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FOUR COMMONLY CONFUSED HAIRSTREAKS (LYCAENIDAE, THECLINAE, EUMAEINI): THREE NEED NAMES, ONE DOES NOT

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ABSTRACT. The taxonomy of four relatively common Neotropical eumaeine hairstreak species has been confused. Newly described are *Iaspis andersoni* Robbins, **new species**, differentiated from *I. talayra* (Hewitson), *I. castitas* (Druce), and *I. exiguus* (Druce); *Michaelus joseph* Robbins, **new species**, differentiated from *M. ira* (Hewitson); and *Ignata caldas* Robbins, **new species**, differentiated from *I. gadira* (Hewitson). *Iaspis andersoni* is unnamed because of a taxonomic misidentification made more than a century ago. The latter two are undescribed because the types of *M. ira* and *I. gadira* are not the species that they had been thought to be. Populations in the *Arawacus togarna* (Hewitson) species complex from Mexico and Costa Rica have been treated as two distinct species, but new data on geographical variation of wing pattern and male genitalia suggests that this classification is incorrect. A lectotype for *Thecla exiguus* Druce, 1907 is designated because taxonomy of the *Iaspis talayra* group in the Amazon Region is unresolved. A lectotype for *Thecla togarna* Hewitson, 1867 is designated because an incorrect type locality has engendered confusion.

Additional key words: *Androconia*, *Arawacus*, *Iaspis*, *Ignata*, Larval foodplants, *Michaelus*

More than 20% of the approximately 1,100 known species of Neotropical Eumaeini (Lycaenidae: Theclinae) are undescribed (Robbins 2004b). Most are exceedingly rare in museum collections, of which some recently described species are representative (Bálint 2003; Nicolay & Robbins 2005; Robbins & Duarte 2005; Hall & Willmott 2005; Hall *et al.* 2005; Robbins & Busby 2008a, b). This rarity makes it difficult to assess intra- and inter-specific variation, which, in turn, makes it difficult to show that they are distinct under a biological species concept. However, a few relatively common and widespread eumaeine species lack names because two species were lumped under one name or because a type specimen was a different species than it had been thought to be (Robbins 2004a, b). In this paper, I describe three such species. Finally, new data on geographical variation show that a common, putatively unnamed species is a geographical variant of a species with a name. This variation is documented.

MATERIALS AND METHODS

Genitalic dissections were made following standard techniques (Robbins 1991), and the number of dissections examined for each species is noted. Genitalic terms follow those in Klots (1970), as modified for the Eumaeini by Robbins (1991). Androconial terminology follows Robbins (1991). Wing vein terminology follows Comstock (1918). Snodgrass (1935) is used as a reference for other morphological structures.

Taxonomic decisions were based upon an analysis of morphological variation (the number of specimens examined is stated in each description) in the museum and private collections noted below. A diagnosis and the reasons for the generic placement of each taxon are presented. Also, the reasons for considering each of the newly available names distinct under a biological species concept are given. The history of each species name is supplemented with new information, where relevant. Males and females were associated by their similar geographic distributions and by their ventral wing patterns, which are barely sexually dimorphic for the species treated in this paper (Figs. 1–13). All species discussed in this paper belong to the Eumaeini as characterized by Eliot (1973).

Brackets are used for information not explicitly noted on holotype labels and for description of holotype labels. All labels on holotypes are printed unless noted otherwise. Months are abbreviated by their first three letters in English. Forewing length of the type series for each new name was measured with a vernier caliper and reported as a mean, standard deviation, and sample size.

Acronyms for the collections from which data are cited are as follows: (AA) Annette Aiello Collection, Ancón, Panamá; (BMNH) Natural History Museum, London, UK; (CMNH) Carnegie Museum of Natural History, Pittsburgh, PA, USA; (FIOC) Fundacão Instituto Oswaldo Cruz, Rio de Janeiro, Brazil; (JHKW) Jason Hall and Keith Willmott Collection, Smithsonian Institution, Washington, DC, USA; (MIZA) Museo del Instituto de Zoología Agrícola, Maracay, Venezuela; (NMCR) Museo Nacional de Costa Rica, San José, Costa Rica; (USNM) National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.

TAXONOMIC RESULTS AND DISCUSSION

Iaspis andersoni Robbins **new species**

History. Hewitson (1868) named *Thecla talayra* from a Rio de Janeiro male (Fig. 1). The type has a distinctive off-white underside ground color and lacks an orange-red spot distal of the postmedian line in cell Cu_2–2A (arrow in Fig. 1). This male also possesses a scent pad at the anterior-distal end of the discal cell that is covered with iridescent blue scales and that is bordered anteriorly at vein R_3 (the same as that illustrated in Fig. 15).

Despite these distinctive characters, the taxonomy of *T. talayra* is confused because of decisions made more than a century ago. Godman & Salvin (1887–1901) noted that *T. talayra* is a common species in Central America (Figs. 4–5), but differed slightly from the one Brazilian female in their possession, which had a "yellow patch at the anal angle". This description does not match the orange-red spot at the anal angle of the type of *T. talayra* (Fig. 1) and was probably another species. Druce (1907) described *Thecla castitas* as a variety of *T. talayra* from Para and Espiritu (sic) Santo, Brazil and stated that it has "a very different appearance below" and may be a distinct species (Fig. 2). Druce (1907) also described *Thecla exiguus* from Surinam (Fig. 3). This species has a wing pattern that is similar to that of *T. castitas*, but Druce presented no evidence why *T. castitas*—and not *T. exiguus*—was a geographical form of *T. talayra*.

Draudt (1919–1920) followed Druce, treating *Thecla talayra* Hewitson as a lowland species that occurs from Mexico to southern Brazil, with *T. castitas* as a geographical form and *T. exiguus* as a distinct species. Most of these names were transferred to *Iaspis* (Johnson 1991), but D'Abrera (1995) basically followed the classification in Draudt. Austin & Johnson (1996) divided *Iaspis* into "groups", including the *I. talayra* group, based on the size of the dorsal forewing scent pad, but no measurements or precise morphological details were presented to support this action. They also described *Iaspis ornata*, *I. minuta*, *I. ambiguanota*, *I. fumosa*, and *I. sinenota* in the *I. talayra* group from Rondônia (Brazil). Robbins (2004a, b) provisionally synonymized the last four names with *I. castitas* because the interspecific differences reported by Austin & Johnson (1996) were less than previous assessments of intraspecific eumaeine variation (J. Brown 1983; Robbins 1990).

