoas brasiliensis</i> (Rothschild & Jordan, 1906) [1, 5; a]
<i>Parides bunichus diodorus</i> (Hopffer, 1865) [1; m]
<i>Parides neophilus eurybates</i> (Gray, 1853) [1; m]
<i>Protesilaus protesilaus</i> (Linne, 1758) [1; m]
Pieridae (n = 17)
Coliadinae (n = 10)
<i>Anteos clorinde</i> (Godart, 1823) [1, 5; a]
<i>Eurema albula</i> (Cramer, 1775) [1; a]
<i>Eurema deva</i> (Doubleday, 1847) [5]
<i>Eurema dina leuce</i> (Boisduval, 1836) [1; m]
<i>Eurema elathea</i> (Cramer, 1777) [1, 2, 5; m, a]
<i>Eurema nise tenella</i> (Boisduval, 1836) [1, 2; a]
<i>Phoebis argante argante</i> (Fabricius, 1775) [1; a]
<i>Phoebis philea</i> (Johansson, 1767) [1, 5; m]
<i>Phoebis sennae</i> (Linne, 1758) [1, 5; a, u]
<i>Phoebis statira</i> (Cramer, 1777) [1, 5; m, a]
Pierinae (n = 4)
<i>Appias drusilla</i> (Cramer, 1777) [1, 5; m, a]
<i>Archonias tereas tereas</i> (Godart, 1819) [1; m]
<i>Ascia monuste</i> (Linne, 1764) [1, 5; a, u]
<i>Melete lycimnia paulista</i> Fruhstorfer, 1910 [1; m, a]

TABLE 1 (Continued)

Dismorphiinae (n = 3)
<i>Dismorphia astynome</i> (Dalman, 1823) [1; m]
<i>Dismorphia limnorina</i> Felder, 1865 [2; +]
<i>Enantia licinia</i> (Fabricius, 1793) [1; m]
Lycaenidae (n = 64)
Theclinae (n = 34)
<i>Arawacus aetolus</i> (Sulzer, 1776) [1; m]
<i>Arawacus ellida</i> (Hewitson, 1867) [1; a]
<i>Arawacus meliboeus</i> Fabricius, 1793 [4]
<i>Arcas imperialis</i> (Cramer, 1775) [1; m]
<i>Atlides polybe</i> Linne, 1763 [1; m; *]
<i>Calycopis beon</i> (Cramer, 1780) [2]
<i>Calycopis cissusa</i> Hewitson, 1877 [2]
<i>Calycopis</i> sp. 1 [1; m]
<i>Calycopis</i> sp. 2 [1; m]
<i>Calycopis</i> sp. 3 [1; m]
<i>Contrafacia imma</i> (Prittwitz, 1865) [1; m; *]
<i>Evenus regalis</i> (Cramer, 1775) [1; m]
<i>Ministrymon azia</i> Hewitson, 1873 [2]
<i>Ocaria ocrisia</i> (Hewitson, 1868) [1; m; *]
<i>Panthiades bitias</i> (Cramer, 1777) [1; m; *]
<i>Panthiades hebraeus</i> Gosse, 1880 [1; c]
<i>Panthiades orgia</i> (Hewitson, 1867) [1; m]
<i>Panthiades phaleros</i> (Linne, 1766) [1; m]
<i>Pseudolycaena marsyas</i> (Linne, 1758) [5]
<i>Rekoa marius</i> (Lucas, 1857) [1; a; *]
<i>Siderus tephraeus</i> (Geyer, 1837) [1; m; *]
<i>Strymon ziba</i> (Hewitson, 1868) [1; u]
<i>Strymon mulucha</i> Hewitson, 1874 [5]
<i>Strymon</i> sp. [1; u]
<i>Symbiopsis lenitas</i> ? (Druce, 1907) [1; m]
" <i>Thecla</i> " <i>cauter</i> Druce, 1907 [2]
" <i>Thecla</i> " <i>mantica</i> Spitz, 1931 [1, 2; a]
" <i>Thecla</i> " <i>melzeri</i> Spitz, 1931 [7]
" <i>Thecla</i> " <i>seitzi</i> Spitz, 1931 [7]
" <i>Thecla</i> " <i>taunayi</i> Spitz, 1931 [2]
" <i>Thecla</i> " <i>tegaea</i> Spitz, 1931 [2]
" <i>Thecla</i> " <i>zurkvitzii</i> Schaus, 1902 [2]
<i>Tmolus azuba</i> (Hewitson, 1874) [2]
<i>Tmolus echion</i> (Linne, 1767) [1; u; *]

