

**FOUR NEW RIODINID SPECIES FROM EASTERN ECUADOR
(Lepidoptera: Riodinidae)**

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Abstract: Four new riodinid species in the genera *Argyrogrammana* Strand, 1932, *Anteros* Hübner, [1819], *Napaea* Hübner, [1809] and *Ithomiola* C. & R. Felder, 1865, are described from eastern Ecuador with brief notes on their habitats and behaviour and illustrations of similar species. *Anteros violetta* Hall, 1939, is synonymised with *Anteros aerosus* Stichel, 1924 **syn. nov.**

Key-words: *Anteros yurakchupa* sp. nov., *Argyrogrammana pacsa* sp. nov., bait trapping, cloud forest, Colombia, *Ithomiola buckleyi* sp. nov., *Napaea neildi* sp. nov., perching behaviour, Peru.

Introduction

Four new riodinid species are herein described from the east Andean slope in Ecuador, as part of an ongoing faunistic study of the Papilionoidea of that country; three of these are from premontane cloud forest localities, again proving the unexpected riodinid diversity in these habitats (HALL & WILLMOTT, 1995a, b, *in press* a,b) even in well studied genera such as *Argyrogrammana* (BREVIGNON & GALLARD, 1995; HALL & WILLMOTT, 1995b, 1996).

The following museum acronyms are used throughout the text:

AMNH - American Museum of Natural History, New York, USA

BMNH - Natural History Museum, London, England

MNMSM - Museo Nacional Mayor de San Marcos, Lima, Peru

USNM - United States National Museum, Smithsonian, Washington, USA

ZMHU - Zoologische Museum Humboldt Universität, Berlin, Germany

***Argyrogrammana pacsa* Hall & Willmott, sp. nov.**

Figs. 1a-d; 8a,b.

Description: Male: forewing length 15.5mm. Hindwing somewhat elongate and rounded. *Dorsal surface:* forewing ground colour black; patch of red-brown filling a basal triangle bounded by the anal margin, costa and an uneven line from discal cell end to near tornus; four black marks in discal cell, one at cell end, two in middle, one at base that extends as a line to vein 1A+2A; two vertical red-brown streaks in tornus extend from anal margin to just above cell 1A+2A; large, postdiscal, turquoise patch, roughly rectangular but rounded at lower edge, extends from middle of cell Cu_2 to vein M_1 ; thin silver-blue submarginal line extends from tornus to apex, where it becomes slightly convex; white fringe elements at distal margin of cells 1A+2A, Cu_1 , M_2 and M_1 . Hindwing ground colour red-brown; line of black submarginal spots extends from tornus to apex, an additional, more proximal spot in tornus and apex; thin, silver-blue, more distal submarginal line extends from tornus to apex. *Ventral surface:* forewing ground colour brown; five black marks in discal cell surrounded by pale blue, one marking cell end, other four equidistant and alternating between lower and upper edge of cell beginning distally at lower edge; two black rectangles with pale blue around upper edges at base of cell 1A+2A; disjointed, postdiscal line of pale blue spots, with similarly shaped black spots proximally and distally, consists of a small streak in middle of cell R_3 , a tiny streak at base of cell R_4 , a small square towards base of cell M_1 , a larger rectangle towards base of cell M_2 , a smaller square towards middle of cell M_3 , a large

rectangle towards base of cell Cu_1 and a similar rectangle more proximally positioned in cell Cu_2 , only two black rectangles below in cell 1A+2A; disjointed, more distal line of smaller pale blue marks extends from vein 1A+2A to subapex with black inbetween a thin, parallel, slightly disjointed submarginal line of silver-blue that extends from tornus to apex where it is slightly convex; orange distal to this line in apex and cells Cu_1 and 1A+2A. Hindwing ground colour pale blue; three black marks in discal cell, one mark at cell end, two black spots in basal half of cell 1A+2A, black spot at wing base, two black squares in middle of cell Rs; disjointed postdiscal line of black spots extends from cell 1A+2A- M_1 ; a less disjointed, more distal line of arrow-shaped black marks extends from tornus to apex where they become larger; submarginal line of rounded black triangles extends from tornus to apex with thin silver-blue immediately distal. Labial palpi brown with some yellow scales. Eyes brown and bare with black medial stripe. Frons black with yellow band across middle. Antennal segments brown with white scaling basally, clubs brown. Thorax black with some red-brown scaling dorsally, ventral surface brown; abdomen dorsal surface red-brown, ventral surface brown. Legs brown. *Genitalia* (Fig. 8a,b): uncus angularly rounded, saccus small, valvae upwardly pointed and inwardly curved at tip with sclerotised arch below tips sheathing aedeagus, smaller point at lower middle; aedeagus long, narrow and pointed at tip with long strip-like serrate cornutus in middle; pedicel broadens towards middle to support aedeagus and extends almost to tip of aedeagus posteriorly before joining at base of vinculum. Female: unknown.