In sum, the name *Iaspis talayra* represents a distinct wing pattern phenotype (Fig. 1) with little variation in the Atlantic Region, as demarcated by K. Brown (1982). This phenotype has an off-white ground color ventrally and lacks an orange-red spot distal of the postmedian line in cell Cu_1–Cu_2. The names *Iaspis castitas* and *I. exiguus* represent a variety of wing pattern phenotypes in the Amazonian Region (including the Orinoco and neighboring drainages, sensu K. Brown 1982). All differ from *I. talayra* in possessing a gray ground color ventrally and an orange-red spot on the distal edge of the postmedian line in cell Cu_2–2A (Figs. 2–3). The dorsal forewing wing pattern, including structure of the scent pad, appears to be the same as *I. talayra*. The number of species in the *I. talayra* species group in the Amazon Region is yet an open question. Finally, there is a distinct wing pattern phenotype from northern Colombia to Mexico that does not have a name (Figs. 4–5).

Diagnosis. The blue dorsal color of males (Fig. 4 top) of *I. andersoni* is perhaps the most diagnostic character, being consistently more brilliant in the study series than that of *I. talayra*, *I. castitas*, or *I. exiguus* (Figs. 1–3 top). Additionally, this Central American phenotype has a more silver ventral ground color than these species. Finally, there is a pair of terminal "spines" (Fig. 19) at the lateral edges of the penis tip in *I. andersoni* that is lacking in *I. castitas*, but a larger study series may show this trait to be variable intraspecifically.

Size. Mean male forewing length = 1.2 cm, sd = 0.09, n = 6. Mean female forewing length = 1.1 cm, sd = 0.10, n = 3.

Reasons for recognizing it as a distinct biological species. Throughout its range from Mexico to northern Colombia (Fig. 30), the wing pattern of male *I. andersoni* varies little and is always distinct from the wing patterns of male *I. castitas* and *I. exiguus* in South America. The range of *I. andersoni* is not known to overlap the ranges of the Amazonian "phenotypes" in the *I. talayra* species group (as listed in Austin & Johnson 1996). If sympatry with an Amazonian "phenotype" were discovered, it would be necessary to determine whether distinguishing characters intergrade.

Generic placement. The placement of *I. andersoni* in *Iaspis* is based on three characters. First, a membranous "duct" connects the anterior end of the female genitalia ductus bursae where the ductus seminalis arises and the posterior end of the corpus bursae in *Iaspis* (Figs. 21–22), a structure that is unreported in other eumaeine genera. Second, a red spot on the distal edge of the postmedian line in cell Cu_2–2A on the ventral hindwing (Figs. 2–5) occurs in some *Iaspis* (including *I. andersoni*) and the *Lamprospilus* Section of the Eumaeini (especially *Calycopis* Scudder). *Iaspis* lacks the synapomorphies of the *Lamprospilus* Section (Duarte & Robbins, in prep.), for which reason the red spot is presumed to be independently derived in *Iaspis*. Third, the male genitalia of *Iaspis* vary little interspecifically (Figs. 19–20), but the squat valvae and overall structure are distinctive (Austin & Johnson 1996). A pair of small terminal spines on the lateral penis tip occurs only in some *Iaspis*, including *I. andersoni* (Fig. 19).

Nomenclature. The International Commission on Zoological Nomenclature (1967) settled confusion about the type species of *Iaspis* Kaye. Johnson (1991) designated a lectotype for *Thecla talayra* Hewitson (Fig. 1). Austin & Johnson (1996) designated a lectotype for *Thecla castitas* Druce (Fig. 2). Because the taxonomy of the Amazon Basin phenotypes is unresolved, as noted, I designate a male lectotype for *Thecla exiguus* Druce (Fig. 3) for the purpose of stabilizing the name. The lectotype is deposited in the BMNH and has the following labels: a round red type label, a white label "B.M. No. Rh 630", and a green locality label "Surinam ex coll. Fruhstorfer".

Holotype ♂ (Fig. 4). [white label, the day is handwritten in black ink] PANAMA: Canal Zone, Summit[, Cacao Plantation Road], 1 IV[Apr] 1979, leg. R. Robbins. [white label] R. K. Robbins Collection. [red label] HOLOTYPE *Iaspis andersoni* Robbins. Deposited USNM.

Paratypes (5♂ & 3♀). Panamá, Canal Zone (now Canal Area): 2♂ & 1♀ Summit, 29 Mar 1979 leg. R. Robbins, 1 Apr 1979 leg. R. Robbins, 24 Mar 1964 leg. G.B. Small. 2♂ La Pita, 1 Jun 1963 leg. G. B. Small, 16 Apr 1963 leg. G. B. Small. Panamá Province: 1♂ & 2♀ Cerro Campana 15 Dec 1963 leg. G. B. Small, 26 Jan 1966, leg. S. S. Nicolay, 23 Dec 1963 2000', leg. G. B. Small. All deposited USNM.

Type locality. Cacao Plantation Road in 1979 was a dirt road through late secondary lowland forest that was used for dry season training exercises by the United States and Panamá military. Ridgely (1976) discussed Cacao Plantation Road in the section on "Summit Gardens and Vicinity", referring to it as the road that is "about a mile beyond Summit Gardens (toward Gamboa)". In 2000, Cacao Plantation Road was a narrow, overgrown dirt path that was called a nature trail.

Etymology. This species is named in honor of Commander Richard A. Anderson, whose collecting greatly increased our knowledge of the Nicaraguan and Panamanian butterfly faunas, especially Lycaenidae and Hesperiidae. It is a noun in the genitive case of masculine gender.

Habitat. *Iaspis andersoni* is common in moderately disturbed wet and dry lowland forest from sea level to 1,100 m elevation.

Larval foodplants. *Iaspis andersoni* appears to be polyphagous, having been reared on a number of different plants. A male (deposited NMCR) was reared from a larva that Isidro Chacón found on 1 Dec 1992 on *Souroubea* (Marcgraviaceae) at Horquetas de Sarapiquí, El Plástico, Heredia, Costa Rica (600 m). Janzen & Hallwachs (2008, adult vouchers in USNM) in the Area de Conservacion Guanacaste, Alajuela and Guanacaste Provinces, Costa Rica, reared two males from *Inga oerstediana* (Fabaceae) (07-SRNP-65853, 08-SRNP-21004), two females from *Inga spectabilis* (Fabaceae) (07-SRNP-4715, 07-SRNP-4716), and two females from *Miconia lacera* (Melastomataceae) (07-SRNP-70877, 07-SRNP-70878). A caterpillar of *I. andersoni* is illustrated (Fig. 14).

