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A revision of the genus *Eremoleon* Banks (Neuroptera: Myrmeleontidae: Nemoleontini)

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Abstract. Descriptions or diagnoses are given for 36 species of New World *Eremoleon* including 12 **new species:** *Eremoleon attenuatus, E. durangoensis, E. jacumba, E. jamaica, E. inca*, *E. monagas, E. morazani, E. pygmaeus, E. samne, E. tanya, E. tepuyiensis* and *E. venezolanus*. A **neotype** is designated for *Hesperoleon atomarius* Navás 1933. The larvae of 25 species are described and keyed. Keys to the adults and larvae are given, and biological notes are provided. Twenty-five species were reared from larvae found in cave mouths, rock overhangs, or other less common habitats; for example, *E. nigribasis* were found in deep recesses of mammal burrows, *E. gracile* were reared from reptile holes in the ground, *E. punctipennis* were found in beetle frass beneath logs, and *E. femoralis* in small twig holes or abandoned termite galleries in termite frass. Many new bombyliid and chalcidid parasites are listed.

Resumen. Se describen doce **especies nuevas**: *Eremoleon attenuatus, E. durangoensis, E. jacumba, E. jamaica, E. inca*, *E. monagas, E. morazani, E. pygmaeus, E. samne, E. tanya, E. tepuyiensis y E. venezolanus* del Mundo Nuevo y se incluyen en una clave para las veinticinco especies. Se designa un **neotipo** para *Hesperoleon atomarius* Navás 1933. Se provee una clave para las larvas y adultos con notas biologicas. Las larvas de veinte cuatro especies fueron descubiertos y veinte especies viven en las bocas de cuevas o sobresaliente de rocas. Las larvas de *E. nigribasis* viven en madrigueras de los mamíferos. *Eremoleon gracile* en madrigueras de los reptiles, *E. femoralis* en agujeros de ramitas y *E. punctipennis* en excremento de escarabajos abajo de troncos. Se provee una clave para las larvas y adultos. Se provee una diagnosis o descripción para las especies además datos sobre distribución geográfica y figuras para ayudar en sus identificaciones. Muchos nuevos parasíticos de las familias Bombyliidae y Chalcididae son nombrados.

Key Words. antlions, biology, keys, New World

Introduction

Stange (2004) recognized 19 species in *Eremoleon* distributed from southern United States south to Peru and Brazil, with an additional 6 species known from the West Indies. One species, *Eremoleon vitreus* (Navás) has been removed from synonymy from *E. macer*. Identification keys have been provided for North America (Banks 1927; Adams 1957; Stange 1989; 2002) and for Hispaniola by Miller and Stange (2011). We recognize 24 described species and 12 additional **new species**: *Eremoleon attenuatus, E. durangoensis, E. jacumba, E. jamaica, E. inca, E. monagas, E. morazani, E. pygmaeus, E. samne, E. tanya, E. tepuyiensis* and *E. venezolanus*. A **neotype** is designated for *Hesperoleon atomarius* Navás 1933. An additional undescribed species from Hispaniola is known only from the larva (Fig. 284-289) recovered from the burrow of *Hutia* (Rodentia).

Twenty five species have been reared from larvae by us. Twenty one species of larvae live under rock overhangs or in caves. Larvae of *Eremoleon femoralis* (Banks) live in termite frass in rain-protected, exposed, and abandoned termite galleries and twig holes. Larvae of *Eremoleon gracile* Adams live shallowly in the protected, but medium-light zone of lizard burrows. *Eremoleon nigribasis* Banks live in the deep recesses of mammal burrows in fine decomposed organic matter. Larvae of the South American *Eremoleon punctipennis* (Banks) live in beetle frass under the logs of fallen trees. *Eremoleon pallens* Banks is one of the few truly cave species of the family, with the entire life cycle carried out in the inner, dark recesses of caves or mine shafts, although larvae also were found in smaller, dark, organic caves.

Eremoleon petrophila Miller and Stange from the Dominican Republic lives on bare rock in similar fashion to larvae of *Navasoleon* Banks and, like *Navasoleon,* has abdominal scolus-like processes.

One interesting biological feature of this genus is that at least the adults of a few species are known to prey on other antlions. This was observed with *Eremoleon nigribasis* Banks in California [preys on *Scotoleon longipalpis* (Hagen)] and *Eremoleon insipidus* Adams in Baja California [preys on *Paranthaclisis congener* (Hagen)]. Both of these species have unusually large pretarsal claws. Another interesting characteristic of this genus is the adaptation of two species (*Eremoleon samne, Eremoleon jacumba*) to lay eggs without previous imaginal feeding, allowing them to oviposit in their protected cave habitat without risking the dangers of extra-troglobitic excursions. They feed facultatively in order to produce more eggs. This has not been observed in other genera.

Recognition characters of this genus are the elongate legs and simple tarsal claws. The only other New World genus of this tribe with these characters is *Glenurus* Hagen, which has distinctive larvae with only two mandibular teeth (as contrasted to three teeth present in *Eremoleon*). Species of *Glenurus* have much more wing suffusion, and the female posterior gonapophysis is short. Nearly all the species of *Eremoleon* have banded abdomens, which is probably an adaption for resting on the rock surface near the larval habitat providing camouflage. Wing venation, chaetotaxy and leg characters provide many of the taxonomic characters. However, the male genitalia and female terminalia are distinctive for most species.

The female terminalia provide many taxonomic characters, especially the shape of the pregenitale, the length of the posterior gonapophysis, the shape of the lateral gonapophysis and the size of the digging setae on the lateral gonapophysis and ectoproct. Often the gonapophyseal plate and/or spermatheca are not easily seen in dissected specimens (nor in the photographs presented here), and thus are of limited taxonomic value. They are not described here for species in which they were unclear.

Recognizing *Eremoleon* larvae in the field can be problematic. All known larvae of *Dimarella*, except *Dimarella totoneca* Miller, have the mandibles shorter than the head capsule measured at ventral midline. All known *Dimarella* larvae have the intertooth distance greater than the distance from the base of the first tooth to the dorsal head capsule. This separates out all *Eremoleon* species from *Dimarella*, except those that live in frass, or others that live in caves with coarser material. *Dimarella* are found in different types of ecological niches such as sand around tree bases. *Eremoleon* do not have curved upturned mandibles like *Dendroleon* Brauer. *Eremoleon* larvae are similar to many of the *Purenleon* larvae in mandible structure. The teeth of *Eremoleon* are evenly spaced except for *E. cerverinus* and *E. petrophila* in the Dominican Republic and *Eremoleon nigribasis* in the southwestern United States and northern Mexico. Most *Eremoleon* have mandibles at least as long as the head capsule measured at midline. Of the 25 species of *Eremoleon* larvae covered in this paper, only six, *Eremoleon dodsoni* n.sp., *Eremoleon femoralis (*Banks*), Eremoleon nigribasis* Banks*, Eremoleon pallens* Banks*, Eremoleon punctipennis (*Banks*),* and *Eremoleon triguttatus* (Navás) have mandibles shorter than the ventral head capsule, and four of these live in organic substrates. This adaptation of shorter mandibles appears to correspond with living in coarser substrates. The genus *Sericoleon* Esben-Peterson of coastal Chile and Peru (Fig. 290-291), with which *Eremoleon* and *Dimarella* might be confused, is separated by having the middle tooth noticeably unevenly spaced toward the distal tooth, the middle tooth being longer, and by its distribution in coastal Peru and Chile. The larvae of *Araucaleon* Banks are not distinguishable from those of common *Eremoleon*. Perhaps further taxonomic studies of the species of *Araucaleon* will result in placing them as a species group of *Eremoleon*. As with the genus *Purenleon* Stange, mandibular teeth in *Eremoleon* are spaced proportionately further out on the mandibles, and head setae are finer on the head capsules, in species preferring a finer dust substrate. In *Eremoleon* species preferring coarser larval substrates, the body setae are stouter and the teeth are placed proportionately closer to the base of the mandible. The phylogenetic relationships for many species are not clear. We are separating the 36 species into 14 species groups based on larval and adult characters. The group diagnostic characters are given in the discussion under each group. Since the adults are not commonly collected at lights, it is probable that many more undescribed species exist, especially in South America.

New parasite rearing records consist of several species of Bombyliidae and one Chalcididae, as follows: *Chrysanthrax* sp., *Dipalta* sp., and *Cyananthrax cyanopterus* (Wiedemann) parasitize *Eremoleon macer* (Hagen) and *Eremoleon vitreus* (Navas). In Venezuela, *Neodiplocampta paradoxa* (Jaennicke) was found to parasitize *Eremoleon pygmaeus*, as well as the genera *Myrmeleon* Linnaeus and *Dimarella*

Banks. Also in Venezuela, *Eremoleon pygmaeus* was parasitized by a black Chalcididae, *Hockeria eriensis* (Wallace). *Eremoleon impluviatus* (Gerstaeker) in Argentina, *Eremoleon pygmaeus* in Venezuela, *Araucaleon withycombei* (Esben-Petersen) in Venezuela, and *Eremoleon punctipennis* (Banks), were parasitized by *Chrysanthrax* nr. *ioptera* (Wiedemann). In the Dominican Republic, *Eremoleon cerverai* (Navas) was parasitized by a species of *Chrysanthrax* Osten Sacken. In Baja California, *Eremoleon jacumba* was parasitized by *Chrysanthrax junctura* (Coquillett). These parasite species identifications were made over twenty years ago by Jack C. Hall.

Methods

Larvae were preserved in 75 percent ethanol after treatment with KAAD larval fixative (solution made from kerosene, ethyl alcohol, glacial acetic acid and dioxane). Some photos of live larvae were made by camera. Most photos of larvae were made from preserved specimens, which lack the natural coloration seen in live material. Measurements, especially of the head, were done using a machinist's caliper on body parts photographed at right angles and enlarged to screen size on a computer screen. Adult photos and most larval color photography were accomplished with Auto Montage. Images of adult antlions were captured from pinned specimens. Male genitalia, after clearing in KOH and dissection, were photographed under ethanol submerged cover slips to prevent movement. After study and photographs, the genitalia were stored in microvials in glycerin associated with pinned specimens. Female terminalia, after clearing in KOH, were placed in petri dishes and covered with a microscope slide, where they were then photographed after correct positioning had been achieved. Preserved larvae were photographed under ethanol submerged microscope slides. Black and white pictures were taken with Fuji Microfile using a bellows and multiple flashes. Pictures were electronically enhanced and cleaned up using the Picasa program. Use of this program on terminalia was found to bring out visual contrast between tissues better than the use of chemical dyes.

In the descriptions, measurements of the pronotum are based on mesal width and longitudinal length of disc. Measurements of the body and wing lengths are based on FSCA specimens, and were taken as accurately as possible given several logistical challenges. For example, rarely, very small specimens were observed. Also, the abdomen of many species is often curved posteriorly and difficult to measure. Further, the wings can be somewhat deformed, especially apically. Finally, the number of flagellomeres given is a best estimate limited by difficulty in differentiating flagellomere margins, particularly in the club, which are sometimes obscured in dried specimens. Coloration characters provided are generally limited in extent in deference to the color photos, which provide much better detail than words.

Proportional measurements of larval head capsules and mandibles were used in larval keys and descriptions, despite the difficulties of taking the measurements easily. They are quite reliable, even in species with a considerable geographic range, and they are observable in the figures. The only species observed to have significant variation was *Eremoleon longior* Banks, and the mandibles of that species, even with variations, separated them from the rest of the species. Chaetotaxy, in the larval key, had to be used carefully due to some species having setal types transitional between dolichasters and simple setae, and therefore difficult to interpret. References stating that species are leg anchorers refer to the fact that many species of *Eremoleon* lay in wait for prey in thin layers of dirt or dust covering rock or hard dirt surfaces just deep enough to conceal the larva. This allows them to remain hidden, but also allows them to have their legs gripping a hard surface to prevent their bodies from being shifted or tossed about when grasping larger prey. Those which are not leg anchorers must subdue their prey by digging backward and dragging them underground. Species not anchoring their legs are collected with screen and shovel. Leg anchorers are collected by blowing away thin layers of material with an aspirator, revealing the anchored larva.

Materials

892 adult and 135 larval specimens studied are deposited in the following institutions:

BMNH — The Natural History Museum, London, England

CASC — California Academy of Sciences, San Francisco, California, U.S.A.
EMAU — Ernst-Moritz-Arndt Universitat Greifswald, Zoologisches Institut und Museum, Greifswald, Germany
EMEC — Essig Museum Entomology, U.California, Berkeley, California, U.S.A.
FSCA — Florida State Collection of Arthropods, Gainesville, Florida, U.S.A.
INPA — Colecao Sistematic da Entomologia, Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil
IZAC — Academia de Ciencias de Cuba, La Habana, Cuba
MACN — Museo Argentina de Ciencias Naturales, Buenos Aires, Argentina
MCZC — Museum of Comparative Zoology, Harvard U., Cambridge, Massachusetts, U.S.A.
MNHN — Museum National d'Histoire naturelle, Paris, France
MZBS — Museo Zoología, Barcelona, Spain
NHMW — Naturhistorisches Museum, Vienna, Austria
TAMU — Texas A & M University Insect Collection, College Station, Texas, U.S.A.
USMB — Upper Silesian Museum, Bytom, Poland
USNM — United States National Museum, Washington, D.C. U.S.A.
UVGC — Universidad del Valle, Guatemala City, Guatemala
ZMUC — Zoologisk Museum, University of Copenhagen, Copenhagen, Denmark

Eremoleon Banks

Eremoleon Banks 1901: 366, by original designation.
Type species: *Myrmeleon macer* Hagen, by original designation.
=*Glenopsis* Banks 1913: 229 (after Stange 1967: 57).
Type species: *Myrmeleon anomalus* Rambur, by original designation.
=*Incamoleon* Banks 1913c: 229 (after Stange 1970: 20; 2004: 166).
Type species: *Psammoleon punctipennis* Banks, by original designation.
=*Sosa* Navás 1914b: 218 (after Stange 1970: 10).
Type species: *Sosa conspicuus* Navás, by original designation and monotypy.
=*Segura* Navás 1914c: 18 (after Banks 1927: 71).
Type species: *Segura vitreus* Navás, by original designation and monotypy.
=*Belen* Navás 1921: 119 (after Adams 1957b: 6).
Type species: *Belen cerverinus* Navás, by original designation and monotypy.
=*Cortesius* Navás 1924: 107 (after Stange 1970: 20).
Type species: *Cortesius genini* Navás, by original designation and monotypy.
=*Novulga* Navás 1925: 189 (after Banks 1938: 235; Adams 1957a: 87).
Type species: *Novulga mexicana* Navás, by original designation and monotypy.
=*Dobla* Navás 1927: 428 (after Stange 1970: 20).
Type species: *Dobla arcuata* Navás, by original designation and monotypy.
=*Joergenia* Esben-Petersen 1933: 118 (after Stange 1970: 20).
Type species: *Joergenia pulchra* Esben-Petersen, by monotypy.
=*Antilloleon* Banks 1943: 168 (after Stange 1970: 20).
Type species: *Glenurus cerverai* Navás, by original designation.

Taxonomy. Navás 1916: 232 (*Incamoleon*=*Formicaleo; Glenopsis*=*Glenurus*); Stange 1967: 57 (*Incamoleon* good genus).

Key to species. Banks 1927: 70, 1942b: 144; Adams 1957a: 85-86; Stange 1999: 8-10; 2002: 284 (Costa Rica); Miller and Stange 2011: 4 (adults and larvae Hispaniola).

Further description. Banks 1927: 69; Stange 1970: 8; 2002: 283; Miller and Stange 2011: 11.

Catalog. Stange 1970: 20; 2004: 167-171.

Distribution. Caribbean; North America; South America.

Diagnosis: **Adult**: antenna long and slender, fossa separated from ocular rim by less than greatest diameter of pedicel; distal palpomere weakly to moderately swollen, palpimacula oval to circular, near middle or distal end; pronotum variable, usually longer than wide; midfemoral sense hair equal or shorter in length to forefemoral sense hair which varies from about three to 6 times the length of femur diameter; legs about equal in length except usually hindleg longer; tibia spurs variable in length, usually shorter than forecoxal length; pretarsal claws not capable of closing again distal tarsomere; forewing with anterior margin evenly curved toward apex, costal area gradually expanding from base (except *Eremoleon dodsoni* and *Eremoleon impluviatus*), at point of coalescing of subcostal and radial veins usually lower than at middle of wing; forewing radial sector originates somewhat before forking of CuA or well beyond; posterior fork of forewing vein CuA at an oblique angle to hind margin; forewing vein 2A widely separated from normal 3A before strong angle toward posterior margin; hindwing vein CuA extends nearly to forking of MP2 or somewhat beyond; male ectoproct simple without postventral lobe; male paramere usually in form of rigid plate; female ectoproct usually with weak digging setae ventrally; lateral gonapophyses transverse or elongate, separate, contiguous, or fused; posterior gonapophysis variable in length, from about 2.5 times longer than middle diameter to about 7 times length of middle diameter, usually digitiform, sometimes weakly swollen; pregenitale variable, often present with apical spine at middle; spermatheca usually elongate and hooked apically.

Larva: mandible with three teeth, length between basal tooth and distal tooth shorter or longer than that between base of mandible and basal tooth; dorsal surface of head with or without dolichasters; labial palpus with three segments; abdomen without scolus-like processes (except *Eremoleon petrophila*).

Biology. Twenty-five species have been reared by us from larvae, nearly all of which live under rock overhangs or cave mouths. However, larvae of *Eremoleon nigribasis* Banks live in the fine decomposed organic matter of mammal nests in the deep recesses of their burrows, and larvae of *Eremoleon gracile* Adams live shallowly in the rain-protected medium-light zone of lizard burrows beneath bushes. Larvae of *Eremoleon femoralis (Banks)* live in exposed, rain-protected, abandoned termite galleries and small twig holes in termite frass. Larvae of *Eremoleon punctipennis* (Banks) live in beetle frass underneath horizontal logs not in contact with the soil. The larvae of an undescribed species of *Eremoleon* live in the burrows of rodents (*Hutia* spp.). *Eremoleon pallens* Banks is one of the few species of the family capable of completing their entire life cycle in the inner, dark recesses of caves or mine shafts. They also inhabit smaller habitats such as cave mouths or rock overhangs. *Eremoleon petrophila* Miller and Stange from the Dominican Republic live on bare rock in similar fashion to larvae of *Navasoleon* Banks, and like *Navasoleon,* have abdominal scolus-like processes.

Another biological feature of this genus is that at least the adults of a few species prey on other antlions. This was observed with *Eremoleon nigribasis* Banks in California [preys on *Scotoleon longipalpis* (Hagen)] and *Eremoleon insipidus* Adams in Baja California [preys on *Paranthaclisis congener* (Hagen)]. Both of these species have larger pretarsal claws than most other species of *Eremoleon*. Yet another characteristic of this genus is the presence of two species *(E. samne, E. jacumba)* which are able to lay eggs without imaginal feeding, allowing them to lay eggs in their protected cave habitat without risking the dangers of extra-troglobitic excursions. They fly out and feed only to produce more eggs. This lack of pre-oviposition feeding has not been observed in other genera.

