

BULLETIN OF THE ALLYN MUSEUM

3701 Bayshore Rd.
Sarasota, Florida 33580

Published By
The Florida State Museum
University of Florida
Gainesville, Florida 32611

Number 69

10 June 1982

VARIATION IN HISPANIOLAN GRETA DIAPHANA (ITHOMIIDAE)

Albert Schwartz
Miami-Dade Community College, North Campus
Miami, FL 33167

INTRODUCTION

Greta diaphana Drury 1773 is one of two species of ithomiid butterflies occurring in the West Indies. *Greta diaphana* is known from Jamaica (where the nominate subspecies occurs) and Hispaniola (whence the subspecies *G. d. quisqueya* Fox 1963 has been known) and *G. cubana* Herrich-Schäffer 1862 occurs on Cuba. When Fox named *G. d. quisqueya*, he did so on the basis of a trio of specimens from Pico Diego de Ocampo, Provincia de Santiago, República Dominicana; all were males. He also figured the genitalia of *G. cubana* and both subspecies of *G. diaphana* and demonstrated that the two taxa are distinct as far as their genitalia are concerned. In contrast to the very small number of *G. d. quisqueya*, he examined 74♂ and 45♀ *G. d. diaphana*. The holotype and paratypes of *G. d. quisqueya* were collected in 1938 by P.J. Darlington at high elevations (3-4000 ft.) in the Dominican Cordillera Septentrional.

The geography of Hispaniola, as well as its paleohistory as an insular unit, have been the subject of discussion in various papers in herpetology (see Schwartz, 1978: 32-33 and 1980: 87-93 for summaries). In simplest terms, the island of Hispaniola is composed of two paleoislands: one of these, the so-called north island, comprises most of Hispaniola (all that portion north of the Cul de Sac-Valle de Neiba plain), and the other, the south island, lies to the south of that plain. Most of the north island is in the República Dominicana, whereas most of the south island is in Haiti. The Cul de Sac-Valle de Neiba plain is a (at places) below sea level plain, with a series of saline lakes arranged from east to west; this plain is the remnant of a marine strait that formerly (until the Pleistocene ?) separated the two islands. During the period of separation (which doubtless was not continuous) the herpetofauna on each of these islands evolved into two complexes or groups of species, which even today, after the joining of the two islands, have to a large extent remained distinct (see Schwartz, 1980). There are some species which have expanded their ranges onto one or the other island and thus their affinities (north or south island) are beyond speculation. The degree of differentiation between the two faunas may be at the specific or subspecific level. The same phenomenon can be observed in birds (although the degree of differentiation is usually on the subspecific level) and to some extent in the mammals, which, as on all Antillean islands,

are almost exclusively bats. Thus the origin of Hispaniola from two paleoislands is certainly reflected in several vertebrate groups, and it seems likely that the same situation applies as well to Lepidoptera and other invertebrates; we simply at this time know too little about most invertebrates (including butterflies) and their fine distribution to speak confidently. The setting is ideal for differentiation, but whether the actors have all played the same roles is not yet determined.

A second geographic fact is pertinent. The south island is actually composed of the west-east Tiburon Peninsula and the southward projecting Peninsula de Barahona. Most of the Tiburon Peninsula lies in Haiti, whereas the Peninsula de Barahona is in the República Dominicana. The spine for the entire south island is a west-east series of high mountain masses — the Massif de la Hotte, Massif de la Selle, and the Sierra de Baoruco. Of these the La Hotte lies in Haiti, the Baoruco in the República Dominicana; the La Selle is primarily in Haiti, but its eastern extreme extends just across the border into the República Dominicana.

The north island is much more complex physiographically. It is basically composed of three major mountain masses: the Cordillera Septentrional in the República Dominicana, the high Cordillera Central (whose major portion is in the República Dominicana, but of which a rugged projection extends into north-central Haiti as the Massif du Nord), and the Sierra de Neiba, which as the Montagnes du Trou-d'Eau, extends into Haiti. The Cul de Sac-Valle de Neiba plain is bounded on the north by the Montagnes du Trou-d'Eau Sierra de Neiba, on the south by the Massif de la Selle-Sierra de Baoruco. All these mountain masses are separated from each other by valleys which are usually low and xeric (such as the western Valle de Cibao in northwestern República Dominicana between the Septentrional and Central massifs) or relatively high and mesic (as the Valle de San Juan between the Central and the Neiba). We are again dealing with an ideal setting for differentiation in organisms that occur only at high elevations (above 915 m).

