

The butterflies of Turquino National Park, Sierra Maestra, Cuba (Lepidoptera, Papilionoidea)

R. Núñez

Núñez, R., 2012. The butterflies of Turquino National Park, Sierra Maestra, Cuba (Lepidoptera, Papilionoidea). *Arxius de Miscel·lània Zoològica*, 10: 29–49.

Abstract

The butterflies of Turquino National Park, Sierra Maestra, Cuba (Lepidoptera, Papilionoidea).— Between February and November 2011, we conducted a species inventory, created a natural history database and made a first approach to the composition and structure of the butterfly communities present at several vegetation types in the Turquino National Park. The inventory included 83 species, 29 of them endemic. We recorded 57 species (18 endemic) in transects along main vegetation pathways. In disturbed vegetation, species richness was higher (48) and abundance was better distributed, but the proportion of endemism was lower (23%). Species richness decreased and the dominance and proportion of endemism increased with altitude. Numbers of species and the proportions of endemism at natural habitats sampled were: 19 and 58% for evergreen forest, 10 and 60% for rainforest, eight and 100% for cloud forest, and four and 100% for the elfin thicket. Flowers of 27 plants were recorded as nectar sources for 30 butterfly species, and host plants were recorded for nine species.

Key words: Communities, Conservation, Natural history, Endemism, Caribbean.

Resumen

Las mariposas del Parque Nacional Turquino, Sierra Maestra, Cuba (Lepidoptera, Papilionoidea).— Entre febrero y noviembre de 2011 realizamos un inventario de especies, creamos un registro de datos de historia natural y efectuamos una primera aproximación a la composición y estructura de las comunidades de mariposas presentes en varios tipos de vegetación del Parque Nacional Turquino. El inventario incluyó 83 especies, 29 de ellas endémicas. Registramos 57 especies (18 endémicas) en transectos situados a lo largo de los principales corredores de vegetación. En la vegetación alterada, la riqueza específica era mayor (48) y la abundancia estaba mejor distribuida, aunque la proporción de endemismo era más baja (23%). Con la altura, la riqueza de especies disminuía mientras que la dominancia y la proporción de endemismo se incrementaban. El número de especies y las proporciones de endemismo en los hábitats naturales muestreados fueron: 19 y 58% en el bosque perennifolio, 10 y 60% en la selva pluvial, ocho y 100% en el bosque nuboso y cuatro y 100% en el bosque enano. Se registraron flores de 27 plantas como fuentes de néctar para 30 especies de mariposas y las plantas huésped de nueve especies.

Palabras claves: Comunidades, Conservación, Historia natural, Endemismo, Caribe.

(Received: 12/10/12; Conditional acceptance: 30/01/13; Final acceptance: 20/02/13)

Rayner Núñez Aguila, División de Colecciones Zoológicas y Sistemática, Inst. de Ecología y Sistemática, carretera de Varona km 3.5, Capdevila, Boyeros, CP 11900, Habana 19, La Habana, Cuba. E-mail: rayner@ecologia.cu

Introduction

Butterflies are poorly represented in conservation planning in Cuba. Several protected areas of Cuba have species inventories of this group (Fontenla, 1987a, 1987b, 2005; Hernández et al., 1994; Pérez et al., 1999; Núñez, 2004, 2010) but most lack information relevant for their conservation, such as data concerning preferred habitats, food sources for adults and immature stages, population size, and so on.

Cuba has a rich Lepidoptera fauna that includes 192 species of butterflies and skippers (Núñez & Barro, 2012). Of this total, 33 species and 39 subspecies are endemic to the island. Located in the Sierra Maestra Mountains, the Turquino National Park (TNP) harbors several of the Cuban endemic butterflies (Schwartz & Hedges, 1991). The cited authors recorded 37 species, nine of them endemic species and subspecies, along a transect from the south coast to Pico Real del Turquino, 1,974 m, the highest of all mountains in Cuba. Schwartz & Hedges (1991) incompletely described the habitats occupied by some species.

The goal of the present study was to increase the inventory of TNP butterfly species, to conduct a first approach to the composition and structure of its butterfly communities at different vegetation types, and to record all possible natural history data on this group in order to contribute to its future conservation and management.

Materials and methods

Study area and vegetation types

The TNP covers 242.1 km² in the highest portion of the Sierra Maestra Mountain range in southeastern Cuba, including the country's highest peak, the Pico Real del Turquino of 1,974 m. Vegetation of the Turquino massif is composed of several natural types of forests and thickets along different altitudes, as well as disturbed vegetation (grasslands and ruderal vegetation) resulting from human activity. Forests include evergreen forest between 300–800 m of elevation, rainforest at 800–1,600 m, and cloud forest between 1,600–1,900 m (Capote & Berazain, 1989). Pine forests are also present at the TNP but were not sampled in this study. The Pico Real del Turquino and its vicinity are covered by a thicket formation that is known by several names but referred to here as elfin thicket, following Borhidi (1996).

Methods

The TNP was visited in February, June, September, and November 2011. Butterflies were inventoried and counted along two vegetation paths on the TNP northern slope. One is 13 km long. It runs from Alto del Naranjo, 900 m, to Aguada de Joaquín Station, 1,250 m, ending at Pico Real del Turquino, 1,974 m. The other path, 16 km long, starts at 250 m at the Santo Domingo town, goes to El Cojo Station, 1,200 m, and also ends at the top of Pico Real del Turquino.

During each visit, transects were placed at random to take samples, completing three sampling times at each vegetation type by the end of the study. Sampling covered at least 20 to 30% of the length of pathway where there was vegetation. The total number of transects at each vegetation type was 24 for disturbed vegetation, 36 for evergreen forest, 36 for rainforest, 24 for cloud forest, and 14 for elfin thicket. The minimum distance between two transects was 50 m.

Each transect was 100 m long and 4 m to each side of the observer. All butterfly species and individuals flying up to 5 m high were counted. In addition, any data on natural history (oviposition plant, nectar sources, and larval food plant) was recorded. Specimens requiring closer examination were netted and released at the same site after identification. Counts were made between 9:00 and 15:00 h, always on sunny days.

All the species detected are reported in the species list and in the annex 1, where they have been classified as dominant, intermediate, or rare based on their position at the rank abundance curves for each habitat type. Species observed only outside transects were considered as rare.

Records of additional species were obtained by reviewing the entomological collection of the Institute of Ecology and Systematics (CZACC).