TABLE 1 (Continued)

Riodininae (n = 28)
<i>Adelotypa malca</i> (Schaus, 1902) [1; m; *]
<i>Amarynthis meneria</i> (Cramer, 1776) [1; m; #]
<i>Ancyluris</i> sp. [1; m]
<i>Anteros formosus</i> (Cramer, 1777) [2]
<i>Apodemia paucipuncta</i> Spitz, 1930 [2]
<i>Aricoris tutana</i> (Godart, 1824) [2]
<i>Audre epulus pasquita</i> (Cramer, 1775) [1, 2, 5; c]
<i>Audre</i> sp. [1; m]
<i>Chamaelymnas doryphora</i> Stichel, 1910 [6]
<i>Charis caryatis</i> (Hewitson, 1866) [1, 5; m]
<i>Emesis fastidiosa</i> ? Ménériés, 1855 [1; m; *?]
<i>Eurybia halimede</i> Hübner, 1807 [1; m; *]
<i>Hyphilaria parthenis</i> Westwood, 1851 [1; m; *]
<i>Lasaia oileus</i> Godman, 1903 [1; a]
<i>Lemonias stalactioides</i> (Butler, 1867) [1; a]
<i>Leuchochimona philemon mathata</i> (Hewitson, 1873) [1; m]
<i>Melanis albugo albugo</i> Stichel, 1910 [1; m]
<i>Melanis iarbas auriferax</i> Stichel, 1910 [1; m]
<i>Melanis xenia</i> (Hewitson, 1853) [1; m]
<i>Mesosemia pardalis</i> Callaghan, 2001 [1; m; #]
<i>Nymphidium lysimon</i> Butler, 1867 [1; m]
<i>Nymphidium onaeum</i> ? Hewitson, 1869 [1; m; *?]
<i>Perophtalma tullius</i> (Fabricius, 1787) [1; m]
<i>Rhetus (periander) arthurianus</i> (Sharpe, 1890) [1; m]
<i>Stalactis phlegia</i> (Cramer, 1765) [5]
<i>Synargis calyce brennus</i> (Stichel, 1910) [5]
<i>Synargis phillone</i> (Godart, 1824) [2]
<i>Theope pieridoides</i> (Felder, 1865) [5]
Polyommatainae (n = 2)
<i>Hemiargus hanno</i> (Stoll, 1780) [1, 2; a]
<i>Leptotes cassius</i> (Cramer, 1775) [1; a]
Nymphalidae (n = 110)
Libytheinae (n = 1)
<i>Libytheana carinenta</i> (Cramer, 1779) [5]
Danainae (n = 2)
<i>Danaus plexippus</i> (Linne, 1758) [1; u]
<i>Lycorea cleobaea</i> (Godart, 1819) [1; m]
Ithomiinae (n = 17)
<i>Aeria elara</i> (Hewitson, 1855) [1; m]
<i>Aeria olena</i> (Weymer, 1875) [1; m]
<i>Dircenna dero</i> (Hübner, 1823) [1; m]
<i>Hypoleria arzalia emyra</i> Haensch, 1905 [1; m]

TABLE 1 (Continued)