Types: Holotype ♂: Ecuador.- Zamora-Chinchipe Prov., Romerillos, ridge to west of Río Jamboe, 1600m, 1 Nov 1997 (K. R. Willmott); to be deposited in the BMNH.
Paratypes: Ecuador.- 1 ♂: Morona-Santiago Prov., km 20 Macas-Nueve de Octubre rd., Río Abanico, 1600m, 27 Sept 1997 (G. W. Busby III); in coll. G. W. Busby III, Boston, USA.

Etymology: This species is named after the Quechua word "pacsa", meaning beautiful and shining, in reference to the dorsal blue forewing patch.

Diagnosis: *Argyrogrammana pacsa* sp. nov. is superficially most similar to *Argyrogrammana natalita* Hall & Willmott, 1995 (Fig. 2a,b), but differs most prominently by having a more elongate, rounded hindwing, and on the dorsal surface a larger, paler turquoise blue forewing patch, darker red-brown colouration, less black speckling in the forewing discal cell, one or two red-brown streaks in the forewing tornus and black submarginal spots on the hindwing separate from the silver-blue line; on the ventral surface, *A. pacsa* has paler, turquoise blue colouration on both wings, smaller turquoise instead of lilac postdiscal forewing markings, more triangular submarginal black markings on both wings and marginal orange on the forewing. However, the male genitalia of *A. pacsa* are somewhat more similar to those of *Argyrogrammana caelestina* Hall & Willmott, 1995 (see HALL & WILLMOTT, 1995b), differing only by having a slightly narrower, shorter saccus, a single, longer aedeagal cornutus instead of two and a more shallowly indented uncus posteriorly. *A. caelestina* can immediately be distinguished from *A. pacsa* by having slightly darker red-brown dorsal colouration that is reduced on the forewing and a very large, brilliant turquoise postdiscal forewing patch that is evident on both wing surfaces.

Discussion: *A. pacsa* is only known with certainty from the two Ecuadorian localities at 1600m, but there is a similar specimen in the MNMSM from central Peru, labelled "Junin, 1-3 km SW of Mina Pichita, 2100m" that probably belongs to this species (KRW). This is therefore the highest occurring species known in the genus and it perhaps replaces the lower flying *A. caelestina* (now known from Colombia (CALLAGHAN, pers. comm.) to Peru (specimen in the MNMSM)) for which we now have altitudinal records from 600-1300m. The holotype male of *A. pacsa* was found at 12:15h in a trap baited with rotting fish that was placed 10 metres above the ground in a small, enclosed ridgetop clearing; the paratype male was collected from a similarly baited trap on which additional specimens were seen (G. W. BUSBY, pers. comm.). This

is very unusual behaviour for a member of this genus, but it increases the number of undescribed species discovered through the use of traps with this type of bait (HALL & WILLMOTT, 1995a, *in press*). Interestingly, *A. natalita* males (one of which is illustrated in Fig. 2a,b) were found perching on the same ridgetop where the holotype of *A. pacsa* was collected, and the latter species will presumably be found perching there.

Anteros yurakchupa Hall & Willmott, sp. nov.

Figs. 3a,b; 9a,b.