Results

Species inventory

To date, 83 butterfly species have been recorded from the TNP, including 29 species and subspecies endemic to Cuba, representing five families (table 1, species list and annex 1). Nymphalidae is the family with the highest number of species (29), followed by Hesperidae (26), Pieridae (17), Papilionidae (8), and Lycaenidae (3). During the field work, 71 species were recorded, 27 being endemic to Cuba. The other 12 species are only known from literature records or from the CZACC collection.

Butterfly communities

57 species (18 Cuban endemics) were recorded from the transect counts (table 2), while an additional 14 species were recorded outside the transects. Lowland to mid-altitude areas covered by disturbed vegetation were the most diverse, with 48 species, of which 16 were endemic (4 species and 12 subspecies). Butterfly abundance was also higher than at the other vegetation types, and was evenly distributed among species (fig. 1). This community is dominated by *Calisto herophile herophile*, Nymphalidae, and *Phoebis sennae sennae*, Pieridae.

At higher altitudes with better preserved habitats, species richness was lower but the proportion of endemic butterflies was higher (table 2). All communities at natural habitats

Table 1. Turquino National Park vegetation types, altitudinal range (A, in m), and total number of butterfly species (S), endemism (E), and percentage of endemism (%E). Records from the present study, literature, and specimens deposited at the IES collection.

Tabla 1. Tipos de vegetación, rango altitudinal (A, en m), y número total de especies de mariposas (S), endemismo (E) y porcentaje de endemismo (%E) en el Parque Nacional Turquino. Registros procedentes de este estudio, referencias bibliográficas y ejemplares depositados en la colección del IES.

Vegetation types	A	S	E	%E
Disturbed vegetation	250–1,000	63	16	25
Evergreen forest	300–800	30	17	57
Rainforest	800–1,600	19	12	63
Cloud forest	1,600–1,900	14	12	86
Elfin thicket	1,900–1,974	5	4	80
Totals	250–1,974	71	27	38

Table 2. Vegetation types, number of butterfly species (S), number of endemic species (E), percentage of endemism (%E) and relative abundance in a community (CRA, individuals/km of path) recorded along transects at the Turquino National Park. *Tabla 2. Tipos de vegetación, número de especies de mariposas (S), número de especies endémicas (E), porcentaje de endemismo (%E), y abundancia relativa en la comunidad (CRA, individuos/km de camino) registrados a lo largo de transectos en el Parque Nacional Turquino.*

Vegetation types	S	E	%E	CRA
Disturbed vegetation	48	11	23	113.5
Evergreen forest	19	11	58	80.0
Rainforest	10	6	60	90.0
Cloud forest	8	8	100	84.7
Elfin thicket	4	4	100	3.1
Totals	57	18	31.6	40.3

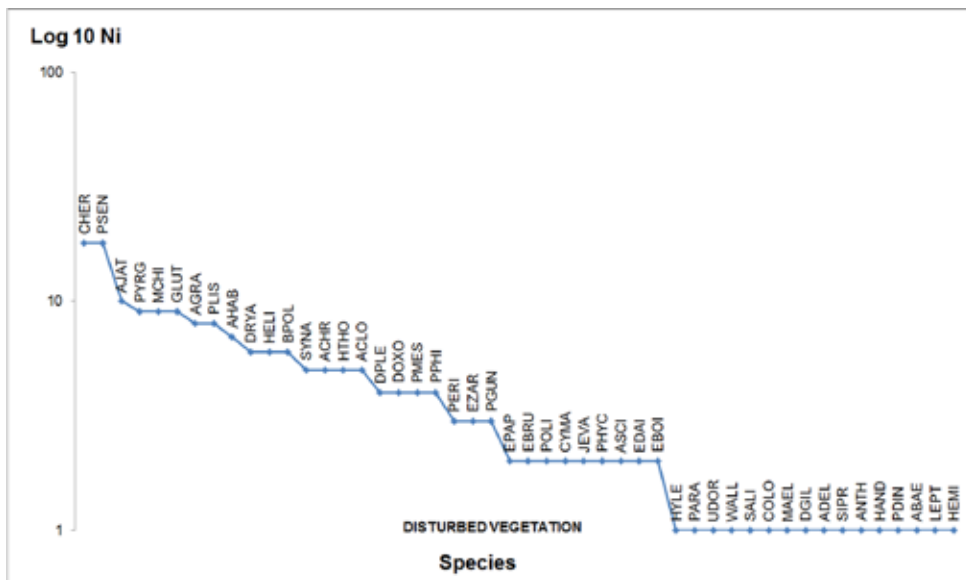


Fig. 1. Rank–abundance curves of the butterfly species present at zones of disturbed vegetation in the Turquino National Park. (For the abbreviations of species, see the annex 1.)

Fig. 1. Curva de rango–abundancia de las especies de mariposas presentes en zonas de vegetación alterada del Parque Nacional Turquino. (Para las abreviaturas de las especies, ver el anexo 1.)

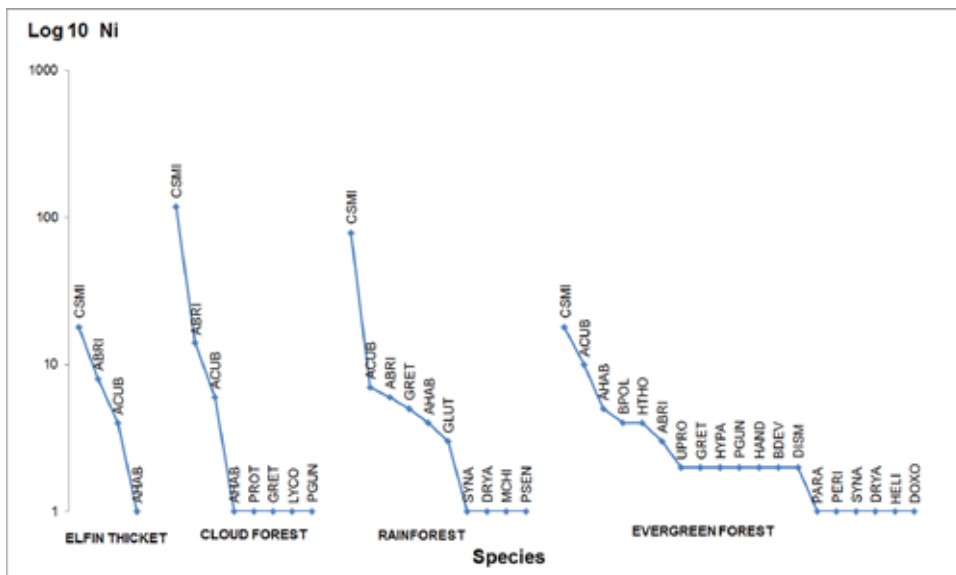


Fig. 2. Rank–abundance curves for the butterfly species present in zones of evergreen forest, rainforest, cloud forest, and elfin thicket at the Turquino National Park. (For the abbreviations of species, see the annex 1.)