Greta diaphana remains unknown from Haiti. Although it doubtless occurs in that country, the extensive deforestation and massive destruction of natural forested habitats have surely played a significant part in its apparent absence. In six months' collecting in Haiti, I not only never saw a *Greta* but also never encountered the ideal habitat which it occupies in the República Dominicana. Aside from habitat modifications in Haiti, another factor may simply be that reaching the proper elevations for *Greta*, coupled with the appropriate habitat, is inconvenient or very difficult. In the República Dominicana, on the other hand, the appropriate elevations and habitats can be reached with some difficulty or even with ease, once the collector knows what sort of habitat is necessary.

Brown (1978:16) summarized the habits and habitats of ithomiids as follows: "Ithomiids are secretive. The majority of Central American species are found in the borders of woods. They emerge from there to feed at flowers during the early morning and late afternoon hours. At the first sign of bad weather they go into hiding." Although the habits and habitat of *G. diaphana* in the República Dominicana are somewhat different than the above summary, still these are butterflies of shaded or sun-dappled ravines or deciduous forests, always very mesic (often associated with mountain streams or torrents). The lowest elevation where we have collected *G. diaphana* is 732 m, the highest 1647 m. *Greta diaphana* feeds during the day, not only early and late, and it is especially attracted to the small yellow flowers of *Palicourea barbinervia*, a small tree (Rubiaceae) that is conspicuous and abundant in upland mesic forest. At a locality in the Sierra de Neiba, we secured *G. diaphana* feeding on a small low (20 cm) member of the Asteraceae, despite the presence at that locality of *Palicourea*. Overcast or cloudy weather does not affect *G. diaphana* so dramatically as Brown suggested for other ithomiids. It is not unusual to see these butterflies actively flying and foraging on overcast days with no sun or even with some light rain falling. They may be amazingly common but are always local.

During 1980 and 1981, with the capable assistance of Frank Gali, Alvis Gineika, Kurt M. Iketani, Carlos J. Jimenez, and John C. Lucio, we secured a total of 87 specimens of

G. diaphana from the República Dominicana, including butterflies from the four major mountain masses (Septentrional, Central, Neiba, Baoruco). Specimens have been taken both in summer (June-August) and winter (December), and the butterflies are equally common at both seasons. Interestingly, females outnumber males in our series (50 ♀ versus 37 ♂), and thus the discussion of variation in *G. diaphana* perforce emphasises differences in the former sex with ancillary comments about the latter.

Riley (1975:41) characterized the two subspecies of *G. diaphana* in the following terms: fw in both sexes 25-26 mm, both wings completely transparent except for black margins and black veins, a black bar across the cell end, followed by a series of three white spots or a white bar positioned subapically; underside like upperside except that black areas are rust-red (*diaphana*) or ochraceous (*quisqueya*). In addition there are four isolated white markings on the fw: (1) an apical spot between the radial veins and M_1 , (2) a submarginal spot in M_2-M_3 , (3) a submarginal spot in M_3-Cu_1 , and (4) between Cu_1 and Cu_2 . There is an apical white spot on the hw just above M_3 and often one (or two) accessory white spots in M_3-Cu_1 and Cu_1-Cu_2 . The white spot in fw M_2-M_3 is close to and may be semiattached to the subapical white bar. Differentiation in *G. diaphana* involves: 1) the width and shape of the black discocellular bar, 2) the size and shape of the white subapical bar, 3) the size and position of the isolated small white fw spots, and 4) the width of the black borders of both wings. In the following accounts, I have not compared the Hispaniolan subspecies with *G. d. diaphana*; it is more convenient to make this comparison at the end of the discussion of variation in the Hispaniolan populations.

TAXONOMIC ACCOUNTS

Greta diaphana (Drury)

Illustrations of Nat. Hist., [1773], 2:Pl. 7, Fig. 3

Greta diaphana quisqueya Fox

Fig. 1A

Hymenitis diaphana quisqueya Fox, 1963, J. Res. Lepidoptera, 2(3):177. *Type-locality*: Pico Diego de Ocampo, Prov. de Santiago, República Dominicana, 3-4000 ft. *Holotype*: Mus. Comp. Zool.

