

**BIODIVERSITY AND BIOGEOGRAPHY OF MEXICAN BUTTERFLIES  
(LEPIDOPTERA: PAPILIONOIDEA AND HESPERIOIDEA)**

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*Abstract.*—We present a brief history of the scientific study of butterflies in Mexico, which began in the 18th century, and provide an overview of the holdings of Mexican butterfly specimens in institutional collections worldwide. The current status of a massive database on Mexican butterflies, at present containing over 450,000 distributional records, is detailed. Around 1800 species of butterflies have been reported from Mexico, which equals roughly 10% of the world butterfly fauna, placing Mexico among the ten most butterfly-rich countries in the world. About 14.8% of Mexico's butterfly species are endemic, and six genera appear to be endemic to Mexico. For the first time, we present a list of all endemic Mexican butterfly taxa: 88 species and 150 additional subspecies of Papilionoidea, and 171 species and 14 additional subspecies of Hesperioidea. Patterns of species richness and endemism are not alike; the richest areas are in the southeastern part of Mexico, mostly in the tropical evergreen forests, whereas endemism is greater in the arid north, and the humid montane forest in the central and southern parts of the country. The twenty richest sites for butterfly diversity in Mexico are identified, and comparisons are made between these sites and regions.

*Key Words:* Rhopalocera, Papilionidae, Pieridae, Nymphalidae, Lycaenidae, Hesperioidea, endemism, species richness, biogeographical patterns, diversity

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Scientific study of Mexican butterflies began with the Royal Scientific Expeditions to New Spain in the late 18th and early 19th centuries (Llorente et al. 1994). Since then, most lepidopterological research has been aimed at efforts to document the biodiversity of the country (Llorente and Luis 1993). Despite these efforts, the knowledge gathered in the last two centuries on the biodiversity and biogeography of Mexican butterflies remains incomplete. Considering the vast biodiversity that exists in Mexico, the continued existence of completely unexplored regions is not surprising, and the

scarcity of institutional collections continues to be a hindrance to efforts at furthering our knowledge (Llorente et al. 1996).

Worldwide, about 18,000 species of butterflies are known, which represent about 13% of the approximately 150,000 species of Lepidoptera [Shields (1989) estimates 17,280 butterfly species, Heppner (1991) estimates 19,238 butterfly species, Robbins and Opler (1997) estimate 17,500 total butterfly species]. Data from Shields (1989) and Heppner (1991) estimate that 1,800 species of butterflies inhabit Mexico, representing around 10% of the world total

Table 1. Richness of Mexican butterfly species, by family, compared to major biogeographical regions. Numbers are taken from Shields (1989) and Heppner (1991). N = Nearctic; M = Mexico; NL = Neotropical; P = Palaearctic; E = Ethiopian; O = Oriental; A = Australia/Oceania. About 13.1% of the species of Lepidoptera are butterflies.

Family	N	M	NL	P	E	O	A	Total
Hesperiidae	290	800	2,016	155	437	569	191	3,658
Papilionidae	33	56	120	84	87	178	70	572
Pieridae	64	90	323	167	174	307	187	1,222
Lycaenidae	164	430	2,611	407	1,413	1,540	429	6,564
Nymphalidae	214	440	2,857	1,083	1,156	1,563	349	7,222
Total	765	1,816	7,927	1,896	3,267	4,157	1,226	19,238

(see Table 1). This richness may be due to two facts: 1) Mexico is located in an area of tectonic convergence (termed the Mexican Transition Zone by Halffter (1976), also see Llorente (1996)), where the Nearctic and Neotropical regions overlap; together these regions contain 40% of the world's butterflies; and 2) Mexico has an extratropical-intertropical situation, with various mountain ranges, which generate a wide variety of climates (ranging from arid to humid), as well as many vegetation types ranging from xerophilous scrubs to tropical forests and various types of temperate forests (Morrone et al. 1999).

The Hesperioidea is the largest group of butterflies; a single family (Hesperiidae) is included, with about 3,600 species. According to Heppner (1991), the Papilionoidea include four families, which are, from largest to smallest: Nymphalidae, Lycaenidae, Pieridae, and Papilionidae (see Table 1) [following Weintraub and Miller (1987), we do not consider the Hedyliidae to be butterflies]. Considering all biogeographical regions, the Neotropical Region is the richest in butterfly species, with the exception of the Papilionidae, which are more diverse in the Oriental Region (Heppner 1991). Mexico harbors more than twice the number of species than the entire Nearctic Region north of Mexico. This figure is considerably larger than that of the Australian Region and similar to the number of species in the Palaearctic Region. Several groups have diversified extensively in Mexico, and there

are also a number of paleoendemic and relictual groups, such as *Baronia* Salvin, 1893; *Eucheira* Westwood, 1834; *Prestonia* Schaus, 1920; *Chlosyne* Butler, 1870; *Cyllopsis* R. Felder, 1869; *Paramacera* Butler, 1868; *Lamphiotis* Callaghan, 1982; *Zobera* H. A. Freeman, 1970; *Piruna* Evans, 1955; *Paratrytone* Godman, 1900; and all megathymine genera (especially *Agathymus* H. A. Freeman, 1959 and *Stallingsia* H. A. Freeman, 1959).

#### MATERIALS AND METHODS

Collections of Mexican butterflies.—The number of butterfly specimens in nine of the largest American collections exceeds 72,000 (see Table 2). Two of the three most important collections in Mexico are housed at UNAM, the collection of the Departamento de Zoología of the Instituto de Biología (IBUNAM), and the collection at the MZFC, which has specialized in the fauna of the Mexican humid montane forests (Navarro and Llorente 1996). Together, both collections contain over 100,000 mounted specimens and another 250,000 specimens papered in envelopes (Table 2). The third most important collection in Mexico is private and is the product of research conducted by members of the de la Maza family, which, according to G. Lamas (personal communication) [information obtained orally], is composed of approximately 35,000 specimens. Three other important private collections that have been assembled during the last three decades are those

Table 2. Numbers of Mexican butterfly records from major institutional collections. All numbers are from the database of butterfly localities maintained by the "Alfonso L. Herrera" Museum of Zoology, at UNAM in Mexico City.

Collection	# of Records
Allyn Museum of Entomology, Sarasota, FL	9,035
American Museum of Natural History, New York, NY	11,530
California Academy of Sciences, San Francisco, CA	5,330
Carnegie Museum of Natural History, Pittsburgh, PA	14,278
Los Angeles County Museum of Natural History, CA	9,484
San Diego Natural History Museum, CA	8,322
University of California, Berkeley, CA	2,394
National Museum of Natural History, Washington, DC	7,804
Nevada State Museum, Las Vegas, NV	3,850
The Natural History Museum, London	15,000
Museo de Zoología "Alfonso L. Herrera," UNAM	300,000
Instituto de Biología, UNAM, Mexico City	55,000
Colegio de la Frontera Sur (Chetumal, QROO)	30,000
TOTAL	472,027

of Díaz Francés, Jesús Saldaña, and González Cota. These collections include a wide variety of material from all the southern Mexican states, and contain many species endemic to Mexico. Fortunately, the two former collections were recently acquired by IBUNAM, and the latter, by the MZFC, sponsored by the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO), thus ensuring their preservation in academic institutions.