Fig. 2. Curvas de rango-abundancia de las especies de mariposas presentes en zonas de bosque perennifolio, selva pluvial, bosque nuboso y bosque enano del Parque Nacional Turquino. (Para las abreviaturas de las especies, ver el anexo 1.)

except the evergreen forest are evidently dominated by *Calisto smintheus*, the only butterfly endemic to the Sierra Maestra Mountain range, followed by *Anetia briarea numidia* and *Anetia cubana*, two other Nymphalids endemic to Cuba (fig. 2). The community in the evergreen forest was the richest of all natural habitats and had a more evenly distributed abundance. It was also dominated by *C. smintheus*, but to a lesser extent than in other habitat types (fig. 2).

An analysis by family indicated that all communities were dominated by the Nymphalidae (table 3). Only in disturbed habitats, the Hesperiiidae had a similar number of species, although their abundance and number of endemisms was almost half that of Nymphalidae. Moreover, this was the only habitat where all the families were present. Habitats at higher elevations were characterized by a stronger dominance by the Nymphalidae, which represented more than two thirds of the communities' abundance and number of endemisms (table 3).

Natural history data

A total of 27 plant species were recorded as nectar sources for 30 butterfly species (see species list and annex). The plant species most visited were *Lantana camara* (11 butterfly species), and *Stachytarpheta jamaicensis* (nine butterfly species). Nectar sources for the endemic species *Greta cubana*, *Anetia cubana*, and *Anetia briarea numidia* are provided here for the first time.

Table 3. Contribution of each butterfly family to the community species richness (S), percentage of species total (%ST), to endemism (%E), and abundance (%A) at each vegetation type sampled at the Turquino National Park, Cuba: DV. Disturbed vegetation; EF. Evergreen forest; RF. Rainforest; CF. Cloud forest; ET. Elfin thicket.

Tabla 3. Contribución de cada familia de mariposas a la riqueza de especies (S) y porcentaje del total de especies (%ST), de endemismo (%E) y de abundancia (%A) de la comunidad en cada tipo de vegetación muestreado en el Parque Nacional Turquino, Cuba: DV. Vegetación alterada; EF. Bosque perennifolio; RF. Selva pluvial; CF. Bosque nuboso; ET. Bosque enano.

	DV				EF				RF				CF				ET			
	S	%ST	%E	%A	S	%ST	%E	%A	S	%ST	%E	%A	S	%ST	%E	%A	S	%ST	%E	%A
Nymphalidae	17	35.4	54.5	41.6	8	42.1	54.5	59.4	6	60	83.3	91.7	5	62.5	62.5	98.6	3	75	75	97
Hesperiidae	14	29.2	18.2	20.8	5	26.3	9.1	15.6	2	20	16.7	4.6	2	25	25	0.7	1	25	25	3
Pieridae	11	22.9	9.1	29	1	5.3	9.1	3.1	2	20	–	3.7	–	–	–	–	–	–	–	–
Papilionidae	4	8.3	18.2	7.7	5	26.3	27.3	21.9	–	–	–	–	1	12.5	12.5	0.7	–	–	–	–
Lycaenidae	2	4.2	–	0.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Totals	48	100	100	100	19	100	100	100	10	100	100	100	8	100	100	100	4	100	100	100

Oviposition was recorded for seven butterflies, all endemic except *Heraclides androgeus epidaurus* (see species list and annex). For *Dismorphia cubana*, *A. briarea numidia*, and *A. cubana* these are the first records of host plants, and for *Doxocopa laure druryi* and *G. cubana* new host plants are recorded.

Larvae of *H. thoas oviedo* and of *Danaus plexippus plexippus* were found on *Piper auritum* and *Asclepias curassavica*, respectively.

List of butterflies species inhabiting the Turquino National Park

Brief comments on habitats where species were recorded, their abundance, nectar sources and/or host plants used are mentioned when appropriate. Literature and collection records are also added. Abbreviations: * Endemism; DV. Disturbed vegetation; EF. Evergreen forest; RF. Rainforest; CF. Cloud forest; ET. Elfin thicket. When possible and following the descriptions of Schwartz & Hedges (1991), habitats are also mentioned for the species they recorded.

Family Papilionidae

Battus devilliers (Godart). Habitat: DV, EF. Abundance: rare. Flowers visited: *Lantana camara*, *Zinnia elegans*.

**Battus polydamas cubensis* Dufrane. Habitat: DV, EF. Abundance: intermediate. Flowers visited: *Lantana camara*.

Heraclides andraemon andraemon Hübner. Habitat: DV. Abundance: rare. Flowers visited: *Lantana camara*. Recorded by Schwartz and Hedges (1991).

Heraclides androgeus epidaurus (Godart). Habitat: DV, EF, RF. Abundance: rare. Flowers visited: *Verbena rigida*. Oviposition observed on *Citrus sinensis*.

**Heraclides aristodemus temenes* (Godart). Habitat: EF. Abundance: rare. Flowers visited: *Lantana camara*.

**Heraclides pelaus atkinsi* Bates. Habitat: EF, RF, CF. Abundance: rare. Flowers visited: *Lantana camara*, *Tournefortia cf. bicolor*, *Verbena rigida*. Old specimens present at CZACC.

**Heraclides thoas oviedo* Gundlach. Habitat: DV, EF. Abundance: intermediate. Flowers visited: *Asclepias curassavica*, *Lantana camara*. Larvae observed feeding on *Piper auritum*.

**Parides gundlachianus gundlachianus* Felder & Felder. Habitat: DV, EF, RF, CF. Abundance: rare. Flowers visited: *Abarema maestrense*, *Lantana camara*, *Verbena rigida*. Recorded by Schwartz & Hedges (1991).

Family Hesperiiidae

Aguna asander haitiensis (Mabille & Bouillet). Recorded only from old specimens present at CZACC.

**Astraptus cassander* (Fabricius). Habitat: DV, EF, RF. Abundance: rare. Old specimens present at CZACC.

**Astraptus habana habana* (Lucas). Habitat: DV, EF, RF, CF. Abundance: intermediate. Flowers visited: *Abarema maestrense*, *Citrus aurantium*, *Coffea arabica*, *Lobelia assurgens*, *Penta coccinea*, *Stachytarpheta cayennensis*, *Stachytarpheta jamaicensis*.

