

# TWO NEW SPECIES OF COSTA RICAN BUTTERFLIES (LEPIDOPTERA: RIODINIDAE)

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**ABSTRACT.**— Two new taxa, *Mesosemia harveyi* n. sp., and *Theope guillaumei cecropia* n. ssp., in the family Riodinidae, are described from Costa Rica and Panama. Remarks on their taxonomy, natural history and distribution are provided.

**KEYWORDS:** Amazon, behavior, Brazil, Cecropiaceae, Central America, French Guiana, hostplant, larval behavior, life history, Mesoamerica, *Mesosemia harveyi* n. sp., Mexico, Neotropical, Panama, taxonomy, *Theope guillaumei cecropia* n. ssp., Urticaceae.

It is well known that the Neotropics has more species of butterflies than other biogeographical regions (see comparisons in DeVries, 1987; Heppner, 1991; Robbins, 1982). The recent surge of interest in ecological comparisons of tropical entomofaunas (Beccaloni and Gaston, 1995; Gaston, 1991; May, 1988) has, among other things, provided much new material for taxonomic studies. Hence, as our understanding of Neotropical entomofaunas increases, more undescribed species are discovered.

Most general entomologists are aware that the butterfly family Riodinidae is largely a tropical group. Nevertheless, surprisingly few entomologists appreciate the fact that no other group of butterflies is so explicitly Neotropical — over 96% of the species are entirely Neotropical (see DeVries, 1991b; Heppner, 1991). Our systematic understanding of the riodinid butterflies stems primarily from two sources. The first is Stichel (1930; see also references therein) who was the first to provide a major taxonomic survey of the group, and his work by and large remains key to any alpha taxonomic work. The second source is Harvey (1987) who provides a modern higher level treatment that examines systematic and evolutionary aspects of the group, and thus forms the basis for future higher systematic work.

Although Costa Rica may lay claim to having one of the best known mainland Neotropical butterfly faunas, the fact is that comparatively little is known of the Costa Rican riodinid fauna — a trait shared with the rest of the Neotropics. Among other factors, the riodinids are probably less well known because of their small size, the fact that most species typically occur in low abundance, and their extremely local nature both in time and space (see DeVries *et al.*, 1994; DeVries, *in press* for overview). This is to say that, typically, riodinids do not get collected or studied by the casual entomologist. During the course of preparing a treatment of the Costa Rican riodinid fauna (DeVries, *in press*), it became apparent that some Costa Rican taxa were in need of description. While recognizing the significance of comprehensive systematic revisions to further our grasp of riodinid taxonomy, we also feel that faunistic works are important steps toward estimating biodiversity. This paper has three goals:

first to provide names for two taxa that will be treated in a forthcoming field guide to the Costa Rican riodinid fauna, second to make this relevant information available for future taxonomic and ecological studies, and finally to stimulate interest in the taxonomy and natural history of riodinid butterflies in general.

## Methods

Morphological terminology of the genitalia follows Klots (1970), and terminology for the wing veins and areas follows the modified Comstock system as treated by Miller (1970). Genitalia were prepared for study by breaking off the abdomen, soaking it in 10% KOH for 12-15 hours, then placing it directly into water, and removing the scales with a small camel hair brush. The genitalia were then separated from the abdomen, further cleaned with the aid of a camel-hair brush and forceps, and then placed into glycerin. Line drawings were made from these preparations using a drawing tube attached to a dissecting microscope.

Acronyms for collections are as follows: American Museum of Natural History, New York, USA (AMNH), Museo Nacional de Costa Rica, San José, Costa Rica (MNCR), National Museum of Natural History, Washington, USA (USNM).

## Genus *Mesosemia* Hübner, [1819]

The genus *Mesosemia* embraces well over 100 taxa that may be divided into about 10 species groups (Stichel, 1930). The butterflies in *Mesosemia* are important components of Neotropical butterfly species richness at most low to middle elevation sites, with the greatest concentration of species being found in the Amazon basin. Due to their habit of walking about on top of the leaves of understory shrubs with characteristic jerky movements (like clock-work toys), *Mesosemia* is one of the most frequently observed riodinid genera in the field.