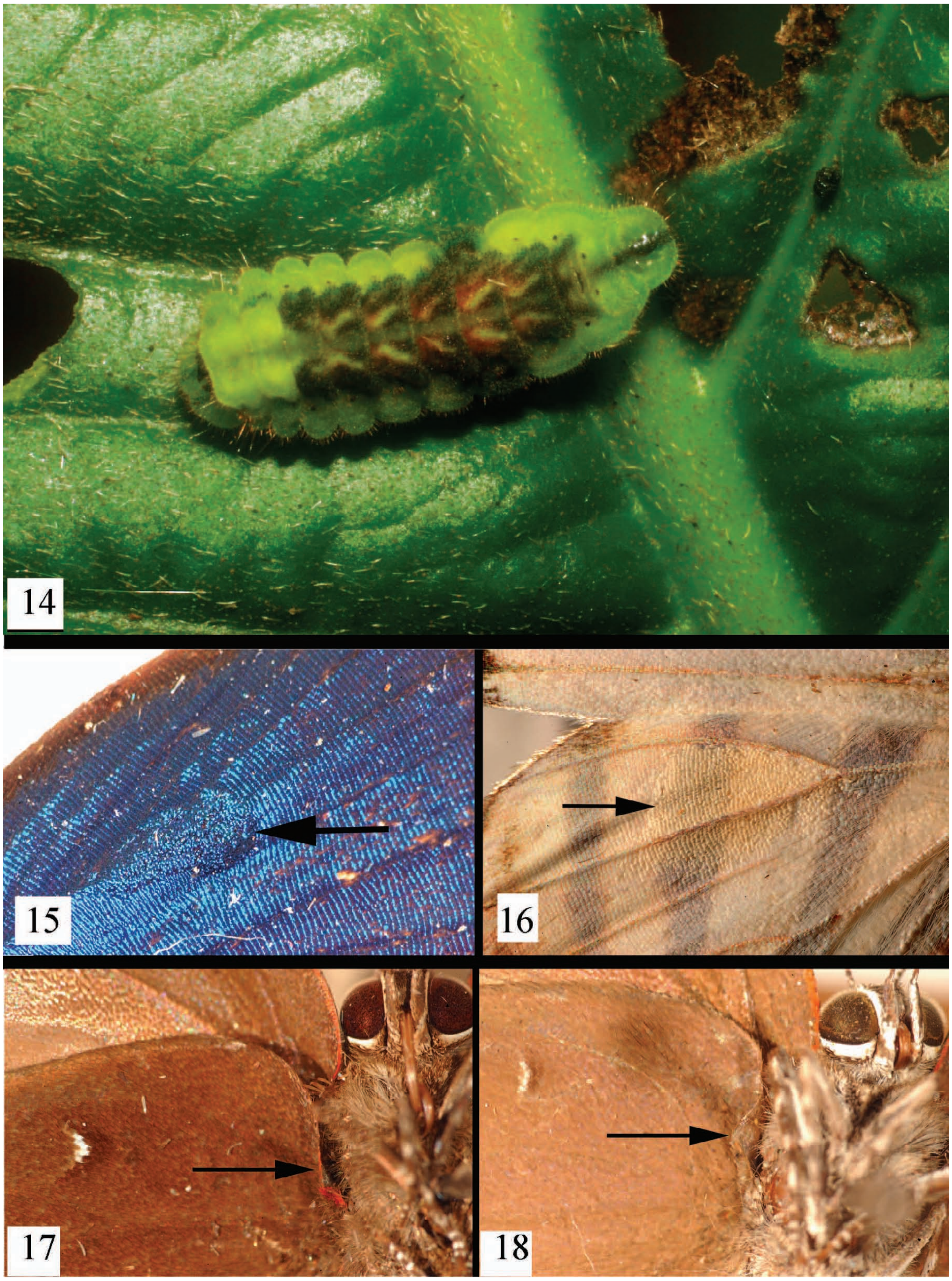
Distribution (Fig. 30). Mexico to northern Colombia (Rio Magdalena Valley), including Isla Coiba off the west coast of Panamá.

Study series. For this paper, I examined 87 males and 16 females of *I. andersoni* from 7 countries, including genitalic dissections of 2 males and 2 females; 59 males and 23 females in the *I. castitas* species complex from 7 countries in the Amazon Region, including genitalic dissections of 3 males and 3 females; 10 males and 1 female of the *I. talayra* from 2 states in Brazil, including 1 male and 1 female genitalic dissection; and the lectotypes of *I. talayra*, *I. exiguus*, and *I. castitas* (BMNH).

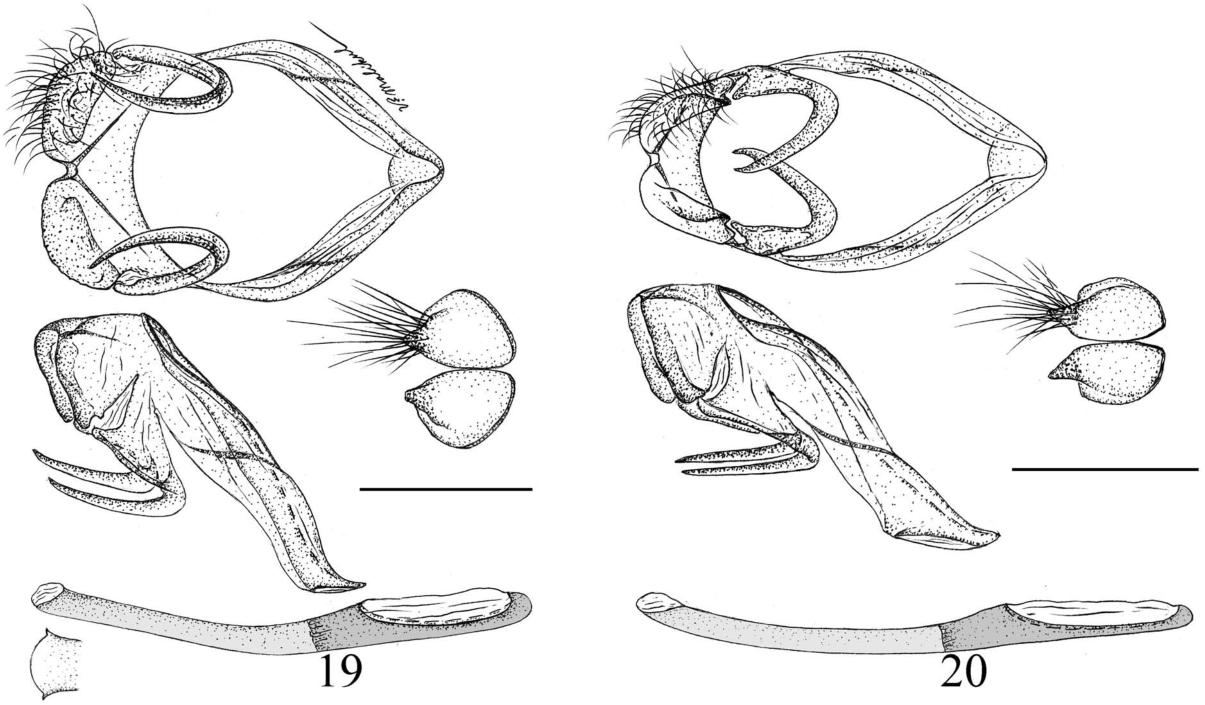
Michaelus joseph Robbins **new species**

History and new information. Nicolay (1979) described *Michaelus* and recognized five species including *M. ira* (Hewitson) and *M. vibidia* (Hewitson). He illustrated the genitalia and wing pattern of these species and gave their distributions. Although Nicolay correctly recognized that he was treating two biologically distinct sympatric species, Robbins (2004a, b) synonymized these names because the Hewitson types of *M. ira* (the older name) and *M. vibidia* are the same species (Robbins 2004a, b).