Astraptus xagua xagua (Lucas). Recorded only from old specimens present at CZACC.

Atalopedes mesogramma mesogramma (Latreille). Habitat: EF. Abundance: rare. Flowers visited: *Stachytarpheta cayennensis*.

Cabares portillo portillo (Lucas). Habitat: DV. Recorded only by Schwartz & Hedges (1991).

Calpodus ethlius (Stoll). Habitat: DV. Abundance: rare.

Choranthus radians (Lucas). Habitat: DV. Recorded only by Schwartz & Hedges (1991).

Cymaenes tripunctus (Herrich-Schäffer). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

- Eantis papinianus* (Poey). Habitat: DV, EF. Abundance: rare. Flowers visited: *Abarema maestrense*.
- Ephyriades brunnea brunnea* (Herrich–Schäffer). Habitat: DV, EF. Abundance: rare.
- Erynnis zarucco* (Lucas). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).
- Gesta gesta gesta* (Herrich–Schäffer). Habitat: DV. Recorded only by Schwartz & Hedges (1991).
- Hylephila phylaeus phylaeus* (Drury). Habitat: DV, ET. Flowers visited: *Borreria laevis*, *Stachytarpheta cayennensis*. Recorded by Schwartz & Hedges (1991).
- Panoquina lucas lucas* (Fabricius). Habitat: DV, EF. Abundance: rare.
- **Panoquina corrupta* (Herrich–Schäffer). Habitat: EF. Abundance: rare. Flowers visited: *Abarema maestrense*.
- Parachoranthus magdalia* (Herrich–Schäffer). Habitat: DV, EF. Abundance: rare. Recorded by Schwartz & Hedges (1991).
- Perichares philetes philetes* (Gmelin). Habitat: DV, EF, RF. Abundance: rare.
- Polites baracoa baracoa* (Lucas). Habitat: DV. Abundance: rare.
- **Proteides mercurius sanantonio* (Lucas). Habitat: CF. Abundance: rare. Flowers visited: *Chimarrhis cymosa*.
- Pyrgus oileus* (Linnaeus). Habitat: DV. Abundance: intermediate. Recorded by Schwartz & Hedges (1991).
- **Saliana esperi soroa* Smith & Hernández. Habitat: DV. Abundance: rare.
- Synapte malitiosa malitiosa* (Herrich–Schäffer). Habitat: DV, EF, RF. Abundance: intermediate (DV) to rare (remaining vegetation types). Flowers visited: *Stachytarpheta jamaicensis*. Recorded by Schwartz & Hedges (1991).
- Urbanus dorantes santiago* (Lucas). Habitat: DV. Abundance: rare. Flowers visited: *Lantana camara*.
- Urbanus proteus domingo* (Scudder). Habitat: DV, CF. Abundance: rare. Flowers visited: *Lantana camara*, *Stachytarpheta jamaicensis*. Recorded by Schwartz & Hedges (1991).
- Wallengrenia otho misera* (Lucas). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

Family Pieridae

- Abaeis nicippe* (Cramer). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).
- Anteos clorinde* (Godart). Habitat: DV, EF. Abundance: rare. Flowers visited: *Ixora coccinea*.
- Anteos maerula* (Fabricius). Habitat: EF. Abundance: rare. Flowers visited: *Lantana camara*.
- Ascia monuste eubotea* (Godart). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).
- **Dismorphia cubana* (Herrich–Schäffer). Habitat: EF, RF. Abundance: rare. Oviposition observed on *Abarema maestrense*. Old specimens present at CZACC.
- Eurema boisduvaliana* (Felder & Felder). Habitat: DV. Abundance: rare.
- Eurema दौर palmira* (Poey). Habitat: DV. Abundance: rare.
- Eurema elathea elathea* (Cramer). Habitat: DV. Recorded by Schwartz & Hedges (1991).
- Glutophrissa drusilla poeyi* (Butler). Habitat: DV, RF. Abundance: intermediate. Recorded by Schwartz & Hedges (1991).
- **Melete salacia cubana* Fruhstorfer. Habitat: RF. Abundance: rare.
- **Phoebis avellaneda* (Herrich–Schäffer). Habitat: DV. Recorded by Schwartz & Hedges (1991).
- Phoebis p. philea* (Johansson). Habitat: DV. Abundance: rare. Flowers visited: *Ixora coccinea*.
- Phoebis s. sennae* (Linnaeus). Habitat: DV. Abundance: dominant. Recorded by Schwartz & Hedges (1991).
- **Pyrisitia d. dina* (Poey). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

Pyrisitia lisa euterpe (Ménétriés). Habitat: DV, RF. Abundance: intermediate. Flowers visited: *Stachytarpheta jamaicensis*, *Tephrosia cf. cinerea*. Recorded by Schwartz & Hedges (1991).

Pyrisitia messalina (Fabricius). Habitat: DV, EF. Abundance: rare. Recorded by Schwartz & Hedges (1991).

Pyrisitia nise nise (Cramer). Habitat: DV. Recorded by Schwartz & Hedges (1991).

Family Lycaenidae

Cyclargus ammon ammon (Lucas). Habitat: DV. Recorded only by Schwartz & Hedges (1991).

Hemiargus hanno filenus (Poey 1832). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991) as *Cyclargus ceraunus philenus*.

Leptotes cassius theonus (Lucas 1857). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

Family Nymphalidae

**Adelpha iphicleola iphimedia* Fruhstorfer. Habitat: DV. Abundance: rare.

Agraulis vanillae insularis Maynard. Habitat: DV, RF. Abundance: intermediate. Flowers visited: *Stachytarpheta jamaicensis*. Recorded by Schwartz & Hedges (1991).

**Anartia chrysopelea* Hübner. Habitat: DV. Abundance: intermediate. Flowers visited: *Stachytarpheta jamaicensis*.

Anartia jatrophae guantanamo Munroe. Habitat: DV. Abundance: intermediate.

**Anetia briarea numidia* Hübner. Habitat: EF, RF, CF, ET. Abundance: intermediate. Flowers visited: *Citrus aurantium*, *Coffea arabiga*, *Lobelia assurgens*, *Abarema maestrense*, *Stachytarpheta cayennensis*, *Stachytarpheta jamaicensis*, *Viburnum villosum*. Oviposition observed on unidentified *Apocynaceae* vine. Old specimens present at CZACC.