In general, these butterflies are recognized by their somewhat square wing-shape, and the presence of an eyespot in the forewing cell that generally contains one to three pupils (in some cases the ocellus is obsolete, but the pupil remains). With a few

exceptions the species of *Mesosemia* typically exhibit strong sexual dimorphism. A small number of species have both sexes almost uniformly brown (e.g., members of the "cippus group": *cippus* Hewitson, 1859, *sylvina* Bates, 1867, and *synnephis* Stichel, 1909), but this group of species has been reported only from South America (see illustrations in D'Abbrera (1994)). Here we describe a new taxon that differs from all other *Mesosemia* species thus far reported from Central America by being monomorphically brown.

*Mesosemia harveyi* DeVries & Hall, new sp.

Fig. 1a-b, 3

**Description.**— MALE: forewing length 18.4mm (mean = 19.8mm, N = 5). *Head*: palpi pale brown on all segments with cream scales where they contact the eye; a tuft of long brown setae-like scales directed forward between the eyes; short white scales within this tuft at base of proboscis, between the antennae, and terminating at the posterior edge of eyes. *Antennae*: brown with white ventral scales between each segment; flagellum bluntly acute. *Thorax*: legs brown, and rest of thorax heavily covered in brown scales. *Abdomen*: dark brown scales dorsally and buff and cream scales ventrally. *Forewing* (dorsal): ground color dark brown with lighter brown postmedial and submarginal bands extending from costa to inner margin; a prominent, slightly iridescent black ocellus in cell bearing three white, epicentric pupils; ocellus ringed in brown, and then with a thin band on ochre. The ochre ring is single basally, and double distally with a few ochre scales on the basal edge of the thin, dark brown postmedial band; fringe entirely pale brown. *Hindwing* (dorsal): angular projection on the distal margin; similar in color and pattern to forewing, but ocellus in cell smaller, indistinctly ringed in pale brown, and bearing two white pupils; long, pale setae distributed sparsely across the basal two-thirds of the wing, all directed distally. *Ventral surface of both wings*: differs by having ochre scales surrounding both ocelli, and having ochre scales lining the dark brown medial band that encompasses both ocelli; a scattering of ochre scales at the hindwing costa and tracing the basal edge of the hindwing postmedial line. *Genitalia* (Fig. 3): tegumen somewhat elongate; gnathos simple and stout; aedeagus stout, unadorned, and gently curving ventrally; valvae simple and somewhat reduced; sacculus with a distinct process that is directed posteriorly and sparsely adorned with elongate setae.

FEMALE: forewing length 19.4mm. Coloration and pattern similar to male, but paler brown ground color; the ochre scaling surrounding the forewing and hindwing ocelli more pronounced, forewing distal margin slightly more convex, no scales on hindwing, and the legs a lighter brown than in the male.

**Types.**— The male holotype bears two labels. The first reads: "Panama, Veraguas Prov., Sta. Fé, 1300m, 23 VIII 81, Gordon B. Small". The second reads: "This specimen used for illustration in Butterflies of Costa Rica: Riodinidae by P. J. DeVries". The holotype specimen is deposited in the USNM collection.

**Paratypes** (5): 1♀, same data as above; 1♂, Costa Rica, Cartago Prov., Orosi-Tapanti, Río Hurrio, 4 Feb 83, leg. R. L. Hesterberg (deposited in the AMNH); 2♂, Panama, Chiriquí Prov., Cerro Colorado, 9 Aug 1979, G. B. Small (deposited in the USNM); 1♂, Panama, Chiriquí Prov., Cerro Colorado, 1450m, 7 Oct 1978, G. B. Small (deposited in the USNM).

**Etymology.**— This butterfly is named for Donald J. Harvey in recognition of his contributions to butterfly systematics, and who over the years has assisted the authors with matters related to the riodinids.