FIGS. 1-13. Adults, dorsal on top, ventral on bottom except for fig. 13. **1.** ♂ *Iaspis talayra* lectotype, Rio de Janeiro, Brazil, arrow points to lack of orange-red scales on the distal border of the postmedian line in cell Cu$_2$-2A. **2.** ♂ *I. castitas* lectotype, Para, Brazil. **3.** ♂ *I. exiguus* lectotype, Surinam. **4.** ♂ *I. andersoni* holotype, Panamá. **5.** ♀ *I. andersoni* paratype, Panamá. **6.** ♂ *Michaelus joseph* holotype, Panamá. **7.** ♀ *M. joseph*, Costa Rica. **8.** ♂ *Ignata caldas* holotype, Panamá. **9.** ♀ *I. caldas* paratype, Panamá. **10.** ♀ *Ignata gadira* holotype, Guatemala. Arrow on right points to pale gray scales in middle of hindwing. Arrow on left points to black anal lobe spot lacking red scales. **11.** ♂ *Thecla togarna* original illustration, "Venezuela". **12.** ♂ *Arawacus togarna* lectotype, Mexico. **13.** ♂ *A. togarna* ventral, Belize on top, Costa Rica on bottom. Scale 1 cm.



FIGS. 14-18. **14.** Larva (dorsal aspect) of *Iaspis andersoni* eating *Inga spectabilis* (Fabaceae) (Costa Rica, 07-SRNP-4715, image courtesy Janzen & Hallwachs). **15.** Dorsal forewing scent pad (arrow) of *Iaspis andersoni* (Panamá) with iridescent blue scales. **16.** Dorsal hindwing scent patch (arrow) of *Arawacus togarna* (Costa Rica). **17.** Base of the ventral wings of *Michaelus joseph* (Panamá) with red scales (arrow). **18.** Base of the ventral wings of *M. ira* (Panamá) without red scales (arrow).



Figs. 19-20. *Iaspis* male genitalia, ventral aspect of genital capsule and valvae (top), lateral aspect of genital capsule and penis (bottom), posterior to left, scale 0.5 mm. **19.** *I. andersoni* (Panamá). Penis tip in dorsal aspect (enlarged) showing terminal "spines". **20.** *I. castitas* (Peru).

In sum, the species that Nicolay called *M. vibidia* should be called *M. ira* (Robbins 2004b), and the species that Nicolay referred to as *M. ira* does not have a name and is being described as *M. joseph*.

Diagnosis. *Michaelus joseph* is the only *Michaelus* that has red scales at the base of the ventral hindwing (Fig. 17). There is a detailed description of *M. joseph* under the name *M. ira* in Nicolay (1979), including excellent genitalic figures. The holotype and a female of *M. joseph* are illustrated (Figs. 6–7).

Size. Mean male forewing length = 1.6 cm, sd = 0.10, n = 6.

Reasons for recognizing it as a distinct biological species. *Michaelus joseph* and *M. ira* have similar wing patterns, but are sympatric and synchronic throughout the range of *M. joseph*. For example, they occur at the same time of year in Guanacaste (Costa Rica), the Canal Area (Panamá), Madre de Dios (Peru), and Rondônia (Brazil) (vouchers in USNM). They differ consistently in the structure of the genitalia and wing pattern, as noted by Nicolay (1979). They also differ in the presence of red scales at the base of the ventral hindwing.

Generic placement. Nicolay (1979) provided characters for the placement of *M. joseph* in *Michaelus*, but a phylogenetic analysis is yet lacking.

Nomenclature. *Thecla ira* Hewitson was described from a presumably single Mexican male in the Saunders Collection. A male in the BMNH is labeled as the holotype of *Thecla ira* (B.M. type No. Rh 670, Type H.T.). *Thecla vibidia* Hewitson was described from a presumably single Amazonian male in the Hewitson Collection. A male in the BMNH is labeled as the type of *T. vibidia* (B.M. type No. Rh 668), and Godman & Salvin (1887–1901: 44) referred to it as the type.

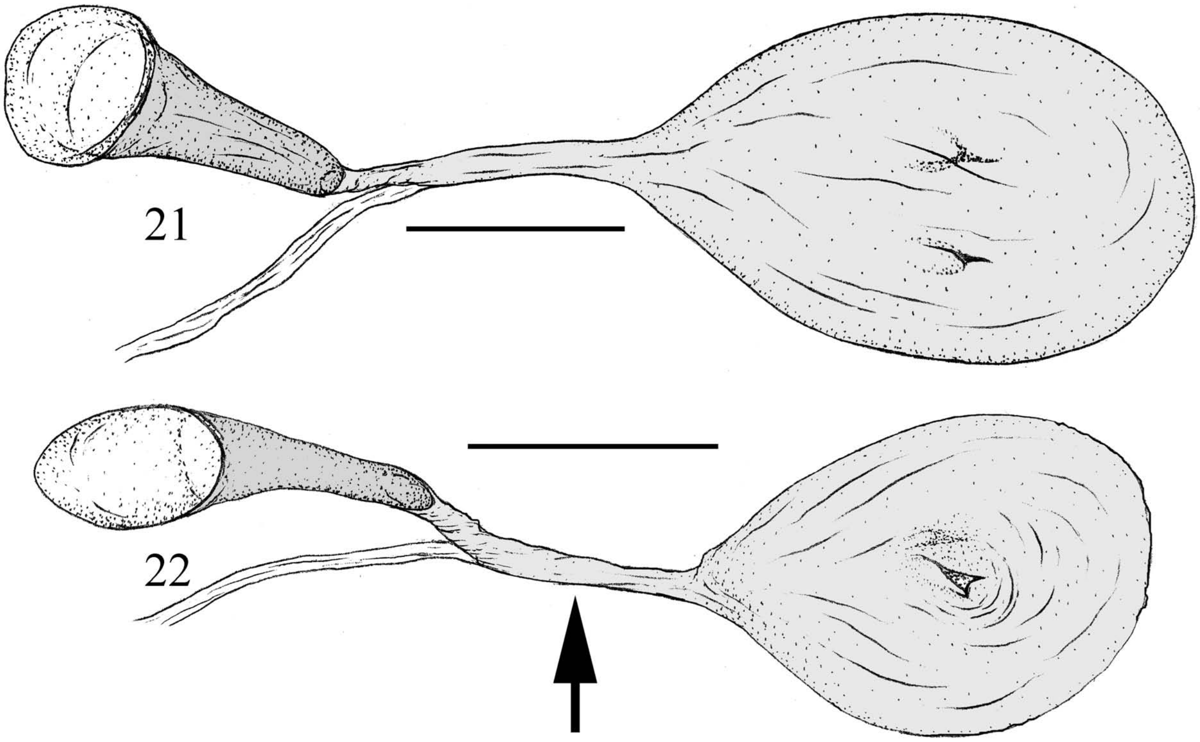
Holotype ♂ (Fig. 6). [white label, date handwritten in blue ink] Madden Forest Pre.[serve], Panama, C.[anal] Z.[one]. VII[July]-24-[19]69, [leg.] G. B. Small. [red label] HOLOTYPE *Michaelus joseph* Robbins. Deposited USNM.

