

Contribution to the knowledge of the Saturniidae fauna of Muzo (Boyaca, Colombia), with the redescription of *Copaxa apollinairei* LEMAIRE, 1978 (Lepidoptera, Saturniidae)

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Abstract: A list of species collected during two expeditions in the region of Muzo (Boyaca Department, Colombia) is presented. 46 species were identified, the majority of which (56.5% of the total species richness) are representatives of the Andean fauna, with a contribution of both the Oriental and the Occidental faunas (45.8 and 20.8% of Andean species, respectively), together with species previously known from both slopes of the Cordillera (33.4% of Andean species). Another significant proportion of the collected fauna is represented by polytopics (34.8% of the total richness), while only 4 species (8.7% of the total richness) may be considered as typical from the Amazonian region. The meaning of this community composition in terms of biogeographic pattern is discussed. The enigmatic *Copaxa apollinairei* LEMAIRE, 1978 was re-discovered for the first time since the collecting of the first and only known specimen by brother APOLLINAIRE-MARIE in the first half of the last century. A redescription with colour illustrations of this species and its genitalia is provided.

Key words: Eastern Colombia, taxonomy, Neotropical entomofauna.

Contribution à la connaissance de la faune de Saturniidae de Muzo (Boyaca, Colombie) et re-description de *Copaxa apollinairei* LEMAIRE, 1978 (Lepidoptera, Saturniidae)

Résumé: Une liste d'espèces collectées au cours de deux expéditions dans la région de Muzo (département du Boyaca, Colombie) est publiée. 46 espèces ont été identifiées, parmi lesquelles une majorité (56.5% de la richesse spécifique totale) appartient à la faune andine, avec une contribution des faunes occidentale et orientale (respectivement 45.8 et 20.8% des espèces andines) ainsi que d'espèces connues des deux versants de la Cordillère (33.4% des espèces andines). Une autre proportion significative de la faune échantillonnée est représentée par des espèces polytopiques (34.8% de la richesse totale), alors que seules 4 espèces (8.7% de la richesse totale) peuvent être considérées comme typiques de la région amazonienne. Enfin, près de 50% des espèces identifiées sont également connues d'Amérique Centrale, principalement du Panama et du Costa Rica. La signification de cette composition en terme de patrons biogéographiques est discutée. Les descriptions originales de deux nouvelles espèces feront l'objet d'une publication ultérieure. L'espèce énigmatique *Copaxa apollinairei* LEMAIRE, 1978 est redécouverte pour la première fois depuis la collecte du premier et unique spécimen connu par le frère APOLLINAIRE-MARIE dans la première moitié du siècle passé. Le nouveau spécimen est utilisé ici pour décrire de nouveau et illustrer en couleur cette espèce méconnue, dont les genitalia sont également décrits et figurés.

Contribución al conocimiento de la fauna de Saturniidae de Muzo (Boyacá, Colombia), con la re-descripción de *Copaxa apollinairei* LEMAIRE, 1978 (Lepidoptera, Saturniidae)

Resumen: Se publica una lista de especies colectadas durante dos expediciones en la región de Muzo (departamento del Boyacá, Colombia). 46 especies se identificaron, dentro de las cuales una mayoría (56.5% de la riqueza específica total) pertenece a la fauna andina, con una contribución de las faunas occidentales y orientales (respectivamente 45.8 y 20.8% de las especies andinas), juntas con especies conocidas de ambos lados de la Cordillera (33.4% de las especies andinas). Otra proporción significativa de la fauna colectada esta representada por especies polytópicas (34.8% de la riqueza total), mientras solo 4 especies (8.7% de la riqueza total) se pueden considerar como típicas de la región amazónica. Finalmente, cerca de 50% de las especies identificadas son también conocidas de America Central, principalmente de Panamá y de Costa Rica. La significación de esa composition en términos de patrones biogeográficos se discute. Se descubrieron dos nuevas especies, cuyas descripciones originales se publicarán luego. Se re-descubre la especie enigmática *Copaxa apollinairei* LEMAIRE, 1978 por primera vez desde la colecta del primero y único espécimen conocido por el hermano APOLLINAIRE-MARIE en la primera mitad del siglo pasado. Ese nuevo espécimen colectado se usa para re-describir e ilustrar la especie, cuyos genitales también se ilustran y se describen.

Beitrag zur Kenntnis der Saturniidenfauna von Muzo (Boyacá, Kolumbien) mit der Wiederbeschreibung von *Copaxa apollinairei* LEMAIRE, 1978 (Lepidoptera, Saturniidae)

Zusammenfassung: Eine Artenliste der in der Region von Muzo (Departement Boyaca, Kolumbien) auf zwei Reisen gefundenen Saturniidae wird vorgestellt. 46 Arten wurden bestimmt, davon waren die Mehrzahl (56.5% aller gefundenen Arten) Vertreter der Andenfauna mit spezifisch ost- (45,5 %) und westandinen Arten (20,8 % der Gesamtzahl der andinen Arten), dazu 33,4 % Vertreter von beiderseits der Andenkette vorkommenden Arten. Ein weiterer wichtiger Anteil von Arten wird durch weitverbreitete (polytopische) Arten (34,8 % der Gesamtf fauna) repräsentiert, während nur 4 Arten (8,7 % der Gesamtzahl) als typisch amazonische Arten einzuschätzen sind. Die Bedeutung dieses Verbreitungsmusters wird diskutiert. Die etwas geheimnisvolle *Copaxa apollinairei* LEMAIRE, 1978 wurde erstmals nach der Urbeschreibung (der Holotypus wurde als Einzelstück von Pater APOLLINAIRE-MARIE in der ersten Hälfte des letzten Jahrhunderts gefangen) wiedergefunden und wird hier erneut beschrieben, mit Farbbildung und Genitalfotografie.