Ithomiinae (continued)
<i>Hypoleria goiana</i> D'Almeida, 1951 [1; m]
<i>Hypoleria plisthenes</i> D'Almeida, 1958 [1; m]
<i>Hypoleria proxima consimilis</i> Talbot, 1923 [1; m]
<i>Hypothyris ninonia daeta</i> (Hübner, 1806) [1; m]
<i>Ithomia agnosia</i> D'Almeida, 1939 [1; m]
<i>Mcclungia salonina</i> (Hewitson, 1855) [1; m]
<i>Mechanitis lysimnia</i> (Fabricius, 1793) [1; m]
<i>Mechanitis polymnia</i> (Linne, 1758) [1, 5; m, u]
<i>Methona themisto</i> (Hübner, 1818) [1, 5; m, u]
<i>Prittwitzia hymenaea</i> (Prittwitz, 1865) [1; m]
<i>Pseudoscada quadrifasciata</i> Talbot, 1928 [1; m]
<i>Sais rosalia rosalinde</i> Weymer, 1890 [1; m]
<i>Tithorea harmonia</i> (Cramer, 1777) [1; m]
Charaxinae (n = 10)
<i>Agrias claudia godmani</i> Fruhstorfer, 1895 [1, 4; m]
<i>Archaeoprepona demophon</i> (Linne, 1758) [1, 4, 5; m, u]
<i>Hypna clytemnestra huchneri</i> Butler, 1866 [4]
<i>Memphis appias</i> (Hübner, 1825) [4]
<i>Memphis morvus</i> (Prittwitz, 1865) [1, 5; m]
<i>Memphis otrere</i> (Hübner, 1825) [4; *?]
<i>Memphis ryphea</i> (Geyer, 1834) [4]
<i>Prepona pylene</i> Hewitson, 1853 [4; *]
<i>Siderone marthesia</i> (Cramer, 1777) [1; a]
<i>Zaretis itys strigosus</i> (Gmelin, 1788) [4]
Morphinae (n = 2)
<i>Morpho achilles paulista</i> Fruhstorfer, 1912 [1, 4; m]
<i>Morpho menelaus mineiro</i> Fruhstorfer, 1913 [1, 4; m]
Brassolinae (n = 7)
<i>Brassolis sophorae</i> Stichel, 1925 [1, 5; u]
<i>Caligo illioneus</i> (Cramer, 1776) [1, 4; a]
<i>Catoblepia berecynthia</i> (Cramer, 1777) [4]
<i>Dynastor darius</i> Fabricius, 1775 [1, 3; m]
<i>Eryphanis polyxena</i> (Meerburg, 1775) [1; m]
<i>Opsiphanes cassiae</i> Linne, 1758 [4]
<i>Opsiphanes invirae</i> (Hübner, 1808) [1, 4, 5; u]
Satyrinae (n = 18)
<i>Cissia terrestris</i> (Butler, 1866) [1, 4, 5]
<i>Hermeuptychia hermes</i> (Fabricius, 1775) [1, 4, 5; m, a]
<i>Magneuptychia</i> (or <i>Cissia</i>) sp. 1 [1; m]
<i>Magneuptychia</i> sp. 2 [1; m]
<i>Pareuptychia ocirrhoe interjecta</i> (D'Almeida, 1952) [1, 4; m]
<i>Paryphthimoides phronius</i> (Godart, 1823) [1, 4, 5; a]

TABLE 1 (Continued)

