Zootaxa 797: 1–20 (2005)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

797

Five new *Penaincisalia* species (Lepidoptera: Lycaenidae: Eumaeini) from the Andes of southern Ecuador and northern Peru

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Abstract

Five new species of *Penaincisalia* (Lycaenidae: Eumaeini) are described from the high Andes of southern Ecuador and northern Peru: *P. caeruleanota* Hall & Willmott **n. sp.**, *P. juliae* Hall & Willmott **n. sp.**, *P. andreae* Busby & Hall **n. sp.**, *P. libertada* Hall **n. sp.** and *P. ismaeli* Busby & Hall **n. sp.**. We present brief discussions on their systematic placement within the genus and on their adult ecology.

Key words*:* Andes, cloud forest, Ecuador, hilltopping, *Penaincisalia*, Peru

Introduction

The lycaenid butterfly fauna of the high Andes remained very poorly known until recently. Entire lineages went undiscovered and/or undescribed for centuries, and museums possessed only a small fraction of the region's true lycaenid species diversity, as indeed do most to this day. These factors contributed to the widespread but mistaken belief that the high Andean lycaenid fauna was genuinely depauperate (Shapiro, 1994).

Johnson (1990, 1992) was the first author since Draudt (1919–21) to substantively treat this group of Neotropical lycaenids, which he dubbed "elfins". He described dozens of new genera and species, using predominantly historical museum material, and placed them in his "infratribe Thecloxurina". However, given the unavailability at the time of sufficient well-labeled material, sometimes careless work practices (Robbins & Nicolay, 1999, 2002; Robbins & Lamas, 2002), and a philosophy of naming and treating what most people would regard as slight variants as different species (Johnson, 2001), we find the

Accepted by J. Brown: 3 Nov. 2004; published: 5 Jan. 2005

utility of Johnson's (1992) classification for elfin lycaenids to be limited. Firstly, none of Johnson's (1992) ten new, truly polytypic, elfin genera appears to be monophyletic. As an example, the species he placed in *Radissima* Johnson, 1992, were treated by Robbins (2004) in his Eumaeini checklist under four different subtribal-level headings. Additionally, the species treated by Johnson (1992) in his subtribal-level taxon Thecloxurina appear in seven subtribal groupings in Robbins (2004).

Most of the elfin lycaenid species described by Johnson and colleagues after 1990 were placed by Robbins (2004) in just two large genera, *Penaincisalia* Johnson, 1992 and *Rhamma* Johnson, 1992 (both Micandra section). Of the 41 new species names proposed by Johnson and colleagues that are now treated in *Penaincisalia*, only 17, or 41%, were regarded by Robbins (2004) as valid species, and of the 42 names now treated in *Rhamma*, only 14, or 33%, were regarded as valid species. Even if this classification is argued to be slightly "over-lumped", the fact that synonyms of *Rhamma arria* (Hewitson, 1870) were treated by Johnson (1992) in four different genera, synonyms of *Penaincisalia amatista* (Dognin, 1895) in three genera, and synonyms of *P. loxurina* (C. & R. Felder, 1865) and *R. bilix* (Draudt, 1919) in two genera, indicates that some of his new species and genera were inadequately defined and differentiated.

The focus of this paper is the genus *Penaincisalia*, which contains at least 24 described species, as circumscribed by Robbins (2004), that occupy high Andean habitats from about 1900 to 4700 m between western Venezuela and northern Argentina. Robbins (2004) synonymized the genera *Abloxurina* Johnson, 1992, *Candora* Johnson, 1992, *Pons* Johnson, 1992 and *Thecloxurina* Johnson, 1992, with *Penaincisalia*, to form a grouping that is morphologically homogeneous, but slightly heterogeneous in wing shape and pattern, and adult habitat preference and behavior. Although there is no obvious universal synapomorphy for such an expanded *Penaincisalia*, and some of the previously recognized genera (*Pons* and *Thecloxurina*), as most recently conceived (Bálint, 2001b; Bálint & Wojtusiak, 2003), may be monophyletic, Robbins's (2004) conservative arrangement serves a useful purpose until the group can be fully revised, and for convenience we follow it here.

Subsequent to Johnson's early 1990's papers, several new *Penaincisalia* species were described from Colombia and Peru (Johnson & Adams, 1993; Salazar *et al*., 1997; Le Crom & Johnson, 1997; Bálint, 2001a,b; Bálint & Wojtusiak, 2003), increasingly based on recently collected material. However, with very few exceptions (e.g. Bálint, 2001a) these names appear to be synonyms. One of the reasons for the high synonymy rate in these papers appears to be that the authors often had insufficient material to confidently match conspecific males and females, and to assess intraspecific variation. This is why, for example, all three of the species-level taxonomic changes proposed by Bálint in his 2001b paper on *Pons* were incorrect (Robbins, 2004).

During more than fifteen years of field work in Ecuador, we have tried to overcome the impediment of insufficient material by constantly seeking out hilltops to find male

perching leks, and deploying rotting fish-baited subcanopy and canopy traps, which strongly attract lycaenids of both sexes, as well as riodinids of both sexes and male nymphalids (Hall & Willmott, 2000). Using these methods, we have been able to substantially improve our knowledge of the distribution and taxonomy of Ecuadorian *Penaincisalia*, and have discovered four new species, which we describe here to provide names for the Lycaenidae volume of our Butterflies of Ecuador project. The lycaenid fauna of the Ecuadorian high Andes is better known in the north than in the south because of the presence there of Quito, the capital city and main entry point into the country. It is perhaps not surprising then that all of these new *Penaincisalia* species appear to be confined to southern Ecuador, south of the Macas area, with the ranges of most, if eventually not all, extending into northern Peru. An additional *Penaincisalia* species is described from northern Peru because it appears to be closely related to two of the Ecuadorian species, and it may eventually even be found in Ecuador.

Methods

Morphological terms for genitalia follow Klots (1956), Eliot (1973) and Robbins (1991). As females are known for only two of the five new *Penaincisalia* species, and the female genital character system for the genus is so poorly understood, these structures are not illustrated or discussed. Terminology for wing venation follows Comstock & Needham (1918), with cells named for the vein above, or anterior. Light microscopy examination was done using an Olympus SZH. The digital images in Fig. 1 were taken using a Nikon Coolpix 995, and those in Figs. 2–4 were taken using a Nikon HC-300Zi attached to a Wild M400 microscope.

