

# FIVE NEW SPECIES AND A NEW GENUS OF RIODINID FROM THE CLOUD FORESTS OF EASTERN ECUADOR (LEPIDOPTERA: RIODINIDAE)

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**ABSTRACT.**— The new genus *Machaya* is described, in addition to five new species in the genera *Anteros* Hübner, [1819], *Euselasia* Hübner, [1819], *Menander* Hemming, 1939, *Symmachia* Hübner, [1819], and *Machaya* n. gen. All of these taxa were discovered in cloud forest habitats in eastern Ecuador.

**KEY WORDS:** *Adelotypa*, *Anteros nubosus* n. sp., aphytophagy, *Apodemia*, *Argyrogrammana*, *Astraeodes*, bait trapping, Bolivia, *Calliona*, *Callistium*, *Calospila*, *Calydna*, Charitini, Colombia, *Dianesia*, *Dinoplotis*, *Echenais*, *Emesis*, *Esthemopsis*, Eurybiini, *Euselasia chinguala* n. sp., Helicopini, hilltopping, *Imelda*, Lemoniini, Lycaenidae, *Machaya* n. gen., *Machaya obstinata* n. sp., *Menander aldsi* n. sp., Mesosemiini, myrmecophily, Neotropical, Nymphidiini, *Pachythone*, *Pandemos*, perching behavior, *Pixus*, Riodinini, *Roerberella*, *Setabis*, Stalachtini, *Symmachia fassli* n. sp., *Symmachiini*, *Zabuella*.

The cloud forests of the eastern Andes are the wettest areas in the entire Amazon basin (Simpson and Haffer, 1978), and for the most part are confined to steep and rugged terrain. Access is limited to the few valleys where roads or trails are carved through the mountains, and during a three hour descent by car from páramo to lowland rain forest, one passes through the mid-altitude cloud forest habitats (1200-1700m) in a mere thirty minutes. This zone also provides a prime environment for agriculture, and in most cases the primary habitat has been cleared or degraded along these arteries. Even when these areas were pristine, many of the pioneering entomologists during the last century paused only briefly before hurrying down to the fabled biological riches of the lowlands. Many mid-altitude riodinid species are still only known from the type specimens collected by these early explorers, while others remain extremely rare in collections to this day. Thus these cloud forests offer unusual opportunities for the discovery of new taxa (Salazar and Constantino, 1993; Salazar, 1993; Hall and Willmott, 1995). In this paper we present descriptions of five new species and a new genus of riodinid from these fascinating and relatively poorly known habitats.

***Anteros nubosus* Hall & Willmott, new sp.**

Fig. 1a-d; 6

**Description.**— MALE: forewing length 17mm. *Recto*: forewing ground color black; white patch extending from postbasal to postdiscal area between 1A, Cu<sub>1</sub> and edge of cell. Hindwing ground color black with white costal margin; very faint white scaling between anal margin and M<sub>3</sub>, outer margin black; fringe black from tornus to end of vein Cu<sub>1</sub>, produced into small "tails" at tornus and ends of veins Cu<sub>2</sub> and Cu<sub>1</sub>; fringe white from end of vein Cu<sub>1</sub> to apex. *Verso*: forewing ground color yellow-cream; outer margin fringe black; anal margin black; submarginal

