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NOTES ON BUTTERFLIES FROM HISPANIOLA

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The island of Hispaniola, broken into many life zones and habitats by its lofty mountain ranges, presents the most interesting—and least known—fauna of any island in the West Indies. Sharpe (1898) and Hall (1925) have given lists of butterflies from the island, the latter enumerating 139 species. The Hispaniolan butterfly fauna is surely as large as that of Cuba and perhaps larger (159 species are now known from Cuba: Bates, 1935; 1936) and almost any collection from the island includes species not previously known from there. The Museum of Comparative Zoology and the American Museum of Natural History now have fairly extensive collections from Hispaniola, and a worthwhile study of the butterfly fauna could be made on the basis of this material. Since, however, there is little likelihood that any such study will be made in the near future, it seems best to publish the following notes on certain particularly interesting species.

The best account of the zoogeography of the island seems to be that of Wetmore and Swales (1931) and most of the localities mentioned in the present paper can be found on their map.

The nomenclature and sequence used in the present paper conforms with that of my "Butterflies of Cuba" (Bates, 1935).

***Eurema dina* (Poey)**

There seem to be two species of *Eurema* in Hispaniola belonging to the *dina* complex: one related to the Cuban

dina and the other to the Bahaman *helios*. Klots, in his revision of the genus *Eurema* (1929, p. 139) has considered that *dina* presents a peculiarly complicated taxonomic problem; but this may be due to the frequency with which morphologically distinct local populations are encountered. Individuals from a given population seem to have a quite uniform facies, as is shown by the long series in the M. C. Z. from Cuba (*dina*), New Providence (*helios*) and Honduras (*westwoodi*). There is considerable variation in the genital structures as Klots (1928, p. 66) has pointed out; but this variation seems in part at least to be geographical.

The Bahaman populations that I have called "*Eurema chamberlaini* Butler" (Bates, 1934, p. 134) seem to belong to the *dina* complex, and the Cuban *Eurema laræ* (Bates, 1936, p. 226) may also belong there, although as our only specimen lacks the abdomen it is impossible to place it with any certainty. The Puerto Rican *Eurema sanjuanensis* (Watson, 1938) is unknown to me.

The known West Indian *dina* populations might, then, be arranged as follows:

<i>Eurema dina dina</i> (Poey)	Cuba
<i>dina memulus</i> (Butler)	Hispaniola
<i>dina parvumbra</i> (Kaye)	Jamaica
<i>laræ</i> (Herrich-Schäffer)	Cuba
<i>helios helios</i> Bates	New Providence, Andros
<i>helios mayobanex</i> subsp. nov.	Hispaniola
<i>chamberlaini chamberlaini</i> (Butler)	Great Inagua
<i>chamberlaini mariguanæ</i> Bates	Mariguana
<i>chamberlaini</i> subsp. indescr.	Cat Is.

***Eurema dina memulus* (Butler)**

Terias memulus Butler, 1871, p. 251, pl. 19, f. 6.

♂. Wings above light orange, somewhat deeper in color toward the margins; apex of forewing black, the inner edge of this black patch evenly rounded or slightly dentate, extending from a point about two thirds of the way out on the costa to the inner angle. Under side yellow: immaculate or with scattered brownish spots on the hindwing. Length of forewing, 16–17 mm.

2♂♂ in the M. C. Z. from Haiti: Ennery (2500 ft., Aug., Bates) and "San Domingo" (Weeks Coll.).

This differs from the Cuban form (*E. dina dina*) in the complete absence of a black border on the hindwing, and in the greater extent of the apical black patch of the forewing. Our specimens agree very well with Butler's description and figure.

***Eurema helios mayobanex* subsp. nov.**

♂. Wings above uniform orange, with a fine black border on the hindwing and a conspicuous border on the forewing, about the same as in the Cuban *dina*. Under side immaculate orange except for a minute double cell spot on the hindwing.

♀. Deeper orange toward the edge of the wings; no black margin to hindwing; apical border of forewing brown rather than black. Under side with a reddish patch at apex of forewing, and another on the margin of hindwing between veins R_s and M_1 ; some scattered purplish spots on disc of hindwing. Length of forewing, 20–22 mm.

Type (♂) and paratypes (2♂♂, 1♀) from Haiti: Ennery (2500 ft., Aug., Bates).

This form may be distinguished from *dina* (*s. s.*), *parvumbra* or *memulus* by the dark orange ground color of both sexes, and from *helios* by the comparatively broad apical border of the forewing.

The "distal process" of the male genitalia of *mayobanex* (Klots, 1928 for terminology) is about twice as wide as in *memulus*, and the various lobes are much more strongly developed in the former species. The genitalia of two specimens of *mayobanex* and of one of *memulus* were examined.