All those collections listed in Hall (1999, 2002) have been examined for material of the species described here, but only the following collection acronyms are used throughout the text: BMNH — The Natural History Museum, London, UK; JHKW — Collection of Jason P. W. Hall & Keith R. Willmott, Washington, DC, USA; MECN — Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador; MUSM — Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; RCB — Collection of Robert C. Busby, Andover, MA, USA; USNM — National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

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Descriptions

Penaincisalia caeruleanota Hall & Willmott, **new species**
(Figs. 1A,B; 2A; 3A,B; 5)

Description.— Male: Forewing length of Holotype [HT] 15 mm (Paratypes [PTs] 14–16

mm). Forewing costal margin approximately straight, distal margin slightly concave around vein Cu_2 and convex in apical half of wing, apex pointed; hindwing anal margin convex, apex rounded and tornus elongated to form a prominent, tailless, spatulate lobe, creating a notably concave distal margin; venation typical for genus (see the venation of *P. loxurina* in Johnson, 1992). *Dorsal surface*: Both wings dull iridescent dark purple, except for a variably broad black border at distal margin that broadens at apex (very broad on hindwing, occupying distal half of wing), a very narrow black border at costal margin of forewing and a broad black border at costal margin of hindwing, and a gray hindwing anal fold, hindwing tornal lobe with reddish brown scaling along inner half and a small, oval patch of brilliant pale blue scales in outer half; forewing androconial cluster appears to be a scent pad, versus a scent patch (*sensu* Clench, 1975; Robbins, 1991), with very densely layered, elongate, smooth-tipped black scales, scent pad oval and centered around upper distal corner of discal cell, with a few androconial scales extending along discal cell end (Fig. 2A); fringe of both wings on both surfaces reddish brown, with variably long whitish scales forming an outer whitish fringe that is most prominent on hindwing. *Ventral surface*: Ground color of both wings rufous brown, becoming paler towards anal margin of forewing, darker towards base (almost black in places) and along distal margin of both wings, and yellowish brown around discal cell ends and throughout much of region between postdiscal and submarginal bands of both wings, tornal lobe with a sparse scattering of white scales; discal cell ends marked by a black spot on forewing and a dark rufous brown line on hindwing; broader, dark rufous brown postdiscal bands have an ill-defined proximal edge and a distal edge more sharply defined by a heavier concentration of dark scales, forewing band extends from costal margin to vein 2A and is diagonal above vein M_3 and vertical below it; jagged hindwing band extends from costal margin to vein Cu_2 before turning sharply toward anal margin; dark brown submarginal spots on both wings prominent in all cells except Cu_2.

Head: Labial palpi brown dorsally, white ventrally; second segment with long, dense, ventrally directed scales, rufous brown along outer margin and whitish along inner margin; third segment short, pointed slightly downwards; eyes brown and densely setose, surrounded by predominantly brown scaling; frons with long, dense, rufous brown setae, some whitish setae ventrally; antennae 50–60% length of forewing, segments brown with darker sclerotization around tip and white scaling at base, white scaling more widespread ventrally on segments immediately before clubs, clubs predominantly orange-brown.

Body: Thorax dark brown and hairy, with dull blue gray setae dorsally, tegula dark brown; all legs brown to rufous brown, with scattered whitish scaling on mid and hindlegs; abdomen dark brown dorsally and orange-brown ventrally.

Genitalia (Figs. 3A,B): Uncus with smoothly rounded posterior margin and very deep medial indentation dorsally; gnathos smoothly rounded at elbow, constricted in diameter before tip; tegumen enlarged into a broadly triangular, slightly inwardly curved, posterioventral projection six times width of lower portion of vinculum, small saccus is triangular

in ventral view and extends at approximately 120° from vinculum; valvae in lateral view consist of elongate, narrowly triangular posterior processes, with a short, broadly triangular projection at their ventral base that has a convex ventral margin, valvae joined at anterio-dorsal margin by membranous tissue; aedeagus long and uniformly narrow throughout, with a prominently convex anterior half, a shallowly concave posterior half, and a blunt angular tip, ductus ejaculatorius exits anterior region of aedeagus from an elongate dorsal area immediately before rounded anterior aedeagal tip (caecum), two cornuti present in distal portion of aedeagus when vesica uneverted, first a narrow, flattened, convex-concave and serrate-tipped rod positioned dorsally in posterior third of aedeagus, and second a short, anteriorly tapered, prominently convex and dorsally serrate spine positioned below posterior tip of first cornutus; eighth abdominal tergite a simple rectangle.

Female: Differs from male as follows: Forewing length 16.5 mm. Forewing distal margin markedly more convex; hindwing distal margin straight, tornal lobe has a long, broad tail extending from vein 2A. *Dorsal surface*: Ground color of both wings slightly paler; dull iridescent dark purple replaced on both wings by pale blue, which is slightly reduced on forewing, oval patch of pale blue scales in hindwing tornal lobe absent and reddish brown scaling along inner margin of lobe more prominent, forewing androconial pad absent. *Ventral surface*: Ground color a more uniform reddish brown; postdiscal bands slightly less prominent, white scaling in hindwing tornal lobe more dense.

Body: Dorsal surface of thorax, abdomen and tegula paler and brighter bluish gray; all legs paler brown.

Type material.— Holotype ♂, ECUADOR: *Loja*, km. 7 Loja-Zamora rd., 3°59.25'S,79°9.20'W, 2500 m, 16 May (I. Aldas & R. C. Busby) (USNM).

Paratypes: ECUADOR: *Loja*, same locality data as holotype, 1♂ Oct (MECN), 1♂ Dec (USNM); 1♂, km. 10 Loja-Zamora rd., 3°59.10'S,79°8.55'W, 2600 m, Nov (I. Aldas & R. C. Busby) (USNM); 2♂, Cerro Palma, km. 27 Loja-Cuenca rd., 3000 m, 7 Apr (J. P. W. Hall & K. R. Willmott) (JHKW); 1♀, km. 11 Yangana-Cerro Toledo rd., 4°23.0'S,79°8.90'W, 2550 m, 23 Sept (R. C. Busby) (RCB). *Morona-Santiago*, 1♂, km. 18 Limón-Gualaceo rd., 2400 m, 3 Oct (R. C. Busby) (RCB). *Azuay*, 1♂, km. 20 Gualaceo-Limón rd., 3200 m, Sept (I. Aldas & R. C. Busby) (RCB).

Etymology.— This species name is derived from the Latin words “caerulea” and “nota”, meaning sky blue and spot, respectively, in reference to the characteristic, iridescent pale blue spot in the tornal lobe of the dorsal hindwing.

Diagnosis.— *Penaincisalia caeruleanota* seems to form a monophyletic group with *P. browni* Johnson, 1992 (= *regala* Le Crom & Johnson, 1997), *P. saraha* Johnson, 1992 (= *pantanosa* Johnson & Adams, 1993), *P. vittata* Johnson, 1992, *P. magnifica* Johnson, 1992, and *P. purpurea* Johnson, 1992 (= *amazona* Bálint & Wojtusiak, 2003), species formerly treated under *Pons* (Johnson, 1992; Bálint, 2001b). All six of these species, hereafter referred to as the “*browni* group”, have a sexually dimorphic hindwing shape that is unique among the Neotropical Eumaeini. Males have a hindwing tornus that is elongated

into a tailless, spatulate lobe, whereas females (that of *P. magnifica* is unknown to us) have a tail extending from that lobe along vein 2A. The male of *P. juliae*, described below, has the same hindwing shape, but because its male genital morphology is so divergent, and several subtle wing pattern characters suggest that it belongs in a different species group of *Penaincisalia*, we conclude that a tailless, spatulate-lobed hindwing tornus has evolved independently in *P. juliae* and the "*browni* group". The six "*browni* group" species are also unusual within *Penaincisalia* in having a prominent, short, triangular process at the ventral base of the male genital valve tip, instead of a rounded process or none at all.