yellow line bordered distally with gold and proximally with black, ending in a tornal black spot; very pale cream patch extending from postbasal to postdiscal area between 1A, Cu<sub>1</sub> and edge of cell; dark red postdiscal spot in space Cu<sub>1</sub>, with central gold spot; dark red bar at cell end with four small distal gold spots, in spaces M<sub>3</sub> and M<sub>2</sub>; costal edge black at cell end; dark red postbasal bar within cell, black at costa, bordered distally and proximally with gold. Hindwing ground color yellow-cream, outer margin fringe same as recto; yellow submarginal line bordered distally with gold and proximally with black; dark red, "n-shaped" marking at end of cell, between M<sub>3</sub> and Rs; four gold spots, basal two fused at end of cell and two distally in M<sub>3</sub> and M<sub>2</sub>; dark red "n-shaped" marking at base of hindwing, with gold spot at distal edge; discal dark red spot in 1A and black spot at anal margin, both with basal edge gold. Labial palpi and frons yellow. Eyes brown and hairy. Antennae white with two longitudinal black stripes, recto and verso, and ringed with thin black stripes, black clubs. Thorax and abdomen recto black, verso black, with yellow hairs around tip of abdomen. Forelegs yellow, middle and hindlegs with black femur, yellow tibia, yellow tarsi with long black hairs and black tip. Genitalia (Fig. 6): valvae bifurcate, falci elongate.

**FEMALE:** forewing length unknown. *Recto*: forewing as in male. Hindwing as in male except white between anal margin and M<sub>3</sub>, outer margin black. *Verso*: forewing and hindwing as in male, except for heavier dark red and gold markings. Labial palpi, frons, eyes, antennae (clubs missing), thorax, abdomen and legs as in male.

**Types.**— *Holotype* ♂: ECUADOR.— Tungurahua Prov., Río Machay, 1700m, 4 Feb 95 (K. R. Willmott). To be deposited in the Natural History Museum, London, England (BMNH).

*Allotype* ♀: "Ecuador." In the BMNH.

**Etymology.**— This species is named after the Spanish for "cloudy," in reference to the characteristic weather conditions at Río Machay.

**Diagnosis.**— This species is most similar to *A. formosus* (Cramer, [1777]) and *A. cruentatus* Stichel (1911), but is readily distinguished by the large white patch on the forewing recto, and the



Fig. 1-5. Type specimens: 1. *Anteros nubosus* Hall & Willmott, holotype male: a) recto; b) verso. Allotype female: c) recto; d) verso. 2. *Euselasia chinguala* Hall & Willmott, holotype male: a) recto; b) verso. 3. *Menander aldasi* Hall & Willmott, holotype male: a) recto; b) verso. 4. *Symmachia fassli* Hall & Willmott, holotype male: a) recto; b) verso. 5. *Machaya obstinata* Hall & Willmott, holotype male: a) recto; b) verso.

lack of any red postdiscal markings in  $Cu_2$  and  $Cu_1$  on the hindwing verso. Also the postdiscal red and gold patch on the hindwing verso is "n-shaped," rather than compact and round. The genitalia of *A. formosus* differs from *A. nubosus* n. sp. in having shorter falci and a bifurcate upper projection of the valvae, which is only two-thirds the length of the lower projection. *A. formosus* is a widespread lowland forest species, while *A. cruentatus* is known only from mid-altitude sites from west Ecuador to west Colombia.

**Discussion.**— During the course of our research on the Ecuadorian butterfly fauna, we noticed two distinctive female *Anteros* specimens in the BMNH, filed as "female forma nov.?" under *A.*

*formosus*. Both were simply labelled "Ecuador." Subsequently on a visit to Ecuador we captured a male specimen with an identical verso pattern to these two females, enabling us to confirm that this was not a form of *A. formosus* but in fact an undescribed species. The male was attracted to a trap baited with rotting fish hung in the canopy along the riverside path at Río Machay, at around 1500h.

In addition to the specimens we have seen from Ecuador, there is an *Anteros* specimen figured as "*Anteros* sp." in Vélez and Salazar (1991: 120), which appears to be a female *A. nubosus* (although the verso surface is not illustrated), indicating the possible presence of this species in Colombia.

*Euselasia chinguala* Hall & Willmott, new sp.