Satyrinae (continued)
<i>Paryphthimoides poltys</i> (Prittwitz, 1865) [4, *]
<i>Paryphthimoides vestigiata</i> (Butler, 1867) [4, *]
<i>Taygetis echo</i> (Cramer, 1779) [1; m]
<i>Taygetis kerea</i> Butler, 1869 [4]
<i>Taygetis laches</i> (Cramer, 1782) [1, 4; m]
<i>Taygetis tripunctata</i> Weymer, 1907 [4; *]
<i>Taygetis virgilia</i> (Cramer, 1779) [1, 4; m]
<i>Yphthimoides disaffecta</i> ? (Butler & Druce, 1874) [2]
<i>Yphthimoides erigone</i> ? (Butler, 1866) [1; a]
<i>Yphthimoides mythra</i> ? (Weymer, 1911) [1; m]
<i>Yphthimoides modesta</i> ? (Butler, 1866) [1; a]
<i>Yphthimoides yphthima pacta</i> (Weymer, 1911) [2]
Limenitidinae (n = 33)
<i>Adelpha iphicla iphicla</i> (Linne, 1764) [1; m]
<i>Adelpha philassa plesaura</i> Hübner, 1823 [1; m]
<i>Adelpha thoasa gerona</i> (Hewitson, 1868) [3]
<i>Biblis hyperia</i> (Cramer, 1779) [1, 4; m]
<i>Callicore hydaspes</i> (Drury, 1782) [4]
<i>Callicore selima</i> (Guenee, 1872) [1, 4; m]
<i>Callicore sorana</i> (Godart, 1823) [1, 2, 3, 4, 5; m, u]
<i>Colobura dirce</i> (Linne, 1758) [1, 4, 5; m]
<i>Cybdelis phaesyala</i> Hübner, 1827 [4; +]
<i>Diaethria candrena</i> (Godart, 1821) [4]
<i>Diaethria clymena janeira</i> Felder, 1862 [1, 4; m]
<i>Dynamine agacles</i> (Dalman, 1823) [1; m]
<i>Dynamine artemisia</i> (Fabricius, 1793) [1, 4; m]
<i>Dynamine myllita</i> (Cramer, 1782) [4]
<i>Dynamine tithia</i> (Hübner, 1823) [1; a, Araguari]
<i>Epiphile huebneri</i> Hewitson, 1867 [4]
<i>Epiphile oreia</i> Hübner, 1823 [4]
<i>Eunica bechina</i> Hewitson, 1852 [1, 2, 4; m]
<i>Eunica maja</i> (Fabricius, 1775) [2]
<i>Eunica margarita</i> ? (Godart, 1824) [1; a]
<i>Eunica tatila bellaria</i> Fruhstorfer, 1908 [1; m]
<i>Euptoieta hegesia</i> Cramer, 1779 [5]
<i>Hamadryas amphinome</i> (Fruhstorfer, 1916) [1, 4, 5; m]
<i>Hamadryas arete</i> (Doubleday, 1847) [4; *]
<i>Hamadryas chloe</i> (Fruhstorfer, 1907) [1, 4; m]
<i>Hamadryas epinome</i> (Felder & Felder, 1867) [4, 5]
<i>Hamadryas februa</i> (Godart, 1921) [1, 4, 5; m]
<i>Hamadryas feronia</i> (Fruhstorfer, 1916) [4]
<i>Hamadryas fornax</i> ? (Hübner, 1823) [4]

TABLE 1 (Continued)

Limnitiidae (continued)
<i>Hamadryas laodamia</i> (Cramer, 1776) [1; m]
<i>Myscelia orsis</i> (Drury, 1782) [4; *]
<i>Nica flavilla</i> (Godart, 1823) [1; m]
<i>Temnis laothoe</i> Fruhstorfer, 1907 [1, 4, 5; m]
Nymphalinae (n = 9)
<i>Anartia amatheia roeselia</i> (Eschscholtz, 1821) [1; m]
<i>Anartia jatrophae</i> (Linne, 1763) [1, 5; a]
<i>Chlosyne lacinia saundersii</i> Doubleday, 1847 [1, 5; m, a, u]
<i>Eresia lansdorfi</i> (Godart, 1819) [1, 5; m, u]
<i>Junonia evarete</i> (Cramer, 1779) [1, 2; a]
<i>Phyciodes ithra</i> (Kirby, 1871) [5]
<i>Tegosa claudina</i> (Eschscholtz, 1821) [1; m]
<i>Telenassa teletusa</i> (Godart, 1824) [6]
<i>Vanessa myrinna</i> (Doubleday, 1849) [1; a]
Heliconiinae (n = 11)
<i>Actinote carycina</i> Jordan, 1913 [1; a]
<i>Actinote parapheles</i> Jordan, 1913 [1; a]
<i>Actinote pellenea</i> Hübner, 1821 [6]
<i>Agraulis vanillae</i> (Stichel, 1907) [1, 5; u]
<i>Dione junonia</i> Cramer, 1779 [1, 5; a, u]
<i>Dryadula phaetusa</i> (Linne, 1758) [1; a]
<i>Dryas iulia</i> (Fabricius, 1775) [1; m]
<i>Eueides isabella</i> (Hübner, 1806) [1, 5; m, u]
<i>Heliconius erato phyllis</i> (Fabricius, 1775) [1, 2, 5; m]
<i>Heliconius ethila narcaea</i> Godart, 1819 [1; m]
<i>Heliconius melpomene burchelli</i> Poulton, 1910 [1; m; #]

Biogeographical comments

There are many butterflies which are locally common and have wide distributions throughout Brazil, such as *Eurema elathea*, *Phoebis sennae*, *Ascia monuste*, *Brassolis sophorae*, *Junonia evarete*, *Hamadryas amphinome*, *Agraulis vanillae*, and *Heliconius erato*, which occur, for example, in Porto Alegre (RS), Campinas (SP), Uberlândia (MG), Brasília (DF), Rio de Janeiro (RJ), João Pessoa (PB), Belém (PA), Imperatriz (MA), and Araguaína (TO) (pers. obs.). However, little is known about the geographic distribution of the majority of Brazilian butterfly species.

