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An Elevational Transect of Lepidoptera on Pico Turquino, Cuba

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ABSTRACT. – A vertical transect of Cuba's highest peak, Pico Turquino in the Sierra Maestra, yielded 203 specimens of 37 species of butterflies. Data are given on the route taken up Pico Turquino, the butterflies taken at six stations at elevations from sea level (5 m) to 1974 m (top of Pico Turquino), and the abundance of each species.

RESUMEN. – Una transection vertical del pico mas alto de Cuba, Pico Turquino en la Sierra Maestra, produjo 203 ejemplares de 37 especies de mariposas diurnas. Presentamos dates sobre la ruts para subir Pico Turquino, las mariposas diurnas cogidas en seis localidades con elevaciones desde nivel del mar (5 m) hasta 1974 m (cima de Pico Turquino), y la abundancia de cada especie.

INTRODUCTION

There have been two major works on the Lepidoptera of Cuba, Bates (1935a) and Alayo and Hernández (1987). The former is a thorough treatment of the then-known butterflies of that island; the latter is primarily a photographic atlas of all Cuban species of butterflies (and some showy diurnal moths) with rather brief accompanying textual comments on each species. Rarely, in both compendia, are precise elevational or locality data given for any species.

Although Pico Turquino is the highest elevation in Cuba, it is much lower than the highest point in the Antilles (Pico Duarte at 3087 m in the República Dominican). Pico Turquino is the highest point in the Sierra Maestra (1974 m), the range that parallels the southern coast of the southeastern portion of Cuba, formerly in Oriente Province, and now in Santiago de Cuba and Granma provinces. Schwartz (1988) recently provided an elevational transect of the isolated Sierra Martín García in the República Dominican. Although the areal extent of the Sierra Maestra is much greater than that of the Martin Garcia, like the latter range, the southern slopes of the Sierra Maestra begin near sea level and ascend to Pico Turquino, going from xerophytic to mesophytic conditions (broadleaf forest).

Collecting was carried out by the junior author and was secondary to the expedition's major objective—collecting herpetological specimens. Nevertheless, 37 species of butterflies with a clear demarcation of aptitudinal zonation were collected. In addition to the route of the ascent detailed below, we have included data from another site, 2.8 km N Uvero, 137 m; this locality is on the southern flank of the Sierra Maestra, about 30 km to the east. We have included it because it tends to fill in the elevational gap between Las Cuevas (5 m) and La Esmajagua (560 m).

The six localities where butterflies were collected are (see Fig. 1): 1. Las Cuevas, on the coast, 5 m; 2. La Esmajagua, several kilometers to the north of Las Cuevas, 580 m; 3. Pico Cuba, 1720 m; 4. Pico Turquino, 1974 m; 5. SW slope of Pico Turquino, 1100 m; 6. 2.8 km N Uvero, 137 m. All specimens are in the collection of the senior author.

Pico Turquino Ascent

The expedition to eastern Cuba in July-August 1989 was organized by the Museo nacional de Historia Natural (La Habana), the Universidad de la Habana, and Pennsylvania State University. Because Pico Turquino encompasses a relatively large area with many place names, and because it has been an important locality for past biological collections, a precise description