Diagnosis: *Female* fw length 23 - 26 mm (mean = 24.7); fw black border wide, especially at fw and hw apices; black subapical bar broad at costal margin, tapering posteriorly, then expanding to form a widely open inverted Y, the two arms extending into space M_2-M_3 and along the upper margin of M_3-Cu_1 ; subapical white bar broad and extending almost to M_2 ; white spot in M_2-M_3 transversely elongate; fw white spots moderately large; hw apical white spot moderate, with accessory white spots at times present in M_3-Cu_1 and Cu_1-Cu_2 .

Male fw length 23 - 24 mm (mean = 23.7); black wing borders narrow; black subapical bar about one-half as wide as that of female, tapering and then expanding only slightly to form a small inverted Y in the same position as that in the female; white spot in fw M_2-M_3 very small and not transversely elongate; white vertical subapical bar incomplete and at most extending from costal margin slightly into fw M_1-M_2 ; hw white apical spot tiny but present, with at times an accessory tiny white dot in hw M_3-Cu_1 .

Remarks. The series of *G. d. quisqueya* includes 7 ♂ and 15 ♀, all from the same locality in the Cordillera Septentrional, removed some 28 km E of the type-locality (see Fig. 2 for all localities) and at a slightly lower elevation. The locality is a small (4 m) wide and shallow rocky stream in mesic broadleaf forest, with *Palicourea* a common stream-side tree. Although the butterflies occur along about 200 m of the stream, they are most abundant on one of the tributaries where the stream is about 1 m wide and heavily closed with forest canopy. Several individuals were seen and a few collected as they crossed

an open but shrubby hillside clearing or flew along the margin of the forest. Collecting dates and weather conditions were: 16.vii.1980, 35° C, 1415-1545 h, bright and sunny alternating with overcast and cloudy; 24.vii.1980, 35° C, 1015-1215 h, bright and sunny; 7.viii.1981, 28° C, 0945-1130 h, overcast and rainy.

The series agrees well with the above diagnosis; in females, the broad black wing margins and the broad inverted Y-shaped subapical bar, as well as the large subapical vertical white bar and the transversely elongate white spot in M_2-M_3 are all distinctive. The accessory hw submarginal white spots in hw M_3-Cu_1 and Cu_1-Cu_2 likewise are noteworthy. Fox's (1963) figure of the male holotype agrees in detail with the longer series of males now available.

Specimens. Rep. Dom.: Prov. de Espallat: 20 km SW Jamao al Norte, 793 m (7 ♂, 15 ♀).

***Greta diaphana charadra*, new subspecies**

Fig. 1B

Diagnosis: Female fw length 20 - 26 mm (mean = 24.1); fw black border wide, especially at fw and hw apices; black discocellular bar broad at costal margin, constricting strongly at lower margin of cell to form a widely opened inverted Y, the two arms extending into M_2-M_3 and along the upper margin of M_2-Cu_1 and further along the lower cell

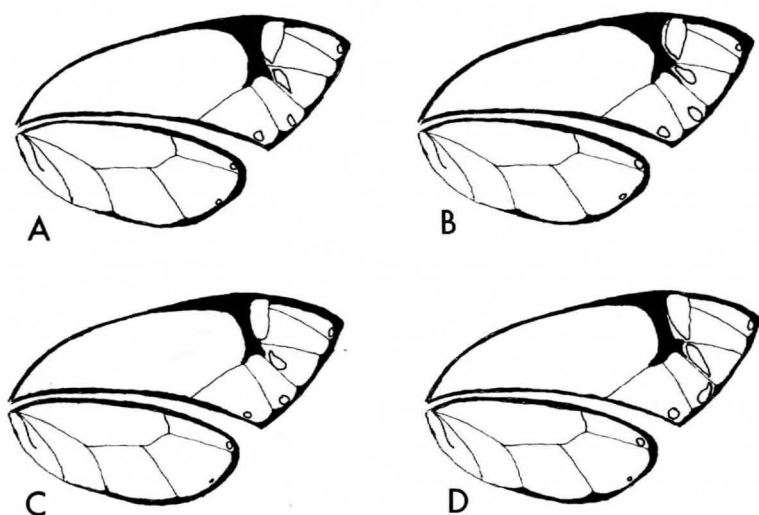


Figure 1. Upperside of female right fw and hw (semidiagrammatic) of four Hispaniolan subspecies of *Greta diaphana*, arranged from north to south, as follow: A, *quisqueya*, B, *charadra*, C, *calimete*, D, *galii*.

vein above Cu_1 ; subapical white bar broad and extending to M_2 , where it almost touches (= separated by black M_2) the transversely elongate white spot in M_2-M_3 , the net effect of an almost complete white bar from the costal margin into M_2-M_3 bordering the black vertical bar; fw white apical spot moderately large; hw white apical spot moderate, an accessory white spot usually present in M_3-Cu_1 .