Description: Male: forewing length 12.5mm. Forewing costa sharply convex towards apex, distal margin angular at apex; hindwing tornus pointed. *Dorsal surface:* forewing ground colour black; large, opaque white square at end of discal cell, small, white square in middle of cell Cu_2 ; a few blue setae at wing base; two cream fringe elements at distal margin of cell $1A+2A$, one element at margin of cells Cu_2 , Cu_1 , M_1 and M_2 . Hindwing ground colour black; basal and anal two-thirds of wing covered with blue setae, tornus setose, small area of red-brown in tornus; cream fringe elements at distal margin as on forewing. *Ventral surface:* forewing ground colour brown along anal margin up to vein Cu_2 ; remainder of wing dark red, mottled with white and yellow scales, mostly red in distal half of cell M_1 and at cell end, yellow along basal half of costa, in apex and at base of discal cell; white squares same as dorsal surface; silver streak at discal cell end, wing base, and two in middle of discal cell with red inbetween; faint trace of postdiscal black scaling creating a disjointed line; silver submarginal line extends from middle of cell $1A+2A$ to apex with red proximally and alternating pattern of red and yellow spots distally. Hindwing ground colour dark red heavily overlaid in discal portion with white scaling and above discal cell with yellow scaling; two red spots at base of costa with pale yellow inbetween, three red marks in discal cell with others below it marked distally with yellow; silver submarginal line extending from middle of cell $1A+2A$ to apex, with thick dark red proximally, and into tornus, with alternating pattern of yellow and red spots distally; tornus setose with patches of red and black, anal margin a mixture of white and black. Labial palpi dark red with some yellow and orange scaling. Eyes brown and setose. Frons dark red. Antennal segments towards base black with white scaling in basal half of segment, towards apex with white scaling in basal three-quarters of segment; clubs black, tips orange-brown. Thorax dorsal surface black with blue scaling, ventral surface black; abdomen dorsal surface black with blue scaling, ventral surface yellowish brown. Fore and midlegs dark red, hindlegs dark red with lower half of tibia white. *Genitalia* (Fig. 9a,b): uncus rounded, medially pointed at posterior margin on dorsum; saccus almost absent; heavily sclerotised sections of valvae joined by membrane, lower, short pointed projection, broad, elongate upper projection upwardly turned at tip; arising from the anterior portion of this upper projection is a heavily sclerotised rod that nearly joins over dorsum of aedeagus but has only a membranous final connection; aedeagus short, narrow and pointed at tip, pedicel broad at base.

Female: unknown.

Types: Holotype ♂: Ecuador.- Napo Prov., km 20 Tena-Puyo rd., Apuya, 600m, 6 Dec 1996 (K. R. Willmott); to be deposited in the BMNH.

Paratypes: Ecuador.- 1 ♂: same locality data as above, 2 Oct 1997 (R. C. Busby), in coll. of the authors.

Etymology: The name is derived from the Quechua words "yurak", meaning "white", and "chupa", meaning "shin", in reference to the diagnostic white hindleg tibia in this species.

Diagnosis: The valve shape of the male genitalia and wing pattern of *Anteros yurakchupa* sp. nov. place it in the *Sarota*-like "*A. carausius* group" of *Anteros*. Indeed, it is most similar to *Anteros carausius* Westwood, [1851], itself. Although the two

illustrated specimens of *A. yurakchupa* and *A. carausius principalis* Hopffer, 1874 (the east Andean subspecies, Fig. 4a,b), collected at nearby sites in eastern Ecuador, exhibit quite different wing patterns, the enormous variability of the latter means that there are few definitive wing pattern characters to distinguish the two species. The figured specimen of *A. carausius principalis* has well contrasted ventral hindwing pattern elements (as seen in the type of *carus* Godman, 1903, a synonym of *principalis*), but these may be more diffuse (as seen in the type of *principalis* and the type of *medusa* H. Druce, 1874, a synonym of nominate *carausius*) and the ventral hindwing provides no reliably consistent differences between the species. The same can be said for the discal to postdiscal areas of the ventral forewing, but *A. carausius* always has a red triangle at the base of the discal cell whereas this is yellow in *A. yurakchupa*. *A. yurakchupa* also lacks the tiny white flecks in cell Cu_1 of the dorsal forewing and hindwing of east Andean *A. carausius* specimens and has less blue scaling on the dorsal forewing. The most invariably distinguishing features of *A. yurakchupa* are its wing shape, with a forewing costa that is more convex near the apex and a distal margin that is markedly more angular at the apex, its white instead of red-brown hindleg tibia and male genitalia; the uncus of the male genitalia of *A. yurakchupa* is more bulbously rounded, the falci are shorter, the saccus is smaller, the upper portion of the valvae are significantly longer, of more uniform width and upturned at the tip, and the anteriorly directed sclerotised "rods" do not meet over the dorsum of the aedeagus whereas they do in *A. carausius* (see Fig. 10).