Fig. 2a,b; 7

**Description.**— MALE: forewing length 17mm. *Recto*: forewing entirely velvety black. Hindwing ground color velvety black, costal area paler; entire area from base to outer margin between 1A and Cu<sub>2</sub> blood red; outer margin fringe black. *Verso*: forewing ground color pale grey-brown; marginal, submarginal and postdiscal broad dark brown bands extending from costa to near anal margin. Hindwing ground color pale grey-brown; margin dark yellow-orange bordered proximally with black, stretching from apex along outer margin and anal margin; black marginal spot in space Cu<sub>2</sub>; broad, dark brown postdiscal and submarginal lines, submarginal thicker and tinged orange in space 1A. Labial palpi brown, frons dark brown with lighter brown edges. Eyes black and bare. Antennae black with white stripes, black clubs. Thorax and abdomen recto black, verso brown. Legs brown. Genitalia (Fig. 7): valvae long and oblong.

FEMALE: unknown.

**Types.**— *Holotype* ♂: ECUADOR.— Sucumbíos Prov., Rfo Chingual, km 12 La Bonita-Rosa Florida, 1550m, 19 Mar 95 (J. P. W. Hall). To be deposited in the BMNH.

**Paratypes:** 3 ♂, same data as above (1 ♂ to be deposited in the National Museum of Natural History, Washington, USA (USNM), 2 ♂ deposited in the collection of the authors).

**Etymology.**— Named for the Rfo Chingual, which flows in the valley beneath the type locality.

**Diagnosis.**— This species clearly belongs in the *Euselasia gelon* (Stoll, [1787]) complex, characterised by the red and black recto coloration and distinctive verso pattern, but is easily identified by the totally black recto surface except for the narrow red area along the hindwing anal margin.

**Discussion.**— The type locality is an old path cut into the steep valley side of the Rfo Chingual, around 200m above the river, through primary and secondary cloudforest. Males were encountered at a couple of sites along the path between 0900h and 1030h, where they perched on the tops of small bushes. Individuals flew out to engage in aerial battles with each other, before returning to rest with their wings closed beneath a particular leaf. It is possible that this species usually frequents the canopy, but was observed at this particular site due to the steep terrain, which gave access to the tops of trees and bushes from the path.

*Menander aldasi* Hall & Willmott, new sp.

Fig. 3a,b; 8.

**Description.**— MALE: forewing length 18.5mm. *Recto*: forewing ground color black, dusted entirely with pale, iridescent blue scales; outer margin fringe black, except white in 1A, Cu<sub>1</sub>, M<sub>2</sub> and M<sub>1</sub>; marginal area pale, iridescent blue with line of black spots, one in each vein space, each bordered proximally with white; four postdiscal white flecks between M<sub>1</sub> and costa; postdiscal line of black spots, those in Cu<sub>1</sub> and M<sub>3</sub> displaced distally with respect to others; black bar at cell end, and two black bars within cell; two black discal spots in space 1A. Hindwing ground color black, dusted with pale, iridescent blue scales; outer margin fringe distal edge black, proximal edge white; marginal area pale, iridescent blue, with faint proximal white border; submarginal line of small indistinct black spots, except for two large black spots in space M<sub>2</sub> and M<sub>1</sub>; postdiscal line of black spots; black bar at cell end, and two black bars within cell; two black discal spots in space 1A. *Verso*: forewing ground color pale iridescent blue-grey; outer margin fringe as in recto; same pattern of black and white spots as in recto, except all black markings reduced. Hindwing ground color pale iridescent blue-

grey; outer margin fringe as in recto; submarginal line of small, indistinct black spots, except for two large black spots in space M<sub>2</sub> and M<sub>1</sub>; postdiscal line of black spots; two small black spots in cell and space Rs. Labial palpi and frons white. Eyes brown and bare. Antennae black with thin white bands, long thin black clubs, orange tips. Thorax and abdomen recto black with faint blue scaling, verso white. Legs white. Genitalia (Fig. 8): typical of the genus with sharply pointed valvae.

FEMALE: unknown.

**Types.**— *Holotype* ♂: ECUADOR.— Pastaza Prov., nr. Mera, 1200m, Feb 95 (Ismael Aldas Villafuerte). To be deposited in the BMNH.