The male of *P. caeruleanota* is most readily distinguished from other "*browni* group" members by having a small oval patch of brilliant pale blue scales in the outer half of the tornus on the dorsal hindwing, but it also has less purple on the dorsal hindwing, which is confined to the basal half of the wing. It is worth noting that the ventral surface of male *P. caeruleanota* appears to be rather variable, but this variability is actually largely due to the condition of the specimen. Worn specimens lose the prominent white fringe and become brown in the postdiscal areas, where the yellow scaling has been rubbed off. Both sexes are additionally diagnosed by having a prominently angular, instead of roughly straight, postdiscal band on the ventral forewing, which extends diagonally from the costal margin to vein M_3 and then vertically below it. *Penaincisalia caeruleanota* can be confused only with *P. purpurea*, as both species have a very undulating, instead of approximately straight, postdiscal band on the ventral hindwing. However, in *P. caeruleanota* this band is: 1) at its most distally extended between cells M_1 and M_3 and at its least distally extended in cell Cu_1, whereas in *P. purpurea* the band is at its most distally extended in cell M_1 and at its least distally extended between cells M_2 and M_3; 2) equally distally extended in cells 2A and Cu_2, instead of less distally extended in cell 2A compared to Cu_2; and 3) bulbously undulating at its distal margin, instead of jaggedly undulating and produced into tiny points at most veins. Aside from *P. purpurea*, the only other candidate for the closest relative to *P. caeruleanota* is *P. magnifica*, as both species have nearly identical wing shapes. The male genitalia vary very little among the "*browni* group" species, but those of *P. caeruleanota* do have a slightly more prominent triangular process at the ventral base of the valve tip in lateral view.

Biology.— This species inhabits elfin cloud forest from 2400 to 3200 m. Males were encountered in Ecuador perching as solitary individuals or in small groups on hilltops and ridgetops. They rested on bushes 2 to 4 m above the ground, and were active on their perching posts from the mid morning to mid afternoon. The only known female was found flying low to the ground along a ridgetop.

Distribution.— *Penaincisalia caeruleanota* currently is known only from southern Ecuador (Morona-Santiago, Azuay and Loja), but almost certainly ranges into northern Peru (see Fig. 5).

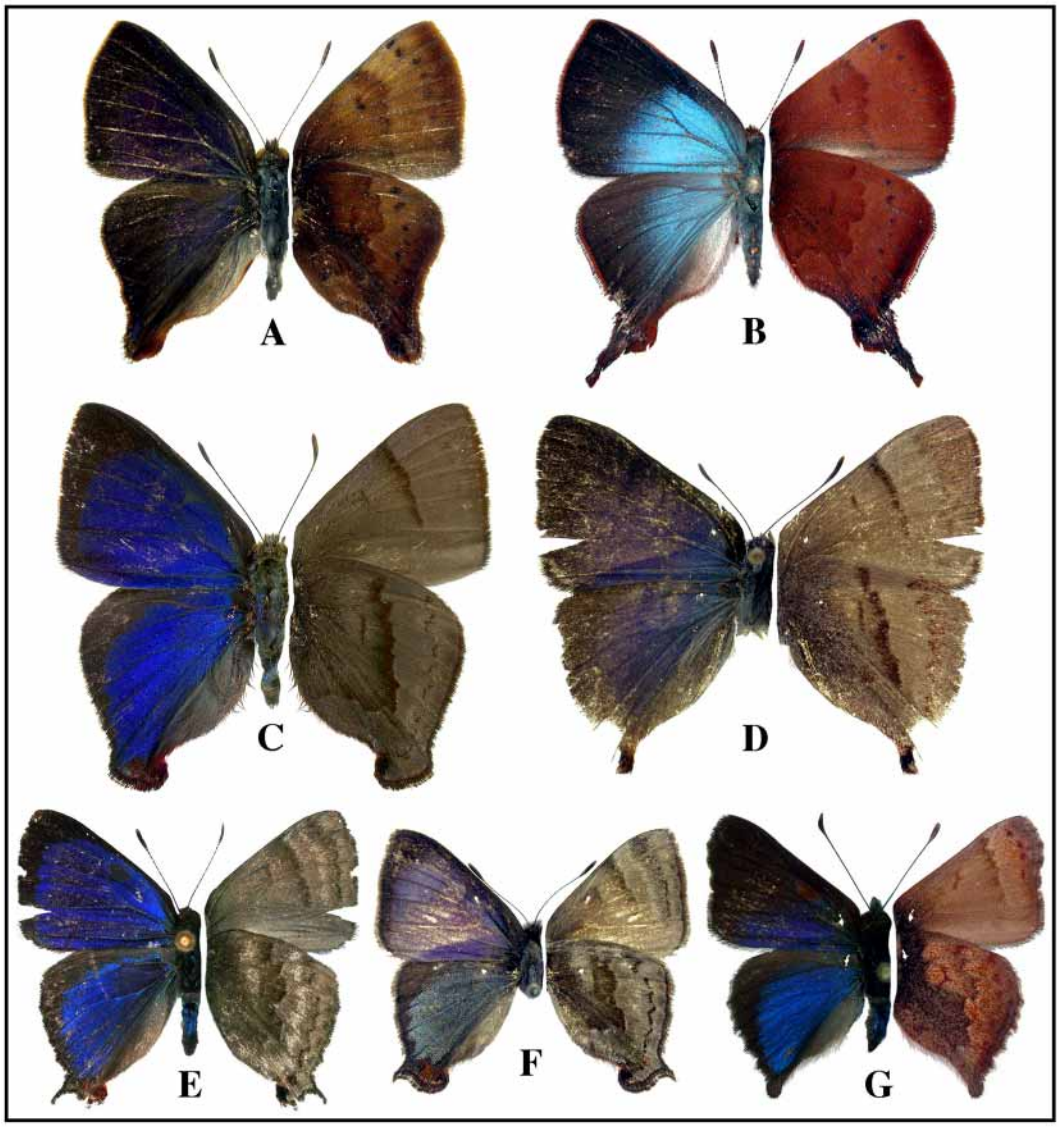

FIGURE 1. *Penaincisalia* adults (dorsal surface on left, ventral surface on right) at x 1.6 life-size. A, paratype ♂ *P. caeruleanota*, Cerro Palma, S. Ecuador (JHKW). B, paratype ♀ *P. caeruleanota*, km. 11 Yangana-Cerro Toledo rd., S. Ecuador (RCB). C, paratype ♂ *P. juliae*, km. 34 Jimbura-San Andrés rd., S. Ecuador (JHKW). D, paratype ♀ *P. juliae*, La Playa, Huicungo, P. N. Río Abiseo, N. Peru (MUSM). E, holotype ♂ *P. andreae*, Río San Francisco, Zamora-Loja rd., S. Ecuador (USNM). F, holotype ♂ *P. libertada*, Cumpang, between Tayabamba and Ongón, N. Peru (MUSM). G, holotype ♂ *P. ismaeli*, km. 10 Loja-Zamora rd., S. Ecuador (USNM).