The third member of the "*A. carausius* group" is *Anteros aerosus* Stichel, 1924 (an examination of both types reveals that *Anteros violetta* Hall, 1939 is a synonym, **n. syn.**); it differs most prominently from the other two species by having a single white forewing patch in cell Cu_1 , three proximally directed silver streaks in the apex of the ventral forewing and pure yellow instead of alternating red and yellow margins on both ventral wing surfaces.

Discussion: No specimens of this new species were uncovered during recent searches of the AMNH, BMNH, USNM and ZMHU collections and *A. yurakchupa* remains known to us only from the type locality at the base of the east Ecuadorian Andes. The holotype male was found at 13:25h in a trap baited with rotting fish that was suspended 15 metres above the ground in an open ridgetop light gap. The paratype was also collected in a similarly baited trap (R. C. BUSBY, pers. comm.).

Napaea neildi Hall & Willmott, sp. nov.

Figs. 5a,b, 11.

Description: Male: forewing length 18mm. Wing shape elongate, forewing very slightly falcate; forewing has five radial veins. *Dorsal surface:* forewing ground colour chestnut brown; small white spot at upper edge of discal cell end, discal cell end marked with darker brown, small dark brown patch at base of cell $1A+2A$; two small postdiscal white rectangles near costa, one at base of cell M_1 and one in R_3 , another more hazy white spot in distal portion of cell M_3 , darker brown colouration proximal to these white markings continues as disjointed, faint band into cells Cu_1 and Cu_2 ; two small apical white spots, increasingly fainter submarginal spots in subsequent cells, all lined proximally with darker brown that continues along submargin towards tornus. Hindwing ground colour chestnut brown; disjointed, poorly defined darker brown postdiscal and submarginal lines traverse wing. *Ventral surface:* forewing ground colour brown; small grey marks at base of cell $1A+2A$ and discal cell, grey streak across middle and at end of discal cell, small white spot at upper edge of discal cell just proximal to cell end; three dark brown spots at upper edge of basal half of cell $1A+2A$; jagged postdiscal line consists of white rectangles at base of cell M_1 and in R_3 , a small grey mark in middle of cell M_2 , a large grey square in distal portion of M_1 , a small grey mark at base of cell Cu_1 and a larger grey mark somewhat more distally in middle of

cell Cu_2 , all of these marks with dark brown proximally up until a point corresponding to discal cell end; a small grey-white submarginal spot in cells R_4 , M_1 - Cu_2 , a pair in $1A+2A$ lined with dark brown proximally. Hindwing ground colour grey, becoming brown towards submargin; dark brown streak at discal cell end, one just before cell end, three dark brown spots along costa above discal cell; disjointed postdiscal line of dark brown spots extends from costa, curving outwards then inwards to cell $1A+2A$; grey-white submarginal spot in M_2 with dark brown proximally, probably also in cell M_1 and perhaps Cu_1 (submargins of these cells not present on either wing). Labial palpi long, a mixture of dark brown and grey scales. Eyes bare and brown. Frons a mixture of pale brown and grey scales. Antennal segments black with basal white scaling; clubs black, tips orange-brown. Thorax brown on dorsal and ventral surface; abdomen chestnut-brown on dorsal surface and grey on ventral surface. Forelegs grey; femur of mid and hindlegs grey, remainder brown. *Genitalia* (Fig. 11): uncus rounded; saccus small; valvae with upwardly curved and pointed lower projection and smaller, rounded upper projection with slight point inbetween; distal portion of aedeagus flattened and narrowed into a point; posterior portion of vesica studded with tiny sclerotised structures, anterior portion of aedeagus contains several sets of sclerotised cornuti, one set of three, then three pairs, then one set of three then another pair. Female: unknown.