Paratypes (5♂). Panamá, Canal Area, leg. G. B. Small: Piña, 12 Jan 1965; Madden Dam, Apr 1968; Madden Forest, 19 Jul 1969; Madden Forest, 5 Aug 1968; Panamá Province, Bayano, 16 Nov 1974, G. B. Small. All deposited USNM.

Type locality. Ridgely (1976) mapped Madden Forest and described it as a fairly large forest reserve straddling the Continental Divide northeast of Summit Gardens. Unfortunately, much of Madden Forest had been clear-cut by 1980 (pers. obs.). However, larger tracts of forest just to the northwest (Summit to Pipeline Road) are now protected in Soberanía National Park.

Etymology. *Michaelus joseph* is named for Nicolay's grandson Joseph Nicolay. It is an indeclinable noun in apposition of masculine gender.

Habitat. *Michaelus joseph* inhabits lowland forests,



FIGS. 21-22. *Iaspis* ductus copulatrix (female genitalia), ventral aspect, posterior to left, scale 0.5 mm. **21.** *I. andersoni* (Panamá). **22.** *I. castitas* (Peru), arrow points to membranous duct connecting the corpus bursae to the ductus bursae.

ranging from those that lack a dry season to those that are seasonally dry with many deciduous trees. It is a rarer species in collections than *M. ira*.

Larval foodplant. *Michaelus joseph* has not been reared, but flowers of Bignoniaceae are the expected foodplant. Individuals of *M. ira* were reared from the fallen flowers of *Pithecoctenium* and *Pyrostegia* in the Bignoniaceae in southern Brazil (Zikán & Zikán 1968 under the name *Thecla venustula* [a nomen nudum], deposited FIOC) and in Panamá (Robbins & Aiello 1982 under the name *Thecla vibidia*, deposited AA).

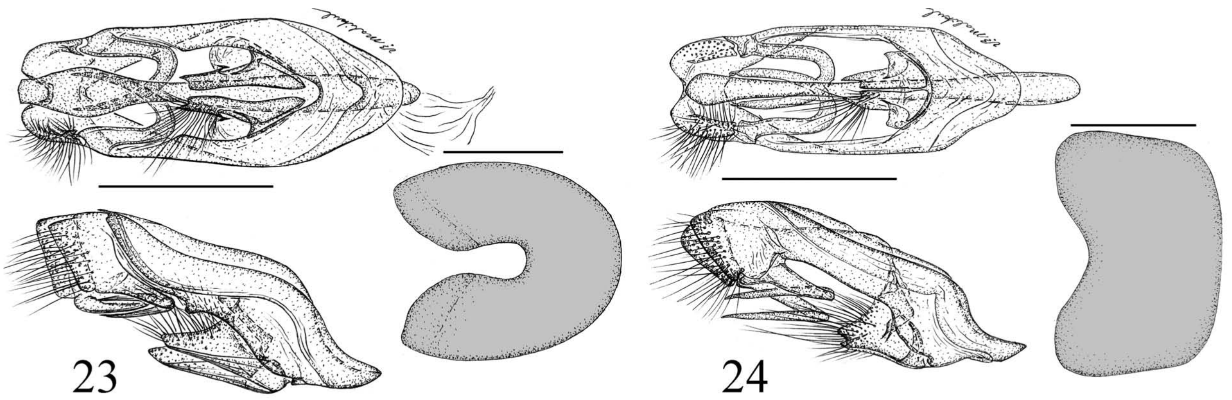
Distribution (Fig. 31). From Costa Rica to the western Amazon in Peru and Brazil. Nicolay (1979) also recorded specimens from Belize, Venezuela, Colombia, Bolivia, and the central Amazon Basin in Brazil, but I have not seen these specimens.

Study series. For this paper I examined 44 males and 9 females of *M. joseph* from 5 countries, including genitalic dissections of 3 males and 1 female; and 84 males and 33 females of *M. ira* from 10 countries, including genitalic dissections of 2 males and the genitalic figures in Nicolay (1979). I also examined the holotypes of *M. ira* and *M. vibidia* (BMNH) with a binocular microscope.

Ignata caldas Robbins **new species**

History and new information. Hewitson (1867) described the tailless *Thecla gadira* from a Guatemalan female (Fig. 10). Godman & Salvin (1887–1901) illustrated a Guatemalan male of *T. gadira* and named *Thecla minthe*—another tailless species with a very similar wing pattern—from a Mexican male. This taxonomy was followed in Draudt (1919–1920) and D'Abrera (1995). Both *gadira* and *minthe* were transferred to *Ignata* Johnson (Robbins 2004b), where they were treated as synonyms because their holotypes are the same species. Although Godman & Salvin (1887–1901) correctly realized that there are two species, the less common species, which they called *Thecla minthe*, is *Ignata gadira* (Robbins 2004b). The more common and widespread of the two, which Godman and Salvin called *Thecla gadira*, does not have a name.

Diagnosis. The ventral wing pattern of both sexes of *I. caldas* has a small orange-red spot at the anal angle (occurring without exception in the study series) and no light gray scales in the middle of the hindwing (Figs. 8–9). In both sexes of *I. gadira*, the anal angle spot is black (as noted by Hewitson 1867) and there are light



FIGS. 23-24. *Ignata* male genitalia, ventral aspect (top), lateral aspect (bottom), 8th abdominal tergum (right), posterior to left, scale 1 mm. **23.** *I. caldas* (Panamá). **24.** *I. gadira* (Costa Rica).

gray scales in the middle of the hindwings (Fig. 10). Additionally, male dorsal blue color of *I. caldas* is a darker hue than that of male *I. gadira*, the scent pad is larger, and the ventral forewing lacks the iridescent blue sheen of *I. gadira* (well-illustrated in Godman & Salvin 1887–1901 and D'Abrera 1995 under the names *Thecla gadira* and *Thecla minthe*, respectively). Finally, male and female genitalia, including shape of the male 8th tergum, valvae, and ductus bursae differentiate *I. caldas* from *I. gadira* (Figs. 23–26).

Size. Mean male forewing length = 1.3 cm, sd = 0.10, n = 6. Mean female forewing length = 1.3 cm, sd = 0.11, n = 7.