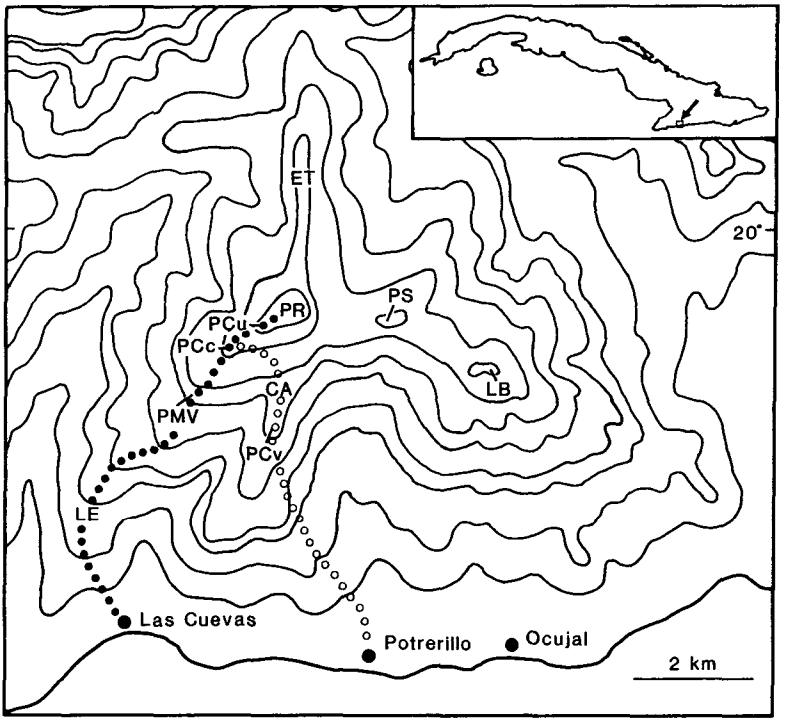

FIG. 1. Topographic map of Pico Turquino (contour interval = 200 m) showing the two different trails that have been used by biologists (hollow circles = old; closed circles = present). Abbreviations are: CA (Cueva del Aura), ET (Estribo Turquino), LB (Loma de Bruja, 1682 m), LE (La Esmajagua, 560 m), PCc (Pico Cuba camp, 1720 m), PCu (Pico Cuba, 1872 m), PCv (Pico Cuevas, 1306 m), PMV (Pico Mar Verde, or "Pico Cardero," 1285 m), PR (Pico Real, 1974 m), and PS (Pico Suecia, 1734 m).

of this area is of value. Previous descriptions (Marrero, 1947; Núñez Jiménez, 1959) are now obsolete, because the route of ascent and several place names have changed. We provide here an updated description of Pico Turquino, current place names, and the present route of ascent.

Pico Turquino is a relatively isolated mountain in the west-central Sierra Maestra. It rises sharply from the south coast. Prior to the 1900's, the trail ascending Pico Turquino began at Playa de Bells Plums and El Dián on the coast, headed north to Pico Cuevas, then crossed a narrow ridge (Estribo de la Cueva) to Pico Cuba and Pico Real. This trail has since been abandoned. The present Turquino trail begins at Las Cuevas (on the coast) and heads roughly northeast along another ridge, joining the old trail at Pico Cuba (Fig. 1). The name "Pico Cardero" has been given to peaks on each of these two routes, possibly leading to some confusion regarding past biological collections. In addition, some modern authors have used the name "Pico Cordero," an obvious misspelling. The peak (1306 m) given this name on the old trail is called "Pico Cuevas" on the Pico Turquino 1:50,000 scale topographic map, whereas the peak (1285 m) on the new trail is called "Pico Mar Verde" on the map. The local inhabitants now refer to Pico Mar Verde as "Pico Cardero." The well-known collecting locality of P. J. Darlington (and others), "Cueva del Aura," is on the old trail (on Estribo de la Cueva).

The butterfly collections on and around Pico Turquino were made during a six day period, 6-11 August 1989. The first collections were made at Las Cuevas, on the coast (5 m). Butterflies were collected here during the morning of 6 August (0800-1200

h) in herbaceous growth along the coast road. Las Cuevas is a small settlement with only a few scattered houses, and much of the surrounding land is devoid of the original xerophytic scrub vegetation. The trail is a narrow dirt road leading from Las Cuevas to two government cabins (La Esmajagua) at 560 m, several kilometers to the north. The road is steep and in very poor condition, and therefore most ascents of Pico Turquino begin at Las Cuevas on mule or on foot. The habitat between Las Cuevas and La Esmajagua is fairly open (cut-over) semixeric woods.