Mexican butterfly database.—Over the past 15 years, one of the primary objectives of the Lepidoptera collection at the MZFC has been the computerization of Mexican butterfly records into a database. This database contains three groups of primary data, including data from specimen labels of Papilionoidea housed in Mexican institutions, the same data from Papilionoidea housed in major institutions in the U.S.A. and England, and data of Papilionoidea and Hesperioidea from over 1,000 literature sources (Table 3). Data from specimens of Mexican Hesperioidea housed in institutional collections are being added to the database. The database is currently supported by the "Sistema de Información Biótica," a program developed by CONABIO to manage nomenclatural, geographic, biblio-

graphic and curatorial information on all of Mexico's biota.

At present, the butterfly database contains over 450,000 records, of which almost 85,000 are from natural history museums outside of Mexico, mainly in the U.S.A. and England. About 55,000 of these records are from IBUNAM, a minimum of 10,000 are from literature reports, and the remaining records are from faunal studies or specific collecting efforts aimed at determining the distributions of certain taxa (Luis et al. 2000).

The records in this database have enabled us to examine the distributions of many of the species that make up the Mexican fauna (Llorente et al. 1997). One of the best studied butterfly faunas in Mexico is that of the western state of Michoacán. Through studies made during the last 10 years, over 100,000 records have been obtained from Michoacán, from 144 localities (Luis et al., in preparation). In contrast, despite its long history of butterfly collecting tracing back to the 18th century, the state of Veracruz is represented by 50,000 records from 562 localities. To supplement this database of locality information, three additional compilations have been or are being prepared: a catalogue of taxonomic names of Mexican

Table 3. Numbers of localities from which butterflies have been recorded in each Mexican state. All numbers are from the database of butterfly localities maintained by the "Alfonso L. Herrera" Zoology Museum, at UNAM in Mexico City.

State	Localities
VERACRUZ	562
BAJA CALIFORNIA SUR	547
BAJA CALIFORNIA	520
CHIAPAS	472
OAXACA	409
GUERRERO	228
SAN LUIS POTOSÍ	215
SINALOA	198
SONORA	196
JALISCO	178
DURANGO	157
MICHOACÁN	144
TAMAULIPAS	139
NAYARIT	139
CHIHUAHUA	137
NUEVO LEÓN	125
HIDALGO	117
PUEBLA	96
COLIMA	96
MORELOS	91
YUCATÁN	72
QUINTANA ROO	65
ESTADO DE MÉXICO	63
DISTRITO FEDERAL	56
CAMPECHE	40
TABASCO	38
COAHUILA	35
QUERÉTARO	19
ZACATECAS	19
AGUASCALIENTES	17
GUANAJUATO	15
TLAXCALA	4
TOTAL LOCALITIES	5,209

butterflies, one of geographical localities of Mexican butterflies (Luis et al. 1996), and one containing literature citations that deal with Mexican Papilionoidea (Luis et al. 2000).

#### GEOGRAPHICAL DISTRIBUTION OF MEXICAN BUTTERFLY RECORDS

Although Mexico is a large Latin American nation, thought by some to be relatively well known and explored, this is not true for insects (Burke and Fryxell 1995). According to the data from nearly 500,000

specimens held in nearly a dozen museums in the U.S.A., The Natural History Museum, London, Mexican collections, and reports from the literature, the number of Mexican localities that have been explored for butterflies since the beginning of the former century is just over 5,000. Such a representation is poor for a country like Mexico which contains a vast megadiversity of organisms (Llorente and Luis 1993).

Published distributional records on Mexican butterflies are varied in their scope. Reports range from occasional collections made during a few hours (e.g., Comstock 1959; Díaz 1975; Guzmán 1975; González 1977, 1978), to comprehensive faunistic studies (e.g., Luis and Llorente 1990; Luis et al. 1991, 1996; Vargas et al. 1994, 1999), with many reports that fall somewhere in between (e.g., Clench 1968, Freeman 1969, de la Maza 1976, Routeledge 1977, Brown et al. 1992, Balcazar 1993). For the Papilionidae and Pieridae (Llorente et al. 1997), it has been observed that the best studied sites are near, or geographically associated with, classic historical collecting sites such as the regions of Jalapa and Los Tuxtlas in Veracruz, the Sierra de Juárez in Oaxaca, and the Sierra Madre del Sur in Guerrero (Sierra de Atoyac de Álvarez, Chilpancingo and Omiltemi).

Our state of knowledge of the geographical distribution of butterflies within Mexico's political boundaries remains poor; of the 31 states comprising the Republic, six states contain 52.56% of the recorded 5,209 collecting localities (Veracruz, Baja California Sur, Baja California, Chiapas, Oaxaca and Guerrero). States with fewer than twenty recorded collecting localities and no published faunal studies include Tlaxcala, Aguascalientes, Zacatecas and Querétaro (Table 3). However, given that a substantial number of Mexican species of papilionoids are known to have wide distributions, and several highly localized endemic species are known, it seems valid to assume that the primary general distributional patterns displayed by Mexican butterflies have been

Table 4. Numbers of butterfly species known from various Mexican states. BC = Baja California; BCS = Baja California Sur; DGO = Durango; COL = Colima; JAL = Jalisco; GRO = Guerrero; VER = Veracruz; OAX = Oaxaca; CHIS = Chiapas; QROO = Quintana Roo.

Family	BC	BCS	DGO	COL	JAL	GRO	VER	OAX	CHIS	QROO
Papilionidae	8	6	12	28	28	32	40	51	42	24
Pieridae	26	27	29	36	44	44	57	64	70	27
Nymphalidae	34	23	61	135	176	209	300	371	379	116
Lycaenidae	53	30	45	125	151	192	279	285	333	64
Hesperiidae	39	35	104	221	258	300	435	416	462	118
Total	159	121	251	545	657	777	1,111	1,187	1,276	349

identified. Nevertheless, a large number of faunal studies remain to be conducted in order to understand at a finer level the distribution of species and groups which are endemic to Mexico (Llorente et al. 1994, 1997; Soberón et al. 2000; Oñate et al. 2000).

According to the literature, museum collections, and recent faunal studies, less than one third of the Mexican states have a butterfly species checklist (Vargas et al. 1996, Warren et al. 1998). Additionally, most of the existing state checklists are based on one or two faunal studies centered in the most diverse parts of those states (leaving large parts of those states un-collected). Exceptions to this are the states of Baja California and Baja California Sur, where no rigorous faunal studies have been made but for which Brown et al. (1992) compiled in book-form numerous data from the literature, museum collections and field work conducted at several localities. Table 4 provides numbers of butterfly species from states for which we have species checklists, and Map 1 shows Mexico's ten richest states, in numbers of Papilionoidea and Hesperioidea species.