The four specimens of *mayobanex* and the Ennery specimen of *memulus* were all caught on the same day, as were specimens of *Eurema lisa* and *E. proterpia*.

***Kricogonia castalia* (Fabricius)**

In the M. C. Z. there are 21 ♂♂, 7 ♀♀ from: Haiti: Cabaret (Aug.); Mont Rouis (Aug.); Mt. Bourette, La Selle Range (5000 ft., Sept.); Cap Haitien; Rep. Dom.: Bonao (Aug.); Saona Is. (Jan.).

The pattern variation of this species seems to show no

geographical correlation, except insofar as certain populations seem to be more uniform than others (*e.g.*, the Bahamas). Very dissimilar specimens from the same region show identical structure in the male genitalia, but there seems to be some, though slight, geographically correlated variation in these organs. The genitalia of the Cuban *K. cabrerai* have not been examined, but the form seems to be distinct. With this exception it seems to me that, pending adequate material from all regions for comparative study, the best course is to treat the entire complex under the oldest name (*Papilio castalia* Fabricius, 1793, Entom. Syst., 3, 1, p. 188, presumably from Jamaica), and to describe the variation shown by different populations in terms as general as possible.

In the Hispaniolan series there are two types of males:

A, with the wings immaculate whitish above, except for the orange area at the base of the forewing, and a light longitudinal streak on the under side of the hindwing;

B, similar above except for a black postmedian bar on the costa of the hindwing, but with the underside of the hindwing uniform light yellow except for a shadow of the black bar of the upper side.

These two types show no intergrades; three specimens belong to type A, the remaining eighteen to type B. We have specimens like type A from Arizona, Nicaragua and Jamaica; like type B from Arizona. These might be considered as "incipient species" but the genitalia of A and B from Hispaniola seem to be identical and slightly different from the genitalia of A and B from Arizona!

Three types of females occur on Hispaniola:

C, above entirely lemon yellow, slightly darker at the base of the forewing; similar below, but with a prominent light longitudinal streak (really a fold) on the hindwing, and a faint silvery reticulation on this wing (1 specimen, Saona Is.);

D, chalky white above, darker on the base of the forewing; similar below, but bright yellow on the base of the forewing, the ground color of the hindwing and the apex of the forewing slightly yellowish, the fold of the hindwing prominent but not marked with contrasting scales (5 specimens);

E, similar but with an indication of a postmedian row of dark spots on the underside of the hindwing (1 specimen, Cabaret).

We have specimens of type C from Texas, Honduras and Nicaragua (the last somewhat intermediate between C and D); of type D from Texas; of type E from Texas. A sixth type with the apex of the forewing rather broadly marked with brown, and with the hindwing somewhat darker than the forewing above, occurs in Guatemala, Honduras and Arizona.

Dismorphia spio (Godart)

Pieris spio Godart, 1819, p. 167 (Antilles).

In the M. C. Z. there are 10 ♂♂, 9 ♀♀ from Haiti: Cap Haitien; La Hotte Peninsula, Camp Perrin, 1000 ft., Oct.; Etang Lachaux, Oct.; Rep. Dom.: San José de las Matas, 1000-2000 ft., June.

The variation in this series is very interesting. The two males from the La Hotte peninsula (Camp Perrin) may represent a distinct population, as they are smaller than any of the other specimens and have the yellow area of the costal margin of the upper side of the hindwing broadly connected with the orange postdiscal area, instead of separated by a black bar as in specimens from Cap Haitien. One yellow male from San José de las Matas, however, has the black bar only partially developed.

Both sexes of this species seem to be dimorphic: of the males in the series, six have orange markings and four have yellow markings; of the females, three are orange and six are yellow. Avinoff (1926, p. 363, pl. 33, f. 1) has described a yellow form from Puerto Rico as "*ab. virago*". The yellow females are strikingly similar to the normal females of the Cuban *Dismorphia cubana*.

Genus **Calisto** Hübner

In my review of the genus *Calisto* (Bates, 1935) I described five new species from Hispaniola, bringing the total known from the island up to nine. This seemed like a very large number of species, and I was greatly surprised to find two more very distinct new species in material collected by Dr. P. J. Darlington in the Dominican Republic in 1938.

One of these is the largest and most striking species of *Calisto* yet to be described. When the island is thoroughly explored, it will probably be found that the various mountain ranges are inhabited by distinct local populations of many of these *Calisto* species, and there is evidence of such geographical variation in some of the series in the collection of the M. C. Z.; there seems, however, to be no point in giving names to such subspecific populations at the present time.