New parasite rearing records consist of several species of Bombyliidae and one species of Chalcididae, as follows: *Chrysanthrax* sp., *Dipalta* sp., and *Cyananthrax cyanopterus* (Wiedemann) parasitize *Eremoleon macer* (Hagen) and *Eremoleon vitreus* (Navas). In Venezuela, *Neodiplocampta paradoxa* (Jaennicke) was found to parasitize *Eremoleon pygmaeus*, as well as the genera *Myrmeleon* Linnaeus and *Dimarella* Banks. Also in Venezuela, *Eremoleon pygmaeus* was parasitized by a black chalcid, *Hockeria eriensis* (Wallace). *Eremoleon impluviatus* (Gerstaeker) in Argentina, *Eremoleon pygmaeus* in Venezuela, *Araucaleon withycombei* (Esben-Petersen) in Venezuela, and *Eremoleon punctipennis* (Banks), were parasitized by *Chrysanthrax* nr. *ioptera* (Wiedemann). In the Dominican Republic, *E. cerverai* (Navas) was

parasitized by a species of *Chrysanthrax* Osten Sacken. In Baja California, *Eremoleon jacumba* was parasitized by *Chrysanthrax junctura* (Coquillett).

Zoogeography. This genus is restricted to the Western Hemisphere, but absent in Canada and the eastern United States (east of 100 meridian). Thirteen species are restricted to North America, particularly Mexico and Central America, and constitute 2 species in the nigribasis group (southwestern U.S.A. and northern Mexico), 1 species in the pallens group (Sonora Region), 2 species in the genini group (southern Mexico to Costa Rica), 5 species in the macer group (Arizona to Honduras), and 3 species in the gracile group (southwestern U.S.A. and northern Mexico). Seven species are found only in the West Indies, with the preponderance of species on the two largest islands, Cuba (with 3 species) and Hispaniola (with 5 species).

Most South American species are known from the northern half of the continent, with the preponderance of species from Venezuela (5 species), Colombia (3 species) and Peru (3 endemic species). *Eremoleon capitatus* (Navás) is one of the most widespread species in South America (Venezuela, Peru and Brazil). The other widespread species is *Eremoleon punctipennis*, which ranges from Venezuela to Argentina along the Andean cordillera. One species (*Eremoleon impluviatus*) is found only in Bolivia, Paraguay and Argentina. *Eremoleon pulcher* (Esben-Petersen) is endemic to Paraguay. However, most of South America is poorly collected, and probably many additional species will be found in that continent, especially along the Andes and especially by collecting the larvae. Related genera from South America are *Araucaleon* Esben-Petersen, *Rovira* Navás and *Sericoleon* Esben-Petersen. The larvae of *Sericoleon* are depicted in Fig. 290-291 for comparison.

Discussion. Characters for recognizing this nemoleontine genus in the New World are the elongate legs and non-modified distal tarsomere (except *E. macer*). The only other New World genera of Nemoleontini with these characters are *Araucaleon* Withycombe, *Glenurus* Hagen and *Ripalda* Navás. Adults of *Glenurus* have much more wing suffusion, and the female posterior gonapophysis is short. The larvae of *Glenurus* are distinct in having only two mandibular teeth (three teeth in *Eremoleon*). *Ripalda* Navás is very similar to *Eremoleon* but is distinguished by the pretarsal claws which are capable of closing against specialized setal patch on ventral surface of distal tarsomere. *Araucaleon* Withycombe is also very similar to *Eremoleon* but differs mostly in wing characters by having the forewing costal area as wide as near coalescing of subcostal and radial veins, about twice as wide as at middle of wing and the hindwing falcate. Most species of *Eremoleon* have the abdomen banded, which is probably an adaption for resting on the rock surfaces providing camouflage, but most of the South American species have the abdomen almost entirely dark brown. *Eremoleon pallens* and *E. nigribasis* larvae have all clear ocelli, while most other species have some ocelli dark colored; however, all preserved larvae have the ocelli bleached out so that this character can only be used for live larvae. The arrangement of the digging setae at the posterior margin of the larval abdomen is taxonomically significant. However, sometimes some setae are broken or have fallen out of their sockets. The group characters are given in the discussion section under each group.

Included species *larva known

pulcher group

1. *Eremoleon pulcher* (Esben-Petersen)	Paraguay
2. *Eremoleon venezolanus* **new species**	Venezuela

pallens group

3. *Eremoleon pallens* Banks*	Mexico (Baja; Sonora); U.S.A. (AZ; TX)

genini group

4. *Eremoleon dunklei* Stange	Costa Rica
5. *Eremoleon genini* (Navás)	Mexico; Guatemala; Honduras

anomalus group	
6. *Eremoleon anomalus* (Rambur)*	Colombia; Ecuador; Venezuela
7. *Eremoleon attenuatus* **new species** *	Colombia
8. *Eremoleon dodsoni* Miller and Stange *	Ecuador
9. *Eremoleon impluviatus* (Gerstaecker)*	Argentina; Bolivia
10.*Eremoleon monagas* **new species***	Venezuela
11.*Eremoleon peterseni* (Banks)	Peru
macer group	
12. *Eremoleon durangoensis* **new species**	Mexico (Durango)
13. *Eremoleon longior* Banks*	Mexico (Yucatan)
14. *Eremoleon morazani* **new species***	Honduras; Mexico (Oaxaca)
15. *Eremoleon macer* (Hagen)*	Mexico
16. *Eremoleon vitreus* (Navás)*	Mexico (Chiapas; Colima; Morelos; Oaxaca; Puebla; Veracruz); Honduras
cerverinus group	
17. *Eremoleon cerverai* (Navás)*	Cuba; Hispaniola
18. *Eremoleon cerverinus* (Navás)*	Cuba; Hispaniola
19. *Eremoleon jamaica* **new species***	Jamaica
20. *Eremoleon ornatipennis* (Alayo)	Cuba
21. *Eremoleon petrophila* Miller and Stange*	Hispaniola
22. *Eremoleon phasma* Miller and Stange*	Hispaniola
Eremoleon sp.	Hispaniola
femoralis group	
23. *Eremoleon femoralis* (Banks)*	Mexico (Baja); U.S.A. (Arizona)
gracile group	
24. *Eremoleon gracile* Adams*	Mexico (Baja California); U.S.A. (CA)
25. *Eremoleon jacumba* **new species***	Mexico (Baja California); U.S.A. (CA)
26. *Eremoleon tanya* **new species**	U.S.A. (Arizona)
capitatus group	
27. *Eremoleon capitatus* (Navás)	Brazil; Peru; Venezuela
triguttatus group	
28. *Eremoleon inca* **new species***	Peru
29. *Eremoleon triguttatus* (Navás)*	Honduras; Mexico (Yucatan)
adonis group	
30. *Eremoleon adonis* Miller and Stange	Colombia
31. *Eremoleon samne* **new species***	Peru
pygmaeus group	
32. *Eremoleon pygmaeus* **new species***	Venezuela
33. *Eremoleon tepuyiensis* **new species***	Venezuela
nigribasis group	
34. *Eremoleon insipidus* Adams	Mexico (Baja California); U.S.A. (California)
35. *Eremoleon nigribasis* Banks*	Mexico (Baja California); U.S.A.
punctipennis group	
36. *Eremoleon punctipennis* (Banks)*	Venezuela to Argentina

Key to species of *Eremoleon* Banks

Note. Caution should be used in keying out species. The setae, especially the femoral sense hair of the adult, can be broken. The quality of the photos of the female terminalia varies considerably. Sometimes the spermatheca and gonapophyseal plate are not visible, but these structures are of limited taxonomic importance.

Adults:

1 Forewing costal area narrowing toward stigma, costal cells before stigma about 1/2 as high as above radial sector (Fig. 74); wing veins nearly all pale brown; forewing and hindwing with prominent dark spot; antennal flagellomere 3 wider than long (pulcher group) (South America) **2**

— Forewing costal area as high or higher proximad of stigma as above radial sector (Fig. 111); wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; wings with or without spots; antennal flagellomere 3 wider than long to longer than wide . **3**

2(1). Hindwing abruptly narrowed toward apex, lanceolate (Fig. 74), with two well-separated dark brown spots; pronotum and mesoscutellum nearly completely bright yellow (Fig. 1) (Paraguay) ..... ***Eremoleon pulcher*** **(Esben-Petersen)**

— Hindwing not abruptly narrowed toward apex (Fig. 75), with one or two spots; pronotum and mesoscutellum mostly dark brown (Fig. 2) (Venezuela) ..... ***Eremoleon venezolanus*** **Miller and Stange**

3(1). Forewing costal area about as wide as radial vein above radial sector (Fig. 111); distal tarsomere longer than other tarsomeres together; wings frequently sexually dichromatic, female with at least two dark brown spots on forewing, one dark brown spot on hindwing, male usually without dark brown spots on wings (punctipennis group) ..... ***Eremoleon punctipennis*** **(Banks)**

— Forewing costal area at least 1.5 times wider than radial vein at radial sector; distal tarsomere shorter than other tarsomeres together; wings not sexually dichromatic **4**

4(3). Hindleg with pretarsal claw as long as or slightly longer than basitarsus (Fig. 72) (southwest U.S.A.) (nigribasis group) ..... ***Eremoleon nigribasis*** **Banks**

— Hindleg with pretarsal claws shorter than basitarsus **5**

5(4). West Indian species (cerverinus group) **6**

— Continental species **11**

6(5). Mesoscutellum with elongate, erect, white setae, some of which are at least 1/3 length of scutellum (Fig. 20) **7**

— Mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum (Fig. 22) **9**

7(6). Antennal flagellomere 3 broader than long (Hispaniola; Cuba) ..... ***Eremoleon cerverinus*** **(Navás)**

— Antennal flagellomere 3 with length co-equal to or greater than width **8**

8(7). Female ectoproct and lateral gonapophysis with several small black digging setae; posterior gonapophysis finger-like, about 3 times longer than wide (Fig. 158) (Jamaica) ..... ***Eremoleon jamaica*** **Miller and Stange**

— Female ectoproct and lateral gonapophysis without digging setae (Fig. 160); posterior gonapophysis thumb-like, about twice as long as wide; (Hispaniola) ..... ***Eremoleon petrophila*** **Miller and Stange**

9(6). Pronotum nearly all pale yellow with many erect white setae; antennal scape with small basal dark brown spot posteriorly (Fig. 22) (Hispaniola) ..... ***Eremoleon phasma*** **Miller and Stange**

— Pronotum at least 1/2 light brown on paler background; with all setae dark brown; antennal scape unmarked posteriorly **10**

10(9). Forewing with oblique dark brown stripe from origin of radial sector to area beyond cubital fork (Fig. 92), and dark brown spots concentrated in basal 1/4 and apical field; forewing costal cells near middle of wing less than twice as high as wide (Cuba; Hispaniola) ..... ***Eremoleon cerverai*** (**Navás**)

— Forewing with oblique dark brown stripe restricted to area between forks of CuA , and numerous dark brown spots (Fig. 95) scattered on most of wing; forewing costal cells near middle of wing more than 3 times higher than wide (Cuba) ..... ***Eremoleon ornatipennis*** (**Alayo**)

11(5). Mesoscutellum with elongate, erect white setae, some of which are at least 1/3 length of scutellum (North America) (macer group) **12**

— Mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum (U.S.A. to Argentina) **15**

12(11). Fore femoral sense hair much longer than tibial spurs; basitarsus of foreleg about 4 times longer than greatest diameter (Fig. 53) (Honduras; Mexico) ..... ***Eremoleon morazani*** **Miller and Stange**

— Fore femoral sense hair shorter than tibial spurs; basitarsus of foreleg no more than 3 times longer than greatest diameter (Fig. 51) **13**

13(12). Pretarsal claws longer than basitarsus of foreleg; distal tarsomere swollen apically with concentration of setae on distal 1/2 of ventral surface (Fig. 52) (Mexico) ..... ***Eremoleon macer*** (**Hagen**)

— Pretarsal claws shorter than basitarsus of foreleg; distal tarsomere not swollen and without concentration of setae (Fig. 55) **14**

14(13). Foretibia with numerous long white setae in addition to black ones (Fig. 47-48); forewing posterior area about 3/4 as high as prefork area immediately proximal to cubital fork (Fig. 87) (Mexico: Durango) ..... ***Eremoleon durangoensis*** **Miller and Stange**

— Foretibia without white setae or with only a few near base (Fig. 54); forewing posterior area less than 1/2 as high as prefork area just before cubital fork (Fig. 91) (Mexico) ..... ***Eremoleon vitreus*** (**Navás**)

15(11). Forewing costal area high (Fig. 78-80), often with interconnected cross veins, much higher above origin of radial sector than greatest presectoral height (except *E. monagas*); hindwing longer than forewing, in repose, hindwing extends beyond apex of forewing **16**

— Forewing costal area above origin of radial sector equal to or lower than greatest presectoral height (Fig. 93), usually no interconnected cross veins; hindwing same length as forewing, in repose, hindwing apex coincides with forewing apex **22**

16(15). Forewing costal area biareolate (sometimes triareolate) for at least one-half length (Fig. 78); thoracic pleura with complete lateral dark brown stripe dorsally in marked contrast to pale brown area ventrally (Fig. 39) (Mexico; Central America) (genini group) **17**

— Forewing costal area with single series of cells for entire distance (Fig. 82); thoracic pleura usually without dark brown stripe dorsally (except *E. impluviatus*) (rarely 1 or 2 interconnected cross veins) (anomalus group) (South America) **18**

17(16). Forewing with prominent sinuate line originating near hind border and vein CuA2 (Fig. 79); middle diameter of eye longer than interocular distance (Costa Rica; Guatemala; Mexico) .... ***Eremoleon genini*** (**Navás**)

— Forewing without prominent sinuate line (Fig. 78); middle diameter of eye about equal to interocular distance (Costa Rica) ..... ***Eremoleon dunklei*** **Stange**

18(16). Mesopleuron with dark brown stripe dorsally in marked contrast to pale brown beneath (Fig. 44); hind basitarsus about 4 times longer than wide (Fig. 44) (Argentina; Bolivia) .... ***Eremoleon impluviatus*** (**Gerstaecker**)

— Mesopleuron without well-defined dark brown stripe dorsally (Fig. 43); hind basitarsus more than 5 times longer than wide (Fig. 43) **19**

19(18). Forewing costal area abruptly expanded near base, cells above radial sector more than 3times higher than wide (Fig. 83) (Ecuador) ..... ***Eremoleon dodsoni*** **Miller and Stange**

— Forewing costal area gradually expanded at base, cells above radial sector no more than 2.5 times higher than wide (Fig. 85) **20**

20(19). Hind basitarsus shorter than distal tarsomere (Fig. 45) (Venezuela) .... ***Eremoleon monagas*** **Miller and Stange**

— Hind basitarsus as long as or longer than distal tarsomere (Fig. 41) **21**

21(20). Forewing costal cells proximal to stigma more than 1.5 times higher than those above cubital fork (Fig. 86); forecoxa with white setae shorter than coxal width; hindfemur without broad dark brown apical ring (Peru) ..... ***Eremoleon peterseni*** (**Banks**)

— Forewing costal cells before stigma about as high as those above cubital fork (Fig. 81; forecoxa with white setae much longer than coxal width; hindfemur with broad dark brown apical ring (Venezuela) ..... ***Eremoleon anomalus*** (**Rambur**)

22(15). Antennal flagellomere 3 broader than long **23**

— Antennal flagellomere 3 as long as or longer than broad **27**

23(22). Hindwing medial area at highest point wider than width of rest of wing dorsally (Fig. 77); (pallens group) ..... ***Eremoleon pallens*** **Banks**

— Hindwing medial area at highest point narrower than width of rest of wing dorsally (about equal in *E. insipidus)* **24**

24(23). Forewing radial sector originates at midpoint of wing (Fig. 99); (southwestern United States; northern Mexico) (femoralis group) ..... ***Eremoleon femoralis*** (**Banks**)

— Forewing radial sector arises at about 40 percent of wing length or less (Fig. 75, 103. 104); costal cells above radialsector higher than wide or wider than high **25**

25(24). Forewing costal cells anterad of radial sector higher than wide (Fig. 104; distal palpomere of labium pale and slender, not much thicker than distal palpomere of maxillary palpus (Peru) . ..... ***Eremoleon inca*** **Miller and Stange**

— Forewing costal cells above radial sector wider than high (Fig. 76, 105); distal palpomere of labium brown and swollen, twice as thick as distal palpomere of maxilla **26**

26(25). Palpimacula located at center of distal palpomere; no dark brown markings on wings; hind tibial spurs reaching distal end of tarsomere I; hind pretarsal claws large, about equal to length of basitarsus (southwestern U.S.A.) ..... ***Eremoleon insipidus*** **Adams**

— Palpimacula located at distal end of distal palpomere; hindwing with distinct dark brown markings at level of union of vein Sc and R; hind tibial spurs reaching distal end of tarsomere II; hind pretarsal claw about equal to 1/2 length of basitarsus (Mexico; Honduras) .... ***Eremoleon triguttatus*** **(Navas)**

27(22). Hind basitarsus 5 times or more longer than middle diameter **28**
— Hind basitarsus 4 times or less longer than middle diameter **31**

28(27). Forewing costal area at least moderately high, with costal cells at most about as wide as high; mesoscutum without bristle-like white setae, although sometimes many elongate hair-like setae present; foretibia mostly pale brown, without decumbent white setae; male tergite III without scale-like sculpturing **29**
— Forewing costal area narrow with costal cells about twice as wide as high; mesoscutum with several bristle-like white setae anterior to mesoscutellum; foretibia mostly infuscate with many decumbent and somewhat flattened white setae; male tergite III with scale-like sculpturing (pygmaeus group) **30**

29(28). Mesoscutellum predominately pale brown; forecoxa without white setae; hind basitarsus shorter than distal tarsomere (Yucatan, Mexico) ..... ***Eremoleon longior* Banks**
— Mesoscutellum predominately dark brown; forecoxa with white setae; hind basitarsus about as long as distal tarsomere (Colombia) ..... ***Eremoleon attenuatus* Miller and Stange**

30(28). Distal palpomere mostly black; distal tarsomere mostly black; forewing more than 30 mm long; pronotum with mostly erect setae black (Gran Savanna, Venezuela) ..... ***Eremoleon tepuyiensis* Miller and Stange**
— Distal palpomere and distal tarsomere mostly pale brown; forewing less than 25 mm long; pronotum with mostly erect setae white (Venezuela) ..... ***Eremoleon pygmaeus* Miller and Stange**

31(27). Hind basitarsus about 4 times longer than mean diameter (Fig. 62-64); forewing costal cells above cubital fork wider than high (Arizona; California; Baja California) (gracile group) . **32**
— Hind basitarsus at most 3 times longer than mean diameter (Fig. 64); forewing costal cells above cubital fork sector about as high as wide or higher than wide (South America) **34**

32(31). Vertex mostly pale brown with prominent sublateral dark brown spot at middle, anterior vertex row of brown markings absent (Fig. 25) ..... ***Eremoleon jacumba* Miller and Stange**
— Vertex with dark brown bands as anterior vertex row (Fig. 26) **33**

33(32). Moderate size species (body length ca. 26 mm.); female posterior gonapophysis ca. 4x longer than median width; lateral gonapophysis elongate in ventral view (Fig. 167-168) (Dragoon Mts., Arizona) ..... ***Eremoleon tanya* Miller and Stange**
— Small species (body length ca. 21 mm.); female posterior gonapophysis ca. 3x longer than median width; lateral gonapophysis transverse in ventral view (Fig.165) ..... ***Eremoleon gracile* Adams**

34(31). Forewing radial sector originates more than twice length of distal presectoral crossvein from cubital fork (Fig. 103); forefemur dark brown on exterior face with numerous decumbent white setae (Venezuela; Peru; Brazil) (capitatus group) ..... ***Eremoleon capitatus* (Navás)**
— Forewing radial sector originates less than twice length of distal presectoral crossvein from cubital fork (Fig. 106-107); forefemur mostly pale brown without decumbent white setae (Colombia) (adonis group) **35**

35(34). Hind basitarsus longer than distal tarsomere (Fig. 69); pedicel mostly pale brown posteriorly (Peru) ..... ***Eremoleon samne* Miller and Stange**
— Hind basitarsus shorter than distal tarsomere (Fig. 68); pedicel with dark brown markings posteriorly ..... ***Eremoleon adonis* Miller and Stange**

Key to third instar larvae of Eremoleon Banks

Note. Measurements of the distance from the basal tooth to the distal tooth are taken from the anterior side of the distal tooth to the posterior side of the basal tooth. Distance from the basal tooth to the mandibular base is the distance from the posterior side of the basal tooth to the place it passes under the dorsal head capsule. Mandibular length is measured on a straight line parallel to the main shaft of the mandible, ending where the mandible passes beneath the dorsal head capsule. Head length is measured ventrally along the midline. In the larva, the digging setae often fall out of the sockets and some of the photos are asymmetrical for this reason, but key characters are nevertheless present.