Butterflies were collected around the two cabins at La Esmajagua and along the nearby road during the morning and afternoon (two days). The habitat was mostly open, with scattered small trees, tall grass, and herbaceous growth. Some small patches of original forest were present along a nearby stream. The road ends just above La Esmajagua, and therefore further ascent must be done by mule or on foot. The ascent of Turquino continued on the morning of 8 August, taking three hours to reach Pico Cuba camp by foot. Patches of forest were first encountered at about 900 m, and relatively continuous forest was encountered at about 1000 m, although signs of previous cutting are evident all the way up to Pico Real. Pico Cardero (=Mar Verde) is just a small knob on the SW ridge of Pico Turquino. It should be noted here that "Pico Turquino" normally refers to the entire mountain, whereas the highest peak is called "Pico Real" (1974 m), although these two names are sometimes used interchangeably.

Pico Cuba (1872 m) is a "satellite peak" of Pico Real, and the two are very close (Fig. 2A). Again, however, there has been some past confusion regarding geographic place names and elevations. Pico Cuba is a small, rocky, densely wooded knob along the narrow Turquino Trail. The "Pico Cuba" of nearly all previous biological collections refers to a large relatively open knoll about 0.5 km to the SW at a lower elevation (1720 m). Judging from the ruins of several large structures, this knoll probably was once the site of a large coffee grove. Presently there is only a wooden cabin and a polluted stream. The cabin was used in this case as main camp for three days. The knoll itself is open, with only some scattered pines, young tree ferns, climbing bamboo, and a ground cover of grass and ferns (Fig. 2B). Cloud forest occurs below the knoll (Fig. 2C), but several hikes into what appeared to be "good" forest revealed signs of selective cutting and cleared patches. Butterflies were collected around the cabin and along the trail. Here, and on Pico Real, *Calisto* were encountered more frequently (but not exclusively) in shaded areas, whereas *Greta* were found only in this habitat and almost always near water (see Schwartz, 1989:452-457, for ecological comments on Hispaniolan *Greta diaphana).*

The climb from Pico Cuba camp to Pico Real takes about one hour along a moderately steep and rocky trail. Pico Cuba itself is reached in about 20 minutes, at which point the trail drops into the distinctive Turquino "notch," and then rises again on the west side of Pico Real. Pico Real (Fig. 2D) is large, gently rounded, and forested except for a central clearing. Another trail begins at this clearing and leads down the north slope, along Estribo Turquino. The cloud forest canopy on Pico Real is about 10-15 m high, with an understory of tree ferns. Bromeliads are abundant. Butterflies were collected along the trail at the peak, which was lined with ferns and herbaceous growth. The butterflies were active in the middle of the day (1000-1500 h), as the early morning and late afternoon were misty and cool. Some sleeping *Calisto* were collected at night on the undersides of tree fern fronds and leaves of small trees. Collections on Pico Turquino were made on 9-10 August. The descent to Pico Cuba (main camp) was made on the morning of 10 August, to La Esmajagua that night, and finally to Las Cuevas on 11 August.

Uvero is on the coast about 30 km E of Las Cuevas and is directly south of Pico Martí. A dirt road follows the Río Uvero upstream (north) through semixeric scrub and pastures. Butterflies were collected on 13 August in bright sun at 1100-1300 h at a location (2.8 km N Uvero, 137 m) where the road begins a steep ascent. There are

skipper is abundant. *Specimens:* 2.8 km N Uvero, 4; La Esmajagua, 9.

Synapte malitiosa malitiosa (Herrich-Schäffer), 1865. Alayo and Hernández (p. 112) considered *S. m. malitiosa* abundant in the extreme eastern portion of Cuba and rare elsewhere on the island, always in fields and meadows, and never along marine coasts. Our single specimen is from 2.8 km N Uvero.