Male fw length 21 - 27 mm (mean = 24.4); wing borders narrow and dark gray rather than black; dark discocellular bar broadest at costal margin, slightly less than half the width of bar in female, slightly constricted medially, and then expanding only slightly to form a small inverted Y in the same position as that in the female but much smaller and less prominent; white spot in fw M_2-M_3 slightly elongate but small; white vertical subapical bar incomplete, consisting of a white spot encroaching into the black costal fw margin and extending into M_1-M_2 ; hw apical white spot small, usually with an accessory tiny white dot in hw M_3-Cu_1 .

HOLOTYPE female: REPUBLICA DOMINICANA: PROVINCIA DE LA VEGA: 10 km W Jayaco, 815 m, 23.vi.1980 (A. Schwartz), *ex colln.* A. Schwartz, now in the Allyn Museum of Entomology.

Remarks. The series of *G. d. charadra* consists of 13 ♂ and 31 ♀, all from the Cordillera Central (see precise localities beyond). The distribution is between 732 m and 1647 m. The type-locality is a mountain torrent which crosses the main road between Jayaco and El Río as it ascends the eastern face of the Cordillera Central. The stream is reached by a short path from the main road (see Gali and Schwartz, MSA). *Palicourea* is abundant in the well-shaded and forested ravine. Along the stream, *G. d. charadra* is common locally, and specimens have been taken in June, July, August, and December. In fact, in the ravine itself, *Greta* is the dominant butterfly. Their activity is often cyclic, in that several individuals are seen flying simultaneously, then all will disappear for several minutes, only to reappear in some numbers once more. Favorite resting places are on bare branches or twigs of low trees where they are almost invisible, or (less often) on the upper surfaces of the leaves of these same trees. Females were seen ovipositing on 21.vi.1980 on *Pilea rugosa* (Urticaceae) and *Solanum crotonoides* (Solanaceae). These two plants are intermixed along the stream, and the *Pilea* record may be an ovipositional "mistake." Dates and conditions of visits at the type-locality were: 21.vi.1980, 1015-1200 and 1500-1600 h, 29° C - 30° C; 23.vi.1980, 1145-1430 h, 31° C; 3.vii.1980, 1230-1300 h, 27° C, overcast and dull after rain; 11.viii.1980, 1130-1320 h, 30° C, alternate sun and clouds; 13.viii.1980, 1330-1400 h, 30°; 30.xii.1980, 1445-1515 h, 23° C, overcast; 21.vi.1981, 1030-1400 h, 30° C, alternated sun and cloudy; 26.vi.1981, 1115-1245, 29° C, generally sunny; 17.viii.1981, 1100-1445 h, 30° C, bright and sunny.

I have examined specimens of *G. d. charadra* from four other localities. One of these (Río Antonsape Malo) I do not know personally; it lies on the northern face of the Cordillera Central. The specimens were given to me by Dr. Eugenio de J. Marciano of the Museo Nacional de Historia Natural de Santo Domingo. A second locality, La Palma, Prov. La Vega, was visited on 30.xii.1980 at 1200-1345 h; the weather was bright and sunny and the temperature was 20° C. The site is a broad (6 m) shallow creek which is moderately wooded with *cafetales* and *cacaotales*; *Palicourea* is present. *Greta* was not abundant there, but several individuals were seen and collected, primarily adjacent to the stream itself and its associated shrubby and wooded banks. At another locality (10 km SE Constanza), a few *Greta* were seen in a very small creek ravine adjacent to a large mountainside fallow cabbage patch, overgrown with *Leonurus sibiricus* (Lamiaceae) and *Cynoglossum amabile* (Boraginaceae). The site was visited on 9.vii.1980 between 1000-1445 h with temperatures 28° - 30° C; the weather was alternately cloudy and sunny. This locality is much more open than the others where *G. diaphana* has been taken. Another locality (7 km W Jayaco) is represented by a single specimen taken 11.viii.1980 at 1340 h and a temperature of 30° C. This butterfly was seen on a roadside composite, shaded by steep hillside woods.