1. Abdomen with short lateral scolus-like processes (Fig. 233-234); head capsule with many long white, hair-like setae laterally; mandible with middle tooth closer to distal tooth than to basal tooth; found on upper surface of rock overhangs projecting from rock ceilings (Hispaniola) . ..... ***Eremoleon petrophila*** **Miller and Stange**

— Abdomen without scolus-like processes; head capsule without long, hair-like setae laterally; mandible usually with teeth nearly equidistant from one another; found in dust or soil under rock overhangs, animal burrows, twig holes or under logs in frass **2**

2(1). Mandible shorter by at least 10 percent than head capsule measured along ventral midline (Fig. 242, 275) **3**

— Mandible about equal to or slightly longer than head capsule measured along ventral midline (Fig. 240) **9**

3(2). Mesothoracic spiracle borne on tubercle at least 1.5 times longer than basal width in dorsal view (Fig. 273) **4**

— Mesothoracic spiracle borne on tubercle at most as long as basal width in dorsal view (Fig. 193, 278) **5**

4(3). Head capsule conspicuously marked ventrally with dark brown pigment (Fig. 276); abdominal segment 8 with small visible spiracles laterally which are half as high as basal width (Venezuela) ..... ***Eremoleon tepuyiensis*** **n.sp**.

— Head capsule without dark brown ventral markings (Fig. 242); no visible abdominal spiracles (Mexico; U.S.A.) ..... ***Eremoleon femoralis*** **(Banks)**

5(3). Ventral head capsule pigmented with dark brown markings laterally, and near middle (Fig. 281) **6**

— Ventral head capsule without dark brown markings except anteriorly (Fig. 191, 253) **7**

6(5). Mandible with distance between basal tooth and dorsal head capsule 60 percent of total distance between mandibular teeth (Fig. 278) (South America) .... ***Eremoleon punctipennis*** **(Banks)**

— Mandible with distance between basal tooth and dorsal head capsule about equal to total distance between mandibular teeth (Fig. 193) (Ecuador) ..... ***Eremoleon dodsoni*** **n.sp.**

7(5). Head capsule glabrous ventrally (Fig. 181); distance from basal tooth to dorsal head capsule about 30 percent of intertooth distance (U.S.A.; Mexico) ..... ***Eremoleon pallens*** **Banks**

— Head capsule ventrally with many straightly sided but flat ended setae (Fig.191); distance from basal tooth to head capsule in dorsal view at least 75 percent of intertooth distance **8**

8(7). Posterior end of abdomen ventrally with inner digging setae on rastrum about 1/2 length of next two digging setae, which are equal in length (Fig. 255); mandible no more than 70 percent length of ventral head capsule measured along midline; dorsal head capsule covered with short thick, blunt dolichasters (Fig 261) (Honduras; Mexico) ..... ***Eremoleon triguttatus*** **(Navás)**

— Posterior end of abdomen ventrally with inner digging setae on rastrum the same length as next two digging setae (Fig. 192); mandible about 90 percent length of head capsule as measured along ventral midline; dorsum of head capsule covered with stout simple setae (Colombia) .... ***Eremoleon attenuatus* n.sp.**

9(2). Entire dorsal head capsule with fine to thick pointed simple setae (Fig. 240) **10**
— Dorsum of head capsule with straight sided setae with flat ends, or tapered dolichasters, sometimes in combination with each other or simple setae (Fig. 185) **13**

10(9). Mandible with distance from basal tooth to mandibular base about equal to 85 percent of total distance between mandibular teeth (Fig.228) **11**
— Mandible with distance from basal tooth to mandibular base greater than or equal to total distance between mandibular teeth (Fig. 238) **12**

11(10). Middle tooth on mandible slightly longer than distal tooth (Fig. 292); ocelli entirely clear in living specimens; found in deep rodent nest tunnels in mixtures of dirt and fine decomposed animal feces (U.S.A., Mexico) ..... ***Eremoleon nigribasis* Banks**
— Middle tooth on mandible shorter than distal tooth; ocelli in living specimens mixture of black and clear ocelli; found in finely powdered calcium carbonate in rain-protected cliff recesses (Fig. 230) (Jamaica) ..... ***Eremoleon jamaica* n. sp.**

12(10). Distance from basal tooth to head capsule in dorsal view 110 percent intertooth distance (Fig. 238) (Dominican Republic) ..... ***Eremoleon phasma* Miller and Stange**
— Distance from basal tooth to head capsule in dorsal view ca. 130 percent intertooth distance (Fig. 207) (Yucatan, Mexico) ..... ***Eremoleon longior* Banks**

13(9). Head capsule venter with dark brown, paired, submedian marks or patterns near middle (Fig. 264) **14**
— Head capsule venter pale brown except usual anterior dark brown markings (Fig. 225, 205) **18**

14(13). Mandible with distance between mandibular teeth shorter than distance between basal tooth and anterior dorsal margin of head capsule by more than 10 percent (Fig. 255, 262) **15**
— Mandible with distance between mandibular teeth about equal to distance between basal tooth and anterior dorsal margin of head capsule (Fig. 183, 224) **16**
15(14). Ventral head capsule with mostly short, tapered dolichasters; anterior directed setae on labrum thick, elongate dolichasters about 10 times longer than width (Fig. 265) (Peru) .... ***Eremoleon samne* n.sp.**
— Ventral head capsule with elongate, straight sided, blunt ended dolichasters; anterior directed setae on labrum short (5 times longer than width)(Fig.256) (Peru) ... ***Eremoleon inca* n.sp.**

16(14). Ventral head capsule with dolichasters expanding out from base to flat ended apex (Fig. 271) (Venezuela) ..... ***Eremoleon pygmaeus* n.sp.**
— Ventral head capsule without expanded setae (Fig. 186, 223) **17**

17(16). South America ..... ***Eremoleon anomalus* (Gerstaecker)**
— Cuba; Hispaniola ..... ***Eremoleon cerverai* (Navás)**

18(13). Mesothoracic spiracle easily observed, but shorter than greatest width in dorsal view **19**
— Mesothoracic spiracle not obvious and difficult to detect in dorsal view **22**

19(18). Mandibular teeth not equally spaced, middle tooth closer to distal tooth (Fig. 226) (Hispaniola) ..... ***Eremoleon cerverinus* Navás**

— Mandibular teeth equally spaced (Fig. 204) **20**

20(19). Second digging setae from inner pair of digging setae on rastrum 1/3 length of outer pair in ventral view (Fig. 206); palpi length equal to basal width of mandible (Venezuela) .... ***Eremoleon monagas* n.sp.**

— Second digging tooth from inner pair of digging setae on rastrum subequal to outer pair in ventral view (Fig. 215); palpi 1.5 times length of basal width of mandible **21**

21(20). Mandibles without setae dorsally; intertooth distance 90 percent of distance from head capsule dorsally to base of first mandibular tooth (Fig. 212) (Mexico) .... ***Eremoleon macer* (Hagen)**

— Mandible with abundant dorsal setae; intertooth distance 115 percent of distance from head capsule dorsally to base of first mandibular tooth (Fig. 216) (U.S.A.) .... ***Eremoleon vitreus* (Navás)**

22(18). Intertooth distance 85 percent of distance from head capsule dorsally to base of first mandibular tooth (Fig. 199) (Argentina; Bolivia) .....***Eremoleon impluviatus* (Gerstaecker)**

— Intertooth distance longer than or equal to distance from head capsule dorsally to base of first mandibular tooth (North America) **23**

23(22). Intertooth distance 78 percent of distance from head capsule to base of first mandibular tooth (Fig. 244); head with greatest width posterior to eye stalks 78 percent of head capsule length measured at midline in dorsal view; dorsal prothorax with short thick dolichasters in addition to other types (California, Baja California) ..... ***Eremoleon gracile* Adams**

— Intertooth distance equal to distance from dorsal head capsule to base of first mandibular tooth; head with greatest width posterior of eye stalks 65 percent of head capsule length measured at midline in dorsal view (Fig. 247); dorsal prothorax with all short thick simple setae (California, Baja California) **24**

24(23). Central area of dorsal head capsule heavily marked with heavy double pair of submedian marks (Fig. 250); dorsal head capsule with stout dolichasters extending anteriorly and posteriorly; (southeastern Arizona) ..... ***Eremoleon tanya* n. sp.**

— Central area of dorsal head capsule unmarked (Fig. 247); dorsal head capsule with stout dolichasters anteriorly, grading to stout simple setae posteriorly (Southern California, USA**;** Baja California, Mexico) ..... ***Eremoleon jacumba* n. sp.**

pulcher group

Diagnosis: antennal flagellomere 3 wider than long; hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; forewing costal area gradually expanded at base; forewing costal area narrowing toward stigma, costal cells before stigma about 1/2 as high as above radial sector (Fig. 74); hindwing medial area at highest point lower than wing area above it; forewing and hindwing with prominent dark spot or spots; wing veins nearly all pale brown.

Discussion. The two uncommonly collected species constituting this group are allied by wing venation, with the forewing costal area narrowing toward the stigma, a trait which is distinctive within this group.

***Eremoleon pulcher* (Esben-Petersen)**
Fig. 1, 74

Joergenia pulchra Esben-Petersen 1933: 118, fig. 8, 9 (wings). **Holotype female**, Paraguay, II.1932, P. Joergensen (ZMUC).

Taxonomy. Stange 1970: 22 (in *Eremoleon*).

Further description. Stange 2010: fig. 4 (holotype photo).

Distribution. Paraguay.

Diagnosis: length of body about 15 mm, forewing length 27 mm. hindwing length 27 mm. **Coloration**: vertex mostly yellowish with dark brown transverse anterior band; antenna lemon colored with upperside on apical 1/3 with broad dark brown rings, scape with dark spot on inner side, pedicel mostly dark brown; pronotum mostly yellow with indistinct brown spots near hind margin; mesothorax and metathorax yellowish with dark brown stripes laterally above, also dark brown below wings; mesoscutellum nearly completely bright yellow; trochanters yellowish; femora blackish with yellow at base; tibiae yellowish with longitudinal black streak on underside and black apical spot; tarsi mostly dark brown with basitarsus yellowish at base; wing veins nearly all pale brown with weak brownish suffusion on subcostal cross veins; stigma nearly all yellowish; forewing with three dark brown spots, one at tip of Cu1 and Cu2, nearly at posterior margin and two in the apical third of wing; hindwing with two dark brown spots in apical 1/3; abdomen mostly black, tergites with several irregular lemon colored and greenish spots, sternites with yellowish margins posteriorly. **Chaetotaxy**: abdomen with short, whitish pubescence. **Structure**: antenna weakly clavate, but long and evenly thickened toward apex; wings slender, pronotum (Fig. 1) slightly longer than broad; forewing acute at apex, hindwing abruptly narrowed toward apex, lanceolate, without banksian lines; forewing with radial sector originating distad of Cu1 fork; hindwing with one presectoral crossvein; forewing costal area narrowing toward stigma, costal cells before stigma about 1/2 as high as above radial sector which are a little higher than wide (Fig. 74); legs slender, femora, tibiae and tarsi almost of equal length; basitarsus as long as tarsomeres II and III together; distal tarsomere as long as II, III and IV together; tibial spurs small and nearly straight, a little longer than basitarsus; abdomen shorter than wings.

Material studied. 1 female. February.
PARAGUAY. No further data (1f, ZMUC).

Discussion. This bright yellow species is known only from the holotype.

Eremoleon venezolanus Miller and Stange, new species

Fig. 2, 36, 75, 112, 141

Holotype female, Hato Masaguaral, 44 km. south Calabozo. Guanico, Venezuela, 11.II. 1986, R. Miller and L. Stange (1f, FSCA). Female terminalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: pronotum and mesoscutellum mostly dark brown; wing veins nearly all pale brown; forewing and hindwing with prominent dark spot; hindwing not abruptly narrowed toward apex (Fig. 74), with one spot or double spot; forewing costal area narrowing toward stigma, costal cells before stigma about 1/2 as high as above radial sector (Fig. 75).

Holotype female: length of body about 25 mm; forewing length 35 mm, width 8 mm; hindwing length 35 mm, width 7 mm. **Coloration**: antennal scape and pedicel mostly black, flagellomeres mostly brown with narrow pale brown apex; vertex with dark brown anterior band connected medially with larger dark brown posterior band; pronotum and mesoscutellum mostly dark brown; fore coxa and midcoxa mostly dark brown externally, pale brown mesally; femora nearly all dark dorsally, mostly pale brown posteriorly; tibiae mostly pale brown, small dark brown subbasal band and apical band, some dark spots at setal

bases; tarsi mostly pale brown, with dark brown apex; forewing and hindwing with prominent dark spot; wing veins nearly all pale brown; abdomen not banded, tergites dark brown with narrow posterior pale brown apex, sternites nearly all dark brown. **Chaetotaxy**: femoral and tibial setae mostly black, shorter than femur diameter; femoral sense hair inconspicuous, shorter than femur diameter. **Structure**: antenna with about 35 flagellomeres, weakly clubbed, basal flagellomere little longer than wide; legs about equal in length except for longer hindleg (Fig. 36); from forelegs to back legs, basitarsus of legs are about 2.2 and 3 times longer than middle diameter; tarsomeres II-IV about 2 times longer than middle diameter on forelegs and middle legs, and 3 times longer on back legs; distal tarsomere of all legs about 7 times longer than middle diameter; pretarsal claws short, about as long as basitarsus; tibial spurs of all legs reaching a little beyond apex of tarsomere II; pronotum about wide as long;, hindwing same length as forewing, when wings in repose; forewing gradually expanded from base, costal cells above radial sector about 1.5 times higher than wide; cubital fork well basad of origin of radial sector; hindwing not abruptly narrowed toward apex, CuA ends well before posterior fork of MP2 reaches hind margin; **female terminalia** (Fig. 141) with pregenitale a broad plate, about 4 times wider than long, weakly produced posteriorly at middle; posterior gonapophysis short, about twice as long as middle diameter bearing many apical setae some of which are 4 times longer than gonaphyseal length; gonapophyseal plate about 10 times longer than middle diameter; lateral gonapophyses elongate, about 6 times longer than middle diameter, diverging anteriorly and nearly touching posteriorly with many stout black setae which are longer than width of gonapophysis but shorter than about 12 black stout setae arrange in 3 rows on ventral margin of ectoproct; somewhat longer hair-like setae on dorsal part of ectoproct; spermatheca about 8 times longer than wide, strongly bent posteriorly.

Male paratype: similar to female but smaller; **male genitalia** (Fig. 112): gonarcus strongly arched, elongated distally, no mediuncus; paramere complex, medio-dorsal sclerite sculptured, produced apically overlapping that of other paramere; lateral sclerite larger, wide apically, strongly narrowed ventrally.

Material studied. 1 male, 1 female. February to May.
VENEZUELA. **Guanico**: Hato Masaguaral, 44 km. south Calabozo, 11.II. 1986, R. Miller and L. Stange (1f, FSCA); Guanico, 100 m., V.1958 (1m, FSCA).

Discussion. The holotype specimen was captured in a flight interceptor trap.

Etymology. Species named after country of origin.

pallens group

Diagnosis: antennal flagellomere 3 broader than long; forewing costal area gradually expanded at base; forewing costal area narrow with cells about twice as wide as high anterad of radial sector, as high or higher proximal to stigma as anterad of radial sector (Fig. 77); hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; hindwing medial area at broadest point broader than wing area anterior to it; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; wings without prominent dark brown spots.

Discussion. The single species assigned to this species group is pale brown with nearly unmarked broad wings. The unique group character is the hindwing which has the medial area at highest point wider than the rest of the wing area above it. No other known species of *Eremoleon* has this character. This is the only true cave antlion known from the New World.

***Eremoleon pallens* Banks**
Fig. 4, 38, 77, 114, 143, 178-182

Eremoleon pallens Banks 1941: 101. **Syntypes**, Picacho Peak, Arizona, VII.23, Bequaert, Tinkham, Flock (MCZC).

=*Eremoleon sectoralis* Adams 1957b:7, fig. 1 (wings, labial palp, male genitalia labeled as *E. cerverinus*) (after Stange 2004: 170). **Holotype female**, 5 miles south San Miguel, Lower California, 20.VII.1938, Michelbacher and Ross (CASC).

Biology. Miller and Stange 1990: 156-157, fig. 9 (photo of larva).

Further description. Adams 1957a: 92, fig. 18, 26 (male genitalia, labial palp).

Distribution. Mexico; U.S.A.