Several Ithomiinae that occur in the Southeast (São Paulo, Campinas and Santos, for example) and Mid-west (Brasília) were not found in Uber-

lândia, like *Thyridia psidii* (that occurs in Araxá, about 170 km to the southeast of Uberlândia), *Hypothyris euclea*, *Oleria aquata*, *Placidula euryanassa*, *Heterosais edessa*, and *Pteronymia carlia*.

On the other hand, *Methona themisto* occurs in all of these locations. However, the Uberlândia population, like those of other nearby cities to the north and west, presents a great degree of larval phenotypic diversity, indicating that this is as a hybridizing zone for populations of the southeast and others of the Central Plateau (Motta, 1998).

One example of a distribution boundary region is that of *Aeria olena* and *A. elara*. In the southeast, only *A. olena* occurs, being common in forests of São Paulo (Campinas, for example).

In Uberlândia, two species occur, but *A. elara* is more abundant, while in Brasília, *A. elara* is common and *A. olena* is extremely rare.

Mesosemia pardalis is considered a rare species (K. Brown, pers. comm.; Callaghan, 2001), even though it is very abundant in the Glória forest, perhaps being endemic to this region.

Sais rosalia (Ithomiinae) and *Protesilaus protesilaus* (Papilionidae) were recorded only once during these four years, with the latter being detected because of a right front wing found on the forest floor.

At least in relation to the Ithomiinae, the region of Uberlândia appears to be an area constituting a distribution limit for some species, or of disjunct distributions, as well as intergrading or isolation of populations from the west, north and southeast of Brazil, and comprising a peripheral region of one of the areas known as an endemism center or “paleoecological refuge” for butterflies (Brown, 1977; 1982; 1987) and plants (Prance, 1982; 1987; 1996).

Seasonality, interactions with plants and predation of butterflies in the Glória forest

The most abundant species during the dry season were *Aeria elara*, *A. olena*, *Hypothesis ninonia*, *Mechanitis polymnia*, *M. lysimnia*, *Heliconius erato* and *Mesosemia pardalis*. In the rainy season, the most abundant species were *Morpho achilles*, *Parides neophilus*, and *Archonias tereas*.

In regard to the Ithomiinae, in the dry season the populations increased and, from the middle of July until mid-September, individuals aggregated in moist areas of the forest, a behavior known as “pocket formation” (Brown & Benson, 1974).

In the study area (Glória forest fragment), the pocket presented a high concentration of 16 species of Ithomiinae, along with some species from other groups. The rainy season, considered a season of dispersion, showed low population densities.

Ovipositions were observed mainly in the rainy season, or at the end of the dry period (Table 2).

TABLE 2
Season preferred for oviposition for the most abundant species of butterflies in the Glória forest fragment.

Species	Month											
	Rainy				Dry				Rainy			
	1	2	3	4	5	6	7	8	9	10	11	12
<i>Aeria elara</i>			×	×					×	×		
<i>Aeria olena</i>			×	×					×	×		
<i>Hypothesis ninonia</i>				×					×			
<i>Mechanitis polymnia</i>				×					×			
<i>Mechanitis lysimnia</i>				×					×			
<i>Heliconius erato</i>				×						×		
<i>Morpho achilles</i>				×						×	×	
<i>Parides neophilus</i>			×	×							×	×
<i>Parides bunichus</i>			×									
<i>Mesosemia pardalis</i>			×									
<i>Eresia lansdorfi</i>					×							
<i>Heliconius ethila</i>												×

Only a few host plants were recorded: *Aeria olena* and *A. elara* used *Prestonia acutifolia* (Apocynaceae), *Parides neophilus eurybates*, *Aristolochia* sp.; *Mechanitis* and *Hypothyris*, *Solanum gemellum*; *Hypoleria* spp. used *Cestrum* spp. The flowers most visited by the species listed in Table 2 were *Stachytarpheta polyura* (Verbenaceae) from November until March, *Eupatorium maximiliani* (Asteraceae) from May to June, *Vernonia* sp. (Asteraceae) in June and July, and *Psychotria prunifolia* (Rubiaceae) from October to November. Perhaps the principal predators of adult butterflies are birds. An indirect means of evaluating this kind of mortality is through the wings found on the soil or litter (Table 3), generally with beak marks.