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Introduction

The biota of Colombia is considered by many authors as one of the most diversified in tropical America. One reason for this is that Colombia is located at the frontiers of different biogeographic regions, all of them influencing the composition of local communities, while the complex topography of the country creates natural barriers that have enhanced species evolution toward a high rate of local endemism. This has been reported in numerous studies dedicated to different groups of animals. As an example EMMONS (1997) considered that 192 of the 315 taxa (i.e. species and genera) of rainforest mammals treated in his book occur in Colombia. Similarly, HILTY & BROWN (1986) cite nearly 1700 species of birds for the country, representing over half the species described so far from South America. The few studies dedicated to Colombian entomofauna endorse a similar pattern. For instance, LE CROM et al. (2002) illustrated 66 species and 130 subspecies of swallowtail butterflies (Papilionidae), that is around 46% and 25% of the total number of American species and subspecies included in the checklist of TYLER et al. (1994).

The diversity of Colombian moths is therefore probably greatly underestimated, if we assume that the factors responsible for high species richness in other zoological groups may have similar results on the diversity of their communities. Paradigmatically however, studies on Colombian moths are relatively scarce when compared to those dedicated to emblematic vertebrates or, to a limited extent, to the more popular butterflies.

Among the different families of moths, Saturniidae is probably the one which received the highest attention from entomologists, due to the attractiveness of its more colourful and large-sized representatives. As many as 185 species – of the subfamilies Hemileucinae, Saturniinae, Arsenurinae and Ceratocampinae – have been reported from Colombia (AMARILLO-SUAREZ 2000). This estimation does not take into account the Cercophaninae and Oxyteninae, two small subfamilies which were recently re-included into Saturniidae (MINET 1994). Nevertheless, this number represents as much as one fifth of the 921 species (Cercophaninae and Oxyteninae excepted) listed by LEMAIRE (1996) in his checklist of Neotropical saturniids. Moreover, considering the poor collecting intensity in Colombia during the past 50 years, many more species are expected to occur in this country. Such a regional gap is certainly a direct consequence of the half-century civil unrest that resulted in dramatic levels of insecurity, especially in the less accessible areas, some of which are suspected of hosting high numbers of species (e.g. the Pacific Region and the Sierra Nevada of Santa Marta). It is therefore not surprising that recent collecting efforts in relatively safe areas have led to spectacular results. In less than 10 years, species were rediscovered (AMARILLO-SUAREZ & WOLFE 1997, WOLFE et al. 2003a) which were not found for many decades before, enigmatic species groups were revised (WOLFE et

al. 2003b, WOLFE 2005), and a number of new species were described (LEMAIRE & AMARILLO 1992, DECAËNS 2003, DECAËNS et al. 2003a, b, d).

In December 2002, D. BONILLA and G. LECOURT visited the insecure region of Muzo (Boyaca, Colombia) for night trapping. This first collecting was followed by a second field trip by D. BONILLA and L. D. RAMIREZ in April 2003. Further laboratory studies of the Saturniidae material collected there revealed the presence of several new species, and provided new distributional data for a number of other taxa. Taxonomic contributions including the description of new species are currently in progress and will be published separately. In this first contribution to the knowledge of the saturniid fauna of Muzo, we provide a list of the species collected there, and we redescribe *Copaxa apollinairei* LEMAIRE, 1978, an enigmatic species only known from the holotype specimen and for which no reliable distributional data was available to date.

Material and methods

Collecting was carried out in two sites located at different elevations in Boyacá Department (Colombia), near the town of Muzo:

- 1.-2. XII. 2002 in the Municipio (County) de Quipama, 1500 m elevation (leg. G. LECOURT and D. BONILLA).
- 14.-18. IV. 2003 in the Municipio de Arcabuco, 2000 m (leg. D. BONILLA and L. D. RAMIREZ).

Vegetation is similar in both localities, constituted by a humid Andean forest with a moderate level of fragmentation. Moths were attracted by a 175 W mercury vapour bulb powered by a small portable generator. A white sheet of 2 m height × 3 m width was used as reflector. Trapping was done throughout each entire night, i.e. from 18.30 h to 6.30 h. Moths were collected as soon as they came to the sheet, injected with ammonia, stored and dried in labelled paper envelopes.

Collected specimens were further moistened in a humid box in the lab, mounted to allow observation of wing patterns and deposited in the collection of the senior author.

Identifications were made at the species level following LEMAIRE (1978, 1980, 1988, 2002) and JORDAN (1924). When necessary, genital parts were prepared in a standard way using KOH. Illustrations were made using a Nikon Coolpix 4500 digital camera, which was attached to a Leica MS5 stereomicroscope for photographing genitalia.