#### PATTERNS OF SPECIES RICHNESS

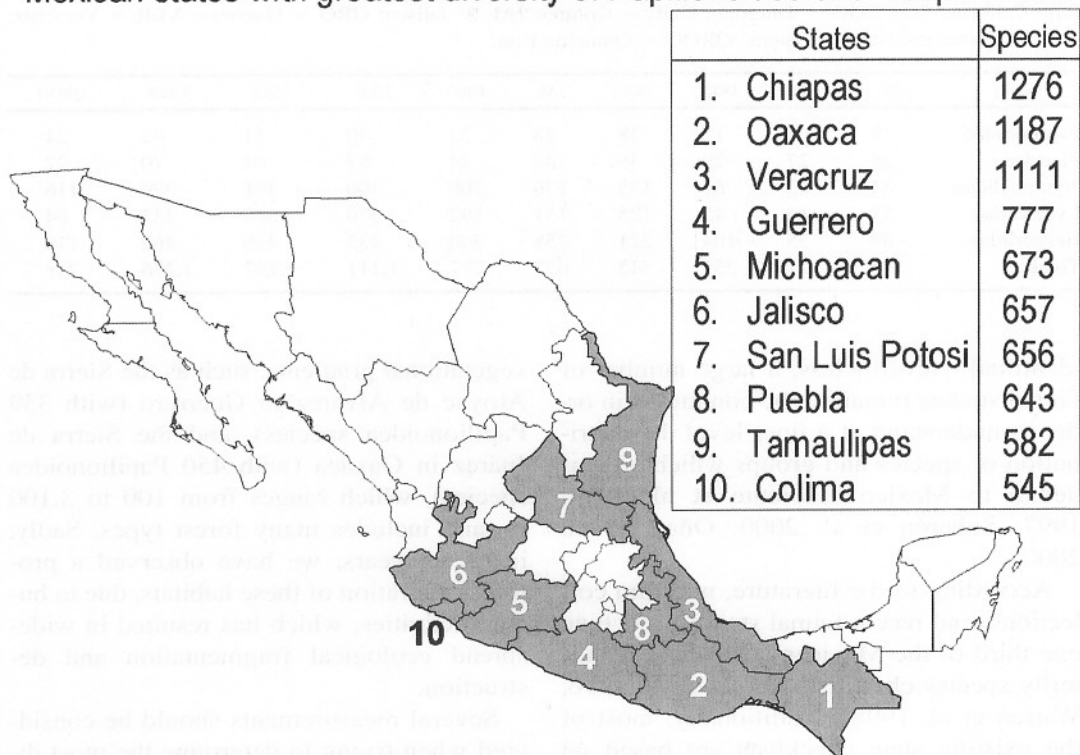
The nine richest regions in Mexico, in terms of butterfly diversity, are shown on Map 2. Each of these regions includes from three to more than 30 individual collecting localities that can arguably be classified as single biotic units. In general, these regions contain various altitudinal, climatic, and

vegetational gradients, such as the Sierra de Atoyac de Álvarez in Guerrero (with 339 Papilionoidea species), and the Sierra de Juárez in Oaxaca (with 450 Papilionoidea species), which ranges from 100 to 3,100 m. and includes many forest types. Sadly, in recent years, we have observed a profound alteration of these habitats, due to human activities, which has resulted in widespread ecological fragmentation and destruction.

Several measurements should be considered when trying to determine the most diverse of these areas; namely the size of the area, variations in elevation, environmental heterogeneity, and the biogeographical history of the region. Luis et al. (1991) shows that the Sierra de Juárez in Oaxaca is the region showing the widest altitudinal range (100–3,100 m), contrasted with the following regions: a) Los Tuxtlas, Veracruz (with 516 Papilionoidea species), with elevational extremes from sea level to 900 m, but with over 30 sampled localities and various vegetation types (Raguso and Llorente 1997), b) Chajul, Chiapas (with 396 Papilionoidea species), composed of a single forest type at 300 m. elevation (de la Maza and de la Maza 1985a, b), and c) Presidio, Veracruz (with 392 Papilionoidea species). Most of the records from the Presidio area are historical (up to 150 years old); forests in this area have been altered considerably, and only a few sites remain that still host native vegetation.

The four richest single Mexican localities for butterflies are located on the Atlantic

## Mexican states with greatest diversity of Papilionoidea and Hesperioidea



Map 1. Numbers of Papilionoidea and Hesperioidea species known from Mexico's ten richest states.

slope, which is the most diverse region in Mexico for several groups of organisms (Escalante et al. 1998, Flores 1998). Mexico's richest sites on the Pacific slope include humid areas with great physiographical heterogeneity (Map 3). Along Mexico's Pacific slope there are only three localities that have more than 200 species. These are: Mismaloya and La Calera in Jalisco, and Río Santiago in Guerrero, all with tropical semi-deciduous forests that contain elements from the montane cloud forest (Monteagudo et al. 2001). While Mismaloya does not appear on Map 3 (see Map 2), Warren and Llorente (1999) reported 315 butterfly species from that site (including Papilionoidea and Hesperioidea).

### PATTERNS OF ENDEMISM

The patterns of species richness and endemism among Mexican butterflies differ.

The tropical evergreen forests of southeastern Mexico comprise the richest region in Mexico, in terms of total numbers of species. Over 50% of the species of Papilionoidea that occur in Mexico (over 700 species, excluding Hesperioidea) are known to occur in these forests (Salinas 1999). Despite this great diversity, only about 2% of the butterfly species associated with the tropical evergreen forests are endemic to Mexico; most species in these forests range south into parts of Central and South America. According to Rzedowski (1978), tropical evergreen forests formerly occupied 12.8% of Mexico; the current remaining forest fragments cover at most between 10 and 15% of their original area (Granillo 1985, Toledo 1988).

Mexico's endemic fauna, in contrast, is associated both with the arid communities of northwestern Mexico, and with the humid