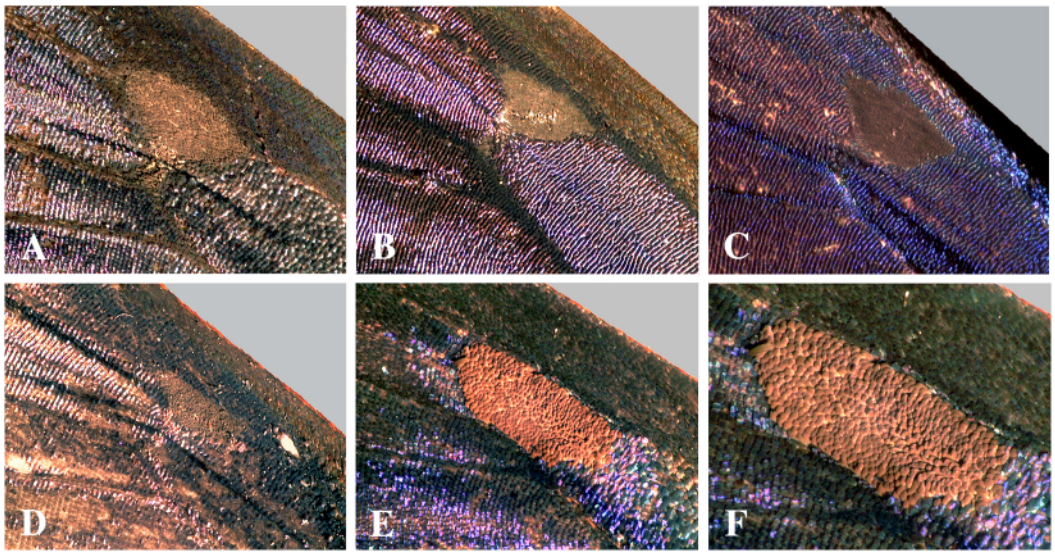

FIGURE 2. Male *Penaincisalia* dorsal forewing scent pads. A, *P. caeruleanota*. B, *P. juliae*. C, *P. andreae*. D, *P. libertada*. E, F (higher magnification view of E), *P. ismaeli*.

Penaincisalia juliae Hall & Willmott, **new species**
(Figs. 1C,D; 2B; 3C,D,E; 5)

Description.— Male: Forewing length of HT 17 mm (PTs 14–17 mm). Forewing costal and distal margins approximately straight, apex pointed; hindwing anal margin convex, apex rounded, and tornus elongated to form a prominent, tailless, spatulate lobe; venation typical for genus. *Dorsal surface*: Both wings deep iridescent royal blue, except for a narrow black border at distal margin that broadens at apex, a very narrow black border at costal margin of forewing, and a dark brown hindwing anal fold, hindwing tornal lobe suffused with reddish brown scaling; forewing androconial cluster appears to be a scent pad, with very densely layered, elongate, smooth-tipped black scales, scent pad triangular and centered around upper distal corner of discal cell, with a few androconial scales extending along discal cell end in some specimens (Fig. 2B); fringe on both wings black. *Ventral surface*: Ground color of both wings dark grayish brown, becoming paler towards anal margin of forewing and darker towards base of both wings; discal cell ends marked by a thin dark red line; dark red postdiscal bands broader, with an ill-defined proximal edge and a sharply defined distal edge with a fine line of paler gray scaling, approximately straight forewing band extends diagonally from costa to vein Cu_2, slightly jagged hindwing band extends diagonally from costa to vein Cu_2, then turns at a sharp acute angle towards anal margin; dark red submarginal markings on forewing tiny spots confined to costal half of wing, markings on hindwing larger crescents extending from apex to tornus, with a few white scales at tornal wing margin and a large black patch immediately distally,

a very faint band of scattered grayish scaling proximal to submarginal markings on hindwing; fringe on both wings reddish brown.

Head: Labial palpi dark brown dorsally, gray brown ventrally; second segment with long, dense, ventrally directed scales; third segment short, pointed slightly downwards; eyes brown and densely setose, surrounded by dark brown scaling; frons with long, dense, dark brown setae; antennae 50–60% length of forewing, segments brown with darker sclerotization around tip and white scaling at base, white scaling more widespread ventrally on segments immediately before clubs, clubs broad and black with orange-brown tips.

Body: Thorax dark brown and hairy, with some dull iridescent purple setae dorsally; tegula dark brown; all legs dark grayish brown; abdomen predominantly brilliant iridescent blue dorsally, and entirely dark brown ventrally.

Genitalia (Figs. 3C,D,E): Uncus with smoothly rounded posterior margin and broad medial indentation dorsally; gnathos smoothly rounded at elbow, constricted in diameter before tip; tegumen enlarged into a broadly rounded posterio-ventral projection three times width of lower portion of vinculum, tegumen with deep dorsal notch, small saccus is rectangular in ventral view and extends at approximately 90° from vinculum; valvae in lateral view consist of elongate, narrow, roundly tipped posterior processes with a smoothly convex area at their ventral base, valvae joined at anterio-dorsal margin by membranous tissue; aedeagus long and approximately uniformly narrow throughout, with a prominently upturned posterior portion and a blunt angular tip, ductus ejaculatorius exits anterior region of aedeagus from a very elongate dorsal area immediately before rounded anterior aedeagal tip (caecum), two cornuti present in distal portion of aedeagus when vesica uneverted, first a narrow, slightly concave and serrate-tipped rod positioned dorsally in posterior quarter of aedeagus, and second a very short, anteriorly tapered, slightly convex and dorsally serrate spine positioned below posterior tip of first cornutus; dorsal posterior tip of eighth abdominal tergite produced into a short (approximately 25% of total tergite length), narrow, downwardly curved, posterior projection with very slightly bifurcate tip.

Female: Differs from male as follows: Forewing length 17.5 mm. Hindwing tornal area damaged in single known specimen, thus unknown if a broad tail present, as in "*browni* group" females. *Dorsal surface*: Distal black margins slightly broader, purple paler and dull, forewing androconial pad absent. *Ventral surface*: Ground color of both wings pale brown, increasing contrast of dark red markings, diffuse red scaling present distal to submarginal markings. *Head*: Second segment of labial palpi slightly shorter.

Type material.— Holotype ♂, ECUADOR: *Loja*, km. 15 Yangana-Valladolid rd., 4°25.1'S,79°9.3'W, 2500 m, 14 May (R. C. Busby) (USNM).