Cymaenes tripunctus tripunctus (Herrich-Schäffer), 1865. Our single specimen is from La Esmajagua. According to Alayo and Hernández (p. 112) this species is very abundant throughout Cuba.

Wallengrenia misers (Lucas), 1857. This is another species that Alayo and Hernández (p. 114) considered common and widespread. We have one specimen from Las Cuevas.

Hylephila phylea phylea (Drury), 1773. Considered by Alayo and Hernández (p. 115) as very common throughout Cuba, we have one individual from Las Cuevas.

Parachoranthus magdalia (Herrich-Schäffer), 1863. Alayo and Hernández (p. 116) stated that this species is locally abundant throughout Cuba, including sunny roadsides in the uplands. Bates did not mention the species. We have one individual from La Esmajagua.

Choranthus radians (Lucas), 1857. Alayo and Hernández (p. 116) considered this species rather uncommon (although most common in the east) but present throughout Cuba. Bates (p. 225) examined twenty specimens from the former provinces of Las Villas (Soledad) and Oriente. Our material consists of four specimens from (f. *radians)* La Esmajagua.

PAPILIONIDAE

Parides gundlachianus (Felder and Felder), 1864. Alayo and Hernández (p. 94) stated that this species is abundant at certain localities in the eastern portion of Cuba, occurring from the high mountains to arid coastal regions. Bates (p. 106) noted that *P. gundlachianus* is commonest in eastern Cuba, with specimens from Sardinero, San Carlos, and "Torquino" *[sic],* taken in January, April, and July. We have one individual with a forewing length of 46 mm. Alayo and Hernández (p. 94) commented on the larger size of specimens from upland and more mesic localities. Wingspreads of such larger individuals are approximately 104 mm. Our specimen is from a moderate elevation and has a wingspread slightly less than 104 mm. *Specimen:* La Esmajugua, 1.

Heraclides andraemon andraemon (Hübner), 1823. Alayo and Hernández (p. 96) considered this species the most abundant papilionid on Cuba, occurring throughout the island and in all localities (although preferring meadows and gardens). Bates (p. 112) examined 32 specimens from throughout the island. We have one specimen from Las Cuevas.

PIERIDAE

Ascia monuste eubotea Comstock, 1943. This species, the most common of the large whites, is widespread on the southern Sierra Maestran slopes. We have specimens from 5 m to 560 m. *Specimens:* Las Cuevas, 9; La Esmajagua, 1.

Appias drusilla poeyi Butler, 1872. Much less common than the previous species, *A. d. poeyi* is apparently uncommon in this region. Alayo and Hernández (p. 75) considered this species rare, although distributed throughout the island in both coastal and inland areas. Bates (p. 119) examined 24 specimens from the provinces of Oriente, Santa Clara, and La Habana. Our specimen is a "dry season" female taken on 7 August and thus does not show the diagnostic characters of the subspecies. *Specimen:* La Esmajagua.

Eurema nise nise (Cramer), 1775. This small yellow is rather uncommon on the Sierra Maestra, having been taken at only one locality. *Eurema n. nise* was first reported from Cuba by Bates (p. 129), whence he examined 15 specimens from La Habana and Las Villas Province. *Specimens:* La Esmajagua, 4.

Eurema elathea (Cramer), 1775. Alayo and Hernández (p. 78) stated that they had collected this species only on the coast near Santiago de Cuba, where it was abundant. Bates (p. 126) examined only 10 specimens from Guantánamo. We have two specimens from La Esmajagua.

Eurema lisa sulphurinum Poey, 1853. This

subspecies, not recognized by either Riley (1975) nor Alayo and Hernández (1987), is not common in the area. We have three specimens from Las Cuevas and one from La Esmajagua.

Eurema messalina messalina (Fabricius), 1787. This, the only small white on Cuba, is considered abundant by Alayo and Hernández (p. 80); they also noted that extremely small individuals are often taken, and one of our specimens is indeed such a dwarf (forewing length 10 mm; male). Bates (p. 127) examined specimens from the former provinces of Oriente, Las Villas, and La Habana. *Eurema m. messalina* is rather uncommon on the southern Sierra Maestran slopes. Specimens: 2.8 km N Uvero, 1; La Esmajagua, 3.