**Diagnosis.**— *M. harveyi* n. sp. is readily distinguished from all other sexually monomorphic brown *Mesosemia* species by the deep chocolate brown on both wing surfaces, and the angular production on the distal margin of the hindwing. Without a

revision of the entire genus *Mesosemia*, it is not possible to make wholly accurate statements about the closest relatives of *M. harveyi*. However, despite the superficial resemblance of *M. harveyi* to members of the all-brown "cippus group", it is almost certainly not closely related to those species. The male genitalia, large forewing eyespot configuration and ventral banding pattern of *M. harveyi* are very close to those of *M. sibyllina* Staudinger, [1887] (W. Colombia-W. Ecuador), whose male has a bright blue dorsal surface (see Willmott and Hall (1994) for an illustration of the adult male and male genitalia of *M. sibyllina* [= *M. hazelae* Willmott & Hall, 1994, n. syn.]).

**Remarks.**— This species is currently only known from Costa Rica and Panama, and judging from locality data, appears to be restricted to cloud forest habitats.

**Genus *Theope* Doubleday, 1847**

Members of *Theope* are found from tropical deciduous forest to lowland rainforest habitats throughout Mexico, Central and South America, from low to middle elevations. In the field (and in some collections) the butterflies in *Theope* are not infrequently mistaken by the casual entomologist for members of the Lycaenidae. On the whole the majority of the *Theope* species are blue on the upperside, as in many lycaenids, but may be quickly recognized by the general tendency toward a dull monochrome underside. Many of the species have the sexes dimorphic.

Due to their outward similarity there has always been difficulty in assessing just how many species the genus *Theope* contains, a problem that is very much in evidence today. For example, Seitz (1920) felt that many of the taxa represented forms or subspecies, and in some cases this is true. However, from recent revisionary work by JPWH, it is evident that the number of species placed in this genus is, overall, slightly underestimated. Here we describe a new subspecies of the recently described *T. guillaumei* Gallard, 1996, which belongs in the "*Theope thestias* group" with *T. thestias* Hewitson, 1860, and *T. janus* Bates, 1867.

*Theope guillaumei cecropia* DeVries & Hall, new ssp.

Fig. 2a-b, 4

**Description.**— MALE: a badly crumpled specimen which only indicates that the dorsal surface is brown and the ventral surface is similar to that of the female. *Genitalia* (Fig. 4): similar to those of other species in the *thestias* group by being simple in form, having reduced, twisted valvae that are more heavily sclerotized basally, and a small, compact uncus.

FEMALE: forewing length 9.6mm (mean 9.7mm, N = 6). *Head*: palpi heavily clothed in short flat scales that are black distally and white proximally; frons bluntly acute with cream scales and black scales on either side of mid-line, this row of scales running between the antennae; vertex covered by a sheet of long, flat, stiff scales originating from the back of the head and projecting forward to the antennae. *Antennae*: black with white scales between the segments. *Thorax*: legs pale brown to cream. *Abdomen*: dark brown dorsally and laterally; ventrally with fawn colored scales on the distal one-third. *Forewing* (dorsal): ground color dull, dirty brown with discal area posterior to cell with a semi-sparse scattering of white and very pale blue scales extending from near base to postmedial area; a few pale blue scales in posterior half of cell; fringe long and entirely dirty brown. *Hindwing* (dorsal): ground color as in forewing, and except for the costa and margins, covered in pale blue scales across entire wing, especially the distal half between Rs and 3A; distal one-third of wing between M<sub>3</sub>, Cu<sub>1</sub>, Cu<sub>1</sub>, and 1A+2A covered in

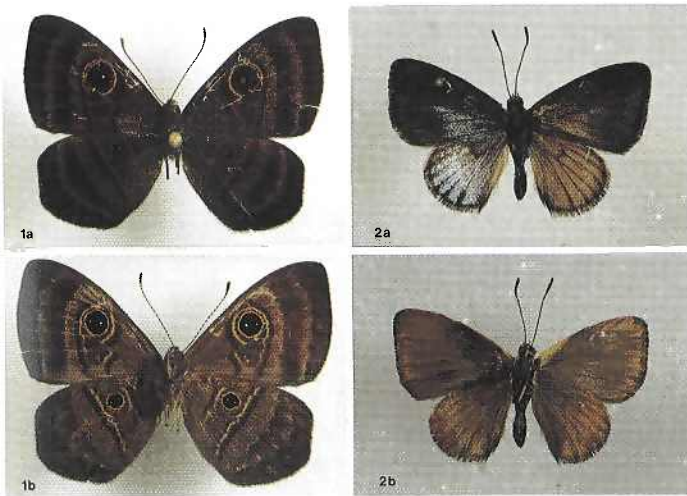


Fig. 1-2. Types: 1) *Mesosemia harveyi* DeVries & Hall, holotype ♂: a) dorsal surface; b) ventral surface. 2) *Theope guillaumei cecropia* DeVries & Hall, holotype ♀: a) dorsal surface; b) ventral surface.