**Etymology.**— This species is named for Ismael Aldas Villafuerte, a most knowledgeable Ecuadorian entomologist, who collected the unique type specimen.

**Diagnosis.**— This species is unique within the genus, and is instantly recognizable by the coloration of the recto surface, black dusted with pale iridescent blue, and the four white spots on the forewing costa.

**Discussion.**— The holotype specimen was acquired from Ismael Aldas (a local collector), miraculously discovered while examining a box of specimens collected the previous day. Unfortunately, we are therefore unable to provide any information on its behavior and time of capture.

*Symmachia fassli* Hall & Willmott, new sp.

Fig. 4a,b; 9

**Description.**— MALE: forewing length 19mm. *Recto*: forewing ground color black; dark orange band from middle of outer margin to postdiscal costa, broadest at outer margin and tapering towards costa; basal and postbasal area dark red-brown below costal vein, except for two black spots, one in cell, one in space 1A. Hindwing ground color black; one basal dark red-brown spot, and one submarginal in space M<sub>3</sub>. *Verso*: forewing ground color black, paler along anal margin; orange band in same position as that on forewing recto. Hindwing entirely very dark brown-grey. Labial palpi and frons dark brown. Eyes brown and bare. Antennae dark brown with faint white rings, long thin dark brown clubs, tips orange. Thorax and abdomen recto black, verso dark brown. Legs dark brown. Genitalia (Fig. 9): valvae bifurcate, aedeagus tip with sclerotized projections, center of uncus sharply pointed.

FEMALE: unknown.

**Types.**— *Holotype* ♂: ECUADOR.— Napo Prov., km 49 rd. Tena-Loreto, 1350m, 14 Mar 95 (K. R. Willmott). To be deposited in the BMNH.

**Etymology.**— This species is named in honor of Anton Fassl, a most ardent and professional collector in the early part of this century, who collected the first known specimen of this species (see discussion).

**Diagnosis.**— This species appears to be most closely related to *Symmachia virgaurea* Stichel, 1910, from Colombia, as indicated by the similarity of the verso pattern which is unique to these two species. The recto surface of *S. fassli* n. sp. is immediately distinguishable, however, by the lack of any orange on the hindwing and completely different forewing pattern. There is also a superficial resemblance to *S. triangularis* (Thieme, 1907), known from W. Colombia to W. Ecuador, which has more pointed wings, a bright orange band from the center of the costa to the tornus, and the rest of the wings black.

**Discussion.**— During a momentary lull in the clouds and rain which usually shroud the type locality at this time of year, a single male specimen of this species flew in and landed on top of a leaf with its wings outspread at around 1330h. Even before we had extracted it from the net, we recognized it as being very