## Mexican regions with greatest diversity of Papilionoidea



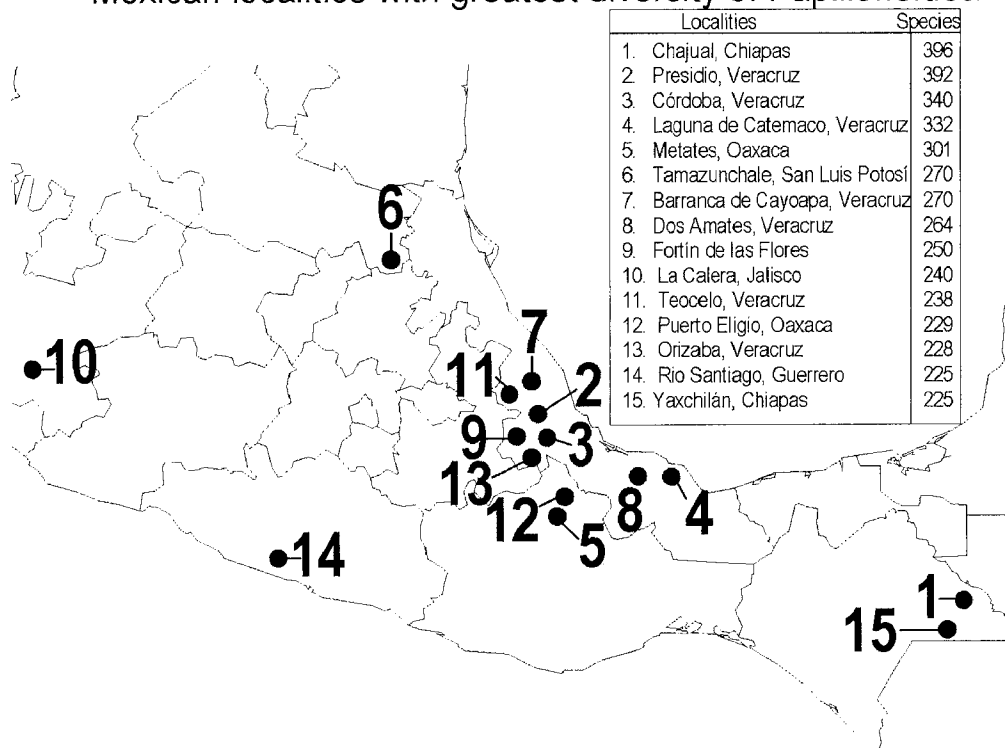
Map 2. Numbers of Papilionoidea species known from Mexico's most diverse regions. Each region includes from three to more than 30 separate collecting sites.

montane forests (especially the montane cloud forests) of central and southern Mexico. The insular distribution of the montane cloud forests along various mountain chains in Mexico has resulted in the speciation of many taxa, a phenomenon evident in many plant and animal groups (Halffter 1987). According to Llorente (1984), there are two altitudinal barriers in Mexico which limit dispersion and generally prohibit continuous distributions of taxa: one around 600 m, and the other around 2,000 m. Each of these altitudinal barriers present dramatically different climatic and vegetational conditions. Throughout Mesoamerica, the lower altitudinal zone is composed of the tropical evergreen and semi-deciduous forests on the Atlantic slope, with tropical deciduous and semi-deciduous forests on the Pacific slope. The middle elevational zone (roughly 600–

2,000), is significantly cooler than the lower zone and is occupied by various humid forest types. The highest elevational zone is seasonally cold, often arid, and is dominated by fir, pine and oak forests.

The insularity of the humid montane forests in Mexico has made them spots of high endemism for several groups of butterflies at the specific and subspecific levels. The assemblages of subspecies scattered in a number of these submontane islands sometimes group together with tropical Mesoamerican species, whereas in other cases they are more closely related with montane Central American species. In Mexico, there are six discernible biogeographical "islands": a) the highlands of Chiapas [and Guatemala]; b) the highlands of the Los Tuxtlas region in Veracruz; c) the Sierra de Juárez-Sierra Madre Oriental mountain chains in

### Mexican localities with greatest diversity of Papilionoidea



Map 3. Numbers of Papilionoidea species known from the twenty richest localities in Mexico.

Veracruz and Oaxaca; d) the Sierra Madre del Sur mountain chain in Guerrero and Oaxaca; e) the Pacific slope of the Nueva Galicia region from Colima to southern Sinaloa; and f) in lesser degree, the Transmexican Volcanic Belt. Some of these “islands” may be further subdivided into two or three portions, such as the highlands of Chiapas and Guatemala (Llorente and Escalante 1992).

We know of 88 species and 150 additional subspecies of Papilionoidea that are endemic to Mexico, with three endemic genera (*Baronia*, *Prestonia* and *Eucheira*). These endemic species and subspecies include 11.7% of Mexican butterfly taxa. Papilionoid genera which have diversified extensively in Mexico include *Chlosyne*, *Cyllopsis*, and *Calephelis* Grote and Robinson, 1869. Currently, 171 species and 14 subspecies of Hesperioidea are known to be

endemic to Mexico, with three endemic genera (*Zobera*, *Aegiale* and *Turnerina*). These endemic hesperioids include 9.1% of Mexican butterfly taxa. Hesperioid genera that have diversified extensively in Mexico include *Piruna*, *Paratrytone* and *Agathymus*. The number of endemic species of Hesperioidea exceeds that of all four papilionoid families combined. Considering all 423 taxa considered to be endemic in this work (including species and subspecies), 43.7% are hesperioids (Appendix). Thus, overall, 14.8% of Mexican butterfly species are endemic, and over 60% of these endemic taxa are distributed in the Mexican Pacific region. The Pacific region is environmentally discontinuous with other Mesoamerican and Central American faunal elements, and possesses two well delimited biogeographical islands: the Sierra Madre del Sur in Guerrero and Oaxaca, and the



Pacific slope of the Nueva Galicia region from Colima to southern Sinaloa. The Tehuantepec Isthmus and the Balsas River Basin, respectively, play the role of physiographic and climatic barriers to these islands (Llorente 1984).

#### CONCLUSIONS

We summarize our biogeographical knowledge of Mexican butterflies, acquired through the past 200 years, as follows:

- 1) Mexico possesses 10% of the butterfly species of the world and 14.8% of these species are endemic, making Mexico one of ten countries with the greatest butterfly diversity.
- 2) Mexico and the areas adjacent to its borders possess relictual, palaeo- and neo-endemic butterfly groups of great scientific interest, mostly in the northwestern arid zones, and in the montane communities to the south.
- 3) Patterns of species richness and endemism are not alike; the richest areas are in the southeast, mostly in the tropical evergreen forests, whereas endemic taxa are mostly distributed in the arid north, and in the humid montane forests in the central and southern portions of the country.
- 4) Areas richest in species numbers and endemic taxa are those exhibiting physiographic, climatic and vegetational heterogeneity, in a mosaic of preserved and partially altered environments, (such as the Los Tuxtlas region in Veracruz, Chajul in Chiapas, and the Sierra de Juárez in Oaxaca, each one possessing over one third of Mexico's butterfly species). In contrast, whole states or physiographic provinces with less environmental heterogeneity, such as the Peninsula of Baja California (which claims less than 9% of the butterfly fauna of Mexico), possess fewer total and endemic taxa.
- 5) Mexico's complex biogeographical history has resulted in several intercontinental, insular, distributional patterns

that are evident among Mexican butterflies; these are the product of a heterogeneous and disjunct distribution of arid, humid and montane environments.

- 6) There are a number of relictual taxa that occur in unique biogeographical areas in Mexico.

#### ACKNOWLEDGMENTS

We thank Drs. Robert K. Robbins (Smithsonian Institution, Washington, D.C.) and Gerardo Lamas Müller (Universidad Nacional Mayor de San Marcos, Lima, Peru) for their comments on and contributions to this paper, as well as for access to the collections and libraries under their supervision. Additionally, we thank Paul A. Opler for comments on this paper. Thanks also to CONACyT for sponsoring project 32002, and to DGAPA-UNAM IN 209900 for funding. Special thanks is extended to the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) for funding research visits by three of the authors to institutional collections in the United States and to The Natural History Museum in London, England.