The Saturniidae fauna of the region of Muzo

A total of 46 species were collected in the two visited sites. The list of the species and their geographical range according to literature is given in Table 1. Collected species belong to the subfamilies Oxyteninae (1 species), Saturniinae (7 species), Arsenurinae (5 species),

Table 1: List of the species collected in the two visited localities of the region of Muzo (Boyaca department, Colombia). — Localities: M1: Quipama (1500 m a.s.l.); M2: Arcabuco (2000 m). Other abbreviations: Am = Amazonia s. str.; Amazonian = Amazonian with possible extension in low elevation Andean regions; CA = Central America; Occi = Occidental Andean Cordillera; Orient = Oriental Andean Cordillera; Others = polytopic and other kind of geographical ranges; SA = South America; SB = South Brazil.

Saturniidae species	Biogeographic area	M1	M2
Oxyteninae			
<i>Oxytenis naemia</i> DRUCE, 1906	Polytopic (CA, SA)	×	
Arsenurinae			
<i>Arsenura armida</i> (CRAMER, 1779)	Polytopic (CA, SA)	×	
<i>Caio championi</i> (DRUCE, 1886)	Polytopic (CA, North of SA)	×	
<i>Copiopteryx semiramis andensis</i> (LEMAIRE, 1974)	Andean (Occi, Orient) to CA	×	
<i>Dysdaemonia boreas</i> (CRAMER, 1775)	Polytopic (CA, SA)	×	
<i>Grammopelta lineata</i> (SCHAUS, 1906)	Polytopic (Am, Occ)	×	
Ceratocampinae			
<i>Adeloneivaia acuta</i> (SCHAUS, 1896)	Amazonian (Am, SB)	×	
<i>Bathyphebia eminens</i> (DOGNIN, 1891)	Andean (Orient)		×
<i>Citheronia (Citheronioides) collaris</i> ROTHSCHILD, 1907	Andean (Occi) to CA	×	
<i>Citioica anthonilis</i> (HERRICH-SCHÄFFER, [1854])	Polytopic (CA, SA)	×	
<i>Eacles imperialis cacicus</i> (BOISDUVAL, 1868)	Amazonian	×	
<i>Priloscola lilacina lilacina</i> (SCHAUS, 1900)	Andean (Occi, Orient)	×	
Hemileucinae			
<i>Automeris amanda subobscura</i> WEYMER, 1909	Andean (Orient)	×	×
<i>Automeris banus proxima</i> (?) CONTE, 1906	Andean (Orient)	×	
<i>Automeris duchartrei</i> BOUVIER, 1936	Andean (Orient, Occi) to Panama		×
<i>Automeris hamata</i> SCHAUS, 1906	Polytopic (CA, SA)	×	
<i>Automeris incarnata</i> (WALKER, 1865)	North SA to Panama	×	
<i>Automeris jucunda</i> (CRAMER, 1779)	North of SA to Panama	×	
<i>Automeris metzli</i> (SALLÉ, 1853)	Andean (Occi) to CA	×	
<i>Automeris midea</i> (MAASSEN & WEYDING, 1885)	Amazonian	×	
<i>Automeris vomona vomona</i> SCHAUS, 1906	Andean (Orient)	×	×
<i>Automeris zugana</i> DRUCE, 1886	Andean (Occi) to Costa Rica	×	
<i>Cerodirphia</i> n. sp.	Andean (Orient)	×	×
<i>Dirphia crassifurca</i> LEMAIRES, 1971	Andean (Orient)	×	
<i>Dirphia somniculosa somniculosa</i> CRAMER, 1777	Andean (Orient)	×	
<i>Dirphiopsis flora</i> (SCHAUS, 1911)	Andean (Occi, Orient) to CA	×	
<i>Hylesia aeneides</i> (DRUCE, 1897)	Andes and French Guyana	×	
<i>Hylesia continua colombiana</i> DOGNIN, 1922	Andean (Occi)	×	
<i>Hylesia medifex</i> DOGNIN, 1916	Andean (Orient)	×	
<i>Hylesia mymex</i> DYAR, 1913	Andean (Occi, Orient) to Costa Rica	×	
<i>Hylesia nanus</i> (WALKER, 1855)	Polytopic (SA)	×	
<i>Hylesia praeda praeda</i> DOGNIN, 1901	Polytopic (SA, Costa Rica)	×	
<i>Hyperchiria nausica</i> (CRAMER, 1779)	Polytopic (CA, North of SA)	×	
<i>Leucanella</i> n. sp.	Andean (Orient)	×	
<i>Lonomia rufescens</i> (?) LEMAIRES, 1970	Andean (Occi) to Costa Rica	×	×
<i>Molippa nibasa</i> MAASSEN & WEYDING, 1885	Polytopic (CA, North of SA)	×	×
<i>Paradirphia oblita oblita</i> (?) LEMAIRES, 1976	Andean (Orient)	×	×
<i>Periphoba arcae</i> (DRUCE, 1886)	Andean (North) to CA		×
<i>Pseudodirphia agis agis</i> (CRAMER, 1775)	Amazonian, Andean (Orient) to Panama	×	
Saturniinae			
<i>Copaxa andensis</i> LEMAIRES, 1971	Andean (Orient, Occi)		×
<i>Copaxa apollinairei</i> LEMAIRES, 1978	Andean (Orient)	×	
<i>Copaxa decrescens</i> WALKER, 1855	Polytopic (SA)	×	×
<i>Copaxa rufinans</i> SCHAUS, 1906	Andean (Occi) north to Mexico	×	
<i>Copaxa satellita</i> WALKER, 1865	Andean (Orient) to SB	×	
<i>Copaxa simson</i> MAASSEN & WEYMER, 1881	Polytopic (SA to Costa Rica)	×	
<i>Rothschildia lebeau inca</i> ROTHSCHILD, 1907	Andean (North) to CA	×	