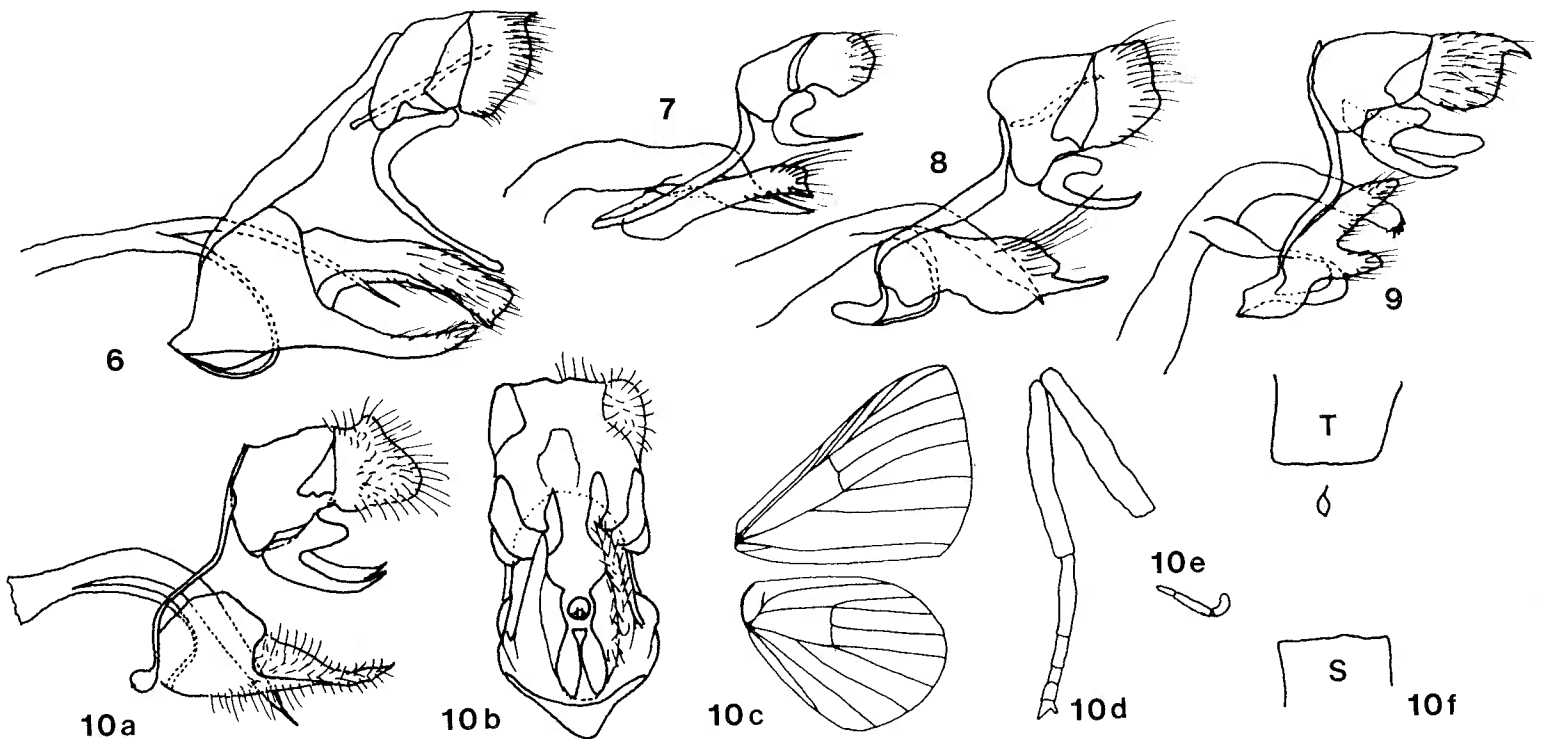


Fig. 6-9. Male genitalia, lateral view: 6. *Anteros nubosus* Hall & Willmott. 7. *Euselasia chinguala* Hall & Willmott. 8. *Menander aldasi* Hall & Willmott. 9. *Symmachiea fassli* Hall & Willmott. 10. *Machaya obstinata* Hall & Willmott: a) male genitalia, lateral view; b) male genitalia, ventral view, setae omitted on left side for clarity; c) wing venation; d) hindleg; e) palpus; f) spiracle arrangement for abdominal segment 3 (tergite (T) and sternite (S)).

similar to an undescribed taxon which we had seen previously on a visit to the Musée Nationale d'Histoire Naturelle, in Paris, France (MNHN). Despite spending several more days waiting in the ridgetop light gap where the type specimen was captured, we never saw any further individuals. The specimen in the MNHN was collected by Fassl at Río Songo (1200m) in Bolivia, and although it has a slightly narrower and more yellowish forewing recto band it is clearly conspecific, but may represent a distinct subspecies.

#### **MACHAYA** Hall & Willmott, new genus

Fig. 5a,b; 10a-f.

Type species: *Machaya obstinata* Hall & Willmott, n. sp.