Types: Holotype ♂: Ecuador.- Napo Prov., Baeza-Tena rd., nr. Cosanga, 2000m, 19 Sept 1995 (A. F. E. Neild); to be deposited in the BMNH.

Etymology: This species is named for our good friend Andrew Neild, who, during one of his brief but surprisingly successful forays into the realms of riodinid collecting, captured the unique holotype.

Diagnosis: *Napaea neildi* sp. nov. presents a unique phenotype in the genus, its elongate wing shape and chestnut brown dorsal surface, which has only a few white spots in the apex of the forewing, being diagnostic. It seems to be most closely related to the widespread species *Napaea orpheus* (Westwood, [1851]), which has very similar male genitalia but, although they have a number of pattern elements in common, *N. orpheus* has a more compact wing shape, a plain brown dorsal ground colour, numerous white dorsal forewing spots and a large white patch on the hindwing.

Discussion: We have no detailed behavioural information for this species. A. NEILD (pers. comm.) informs us that the single male was perching on secondary growth vegetation at the edge of a field near forest. It is the highest flying species of *Napaea* in Ecuador, its close relative *N. orpheus* currently being known to occur only from 1050-1900m.

Ithomiola buckleyi Hall & Willmott, sp. nov.

Figs. 6a,b; 12.

Description: Male: forewing length 18.5mm. Wing shape elongate; forewing sharply convex at tornus; forewing has five radial veins; hindwing sharply convex at apex, tornus slightly pointed. *Dorsal surface:* forewing ground colour black; pale blue extends from wing base to near tornus between anal margin and vein Cu_2 , with vein $1A+2A$ outlined in black, then extends as an increasingly narrower submarginal line into the apex as far as cell M_3 , with all veins through it broadly marked with black; opaque white fenestration fills discal cell with single black bar towards cell end; narrow and elongate opaque white fenestration in basal two-thirds of cell Cu_2 , shorter, triangular fenestration at base of cell Cu_1 ; diagonal, subapical band of opaque white fenestrations consists of an ovoid patch in cell R_3 , a tiny fleck at the base of cell R_4 , a larger elongate ovoid patch towards the base of cell M_1 , a longer rectangle towards the base of cell M_2 and a triangle in the middle of cell M_3 ; white fringe at distal margin of cells $1A+2A$ and

Cu₁. Hindwing ground colour black; horizontal line of elongate, opaque white fenestrations overlaid with some black scales traverses wing below discal cell from cell 1A+2A-M₃, tiny fleck of a fenestration at lower edge of discal cell; pale blue extends from these fenestrations towards distal margin, including anal margin, becoming narrower towards apex, then up to cell M₁, leaving thin black area distal to fenestrations and around distal margin; white fringe elements weakly defined at distal margins of cells 1A+2A-Cu₁, well defined in cells M₃-M₂. *Ventral surface*: forewing differs from dorsal surface in following ways: pale blue in cell 1A+2A reduced to one submarginal mark, one mark in middle of cell, a third towards the base; submarginal markings are more whitish in colouration, especially towards apex; faint blue scaling distal to opaque white fenestration in cells R₃, M₂-Cu₂, and at upper edge of fenestrations in discal cell. Hindwing differs from dorsal surface in following ways: pale blue at basal, upper edge of discal cell and above it at costal margin contains faint black markings and a diagonal black line at wing base; diffuse pale blue scaling at distal margins of fenestrations, additional small pale blue marks in middle of cells M₂ and M₁, and band of whitish scaling through middle of distal pale blue extending into apex. Labial palpi long, dark brown with pale blue scaling on all but last segment. Eyes brown and bare. Frons black with broad white distal margins. Antennal segments black with two patches of white scaling on basal segments, reduced to one patch on apical segments; clubs black, tips orange-brown. Thorax and abdomen dorsal surface black with pale blue scaling, ventral surface pale grey-blue. Forelegs pale grey-blue, mid and hindlegs brown with some pale blue scales and hairs. *Genitalia* (Fig. 12): uncus rounded, vinculum thickened at middle; saccus tiny; valvae with a single upwardly pointed projection; aedeagus flattens abruptly and narrows towards tip, where there is a single anterior cornutus and three rows of more posteriorly positioned multiple cornuti, two rows towards the dorsum, one ventrally.