Hemileucinae (27 species), and Ceratocampinae (6 species). From this total, 42 species (90% of the total) were collected in the first site (elev. 1500 m) and 11 (25%) in the second one (elev. 2000 m). Only 4 species out of the latter were not present in the former site (i.e. *Bathyphebia eminens*, *Automeris duchartrei*, *Periphoba arcaei* and *Copaxa andensis*). This list given in Table 1 must be considered with caution due to the low collecting intensity carried out, but nonetheless it constitutes a preliminary contribution to the knowledge of the Saturniidae fauna of this barely known region.

Although the region of Muzo clearly belongs to the Oriental Cordillera, it hosts representatives of various biogeographical regions together with more polytopic species (Fig. 1a). Typically Andean species only account for 56.5% of the total recorded richness, while the remaining species contain a number of taxa that usually occur at lower elevations. Four species collected in the 1500 m locality are typical Amazonian inhabitants, which are not unusually collected at this altitude. Among the Andean species, 45.8% are typical from the Oriental region (e.g. *Automeris amanda subobscura*, *Dirphia crassifurca*), 20.8% from the Occidental region (e.g. *Automeris metzli*, *Citheronia (Citheronioides) collaris*), whereas the remaining (i.e. 33.4%) are yet reported to occur on both sides of the Cordillera (Fig. 1b). This unusual feature, never previously recorded, may be due to the geographical location of the region of Muzo, which is part of the Occidental slopes (Magdalena valley) of the Oriental mountains, a situation that may host a mix of endemics from the two sides of the Andean Cordillera. This highlights the fact that loose physical barriers may exist between Oriental and Occidental faunas in North Colombian mountains, mainly because contacts between populations are allowed at the Northern extremity of the Cordillera. This contrasts with the situation in other South American countries where a clear separation between both biogeographic regions was described and proposed as a reason for the high endemism rates observed in the occidental Andean slopes (LEMAIRE & VENEDICTOFF 1989).

Another relevant feature is that 24 of the collected species (i.e. more than 50% of the total species richness) are species that also occur in Central America. This includes species with ubiquitous distribution and northern Andean species which present an extension of their geographic range to Panama and Costa Rica (13 species in our data). This clear relationship with the fauna of Central America has not been previously reported for other Oriental Andean locality. Conversely, this has been previously described for the Occidental regions of Colombia and Ecuador (LEMAIRE & VENEDICTOFF 1989, DECAËNS et al. 2003c). As an example, 50% of the saturniids collected in San José del Palmar (Pacific Region of Colombia, Chocó department) were species also occurring in Central America (DECAËNS et al. 2003c). The observation of a similar pattern in the region of Muzo again supports the existence of a relationship between

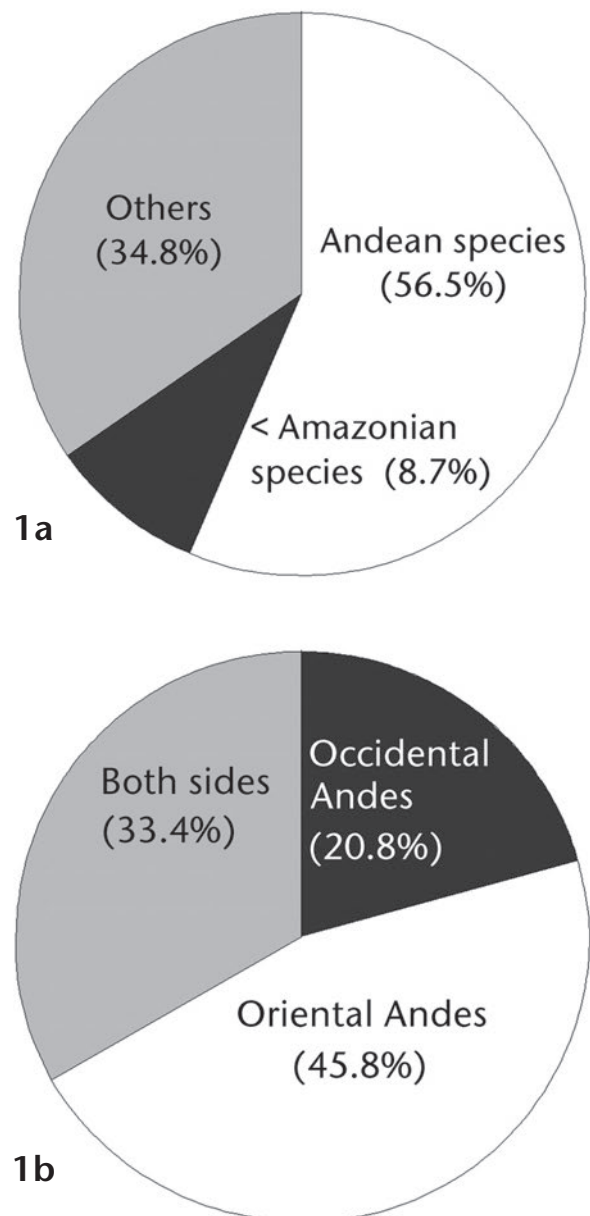


Fig. 1: Relative representation of the different types of biogeographic ranges with the entire Saturniidae community (1a), and within the Andean species (1b) collected in the region of Muzo.

populations from both Andean regions, and highlights the important contribution of Central American species to the composition of Colombian biota. Biogeographic and evolutionary outcomes of such a contact zone should be considered with attention in further studies.