**Description.**— **MALE:** *Recto*: simple, two-color pattern consisting of orange ground color with very broad, shiny black costal, outer and anal margins on both fore and hindwings. *Verso*: dull black, only pattern yellow on forewing, mirroring that of verso, obscured in part by black scaling. *Venation* (Fig. 10c): four forewing radial veins,  $R_1$  and  $R_2$  arising from cell, junction of  $R_{3+4}$  and  $M_1$  distal to cell end. *Eyes*: black, naked. *Palpi* (Fig. 10e): short, not projecting beyond frons in dorsal view, third segment one half length of second. *Antennae*: missing. *Fore and midleg*: missing. *Hindleg* (Fig. 10d): details indiscernible due to "greasiness". *Genitalia* (Fig. 10a, b): uncus thickened ventro-posteriorly; valvae simple, pointed; pedicel thin, connecting to near base of aedeagus; aedeagus simple, with no internal sclerotized structures and sharply pointed; saccus much reduced and rounded. *Abdomen*: lacking any androconial scales on anterior margins of segments; spiracle nearer tergite than sternite: distance from spiracle to tergite 0.25 distance sternite-tergite on segment 3, 0.25 on segment 4, and 0.275 on segment 5 (Fig. 10f).

**FEMALE:** unknown.

**Etymology.**— This genus is named after Río Machay, the type locality, whose cloudforests have yielded several interesting discoveries (see also Willmott and Hall, 1995).

**Diagnosis.**— This monotypic genus belongs in the subfamily Riodiniinae Grote, 1895 (*sensu* Harvey, 1987), defined by the possession of a pedicel in the male genitalia. However, it lacks any of the apomorphic characters of the tribes within this subfamily as defined by Harvey (1987). The genera within these tribes can be distinguished from *Machaya* n. gen. by the following characteristics: Mesosemiini Bates, 1859 – the pedicel of the male genitalia is split medially at its base; Eurybiini Stichel, 1910, and *incertae sedis* – all genera have five radial veins; Riodiniini Grote, 1895 – the posterior margin of the tegumen of the male genitalia has a deeply indented notch; Symmachiini Bates, 1859 – there are androconial scales on the anterior margins of several male abdominal tergites; Charitini Stichel, 1911 – the male genitalia have a posteriorly pointed uncus; Helicopini Reuter, 1897 – the hindwing has tails at veins  $M_1$ - $Cu_2$ ; Lemoniini Kirby, 1871 – the posterior projection of the terminal male sternite (ramus) is bifurcate; Nymphidiini Bates, 1859 – the position of the spiracle on male abdominal segment three is closer to the sternite than the tergite; Stalachtini Bates, 1861 – there is a tuft of long scales inserted on male abdominal segment eight.

*Machaya* n. gen. can thus only be loosely grouped with a number of other genera, in the paraphyletic *incertae sedis* section (four radial veins), of Harvey (1987), which have no known tribal affinities. This section includes the genera *Argyrogrammana* Strand, 1932, *Callistium* Stichel, 1911, *Calydna* Doubleday, 1847, *Emesis* Fabricius, 1807, *Pachythone* Bates, [1868], *Roerberella*

Strand, 1932, *Apodemia* Felder & Felder, 1859, *Dianesia* Harvey & Clench, 1980, *Dinoplotis* Stichel, 1911, *Imelda* Hewitson, 1870, *Astraeodes* Staudinger, [1887], *Echenais* Hübner, [1819] and *Zabuella* Stichel, 1911 (and probably *Pixus* Callaghan, 1982, due to its close affinities with *Pachythone*). *Machaya* n. gen. does not possess the diagnostic characters of any of the above genera (Stichel, 1911; Harvey and Clench, 1980), and can be distinguished by the junction of veins  $R_{3+4}$  and  $M_1$  being distal to the cell end of the forewing.