Diagnosis: length of body about 21-23 mm, forewing length 22-24mm.; abdomen about 16 mm, third abdominal tergite of male about 3.6 mm. **Coloration**: general coloration pale brown; lower face and mouthparts pale, frons and vertex fuscous; vertex scars (Fig. 4) brown suffused, two lateral spots of second vertex row are fused; scape shiny brown, pedicel brown above; antennal scape unmarked posteriorly; pronotum at least 1/2 light brown on paler background with all setae dark brown; legs pale, sometimes brown dotted at setal bases; brown bands at apex of femur, near base and at apex of tibia and apex of distal tarsomere; venation mostly brown, some pale streaks along main veins of forewing and C, Sc and R in hindwing; faint brown spots at stigma, apex of hypostigmatic cell, rhegma and end of CuA2 in forewing; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen brown fuscous, without distinct markings; many sternites pale brown especially sternites II-III and VII to X. **Chaetotaxy**: midfemoral sense hair much shorter than forefemoral sense hair which is about 3 times longer than femur diameter; setae mostly dark brown, except some pale setae on frons, clypeus, cervical sclerites, mesopleura and metapleura, base of forecoxa, and abdominal sternites II and III; setae on apex of abdominal tergite IX and posteroventral portion of X short, black, stout, and decumbent with tips flattened, expanded and blunt. **Structure**: antennal flagellomere 3 broader than long; labial palpus slender, palpimacula located about in middle; pronotum (Fig. 4) slightly longer than wide; foretibial spurs (Fig. 38) equal to basal three and one half tarsomeres, hindtibial spurs equal to basal two and one half tarsomeres; distal tarsomere of foretarsus cylindrical, length 0.37 times that of entire tarsus; pretarsal claws shorter than hind basitarsus; wings (Fig. 77) broad with basal costal veinlets widely spaced; without cross veins from first few branches of Rs; forewing costal area as high or higher before stigma as above radial sector; forewing with basal costal veinlets widely spaced, cross veins absent from first few branches of radial sector; hindwing medial area at highest point higher than wing area above it; **male genitalia** (Fig. 114) with gonarcus strongly arched, apices simple, mediuncus absent, but with large weakly pigmented semi-membranous area medially; paramere large broad plate, wider than long, weakly sculptured in part and more strongly sclerotized along anterior and medial margins, parameres widely separated with setose membranous sac between them and extensive setose membrane at posterior margin; **female terminalia** (Fig. 143) with pregenitale nearly rhomboidal with central small depression; posterior gonapophysis about 4 times longer than middle diameter, slightly narrowed medially, with some setae longer than gonapophysis; gonapophyseal plate well developed, more than 12 times longer than middle diameter, broader basally than apically; lateral gonapophyses transverse, about 2 times wider than long, well separated with long black setae which are about 2 times longer than width of gonarcus and about as long as setae on ventral surface of ectoproct; spermatheca elongate, over 12 times longer than middle diameters, strongly hooked apically.

Larva (Fig. 178-182). **Coloration**: color predominantly pale straw with light brown markings on dorsal head (Fig. 178); ocelli all clear and unpigmented (living material); mandibles pale brown. **Chaetotaxy**: ventral abdomen with sparse, pale, unexpanded dolichasters; ventral thorax with fine, long, simple setae; ventral head glabrous; dorsal head with unexpanded dolichasters posteriorly and bead-like setae anteriorly; thorax and abdomen with unexpanded dolichasters dorsally; rastrum with digging setae increasing evenly from short central pair to elongate outer pair (Fig. 182). **Structure**: basal area of mandible between basal tooth and where mandible passes beneath dorsal head capsule one third inter-tooth dis-

tance of first and third tooth; mandibular length 48 percent of ventral head capsule; palpi longer than basal width of mandible.

Biology. This is the only known true cave dwelling antlion in the Western Hemisphere. The pale adults and larvae are able to remain in the dark recesses of a large cave or mine shaft. In the bat cave, the larvae feed on dermestids and other insects associated with bat guano. The adults, on the other hand, eat bat parasites, causing their abdomens to appear to be filled with blood. In large deep caves or mines, the larvae live in mounds of decomposed bat guano, dermestid feces, and shed skins of dermestid larvae. In smaller habitats, such as small caves or overhangs occupied by rodent nests, they are found in the darkest zone in fine decomposed organic matter mixed with rodent feces. They are always associated with some type of organic matter supporting the dermestid larvae on which they feed. Adults emerging from small caves or overhangs undoubtedly fly out into the environment to feed. In most localities the larvae occur alone in the dark recess of the cave, but in central Baja California, they were found to share the dark zone of the cave with an undescribed species of *Scotoleon*, which also has unpigmented ocelli. The *Scotoleon* larva lives in decomposed volcanic rock adjacent to organic matter containing *Eremoleon pallens*.

Material studied. 77 males, 53 females, 14 larvae. March to July.
MEXICO. **Baja California**: five miles south San Miguel, 20.VII.1938, Michelbacher and Ross (holotype female of *E. sectoralis*, CASC); Juncalito beach, near Loreto, large cave, **reared**, 12.VII.1983, L. Stange and R. Miller (1larva, 4m, 6f, FSCA); 22 mi. S. Mulege, small volcanic cave, 21.VI-1983, R. Miller, L. Stange, (1 larva, FSCA); **Sinaloa**: 16 miles west Los Mochis, 19.III.1968, **reared**, L. Stange and R. Miller (4 larvae, 5m, 6f, FSCA). U.S.A. **Arizona**: Picacho Peak State Park, Pinal County, mine shaft, 8.VII.1983, **reared**, R. Miller and L. Stange (8 larvae, 68m, 45f, FSCA; TAMU; USMB). **Texas**: Upper end Health Canyon airstrip near south end TX rd. 2627, Brewster County 29.45105N 102.83733W, 5760 m, 5.VIII.2010, Oswald, Diehl and Hanrahan (1m, TAMU).

Discussion. Adams (1957b:7) proposed *Eremoleon sectoralis* as a distinct species similar to *Eremoleon pallens* but differing in wing shape, number of rows of cells in the cubital field of the hindwing, coloration of the pedicel and scape and legs (dark spots) and pointed, straight setae on the 9th abdominal tergite of the female. However, examination of a long series of *Eremoleon pallens* does not support this species separation. The larva has short mandibles and appears unique in the genus in having the venter of the head capsule glabrous (Fig. 181).

genini group

Diagnosis: antennal flagellomere 3 about as long as wide; hind basitarsus about 5 times longer than middle diameter; mesoscutum without bristles; foretibia without decumbent hair; forewing costal area gradually expanded at base; hindwing longer than forewing, in repose hindwing extends beyond forewing; forewing costal area high (Fig. 78), with interconnected cross veins, much higher above origin of radial sector than greatest presectoral height; thoracic pleura with dark brown stripe dorsally in marked contrast to pale brown beneath; forewing with prominent dark brown areas or stripes; hindwing medial area at highest point lower than wing area above it.

Discussion. These large ant lions are distinctive in the genus by having numerous cross veins connecting the subcostal veinlets in the forewing costal area. Also characteristic of the species in this group is having thoracic pleura with complete dark brown stripe dorsally in marked contrast to pale brown beneath. This group appears to be closely related to the anomalus group based on male genitalia and wing characteristics.

***Eremoleon dunklei* Stange**
Fig. 5, 39, 78)

Eremoleon dunklei Stange 1999: 5, fig. 1-3 (habitus; head; vertex and nota). **Holotype male**, Monteverde, Puntarenas Province, Costa Rica, 26.II.1987, S. Dunkle (FSCA).

Further description. Stange 2002: 284, fig. 632-635 (habitus; head; vertex and nota).

Distribution: Costa Rica.

Diagnosis: length of body about 29 mm, forewing length 34 mm; hindwing length 36 mm. **Coloration**: pale brown with extensive dark brown coloration, especially on nota; face mostly pale brown with broad dark brown band beneath antennal scoli, faint dark brown spot sublaterally on frons; mouthparts pale brown except for dark brown cardo and stipes, dark brown area on base of prementon extended weakly anteriorly; antenna pale brown with dark brown on anterior surface of scape, pedicel, and basal flagellomeres, darkening apically until about flagellomere 19, after this mostly pale brown, but apical flagellomeres dark brown; vertex (Fig. 5) pale brown with sublateral dark brown area and submedian dark brown area on anterior row of vertex scars, dark brown area medially on middle row of vertex scars connected to similar dark brown area at posterior row, diffuse dark brown areas elsewhere; pronotum pale brown with broad, dark brown stripe medially which is prolonged laterally at anterior margin; mesonotum and metanotum mostly dark brown with light brown areas sublaterally; pleura (Fig. 39) pale brown with complete dark brown stripe extending from propleuron to metapleuron, mesopleura with light brown above and below stripe; coxae pale brown except forecoxa basally and medially with dark brown; forefemur predominately dark brown with pale brown basally and on some of closing surface; midfemur and hindfemur predominately pale brown but with extensive dark brown at middle and apical margin; tarsi pale brown with tarsomeres II-IV mostly dark brown, apex of distal tarsomere dark brown; forewing with reduced dark brown suffusion, without sinuate line, small dark brown areas along posterior margin, rhegma, and along radial vein; major veins (except costa) alternating dark and light brown, crossveins mostly dark brown, some white crossveins; hindwing nearly unmarked; abdomen with tergites and sternites mostly light brown basally, mostly dark brown on segments V-VIII. **Chaetotaxy**: head with elongate, white setae on clypeus, frons and postmentum, elsewhere sparse with short, dark brown, prostrate setae on vertex; pronotum with 6 to 7 elongate, white setae laterally on posterior half, shorter setae on anterior and posterior margins; pteronotum nearly denuded of setae; fore coxa with many elongate, white setae on posterior face, some of which longer than width of coxa; forefemoral and midfemoral sense hair about equal in length, about 3 times longer than greatest femur diameter; femora with white and black elongate setae, most of which longer than diameter of femur, longest are white setae at base of closing face; setae on tibiae mostly black; abdomen with some long setae on basal tergites, rest of abdomen with short setae except for numerous elongate, black setae on ectoproct and segments V-VIII. **Structure**: antenna elongate, about 34 flagellomeres, clava strong, antennal flagellomere 3 about as long as wide; distal palpomere of labium not much swollen, palpimacula oval and about in center; head with vertex moderately raised above eyes, greatest ocular width less than inter ocular distance at middle; pronotum (Fig. 5) about as long as wide; scutelli not bulging, nearly flat; legs (Fig. 39) similar in length, midleg longer than foreleg but shorter than hindleg; femora not swollen; forefemur and midfemur longer than tibiae, hindfemur shorter than hindtibia; tibial spurs of foreleg and midleg reach beyond tarsomere III, those of hindleg reach to about apex of tarsomere III; basitarsus of foreleg and midleg about 3 times longer than greatest diameter, that of hindleg about 5 times longer than greatest diameter; pretarsal claws about 1/3 as long as tibial spurs; forewing (Fig. 78) costal area high, biareolate for at least 1/2 length, much higher above origin of radial sector than greatest presectoral height; subcostal area as high before stigma as above origin of radial sector; hindwing medial area at highest point lower than wing area above it; abdomen shorter than wings, broadened posteriorly, without scales on tergites and sternites; **male genitalia** with simple ectoproct, male paramere plate-like, about twice as long as greatest width.

Material studied. 1 male. February.
COSTA RICA. **Puntarenas**: Monteverde, 1400', 26.II.1987, S. Dunkle (1m, FSCA)

Discussion. This species is easily distinguished from all other known species of *Eremoleon*, except *E. genini* (Navas), by the broadened forewing costal area with most cross veins interconnected. The forewing markings renders it distinct from *E. genini* which has a prominent sinuate brown stripe originating near the hind border and vein CuA2. The male paramere is about twice as long as greatest width in *E. dunklei* whereas in *E. genini* the paramere is about 3 times longer than greatest width. Also, the wings are proportionally more elongate in *E. dunklei* than in *E. genini*, the eye is smaller in *E. dunkei* and the male lacks prominent scales on the abdominal tergites and sternites.

Etymology. This species is name for the collector of the holotype, Sidney Dunkle.

***Eremoleon genini* (Navás)**
Fig. 6, 40, 79, 144)

Cortesius genini Navás 1924: 108, fig. 4 (wings). **Syntypes**, Vera Cruz, Mexico, 1921 (MNHN).
=*Dobla arcuata* Navás 1927: 428 (after Stange 1970:21). **Holotype female**, San José, Costa Rica (MNHN).

Taxonomy. Stange 1970: 21 (in *Eremoleon*).

Further description. Navás 1928: 34; Stange 2002: 284, fig. 636-637 (wings; dorsal view head and thorax of adult).

Distribution. Mexico; Guatemala; Costa Rica.

Diagnosis: length of body about 27-29 mm., forewing length 32-36 mm, width 7-9 mm; hindwing length 36-38 mm, width 6-7 mm. **Coloration**: face pale brown with large dark brown transverse band below antennae extending lateral to ocular rim and dorsally toward anterior vertex row; antenna with scape dark brown basally, light brown apically; pedicel pale brown anterior, dark brown posterior; flagellomeres 1 to about 21 dark brown anteriorly, pale brown posteriorly, flagellomeres 22 to about 28 mostly pale brown, club (about 10 flagellomeres) mostly dark brown; vertex pattern (Fig. 6) complex, mostly pale brown anteriorly, middle row with two submedial spots and laterally with short dark brown stripe, posteriorly with dark brown median spot and sublateral dark brown areas; pronotum mostly pale brown with broad submedian dark brown stripe, stripes narrowly connected near middle and extended laterally at anterior end; mesoscutum mostly dark brown, with pale brown submedial stripe divided by dark brown stripe; scutelum mostly pale brown with broad submedian dark brown stripe; metanotum mostly dark brown with narrow median pale brown stripe enlarging posteriorly; forewing (Fig. 79) with prominent sinuate line originating near hind border and vein CuA2; abdomen mostly dark brown with tergite III with large pale brown area basally narrowing to thin stripe posteriorly; other tergites with some pale brown markings especially posteriorly before female terminalia which are nearly black. **Chaetotaxy**: head with elongate, white setae on clypeus, frons and postmentum, elsewhere sparse with short, dark brown; very small, decumbent setae on vertex; pronotum with several elongate, white setae laterally on posterior half, long erect dark brown setae on pronotal disc, shorter setae on anterior and posterior margins; pteronotum nearly denuded of setae; metapleuron with several elongate white setae, especially ventrally; forecoxa with many elongate, white setae on posterior face, some of which longer than width of coxa; forefemoral and midfemoral sense hair about equal in length, about 4 times longer than greatest femur diameter; femora with white and black elongate setae, most of which longer than diameter of femur, longest are white setae at base of closing face; setae on tibiae mostly black, all black on hind tibial; abdomen with some long setae on basal tergites, rest of abdomen with short setae except for numerous elongate, black setae on ectoproct and segments V-VIII. **Structure**: antenna with about 38 flagellomeres, flagellomere 3 about as long as wide; distal labial palpomere elongate, weakly swollen, palpimacula oval, situated near center; greatest ocular width greater than greatest interocular distance; pronotum (Fig. 6) longer than broad; mesoscutellum nearly flat; legs (Fig. 40) about equal in length; tibial spurs long and apically hooked, those of foreleg and midleg reaching beyond tarsomere III, those of hindleg reaching to about apex of tarsomere II; hind basitarsus about 5 times longer than middle diameter, about 1/2 length

of distal tarsomere; hindwing (Fig. 79) longer than forewing, in repose extending beyond apex of forewing; forewing costal area high (fig. 79), biareolate (sometimes triareolate) for at least 1/2 length, much higher above origin of radial sector than greatest presectoral height; abdomen shorter than wings with small whitish scales at least on tergites and sternites III-VI; **male genitalia** with simple ectoproct, male paramere plate-like, about 3 times as long as greatest width; **female terminalia** (Fig. 144) with pregenitale with central spine small, borne on broad, rectangular sclerite, posterior gonapophysis about 5 times longer than middle diameter, some setae about long as gonapophysis, somewhat swollen toward apex; gonapophyseal plate dark brown, about 10 times longer than middle diameter, broadest near gonapophyseal base; lateral gonapophyses, narrow, transverse, fused, with elongate black setae longer than length of gonapophysis but shorter than many black setae on ventral part of ectoproct; ectoproct with elongate oval, widest ventrally, narrower dorsally, with elongate black setae ventrally which are 1/2 length shorter than many hair-like setae dorsally; spermatheca about 10 times longer than middle diameter, hooked apically.

Material studied. 1 male, 4 females. April to September
COSTA RICA. **San Jose**: San José (1f, MNHN). GUATEMALA. **Guatemala**: El Zapote, 2.V.2001, Mocias (1f, FSCA); La Ciudad, Zona15 Cayalá, 20-26.IV., 1999, R. Valdez (1m, 1 f, FSCA); Zona 12, Santa Rosita, 5.V.2001, M. L. Miller (1f, FSCA); Zona 16, Guatemala City, 26.IX.1929, C. Marcos (1f, UVGC). MEXICO. **Veracruz**: Vera Cruz (1f, MNHN).

Discussion. The proportionally broader forewing with a conspicuous sinuate brown stripe near vein CuA2 readily distinguishes this species from the closely related *E. dunklei*. Unfortunately the only male specimen seen now lacks the posterior part of the abdomen.

anomalus group

Diagnosis: antennal flagellomere 3 at least as long as wide; distal palpomere of labius weakly swollen, palpimacula oval or circular, situated near center; forefemoral sense hair about equal to that of midfemur, about 3 times as long as femoral diameter; forewing costal area gradually expanded or abruptly expanded at base; hindwing longer than forewing, in repose hindwing extends beyond apex of forewing; forewing costal cells above radial sector higher than wide, sometimes 3 times higher than wide; sometimes with few interconnected cross veins; hindwing medial area at highest point lower than wing area above it; wings without prominent dark brown spots although with brown suffusion especially in apical field; male genitalia with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 6 times longer than middle diameter, nearly touching near gonarcus but broadly diverging posteriorly; female terminalia with pregenitale small, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6 times longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Discussion. The six species constituting this group are large-bodied species that have the forewing costal area broad (Fig. 80) (except *Eremoleon monagas*). The species are similar morphologically with nearly identical male genitalia and female terminalia and appear to be closely related to the genini group based on wing venation and male genitalia.

***Eremoleon anomalus* (Rambur)**
Fig. 7, 41, 80, 115, 145, 183-187

Myrmeleon anomalus Rambur 1842: 388. **Type** (?s), Colombia (not located)
=*Glenurus mollis* Gerstaecker 1888: 101 (after Banks 1913: 229; Navás 1916: 232). **Holotype**, Colombia (EMAU)
=*Glenurus psilocerus* Gerstaecker 1893: 124 (after Banks 1922: 59). **Holotype**, Merida, Venezuela (EMAU)

Taxonomy. Hagen 1866: 405 (in *Glenurus*); Banks 1913: 229 (in *Glenopsis*); 1943: 172 (*psilocerus* good species); Navás 1916: 232 (in *Glenurus*); Stange 1967: 57 (in *Eremoleon*), 1970: 20 (in *Eremoleon*).

Further description. Walker 1853: 333; McLachlan 1873: 134; Navás 1916: 232; Markl 1954: 199, fig. 28 (venation).

Distribution. Colombia; Venezuela (Banks 1943: 171); Ecuador.