After identifying the collected material, we found two species to be new for science (i.e. one *Leucanella* and one *Cerodirphia*). The description of these new taxa will be published in a separate paper. We also rediscovered *Copaxa apollinairei*, and we provide here the first reliable data about its geographical range. Considering the low collecting intensity performed to date in the two visited localities, this result may be interpreted as a sign of relatively high endemism rate within the local faunas. This would not be surprising, as the Oriental Cordillera of Colombia is known to be particularly rich in local endemics. For instance, the region of Bogota host as

many as 65% of endemics from the Oriental Cordillera of Colombia, some of which are restricted to the plateau of Bogota (e.g. *Copaxa sapatoza* (WESTWOOD, [1854]), *Leucanella nyctimene* (LATREILLE, 1832), or *Meroleuca litura* (WALKER, 1855); DECAËNS, BONILLA & RAMIREZ, unpublished data). The reason for a high endemism rate in the region of Muzo is probably related to the topographic position of the region, which is isolated from the Eastern plains by the mountain chain, and from the Central Cordillera by the dry valley of the Magdalena. Additional collecting is now necessary to fully describe the taxonomic richness and specificity of the Andean Forests of this area.

Redescription of *Copaxa apollinairei*

Background: *Copaxa apollinairei* was described in 1978 by Claude LEMAIRE from a single ♂ specimen collected in 1927 by APOLLINAIRE-MARIE (LEMAIRE 1978). The locality indicated on the type specimen label was “Bogota”, suggesting the presence of this species in the high elevation Andean forests of the Bogota Plateau. However, despite the increasing intensity of the collecting efforts carried out in this region by T. DECAËNS, D. BONILLA, L. D. RAMIREZ, A. AMARILLO and K. WOLFE (AMARILLO 2000, DECAËNS et al. unpubl. data), the species never was collected in this area. During their collecting trip in 2002 in the region of Muzo (see material and methods section for details), D. BONILLA and G. LECOURT collected a small ♂ of a species that was identified as *C. apollinairei* after genitalia dissection. The single type specimen used by C. LEMAIRE for the original description was therefore probably mislabelled, since it corresponds to an area of higher elevation (2700 m for Bogota) when compared with the new locality where the species was rediscovered (1500 m). Such discrepancy is not unexpected, because APOLLINAIRE-MARIE used to label his commercialized specimens with the name of the nearest large town (e.g. *Erythromeris saturniata* (WALKER, 1865) cited from Villavicencio in LEMAIRE 1973). The recent collecting of *Copaxa apollinairei* therefore probably constitutes the first reliable contribution to the knowledge of the distribution range of this rare and poorly known species.

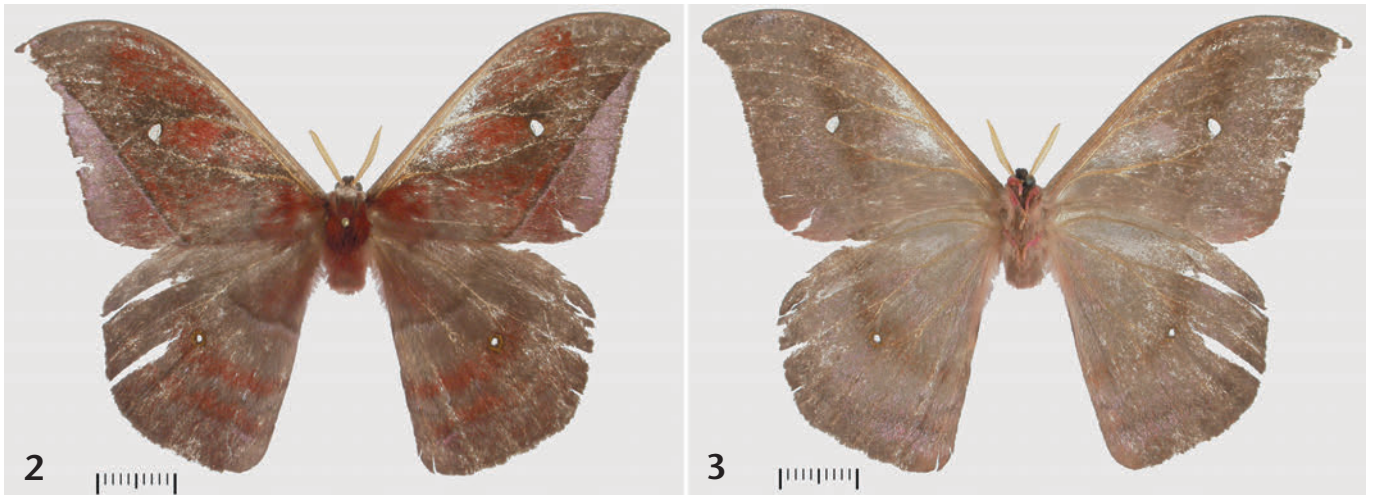
As stated by LEMAIRE (1978), the very bad condition of the holotype would not have allowed a clear separation from related species without the examination of the structure of the ♂ genitalia. This also led to a very short description of the wing patterns in the original description of the species (LEMAIRE 1978), which plainly justifies a redescription based on the newly collected specimen (deposited in the collection of the senior author).