**Discussion.**— Attempting to isolate close relatives is difficult. The genitalia of the genus *Pachythone* are somewhat similar to that of *Machaya* n. gen., but members of *Pachythone* can be distinguished by the different venation, shorter third palpus segment and more compact and rounded hindwing shape. In the experience of the authors, *Pachythone* is the only genus outside of the tribe Nymphidiini which exhibits "greasiness" of the wings, as found in *Machaya* n. gen., again perhaps indicating a phylogenetic relationship between the two genera. Within the myrmecophilous tribe Nymphidiini, there are several genera (*Setabis* Westwood, [1851], *Calospila* Geyer, [1832], *Calliona* Bates, [1868], *Pandemos* Hübner, [1819], and *Adelotypa* Warren, 1895) which exhibit "greasiness" of the wings, and it has been suggested that this phenomenon correlates with carnivory in the larval stages (DeVries, pers. comm.). Since it has also been shown that aphytophagy has always evolved from myrmecophilous lineages, at least in the Lycaenidae (Cottrell, 1984), it seems possible that *Machaya* n. gen. might have evolved from ancestral members of a myrmecophilous tribe, perhaps the Nymphidiini. This is of course speculative.

***Machaya obstinata* Hall & Willmott, new sp.**

Fig. 5a,b; 10a-f

**Description.**— MALE: forewing length 18mm. *Recto*: forewing ground color orange; broad black costal, outer and anal margin, and apical third of wing; cell end marked by a thin black line. Hindwing ground color orange; broad black costal, outer and anal margins; black "notch" at cell end. *Verso*: forewing ground color dull black; yellow area same pattern as forewing recto, except partially obscured by black in the cell and basal areas. Hindwing entirely dull black. Labial palpi and frons brown. Eyes black and bare. Antennae missing. Thorax and abdomen recto and verso black. Legs brown. Genitalia (Fig. 10a,b): see generic description above.

FEMALE: unknown.

**Types.**— *Holotype* ♂: ECUADOR.— Tungurahua Prov., Río Machay, 1700m, 19 Aug 93 (J. P. W. Hall). To be deposited in the BMNH.

**Etymology.**— The name derives from the Latin for "obstinate," in reference to the defiance of this species at being placed in any extant genus or tribe.

**Diagnosis.**— This species has an unusual wing shape and color pattern, superficially resembling only *Esthemopsis inaria* (Westwood, [1851]), from which it is easily distinguished by the entirely black hindwing verso, orange forewing coloration and rounded hindwings. *E. inaria* also has androconial scales on the anterior margins of abdominal tergites 4 and 5 (Harvey, 1987), placing it in the tribe Symmachiini (*sensu* Harvey, 1987).

**Discussion.**— The unique holotype was captured flying slowly across a riverside path about 4m above the ground in secondary

vegetation, lower down the valley from the primary habitat, at around 1500h.

## ACKNOWLEDGEMENTS

We would like to thank all those who helped to fund our 1993 research expedition: Mr. I. Willmott, Mrs. M. Willmott, Christ's College Cambridge Univ., Albert Reckitt Charitable Trust (C. T.), Poulton Fund Oxford Univ., Balfour-Browne Fund (and 1994), Round Table Trust, Lindeth C. T., Catherine Cookson Foundation, Worts Fund (1994), Morton C. T., Royal Entomological Society, Butler C. T., Mr. D. Exell, Peter Nathan C. T., Harry Crook Foundation, Douglas Heath Eves C. T., R. & M. Foreman C. T., Northern Bank, Banbridge Academy, C. Bruce, Hickley Valtone Ltd., Vera Trinder Ltd., Agfa, Phoenix Mountaineering. We would like to thank Philip Ackery at the Natural History Museum, London, and Dr. Jacques Pierre at the Musée Nationale d'Histoire Naturelle, Paris, for giving us access to the collections and allowing us to photograph specimens. We are very grateful to Matthias Nuß, graduate student at the Zoologische Museum, Berlin, for showing us around the collections and providing us with food, accommodation, camera and advice during our brief visit. We thank INEFAN and the Museo Nacional de Ciencias Naturales for arranging the necessary permits for research in Ecuador, and Sigma Xi, the Scientific Research Society, for assisting the field work of JPWH with a Grant-in-Aid of Research.

This is Florida Agricultural Experiment Station Journal Series number R-04796.

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