Eurema dins dins (Poey), 1832. This medium-sized and bright yellow butterfly is abundant throughout the island (Alayo and Hernández, p. 81) and has a broad vertical distribution on the southern Maestran slopes, occurring from 5 m to 560 m. *Specimens:* Las Cuevas, 1; 2.8 km N Uvero, 2; La Esmajagua, 1.

Eurema nicippe (Cramer), 1779. Considered by Alayo and Hernández (p. 82) as very conspicuous in fields and meadows, *E. nicippe* is one of the truly abundant Cuban butterflies. It is common at lower elevations on the southern Maestran slopes. *Specimens:* Las Cuevas, 8; 2.8 km N Uvero, 1.

Phoebis avellaneda (Herrich-Schäffer), 1864. Alayo and Hernández (p. 87) stated that this species is local in eastern Cuba, and at Cienfuegos and Santiago de las Vegas. In the east it is generally abundant. Our single specimen is somewhat tattered but still beautiful. *Specimen:* Las Cuevas, 1.

Phoebis sennae sennae (Linnaeus), 1758. This large sulfur also appears to be uncommon in the Sierra Maestra area. Alayo and Hernández (p. 90) considered *Ph. s. sennae* "very abundant" on the entire island, and Bates (p. 133) stated that it was "exceedingly common." *Specimens:* Las Cuevas, 1; La Esmajagua, 520-560 m, 1.

LYCAENIDAE

Leptotes cassius theonus (Lucas), 1857. Although Alayo and Hernández (p. 71) and Bates (p. 199) considered this species common (Bates examined 99 specimens from throughout Cuba), we have only one individual from Las Cuevas, and one from La Esmajagua.

Cyclargus ceraunus filenus (Poey), 1832. By far the most common of the three blues in the area under study, *C. c. filenus* is restricted to lower elevations. *Specimens:* Las Cuevas, 12; La Esmajagua, 1.

Cyclargus ammon ammon (Lucas), 1857. Although considered by Alayo and Hernández (p. 72) as very abundant and islandwide, we have only one individual from Las Cuevas.

HELICONIIDAE

Heliconius charitonius ramsdeni Comstock and Brown, 1950. This species is common throughout Cuba and in our study area. We have specimens from 5 m to 560 m. *Specimens:* Las Cuevas, 3; 2.8 km N Uvero, 4; Las Esmajagua, 1.

Dryas iulia nudeola (Bates), 1935. This heliconiid is apparently quite uncommon on the southern Maestran slopes. We have one individual from La Esmajagua.

Argraulis vanillae insularis (Maynard), 1889. Alayo and Hernández (p. 64) considered this the most abundant of all Cuban butterflies, as it is elsewhere in the West Indies. In our study area it was quite common at 5 m and 560 m. *Specimens:* Las Cuevas, 12; La Esmajagua, 1.

NYMPHALIDAE

Marpesia chiron (Fabricius), 1775. Considered relatively abundant in woods and shrubby areas (Alayo and Hernández, p. 46), 28 specimens of this species were examined by Bates (p. 171) from throughout the island. We have two individuals from La Esmajagua.

Junonia genoveva zonalis (Felder and Felder), 1867. Our series is from near sea level. All are assignable to *J. g. zonalis;* none is *J. coenia* (Hübner), 1822, another species which occurs on Cuba. *Specimens:* Las Cuevas, 8.

Athanassa frisia frisia (Poey), 1832. Although considered abundant and islandwide in distribution by Alayo and Hernández (p. 58), we have only one individual from 2.8 km N Uvero.