Female: differs from male in following ways: wing shape slightly broader, forewing apex less pointed, hindwing slightly more angular. Submarginal blue on dorsal forewing becomes white towards apex, an additional black bar through middle of basal opaque white fenestration in discal cell and no opaque white streak at base of cell R₄. On ventral forewing white submarginal spot is partially joined to subapical fenestration in cell M₃; on ventral hindwing, no blue-grey spots in middle of cells M₂ and M₁, central fenestrations not overlaid with darker scaling.

Types: Holotype ♂: Ecuador.- Morona-Santiago Prov., km 20 Macas-Nueve de Octubre rd., Río Abanico, 1600m, 1 Nov 1996 (K. R. Willmott); to be deposited in the BMNH.

Paratypes: Ecuador.- 2 ♂♂: Zamora-Chinchipe Prov., km 7 Zamora-Loja rd., Quebrada Chorillos, 1250m, 3 Apr 1995 (J. P. W. Hall); in coll. of the authors. Peru.- 1 ♂: Amazonas, E. of Nueva Esperanza, La Orilla, Río Huamanpata, Nov 1985 (B. Calderón); 1 ♀: 3 km N. of Nueva Esperanza, Piruño, 1700m, 5 Mar 1986 (B. Calderón); both in the MNMSM.

Etymology: We name this species after the pioneering amateur entomologist Clarence BUCKLEY, who collected some of the first east Andean riodinids in Ecuador in the 1860's and 70's for W. C. HEWITSON (see VANE-WRIGHT, 1991).

Diagnosis: The male genitalia and wing pattern elements clearly place this new species in *Ithomiola*, but in many respects the species of that genus are similar to those of *Napaea* and a detailed cladistic analysis may find that *Ithomiola* represents a derived group of mimetic species that are phylogenetically embedded within *Napaea*. *Ithomiola buckleyi* sp. nov. is very similar only to *Ithomiola callixena* (Hewitson, 1870) (Fig. 7a,b). It differs from that species by having only one black bar in the forewing discal cell (in males only), more elongate opaque white postdiscal and subapical fenestrations on the forewing and across the hindwing, an extra subapical fleck at the base of forewing cell R₄, and by lacking the two white forewing apical spots (in males). The male genitalia of the two species are also very similar, differing only in the arrangement of aedeagal cornuti; *I. buckleyi* has two layers of multiple cornuti in the posterior roof of the aedeagus whereas *I. callixena* has only a single layer.