**Anetia cubana* (Salvin). Habitat: EF, RF, CF, ET. Abundance: intermediate. *Asclepias nivea*, *Catharanthus roseus*, *Eupatorium* sp., *Palicourea alpina*, *Varronia longipedunculata*, *Viburnum villosum*. Oviposition observed on unidentified *Apocynaceae* vine. Recorded by Schwartz & Hedges (1991). Old specimens present at CZACC.

Anthanassa frisia frisia (Poey). Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

**Antillea pelops anacaona* (Herrich–Schäffer). Habitat: EF. Abundance: rare. Flowers visited: *Stachytarpheta cayennensis*, *Stachytarpheta jamaicensis*.

**Archaeoprepona demophoon crassina* (Fruhstorfer). Habitat: DV, EF. Abundance: rare.

**Calisto herophile herophile* Hübner. Habitat: DV. Abundance: dominant. Flowers visited: *Stachytarpheta cayennensis*. Recorded by Schwartz & Hedges (1991). Old specimens present at CZACC.

**Calisto smintheus* Bates. Habitat: EF, RF, CF, ET. Abundance: dominant. Flowers visited: *Borreria laevis*, *Palicourea alpina*, *Pavonia fruticosa*, *Chimarrhis cymosa*, *Dendropanax arboreus*, *Mikania micrantha*, *Rubus turquinensis*, *Stachytarpheta cayennensis*, and *Stachytarpheta jamaicensis*. Oviposition observed on *Arthrotylidium multispicatum*, here the host plant is rectified. The identification made by Núñez et al. (2012), *Ichnanthus mayarensis*, was erroneous. Recorded by Schwartz & Hedges (1991) as *Calisto delos*. Old specimens present at CZACC.

Colobura dirce wolcottii (Comstock). Habitat: DV, ER. Abundance: rare.

Danaus gilippus berenice (Cramer). Habitat: DV. Abundance: rare.

Danaus plexippus plexippus (Linnaeus). Habitat: DV. Abundance: rare. Larvae observed feeding on *Asclepias curassavica*.

**Doxocopa laure druryi* (Hübner). Habitat: DV, ER. Abundance: rare. Oviposition observed on *Dendropanax arboreus*.

**Dryas iulia nudeola* (Bates). Habitat: DV, EF, RF, CF. Abundance: intermediate (DV) to rare (remaining habitats). Flowers visited: *Lantana camara*, *Zinnia elegans*. Recorded by Schwartz & Hedges (1991).

Eunica tatila tatilista Kaye. Recorded only from old specimens present at CZACC.

**Greta cubana* (Herrich–Schäffer). Habitat: EF, RF, CF, ET. Abundance: intermediate (RF) to rare (EF, CF). Flowers visited: *Chimarrhis cymosa*. Oviposition observed on *Cestrum turquinense*. Recorded by Schwartz & Hedges (1991).

Heliconius charithonia ramsdeni Comstock & Brown. Habitat: DV, CF. Abundance: intermediate (DV). Flowers visited: *Jatropha gossypifolia*. Recorded by Schwartz & Hedges (1991).

Hypanartia paullus (Fabricius). Habitat: EF. Abundance: rare.

**Hypna clytemnestra iphigenia* (Herrich–Schäffer). Recorded only from old specimens present at CZACC.

Junonia evarete zonalis Felder & Felder. Habitat: DV. Abundance: rare. Recorded by Schwartz & Hedges (1991).

**Lucinia sida sida* Hübner. Habitat: DV. Abundance: rare.

**Lycorea halia demeter* Felder & Felder. Habitat: RF, CF. Abundance: rare. Old specimens present at CZACC.

Marpesia chiron (Fabricius). Habitat: DV, RF. Abundance: intermediate (DV) to rare (RF). Recorded by Schwartz & Hedges (1991).

**Marpesia e. eleuchea* (Hübner). Habitat: DV, EF, CF. Abundance: rare. *Phyciodes phaon phaon* (Edwards). Habitat: DV. Abundance: rare.

Siderone galanthis nemesis (Illiger). Habitat: DV. Abundance: rare. Adults observed feeding on rotten fruit of *Citrus aurantium*.

Siproeta stelenes biplagiata (Fruhstorfer). Habitat: DV. Abundance: rare.

Vanessa virginiensis (Drury). Recorded only from old specimens present at CZACC.

Discussion

The list of butterfly species from the TNP represents 43% of all members of this group in Cuba. The same percentage applies to the species endemic to Cuba, when both species (nine) and subspecies (20) are considered. The only family lacking is Riodinidae, with a single Caribbean species restricted, both ecologically and geographically, to the north keys of central Cuba, the extreme southeastern coast, and northeastern mountains (Alayo & Hernández, 1987; Hernández et al., 1998; Rivero et al., 2003). Compared to the only previous study, performed by Schwartz & Hedges (1991), we observed an additional 34 species during field work, including 20 endemic species. We did not detect four other species that were reported by Schwartz & Hedges. Differences in species richness and composition might be explained by environmental dissimilarities (humidity, habitats, and conservation status) between the northern slope, where present work was conducted, and the southern slope where Schwartz & Hedges (1991) worked. In addition, sampling effort was greater in this study than in the six working days in the previous study.

The species richness per family is comparable to that of the entire Cuban butterfly fauna (Alayo & Hernández, 1987; Smith et al., 1994). Schwartz & Hedges (1991) found a similar family proportion but observed more Pieridae species, probably because they spent more time collecting in open, disturbed areas.

Habitat disturbance increased species richness by diminishing endemism and adding generalist widespread species. Sixteen of the 17 butterflies listed by Fontenla (1992) as members of the Cuban butterfly generalist group were present at disturbed areas of the TNP. This author also found that Cuban Nymphalidae, including many endemic species, were better represented in the mountain forests, as occurred in the TNP, where this family attained the highest diversity in the rainforest, the cloud forest, and the elfin thicket.

Low to moderate levels of disturbance can even increase butterfly diversity by offering additional resources to some endemic species, such as nectar sources close to evergreen forest (as recorded in La Platica village). Fontenla (1987a, 1987b, 1992) and Núñez & Barro (2003) found that edges of several Cuban vegetation types have higher values of butterfly diversity than pure habitats. However, severe disturbances (e.g. forest degradation to grassland by fires), caused impoverishment of the butterfly communities. At TNP, Loma del León suffered this kind of change and during the present study only two generalist non-endemic species, *Agraulis vanillae* and *Leptotes cassius*, were found there.

Results from this study show that the TNP has a diverse butterfly fauna that needs to be preserved. More studies should be conducted in this area to increase the inventory of its species and to add more data to the presently known natural history. Information gathered during the present work will help to improve park management and to develop existing ecotourism.