Reasons for recognizing it as a distinct biological species. *Ignata caldas* and *I. gadira* differ in wing pattern, androconia, male genitalia, and female genitalia, as noted above. They are sympatric in Nicaragua (Robbins & Anderson submitted) and Panamá (Robbins & Small 1981). Individuals with intermediate character states are unknown in areas of sympatry or allopatry. The results of preliminary phylogenetic analyses indicate that they are phylogenetically distinct species (Robbins unpubl.). Whereas *I. gadira* is restricted to Central American montane forest (600–1750 m), *I. caldas* occurs in both lowland and montane forest from Mexico to the upper Amazon Basin.

Generic placement. The original description of *Ignata* (Johnson 1992) included no synapomorphies for the genus, and the genus as described was not monophyletic (Robbins 2004a). *Ignata* was placed in the *Panthiades* Section (see Robbins & Duarte 2004 for characters) and provisionally characterized in Robbins (2004b) by the readily recognizable "smooth" blue iridescence on the dorsal wings of males (Fig. 8) and by the wide posterior penis in ventral aspect (Figs. 23–24) that is somewhat flattened in lateral aspect (similar to penis shape in *Parrhasius* Hübner, Nicolay 1979). Results of an ongoing phylogenetic analysis of *Ignata* and its relatives may modify the current generic classification of these species.

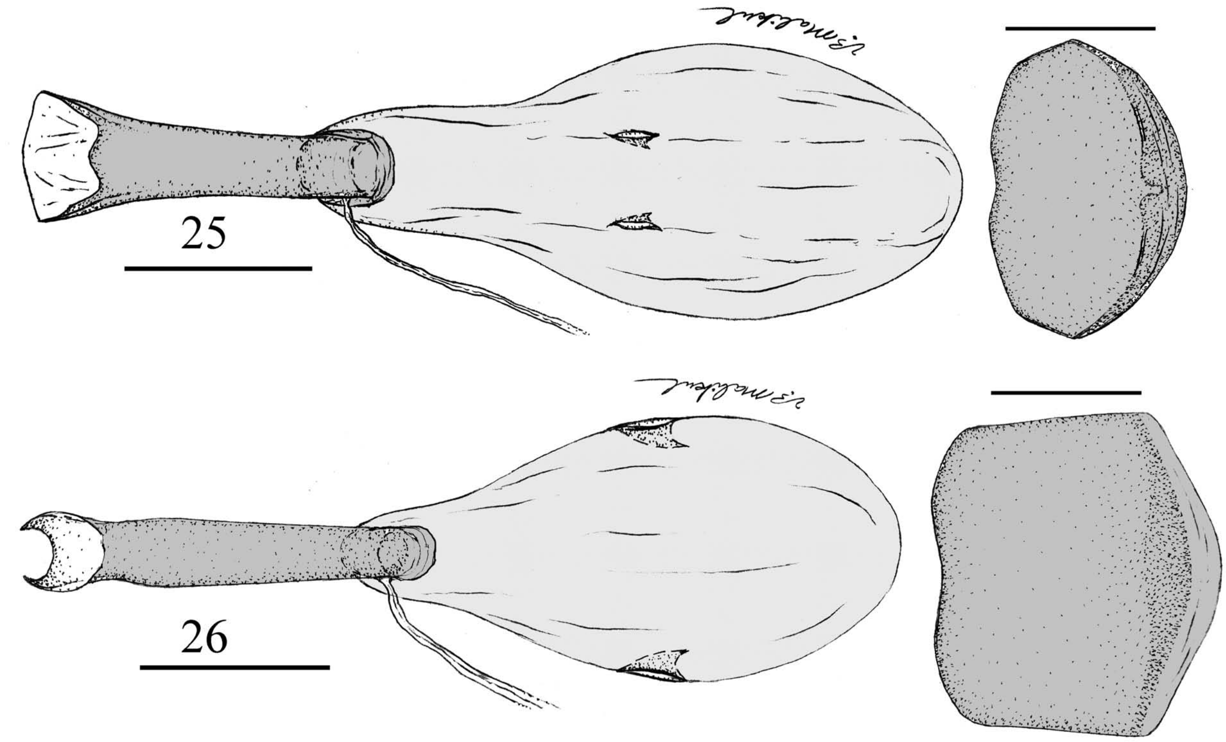
Holotype ♂ (Fig. 8). [white label, elevation and date handwritten in black ink] Panama, [Panama Province], Cerro Campana, 1000 ft, 4 Aug 1967, leg. G. B. Small. [red label] HOLOTYPE *Ignata caldas* Robbins. Deposited USNM.

Paratypes (5♂&7♀). Panamá, Cerro Campana, leg. G. B. Small: 1♀ 1500 ft, 23 Jan 1965; 2♀ 2000 ft, 23 Dec 1963; 1♀ 2000ft, 4 Jan 1964; 1♀ 2000ft, 5 Jan 1964; 2♂ 2000 ft, 8 Dec 1963; 1♀ 2500 ft, 9 Sep 1967. Panamá, Panamá Province, Cerro Campana, leg. R. Robbins, 1♀ 500 m, 23 Feb 1979. Panamá, Chiriqui Province, Potrerillos, 3600 ft, leg. G. B. Small: 2♂ 27 Dec 1965; 1♀ 29 Dec 1965. All paratypes deposited USNM.

Type locality. The type locality is remnant forest and scrub vegetation surrounded by pasture along the road from the Pan American Highway to Cerro Campana (further descriptions in Ridgely 1976, Robbins & Small 1981).

Etymology. *Ignata caldas* is named for my wife, insect population ecologist Astrid Caldas, who conducted dissertation research on butterflies at the type locality. It is an indeclinable noun in apposition of feminine gender.

Habitat. *Ignata caldas* occurs in wet and seasonally dry forest from sea level to 1,100 m in Central America and from the Amazon lowlands to 1,900 m on the eastern slope of the Andes.



FIGS. 25-26. *Ignata* female genitalia, ductus copulatrix (left), 8th abdominal tergum (right), ventral aspect, posterior to left, scale 1 mm. **25.** *I. caldas* (Panamá). **26.** *I. gadira* (Panamá).

Larval foodplant. Unknown.

Distribution (Fig. 32). *Ignata caldas* ranges from Mexico to southeastern Peru in the Amazon Basin (Rio Madre de Dios drainage). This species undoubtedly occurs in Bolivia and Brazil near the border with Peru.

Study series. For this paper I examined 42 males and 31 females from 9 countries of *I. caldas*, including genitalic dissections of 6 males and 3 females, and 22 males and 11 females from 5 countries of *I. gadira*, including genitalic dissections of 2 males and 2 females. I also examined the holotypes of *I. gadira* and *I. minthe* (BMNH).