SATYRIDAE

Before discussing the two species of *Calisto* collected on the Sierra Maestra, we should review the taxa involved in Cuba and the Isla de la Juventud. A major problems is: how many taxa (species or subspecies) occur on those islands? Authors do not agree on the arrangement of names or even on the validity of some of them. Bates (1935a) recognised only *C. herophile* Hübner, 1823. Later, Bates (1935b) described two new species (*C. delos* from the Sierra Maestra and *C. smintheus* from Loma del Gato in the extreme eastern Sierra Maestra). The latter name was based on nine males and four females, the former on two males, one from Loma Cardero, the other from Pico Turquino. He noted that the differences between these two taxa were more subspecific than specific in nature, but he preferred to consider them separate species.

Munroe (1950) accepted *C. herophile,* without other Cuban subspecies, *C. smintheus* Bates (with subspecies *muripetens* Bates, 1939, and *bradleyi* Munroe, 1950), and *C. sibylla* Bates, 1934 without subspecies. Munroe also noted the occurrence of two "unclassified forms" from Cuba, one from Loma del Gato (stating that they were not *C. smintheus,* of which species Loma del Gato is the type-locality), the other similar to, but not the same as, *parsonsi* Clench, 1943. Clench (1943), when describing *C. herophile parsoni,* suggested that it seems to connect *herophile* (s.l.) with *smintheus,* using the latter name as a specific epithet.

Michener (1949) considered the as-then-known ranges of six taxa, and suggested that *delos* might be better considered a subspecies of *C. smintheus.* Riley (1975) recognized the following: *C. herophile* (sea level to 3000 ft; subspecies *parsonsi* on the Sierra de Trinidad; *bruneri* Michener, 1949, from Mea, Prov. de Holguín [and *apollinis* Bates, 1934, in the Bahamas]); *C. sibylla* (a montane species; subspecies *smintheus,* Sierra del Cobre; *delos* Bates, 1935, Pico Turquino; *muripetens* Bates, 1939, Sierra de Escambray; *bradleyi,* Sierra de Rangel); and *C. biocellata* de la Terre, 1968 (Pico Cuba, Sierra Maestra). Alyo and Hernández (1987) discussed: *C. herophile* and retained *parsonsi* and *bruneri* as subspecies; *C. sibylla* with three subspecies: *smintheus, delos,* (but *biocellata* a forma of *delos),* and *brochei* de la Terre, 1973 (Cupeyal, Prov. de Guantánamo); and *C. israeli* de la Terre, 1973 (Cupeyal).

We have two species from the Pico Turquino transect; one a high elevation, large, very dark species (forewing length 22-23 mm [3 males]; 21-26 mm [28 females], the other a lower elevation species, much smaller (forewing length less than 21 mm in both sexes), and much more obviously marked on the underside. Comparison of our high elevation specimens with Alayo and Hernández's photograph (Pi. 5, Fig. K) of *C. delos* reveals no similarities. Their specimen differs in its pale color and therefore in its relatively vivid underside markings. But Bates' (1935b) description leaves no doubt that our freshly collected specimens are *C. delos.* The salient characters given by him are: dark fuscous upper side, underside of forewing cell with an oval dark red patch, postmedian and submarginal lines fine on underside of forewing, hindwing with antemedian, postmedian, and submarginal fine lines indistinct, ocellus oval with a basal white spot [=dot], and three tiny white spots [=dots] in the ocellar row. The series of smaller individuals we consider *herophile* but do not assign them to subspecies; details of subspecies in that species have yet to be ascertained. We also consider *delos* a distinct species, due primarily to its (apparent) isolation. The lack of specimens of any *Calisto* from Las Cuevas and Uvero may indicate that there are no members of the genus there; on the other hand it may only be due to insufficient collecting.

Calisto herophile Hübner, 1823. Fifteen specimens of this small *Calisto* were collected at La Esmajagua, where they were abundant. The two species of *Calisto* are apparently not syntopic.