Description

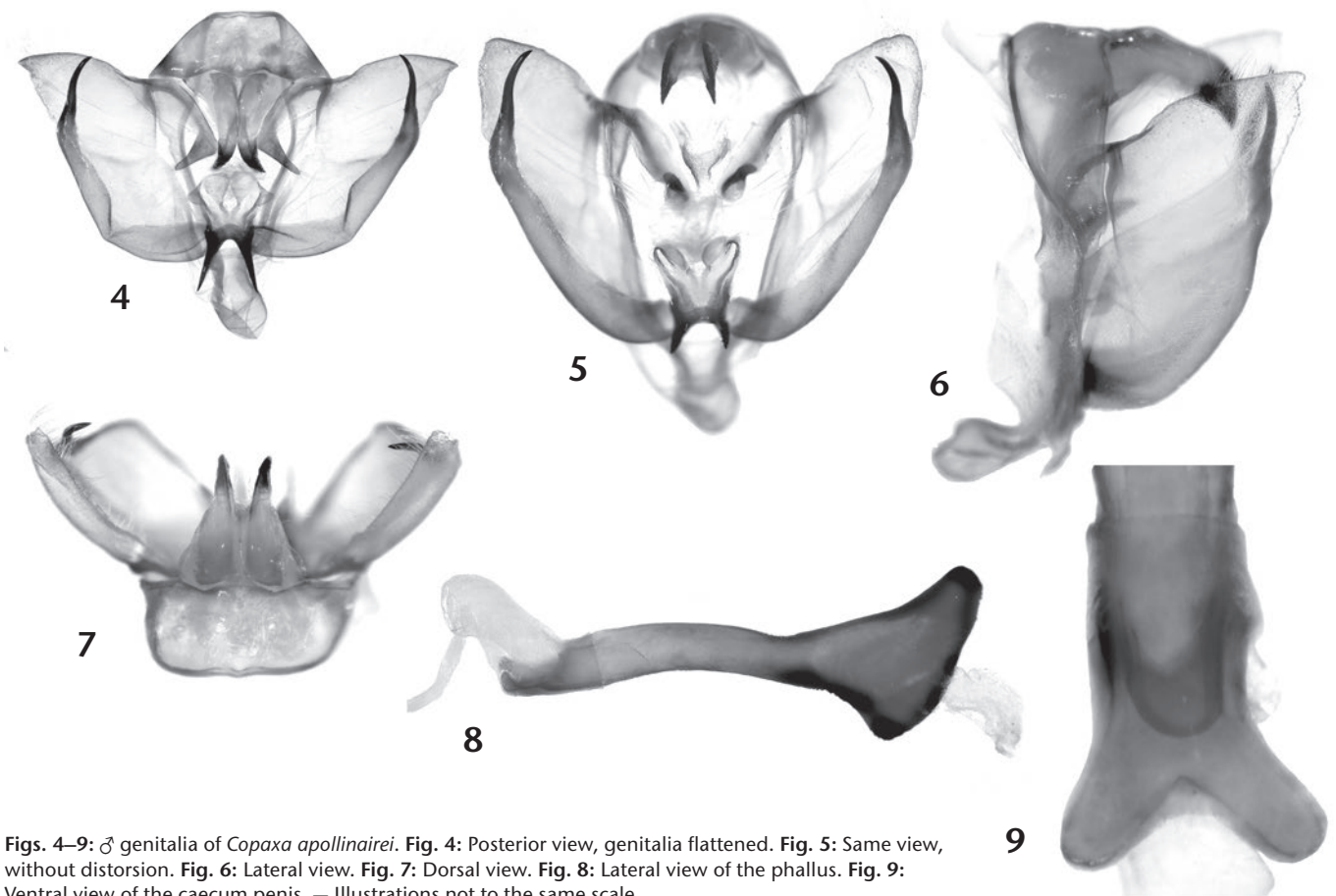
♂ (Figs. 2, 3). Length of forewing: 44 mm; wingspan: 82 mm. Head dark brown, labial palpi of the same colour, antennae dull yellow. Thorax: dorsal part of the prothorax covered with erected white scales forming a contrasting collar behind the head; the remaining dorsal surface of