Paratypes: ECUADOR: *Loja*, same locality data as holotype, 1♂ (R. C. Busby) (USNM), 1♂ (R. C. Busby) (MECN), 3♂ (R. C. Busby) (RCB), 2♂ (K. R. Willmott) (JHKW); 1♂, km. 7 Loja-Zamora rd., 3°59.25'S,79°9.2'W, 2500 m, Oct (I. Aldas & R. C. Busby) (RCB). *Zamora-Chinchipe*, 1♂, km. 34 Jimbura-San Andrés rd., 4°46.6'S,79°23.5'W, 2900 m, 23 Sept (J. Robinson-Dean) (JHKW); *Morona-Santiago*, 1♂,

Río Abanico, 2°15.7'S 78°12.9'W, 2150 m, 16 Oct (R. C. Busby) (RCB). PERU: *San Martín*, 1♀, La Playa, Huicungo, Parque Nacional Río Abiseo [c. 7°40'S, 77°26'W], 2480–2680 m, 25 July (M. Medina) (MUSM).

Etymology. — This species is named for the second author's (KRW) wife, Julia Robinson-Dean, who, to our knowledge, collected the first known male.

Diagnosis.— Because of its distinctive male hindwing shape, we long assumed that *juliae* belonged to the "*browni* group" of *Penaincisalia*. However, the gross differences we discovered in its male genital morphology, and subtle differences in its ventral wing pattern and body, when examined in more detail, suggest otherwise. Several characters indicate that it belongs to a hitherto unknown species group, hereafter referred to as the "*juliae* group", that includes *andreae* and *libertada*, both described below. These three species all differ from "*browni* group" members by having brilliant blue iridescence on the dorsum of the abdomen in males, a grayish ground color to both ventral wings resulting in a grayish ventral abdominal surface, instead of a rufous to orange-brown one (these two characters could not be examined in *libertada*), well-contrasted reddish brown to red chevrons along the submargin of the ventral hindwing and, to a lesser extent, the ventral forewing, with a variably prominent band of diffuse grayish scaling proximally, and a reddish brown to red postdiscal band on both ventral wings. Although *juliae* and *andreae* have somewhat divergent male genital morphology, that of *libertada* is typical of *Penaincisalia*, and we therefore tentatively place all three species in that genus.

Penaincisalia juliae is easily distinguished from *P. andreae* and *P. libertada* by its larger size, and by lacking a tail from the hindwing tornus, but it also has a darker ventral ground color, reduced submarginal markings on the ventral forewing, substantially reduced grayish scaling on both ventral wings, and a straighter distal margin to the postdiscal band on the ventral hindwing. It is probably most closely related to *P. andreae*, as both species share an unusual, downwardly curved, posterior projection from the last (eighth) male abdominal tergite (see Figs. 2E,H). All other *Penaincisalia* species have a simple rectangular last male abdominal tergite, and such a prominent posterior projection is apparently known elsewhere in the Neotropical Eumaeini only in a few species of the very distantly related Hypostrymon section genus *Nesiostrymon* Clench, [1964] (Johnson, 1991; Robbins, pers. comm.).

Biology.— This species inhabits cloud forest from 2150 to 2900 m. Males were encountered in Ecuador perching as solitary individuals or in small groups on hilltops and ridgetops. They rested on bushes 2 to 5 m above the ground and were actively perching from late morning to mid afternoon. One individual was attracted to a rotting fish baited trap placed about 7 m above the ground in an isolated hilltop tree, a phenomenon that is relatively common in forest Lycaenidae.

Distribution.— *Penaincisalia juliae* currently is known only from southern Ecuador (Morona-Santiago, Zamora-Chinchipe and Loja) to northern Peru (San Martín) (see Fig. 5).

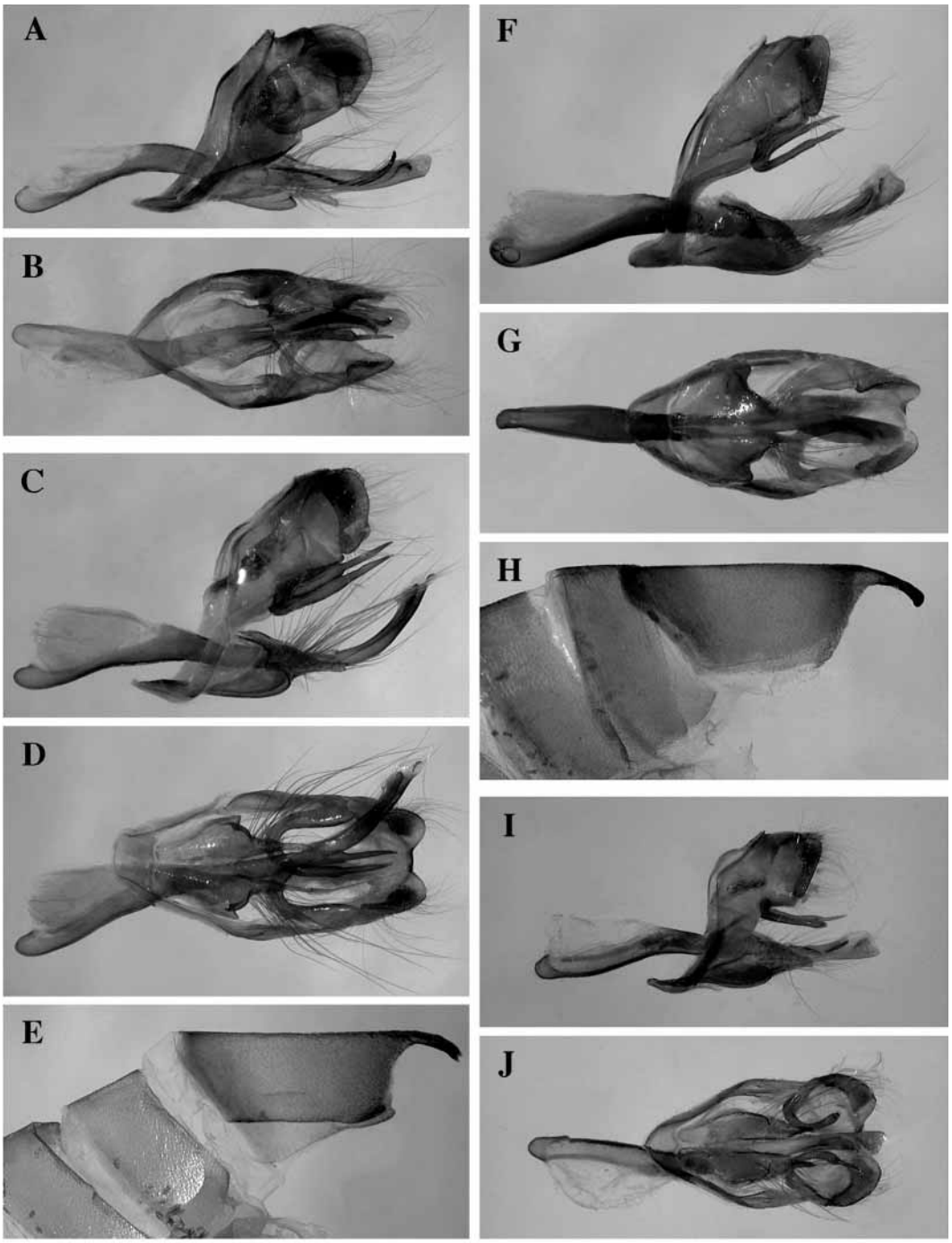

FIGURE 3. *Penaincisalia* male genitalia in lateral (A, C, F, I) and ventral (B, D, G, J) views, with lateral view of eighth tergite in E and H; all genitalia are figured at approximately the same scale, with the width of each boxed figure 3.4 mm. A, B, *P. caeruleanota*. C, D, E, *P. juliae*. F, G, H, *P. andreae*. I, J, *P. libertada*.