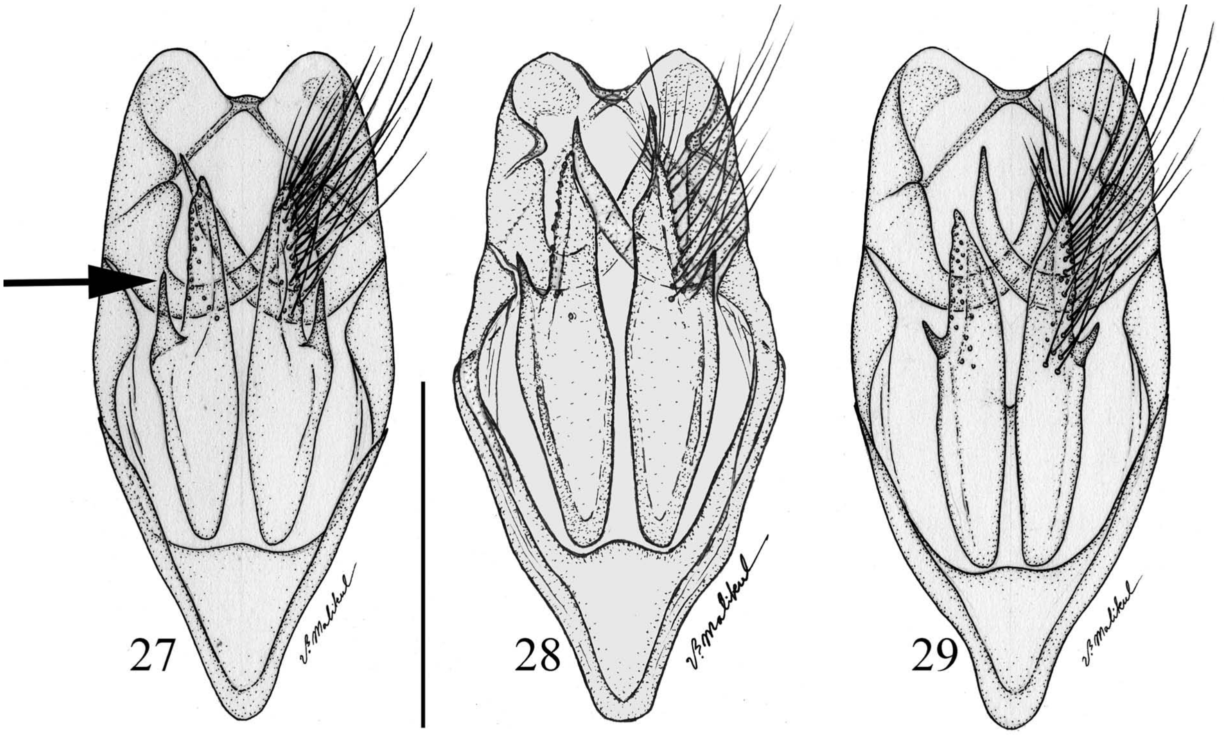
Arawacus togarna (Hewitson)

History and new information. Following Godman & Salvin (1887–1901), Draudt (1919–1920) distinguished *Thecla togarna* Hewitson with four ventral hindwing brown/black bands from *T. linus* (Fabricius) with five. He divided the former into geographical "forms" *Thecla togarna* and *Thecla lincoides* Draudt.

The late H. K. Clench (unpublished manuscript in CMNH) transferred the "four-banded" *togarna* and *lincoides* to *Arawacus* (previously characterized in Clench 1961) and treated them as subspecies of the "five-banded" South American *A. aetolus* (Sulzer), which is a senior synonym of *A. linus* (Comstock & Huntington 1961). He further noted that there were two wing pattern forms from Guatemala to Costa Rica on the Atlantic slope of Central America and that both differed from that of *A. a. togarna* to the north and from that of *A. a. lincoides* to the south. He planned to name these wing pattern phenotypes as subspecies, but had not yet examined the genitalia of these taxa at the time of his death.

Some subspecies of *A. aetolus*, which Clench had based on wing pattern and androconial characters, also have distinct genitalia. Because there was no evidence for hybridization at the distribution edges where these putative subspecies meet (with one exception in South America), Robbins (2000) treated them as distinct species. The unnamed wing pattern phenotypes from Guatemala to Costa Rica have distinct male genitalia, for which reason they were noted to be a distinct species (Robbins 2000) and were so treated by Dyer & Gentry (2002), Robbins (2004b), Colwell & Longino (2008), and Janzen & Hallwachs (2008).

As part of a project on the butterflies of Belize (Shuey



FIGS. 27-29. Variation of *Arawacus togarna* male genitalia, ventral aspect of genital capsule with penis removed, posterior to top, scale 1 mm. **27.** Mexico "long tooth, parallel". **28.** Belize "short tooth, parallel". **29.** Costa Rica "short tooth, oblique". Arrow points to tooth on valva.

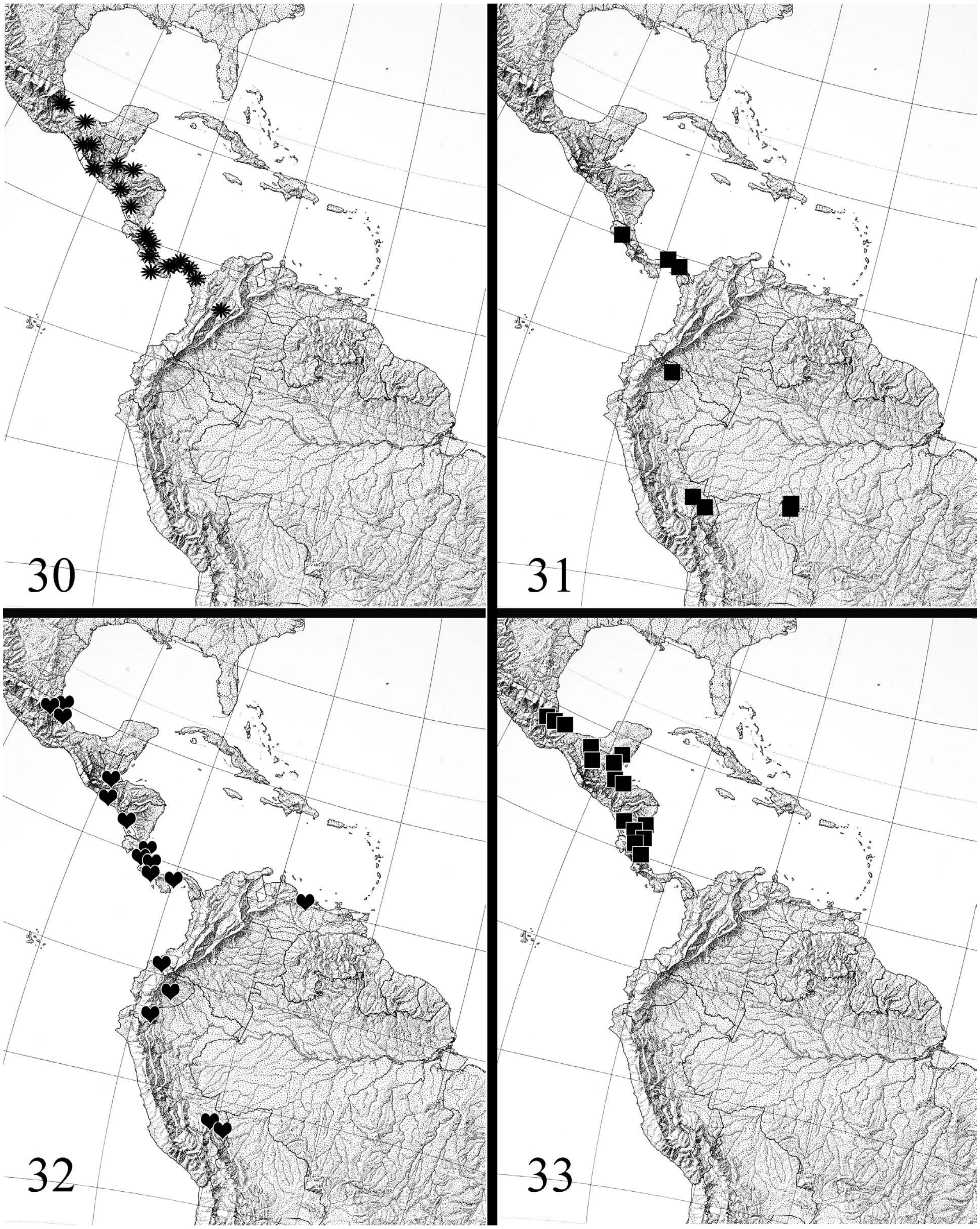
et al. 2005), eight males and two females from Belize were donated to USNM. Variation of wing pattern and male genitalia in this sample suggests hybridization between the unnamed taxon and *A. togarna*.