the thorax covered by reddish brown hairs; ventral side pale brown, tibiae and tarsi pink. Abdomen: dorsal side dark brown, ventral side pale brown. Forewing elongated and falcate, straight border, sharp and prominent apex; above ground colour dark brown alternated with reddish brown patches, and densely suffused with light pink scales in the external area; antemedial line dark brown, barely distinct, slightly bordered with light pink scales and strongly deviated when crossing the discal cell; postmedial line dark brown, bordered externally by a thin strip of light pink scales; this line straight, becoming less apparent toward apex and clearly delimiting a light pink triangular external area contrasting with the large dark reddish brown area extending from the base to the apex of the wing; discal vein between M2 and M3 bearing a small hyaline subvoid discal spot, bordered with a thin line of brown scales. Ventral side brown, extensively suffused with light pink scales and with a median darker band extending across the wing through the discal spot. Hindwing: antemedial line distinct, dark brown, externally bordered with a thin row of light pink scales; this line delimiting a relatively large reddish brown basal area. Postmedial line barely distinct, dark brown, sinuous and marked by small light pink patches where crossing the veins; the median area, delimited by the ante- and postmedial lines, divided in a large proximal band of brown scales and a somewhat narrower distal band of reddish brown scales. Discal spot rounded, formed of a small hyaline central area surrounded by a thin dark brown ring, a slightly wider yellow ring and then another thin dark brown ring. The postmedial line immediately followed by a reddish brown band, a barely distinct submarginal line (visible and underlined with light pink scales next to the anal corner of the wing), and a brown marginal area. Ventral side similar in colour and pattern to that of the forewings; discal spot as for the upperside, but less contrasting.

♂ **genitalia** (Figs. 4–9). Entire structure short, its height exceeding its length (Fig. 6). Uncus with a pair of strong parallel teeth, downcurved and heavily sclerotized apically (Figs. 4–7). Lateral arms of the gnathos rudimentary, only discernible next to their junction point with the uncus; median plate of the gnathos triangular, weakly sclerotized (Fig. 5). Costulae (usually referred to as the transtilla in this genus by authors, but see MINET 2003) converging medially, ending on both sides of the median plate of the gnathos; each costula terminated by a long triangular process oriented backward, with its posterior tip setose and somewhat digitiform (Fig. 4). Valvae short, slightly pointed at the apex, costa setose (Fig. 6). Sacculus forming an heavily sclerotized and much elongated spine oriented upward (Fig. 6); this spine lying on the inner part of the valva and reaching the costa (Figs. 4–6). Juxta bearing on its ventral margin a pair of heavily sclerotized spines oriented backward (Figs. 4, 5). Saccus short, bulbous, its width roughly constant from its base to its anterior tip (Figs. 4–6). Phallus slightly curved (Fig. 8), its posterior third strongly compressed laterally (“club-



Figs. 2–3: Newly collected ♂ specimen of *Copaxa apollinairei* LEMAIRE, 1978. Fig. 2: dorsal view. Fig. 3: ventral view. — Scale bar 10 mm.



Figs. 4–9: ♂ genitalia of *Copaxa apollinairei*. Fig. 4: Posterior view, genitalia flattened. Fig. 5: Same view, without distortion. Fig. 6: Lateral view. Fig. 7: Dorsal view. Fig. 8: Lateral view of the phallus. Fig. 9: Ventral view of the caecum penis. — Illustrations not to the same scale.

shaped” as stated by LEMAIRE 1978), heavily sclerotized and slightly dentate ventrally (Fig. 8); caecum penis with two small divergent lobes (Fig. 9); vesica short, lacking cornuti and evaginating laterally on the right side (Fig. 8).

Differential diagnosis to ♂ genitalia of *C. koenigi* LEMAIRE, 1974 and related species: As stated by LEMAIRE (1978), the genitalia of *C. apollinairei* clearly differ from those of related species with regards to at least two significant traits. First, the ventral spines of the juxta are subequal, while they are strongly asymmetrical in *C. koenigi*, *Copaxa*

moinieri LEMAIRE, 1978, and *Copaxa decrescens* WALKER, 1855. The most distinct character, however, is the shape of the very peculiar club-like phallus from which the vesica evaginates from the left, instead of dorsally in related species.

♀ and preimaginal morphology: unknown.

Distribution and biology: To date, *Copaxa apollinairei* is only known with certitude from the new locality cited in this paper (see in material and method section, first locality). This species is therefore probably restricted to

the medium elevation areas of the Oriental mountains of Colombia. Immature stages and foodplants are unknown.

Diagnosis: *C. apollinairei* is clearly close to *C. koenigi* by its size, colour and wing pattern. Although the differentiation between both species may be problematic on the sole examination of the external morphology, the existing differences in characters of ♂ genitalia, and especially in the shape of the phallus, are extremely clear and prevent from any possible misidentification.