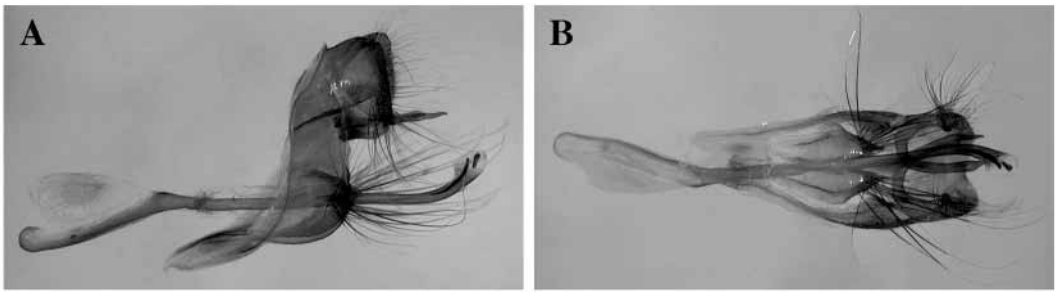

FIGURE 4. *Penaincisalia ismaeli* male genitalia in lateral (A) and ventral (B) views; the width of each boxed figure is 3.4 mm.

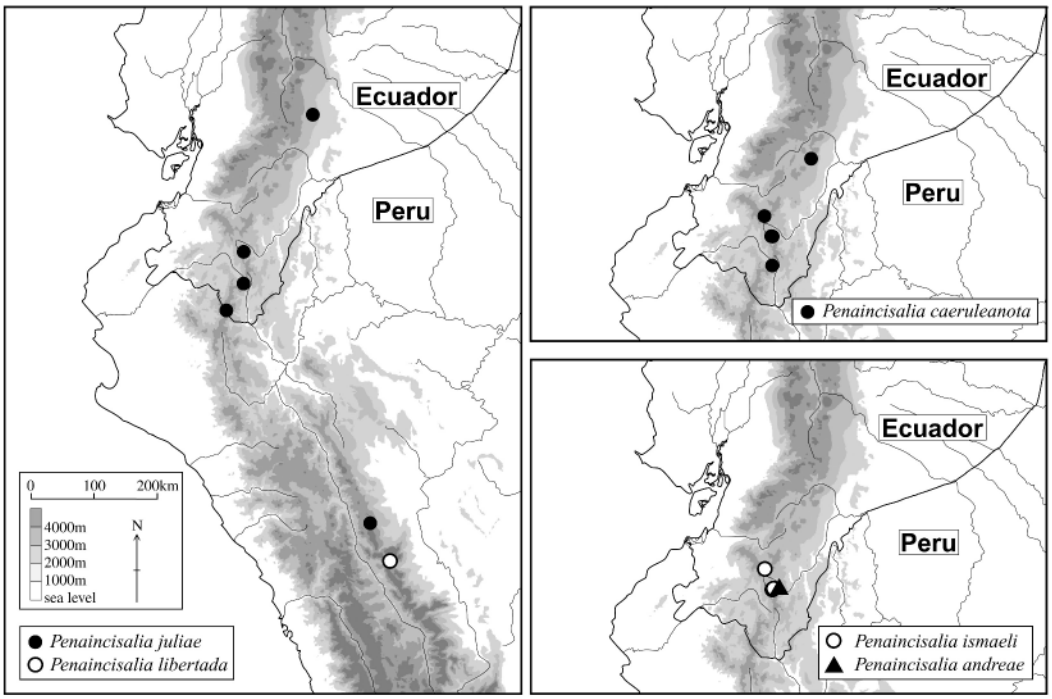

FIGURE 5. Topographic maps of the northern Andes, illustrating the known geographic ranges of the five new *Penaincisalia* species.

Penaincisalia andreae Busby & Hall, **new species**
(Figs. 1E; 2C; 3F,G,H; 5)

Description.— Male: Forewing length of HT 14 mm. Forewing costal margin approximately straight, distal margin slightly convex, apex pointed; hindwing anal margin convex, apex rounded, and tornus formed into a round lobe with a short triangular tail extending from vein Cu_2; venation typical for genus. *Dorsal surface*: Both wings dark iridescent blue, except for a narrow black border at distal margin that broadens at apex, a

very narrow black border at costal margin of forewing, a broader black border at costal margin of hindwing (with blue not extending above vein Rs in apex), and a gray hindwing anal fold, hindwing tornal lobe suffused with dark red scaling; forewing androconial cluster appears to be a scent pad, with very densely layered, elongate, smooth-tipped black scales, scent pad broadly triangular and positioned in upper distal corner of discal cell (Fig. 2C); fringe on both wings black, with a few white scales at tip and base of hindwing tail. *Ventral surface*: Ground color of both wings pale brown, becoming paler towards anal margin of forewing and darker towards base of hindwing, which reflects a bluish green iridescence when tilted 45°; discal cell ends marked by a thin rufous brown line; broader rufous brown postdiscal bands have an ill-defined proximal edge and a sharply defined distal edge with a fine line of black and red and then dirty white scaling, straight forewing band extends diagonally from costa to vein Cu_2, broader and very jagged hindwing band extends from costa to vein Cu_2 and then turns sharply towards anal margin to become poorly defined beyond vein 2A; broad, diffuse band of scattered gray scales between postdiscal band and wing base on hindwing and between postdiscal and submarginal bands on both wings; thin, undulating, reddish brown submarginal band extends on forewing from costal margin to vein Cu_2, and on hindwing from apex to tornus, hindwing band becomes red in tornus, with a few white scales at wing margin and a large black patch immediately distally, small dark brown marginal spots more prominent on hindwing; fringe on both wings rufous brown, becoming red in hindwing tornus.

Head: Labial palpi brown dorsally, gray and brown speckled ventrally; second segment with long, dense, ventrally directed scales; third segment short, pointed slightly downwards; eyes brown and densely setose, surrounded by pale gray scaling; frons with long, dense, dark gray and white setae; antennae 50–60% length of forewing, segments brown with darker sclerotization around tip and white scaling at base, white scaling more widespread ventrally on segments immediately before clubs, clubs broad and black with orange tips.

Body: Thorax dull blue gray dorsally and grayish ventrally; tegula dull blue gray; all legs grayish; abdomen predominantly iridescent blue dorsally, and entirely brown ventrally.