Acknowledgements

I am grateful to all the workers and park authorities at the Turquino National Park, especially to Pedro López del Castillo and his family, for their support during work in the park. I also want to thank Tomas Melichar, Ormailly Madruga, Sergio Gutiérrez, Dania Saladrigas, Ariel Rodríguez, Alejandro Barro, and Ledis Regalado for their companionship and support during the field work, including some observations. My thanks also to Ramona Oviedo and Iralys Ventosa for their help with plant identification. This work was funded by the Rufford Small Grant #8909–1. Finally, I want to acknowledge the work of the editor and an anonymous reviewer.

References

- Alayo, P. & Hernández, L. R., 1987. *Atlas de las mariposas diurnas de Cuba (Lepidoptera, Rhopalocera)*. Científico-Técnica, La Habana.
- Borhidi, A., 1996. *Phytogeography and Vegetation Ecology of Cuba*. Akadémiai Kiadó. Budapest.
- Capote, R. P. & Berazaín, R., 1989. Cuba IIB. The present vegetation of the Cuban archipelago. In: *Floristic inventory of tropical countries: the status of plant systematics, collections, and vegetation, plus recommendations for the future: 321–327* (D. Campbell & Hammond H., Eds.). New York Botanical Garden Press, New York.
- Fontenla, J. L., 1987a. Aspectos comparativos estructurales de tres comunidades de mariposas (Lepidoptera, Rhopalocera) en Cuba. *Poeyana*, 337: 1–20.
- 1987b. Características zoogeográficas de las ropalóceras (Insecta, Lepidoptera) de Viñales, Pinar del Río, Cuba. *Poeyana*, 339: 1–11.
- 1992. Biogeografía ecológica de las mariposas diurnas cubanas. Patrones generales. *Poeyana*, 427: 1–30.
- 2005. Butterflies. In: *Rapid Biological Inventories 13. Cuba: La Bayamesa: 136*, Appendix 10 (A. D. Maceira, W. S. Fong & T. Watcher, Eds.). The Field Museum, Chicago.
- Hernández, L. R., Miller, L. D., Miller, J. Y., Simon, M. J. & Turner, T. W., 1998. New records and range extensions of butterflies from Eastern Cuba. *Caribbean Journal of Science*, 34(3–4): 324–327.
- Hernández, L. R., Smith, D. S., Davies, N. & Areces-Maella, A., 1994. The butterflies and vegetational zones of Guanahacabibes National Park, Cuba. *Bulletin of the Allyn Museum*, 139: 1–19.
- Núñez, R., 2004. Lepidoptera (Insecta) de Topes de Collantes, Sancti Spíritus, Cuba. *Boletín de la Sociedad Entomológica Aragonesa*, 34: 151–159.

- 2010. Especies del orden Lepidoptera (Insecta) en el área protegida de recursos manejados “Mil Cumbres”, Pinar del Río, Cuba. *Poeyana*, 498: 31–38.
- Núñez, R. & Barro A., 2003. Composición y estructura de dos comunidades de mariposas (Lepidoptera: Papilionoidea) en Boca de Canasí, La Habana, Cuba. *Biología*, 17(1): 8–17.
- 2012. A list of Cuban Lepidoptera (Arthropoda: Insecta). *Zootaxa*, 3384: 1–59.
- Núñez, R., Oliva, E., Matos, P. F. & Wahlberg, N., 2012. Cuban *Calisto* (Lepidoptera, Nymphalidae, Satyrinae), a review based on morphological and DNA data. *ZooKeys*, 165: 57–105.
- Pérez, B., Palau, C. M., Brito, V., Blanco, S. & Guerra, M., 1999. Lista de lepidópteros (Rhopalocera) del área protegida El Naranjal, Sancti Spiritus. *Cocuyo*, 8: 20.
- Rivero, A., Grillo, H., Regera, S. & Aborrezco, P., 2003. Lista de insectos conocidos de los cayos Majá y Español de Adentro, Cayería Norte de Villa Clara. *Centro Agrícola*, 2: 71–75.
- Schwartz, A., & Hedges, S. B., 1991. An Elevational Transect of Lepidoptera on Pico Turquino, Cuba. *Caribbean Journal of Science*, 27(3–4): 130–138.
- Smith, D. S., Miller, L. D. & Miller, J. Y., 1994. *The Butterflies of the West Indies and South Florida*. Oxford University Press, New York.

Annex 1. List of butterflies species inhabiting the Turquino National Park with information on endemism (*) habitat (DV. Disturbed vegetation; EF. Evergreen forest; RF. Rainforest; CF. Cloud forest; ET. Elfin thicke), abundance (A: R. Rare; I. Intermediate; D. Dominant), nectar sources and/or host plants, and additional information on literature and collection records.

Anexo 1. Lista de mariposas del Parque Nacional Turquino con información sobre endemismo (*), hábitat (DV. Vegetación alterada; EF. Bosque perennifolio; RF. Selva pluvial; CF. Bosque nuboso; ET. Bosque enano), abundancia (A: R. Rara; I. Intermedia; D. Dominante), fuente de néctar y/o planta huésped y información adicional sobre su referencia bibliográfica y el número de registro de la colección.

	Species	Habitat	A	Flowers visited
	Additional information			
Family Papilionidae				
BDEV	<i>Battus devilliers</i> (Godart)	DV, EF	R	<i>Lantana camara</i> , <i>Zinnia elegans</i>
BPOL	* <i>Battus polydamas cubensis</i> Dufrane	DV, EF	I	<i>Lantana camara</i>
	<i>Heraclides andraemon andraemon</i> Hübner Recorded by Schwartz & Hedges (1991)	DV	R	<i>Lantana camara</i>
HAND	<i>Heraclides androgeus epidaurus</i> (Godart) Oviposition observed on <i>Citrus sinensis</i>	DV, EF, RF	R	<i>Verbena rigida</i>
	* <i>Heraclides aristodemus temenes</i> (Godart)	EF	R	<i>Lantana camara</i>
	* <i>Heraclides pelaus atkinsi</i> Bates Old specimens present at CZACC	EF, RF, CF	R	<i>Lantana camara</i> , <i>Tournefortia cf. bicolor</i> , <i>Verbena rigida</i>
HTHO	* <i>Heraclides thoas oviedo</i> Gundlach Larvae observed feeding on <i>Piper auritum</i>	DV, EF	I	<i>Asclepias curassavica</i> , <i>Lantana camara</i>
PGUN	* <i>Parides gundlachianus gundlachianus</i> Felder & Felder Recorded by Schwartz & Hedges (1991)	DV, EF, RF, CF	R	<i>Abarema maestrense</i> , <i>Lantana camara</i> , <i>Verbena rigida</i>

Annex 1. (Cont.)