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References

- AMARILLO-SUAREZ, A. R. (2000): Polillas Saturniidas (Lepidoptera: Saturniidae) de Colombia. — *Biota Colombiana*, Bogotá, 1 (2): 177–186.
- , & WOLFE, K. L. (1997): Descripción del ciclo de vida y ampliación de ámbito de *Rothschildia zacateca* (Lepidoptera: Saturniidae). — *Tropical Lepidoptera*, Gainesville, 8 (2): 71–74.
- DECAËNS, T. (2003): *Dirphia carimaguensis*, a new Hemileucinae from the Eastern Plains of Colombia (Lepidoptera: Saturniidae). — *Galathea, Berichte des Kreises Nürnberger Entomologen*, Nürnberg, **Suppl. 15**: 13–21.
- , BONILLA, D., & RAMIREZ, L. D. (2003a): A new *Gamelia* from the Pacific region of Colombia (Lepidoptera: Saturniidae, Hemileucinae). — *Galathea, Berichte des Kreises Nürnberger Entomologen*, Nürnberg, **Suppl. 16**: 173–180.
- , ——, & —— (2003b): *Meroleuca (Meroleuoides) diazmaurini*, a new Saturniidae from Central Colombia (Lepidoptera: Saturniidae, Hemileucinae). — *Galathea, Berichte des Kreises Nürnberger Entomologen*, Nürnberg, **Suppl. 15**: 47–53.
- , ——, ——, AMARILLO, A., WOLFE, K., BROSCHE, U., & NAUMANN, S. (2003c): Diversidad de Saturniidae (Lepidoptera) en la selva andina de San José del Palmar (Alto Chocó, Colombia). — *Boletín Científico del Museo de Historia Natural, Manizales*, 7: 57–75.
- , ——, & WOLFE, K. (2003d): A new *Hylesia* (Lepidoptera: Saturniidae, Hemileucinae) from the National Park of Iguaque (Eastern Cordillera, Colombia). — *Nachrichten des Entomologischen Vereins Apollo*, Frankfurt am Main, N.F. 24 (1/2): 39–46.
- EMMONS, L. H. (1997): Neotropical rainforest mammals. A field guide, 2nd edition. — Chicago (University of Chicago Pr.), 307 pp.
- JORDAN, K. (1924): On the saturnoidean families Oxytenidae and Cercophanidae. — *Novitates Zoologicae*, Tring, 31: 135–193.
- HILTY, S. L., & BROWN, W. L. (1986): A guide to the birds of Colombia. — Priceton (Priceton University Press), 836 pp.
- LE CROM, J. F., CONSTANTINO, L. M., & SALAZAR, J. A. (2002): Mariposas de Colombia. Tomo 1: Papilionidae. — Bogotá (Carlec), 112 pp.
- LEMAIRE, C. (1973): Révision du genre *Automeris* HÜBNER et des genres voisins — Biogéographie, éthologie, morphologie, taxonomie. Part II. — Paris (Editions du Muséum), 576 pp.
- (1978): Les Attacidae Américains — The Attacidae of America. Part 1, Attacinae. — Neuilly sur Seine (the author), 238 pp.
- (1980): Les Attacidae Américains — The Attacidae of America. Part 2, Arsenurinae. — Neuilly sur Seine (the author), 199pp.
- (1988): Les Saturniidae Américains — The Saturniidae of America — Los Saturniidae Americanos. Part 3, Ceratocampinae. — San José (Museo Nacional de Costa Rica), 480 pp.
- (1996): 117. Saturniidae. — Pp. 28–49, 61–62 in: HEPPNER, J. B. (ed.), Atlas of Neotropical Lepidoptera, vol. 5B, Checklist: Part 4B. Drepanoidea — Bombycoidea — Sphingoidea. — Gainesville, Washington, Hamburg, Lima, Taipei, Tokyo (ATL, Scientif. Publ.), L + 87 pp.
- (2002): Les Attacidae Américains — The Attacidae of America — Los Saturniidae Americanos. Part 4, Hemileucinae. — Kelttern (Goetze & Evers), 1388 pp. + 143 pp. of colour plates without pagination.
- , & AMARILLO, A. (1992) Une nouvelle espèce du genre *Automeris* de Colombie Orientale (Lepidoptera: Saturniidae). — *Tropical Lepidoptera*, Gainesville, 3 (2): 153–154.
- , & VENEDICTOFF, N. (1989): Catalogue and biogeography of the Lepidoptera of Ecuador. I. Saturniidae. With a description of a new species of *Meroleuca* PACKARD. — *Bulletin of the Allyn Museum*, Sarasota, 129: 1–60.
- MINET, J. (1994): The Bombycoidea: phylogeny and higher classification (Lepidoptera: Glossata). — *Entomologica Scandinavica* 25: 63–88.
- (2003): The Epicopeiidae: phylogeny and a redefinition, with the description of new taxa (Lepidoptera: Drepanoidea). — *Annales de la Société Entomologique de France*, Paris, 38 (4): 463–487.
- TYLER, H., BROWN, K. S. jr., & WILSON, K. (1994): Swallowtail butterflies of the Americas. A study in biological dynamics, ecological diversity, biosystematics, and conservation. — Gainesville (Scientific Publ.), 376 pp.
- WOLFE, K. L. (2005) Revision of the *Copaxa semioculata* and *Copaxa medea* groups, with corrigenda of WOLFE et al. (2003a), descriptions of three new species, and notes on their early stages (Lepidoptera: Saturniidae). — *Nachrichten des Entomologischen Vereins Apollo*, Frankfurt am Main, N.F. 26 (3): 121–136.
- , BONILLA, D., RAMIREZ, L. D., & DECAËNS, T. (2003a): Rediscovery of *Copaxa sapatoza* and revealing of its immature stages (Lepidoptera: Saturniidae, Saturniinae). — *Nachrichten des Entomologischen Vereins Apollo*, Frankfurt am Main, N.F. 24 (3): 143–146.
- , LEMAIRES, C., AMARILLO-SUAREZ, A., & CONLAN, C. A. (2003b): A contribution to the systematics of the *Copaxa semioculata* species-group (Saturniidae), with notes on the early stages, and a description of *Copaxa lunula*, new species. — *Journal of the Lepidopterist Society*, Los Angeles, 57 (1): 54–61.

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