Calisto delos Bates, 1935. This larger species is abundant and widespread above 1100 m and is most common above 1647 m. Several were taken sleeping 1-2 m above the ground on tree fern fronds. *Specimens:* S W

slope, Pico Turquino, 2; SW slope of Pico Turquino, at Pico Cardero, 1230 m, 3; Pico Turquino, below Pico Cuba, 1525 m, 3; Pico Cuba (vicinity), 1647-1769 m, 15; Pico Turquino, top, 14.

ITHOMIIDAE

Greta cubana (Herrich-Schäffer), 1862. This clearwing is an inhabitant of upland areas above 1647 m and is very common at the top of Pico Turquino. It is an inhabitant of wooded and shaded situations. *Specimens;* Pico Cuba (vicinity), 1647-1769 m, 4; Pico Turquino, 10.

DANAIDAE

Anetia briarea numidia (Hübner), 1823. Alayo and Hernández (p. 37) considered this species rather abundant in the central and eastern Cuban mountains, and on the Isla de la Juventud. It occurs in clearings in forest. In the Pico Turquino area, it is common above 1647 m and is a member of a quartet of lepidopteran species in this upland area. A few were taken while sleeping on tree fern fronds 1–2 m above the ground. *Specimens:* Pico Cuba (vicinity), 1647-1769 m, 5; Pico Turquino, 8.

Anetia cubana (Salvin), 1869. This, the phenotypically most "aberrant" of the Antillean *Anetia,* is common above 1647 m in the Pico Turquino area. Alayo and Hernández (p. 38) stated that it is restricted to the old province of Oriente, where it lives in the deepest forests, rarely sallying forth from their deep shade. *Specimens:* Pico Cuba (vicinity), 1647-1769 m, 7; Pico Turquino, 4.

DISCUSSION

The number of butterfly species known from Pico Turquino (37, or about 22% of the 170 species known from all of Cuba) is fewer than the number of butterfly species known from the Sierra Martín García (67, or about 40% of the 200 species known from Hispaniola). This is perhaps an unfair comparison, because the Martín García was worked during 1982-1986 by four butterfly collectors associated with the senior author, and all were engaged only in butterfly collecting. The maximum elevation visited on the Sierra Martín García is 1037 m, less than that on Pico Real. In addition, there are fewer species of butterflies known as residents on Cuba (about 170) than there are on Hispaniola (about 200). The difference between these two totals is due primarily to the number of species of ringlets (Satyridae), of which there are 37 on Hispaniola (and more are confidently expected) and only six on Cuba (but the number is sure to change; see the discussion of *Calisto* in the text). We are certain that the total number of species now known from Pico Turquino will increase with additional work there. Several families (Lycaenidae, Nymphalidae, Apaturidae) are poorly or not at all represented in present collections.

Still, comparisons of the lepidopteran faunas of the two massifs are interesting and pertinent. The 37 species from Pico Turquino fall almost perfectly into two groups: 33 occur from sea level to 560 m (i.e., lowland and moderate elevations) and four occur only above 1100 m. The only exception is the skipper *Urbanus p. domingo,* a primarily lowland species that reaches 1100 m. Since we doubt that we have examples of all species found on Pico Turquino, in reality this dichotomy may not be so diagrammatic as here suggested.

Schwartz (1989:406-407) stated that on Hispaniola there are two basic butterfly faunas, a lowland-to-moderate elevation fauna (to 2300 m) and a truly upland butterfly fauna (down to 1100 m) that consists of about 14 species (including *Greta diaphana,* two species of *Anetia,* and 29 species [83%] of the Hispaniolan *Calisto* fauna). The concordances of about the same elevation in the two cases and of genera are striking.

Even more interesting is the large number of Hispaniolan species (ten) that have very broad elevational ranges, from sea level to 2300 m. Thus, on that island one encounters, at high elevations, examples of species that also occur at sea level. This difference between Cuba and Hispaniola is surely not due to the vagaries of collecting on Pico Turquino.

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