	Species	Habitat	A	Flowers visited
	Additional information			
Family Hesperidiidae				
	<i>Aguna asander haitiensis</i> (Mabille & Bouillet) Recorded only from old specimens present at CZACC			
	* <i>Astraptès cassander</i> (Fabricius) Old specimens present at CZACC	DV, EF, RF	R	
AHAB	* <i>Astraptès habana habana</i> (Lucas)	DV, EF, RF, CF	I	<i>Abarema maestrense</i> , <i>Citrus aurantium</i> , <i>Coffea arabiga</i> , <i>Lobelia assurgens</i> , <i>Penta coccinea</i> , <i>Stachytarpheta</i> <i>cayennensis</i> , <i>Stachytarpheta jamaicensis</i>
	<i>Astraptates xagua xagua</i> (Lucas) Recorded only from old specimens present at CZACC			
	<i>Atalopedes mesogramma mesogramma</i> (Latreille)	EF	R	<i>Stachytarpheta cayennensis</i>
	<i>Cabares portrillo portrillo</i> (Lucas) Recorded only by Schwartz & Hedges (1991).	DV		
	<i>Calpodes ethlius</i> (Stoll)	DV	R	
	<i>Choranthus radians</i> (Lucas) Recorded only by Schwartz & Hedges (1991)	DV		
CYMA	<i>Cymaenes tripunctus</i> (Herrich–Schäffer) Recorded by Schwartz & Hedges (1991)	DV	R	
EPAP	<i>Eantis papinianus</i> (Poey)	DV, EF	R	<i>Abarema maestrense</i>
EBRU	<i>Ephyriades brunnea brunnea</i> (Herrich–Schäffer)	DV, EF	R	

Annex 1. (Cont.)

	Species	Habitat	A	Flowers visited
EZAR	<i>Erynnis zarucco</i> (Lucas) Recorded by Schwartz & Hedges (1991)	DV	R	
	<i>Gesta gesta gesta</i> (Herrich–Schäffer) Recorded only by Schwartz & Hedges (1991)	DV		
HYLE	<i>Hylephila phylaeus phylaeus</i> (Drury) Recorded by Schwartz & Hedges (1991)	DV, ET		<i>Borreria laevis</i> , <i>Stachytarpheta cayennensis</i>
	<i>Panoquina lucas lucas</i> (Fabricius)	DV, EF	R	
	* <i>Panoquina corrupta</i> (Herrich–Schäffer)	EF	R	<i>Abarema maestrense</i>
PARA	<i>Parachoranthus magdalia</i> (Herrich–Schäffer) Recorded by Schwartz & Hedges (1991)	DV, EF	R	
PERI	<i>Perichares philetus philetus</i> (Gmelin)	DV, EF, RF	R	
POLI	<i>Polites baracoa baracoa</i> (Lucas)	DV	R	
PROT	* <i>Proteides mercurius sanantonio</i> (Lucas)	CF	R	<i>Chimarrhis cymosa</i>
PYRG	<i>Pyrgus oileus</i> (Linnaeus) Recorded by Schwartz & Hedges (1991)	DV	I	
	* <i>Saliana esperi soroa</i> Smith & Hernández	DV	R	
SYNA	<i>Synapte malitiosa malitiosa</i> (Herrich–Schäffer) Recorded by Schwartz & Hedges (1991)	DV, EF, RF	I (DV) to R (remaining vegetation types)	<i>Stachytarpheta jamaicensis</i>
UDOR	<i>Urbanus dorantes santiago</i> (Lucas)	DV	R	<i>Lantana camara</i>

Annex 1. (Cont.)

	Species			
	Additional information	Habitat	A	Flowers visited
UPRO	<i>Urbanus proteus domingo</i> (Scudder) Recorded by Schwartz & Hedges (1991)	DV, CF	R	<i>Lantana camara</i> , <i>Stachytarpheta jamaicensis</i>
WALL	<i>Wallengrenia otho misera</i> (Lucas) Recorded by Schwartz & Hedges (1991)	DV	R	
Family Pieridae				
ABAE	<i>Abaeis nicippe</i> (Cramer) Recorded by Schwartz & Hedges (1991)	DV	R	
ACLO	<i>Anteos clorinde</i> (Godart) <i>Anteos maerula</i> (Fabricius)	DV, EF EF	R R	<i>Ixora coccinea</i> <i>Lantana camara</i>
ASCI	<i>Ascia monuste eubotea</i> (Godart) Recorded by Schwartz & Hedges (1991)	DV	R	
DISM	* <i>Dismorphia cubana</i> (Herrich–Schäffer) Oviposition observed on <i>Abarema maestrense</i> . Old specimens present at CZACC	EF, RF	R	
EBOI	<i>Eurema boisduvaliana</i> (Felder & Felder)	DV	R	
EDAI	<i>Eurema daira palmira</i> (Poey) <i>Eurema elathea elathea</i> (Cramer) Recorded by Schwartz & Hedges (1991)	DV DV	R	
GLUT	<i>Glutophrissa drusilla poeyi</i> (Butler) Recorded by Schwartz & Hedges (1991)	DV, RF	I	

Annex 1. (Cont.)

	Species			
	Additional information	Habitat	A	Flowers visited
	* <i>Melete salacia cubana</i> Fruhstorfer	RF	R	
	* <i>Phoebis avellaneda</i> (Herrich-Schäffer) Recorded by Schwartz & Hedges (1991)	DV		
PPHI	<i>Phoebis p. philea</i> (Johansson)	DV	R	<i>Ixora coccinea</i>
PSEN	<i>Phoebis s. sennae</i> (Linnaeus) Recorded by Schwartz & Hedges (1991)	DV	D	
PDIN	* <i>Pyrisitia d. dina</i> (Poey) Recorded by Schwartz & Hedges (1991)	DV	R	
PLIS	<i>Pyrisitia lisa euterpe</i> (Ménétriés) Recorded by Schwartz & Hedges (1991)	DV, RF	I	<i>Stachytarpheta jamaicensis</i> , <i>Tephrosia cf. cinerea</i>
PMES	<i>Pyrisitia messalina</i> (Fabricius) Recorded by Schwartz & Hedges (1991)	DV, EF	R	
	<i>Pyrisitia nise nise</i> (Cramer) Recorded by Schwartz & Hedges (1991)	DV		
Family Lycaenidae				
	<i>Cyclargus ammon ammon</i> (Lucas) Recorded only by Schwartz & Hedges (1991)	DV		
HEMI	<i>Hemiargus hanno filenus</i> (Poey 1832) Recorded by Schwartz & Hedges (1991) as <i>Cyclargus ceraunus philenus</i>	DV	R	
LEPT	<i>Leptotes cassius theonus</i> (Lucas 1857) Recorded by Schwartz & Hedges (1991)	DV	R	

Annex 1. (Cont.)