Genitalia (Figs. 3F,G,H): Uncus rectangular with a broad medial indentation dorsally; gnathos smoothly rounded at elbow, constricted in diameter before tip; tegumen enlarged into a broadly rounded posterio-ventral projection twice width of lower portion of vinculum, small saccus is rectangular in ventral view and extends at approximately 90° from vinculum; heavily sclerotized valvae have a prominent lateral flange at base and in lateral view have a smoothly convex posterio-ventral margin ending in a slightly projecting, rounded tip, with a prominent “brow” above it, valvae slightly concave dorsally and joined at anterio-dorsal margin by a very narrow area of membranous tissue; aedeagus long and approximately uniformly narrow throughout, with a slightly upturned posterior portion and a blunt angular tip, ductus ejaculatorius exits anterior region of aedeagus from a very

elongate dorsal area immediately before rounded anterior aedeagal tip (caecum), two cornuti present very similar in size, shape and position to those of *P. juliae*; dorsal posterior tip of eighth abdominal tergite produced into a short (approximately 20% of total tergite length), narrow, downwardly curved, slightly bulbous-tipped, posterior projection.

Female: Unknown.

Type material.— Holotype ♂, ECUADOR: *Zamora-Chinchipe*, Río San Francisco, Zamora-Loja rd., 3°58.7'S, 79°05.1'W, 1900 m, 7 Oct (R. C. Busby) (USNM).

Etymology. — This species is named for the third author's (RCB) wife, Andrea Martinson, on whose birthday the unique holotype was collected.

Diagnosis.— *Penaincisalia andreae* appears to be the sister species to *P. juliae*, based on the fact that both species share a uniquely modified eighth male abdominal tergite (see the species account of *P. juliae*), but it is otherwise much more similar to *P. libertada*. It is distinguished externally from that species only by its larger size, and by having unicolorous dorsal blue iridescence, and, at least in the specimens available, more prominent basal and postdiscal bands of diffuse gray scaling. Its male genitalia are quite distinct though, differing from those of *P. libertada* by having a smoothly curving instead of angular upper vinculum, an upturned tip to the aedeagus, and valvae with an entirely convex, instead of "S"-shaped, ventral margin, which ends in only a very small and rounded, instead of elongate and angular, posteriorly projecting tip, with a prominent "brow" above it.

Biology.— This species is known only from the cloud forest type locality at 1900 m. The holotype was attracted to a rotting fish baited trap placed about 7 m above the ground on a wide, forested hillside trail.

Distribution.— *Penaincisalia andreae* is currently known only from the Zamora valley in southeastern Ecuador (Zamora-Chinchipe) (see Fig. 5).

Penaincisalia libertada Hall, **new species**
(Figs. 1F; 2D; 3I,J; 5)

Description.— Male: Forewing length of HT 13 mm. Forewing costal and distal margins approximately straight, apex pointed; hindwing anal margin convex, apex rounded, and tornus formed into a round lobe with a short triangular tail extending from vein Cu_2; venation typical for genus. *Dorsal surface*: Forewing iridescent purple, except for a narrow black border at distal margin that broadens at apex and a very narrow black border at costal margin, hindwing a silvery dark turquoise blue, except for a narrow black border at distal margin that broadens at apex and extends along costal margin, and a gray hindwing anal fold, hindwing tornal lobe with extensive dark red scaling; forewing androconial cluster appears to be a scent pad, with very densely layered, elongate, smooth-tipped black scales, scent pad oval and positioned in upper distal corner of discal cell (Fig. 2D); fringe on both wings black, with a few white scales at tip and base of hindwing tail. *Ventral sur-*

face: Ground color of both wings grayish brown, becoming paler towards anal margin of forewing and darker towards base of both wings (particularly on hindwing); discal cell ends marked by a narrow rufous brown line; broader rufous brown postdiscal bands have an ill-defined proximal edge and a sharply defined distal edge with a fine line of black and then gray scaling, straight forewing band extends diagonally from costa to vein Cu_2, broader and very jagged hindwing band extends from costa to vein Cu_2 and then turns sharply towards anal margin; very narrow, diffuse band of scattered gray scales between postdiscal and submarginal bands on both wings; thin, undulating, dark red submarginal band that broadens in apex extends on forewing from costal margin to vein Cu_2, and on hindwing from apex to tornus, hindwing band also becomes broader in tornus and ends at wing margin with a few white scales and a round black patch immediately distally, dark brown marginal spots small and faint on both wings; fringe on both wings reddish brown, becoming black in hindwing tornus.

Head: Labial palpi brown dorsally, gray and brown speckled ventrally; second segment with long, dense, ventrally directed scales; third segment short, pointed slightly downwards; eyes brown and setose, surrounded by pale gray scaling; frons with long dense, brown and gray setae; antennae 50–60% length of forewing, segments brown with darker sclerotization around tip and white scaling at base, clubs broad and black, with orange-brown tips.

Body: Thorax dull blue gray dorsally and grayish ventrally; tegula dull blue gray; all legs grayish; abdomen not seen prior to historical dissection.

Genitalia (Figs. 3I,J): Uncus rectangular with a broad medial indentation dorsally; gnathos smoothly rounded at elbow, constricted in diameter before tip; tegumen enlarged into a broadly rounded posterio-ventral projection two to three times width of lower portion of vinculum, tegumen with deep dorsal notch, small saccus is triangular in ventral view and extends at approximately 110° from vinculum; valvae in lateral view consist of elongate, broadly triangular, blunt-tipped posterior processes, with a very short, broadly triangular projection at their ventro-lateral base that has a convex ventral margin, valvae joined at anterio-dorsal margin by membranous tissue; aedeagus long and approximately uniformly narrow throughout, with a slightly convex medial section and a blunt angular tip, ductus ejaculatorius exits anterior region of aedeagus from a very elongate dorsal area immediately before rounded anterior aedeagal tip (caecum), two cornuti present very similar in size, shape and position to those of *P. juliae*; eighth abdominal tergite a simple rectangle.

Female: Unknown.

Type material.— Holotype ♂, PERU: *La Libertad*, Cumpang, between Tayabamba and Ongón [c. 8°12'S, 77°10'W], 2400–2700 m, 20 Oct (T. Parker) (MUSM).

Etymology. — This species is named for the Peruvian department (La Libertad) from which the unique male holotype originated.

Diagnosis.— Despite substantial differences in male genital morphology, *P. libertada*

appears to be very closely related to *P. andreae*, the two species sharing an exceedingly similar ventral wing pattern and a male hindwing shape that is unique within the genus, with the tornus elongated to form a small rounded lobe with a very small tail emanating from vein 2A at the junction of the lobe and the distal wing margin. *Penaincisalia libertada* is distinguished in detail from *P. andreae* in that species account, but its most diagnostic feature is its two-tone blue dorsal coloration, with an iridescent purple forewing and a silvery dark turquoise blue hindwing.

For the sake of completeness, it is worth mentioning that there is a male specimen in the MUSM from Junín, central Peru (2100 m), that appears to be another undescribed "*juliae* group" species, but, because it has no body, its description must await the collection of more material. It is similar to *P. libertada*, but its blue dorsal coloration is similar on both wings, and the postdiscal and submarginal bands on the ventral forewing and the postdiscal band on the ventral hindwing are merely thin red lines (with the typical black and then grayish scaling distally), without the broad, ill- defined areas of dark scaling proximally.