TABLE 3

Number of individuals (N) preyed upon by birds and the months (1 through 12) in which the wings were found on the ground. Arctiidae, Castniidae, Noctuidae, and Saturniidae are moths.

Family	Subfamily	Species	N	Month
Papilionidae		<i>Parides neophilus eurybates</i>	1	6
		<i>Protesilaus protesilaus</i>	1	10
Pieridae	Coliadinae	<i>Anteos clorinde</i>	2	7, 9
		<i>Phoebis philea</i>	2	4, 5
		<i>Phoebis statira</i>	1	9
	Dismorphinae	<i>Dismorphia astynome</i>	1	12
	Pierinae	<i>Melete lycimnia paulista</i>	2	5, 6
Lycaenidae	Theclinae	<i>Atlides polybe</i>	1	11
		<i>Arcas imperialis</i>	1	4
		<i>Contrafacia imma</i>	1	12
		<i>Evenus regalis</i>	1	12
		<i>Ocaria ocrisia</i>	1	6
		<i>Panthiades büias</i>	3	5, 7, 9
	Riodinidae	<i>Hyphilaria parthenis</i>	1	4
		<i>Leucochimona mathata</i>	1	7
	Nymphalidae	Ithomiinae	<i>Dircenna dero</i>	2
<i>Hypothyris ninonia</i>			1	4
<i>Mechanitis lysimnia</i>			2	9
<i>Mechanitis polymnia</i>			2	7, 9
<i>Tithorea harmonia</i>			1	6
Charaxinae		<i>Archaeoprepona demophon</i>	1	10
Morphinae		<i>Morpho achilles paulista</i>	10	5, 8, 9, 10
		<i>Morpho menelaus mineiro</i>	5	4, 7, 8, 9
Limenitidinae		<i>Callicore selima</i>	3	3, 6, 7
		<i>Diaethria clymena</i>	1	7
		<i>Hamadryas amphinome</i>	1	7
Heliconiinae		<i>Heliconius erato</i>	1	9
Noctuidae			<i>Catacalinae</i> sp. 1	1
		<i>Catacalinae</i> sp. 2	1	11
Castniidae		<i>Castnia laura</i>	1	3
Arctiidae		<i>Eucyane bicolor</i>	1	5
Saturniidae		<i>Automeris ca. illustris</i>	1	9

The majority of individuals (63%) were found in the dry season, but this does not necessarily indicate greater predation intensity for this period, because the wings are more easily seen in this period.

Morpho spp., the large and famous iridescent blue butterflies, were the most commonly preyed upon (15 individuals).

Orb web spiders are also potential predators of small and medium-sized butterflies.

The most abundant spiders in the area were *Araneus* sp., *Gasteracantha cancriformes*, *Micrathena plana*, *Nephila clavipes*, and *Parawixia kocki*.

The funnel web spider, *Aglaoctenus lagotis* (Lycosidae), was also very common in the area, but is probably not an important predator of butterflies due to the kind of web it weaves.

General considerations

The number of species (251) may be considered low, when compared with other regions of the country, although it is difficult to make comparisons due to differences in methodology, area sampled, and habitat type.

For example, in the Serra do Japi (Jundiaí, SP) and Linhares (forest reserve, ES) 652 and 680 species were recorded, respectively (Brown, 1992).

Most likely, the butterflies collected represent about 50% of the regional total, since the principal habitat (cerrado, in the strict sense) was under-sampled.

Collections in open, riverside, and wetland areas, and the use of bait should increase the number of species.

Hesperiidae and Lycaenidae are families which should represent a much greater number of species.

As the sampling was mostly in dry forest, there should not be a substantial increase in the number of species recorded in this type of vegetation.

To maintain the diversity of butterflies, as well as of other animals, their interactions, and specified areas, it is essential that areas of forest, cerrado, wetlands, and palm *veredas* are preserved in Uberlândia and surrounding region.

The rapid expansion of urban areas tends to drastically decrease wildlife populations, driving some or many to extinction.

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