brown scales that form cuneiform shapes at margin; fringe long and entirely dirty brown. *Forewing* (ventral): dull gray-fawn with cream colored scales along costa encompassing the area between the costa and cell, narrowing sharply at Sc-R<sub>1</sub>, then continuing only at costa to the apex; distal margin faintly fawn colored from apex to 1A+2A. *Hindwing* (ventral): ground color dull fawn as in the forewing, but without cream along the costa.

**Types.**— The female holotype bears two labels. The first is hand written and reads: “Costa Rica, Heredia Prov., La Selva, 26 March 1989, J. Longino, ex larva: *Cecropia insignis*”. The second printed label reads: “This specimen used for illustration in *Butterflies of Costa Rica: Riodinidae* by P. J. DeVries”. The holotype is deposited in the AMNH collection.

*Paratypes:* with the following hand written label data: 2♀, same data as above; 1♂ (in a very crumpled condition within a gelatin capsule) and 3♀, Costa Rica, Heredia Prov., La Selva, 15 Mar 1989, voucher, DeVries & Longino, ex larva *Cecropia insignis*. The ♂ paratype and 4♀ paratypes are deposited in the collections of the AMNH; 1♀ paratype is deposited in the collection of the MNCR.

**Etymology.**— The name refers to the larval hostplant for this butterfly, *Cecropia insignis*.

**Diagnosis.**— *Theope guillaumei* differs from the other two species of the *thestias* group by the uniform brown coloration of the dorsal surface in the male and the plain, uniform coloration of the ventral surface with a smaller yellow area at the base of the forewing costa in both sexes. The male genitalia of *T. guillaumei* differ from *T. thestias* in the smaller size of the uncus, and the uniform thickness of the aedeagus, which is not curved at the distal end; the valvae of *T. guillaumei* appear smaller than those of *T. thestias* (although this trait is variable in the latter species). In overall configuration the genitalia of *T. guillaumei* are most similar to *T. janus*, but notably, in the latter species, the lower edge of the aedeagus extends outwards at the tip. The new subspecies, *T. g. cecropia*, differs from the nominate, described from French Guiana, by the increased amount of blue on the dorsal surface of the female. In the nominate there are only traces of blue at the base of both wings, whereas in *T. g. cecropia* the entire hindwing is blue, except for a thin black border, and the forewing has a triangular shaped patch of blue at the base of the wing.

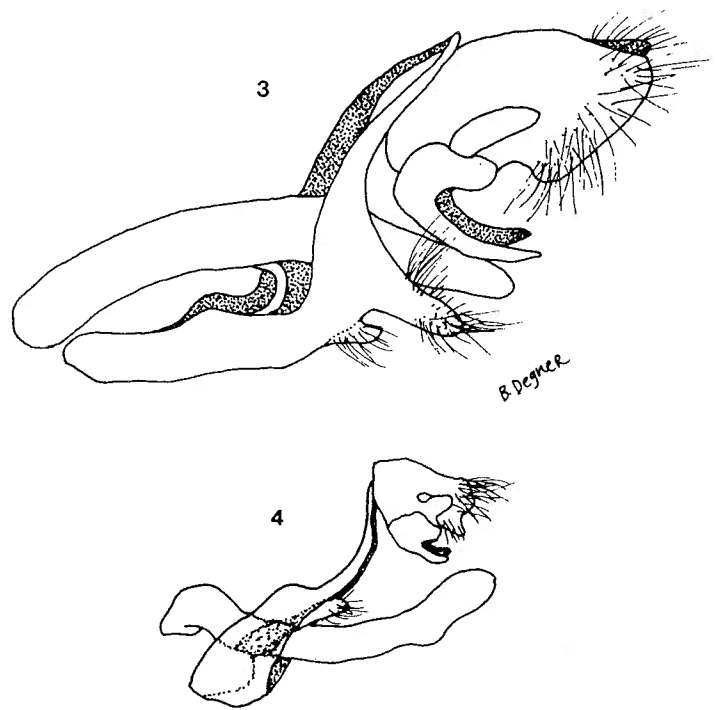


Fig. 3-4. Male genitalia in lateral views: 3) *Mesosemia harveyi* DeVries & Hall, holotype. 4) *Theope guillaumei cecropia* DeVries & Hall, allotype.