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## APPENDIX

## Species and Subspecies of Endemic Mexican Butterflies

- \* = Taxon that has been reported from the USA by stray specimens or in error.
- ^ = Taxon reported from Belize or Guatemala by rare strays.
- ^ = Taxon originally described from Arizona but now extinct in the USA.
- « = Questionable taxonomic status, further study required (this symbol is after names).

Taxa listed in **bold** are endemic to Mexico at the species level. We note that some taxa listed as endemic herein may be found to have distributions that extend outside of Mexico with future fieldwork. However, taxonomic revisions and new species discoveries also will increase the number of endemic species in the future.

Endemic genera include: *Baronia* (Papilionidae), *Prestonia*, *Eucheira* (Pieridae), *Zobera*, *Aegiale*, and *Turnerina* (Hesperiidae).

We list subspecies (geographical races) to aid in the identification of patterns of endemism. Distributions of many Theclinae and Hesperidae are less well known, and most modern publications on these groups have not recognized subspecies extensively.

## PAPILIONIDAE

## Baroniinae

- Baronia brevicornis brevicornis* Salvin, 1893
- Baronia brevicornis rufodiscalis* J. Maza & J. White, 1987

## Papilioninae

- Battus philenor orsua* (Godman & Salvin, 1889)
- ^*Battus philenor acauda* (Oberthür, 1880)
- Battus laodamas iopas* (Godman & Salvin, 1897)
- Battus eracon*** (Godman & Salvin, 1897)
- \**Parides alopius* (Godman & Salvin, 1890)
- Parides erithalion trichopus* (Rothschild & Jordan, 1906)
- Parides panares panares* (Gray, [1853])
- Protographium agesilaus fortis* (Rothschild & Jordan, 1906)
- Protographium epidaus tepicus* (Rothschild & Jordan, 1906)

*Protographium epidaus fenochionis* (Salvin & Godman, 1868)

*Protographium thyastes occidentalis* (R. G. Maza, 1982)

*Mimoides ilus occiduus* (Vázquez, 1956)

*Mimoides thymbraeus aconophos* (Gray, [1853])

*Heraclides erostratus erostratinus* (Vázquez, 1947)

*Heraclides erostratus vazquezae* (Beutelspacher, 1986)

*Heraclides rogeri rogeri* (Boisduval, 1836)

*Heraclides torquatus mazai* (Beutelspacher, 1974)

*Heraclides astyalus bajaensis* (J. W. Brown & Faulkner, 1992)

*Pterourus esperanza* (Beutelspacher, 1975)

*Pterourus glaucus alexiarses* (Hopffer, 1865)

*Pterourus glaucus garcia* (Rothschild & Jordan, 1906)

*Pterourus palamedes leontis* (Rothschild & Jordan, 1906)

\**Pterourus abderus abderus* (Hopffer, 1856)

*Pterourus abderus baroni* (Rothschild & Jordan, 1906)

*Pterourus garamas* (Geyer, [1829])

*Pterourus menatius morelius* (Rothschild & Jordan, 1906)

#### PIERIDAE

##### Dismorphiinae

*Enantia mazai mazai* Llorente, 1984

*Enantia mazai diazi* Llorente, 1984

*Lieinix lala turrenti* J. Maza & R. G. Maza, 1984

*Lieinix neblina* J. Maza & R. G. Maza, 1984

*Lieinix nemesis nayaritensis* Llorente, 1984

*Dismorphia amphione lupita* Lamas, 1979

*Dismorphia amphione isolda* Llorente, 1984

*Dismorphia crisia alvarezii* J. Maza & R. G. Maza, 1984

*Dismorphia eunoe eunoe* (Doubleday, 1844)

*Dismorphia eunoe populuca* Llorente & Luis, 1988

*Dismorphia eunoe chamula* Llorente & Luis, 1988

##### Coliadinae

\**Phoebis agarithe fisheri* (H. Edwards, 1883)

*Prestonia clarki* Schaus, 1920

*Eurema agave millerorum* Llorente & Luis, 1987

##### Pierinae

*Anthocharis cethura bajacalifornia* J. Emmel, T. Emmel & Mattoon, 1998

*Anthocharis limonea* (Butler, 1871)

\**Euchloe guaymasensis* Opler, 1987

*Hesperocharis crocea jaliscana* (Schaus, 1898)

*Hesperocharis graphites avivolans* (Butler, 1865)

*Eucheira socialis socialis* Westwood, 1834

*Eucheira socialis westwoodi* Beutelspacher, 1984

*Catasticta flisa oaxaca* Beutelspacher, 1986

*Catasticta* undescribed species

\**Catasticta nimbece nimbece* (Boisduval, 1836)

*Catasticta teutila flavifaciata* Beutelspacher, 1986

*Catasticta teutila teutila* (Doubleday, 1847)

*Pereute charops charops* (Boisduval, 1836)

*Pereute charops leonilae* Llorente, 1986

*Pereute charops sphocra* Draudt, 1931

*Melete polyhymnia serrana* R. G. Maza, 1984

*Perrhybris pamela chajulensis* J. Maza & R. G. Maza, 1989

*Perrhybris pamela mapa* J. Maza & R. G. Maza, 1989

*Ascia monuste raza* Klots, 1930

\**Ganyra howarthi* (Dixey, 1915)

#### NYPHALIDAE

##### Heliconiinae

*Actinote stratonice oaxaca* (L. Miller & J. Miller, 1979)

*Actinote guatemalena guerrerensis* J. Maza, 1982

*Actinote guatemalena veraecrucis* Jordan, 1913

*Eueides isabella nigricornis* R. G. Maza, 1989

*Heliconius erato cruentus* Lamas, 1998

*Speyeria nokomis wenona* dos Passos & Grey, 1945 «

*Speyeria nokomis melaena* Mooser & García, 1979 «

\**Speyeria nokomis coerulecens* (Holland, 1900)

##### Nymphalinae

*Nymphalis cyanomelas* (Doubleday, [1848])

*Polygonia g-argenteum* (Doubleday, 1848)

*Polygonia haroldii* (Dewitz, 1877)

*Anartia amathea colima* Lamas, 1995

*Chlosyne kendallorum* Opler, 1999

\**Chlosyne ehrenbergii* (Geyer, [1833])

*Chlosyne definita anastasia* (Hemming, 1934)

*Chlosyne definita schausi* (Godman, 1901)

*Chlosyne endeis endeis* (Godman & Salvin, 1894)

*Chlosyne gaudialis wellingi* L. Miller & Rotger, 1979

\**Chlosyne eumeda* (Godman & Salvin, 1894)

*Chlosyne marina* (Geyer, 1837)

\**Chlosyne melitaeoides* (R. Felder 1867)

*Chlosyne janais gloriosa* Bauer, 1960

*Chlosyne janais marianna* Röber, [1914]