Greta d. quisqueya and *G. d. charadra* are similar, but they differ in details. Both have the black subapical bar broad and Y-shaped in females, but the arms of the Y are more extensive in *charadra* than in *quisqueya*, and the bar is more uniform in width in

the latter than in the former. The virtual continuation of the white subapical bar with the transversely elongate white spot in M_2-M_3 is more typical of *charadra* than *quisqueya*. The presence of only one accessory hw spot (in M_3-Cu_1) in *charadra* contrasts with the frequent occurrence of two accessory hw spots in *quisqueya*. Males of the two subspecies likewise are very similar but the fw subapical bar is narrower in *charadra* than in *quisqueya*, and the up dark coloration is more grayish than black.

The name *charadra* is from the Greek for "torrent," in allusion to the tumultuous stream at the type-locality.

PARATYPES: Rep. Dom.: Prov. de la Vega: 10 km W Jayaco, 915 m (7 ♂, 29 ♀); 7 km W Jayaco, 732 m (1 ♂); La Palma, 19 km W Jayaco, 1007 m (2 ♂, 1 ♀); 10 km SE Constanza, 1647 m, (1 ♂); Prov. de Santiago: Mun. San José de las Matas, Río Antonsape Malo (2 ♂).

Greta diaphana calimete, new subspecies

Fig. 1C

Diagnosis. Female fw length 24 mm; fw black border narrow, hardly broader at the fw and hw apices; black subapical bar relatively narrow, broadest at costal margin, gradually tapering to form an inverted Y along the veins at M_2-M_3 and M_3-Cu_1 ; subapical vertical white bar extending into M_1-M_2 , with a clear break between its posterior end and the white spot in M_2-M_3 , that spot small and slightly elongate and separated from the white bar; fw apical white spot small, white spots in M_3-Cu_1 and Cu_1-Cu_2 moderate; hw apical white spot moderate, one tiny accessory hw white spot in M_3-Cu_1 .

Male fw length 23 - 26 mm (mean = 24.3); dark wing borders narrow; black discocellular bar very narrow and similar in configuration to female although the arms of the terminal Y are much less obvious; white spot in fw M_2-M_3 small and hardly elongate; white vertical subapical bar incomplete, consisting of a white spot encroaching into the black costal fw margin and extending into M_1-M_2 ; hw apical white spot small, rarely with an accessory white spot in hw M_3-Cu_1 .

HOLOTYPE female: REPUBLICA DOMINICANA: PROVINCIA DE LA ESTRELETA: 21 km S Elias Piña, 1464 m, 27.vii.1981 (A. Schwartz), *ex colln.* A. Schwartz, now in the Allyn Museum of Entomology.

Remarks. The series of *G. d. calimete* consists of one female and 17 ♂: this is the only subspecies where the sample is composed predominantly of males. The locality lies on the north range of the Sierra de Neiba, on the Dominico-Haitian border road and just below (= north of) Puesto Calimete, an army post. The type-locality is a deep and densely wooded mesic broadleaf ravine with a small (2 m wide) creek. Tree ferns form a prominent understory and *Palicourea* was abundantly in bloom. However, no *Greta* were taken feeding on that plant; rather, most were secured either feeding on a low herbaceous composite or flitting through the sun-dappled forest. Collecting was difficult due to the density of the vegetation and the steep slope. The series was secured on two visits: 26.vii.1981, 1300-1515 h, 29° C, bright and sunny; 27.vii.1981, 1100-1230 h, 27° C, bright and sunny. More individuals were seen than were collected; no other locality between Elias Piña and Puesto Calimete was so obviously suitable for *Greta* as was the type-locality.

The *Greta d. calimete* female differs from both *G. d. quisqueya* and *G. d. charadra* in that the black subapical bar is narrower. The Y at the posterior end of the bar is less well developed. The vertical white fw bar is clearly separated from the spot in M_2-M_3 . The male dark markings are black, rather than dark gray, and the subapical black bar is very narrow with the inverted Y tiny. Accessory hw white spots are absent or very tiny in both sexes, in contrast to their presence and larger size in one or both sexes of the more northern subspecies.

The name *calimete* is derived from Puesto Calimete, the nearby army post.

PARATYPES: Rep. Dom.: Prov. de la Estrelleta: 21 km S Elias Piña, 1464 m (17 ♂).