Variation. The black bands on the ventral wings of *A. togarna* are narrowest in Mexico and widest in Costa Rica (Figs. 12–13). The submarginal orange-yellow ventral hindwing band may extend posteriorly to the anal lobe (Fig. 12), to vein 2A (Fig. 13 top), or to vein Cu_2 (Fig. 13 bottom). The tooth on the male genitalia valvae may be "long" and parallel to the sagittal plane (Fig. 27), shorter in length and parallel to the sagittal plane (Fig. 28), or shorter in length and at an oblique angle (Fig. 29). Position of the tooth on the valva is also highly variable (Figs. 27–29). There is no substantive variation in the structure of the female genitalia within *A. togarna*.

Reasons for expanding the concept of A. togarna as a biological species. Ventral wing pattern and male genitalia in Mexico do not vary much and are distinct from the ventral wing pattern and male genitalia that occur with little variation in Costa Rica (cf. Figs. 12, 13 bottom, 27, 29). However, in Guatemala and Belize, intermediate wing pattern and male genitalia forms occur, and the same wing pattern forms of *A. togarna* may have different male genitalia and vice versa. This result is most consistent with the hypothesis that the populations from Mexico to Costa Rica are one species.

Nomenclature. To stabilize the nomenclature of *Thecla togarna* Hewitson, 1867, a lectotype is designated. The lectotype is a male from the Hewitson Collection (Fig. 12) in the BMNH that has a red label "lectotype male designated by G. Lamas 2004," but Lamas did not publish the lectotype designation. The lectotype is labeled Mexico, but in the original description, *Thecla togarna* was stated to be from Venezuela. Several lines of evidence suggest that Hewitson made a simple mistake. First, the proposed lectotype is a remarkably good fit to the illustration in the original description both in wing pattern and the way that the wings are set (Figs. 11–12). Second, the proposed lectotype is from the Hewitson collection, and no other extant specimen from that collection fits the original description. Third, *A. togarna*, which is clearly recognizable from the original description (Fig. 11) as the form that occurs widely in Mexico is unknown from Venezuela. There are no Venezuelan specimens in MIZA (Robbins unpubl.) nor are any others reported from any other museum collection.

Habitat. Wet lowland forest. *Arawacus togarna* is



FIGS. 30-33. Distributions. **30.** *Iaspis andersoni* (stars). **31.** *Michaelus joseph* (squares). **32.** *Ignata caldas* (hearts). **33.** *Arawacus togarna* (squares).

unrecorded from seasonally dry forest, but two specimens were collected at a locality 14 km east of Managua that is a mosaic of habitats (Anderson, pers. comm.).

Larval foodplants. The caterpillars of *A. togarna* eat the leaves of many species of *Solanum* (Solanaceae) in Costa Rica. Records from Janzen & Hallwachs (2008, Area de Conservacion Guanacaste, Alajuela and Guanacaste Provinces, 16 vouchers in USNM,) are *Solanum jamaicense* (07-SRNP-42513), *S. hayesii* (06-SRNP-65566, 06-SRNP-30585, 06-SRNP-30581, 06-SRNP-30247, 06-SRNP-30785, 00-SRNP-12688, 06-SRNP-30789, 06-SRNP-30784, 06-SRNP-65564, 07-SRNP-30003, 07-SRNP-30928), *S. rugosum* (06-SRNP-42660), and *S. schlechtendalianum* (05-SRNP-31191, 06-SRNP-30821, 05-SRNP-32441). Records from Dyer & Gentry (2002, 4 vouchers in USNM) are *S. adherens*, *S. rudepanum*, *S. aturense* (*sipuranoides*), *S. rugosum*, *S. jamaicense*, and *S.* (*Cyphomandra*) *hardtwegii* (cf. Bohs 1995 for generic nomenclature). *Arawacus togarna* has also been recorded in Colombia on *Cestrum mariquitense* (Solanaceae)(Beccaloni *et al.* 2008), but this record is a misidentification because *A. togarna* does not occur in Colombia (no vouchers were noted).

Distribution (Fig. 33). *Arawacus togarna* occurs on the Atlantic slope of Central America from central Mexico to Costa Rica. It is unknown from the Pacific slope, but two individuals from 14 km east of Managua were found in Nicaragua's central rift valley (Robbins & Anderson in prep.). Specimens in the *A. togarna* species complex from Panamá and from the Pacific coast of Costa Rica are *A. linocides*, not *A. togarna*.

Remarks. A "cream" colored dorsal hindwing scent patch occurs in all males of *A. togarna* (Fig. 16). It has not been reported previously, probably because its color is very similar to the surrounding "white" scales (Fig. 12 top). It occurs in *A. togarna*, *A. lincoides*, *A. aetolus* (Sulzer), and in modified forms in *A. separata* (Lathy) and *A. aethesa* (Hewitson) (Robbins unpubl.). In *A. lincoides* in Panamá, landed males being courted by other males rapidly vibrate their hindwings (Robbins unpubl.), a behavior that could conceivably be related to pheromones disseminated by these androconia.

Study series. For this paper, I examined 88 males and 36 females of *A. togarna* from 6 countries, including 17 male and 6 female genitalic dissections and 20 adults reared from larvae. I also examined an image of the lectotype of *A. togarna* provided by G. Lamas. Finally, I had access to the extensive data collated by Clench.

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