*Chlosyne rosita mazarum* L. Miller & Rotger, 1979

*Chlosyne rosita riobalsensis* Bauer, 1961

*Thessalia cyneas cynisca* (Godman & Salvin, 1882)

*Thessalia leanira austrina* Austin & M. J. Smith, 1998

*Thessalia theona brocki* Austin & M. J. Smith, 1998

*Thessalia theona mullinsi* Austin & M. J. Smith, 1998

*Texola anomalus* (Godman & Salvin, 1897)

*Texola coracara* (Dyar, 1912)

*Texola elada elada* (Hewitson, 1868)

*Phyciodes pallescens* (R. Felder, 1869)

*Phyciodes mylitta mexicanus* Hall, 1928

*Anthanassa alexon* (Godman & Salvin, 1889)

*Anthanassa ptolyca amator* (Hall, 1929)

*Anthanassa sitalces cortes* (Hall, 1917) «

*Anthanassa otanes cyno* (Godman & Salvin, 1889)

*Anthanassa otanes oaxaca* Beutelspacher, 1990

*Castilia chinantlensis* (R. R. Maza, 1978)

##### Limenitidinae

*Myscelia cyananthe diaziana* R. G. Maza & J. Maza, 1985

\**Myscelia cyananthe skinneri* Mengel, 1894  
*Myscelia cyananthe streckeri* Skinner, 1889  
*Myscelia cyaniris alvaradia* R. G. Maza & Díaz, 1982  
***Catonephele cortesi*** R. G. Maza, 1982  
*Eunica malvina almae* Vargas, Llorente & Luis, 1998  
*Hamadryas amphinome mazai* Jenkins, 1983  
 \**Hamadryas atlantis lelaps* Godman & Salvin, 1883  
 \**Hamadryas glauconome grisea* Jenkins, 1983  
 \**Hamadryas guatemalena marmarice* (Frühstorfer, 1916)  
 ^*Hamadryas honorina* (Frühstorfer, 1916)  
*Pyrrhogyra edocla paradisea* R. G. Maza & J. Maza, 1985  
*Temenis laothoe quilapayunia* R. G. Maza & Turrent, 1985  
*Epiphile adrasta escalantei* Descimon & Mast, 1979  
*Bolboneura sylphis beatrix* R. G. Maza, 1985  
*Bolboneura sylphis lacandona* R. G. Maza & J. Maza, 1985  
*Bolboneura sylphis veracruzana* Draudt, 1931  
*Diaethria astala asteroidea* R. G. Maza & R. R. Maza, 1985  
***Diaethria asteria*** (Godman & Salvin, 1894)  
*Diaethria salvadorensis mixteca* J. Maza, 1977  
*Callicore astarte casta* (Salvin, 1869)  
*Callicore texa grijalva* R. G. Maza & J. Maza, 1983  
*Callicore texa loxicha* R. G. Maza & J. Maza, 1983  
*Callicore tolima tehuana* R. G. Maza & J. Maza, 1983  
***Adelpha milleri*** Beutelspacher, 1976  
*Adelpha boeotia oberthurii* (Boisduval, 1870)  
***Adelpha diazi*** Beutelspacher, 1975  
*Adelpha diocles creton* Godman, 1901  
*Adelpha leucerioides leucerioides* Beutelspacher, 1975  
*Basilarchia archippus hoffmanni* (Chermock, 1947)

Charaxinae

*Archaeoprepona amphimachus baroni* J. Maza, 1982  
*Archaeoprepona demophon occidentalis* Stoffel & Descimon, 1974  
*Archaeoprepona demophoon mexicana* Llorente, Descimon & Johnson, 1993  
*Archaeoprepona phaedra aelia* (Godman & Salvin, 1889)  
*Prepona deiphile brooksiana* Godman & Salvin, 1889  
*Prepona deiphile diaziana* L. Miller & J. Miller, 1976  
*Prepona deiphile escalantiana* Stoffel & Mast, 1973  
*Prepona deiphile ibarra* Beutelspacher, 1982  
*Prepona deiphile lambertoana* Llorente, Luis & González, 1992  
*Hypna clytemnestra mexicana* Hall, 1917  
*Consul electra* undescribed subspecies  
*Fountainea eurypyle glanzi* (Rotger, Escalante & Coronado, 1965)  
*Fountainea halice martinezi* (J. Maza & Díaz, 1978)  
*Fountainea halice maya* (Witt, 1980)  
*Fountainea halice tehuana* (Hall, 1917)  
*Fountainea nobilis rayoensis* (J. Maza & Díaz, 1978)  
***Memphis schausiana*** (Godman & Salvin, 1894)  
***Memphis wellingi*** L. Miller & J. Miller, 1976

## Morphiinae

*Morpho achilles guerrerensis* Le Mout & Réal, 1962  
*Morpho achilles montezuma* Guenée, 1859  
*Iphimedeia telemachus oaxacensis* Le Mout & Réal, 1962

## Satyrinae

***Cissia cleophes*** (Godman & Salvin, 1889) «  
***Cyllopsis caballeroi*** Beutelspacher, 1982  
***Cyllopsis clinas*** (Godman & Salvin, 1889)  
***Cyllopsis diazi*** L. Miller, 1974  
***Cyllopsis dospassosi*** L. Miller, 1969  
*Cyllopsis hedemanni tamaulipensis* L. Miller, 1974  
*Cyllopsis henschawi hoffmanni* L. Miller, 1974 «  
***Cyllopsis jacquelineae*** L. Miller, 1974  
***Cyllopsis nayarit*** Chermock, 1947 «  
***Cyllopsis parvimaculata*** L. Miller, 1974  
***Cyllopsis perplexa*** L. Miller, 1974  
*Cyllopsis pertepida pertepida* (Dyar, 1912)  
*Cyllopsis pertepida intermedia* L. Miller, 1974  
***Cyllopsis pseudocephredo*** Chermock, 1947  
*Cyllopsis suivalens suivalens* (Dyar, 1914)  
***Cyllopsis whiteorum*** L. Miller & J. Maza, 1984  
***Cyllopsis windi*** L. Miller, 1974 «  
***Euptychia fetna*** Butler, 1870  
***Euptychia rubrofasciata*** L. Miller & J. Miller, 1988  
**“Megisto” pellationia** (Godman, 1901)  
*Megisto rubricata pseudocephredo* L. Miller, 1976  
***Paramacera chinanteca*** L. Miller, 1972  
***Paramacera copiosa*** L. Miller, 1972  
***Paramacera xicaque rubrosuffusa*** L. Miller, 1972  
***Paramacera xicaque xicaque*** (Reakirt, [1867])  
***Splendeuptychia kendalli*** L. Miller, 1976  
*Taygetis mermeria griseomarginata* L. Miller 1978  
***Taygetis uncinata*** Weymer, 1907  
***Taygetis weymeri*** Draudt, 1912  
*Pedaliodes* undescribed species