***Calisto arcas* sp. nov.**

♂ ♀. Sexes similar. Upper side: forewing: dark fuscous with a row of large more or less confluent submarginal fulvous spots extending from the inner margin to vein M_2 ; hindwing with the basal half fuscous, the distal half fulvous, except for a narrow, sharply defined, burnt orange submarginal line and a fuscous margin at the outer angle extending to vein M_1 . Under side: forewing: dark reddish brown from base to just beyond cell, except for a black area along the inner margin; postmedian area fulvous, marked off by narrow brown lines; margin somewhat darker; ocellus in the fulvous area: black surrounded by a yellow ring; two bluish white central dots. Hindwing a rich brown, the basal half slightly yellowish, the distal half reddish; distinct antemedian, postmedian and submarginal dark lines; two ocelli of about equal size, both marked with yellow rings, the center black enclosing small, central, bluish-white dots; one ocellus in the M_1 — M_2 area, the other in the Cu_1 — Cu_2 area; an isolated white dot in the M_2 — M_3 area; Length of forewing, 24—27mm.

♂. The androconia are limited to the Cu_1 — Cu_2 and Cu_2 —2A areas; they do not form a sharply defined patch. The genitalia of this species are quite distinctive: the uncus being asymmetrical, and the valves elongate, squared at the end.

Type (♂) and 3 ♂ ♂ 2 ♀ ♀ paratypes from Valle Nuevo, S. E. Constanza, Rep. Dom., Aug. 1938, c. 7000 ft., P. J. Darlington; 3 ♂ ♂ and 3 ♀ ♀ from Loma Vieja, S. Constanza, Aug. 1938, c. 6000 ft., P. J. Darlington.

The position of vein R, of the forewing, which arises at the end of the cell, and the symmetrical ocelli of the hind-

wing, indicate that this species should be put in the *Archebates* Group. It differs strikingly, however, from the other members of this group and from all other species of the genus both in genital structure and in pattern. It is the only known species with fulvous markings on the upper side of the forewing, and the only species, except the new one described below as *grannus*, with two symmetrical ocelli on the under side of the hindwing.

***Calisto chrysaoros* Bates**

Dr. Darlington captured four specimens of this species in the "foothills of the Cordillera Central S. of Santiago" and one "between Constanza and Valle Nuevo, 6000 ft." in the Dominican Republic. These differ from the typical specimens from the La Hotte and La Selle mountains of Haiti in having the under side of the hindwing fuscous rather than brown, and in having the white median band of this wing somewhat nearer the similar band over the ocellus. This species, then, seems to occur at high elevations in several parts of the island.

***Calisto grannus* sp. nov.**

Upper side: dark fuscous, the disc of the forewing (androconia patch) very dark. Under side: forewing: fuscous, with a fine dark postmedian line extending from the costal to the inner margin, and with two wavy submarginal lines along the outer margin; ocellus of the usual design: black, ringed with yellow, with two minute white pupils. Hindwing: fuscous, with fine reddish-brown ante-median and postmedian lines and with two very irregular submarginal lines; two symmetrical ocelli (black ringed with yellow or orange, with a single central white dot): one, slightly smaller, in the M_1-M_2 area, the other in the Cu_1-Cu_2 area; a prominent white spot in the M_2-M_3 area and another in the M_3-Cu_1 area. Length of forewing, 16-18 mm.

♂. Androconia patch like that of *C. hysius*. Genitalia strikingly similar to those of *C. hysius*, differing only in details of proportion and chitinization.

Type (♂) and one paratype ♂ from Valle Nuevo, S. E. Constanza, Rep. Dom., Aug. 1938, c. 7000 ft., P. J. Darling-

ton; 3 paratypes ♂♂ from Loma Rucilla, June 1938, 8000 ft., P. J. Darlington.

The three specimens from Loma Rucilla differ from the others in that the lines of the under side are more obscure, the ocellus of the forewing smaller.

This species, structurally, seems to be close to *C. hysius*, but it differs from all other species of the *hysius* group in having two symmetrical ocelli on the under side of the hindwing—instead of one asymmetrical ocellus—and in the absence of a distinct red patch in the cell of the forewing.

Calisto pulchella Lathy

Dr. Darlington caught four males of this species in the Constanza region (3000–4000 ft.) which differ rather strikingly from the common Haitian form in having the under side of the hindwing marked with orange rather than reddish-orange, and in having the antemedian and postmedian lines more widely separated.

Hypolimnas misippus (Linnaeus)

There is one male in the M. C. Z. collection from Haiti: Cul-de-Sac Plain, Jan., A. Audant. This is the first record of the species from Hispaniola.

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