Greta diaphana galii, new subspecies

Fig. 1D

Diagnosis. Female fw length 21-26 mm (mean = 23.3); fw black border very wide, especially so also at hw apex; black subapical bar broad, widest at costal margin, slightly tapering to form an inverted Y, the arms of the Y extending into M_2-M_3 and as far as beyond the intersection of the lower cell vein and Cu_1 ; subapical white vertical bar complete and extending from within the black costal border into M_1-M_2 , where it is sharply pointed and ends at M_2 ; white spot in M_2-M_3 large and transversely elongate, extending marginally for about one-half the length of M_2-M_3 ; white spot in M_3-Cu_1 large and inverted comma-shaped, the tail of the comma directed toward the outer end of the elongate white spot in M_2-M_3 , the net effect of this arrangement of white scales a more or less continuous line (vertical transverse bar-elongate spot in M_2-M_3 -large comma mark in M_3-Cu_1); additionally the comma-shaped mark in M_3-Cu_1 is so large that it reduces the black wing margin in that space to a fine line; apical white spot small, anal white spot large; hw apical white spot small, a tiny accessory hw white spot. *Male* unknown.

HOLOTYPE female: REPUBLICA DOMINICANA: PROVINCIA DE PEDERNALES: Las Abejas, 12 km NW Aceitillar, 1129 m, 18.vii.1981 (F. Gali), *ex colln.* A. Schwartz, now in the Allyn Museum of Entomology.

Remarks. *Greta d. galii* is known from only three females, of which one must have been very freshly emerged since the wings of the spread specimen are distorted. The locality, Las Abejas, has been described in detail (Gali and Schwartz, MSb); it is an enclave of mesic broadleaf forest in upland pine woods. *Palicourea* was abundant and in flower, yet no *Greta* was seen feeding on this plant nor was the small white-flowered Asteraceae on which they were feeding in the Sierra de Neiba present. All three specimens were taken along a dense and sun-dappled path (no creek present) near its opening onto the main road. This is all the more surprising since we had walked at least a kilometer through the woods without seeing any other individuals. One other *Greta* was seen at the margin of the road through dense woods, but it escaped. The three specimens were collected under the following conditions: 18.vii.1981, 1130-1515 h, 30° C, alternately sunny and overcast; 19.vii.1981, 0900-1415 h, 28° C, overcast and sunny in morning, overcast in afternoon. A third visit on 20.vii.1981 between 1430 and 1530 h, after an overcast and rainy day, yielded no specimens. At the time of our visit, *Greta* seemed to be quite uncommon.

Greta d. galii is certainly the most distinctive of the subspecies on Hispaniola. The virtually continuous white fw line from the costal margin of the fw to the deeply indented dark border of fw M_3-Cu_1 is diagnostic. *Greta d. galii* is quite different from its neighbor *G. d. calimete*, in which the narrow black wing margins and narrow discocellular bar are common to both sexes.

The subspecies is named in honor of Frank Gali who secured two of the three known specimens and whose companionship, friendship, and capable assistance greatly enhanced my field work during the summer of 1981.

PARATYPES: Rep. Dom.: Prov. Pedernales: Las Abejas, 12 km NW Aceitillar, 1129 m (2 ♀).

DISCUSSION

With the recognition of four subspecies of *G. diaphana* on Hispaniola, it is profitable to compare these populations with the single (nominate) subspecies on Jamaica. If the illustrations in Brown and Heineman (1972: Pl. 1, Fig. 5) and Riley (1975: Pl. 2, Fig. 2) of male *G. d. diaphana* are correct in their details, one important difference in males is the fact that the white subapical bar in *diaphana* is limited to one (costal) spot, whereas this is never the case in any of the Hispaniolan taxa. Likewise, the vertical black subapical bar is wider in *diaphana* than in any Hispaniolan subspecies. The color of the

up black areas is, on the un, rust-red in *diaphana*, straw or ochraceous in the Hispaniolan subspecies.

Although there are differences in the male genitalia between *G. diaphana* and *G. cubana* (Fox, 1963: 176-177), at least one pattern difference (Riley, 1975:42), that in *G. cubana* there is a "continuous transverse white band...wider in the female than in the male," does not seem to differentiate the two species. The genitalic differences do not seem extreme; Fox (1963: 176) noted that *G. diaphana* has "the saccus, penis and uncus shorter and a different armature at the apex of the valve." Brown and Heineman (1972:97), however, stated that *G. cubana* and *G. diaphana* were "very closely related to species that are common in southern Central America. Whether or not the Cuban, Hispaniolan, Jamaican, and Honduran taxa are to be considered species or subspecies is problematical."