Diagnosis: length of body 29 to 35 mm,; forewing length 34 to 41 mm, width 10 to 11 mm hindwing length 35 to 43 mm, width 7 to 8 mm. **Coloration**: antenna mostly pale brown with dark brown band, club mostly dark brown; mouthparts mostly pale brown; vertex mostly dark brown; pronotum mostly dark brown with narrow, incomplete, pale brown line mesally, pale brown area anterior to furrow, nearly complete sublateral pale stripe; mesopleuron without well-defined dark brown stripe dorsally; mesonotum (Fig. 7) mostly dark brown with prominent submedial pale brown area on prescutum, nearly complete narrow pale brown line mesally extended onto mesoscutellum where it expands posteriorly; irregular pale brown area lateral to mesoscutellum; metanotum darker with relatively broad posterior pale brown area mesally extended onto metascutellum; wings (Fig. 80) without spots but with considerable brown suffusion especially in apical field; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; legs with coxae mostly pale brown, fore femur pale brown with prominent dark brown area exteriorly, midfemur mostly pale brown with broad apical dark brown band, hindfemur nearly all pale brown with dark brown spot at setal bases; foretibia and midtibia mostly dark brown, hindtibia mostly pale brown with dark brown spots at setal bases; tarsus with basitarsus mostly pale brown, darker brown increasing distally; leg setae mostly dark brown; abdomen with most tergites dark brown with varying degrees of pale brown markings; sternites mostly pale brown; male tergite IX and ectoproct mostly pale brown. **Chaetotaxy**: face with many long white setae; labrum with short reddish ones; vertex with few short, appressed setae; pronotum with many erect, mostly black setae on disc, few long white setae sublaterally toward posterior margin; pterothoracic notum with few setae, few white ones on mesoscutellum and metascutellum; forefemoral sense hair about equal to that of midfemur, about 3 times as long as femoral diameter; coxa, femur and tibia with many long white setae, tibia also with black setae. abdomen with small black setae on tergites, small white setae on sternites, much longer mostly black setae on tergite IX and ectoproct. **Structure**: antenna with 40 to 44 flagellomeres, flagellomere 3 longer than wide, distal palpomere not much swollen; pronotum about as wide as long; tibial spurs long and weakly curved apically, reaching apex of tarsomere III (foreleg and midleg) or apex of tarsomere II (hindleg); hind basitarsus more than 5 times longer than wide; forewing costal area gradually expanded at base, cells above radial sector about 2.5 times higher than wide, not forked; wings as in Fig.80; **male terminalia** (Fig. 115) with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 5 times longer than middle diameter, nearly touching basally near gonarcus but broadly diverging distally; **female terminalia** (Fig. 145) with pregenitale small, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6x longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Material studied. 43 males, 25 females, 13 larvae. February to March, July to September.
COLOMBIA. **Cundinamarco**: Monterredondo, IX. 1959, F. H. Walz (1f, CASC). ECUADOR. **Tungurahua**: Baños, 18.VII.1989, **reared** (5 larvae, 4m, 1f, FSCA). VENEZUELA. **Aragua**: 3 km. south Rancho Grande, 16.II.1986, **reared**, R. Miller and L. Stange (1 larva, 6m, 3f, FSCA; USMB); **Barinas**: Barinitas, 25.II.1986, **reared**, R. Miller and L. Stange (8m, 2f, FSCA). **Falcon**: 15 km. south La Tabla, 13.III.1987, R. Miller and L. Stange (2m, 5f, FSCA); Sanare, 20.III.1987, **reared**, R. Miller and L. Stange (l larva, 6m, 1f, FSCA). **Merida**: 5 km. east Mesa Bolivar, 26.II.1986, **reared**, R. Miller and L. Stange (3 larvae, 12m, 5f, FSCA; TAMU); 4 km. southwest Mucuruba, 25.II.1986, **reared**, R. Miller and L. Stange (3 larvae, 1f, FSCA). **Monagas**: Bella Vista, 4.III.1986, R. Miller and L. Stange (2m, 2f, FSCA). **Sucre**: El Guacharo, III.15.1987, **reared**, R. Miller and L. Stange (1m, FSCA); Irapa, 13.III.1987,

reared, R. Miller and L. Stange (2 larvae, 1f, FSCA); Quebrada Seca, 13.III.1986, **reared**, Miller and Stange (1m, 1f, FSCA). **Trujillo**: 10 km. south Santo Domingo, Linocito, 25.II.1986, **reared**, R. Miller and L. Stange (1 larva, 1m, 2f, FSCA).

Larvae (Fig. 183-187). **Coloration**: straw to light brown with dark brown markings (Fig. 183) ventral head with sub-median spots (Fig. 186). **Chaetotaxy**: ventral head capsule with long, straight sided, flat ended dolichasters; setae on clypeolabral margin tapered and verging on being simple; dorsal abdomen with simple and straight sided dolichasters in combination; setae of head capsule mostly straight sided dolichasters with a few simple seta posteriorly; setae on rastrum short, thick, and similar in length (Fig. 187). **Structure**: dorsal mandibles equal in length to ventral head capsule measured along midline; intertooth distance equal to distance from basal tooth to dorsal head capsule; meso- thoracic spiracles inconspicuous and difficult to see; palpi 1.5 times longer than basal mandibular width.

Biology. This species may be found by looking for small rock overhangs or overhanging cliff faces with pockets of fine humid earth. Optimal habitats exhibit enough exposure to filtered light and air circulation to keep the soil from being actually wet in the tropical environment, but are protected from direct sun enough to prevent overheating or actual drying out. Such substrates are loose but slightly sticky. This species was found to coexist in the same ecological larval niches with *Eremoleon monagas*, which has a similar general appearance, but lacks sub median markings on the ventral head capsule. The two species are sometimes found together.

Discussion. This species is found by itself or with *Eremoleon monagas* in Venezuela. The adults can be distinguished by the length of the hind basitarsus, which is as long as the distal tarsomere in *Eremoleon anomalus* and shorter than the hind basitarsus in *Eremoleon monagas*. The larvae can be distinguished by the color pattern on the ventral surface of the head capsule and the longer palpi of *Eremoleon anomalus*. In *Eremoleon anomalus* the ventral head capsule has dark brown paired submedian marks or patterns near the middle whereas *Eremoleon monagas* is nearly all pale brown ventrally except for the usually dark brown area anteriorly.

Eremoleon attenuatus Miller and Stange, new species

Fig. 8, 42, 82, 116, 146, 188-192

Holotype male, Caqueza, Cundimarca, Colombia, 23.VI.1974, L. Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: mesopleuron without well-defined dark brown stripe dorsally; forecoxa with white setae much longer than coxal width; hind basitarsus more than 5 times longer than wide, about as long as distal tarsomere; forewing gradually expanded at base, narrower than highest presectoral area, cells above radial sector no more than 2.5 times higher than wide, cells before stigma about as high as those above cubital fork.

Holotype male: length of body about 27 mm, forewing length 35 mm, width 10 mm; hindwing length 37 mm, width 9 mm. **Coloration**: face mostly white with dark brown band below antennae; antenna with scape and pedicel dark brown basally and pale brown dorsally; flagellomeres mostly dark brown with narrow pale brown apex until about flagellomeres 28-37, which are mostly pale brown, club (about 9 flagellomeres) mostly dark brown; femora mostly pale brown except dark brown apically; tibiae pale brown except subbasal and apical dark brown areas; tarsus mostly pale brown except tarsomeres 3-4 mostly dark brown; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; wings (Fig. 82) without spots but with considerable brown suffusion especially in apical field; mesoscutellum predominately dark brown; hindfemur with broad dark brown apical ring; abdomen mostly dark brown with pale area anteriorly, posteriorly on tergite I, posteriorly on tergite II, medially and posteriorly on tergites III-VIII. **Chaetotaxy**: face with long hair; labrum with short reddish setae; vertex nearly glabrous; pronotum with many long white setae sub laterally toward posterior

margin, some long, erect black setae on disc; mesonotum and metanotum with numerous long, hair-like setae; thoracic pleura with many long white setae; abdomen with moderately long black setae on tergites I-VI, longer black setae on tergite IX and ectoproct; forecoxa with prominent erect white setae, some longer than coxal width, some decumbent, posteriorly and anteriorly; fore tibia mostly without decumbent white setae; forefemoral sense hair about equal to midfemoral sense hair, about 4 times as long as femur diameter. **Structure**: antenna with about 47 flagellomeres, flagellomere 3 as long as wide; distal palpomere of labium weakly swollen; pronotum about as wide as long; forewing costal cells above radial sector about 1.5 times higher than wide; hind basitarsus more than 5 times longer than wide, longer than distal tarsomere; forewing costal area gradually expanded at base; forewing costal area as high or higher before stigma as above radial sector (Fig. 82); **male terminalia** (Fig. 116) with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 6 times longer than middle diameter, nearly touching near gonarcus but broadly diverging distally.

Female. On the average the females are larger than males, with forewing length 36-37 mm., hindwing length 37-39 mm. **Terminalia** (Fig. 146) with small pregenitale, about 3 times wider than long, with keel-like process at middle; posterior gonapophysis about 2.5 times longer than middle diameter, with many setae about 3 times longer than gonapophysis; gonapophyses fairly close together; gonapophyseal plate short, moderately broad, about 8 times longer than middle diameter; lateral gonapophyses transverse, contiguous, about 2 times longer than wide, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Larvae: (Fig. 188-192). **Coloration**: straw colored with extensive dark brown markings (Fig. 188); ventral head unmarked. **Chaetotaxy**: head capsule with stout tapering simple setae dorsally; ventral head with fine simple setae; mandibles without dorsal setae; thorax and abdomen with simple setae dorsally and ventrally; digging setae on rastrum with inner three pair medium in length and roughly equal (Fig. 192). **Structure**: mandible slightly less than 90 percent length of ventral head capsule measured at midline; basal length of mandible from posterior base of first tooth to dorsal head capsule 87 percent of intertooth distance; mesothoracic spiracles not visible.

Biology. Larvae were found at the mouth of a small cave.

Material studied. 1 male, 3 females, 1 larva. June.
COLOMBIA. **Cundimarca**: Caqueza, 23.VI.1974, **reared**, L. Stange (1 larva, 1m, 3f, FSCA).

Discussion. This species differs from other known species of the anomalus group in having the hind basitarsus about 5 times longer than broad and as long as the distal tarsomere in combination with the elongate white setae on the forecoxa and narrower forewing costal area. Larvae are distinguished from other species by having the mandibles 75 percent the length of the venter of head capsule, straight sided and flat ended dolichasters on the ventral head capsule, an unmarked head capsule venter, and spiracles on the mesothorax short. Digging setae (Fig. 192) are thick and pointed, with thick secondary setae anterior to the rastrum, as heavy as those on the rastrum. Head, thorax, and abdomen have simple setae. Mandible area between basal tooth and head capsule is 85 percent intertooth distance.

Eremoleon dodsoni Miller and Stange, new species

Fig. 9, 43, 83, 117, 147, 193-198

Holotype male, 24 km. west Catamayo, Loja, Ecuador, 9.VII.1989, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: mesopleuron without well-defined dark brown stripe dorsally; hind basitarsus more than 5 times longer than wide; forewing costal area abruptly expanded near base, cells above radial sector more than 3 times higher than wide .

Holotype male: length of body about 24 mm, forewing length 35 mm, width 8 mm; hindwing length 37 mm, width 7 mm. **Coloration**: face pale brown with broad dark band below antennae reaching laterally to ocular rim, small dark brown spot at anterior tentorial pit; antennal scape mostly pale brown with some dark brown anteriorly; pedicel pale brown anteriorly, dark brown posteriorly; flagellomeres 1-26 mostly dark brown with narrow pale brown apices, flagellomeres 27-32 mostly pale brown, 33-41 (club) mostly dark brown; vertex moderately dark brown anteriorly, first anterior row nearly complete dark brown stripe; middle row with dark brown double submedian area; posterior area nearly all pale brown; pronotum mostly pale brown with many dark brown spots at setal bases; mesonotum mostly dark brown with submedial pale brown area; mesoscutellum with diffuse pale area except posteriorly; mesopleura without well-defined dark brown stripe dorsally, mostly pale brown with some dark brown areas dorsally, mesopleural process dark reddish; legs mostly pale brown, forefemur with dark stripe on anterior face, midfemur and hindfemur pale brown with dark apical area (Fig. 43); tibiae mostly pale brown with sub basal and apical dark brown areas; wings (Fig. 83) without spots but with considerable brown suffusion, especially in apical field; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen with tergite I pale brown, II mostly dark brown except posteriorly III-VII dark brown with pale brown medially and posteriorly, VIII dark brown except posteriorly; tergite IX and ectoproct pale brown; sternites mostly pale brown. **Chaetotaxy**: face with many long white setae, labrum with short reddish ones; vertex with short, sparse, appressed setae; pronotum with several long white setae sublaterally near posterior margin; pterothoracic notum nearly glabrous except some on prescutum and several scattered white setae; pleura with many long white setae; forefemoral sense hair about equal to that of midfemur, about 4 times as long as femoral diameter; abdominal tergites and sternites with short, erect white setae, much longer than tergite IX and ectoproct. **Structure**: antenna with about 41 flagellomeres, flagellomere 3 as long as wide; tibial spurs long, slender with apex weakly hooked, extending to tarsomere III (foreleg and midleg) or II (hindleg); hind basitarsus about 5 times longer than middle diameter, somewhat shorter than distal tarsomere; basitarsus of foreleg and midleg about 4 times longer than middle diameter, about 1/2 length of distal tarsomere; forewing (Fig. 83) costal area abruptly expanded near base, costal cells above radial sector more than 3 times higher than wide, sometimes forked, much higher above origin of radial sector than greatest presectoral height; hind basitarsus more than 5 times longer than wide; **male terminalia** (Fig. 117) with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 6 times longer than middle diameter, nearly touching near gonarcus but broadly diverging distally.

Female. Averages larger than males, forewing about 36 mm, hindwing about 37 mm; some black erect setae on pronotal disc. **Terminalia** (Fig. 147) with pregenitale small, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6 times longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Larva (Fig. 193-198). **Coloration**: color pattern as in Fig. 193-196; ventral head with submedian pair of marks (Fig. 196). **Chaetotaxy**: central pair of digging setae on rastrum 1/2 length of next pair, ventral head with long, fine, simple setae posteriorly grading to long unexpanded dolichasters anteriorly, dorsal head with all dolichasters slightly expanded near tip (Fig. 197); ventral thorax with long simple setae, ventral abdomen with a combination of simple setae and long thin dolichasters. **Structure**: mandibles 80 percent length of ventral head capsule measured at midline; length from posterior base of basal tooth to dorsal head capsule 80 percent of intertooth distance; mesothoracic spiracles as long as basal width; palpi longer than basal width of mandibles.

Biology. The larvae were found in small pockets of humid but loose rock dust in rain-protected, elevated sections of cliffs. They are typical leg anchorers. They have only been found as larvae.

Material studied. 3 males, 3 females, 2 larvae. July.

ECUADOR. **Loja**: 14 km. west Catamayo, 9.VII.1989, **reared**, R. Miller and L. Stange (2 larvae, 2m, 3f, FSCA); **El Oro**: Baños, 800 m., 12.VII.1989, **reared**, Miller and Stange (1m, FSCA).

Discussion. This species can be recognized by having the forewing costal area abruptly expanded near base except for *Eremoleon impluviatus* which has the thoracic pleura with a black stripe dorsally. The hindwing is about the same length as the forewing and the forewing costal cells are not as high as in other species of the group. The larvae are distinguished by the short mandibles compared to the head capsule, the proportional spacing of the teeth, and the submedian marks on the ventral head capsule.

Etymology. This species is named in honor of the orchid botanist, Calaway H. Dodson, who assisted the authors during collecting in Ecuador.

***Eremoleon impluviatus* (Gerstaecker)**
Fig.10, 44, 84, 118, 148, 199-201

Glenurus impluviatus Gerstaecker 1893: 122. **Holotype**, Locotal, Bolivia (EMAU)

Distribution: Argentina; Bolivia.

Diagnosis: length of body about 28 - 32 mm; forewing length about 30-36 mm, width about 6-8 mm; hindwing length about 31-37 mm, width about 6 mm. **Coloration**: antenna with scape and pedicel pale brown posteriorly, dark brown anteriorly; flagellomeres 1-11 mostly pale externally, dark brown mesally; 12-29 with basal dark brown, 30-40 mostly pale brown; mesopleura with dark brown stripe dorsally in marked contrast to pale brown beneath (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; forewing with short dark brown costal vein basally; wings (Fig. 84) without spots. **Chaetotaxy**: pteronota with few setae except on prescutum; thoracic pleura with abundant long white setae; forefemoral sense hair about equal to that of midfemur, about 3 times as long as femoral diameter. **Structure**: antenna with about 40 flagellomeres, flagellomere 3 longer than wide; pronotum little wider than length; hind tibial spurs reach to tarsomere II, foreleg and midleg tibial spurs reach to apex of tarsomere 3; forewing slightly longer than hindwing; forewing costal area abruptly expanded near base, (Fig. 84), costal cells above radial sector about 3 times higher than wide, sometimes forked; hind basitarsus about 4 times longer than wide; **male terminalia** (Fig. 118) with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 6 times longer than middle diameter, nearly touching near gonarcus but broadly diverging posteriorly; **female terminalia** (Fig. 148) with small pregenitale, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6 times longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface

Larva (Fig. 199-201). Based on the amount of data available on the highly cleared specimens, they may be separated from other species by locality, the mandible being equal to the length of the ventral head capsule measured ventrally, and a few scattered simple setae are present dorsally on the mandibles.

Biology. Larvae were found living in a small rock overhang located in a cliff. The bombyliid *Chrysanthrax* near *ioptera* (Wiedermann) is a parasite of this species.

Material studied. 2 males, 5 females, 1 larva. November to January.
ARGENTINA. **Catamarca**: Las Estancias, 30.I.1965, Rivas (1f, FSCA). **Jujuy**: Jujuy, 16.I. 1966, Townes (1f, FSCA). **Tucumán**: Horco Molle, 15.XII.1965, **reared**, L. Stange (1 larva, 2m, 1f, FSCA); Tacanas**,** 5.XI.1958, L. Stange (1f, FSCA).
BOLIVIA. Locotal (EMAU).

Discussion. Within the anomalus group, the mesopleuron with dark brown stripe dorsally in marked contrast to pale brown beneath is distinctive. The basally abruptly expanded forewing costal area is not found elsewhere in the group except for *Eremoleon dodsoni*.

***Eremoleon monagas* Miller and Stange, new species**
Fig. 11, 45, 85, 119, 149, 202-206

Holotype male, Cueva Guacharo, Monagas, Venezuela, 15.III.1987, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: mesopleuron without well-defined dark brown stripe dorsally; hind basitarsus more than 5 times longer than wide; forewing costal area gradually expanded at base, cells above radial sector no more than 2.5 times higher than wide; hind basitarsus shorter than distal tarsomere.

Holotype male: length of body about 26 mm, forewing length about 31 mm, width about 8 mm; hindwing length about 31 mm, width about 5 mm. **Coloration**: foretibia mostly pale brown. wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; wings (Fig. 85) without spots but with considerable brown suffusion especially in apical field; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas wings (Fig. 85) without spots, forewing with brown suffused cross veins near hind margin of posterior fork of CuA and in distal field; hindwing with suffused brown cross veins restricted to apical field; mesoscutellum predominately dark brown; hindfemur with broad dark brown apical ring. **Chaetotaxy**: mesoscutum without bristle-like white setae nor elongate hairs; forecoxa with white setae much longer than coxal width; foretibia without decumbent white setae; forefemoral sense hair about equal to that of midfemur, about 3 times as long as femoral diameter. **Structure**: antennal flagellomere 3 longer than wide; hind basitarsus more than 5 times longer than wide, shorter than distal tarsomere; forewing slightly longer than hindwing; forewing costal area gradually expanded at base; forewing costal cells before stigma about as high as those above cubital fork; **male terminalia** (Fig. 119) with strongly arched gonarcus, somewhat twisted apically, paramere elongate, about 6 times longer than middle diameter, nearly touching near gonarcus but broadly diverging distally.