## Ithomiinae

*Melinaea ethra flavicans* Hoffmann, 1924  
*Oleria zea diazi* J. Maza & Lamas, 1978  
*Callithomia hezia wellingi* Fox, 1968  
*Epscada salvinia portilla* J. Maza & Lamas, 1978  
*Pteronymia artena praedicta* J. Maza & Lamas, 1982  
***Pteronymia rufocincta*** (Salvin, 1869)  
*Pteronymia simplex timagenes* Godman & Salvin, 1889  
*Greta annette moschion* (Godman, 1901)

## LYCAENIDAE

## Theclinae

***Habrodais poodiae*** J. W. Brown & Faulkner, 1982

## Eumaeinae

***Micandra tongida*** Clench, 1971  
***Laiothus erybathis*** (Hewitson, 1867)  
***Callophrys dospassosi*** Clench, 1981  
***Callophrys estela*** Clench, 1981

*Symbiopsis* undescribed species  
*Ministrymon* undescribed species  
*Erora* undescribed species  
*Thecla semones* (Godman & Salvin, 1887)  
*Ipipecla miadora* Dyar, 1916

## Polyommatainae

*Everes* undescribed species  
*Euphilotes bernardino garthi* Mattoni, 1989  
*Lycaeides melissa mexicana* (Clench, 1965)

## Riodininae

*Euselasia catalaeca* (R. Felder, 1869)  
*Euselasia hypophaea mexicana* Lathy, 1926  
*Euselasia* undescribed species  
*Mesosemia gemina* J. Maza & R. G. Maza, 1980  
*Napaea danforthi* A. Warren & Opler, 1999  
*Rhetus arcus beutelspacheri* Llorente, 1987  
*Calephelis acapulcoensis* McAlpine, 1971 «  
*Calephelis azteca* McAlpine, 1971 «  
 \**Calephelis dreisbachi* McAlpine, 1971 «  
*Calephelis huasteca* McAlpine, 1971 «  
*Calephelis nemesi bajaensis* McAlpine, 1971 «  
*Calephelis matheri* McAlpine, 1971 «  
*Calephelis mexicana* McAlpine, 1971 «  
*Calephelis montezuma* McAlpine, 1971 «  
*Calephelis perditalis donahuei* McAlpine, 1971 «  
*Calephelis sinaloensis sinaloensis* McAlpine, 1971 «  
*Calephelis sinaloensis nuevoleon* McAlpine, 1971 «  
*Calephelis yautepequensis* R. G. Maza & Turrent, 1971  
*Caria melino* Dyar, 1912  
*Caria stillaticia* Dyar, 1912  
*Exoplisia* undescribed species  
*Melanis cephise huasteca* J. White & A. White, 1989  
*Melanis cephise acroleuca* (R. Felder, 1869)  
*Emesis poeas* Godman & Salvin, 1901  
*Emesis zela zela* Butler, 1870  
*Apodemia hepburni remota* Austin, 1991  
*Apodemia mormo dialeuca* Opler & Powell, 1962  
*Apodemia mormo maxima* A. G. Weeks, 1891  
*Apodemia murphyi* Austin, 1988  
*Apodemia palmerii australis* Austin, 1988  
 \**Apodemia phyciodoides* Barnes & Benjamin, 1924  
*Apodemia hypoglauca wellingi* Ferris, 1985  
*Adelotypa eudocia* (Godman & Salvin, 1897)  
*Theope villai* Beutelspacher, 1981

## HESPERIIDAE

## Pyrrhopyginae

*Chalypge chalybea chalybea* (Scudder, 1872) «  
*Jonaspyge tzotzili* H. A. Freeman, 1969  
*Melanopyge mulleri* (Bell, 1934)  
*Apyrothrix araxes araxes* (Hewitson, 1867)  
*Mysoria wilsoni* H. A. Freeman, 1969

## Pyrginae

*Entheus crux* Steinhauser, 1989  
*Epargyreus brodkorbi* H. A. Freeman, 1966 (must also occur in GUAT)  
*Epargyreus deleoni* H. A. Freeman, 1977  
*Typhedanus salas* H. A. Freeman, 1977  
*Typhedanus* undescribed species  
*Zestusa elwesi* (Godman & Salvin, 1893)  
*Zestusa* undescribed species  
*Codattractus cyledis* (Dyar, 1912)  
*Codattractus uvydixa* (Dyar, 1914)  
*Codattractus yucatanus* H. A. Freeman, 1977  
*Ridens mercedes* Steinhauser, 1983  
*Urbanus* undescribed species #1  
*Urbanus dorantes calafia* (R. C. Williams, 1926)  
*Urbanus* undescribed species #2  
*Urbanus viridis* H. A. Freeman, 1970  
 \**Autochton pseudocellus* (Coolidge & Clemence, [1910])  
*Autochton siernadror* Burns, 1984  
*Thorybes* undescribed species  
*Cephise mexicanus* Austin & Mielke, 2000  
*Cogia aventinus* (Godman & Salvin, 1894)  
*Cogia hippalus peninsularis* L. Miller & MacNeill, 1969  
*Telemiades choricus* (Schaus, 1902)  
*Mimia chiapaensis* H. A. Freeman, 1969  
*Polyctor* undescribed species  
*Myrinia raymundo* H. A. Freeman, 1979  
*Bolla cybele* Evans, 1953  
*Bolla fenestra* Steinhauser, 1991  
*Bolla guerra* Evans, 1953  
*Bolla litus* (Dyar, 1912)  
*Bolla oriza* Evans, 1953  
*Bolla solitaria* Steinhauser, 1991  
*Staphylus* undescribed species  
*Staphylus tepeca* (Bell, 1942)  
*Staphylus tierra* Evans, 1953  
*Zera eboneus* (Bell, 1947)  
*Quadrus francesius* H. A. Freeman, 1969  
*Pythonides mundo* H. A. Freeman, 1979  
*Pythonides rosa* Steinhauser, 1989  
*Zobera albopunctata* H. A. Freeman, 1970  
*Zobera marginata* H. A. Freeman, 1979  
*Zobera oaxaquena* Steinhauser, 1991  
 \**Antigonus emorsa* (R. Felder, 1869)  
*Antigonus funebris* (R. Felder, 1869)  
*Systasea microsticta* Dyar, 1923  
*Doberes hewitsonius* (Reakirt, [1867])  
*Doberes sobrinus* Godman & Salvin, 1895  
*Anastrus luctuosus* Godman & Salvin, 1894  
*Camptopleura oaxaca* H. A. Freeman, 1969  
*Chiomara georgina pelagica* (Weeks, 1891)  
*Erynnis brizo mulleri* (Draudt, 1923)  
*Erynnis mercurius* (Dyar, 1926)  
*Erynnis meridianus fieldi* Burns, 1964  
*Erynnis tristis pattersoni* Burns, 1964  
*Heliopyrgus sublinea* Schaus, 1902