It is perhaps not surprising that *G. d. galii* is the most distinctive of the Hispaniolan subspecies. Only this subspecies is known from the south island, and it has been presumably isolated for a longer period than have its relatives to the north. *Greta d. quisqueya*, *G. d. charadra*, and *G. d. calimete* are close to each other, both geographically and in characters, but they are now separated by low valleys totally unsuitable for members of this genus. As far as the north island subspecies are concerned, characters suggest that *calimete* has been isolated longer from the northern *charadra* and *quisqueya* than they have from each other.

The degree of differentiation of Jamaican *G. d. diaphana* appears to be commensurate with that between the four Hispaniolan subspecies. It should be noted that no one has studied in detail the variation between Jamaican populations, since almost all specimens have come from the uplands of the eastern Blue Mountains in Jamaica, with only one specimen from the central Mt. Diablo region (Brown and Heineman, 1972:101). It is quite possible that with adequate series, the Jamaican populations will show some degree of differentiation similar to that of those on Hispaniola.

There remains the problem of relationship between *G. cubana* and *G. diaphana*. Without question they are closely related, but the degree of relationship (species or subspecies ?) remains in question. Fox (1963: 179-183) discussed at some length the relationships of the Antillean species with those on the mainland and the method of dispersal to the islands of some ancestral stock, without reaching any conclusions. Whatever the *method*, the *sequence* of colonization seems rather clear-cut: a mainland stock reached Cuba, and spread thence to Jamaica and Hispaniola, presumably reaching Hispaniola earlier than Jamaica. This allowed for: 1) differentiation (at the species level?) on Cuba, and 2) differentiation on pre-Hispaniola into north and south island fractions, which have in turn, 3) differentiated on those two paleoislands, resulting in the very distinct *G. d. galii* on the south island, and three subspecies on the north island. Apparently the differentiation on Jamaica itself has not been equal to that on Hispaniola, but this statement is equivocal. The "lack of" subspecific differentiation on Jamaica may be an artifact of lack of material from various upland areas.

ACKNOWLEDGMENTS

I am grateful for the field assistance of the five students who have helped me in the field in the República Dominicana, but I wish to single out Frank Gali for special merit since he collected specimens of all four of the Hispaniolan subspecies, and two of the three specimens of the subspecies named in his honor. For plant identification, donation of specimens, and other aids, my gratitude is due to Dr. Eugenio de J. Marciano, director of the Museo Nacional de Historia Natural de Santo Domingo. Equally important is my debt to the Alcoa Exploration Company, who allowed Gali and myself to stay at their guest house at Cabo Rojo and on whose property Las Abejas lies. Alfredo Lebrón and Victor Garcia of that company were more than helpful in their cooperation. Jacqueline Y. and Lee D. Miller have been unfailingly kind in answering my requests for information and literature.