Females. Averages larger than males, forewing length about 29-40 mm, hindwing length about 29-40 mm; some black erect setae on pronotal disc; **terminalia** (Fig. 149) with pregenitale small, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6 times longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Larva (Fig. 202-206). **Coloration**: pale and brown color pattern as in Fig. 202-203; head unmarked ventrally. **Chaetotaxy**: straight sided flat ended setae on dorsal head anteriorly and simple posteriorly; ventral head with fine, elongate unexpanded dolichasters; mandibles without dorsal setae; second to inner teeth on rastrum 1/3 length of outer pair (Fig. 206). **Structure**: mandibles equal in length to ventral head capsule measured at midline; basal distance on mandible from base of first tooth to head capsule dorsally 85 percent of intertooth distance; mesothoracic spiracles prominent and easily seen; palpi length equal to basal width of mandibles (Fig. 205).

Biology. The larva of this species occupies an ecological niche like that of *Eremoleon anomalus*, and may sometimes be found in the same localities as that species. The soil in the cliff pockets or overhangs they inhabit are moist enough to be sticky, but dry enough to be loose. Just the right degree of light and air exposure is required. They are not found at ground level due to humidity considerations. They anchor their legs.

Material studied. 20 males, 39 females, 3 larvae. March.
VENEZUELA. **Falcon**: Sanare, 20.III.1987, R. Miller and L. Stange (1f, FSCA), **reared**. **Monagas**: Bella Vista, 4.III.1986, **reared**, R. Miller and L. Stange (1 larva, 6m, 5f, FSCA); Cueva Guacharo, 15.III.1987, **reared**, R. Miller and L. Stange (4m, 9f, FSCA). **Sucre**: Nine km. northwest Las Piedras, 4.III.1986, **reared**, R. Miller and L. Stange (2 larvae, 10m, 17f, FSCA); Quebrada Seca, 12.III.1987 **reared**, R. Miller and L. Stange (7f, FSCA).

Discussion. Within the anomalus group, the combination of having the forewing costal area gradually expanded at base with the cells above radial sector no more than 2.5 times higher than wide and the short hind basitarsus which is shorter than distal tarsomere provide diagnostic characters. In their range, their general size and lack of sub median spots on the ventral head capsule separate the larvae from those of *E. anomalus*.

Etymology. This species is name after the Province of Monagas where the holotype was captured.

Eremoleon peterseni (**Banks**)
Fig. 12, 46, 86, 150

Glenopsis peterseni Banks 1922: 59. **Lectotype female**, Chanchamayo, Peru, XI (MCZC), designated by Stange 1961: 674.

Taxonomy. Stange 1970: 22 (in *Eremoleon*).

Diagnosis: forewing length about 40 mm., width about 10 mm; hindwing length about 40 mm, width about 9 mm. **Coloration**: mesoscutellum with submedian dark brown stripes; mesopleuron without well-defined dark brown stripe dorsally. hindfemur without broad dark brown apical ring; wings (Fig. 86) without spots but with considerable brown suffusion especially in apical field; wings (Fig. 86) without dark brown spots; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas. **Chaetotaxy**: mesoscutum with elongate, white setae (not bristle-like); forefemoral sense hair about equal to that of midfemur, about 3 times as long as femoral diameter; forecoxa with white setae shorter than coxal width. **Structure**: antennal flagellomere 3 longer than wide; hind basitarsus more than 5 times longer than wide, about as long as distal tarsomere; forewing and hindwing about equal length; forewing costal area gradually expanded at base, cells above radial sector more than 1.5 times higher than wide; **female terminalia** (Fig. 150) with small pregenitale, spine-like; posterior gonapophysis about 2.5 times longer than middle diameter with many setae about 3 times longer than gonapophysis; gonapophyseal plate short, fairly broad, about 6 times longer than middle diameter; lateral gonapophyses transverse, contiguous, with at least 10 black digging setae one each side of middle, longer than on ventral side of oval ectoproct; hair-like setae on dorsal surface of ectoproct about 2 times longer than on ventral surface.

Material studied. 4 females. November.
PERU. **Junin**: Chanchamayo, XI (4f, FSCA, MCZC).

Discussion: This species is known only by the female syntypes, which are all in poor condition.

macer group

Diagnosis: antennal flagellomere 3 broader than long; distal palpomere of labium slender, not much thicker than distal palpomere of maxillus, palpimacula at middle; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum; forewing costal area gradually expanded at base; hindwing about same length as forewing, in repose not extending beyond apex of

forewing; hindwing medial area at highest point lower than wing area above it; wings without prominent dark brown spots.

Discussion. This is a complex group with enough variation to make species discriminations difficult. The leg chaetotaxy provides diagnostic characters for species. *Eremoleon macer* has concentrated setae on anterior side on the ventral side of the distal tarsomere whereas the foretibia of *E. durangoensis* has numerous elongate white setae. *Eremoleon longior* Banks is the most distinct species of the group. The group is defined by having the antennal flagellomere 3 broader than long; mesoscutellum with elongate, erect white setae, some of which are at least 1/3 length of scutellum; the forewing costal area which is at least 1.5 times wider than radial vein at radial sector; and the distal tarsomere is shorter than other tarsomeres together.

***Eremoleon durangoensis* Miller and Stange, new species**
Fig. 13, 47-49, 87, 151

Holotype female, ten miles northwest Los Adjuntas, Durango, Mexico, 4.VII.1952 (FSCA). Dissected terminalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: forefemoral sense hair shorter than tibial spurs; basitarsus of foreleg no more than 3times longer than greatest diameter; pretarsal claws shorter than basitarsus of foreleg; distal tarsomere not swollen and without concentration of setae; foretibia with numerous long white setae in addition to black ones (Fig. 48); forewing posterior area about 3/4 as high as prefork area just before cubital fork (Fig. 86).

Holotype female: length of body about 30 mm, forewing length 38 mm, width 10 mm; hindwing length 37 mm, width 8.5 mm. **Coloration**: general coloration pale reddish; face mostly pale, mouthparts mostly pale with dark brown on apex of labial palpomere II, most of labial palpomere III; antenna nearly all pale brown; vertex (Fig. 13) mostly pale brown with triangular dark area at middle anteriorly, middle scar row consists of three well separated dark brown stripes; pronotum mostly pale reddish brown with some small dark brown spots; nota mostly pale reddish with many darker areas; scutelli mostly pale brown with dark brown anteriorly; pleura (Fig. 48) mostly reddish brown, darker ventrally; forefemur nearly all reddish brown, midfemur pale brown with conspicuous dark brown setal spots, hindfemur nearly all pale brown; foretibia pale brown, midtibia with many dark brown setal spots, subbasal and apical dark brown areas; hindtibia mostly pale brown; wings (Fig. 87) without dark brown spots; many cross veins with weak suffusion, most prominent near juncture of posterior fork of CuA and hind margin and rhegma; hindwing with less pronounced suffusion. **Chaetotaxy**: pronotum with many elongate white setae; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum forefemoral sense hair shorter than tibial spurs; foretibia with numerous long white setae in addition to black ones (Fig. 47-48). **Structure**: antennal flagellomere 3 as long as wide or longer than wide; pretarsal claws shorter than basitarsus of foreleg; which is no more than 3 times longer than greatest diameter; distal tarsomere (Fig. 49) not swollen and without concentration of setae; forewing costal area as high or higher before stigma as above radial sector (Fig. 87); forewing posterior area about 3/4 as high as prefork area just before cubital fork; **female terminalia** (Fig. 151) with small pregenitale, broad, about 4 times wider than long with prominent medial spine posteriorly; posterior gonapophysis about 4 times longer than middle diameter, setae not exceeding length of gonapophysis; gonapophyseal plate over 10 times longer than middle diameter, broadest basally; lateral gonapophyses transverse, separated, about 1.5 times wider than long with strong black digging setae which are about 1/2 as long as gonophyseal length but shorter than those on ventral margin of ectoproct; spermatheca over 12 times longer than middle diameter, broad and strongly hooked apically.

Material studied. 1 female. July.
MEXICO. **Durango**: ten miles northwest Los Adjuntas, 4.VII.1952 (1f, FSCA).

Discussion. Within the macer group, *E. durangoensis* has the foretibia (Fig. 47-48) with numerous long white setae in addition to black ones which provides diagnostic differences. Also, the forewing posterior area is about 3/4 as high as prefork area just before cubital fork.

***Eremoleon longior* Banks**
Fig. 14, 50, 88, 120, 152, 207-210

Eremoleon longior Banks 1938b: 235. **Female syntypes**, Xtoloc Cenote Cave, Chichén-Itzá, 24.VI. (MCZC); Chakxix Cave, Tekax, 1.VIII (MCZC); Puz Cave, Oxkutzcab, 20.VII, A. S. Pearse (MCZC).

Further description. Adams 1957a: 92, fig. 22, 23, 25 (male genitalia, labial palp).

Distribution. Mexico

Diagnosis: length of body about 29 - 32 mm, forewing length about 30-34 mm, width about 6 mm; hindwing length about 29-33 mm, width about 5 mm. **Coloration**: general coloration pale brown; face mostly pale brown, dark brown below antennae; mouthparts pale brown; vertex (Fig. 14) mostly pale brown except broad dark brown area above antennae, anterior scar row a continuous stripe; pronotum pale brown with tiny dark brown setal bases; nota pale brown with darker brown mostly laterally; scutelli pale brown with dark brown laterally; pleura pale yellowish brown; coxae mostly pale brown; fore- and midfemora and tibiae brownish, hindfemur and tibia pale brown; tarsi nearly all pale brown with small dark brown apices; wings (Fig. 88) without dark brown spots nor much suffusion; abdomen banded, pale brown anteriorly, dark brown posteriorly. **Chaetotaxy**: forecoxa without white setae; mesoscutum without bristle-like white setae although sometimes many elongate hair-like setae present; foretibia without decumbent white setae; forefemoral sense hair same length as midfemoral sense hair, about 5 times longer than femur diameter. **Structure**: hind basitarsus at least 5 times longer than middle diameter, somewhat shorter than distal tarsomere; forewing slightly longer than hindwing; forewing costal area as high or higher before stigma as above radial sector (Fig. 88); **male genitalia** (Fig. 120) with gonarcus moderately arched, apex rounded; mediuncus prominent; parameres complex, narrowly separated, consisting of elongate plate about 7 times longer than middle width which is strongly pointed toward mediuncus, preceded by strongly sclerotized broad process; large sclerotized area between parameres anteriorly, touching mediuncus anteriorly and acuminate posteriorly; secondary prominent paramere area at posteriorly 1/2 extending mesally beyond paramere plate; **female terminalia** (Fig. 152) with pregenitale narrow but about 10 times wider than long, no medial spine; posterior gonapophysis about 6 times longer than middle diameter with some setae as long as gonapophysis; lateral gonapophyses elongate but short, no digging setae; spermatheca about 10 times longer than middle diameter, slightly bowed, hooked posteriorly.

Larva (Fig. 207-210). **Coloration**: coloration pale (Fig. 207). **Chaetotaxy**: dorsal setae on head, thorax, and abdomen simple and coarse; setae on ventral head capsule fine and elongate with flat ends; dorsal surface of mandibles without setae; preserved larvae had the digging setae missing from the rastrum. **Structure**: palpi a little shorter than basal mandibular width; intertooth distance 75 percent of distance from base of first tooth to ventral head capsule; distal palpomere sausage-shaped and not expanded at base; mesothoracic spiracles visible; mandibles slightly longer than ventral head capsule measured at midline; palpi shorter than width of mandibles at base.

Biology. This larva was found in chalky pockets in the calcium carbonate walls of wells in Yucatan, Mexico, an ecological niche shared in the genus by *Eremoleon phasma* and *Eremoleon jamaica*. The larvae appear to be pale as an adaptation to living in white chalk. The extremely fine material in which they live may be the reason for these leg anchorers having elongate mandibles.

Material studied. 11 males, 19 females, 12 larvae. January to August**.**

MEXICO. **Quintana Roo**: Ruinas de Coba, 17.VIII.1979, Pletsch (1m, FSCA); **Yucatán**: Chakxix Cave, Tekax, 1.VIII, Pearse (1f, MCZC); Chichén Itzá, 18.IV.1982, **reared**, Stange (12 larvae, 4m, 5f, FSCA); Pisté, 14.VI.1967, Welling (6m, 10f, FSCA); Puz Cave, Oxkutzcab, 20.VII, Pearse (1f, MCZC); Xtoloc Cenote Cave, Chichén Itzá, 24.VI, Pearse (f, MCZC), 23.VI.1932, E. P). Creaser (1f, UMMZ).

Discussion. This is the least typical species of the macer group with different male genitalia and the hind basitarsus is at least 5 times longer than middle diameter.

***Eremoleon macer* (Hagen)**
Fig. 15, 51, 89, 121, 153, 211-215

Myrmeleon macer Hagen 1861: 236. **Holotype**, Mexico (NHMW?).

Taxonomy. Hagen 1866: 404 (in *Formicaleo*); Banks 1901: 366 (in *Eremoleon*), 1938: 235 (*Novulga mexicana* = *E. macer*); Stange 2004: 170 (*atomarius* = *macer*).

Further description. Banks 1927: 71, fig. 39 (base forewing); Adams 1957: 21, fig. 30 (male genitalia, labial palp)

Distribution. Honduras; Mexico

Diagnosis: length of body 29 to 35 mm, wingspan 50 to 62 mm; forewing length 25 to 32 mm, width 7 to 9 mm; hindwing length 24 to 30 mm, width 5 to 7 mm. **Coloration**: face and mouthparts mostly pale, dark band below antennae; antenna pale, flagellomeres 1-2 dark brown apically, 3 and beyond with dark brown basally; vertex (Fig. 15) with prominent dark brown scars; pronotum mostly pale brown, many dark brown setal bases, complex dark brown areas laterally, sublaterally, submedially, large U-shape spot anteriorly on each side; thoracic pleura with about equal dark brown and pale brown areas; coxae pale brown with prominent dark brown base; forefemur, foretibia, midfemur and midtibia pale brown with prominent dark brown setal bases, tibiae with dark brown toward middle; hindfemur and hindtibia much paler with reduced setal spots on femur; tarsi pale except mostly distal tarsomere apically; wings (Fig. 89) without spots, weakly suffused; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen banded with complex dark brown and pale brown areas on tergites. **Chaetotaxy**: forefemoral sense hair shorter than tibial spurs; distal tarsomere apically with concentration of setae on anterior 1/2 of ventral surface; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum. **Structure**: pretarsal claws longer than basitarsus of foreleg; which is no more than 3 times longer than greatest diameter; distal tarsomere swollen apically (Fig. 51); forewing costal area as high or higher before stigma as above radial sector; **male genitalia** (Fig. 121) with gonarcus moderately arched, bent apically; mediuncus inconspicuous; paramere broad, sub rectangular plate, wider than long, weakly sculptured, narrowly separated from other paramere; mesal margin of paramere more strongly sclerotized, upturned posteriorly; **female terminalia** (Fig. 153) with small pregenitale, broad, about 4 times wider than long with prominent medial spine posteriorly; posterior gonapophysis about 4 times longer than middle diameter, setae no exceeding length of gonapophysis; gonapophyseal plate over 10 times longer than middle diameter, broadest basally; lateral gonapophyses transverse, separated, about 1.5 times wider than long with strong black digging setae which are about 1/2 as long as gonophyseal length but shorter than those on ventral margin of ectoproct; spermatheca over 12 times longer than middle diameter, broad and strongly hooked apically.

Larva (Fig. 211-215). **Coloration**: body somewhat pale with sizable dark brown markings on the dorsal head (Fig. 213); ventral head without markings; ventral abdomen with rows of brown spots (Fig. 202). **Chaetotaxy**: dorsum of mandibles without scattered dolichasters; ventral head with fine short dolichasters; dorsal head capsule with dolichasters anteriorly, grading to thick simple setae posteriorly; ventral thorax and abdomen with fine long setae; digging setae as in Fig. 215. **Structure**: intertooth

distance 90 percent of distance from posterior base of first tooth to dorsal head capsule; palpi longer than width of mandibular base; mandibles equal in length to length of ventral head capsule measured at midline; mesothoracic spiracles visible but short.

Biology. This species, like *Eremoleon vitreus*, will inhabit any zone of a dry cave with sufficient dryness, fine dust, and warmth, to rest partially buried horizontally with its legs anchored to a solid substrate. They may be found on the floor of a cave, or in small to large pockets in the cave wall. The dust in these pockets appears to be dry, and not humid or sticky. Both this species and *Eremoleon vitreus* were found together in the same niches in some caves in the Mexican states of Oaxaca, Jalisco, and Colima. Both species usually require two years to develop in the wild. In the *Eremoleon macer* and *Eremoleon vitreus* collecting sites, three species of Bombyliidae were found to parasitize these species. In the state of Chiapas, Mexico, both *E. macer* and *E. vitreus* are parasitized by an undescribed species of *Chrysanthrax* (identification: Jack Hall). In the Mexican state of Coahuila, *Eremoleon vitreus* by itself was found to be parasitized by an undescribed species of *Dipalta* (identification: J. Hall). In the Mexican state of Colima, *Eremoleon vitreus* and *Eremoleon macer* are parasitized by *Cyananthrax cyanopterus* (Wiedemann) (ID: J. Hall).

Material studied. 31 males, 17 females, 7 larvae. March to June, September.
MEXICO: **Chiapas**: Mazapa between Tampachula and Comitan, **reared**, 2.III.1985, Miller, Stange (4m, 5f); Rio Salado, 7 km. S. Colima, reared, 14.III.1985, R. Miller, L. Stange (1f, FSCA). **Guerrero**: 19 miles north Guadalajara, Posada San Isidro, 23.VI.1986, R. Miller and L. Stange (1 larva, 1m, 2f, FSCA); 10 miles northeast Zumpango, 15.IV.1964, **reared**, L.Stange (1 larva, 4m, FSCA). **Jalisco**: 41 km. east Colima, 12.III.1985, **reared**, R. Miller and L. Stange (4 larvae, 12m, 1f, FSCA); 2.5 miles northeast Tuxpan , 12.III.1985, R. Miller and L. Stange (1f, FSCA); 13 km. N. Guadalajara, 28.X.1986, **reared**, Miller, Stange (3m, 4f). **Michoacan**: 6 km. south Santa Tomas (Santa Barbara), 30.IX.1986, **reared**, R. Miller and L. Stange (1 larva, 1m, FSCA). **Oaxaca**: 23 mi. S. Matías Romero, II.26.1985, R. Miller, L. Stange, **reared**, (4m, 2f); Rio Ostuto, 5mi. W. Zanatepec, 27.II.1985, Miller, Stange, **reared**, (2m, FSCA); **Tamaulipas**: Cd. Victoria, 15.VI.1971, H. Weems (1f, FSCA).