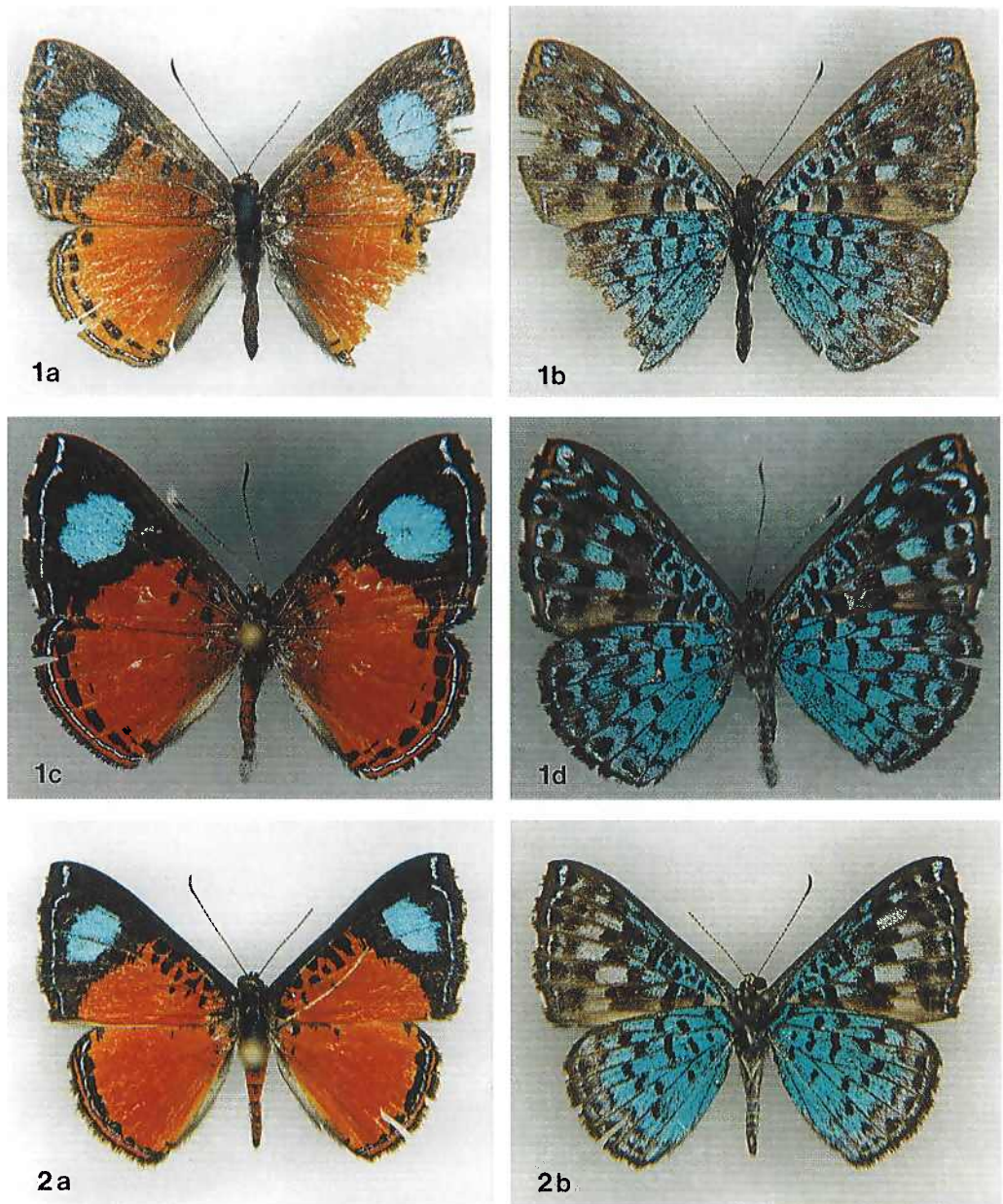
Discussion: Currently *I. callixena* is known to range from north-east Ecuador (and certainly south-east Colombia) to north-east Peru, while *I. buckleyi* is known from the more restricted range of central-east Ecuador to north-east Peru. Although the two species are thus broadly sympatric over large parts of their ranges, they have not been found at the same locality, possibly because they are altitudinally parapatric. We have Ecuadorian records of *I. callixena* from 1700-2000m, while locality data suggests *I. buckleyi* occurs lower, from 1250-1700m. Males of *I. buckleyi* are found perching singly or in small groups on streamside vegetation around 4-6 metres high and we have found them to be active between about 11:00-14:00h; their flight is rapid when engaged in spiralling male-male chases.

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Figs. 1-2 (above). 1. *Argyrogrammana pacsá* Hall & Willmott **sp. nov.**, holotype ♂: a) dorsal surface; b) ventral surface. Paratype ♂: c) dorsal surface; d) ventral surface. 2. *Argyrogrammana natalita* Hall & Willmott, 1995, Ecuadorian male: a) dorsal surface; b) ventral surface.

Figs. 3-7 (right). 3. *Anteros yurakchupa* Hall & Willmott **sp. nov.**, holotype ♂: a) dorsal surface; b) ventral surface. 4. *Anteros carausius principalis* Hopffer, 1874, Ecuadorian ♂: a) dorsal surface; b) ventral surface. 5. *Napaea neildi* Hall & Willmott **sp. nov.**, holotype ♂: a) dorsal surface; b) ventral surface. 6. *Ithomiola buckleyi* Hall & Willmott **sp. nov.**, holotype ♂: a) dorsal surface; b) ventral surface. 7. *Ithomiola callixena* (Hewitson, 1870), Ecuadorian ♂: a) dorsal surface; b) ventral surface.