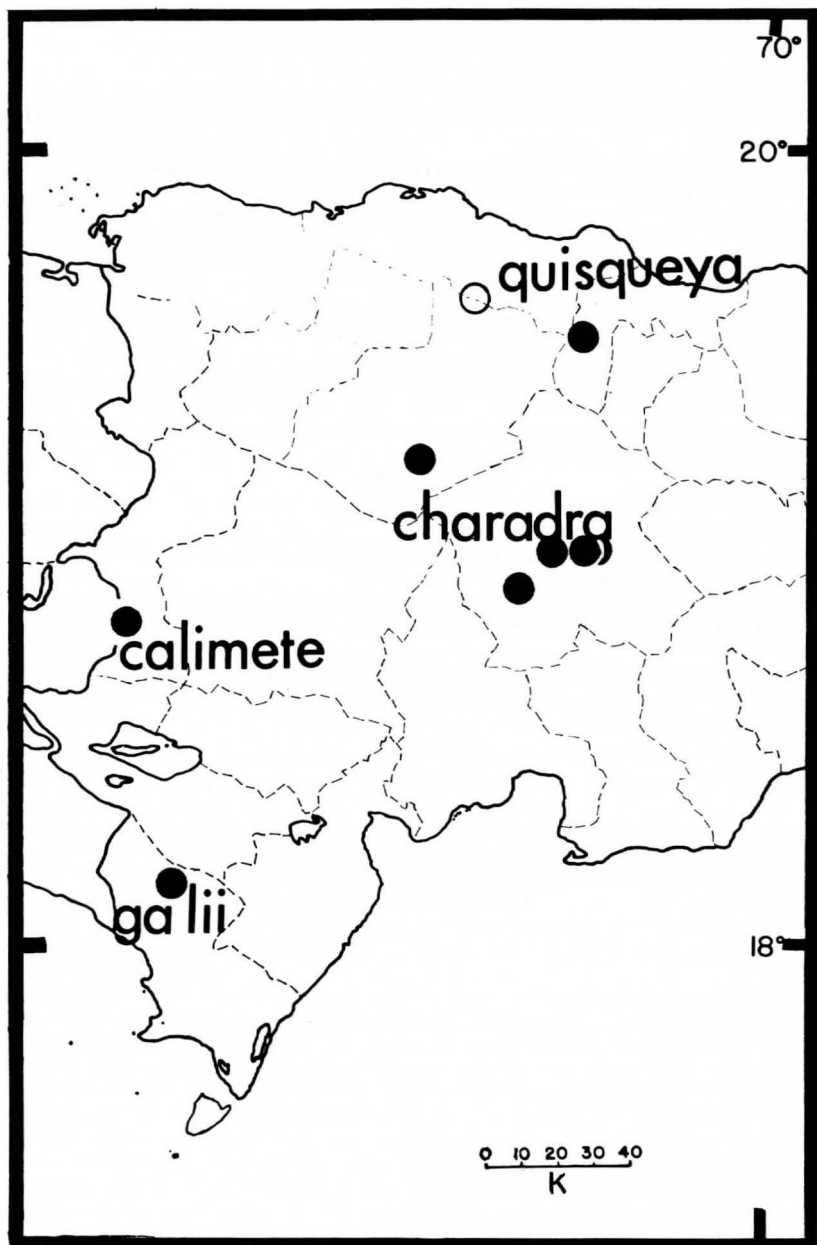


Figure 2. Map of western República Dominicana, showing localities (solid circles) whence specimens of *Greta diapahana* have been examined; subspecies are named. The open circle is the type-locality of *G. d. quisqueya*.

LITERATURE CITED

- Brown, F. M. 1978. The origins of the West Indian butterfly fauna. Acad. Nat. Sci. Philadelphia, Spec. Publ. 13:5-30.
- and B. Heineman. 1972. Jamaica and its butterflies. E. W. Classey, Ltd., London, xv + 478 pp.
- Drury, D. [1773]. Illustrations of Natural History, London, Pt. 2:vii+ 90 pp.
- Fox, R. M. Affinities and distribution of Antillean Ithomiidae. J. Res. Lepidoptera, 2(3):173-184.
- Gali, F., and A. Schwartz. MSa. The second specimen of *Epargyreus spanna*. MSb. *Battus zetides* in the República Dominicana.
- Riley, N. D. 1975. A field guide to the butterflies of the West Indies. New York Times Book Co., N.Y., 224 pp.
- Schwartz, A. 1978. Some aspects of the herpetogeography of the West Indies. Acad. Nat. Sci. Philadelphia Spec. Publ. 13:31-51.
- , 1980. The herpetogeography of Hispaniola, West Indies. Stud. Fauna Curaçao and Caribbean Is., 189:86-127.

KEY TO FEMALES OF HISPANIOLAN SUBSPECIES OF *Greta diaphana*

1. Marginal white spot in M_3 -Cu, large, inverted comma-shaped. almost touching transversely elongate white spot in M_2 - M_3 *G. d. galii*
- 1'. Not as above..... 2
2. Black subapical bar narrow, its posterior Y short; white spot in M_2 - M_3 virtually isolated from subapical white bar..... *G. d. calimete*
- 2'. Black subapical bar broad with posterior Y longer; white spot in M_2 - M_3 with its inner point closer to the subapical white bar..... 3
3. Black subapical bar broad and not strongly tapering, the arms of the posterior Y not so extensive (= following M_2); subapical white bar separated from white spot in M_2 - M_3 *G. d. quisqueya*
- 3'. Black subapical bar narrow and tapering strongly before posterior Y, which is extensive and has one arm following M_2 ; subapical white bar virtually continuous with white spot in M_2 - M_3 *G. d. charadra*

This public document was promulgated at a cost of \$447.00 or \$0.745 per copy. It makes available to libraries, scholars and all interested persons the results of researches in Entomology.