Discussion. The condition of the pretarsal claws is somewhat intermediate in *Eremoleon macer* between groups in which they can fold against the ventral setae of the distal tarsomere and those that don't. In this species the claws can bend toward the ventral patch of setae on the distal tarsomere. This species is closely related to *Eremoleon vitreus*. Larvae may be separated by the presence or absence of dolichasters on the dorsal surface of the mandibles, and the proportional placement of the teeth on the mandibles. They coexist in transitional areas, and no intermediate forms of adults or larvae were discovered.

Eremoleon morazani Miller and Stange, new species

Fig. 16, 53, 90, 122, 154

Holotype male, El Zamorano, Monte Uyuca, Francisco Morazan, Honduras, 5500', 23.IV.1993, L. Stange and R. Miller (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: forefemoral sense hair longer than tibial spurs; distal tarsomere not swollen and without concentration of setae; foretibia without numerous long white setae in addition to black ones (Fig. 16); pretarsal claws shorter than basitarsus of foreleg which is about 4times longer than greatest diameter; forewing costal area as high or higher before stigma above radial sector; forewing posterior area about 1/2 as high as prefork area just before cubital fork.

Holotype male: length of body about 27 mm, forewing length 28 mm, width 8 mm; hindwing length 27 mm, width 7 mm. **Coloration**: face with broad dark brown band below antennae, mostly pale brown on clypeus and labrum; mouthparts mostly pale brown, some dark brown on distal palpomere; antenna with scape, pedicel and flagellomeres dark brown basally, pale brown distally; vertex as in Fig.16; pronotum mostly pale with many dark brown setal bases, mostly dark brown laterally; meoscutum pigmented

similarly to metanotum, nota with complex pattern of dark brown and pale brown areas (Fig. 16), scutelli mostly dark brown with median pale brown line; pleura (Fig. 53) mostly pale brown with some dark brown areas; femora pale brown with dark brown band apically and many dark brown setal bases; tibiae mostly pale brown with dark brown subbasal and apical dark brown bands; abdomen mostly banded, tergite I mostly pale brown, II mostly dark brown; sternite I mostly dark brown, II mostly pale brown anteriorly, dark brown posteriorly; other sternites mostly pale brown; wings (Fig. 90) without spots but with considerable brown suffusion especially in apical field; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas. **Chaetotaxy**: forefemoral sense hair much longer than tibial spurs; foretibia without numerous long white setae; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum. **Structure**: pretarsal claws shorter than basitarsus of foreleg which is about 4 times longer than greatest diameter; forewing costal area as high or higher before stigma above radial sector; forewing posterior area about 1/2 as high as prefork area just before cubital fork; **male genitalia** (Fig. 122) with gonarcus broad, weakly curved, laterally with short process, no mediuncus; paramere with sclerotized, subrectangular sculptured plate below which a second weakly subrectangular sclerotized plate**,** small elongate sclerite between strongly sclerotized plates which are more strongly sclerotized along anterior, medial and posterior margins.

Female terminalia (Fig. 154) with pregenitale small, broad, about 4 times wider than long with prominent medial spine posteriorly; posterior gonapophysis about 4 times longer than middle diameter, setae no exceeding length of gonapophysis; gonapophyseal plate over 10 times longer than middle diameter, broadest basally; lateral gonapophyses transverse, separated, about 1.5 times wider than long with strong black digging setae which are about 1/2 as long as gonophyseal length but shorter than those on ventral margin of ectoproct; spermatheca over 12 times longer than middle diameter, broad and strongly hooked apically.

Material studied. 2 males, 1 female, April to July.
MEXICO. **Oaxaca**: 45 km. S. Valle National, 2100m, 30.VI.1992, Curoe Blackaller coll., (1m, CASC); 70 km. SE Oaxaca, 8.V.1962, L. Stange (1f, FSCA), HONDURAS. **Francisco Morazan**: El Zamorano, Monte Uyuca, 5500', 23.IV.23.1993, **reared,** L. Stange and R. Miller (1m, FSCA).

Discussion. Within the macer group, distinguishing characters are the forefemoral sense hair which is much longer than tibial spurs and the basitarsus of foreleg about 4 times longer than greatest diameter. The type locality in Honduras is an isolated cloud forest atop a mountain. The Mexican specimens are also from high elevation (2100 m).

Etymology. This species is named after the Honduran Department of Francisco Morazán where the type locality occurs.

Eremoleon vitreus (**Navás**)
Fig. 17, 54, 55, 91, 123, 155, 216-221

=*Segura vitreus* Navás 1914c: 18. **Holotype male,** Cuernavaca, Mexique, 1871 Bilimek (MNHN).
=*Novulga mexicana* Navás 1925: 189, fig. 17 (vertex, pronotum, base of wings). **Holotype male**, Vera Cruz, Mexique, 1921 (MNHN). **New Synonymy**
=*Hesperoleon atomarius* Navás 1933: 105 (after Stange 2004: 170). **Holotype**, Cuernavaca, Mexico, 1929-30 (ZMUH, destroyed). **Neotype male**, Cuernavaca, Mexico, 24.VI.1959, M. Evans (FSCA), by present designation.

Taxonomy. Banks 1927: 71 (*E. vitreus*= *E. macer*); Stange 2004: 170 (*H. atomarius* = *E. vitreus*)

Distribution. Mexico; Honduras

Diagnosis: length of body 25 to 27 mm; wingspan 50 to 63 mm; length of forewing 25 to 32 mm; width 7 to 9 mm; length of hindwing 24 to 30 mm;,5 to 7 mm. **Coloration**: face and mouthparts mostly pale, dark band below antennae; antenna pale, flagellomere 2 dark brown apically, 3 and beyond with dark brown basally; vertex (Fig. 17) with prominent dark brown scars; pronotum mostly pale brown, many dark brown setal bases, complex dark brown areas laterally, sublaterally, submedially, large U-shape spot anteriorly on each side; thoracic pleura with more pale areas than dark brown areas; coxae pale brown with dark brown base; forefemur and foretibia, midfemur and midtibia pale brown with prominent dark brown setal bases, tibiae with dark brown toward middle and apically; hindfemur and hindtibia paler with reduced setal spots on femur; tarsi pale except mostly distal tarsomere apically; wings (Fig. 91) without spots, weakly suffused; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen banded with complex dark brown and pale brown areas on tergites. **Chaetotaxy**: forefemoral sense hair shorter than tibial spurs; distal tarsomere without concentration of setae; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum. **Structure**: antennal flagellomere 3 as long as wide or longer than wide; pretarsal claws shorter than basitarsus of foreleg; which is no more than 3 times longer than greatest diameter; distal tarsomere not swollen; forewing costal area as high or higher before stigma as above radial sector; forewing posterior area less than 1/2 as high as prefork area just before cubital fork; foretibia without white setae or with only a few near base; **male genitalia** (Fig. 123) with gonarcus weakly arched, weakly excavated apically; mediuncus inconspicuous; parameres broad, moderately separated, about 5 times longer than wide, weakly L-shaped, weakly sculptured; darker brown along mesal margin; **female terminalia** (Fig. 155) with small, broad pregenitale about 4 times wider than long with prominent medial spine posteriorly; posterior gonapophysis about 4 times longer than middle diameter, setae not exceeding length of gonapophysis; gonapophyseal plate over 10 times longer than middle diameter, broadest basally; lateral gonapophyses transverse, separated, about 1.5 times wider than long with strong black digging setae which are about 1/2 as long as gonophyseal length but shorter than those on ventral margin of ectoproct; spermatheca over 12 times longer than middle diameter, broad and strongly hooked apically.

Larva (Fig. 216-221). **Coloration**: variable, depending on locality, with size and intensity of the basic pattern markings differing due to an area's geology; body somewhat pale with sizable dark brown markings on the dorsal head (Fig. 216); ventral head (Fig. 220) without markings; ventral abdomen with rows of brown spots (Fig. 219). **Chaetotaxy**: dorsum of mandibles with scattered dolichasters (Fig. 216); ventral head with fine short dolichasters; ventral thorax and abdomen with fine long setae; dorsal head with dolichasters anteriorly grading to simple setae posteriorly. **Structure**: distance from basal tooth to dorsal head capsule 85 percent of intertooth distance; length of mandibles equal to length of ventral head capsule measured at midline; digging setae as in Fig. 221; palpi longer than width of mandibular base.

Biology. This species, like *Eremoleon macer*, will inhabit any zone of a dry cave with sufficient dryness, fine dust, and warmth, to rest partially buried horizontally with its legs anchored to a solid substrate. They may be found on the floor of a cave, or in small to large pockets in the cave wall. The dust in these pockets appears to be dry, and not humid or sticky. Both this species and *Eremoleon vitreus* were found together in the same niches, in the same caves in the Mexican states of Oaxaca, Jalisco, and Colima. Both species usually require two years to develop in the wild. This was evident because larvae from the previous year's adult activity were mostly early second instars when the current year's adults were flying. They would not become adults before the following year. In the *Eremoleon macer* and *Eremoleon vitreus* collecting sites, three species of Bombyliidae were found to parasitize these species. In the state of Chiapas, Mexico, the *Eremoleon macer* and *Eremoleon vitreus* are parasitized by an undescribed species of *Chrysanthrax* (identification: Jack Hall). In the Mexican state of Coahuila, *Eremoleon vitreus* is parasitized by an undescribed species of *Dipalta* (identification: J. Hall). In the Mexican state of Colima, *Eremoleon macer* and *Eremoleonvitreus* are parasitized by *Cyananthrax cyanopterus* (Wiedemann) (ID: J. Hall). In this instance, egg laying was observed. The fly would fan the dust pockets in the wall closely until dust would come off of the wall. When an antlion larva would snap at it, the fly would flip her abdomen forward rapidly, throwing an egg in the antlion's direction. Two flies were observed doing this. It should be noted that the parasite identifications of Hall were made over twenty years ago.

Material studied. 32 males, 24 females, 22 larvae. March to August.
MEXICO. **Baja California: Sur**: Perdito, 2 mi. N. Reserva Gate, 16.VII.1999, 23æ%. 21'49" N, 110æ%1'12" W, elevation 500 m., R Aaibu, K. Brown, I. Stahl, (1m, CASC); **Chiapas**: Valle de Mazapa, 2.III.1985, **reared**, R. Miller and L. Stange (4 larvae, 2m, FSCA). **Coahuila**: Saltillo; 2.III.1981, R.B. Miller (2m, 3f, 11 larvae). **Colima**: Colima, 7.X.1982, Spade (2m, FSCA). **Jalisco**: 41 km. N.E. Colima, 12.II.1985 **reared**, (2m,2f). **Oaxaca**: 23 miles south Matías Romero, 5.IV.1962, L. Stange (1m, FSCA); Oaxaca, 24.VIII.1973, G. Buckingham (3m, FSCA); 23 mi. S. Mateas Romero, 26.II.1985; Miller, Stange (1m,4f, FSCA). **Morelos**: 9 miles east Cuernavaca, 12.VII.1963, J. A. Beatty (1m, TAMU); Cuernavaca, 24.VI.1959, M. Evans (1m, FSCA). **Nueva Leon**: Cola de Cabello, 21.VI1.1975, Weems (1m, FSCA). **Puebla**: Five miles northeast Tehuacan, 19.VIII.1963, **reared**, L. Stange (4 larvae, 1m, FSCA), 23 km. N. Tehutzingo, 4.X.1986, Miller, Stange reared, (1m, 4f). **Veracruz**: Fortín de las Flores, Cerveceria Moctezuma, 18.V.1964, R. Woodruff (1m, FSCA); Puente Nacional, 21.II.1985, **reared**, L. Stange and R. Miller (4 larvae, 6m, 11f , FSCA; TAMU). HONDURAS. **Octopeque**: 13 km. north Ocotepeque, 5000', 1.V.1993, R. Miller and L. Stange (5m, FSCA).

Discussion. This species is closely related to *Eremoleon macer*, but does not have the ventral setae of the distal tarsomere concentrated near the distal end. Since there is no way to identify the destroyed type of *Hesperoleon atomarius* Navás, it is more likely that it is a synonym of *Eremoleon vitreus* rather than *Eremoleon macer*, since the localities are similar and *E. vitreus* appears to be the more common species. A specimen from the museum was selected as the Neotype based on agreement with the original description and locality. The larvae may be separated from those of *Eremoleon macer* by the characteristics of the mandibles.

cerverinus group

Diagnosis: antennal flagellomere 3 wider than long (*Eremoleon cerverinus*) or longer than wide; distal palpomere moderately swollen; hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; forewing costal area gradually expanded at base; forewing costal area as high or higher before stigma as above radial sector; hindwing medial area at highest point lower than wing area above it; mesoscutum usually with elongate, erect setae; wings with or without prominent dark brown areas.

Discussion. For the present, the six described species of *Eremoleon* from the West Indies are grouped together. However, there are considerable morphological differences in the male genitalia and especially female terminalia. This group includes *E. petrophila*, which have larvae that live on bare rock on the undersides of rock overhangs. Also, there is an undescribed species from Hispaniola known only from the larvae (Fig. 284-289) which live deep in *Hutia* burrows, and have all clear ocelli.

***Eremoleon cerverai* (Navás)**
Fig. 18, 56, 92, 124, 156, 222-224

Glenurus cerverai Navás 1921: 118, fig. 3 (forewing). **Holotype female**, Santiago (de las) Vegas, Habana, Cuba, 23.VIII.1915, Cervera (MCZC).

Taxonomy. Navás 1929: 39 (in *Dendroleon*); Banks 1943: 168 (in *Antilloleon*); Stange 1970: 21 (in *Eremoleon*).

Further description. Smith 1931: 814, fig. 13 (wings); Alayo 1968: 68, fig. 22, Plate VI, fig. 1, Plate VII, fig. 5 (head; nota; wings; female terminalia). Miller and Stange 2011: 12, fig. 4 (adult male), 20-22 (larva).

Biology. Miller and Stange 2011: 11, fig. 20-22 (larva).

Distribution. Cuba; Hispaniola.

Diagnosis: adult length of body 18-21 mm., forewing 24-26 mm. **Coloration**: general coloration dark brown; antenna with scape, pedicel and clava dark brown, most flagellomeres pale brown with dark brown bases; vertex (Fig. 18) with prominent dark brown scar pattern; pronotum mostly dark brown, especially laterally, with pale brown sublaterally; nota mostly dark brown with pale brown areas mostly submedial and sublateral spot on mesoscutellum; coxae mostly pale brown, with dark brown basally; fore femur with basal half pale brown, distal half dark brown; midfemur and hindfemur pale brown except broad dark brown band apically; tibiae pale brown with dark brown band subbasally and apically; tarsi with basitarsus mostly pale brown, II-IV mostly dark brown distal tarsomere pale brown with dark brown apex; abdomen mostly dark; forewing (Fig. 92) many dark brown spots on basal one-four and in apical field and with oblique dark brown stripe from origin of radial sector to area beyond cubital fork (Fig. 92); hindwing with two dark brown spots in distal field; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen mostly dark brown but banded. **Chaetotaxy**: forefemur with sparse pubescence; femoral sense hair of foreleg less than 1/3 length of femur; mesoscutellum with short, hair-like setae; thoracic pleura with many elongate white setae. **Structure**: antennal flagellomere 3 as long as wide or longer than wide; distal palpomere of labium moderately swollen (about twice that of maxillus) with palpimacula in distal 1/2; forefemur slender and elongate, at widest point about equal at most to interantennal distance; hind basitarsus 4 times or less longer than middle diameter; forewing costal cells near middle of wing less than twice as high as wide; **male genitalia** (Fig. 124) with gonarcus moderately arched, lateral margin simple, no mediuncus; paramere complex, larger ventral part about 4 times longer than wide, not sculptured, dorsal part about 2 times longer than middle diameter, narrowed apically; parameres well separated with distinct sclerite that is about 3 times longer than wide between them; **female terminalia** (Fig. 156) with pregenitale small, posterior part narrow, about 6 times wider than long with small medial spine posteriorly; posterior gonapophysis about 7 times longer than middle diameter, slightly sinuate, with long setae but none longer than gonapophysis; gonapophyseal plate dark brown, about 10 times longer than middle diameter, not strongly narrowed posteriorly; lateral gonapophyses elongate, club-shape, about 4 times longer than middle diameter with many long black digging setae which are a little longer than black digging setae on ventral part of ectoproct which is not produced ventrally; spermatheca dark brown, weakly serpentine, about 8 times longer than middle diameter, broadest anteriorly, with long hook posteriorly.
Larva (Fig. 222-224). **Coloration**: background color pale straw with brown color pattern as in Fig. 221 and 222; ventral head with submedian markings. **Chaetotaxy**: dorsal head with dolichasters; ventral head with unexpanded dolichasters; digging setae as in *Eremoleon macer*. **Structure**: intertooth distance equal to distance from base of first tooth to margin of head capsule; mandible equal in length to ventral head capsule measured at midline; mandible with distal tooth as long as or longer than middle tooth.

Biology. This species was reared from larvae found in fine sand beneath rock overhangs and cave mouths. They were not in pockets in the walls. They are not leg anchorers. The length of time in the pupal stage averaged about 30 days. About 5 percent of the larvae were parasitized by a bombyliid fly in the genus *Chrysanthrax* Osten Sacken.

Material studied. 25 males, 32 females, 1 larva. May to August.
DOMINICAN REPUBLIC. **La Altagracia Province**: Cueva de Berna, Boca de Yuca, 6.VI.1986, Miller and Stange **reared** (1 larva, 1m, 8f, FSCA). **La Vega Province**: 6 km. southeast Jarabacoa, 31.V.1986, **reared**, Miller and Stange (23m, 24 f, FSCA, TAMU; USMB). **Pedernales Province**: south end of Lago Oviedo, 24.V.1986, Miller and Stange (1m, FSCA). HAITI. Damien (MCZC); Port-au-Prince VIII.1924, G. Wolcott (1f, MCZC).

Discussion. The abundant wing markings (Fig. 92) distinguish this species from other *Eremoleon* found in Hispaniola or Cuba, except for *Eremoleon ornatipennis*, which has even more abundant dark brown wing spots and the forewing costal cells near the middle of the wing over 3 times broader than

wide (less than twice as broad in *Eremoleon cerverai*). This species has the best developed digging setae in the group.

***Eremoleon cerverinus* (Navás)**
Fig. 19, 57, 93, 125, 157, 225-227

Belen cerverinus Navás 1921: 120, fig. 4 (apex forewing). **Holotype female**, Rio Almendares, Habana, Cuba, 1.VIII.1915, Cervera (MCZC, type examined, with attached female abdomen from another species).

Taxonomy. Adams 1957b: 6 (in *Eremoleon*).

Further description. Adams 1957: 6, fig. 1 (vertex; pronotum; wings, (male genitalia mislabeled, actually genitalia of *E. pallens*); labial palps); Alayo 1968: 70, fig. 10 (wings); Plate III, fig. 3 (head abdomen and thorax; Plate VII, fig. 10 (female terminalia); Miller and Stange 2011: 13, fig. 5-8 (adult), 23-24 (larva).