Biology.— Nothing is known about the biology of this species.

Distribution.— *Penaincisalia libertada* is currently known only from the upper Río Marañón valley in northeastern Peru (La Libertad) (see Fig. 5).

Penaincisalia ismaeli Busby & Hall, **new species**
(Figs. 1G; 2E,F; 4A,B; 5)

Description.— Male: Forewing length of HT 13 mm (PTs 12–14 mm). Forewing costal margin approximately straight, and distal margin medially concave, creating a bulbous apex; hindwing anal margin convex, apex rounded, distal margin rounded and slightly scalloped, and tornus elongated to form a narrow, tailless lobe; venation typical for genus. *Dorsal surface*: Basal half of forewing dark iridescent bluish purple and distal half black, forewing androconial cluster appears to be a scent pad with very densely layered, elongate, smooth-tipped brown scales, scent pad an elongate oval centered across discal cell end (Figs. 2E,F); hindwing iridescent blue, except for a narrow black border at distal margin that broadens at apex and extends along costal margin, and a gray anal fold, tornal lobe reddish with a few gray scales in middle; forewing fringe black, hindwing checkered black and dirty white with a few red scales around tornus. *Ventral surface*: Ground color of both wings brown, becoming paler towards anal margin and darker towards base of forewing, scattered red scaling confined to apex of forewing but widespread across distal third and costal half of hindwing; discal cell ends marked by a narrow "V"-shaped line, brown on forewing and reddish on hindwing; similarly narrow reddish brown postdiscal bands generally have an ill-defined proximal edge and a distal edge crisply defined by a fine line of darker and then gray scaling, slightly jagged forewing band extends diagonally from costa

to vein Cu_2, very jagged hindwing band extends from costa to vein Cu_2 and then turns sharply towards anal margin, dark gray brown area extends from hindwing postdiscal band below vein M_3 to wing base and then along basal fifth of wing to costa; reddish brown submarginal spots prominent in apical half of forewing and slightly fainter between apex and tornus of hindwing, marginal band gray with dark brown spots within; forewing fringe brown, hindwing checkered reddish brown and dirty white.

Head: Labial palpi a speckled mixture of brown and gray setae, ventral setae very long; third segment short, pointed slightly downwards; eyes brown and densely setose, surrounded by gray scaling; frons with long, dense, brown and gray setae; antennae 60% length of forewing, segments brown with darker brown scaling around tip and white scaling at base (especially prominent ventrally and near clubs), spatulate clubs black dorsally and rufous brown ventrally.

Body: Thorax dull blue gray dorsally and brown ventrally; tegula dull blue gray; all legs grayish brown; abdomen brown with dull iridescent blue scaling dorsally, and orange-brown ventrally.

Genitalia (Fig. 4A,B): Uncus rectangular with a broad and shallow medial indentation dorsally; gnathos smoothly rounded at elbow, constricted in diameter before tip; tegumen enlarged into an elongate, rectangular, posterio-ventral projection four times width of lower portion of vinculum, which extends ventrally to overlap upper third of valvae, large and elongate saccus that is rectangular in ventral view extends at approximately 130° from vinculum; valvae in lateral view short and broadly triangular, with a straight dorsal margin, a smoothly convex ventral margin, and a pointed tip, valvae joined at anterio-dorsal margin by membranous tissue; aedeagus very long and narrow, with its anterior third slightly diagonal and the remainder horizontal except for an upturned tip, which is flared and angular, ductus ejaculatorius exits anterior region of aedeagus from a very elongate dorsal area immediately before rounded anterior aedeagal tip (caecum), two cornuti present in distal portion of aedeagus when vesica uneverted, first a narrow, slightly concave and serrate-tipped rod positioned dorsally in posterior tip of aedeagus, and second a very short, slightly bulbous-tipped and dorsally serrate spine positioned below posterior tip of first cornutus; eighth abdominal tergite a simple rectangle.

Female: Unknown.

Type material.— Holotype ♂, ECUADOR: *Loja*, km. 10 Loja-Zamora rd., 3°59.10'S,79°8.55'W, 2600 m, Nov (I. Aldas & R. C. Busby) (USNM).

Paratypes: ECUADOR: *Loja*, 1♂, same data as holotype (RCB); 1♂, km. 7 Loja-Zamora rd., 3°59.25'S,79°9.2'W, 2500 m, Oct (I. Aldas & R. C. Busby) (RCB); Cerro Palma, km. 27 Loja-Cuenca rd., 3000 m, Nov (I. Aldas & R. C. Busby), 3♂ (RCB), 1♂ (MECN).

Etymology. — This species is named for our good friend Ismael Aldas Villafuerte, who collected the first known specimens.

Diagnosis.— *Penaincisalia ismaeli* appears to be the sister species to *P. balzapamba*

Johnson, 1992, as both species have an indistinguishable ventral wing pattern and a unique male genital valve shape within the genus - short and broadly triangular with only a tiny posterior projection at the tip. Both species also have more-or-less the longest aedeagi in the genus. It should be noted that Johnson's (1992) adult (male and female) and male genitalia illustrations of *Abloxurina amatista* are actually referrable to male *P. balzapamba*. *Penaincisalia ismaeli* differs from *P. balzapamba* by being slightly larger (forewing length 12–14 mm instead of 11–13 mm), and by having a slightly larger forewing scent pad, bluish purple instead of purple dorsal forewing iridescence, lustrous blue instead of dull purple dorsal hindwing iridescence, a slightly broader black distal border in the subapex of the dorsal hindwing, and a few gray scales instead of numerous reddish brown scales in the middle of the tornus on the dorsal hindwing. Additionally, *P. ismaeli* consistently has a slightly scalloped distal hindwing margin with a checkered brown and white fringe, whereas this trait is prevalent only in southern Ecuadorian specimens of *P. balzapamba*, with those from further north possessing a straighter distal hindwing margin that is largely brown. The male genitalia of the two species do not differ significantly.

Biology.— This species inhabits elfin cloud forest from 2500 to 3000 m. Males were encountered in Ecuador perching as solitary individuals or in small groups on hilltops, on bushes 2–4 m above the ground during the afternoon.

Distribution.— *Penaincisalia ismaeli* currently is known only from extreme southern Ecuador (Loja), but almost certainly ranges into northern Peru (see Fig. 5). It is sympatric there with its sister species *P. balzapamba*, and both species can be found flying on the same hilltops.

Acknowledgments

The research that resulted in this paper was funded by the National Geographic Society (Research and Exploration Grant # 5751-96 to JPWH and KRW) and the National Science Foundation (Biodiversity Surveys & Inventories Grant # 0103746 to JPWH and KRW); we thank the many curators in Europe and the Americas who kindly allowed us to examine the collections under their care; Ismael Aldas and Julia Robinson-Dean for their help and company during field work in Ecuador, the Museo Ecuatoriano de Ciencias Naturales and the Ministerio del Ambiente (formerly INEFAN), in Quito, for arranging the necessary permits for research in Ecuador; and R. Robbins and G. Lamas for helpful comments on the manuscript.

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