**Remarks.**— *Theope guillaumei* was very recently described from French Guiana (Gallard, 1996), but photographs of riodinids collected in Rondônia, Brazil and examined by JPWH (Austin and Emmel, pers. comm.), include nominate *T. guillaumei* (although the traces of blue at the base of the wings in the female are absent), and this indicates that the species probably ranges throughout much of the Amazon basin. Since it is also found in Costa Rica, *T. guillaumei* appears to be a widespread species but it is clearly rare throughout its range, and no specimens have been found in the major European and American museums searched by JPWH during revisionary work on the genus.

*T. guillaumei cecropia* was initially found by J. Longino who pointed out a group of caterpillars to PJD. The entire type series was reared from a small group of caterpillars that were feeding on the foliage of *Cecropia insignis* Liebman (Cecropiaceae or Urticaceae *sensu lato* (W. Judd, pers. comm.)). Some life history details have been reported under the name *Theope* nr. *decorata* in DeVries *et al.* (1994), but a few more are provided here (it is important to note here that life history details reported under *Theope* nr. *thestias* in the 1994 paper refer to *Theope lycaenina* Bates, 1868).

The mature caterpillar (Fig. 5) has a gray body with a broad rich maroon dorsal mid-line that has the distal edges somewhat jagged and bordered by white; a conspicuous black dot on the posterior margin of all abdominal segments; anal plate with a distinct central black triangle with the apex directed toward posterior; areas distal to this triangle are pale pink; the areas surrounding the tentacle nectary organs are rich maroon; the head is brown surrounded by a sparse corona of short brown balloon-setae; the anterior edge of the first thoracic segment, the interface of all abdominal segments, and the venter with fairly long white setae.

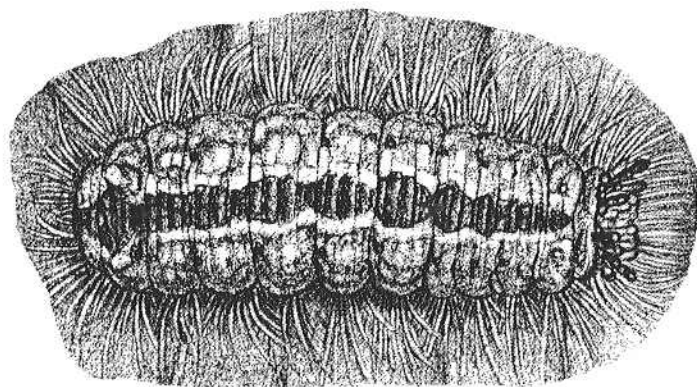


Fig. 5. Fifth instar larva of *Theope guillaumei cecropia*, taken from the rearing of the type series (original drawing by Jennifer Clark).

The caterpillars were semi-gregarious and skeletonized the underside of a single *C. insignis* leaf near the radiating central veins. These caterpillars were not tended by the *Azteca* ants that inhabited the *Cecropia* tree, but rather by the *Solenopsis* (*Diplo-rhoptrum* group) ants that formed small colonies in the radiating leaf veins at the base of the petiole. The caterpillars were never observed interacting with the *Azteca* ants. The caterpillars were loosely gregarious when resting near the radiating central veins of the leaf, and less so when feeding. The caterpillars possess vibratory papillae, and produce a call like other members of the riodinid tribe Nymphidiini (DeVries, 1990, 1991b). Pupation took place in a curled edge of the hostplant leaf, and the pupa resembled a tiny version of other members of *Theope* (see DeVries (*in press*) for illustration). Subsequent searching on the original *Cecropia insignis* tree, and others in the vicinity has failed to yield more caterpillars. Adults of *T. guillaumei cecropia* have never, to our knowledge, been observed in nature.

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