*Celotes* undescribed species

## Heteropterinae

- Piruna ceracates* (Hewitson, 1874)  
*Piruna cyclosticta* (Dyar, 1920)  
*Piruna dampfi* (Bell, 1942)  
*Piruna gyrans* (Plotz, 1884)  
*Piruna jonka* Stainhauser, 1991  
*Piruna kemneri* H. A. Freeman, 1990  
*Piruna maculata* H. A. Freeman, 1970  
*Piruna microsticta* (Godman, 1900)  
*Piruna millerorum* Stainhauser, 1991  
*Piruna mullinsi* H. A. Freeman, 1991  
*Piruna purepecha* A. Warren & Gonzalez, 1998  
*Piruna roeveri* (L. Miller & J. Miller, 1972)  
*Piruna* undescribed species #1  
*Piruna sina* H. A. Freeman, 1970  
*Piruna* undescribed species #2  
*Dalla bubobon* (Dyar, 1921)  
*Dalla dividuum* (Dyar, 1913)  
*Dalla faula* (Godman, 1900)  
*Dalla kemneri* Stainhauser, 1991  
*Dalla* undescribed species  
*Dalla mentor* Evans, 1955  
*Dalla nubes* Stainhauser, 1991  
*Dalla stainhauseri* H. A. Freeman, 1991

## Hesperiinae

- Synapte silna* Evans, 1955  
 \**Synapte syraces* (Godman, 1901)  
*Zariaspes mytheucus* Godman, 1900  
*Anthoptus macalpinei* H. A. Freeman, 1969  
*Pheraeus covadonga covadonga* H. A. Freeman, 1969  
*Pheraeus covadonga loxicha* Stainhauser, 1991  
*Virga clenchi* L. Miller, 1970  
*Monca jera* Godman, 1900  
*Remella* undescribed species  
*Cobalopsis zetus* (Bell, 1942)  
*Turesis tabascoensis* H. A. Freeman, 1979  
*Thoon wellingi* H. A. Freeman, 1969  
*Enosis matheri* H. A. Freeman, 1969  
*Ebusus ebusus nigrior* L. Miller, 1985  
*Carystoides escalantei* H. A. Freeman, 1969  
*Carystoides abrahami* H. A. Freeman, 1969  
*Carystoides floresi* H. A. Freeman, 1969  
*Carystoides mexicana* H. A. Freeman, 1969  
*Cynea nigricola* H. A. Freeman, 1969  
*Decinea rindgei* H. A. Freeman, 1968  
*Decinea mustea* H. A. Freeman, 1979  
*Oeonus pyste* Godman, 1900  
*Oarisma era* Dyar, 1927  
*Adopaeodes bistriata* Godman, 1900  
*Stinga* undescribed species  
*Hesperia uncas gilberti* MacNeill, 1964  
*Polites norae* MacNeill, 1993  
*Polites pupillus* (Plotz, 1883)  
*Polites puxillus* (Mabille, 1891)  
*Polites sabuleti margaretae* L. Miller & MacNeill, 1969

- Ochlodes samenta* Dyar, 1914  
*Poanes monticola* (Godman, 1900)  
 “*Poanes*” *benito* H. A. Freeman, 1979  
*Paratrytone aphractioia* Dyar, 1914  
*Paratrytone decepta* L. Miller & J. Miller, 1972  
*Paratrytone kemneri* Stainhauser, 1996  
*Paratrytone* undescribed species #1  
*Paratrytone raspa* (Evans, 1955)  
*Paratrytone* undescribed species #2  
*Paratrytone omiltemensis* Stainhauser, 1996  
*Paratrytone* undescribed species #3  
*Paratrytone pilza* Evans, 1955  
*Paratrytone polyclea* Godman, 1900  
*Paratrytone rhexenor* Godman, 1900  
*Paratrytone* undescribed species #4  
*Quasimellana siblinga* Burns, 1994  
*Quasimellana agnesae* (Bell, 1959)  
*Quasimellana mulleri* (Bell, 1942)  
 “*Mellana*” *gala* (Godman, 1900)  
*Librita heras* (Godman, 1900)  
*Euphyes chamuli* H. A. Freeman, 1969 (must also occur in GUAT)  
*Euphyes canda* Stainhauser & Warren, [2002]  
*Atrytonopsis frappenda* (Dyar, 1920)  
*Atrytonopsis zweifeli* H. A. Freeman, 1969  
*Atrytonopsis* undescribed species  
*Amblyscirtes anubis* (Godman, 1900)  
*Amblyscirtes brocki* H. A. Freeman, 1992  
*Amblyscirtes fimbriata pallida* H. A. Freeman, 1993  
*Amblyscirtes fluonia* Godman, 1900  
*Amblyscirtes folia* Godman, 1900  
*Amblyscirtes novimaculatus* A. Warren, 1998  
*Amblyscirtes raphaeli* H. A. Freeman, 1973  
*Lerodea similea* Bell, 1942 «  
*Vacerra* undescribed species #1  
*Vacerra gayra* (Dyar, 1918)  
*Vacerra* undescribed species #2  
*Vacerra* undescribed species #3  
*Niconiades comitana* H. A. Freeman, 1969  
*Halotus jonaveriorum* Burns, 1992  
*Aides* undescribed species

## Megathyminae

- Stallingsia smithi* (H. H. Druce, 1896)  
*Stallingsia* undescribed species  
*Stallingsia jacki* D. Stallings, Turner, & V. Stallings, 1963  
*Megathymus beulahae beulahae* D. Stallings & Turner, 1958  
*Megathymus beulahae gayleae* D. Stallings, Turner & V. Stallings, 1963  
*Aegiale hesperiaris* (Walker, 1856) (may represent a species complex)  
*Turnerina mejicanus* (Bell, 1938)  
*Turnerina hazelae* (D. Stallings & Turner, 1958)  
*Agathymus belli* (H. A. Freeman, 1955)  
*Agathymus comstocki* (Harbison, 1957)  
*Agathymus dawsoni* Harbison, 1963  
*Agathymus* undescribed species #1

- Agathymus* undescribed species #2  
*Agathymus* undescribed species #3  
*Agathymus* undescribed species #4  
*Agathymus escalantei* D. Stallings, Turner & V. Stallings, 1966  
*Agathymus remingtoni* (D. Stallings & Turner, 1958)  
*Agathymus fieldi* H. A. Freeman, 1960  
*Agathymus hoffmanni* (H. A. Freeman, 1952)  
*Agathymus juliae* (D. Stallings & Turner, 1958)  
*Agathymus* undescribed species #5  
*Agathymus* undescribed species #6
- Agathymus* undescribed species #7  
*Agathymus* undescribed species #8  
*Agathymus micheneri* D. Stallings, Turner & V. Stallings, 1961  
*Agathymus* undescribed species #9  
*Agathymus* undescribed species #10  
*Agathymus* undescribed species #11  
*Agathymus* undescribed species #12  
*Agathymus* undescribed species #13  
*Agathymus rethon* (Dyar, 1913)  
*Agathymus ricei* D. Stallings, Turner & V. Stallings, 1966