	Species			
	Additional information	Habitat	A	Flowers visited
Family Nymphalidae				
ADEL	* <i>Adelpha iphicleola iphimedia</i> Fruhstorfer	DV	R	
AGRA	<i>Agraulis vanillae insularis</i> Maynard Recorded by Schwartz & Hedges (1991)	DV, RF	I	<i>Stachytarpheta jamaicensis</i>
ACHR	* <i>Anartia chrysopelea</i> Hübner	DV	I	<i>Stachytarpheta jamaicensis</i>
AJAT	<i>Anartia jatrophae guantanamo</i> Munroe	DV	I	
ABRI	* <i>Anetia briarea numidia</i> Hübner	EF, RF, CF, ET	I	<i>Citrus aurantium</i> , <i>Coffea arabica</i> , <i>Lobelia assurgens</i> , <i>Abarema maestrense</i> , <i>Stachytarpheta cayennensis</i> , <i>Stachytarpheta jamaicensis</i> , <i>Viburnum villosum</i>
	Oviposition observed on unidentified <i>Apocynaceae</i> vine Old specimens present at CZACC			
ACUB	* <i>Anetia cubana</i> (Salvin)	EF, RF, CF, ET	I	<i>Asclepias nivea</i> , <i>Catharanthus roseus</i> , <i>Eupatorium</i> sp., <i>Palicourea alpina</i> , <i>Varronia longipedunculata</i> , <i>Viburnum villosum</i>
	Oviposition observed on unidentified <i>Apocynaceae</i> vine Recorded by Schwartz & Hedges (1991) Old specimens present at CZACC			
ANTH	<i>Anthassa frisia frisia</i> (Poey) Recorded by Schwartz & Hedges (1991)	DV	R	
	* <i>Antillea pelops anacaona</i> (Herrich–Schäffer)	EF	R	<i>Stachytarpheta cayennensis</i> , <i>Stachytarpheta jamaicensis</i>
	* <i>Archaeoprepona demophoon crassina</i> (Fruhstorfer)	DV, EF	R	

Annex 1. (Cont.)

	Species	Habitat	A	Flowers visited
CHER	<i>*Calisto herophile herophile</i> Hübner Recorded by Schwartz & Hedges (1991) Old specimens present at CZACC	DV	D	<i>Stachytarpheta cayennensis</i>
CSMI	<i>*Calisto smintheus</i> Bates Oviposition observed on <i>Arthrostylidium multispicatum</i> , here the host plant is rectifie The identification made by Núñez et al. (2012), <i>Ichnanthus mayarensis</i> , was erroneous Recorded by Schwartz & Hedges (1991) as <i>Calisto delos</i> . Old specimens present at CZACC	EF, RF, CF, ET	D	<i>Borreria laevis</i> , <i>Palicourea alpina</i> , <i>Pavonia fruticosa</i> , <i>Chimarrhis cymosa</i> , <i>Dendropanax arboreus</i> , <i>Mikania micrantha</i> , <i>Rubus turquinensis</i> , <i>Stachytarpheta cayennensis</i> , and <i>Stachytarpheta jamaicensis</i>
COLO	<i>Colobura dirce wolcottii</i> (Comstock)	DV, ER	R	
DGIL	<i>Danaus gilippus berenice</i> (Cramer)	DV	R	
DPLE	<i>Danaus plexippus plexippus</i> (Linnaeus) Larvae observed feeding on <i>Asclepias curassavica</i>	DV	R	
DOXO	<i>*Doxocopa laure druryi</i> (Hübner) Oviposition observed on <i>Dendropanax arboreus</i>	DV, ER	R	
DRYA	<i>*Dryas iulia nudeola</i> (Bates) Recorded by Schwartz & Hedges (1991)	DV, EF, RF, CF	I(DV) to R	<i>Lantana camara</i> , <i>Zinnia elegans</i> (remaining habitats)

Annex 1. (Cont.)

	Species	Habitat	A	Flowers visited
	Additional information			
	<i>Eunica tatila tatilista</i> Kaye Recorded only from old specimens present at CZACC			
GRET	* <i>Greta cubana</i> (Herrich–Schäffer) Oviposition observed on <i>Cestrum turquinense</i> Recorded by Schwartz & Hedges (1991)	EF, RF, CF, ET	I (RF) to R (EF, CF)	<i>Chimarrhis cymosa</i>
HELI	<i>Heliconius charithonius ramsdeni</i> Comstock & Brown Recorded by Schwartz & Hedges (1991)	DV, CF	I (DV)	<i>Jatropha gossypifolia</i>
HYP A	<i>Hypanartia paullus</i> (Fabricius) * <i>Hypna clytemnestra iphigenia</i> (Herrich–Schäffer) Recorded only from old specimens present at CZACC	EF	R	
JEVA	<i>Junonia evarete zonalis</i> Felder & Felder Recorded by Schwartz & Hedges (1991)	DV	R	
	* <i>Lucinia sida sida</i> Hübner	DV	R	
LYCO	* <i>Lycorea halia demeter</i> Felder & Felder Old specimens present at CZACC	RF, CF	R	
MCHI	<i>Marpesia chiron</i> (Fabricius) Recorded by Schwartz & Hedges (1991)	DV, RF	I (DV) to R (RF)	
MAEL	* <i>Marpesia e. eleucea</i> (Hübner)	DV, EF, CF	R	
PHYC	<i>Phyciodes phaon phaon</i> (Edwards)	DV	R	

Annex 1. (Cont.)

Species		Habitat	A	Flowers visited
Additional information				
	<i>Siderone galanthis nemesis</i> (Illiger)	DV	R	
	Adults observed feeding on rotten fruit of <i>Citrus aurantium</i>			
SIPR	<i>Siproeta stelenes biplagiata</i> (Fruhstorfer)	DV	R	
	<i>Vanessa virginiensis</i> (Drury)			
	Recorded only from old specimens present at CZACC			