Biology. Miller and Stange 2011: 13, fig. 23-24 (larva).

Distribution. Cuba (Teruel 2005: 216, fig. 2, distribution map); Hispaniola.

Diagnosis: adult length of body 19-21 mm., abdominal tergite III about 3 mm (male); forewing length 24-26 mm., width 6.2 mm.; hindwing 23 to 24 mm long, about 5. 0 mm wide. **Coloration**: face pale brown with dark brown band below antennae; mouthparts pale brown with dark brown on apex of distal labial palpomere; antenna most pale brown, clava mostly dark brown, narrow basal dark brown bases on flagellomeres; vertex (Fig. 19) with anterior scar row continuous but not reaching lateral margin, extended posteriorly to posterior scar row; no middle scar row discernible; pronotum mostly pale brown with brown inverted U-shape dark brown area laterally toward anterior margin, submedial spot near posterior margin, some dark brown sublaterally; nota mostly pale brown with most of dark brown area lateral; mesoscutellum pale brown with large dark brown lateral area enclosing pale brown spot; metascutellum mostly pale brown with broad sublateral stripe which is extended laterally; mesepimeral wing process light brown; coxae pale with dark area subapically; femora mostly pale brown with dark brown apex; foretibia and midtibia pale brown with dark brown area subbasally and apically; hindtibia pale brown with small dark brown area apically; tarsi nearly all pale brown with reduced dark brown on apices of some tarsomeres; forewing (Fig. 93) without dark brown spots or stripes and with reduced cross vein suffusion; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; abdomen banded, tergite II dark brown, III-VIII pale brown basally with apical half black. **Chaetotaxy**: setae on head and thorax mostly white, on legs, mostly black; forefemur with sparse pubescence; femoral sense hair of foreleg less than 1/3 length of femur; mesoscutellum with short, hair-like setae. female ectoproct with short digging setae, posterior gonapophysis with some setae longer than gonapophyseal length. **Structure**: distal palpomere of labium moderately swollen (about twice that of maxillus) with palpimacula distal to middle; antennal flagellomere 3 wider than long; forefemur slender and elongate, at widest point about equal at most to interantennal distance; distal tarsomere of foreleg about as long as four preceding segments, cylindrical with setae evenly spaced; hind basitarsus 4 times or less longer than middle diameter; wings slender; forewing with 9-11 veinlets from PCU+A to hind margin; forewing costal cells near middle of wing less than twice as high as wide; **male genitalia** (Fig. 125) with gonarcus moderately curved, weakly twisted apically and strongly angled apically; mediuncus inconspicuous; parameres complex, widely separated, strongly sculptured on apically narrowed portion toward gonarcus; paramere strongly concave at middle due to reflexed medial margin; nearly rectangular sclerite between parameres near center with sclerotized, pointed process at middle; **female terminalia** (Fig. 157) with pregenitale nearly rectangular, about 3 times wider than long with medial double spines which touch apically; posterior gonapophysis about 4 times longer than middle diameter with some setae longer than gonapophyseal length; gonapophyseal plate at least 10 times longer than middle diameter;

lateral gonapophysis club-shapedabout 4 times longer than wide, posterior part widest, nearly touching, posteriorly widely diverging; with more than 10 stout black digging setae, some about as long as gonapophyseal width, but much shorter than those on posterior margin of ectoproct which is produced ventrally.

Larva (Fig. 225-227). **Coloration**: pale with brown markings (Fig. 225-226); head unmarked ventrally. **Chaetotaxy**: setae on dorsal head slightly flattened, but verging on simple; head with straight unexpanded dolichasters ventrally; body with simple setae; dorsal surface of mandibles with a few scattered dolichasters. **Structure**: mandible same length as ventral head capsule measured at midline; distance from basal mandibular tooth to middle tooth 60 percent of distance from first tooth to third tooth; second tooth same length as third tooth; palpi longer than basal width of mandible.

Biology. Larvae were found and reared from fine, white silt and sand on and at the bottom of rock overhangs in caves. They were not anchored to a hard surface.

Material studied. 14 males, 6 females, 3 larvae. May to September.
DOMINICAN REPUBLIC. **Azua Province**: Playa Tortuguero, 23.V. 1986, Miller and Stange , **reared** (3 larvae, 14m, 5 f, FSCA); Puerto Tortuguero, 19.IX.1985, Woodruff and Stange (1f, FSCA).

Discussion. Superficially this species resembles *Eremoleon petrophila*, but differs in having the antennal flagellomere 3 times wider than long. The scutellum has a complete dark sublateral dark brown stripe. Also, the chaetotaxy of the female terminalia is different. This is related to a basic difference in biology. Navás (1921) placed this species in his new genus *Belen* based on the anastomosis of several prestigmatic cross veins. However, this character is variable and not of generic importance. The larva is distinctive in having the middle mandibular tooth closer to the distal tooth than the basal tooth. This character is only shared with *Eremoleon petrophila* and *Eremoleon nigribasis* in the genus. Adams (1957b) drawing of the genitalia of *Eremoleon cerverinus* is actually the mislabeled genitalia of *Eremoleon pallens* (=*Eremoleon sectoralis*).

***Eremoleon jamaica* Miller and Stange, new species**
Fig. 20, 58, 94, 126, 158, 228-232

Holotype male, two miles southwest Reading, St. James, Jamaica, 4.VI.1983, reared, R. Miller and W.D. Miller (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: mesoscutellum with elongate, erect white setae, some of which are at least 1/3 length of scutellum; female ectoproct and lateral gonapophysis with several small black digging setae; posterior gonapophysis finger-like, about 3 times longer than wide.

Holotype male: length of body about 30 mm, forewing length 28 mm., width 9 mm., hindwing length 28 mm., width about 7 mm. **Coloration**: face with dark brown band below antennae, clypeus and labrum pale brown; mouthparts pale brown except weak dark brown on apex on distal labial flagellomere; antenna mostly pale brown except dark brown apex, scape, pedicel and most flagellomeres with weak dark brown apices, especially dorsally; vertex (Fig. 20) with prominent dark brown scar areas; pronotum pale brown with some darker brown anteriorly, laterally, sub laterally and sub medially; nota mostly pale brown with many darker brown areas; scutelli mostly pale brown; thoracic pleura (Fig. 58) mostly pale brown; legs with coxae pale brown with small subapical dark brown mark, femora pale brown with dark brown near middle and apically; tibiae pale brown with dark brown subbasally and apically; tarsi pale brown with weak dark brown apices except larger on distal tarsomere; abdomen banded; wings (Fig. 94) without conspicuous dark brown markings; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas. **Chaetotaxy**: mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum; femoral sense hair of foreleg less than 1/3 length of femur. **Structure**: antennal flagellomere 3 as long as wide or longer than wide; distal palpomere of

labium moderately swollen (about twice that of maxillus) with palpimacula in distal 1/2; forewing costal area as high or higher before stigma as above radial sector; **male genitalia** (Fig. 126) with gonarcus weakly arcuate, narrowed and twisted laterally, mediuncus nearly absent; paramere complex with part near gonarcus more sclerotized, about 3 times wider than long, with strong, wide sclerotized band on anterior, medial and posterior margins; posterior part broad, setose, semi-membranous, broader than long; prominent sclerite between parameres about 3 times longer than wide, not reaching anterior margin of paramere.

Female terminalia (Fig. 158) with pregenitale relatively large with anterior band about 6 times wider than long with posterior median process large, about 3 times wider than long; length about 4 times as long as that of anterior band; posterior gonapophysis about 7 times longer than wide with some setae about as long as gonapophysis; lateral gonapophyses broad, elongate, about 4 times longer than middle diameter, diverging anteriorly but nearly touching posteriorly, with about 6-8 stout dark brown digging setae which are longer than anterior width of gonapophysis but shorter than about 7 stout brown digging setae on ventral margin of ectoproct which are shorter than dorsal hair-like setae; spermatheca at least 8 times longer than middle diameter, broadly hooked apically.

Larva (Fig. 228-232). **Coloration**: larva generally pale with brown markings on dorsal head capsule (Fig. 229), pronotum, and a couple rows of spots on dorsal abdomen; ventrally, larva unmarked except for pale markings on abdomen (Fig. 228). **Chaetotaxy**: larva with simple stout setae dorsally and ventrally; setae anteriorly protruding from labrum simple; digging setae as in Fig. 232. **Structure**: distance from basal tooth to dorsal head capsule 85 percent intertooth distance; mandibular length equal to length ventral head capsule measured at mid line; palpi 1.5 length of basal mandibular width.

Biology. Larvae live in white powder-like decomposed calcium carbonate material under cave overhangs and in horizontal wall pockets. They are leg anchorers. The calcium carbonate in which they were found was dry, but slightly sticky from high humidity. When captured, larvae have their bodies covered with white powder.

Paratypes: 11 males, 30 females, 2 larvae. February to August.
JAMAICA. **Portland**: Hectors River, 25.VIII.1954, R. Bengry (1f, FSCA). **St. Ann**: Runaway Bay Cave, 50', 30.IV.1973, D. Davis (1m, FSCA); Long Slope, 19.VIII.1956, R. Farr (1m, FSCA); **St. Andrew**: Stony Hill, II.1954, C. Lewis (1f, 1m, FSCA). **St. James**: two miles southwest Reading, 4.VI.1983, **reared**, R. Miller and W.D. Miller (2 larvae, 10m, 28f, FSCA).

Discussion. The larvae of this species may be separated from superficially similar *Eremoleon longior* and *Eremoleon phasma* by key characters relating to the mandibles.

Etymology. This species is named for the country of origin.

***Eremoleon ornatipennis* (Alayo)**
Fig. 95

Antilloleon ornatipennis Alayo 1968: 69, fig. 22 (wings), Plate VI. fig. 4 (vertex, nota), Plate VII, fig, 6 (female terminalia). **Holotype male**, Soroa, Pinar del Rio, Cuba, IV.1963 (IZAC).

Taxonomy. Stange 1970: 21 (in *Eremoleon*).

Distribution. Cuba.

Diagnosis (from original description): body length 23 mm, forewing 30 mm., hindwing 31 mm.
Coloration: face pale brown with dark brown band below and between antennal fossae; mouthparts mostly pale brown with sensory area of distal palpomere of labium with dark brown; antenna yellowish

with reddish bands and clava dark brown; nota mostly dark brown, pleura mostly pale brown, mesopleuron without well-defined dark brown stripe dorsally; femur mostly pale brown with brownish area apically and midfemur and hindfemur except forefemur mostly dark brown dorsally; foretibia and midtibia pale brown with dark brown area apically and at middle, hindtibia almost completely pale brown; tarsus mostly pale brown with dark brown apically and at middle; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; forewing with numerous dark brown spots including costal area; hindwing with several dark brown spots apically; abdomen mostly dark brown with pale brown on female terminalia. **Structure**: antenna longer than head and thorax together; pronotum longer than broad as measured at middle; hind basitarsus shorter than distal tarsomere; forewing wider than hindwing but slightly shorter in length; forewing vein CuP+1A extends to posterior vein beyond level of radial sector; forewing costal cells near middle of wing over 3 times higher than wide; hind basitarsus more than 5 times longer than wide wing.

Distribution
CUBA. **Pinar del Rio**: Soroa, IV.1963 (1m, IZAC).

Discussion. Judging from the drawings of the wings given by Alayo (1968), the wide costal area (cells more than 3 times higher than wide) with the cells not interconnected appears diagnostic, especially when used with the extensive dark brown dotting of the forewing.

***Eremoleon petrophila* Miller and Stange**
Fig. 21, 59, 96, 127, 159-160, 233-237

Eremoleon petrophila Miller and Stange 2011: 14, fig. 9, 10, 11 (color photo adult body, legs, female terminalia); 25-26 (larva). **Holotype male**, El Capa, 17 km. northeast Vallejuelo, San Juan Province, Dominican Republic, 27.V.1986, Miller and Stange (FSCA).

Biology. Miller and Stange 2011: 15.

Diagnosis: length of body about 20 mm, forewing and hindwing about 25 mm, abdominal tergite III 3.1 mm. **Coloration**: pale brown with contrasting dark brown markings; clypeus and labrum pale brown, with small sublateral dark brown spot on clypeus; mouthparts pale brown except for dark brown cardo and dark suffusion at palpimacula; broad interantennal dark brown spot, more extensive below antennal, dark brown encircling antennal bases; vertex pale brown with 4 dark brown suffused scars on anterior row, lateral ones much wider than long, double median scars longer than wide; small, irregular dark spot behind lateral spot of anterior row, with another dark brown area behind that; dark brown at lateral posterior margin; antenna mostly pale brown, scape dark brown mesally and laterally; pedicel mostly dark brown except apex; flagellomeres before subapical swelling with dark brown basally on median face and lateral face, thus uninterrupted pale bands extend from near base to flagellar expansion on two sides; clava mostly darker brown preceeded by several mostly pale brown flagellomeres; pronotum pale brown with dark brown areas submedially at middle and anteriorly, sublateral dark brown spots posteriorly and anteriorly, and small dark brown spot laterally at posterior end; nota pale brown with dark brown spots; pterothorax mostly pale brown with numerous dark brown areas on scutum, mesoscutellum and pleura; metascutellum nearly all pale brown; postnota extensively dark brown; coxae pale brown with small dark brown spot on lateral face; femora, tibiae and tarsus of all legs similarly colored, pale brown with dark brown apical spot on femora and tibiae, tibiae also with subbasal dark brown area (reduced in size on hind tibial), tarsus mostly pale brown with some dark brown on tarsomeres 3 and 4 and apex of distal tarsomere; abdomen mostly pale brown with dark brown banding dorsally; large dark brown spot on middle of tergite II, most of posterior third of tergites III-IV except apically, tergite VIII and most of sternites nearly all pale brown; wings (Fig. 96) without dark brown spots or suffusion except small rhegmal and stigmal areas; veins pale brown with dark brown interruptions at vein and cross vein junctures. **Chaetotaxy**: pronotum with many elongate, erect white bristles including sublateral ones; nota and scutelli with elongate, erect white bristles; forecoxa with several elongate

white bristles posteriorly; femoral sense hair of foreleg less than 1/3 length of femur; mesoscutellum with several elongate, erect white setae, some of which are at least 1/3 length of scutellum. **Structure**: antenna with flagellomere 3 longer than wide; distal palpomere of labium moderately swollen; forefemur slender and elongate, at widest point about equal at most to interantennal distance, with sparse pubescense; forewing with costal area higher before stigma as above radial sector, not narrowing toward stigma, with single series of cells for entire distance, radial sector arising about 1/3 distance from base; hindwing not abruptly narrowed toward apex, medial area at highest point lower than wing area above it; pretarsal claws of hindleg shorter than basitarsus which is about 4 times longer than greatest diameter; hind tibial spurs reaching beyond tarsomere II; female ectoproct not produced ventrally; **male genitalia** (Fig. 127) with gonarcus weakly arcuate, narrowed and twisted laterally, mediuncus nearly absent; paramere complex with part near gonarcus more sclerotized, about 4 times wider than long, with strong, wide sclerotized band on anterior, medial and posterior margins; posterior part broad, setose, semi-membranous, broader than long; prominent sclerite between parameres about 3 times longer than wide, not reaching anterior margin of paramere; **female terminalia** (Fig. 159, 160) with pregenitale narrow, about 8 times wider than long with prominent medial process posteriorly; female posterior gonapophysis about 2 times longer than middle diameter, inflated, with no setae longer than gonapophyseal length; gonapophyseal plate broadest at gonapophyseal base, then narrowing apically, at least 6 times longer than middle diameter; lateral gonapophyses small, fused, about 2 times longer than wide, without digging setae; ectoproct without digging setae, longest setae dorsally; spermatheca at least 8 times longer than middle diameter, hooked apically.

Larva (Fig. 233-237). **Coloration**: larvae mostly pale with pale, hair-like setae. **Chaetotaxy**: dorsal head with short thick, rounded dolichasters and much hair-like setae; setae on rastrum as in Fig. 237; **Structure**: abdomen with short, thick, rounded scolus-like processes; mesothoracic spiracle borne on tubercle; labial palpus twice basal mandibular width; middle tooth on mandible closer to distal tooth and as long; intertooth distance 60 percent of distance from base of first tooth to dorsal head capsule; mesoscutum and mesoscutellum with many elongate erect white bristles.

Biology. Larvae were found and reared from rock overhangs where they live on the bare rock of the ceiling. They are difficult to see. They are not trash carriers. Some adults were found during the day resting on the ceiling where larvae were also present. The female probably lays her eggs on the rock ceiling using her modified terminalia to clean the egg deposition site. Small clusters of eggs were found on the rock surfaces where larvae were found. Cocoons are located in rain protected zones where two surfaces come together at a slight angle.

Material studied. 10 males, 14 females, 8 larvae. May to September.
DOMINICAN REPUBLIC. **Barahona**: 29 km. east Barahona, 29.IX.1985, L. Stange and R. Woodruff (1f, FSCA); 6 km. northeast Paraiso (San Rafael), 24.V.1986, **reared**, R. Miller and L. Stange (1m, 1f, FSCA), **San Juan**: El Capa, 17 km. northeast Vallejuelo, 27.V.1986, **reared**, R. Miller and L. Stange (8 larvae, 9m, 12 f, FSCA).

Discussion. This species is similar to *Eremoleon cerverinus* in coloration and structure. The major differences are found on the female terminalia. Also, the antennae are longer with the third flagellomere about as long as wide, rather than wider than long, as in *cerverinus*. There also appears to be more bristle-like setae on *Eremoleon petrophila*, especially on the metanotum and forecoxa. The posterior gonapophysis is short and inflated, and the lateral gonapophysis and ectoproct lack digging setae. This species could be segregated into its own genus, as the characters of the female terminalia and larvae are different than in other *Eremoleon*. These modifications are probably attributable to the different microhabitat of the larvae. As in most rock dwelling larvae, the larvae are flattened, with well developed scolus-like processes which provide camouflage. The short, stout setae on the posterior gonapophysis presumably evolved for laying eggs on rock, although they are not as well developed in other species with this habit, such as those of *Navasoleon* Banks and *Jaffuelia* Navás. The larvae are similar to those of *Eremoleon cerverinus* in having the middle mandibular tooth closer to the distal tooth than to the basal tooth.

Etymology. The specific name is Greek for rock-loving.

Eremoleon phasma Miller and Stange
Fig. 22, 60, 97,128, 161-163, 238-240

Eremoleon phasma Miller and Stange 2011: 15, fig. 12-15 (adult, 27-29 (larva). **Holotype male**, Los Rios, Lago Enriquillo, Independencia Province, Dominican Republic, 23.V.1986, Miller and Stange (FSCA).

Biology. Miller and Stange 2011: 16.

Diagnosis: body length 23 mm., forewing length about 26 mm., third abdominal segment length 3.5 mm. **Coloration**: yellowish brown with restricted dark brown marking as follows: submedial dark brown spot on clypeus, palpimacula, scape and pedicel anteriorly and laterally as band; small coma-shaped mark sublaterally on anterior row of vertex marking, larger submedial spot on middle row of vertex markings; 3 small spots laterally on pronotum, anterior area of prescutum, several lateral spots on mesonotum, postnotum, mera of midleg and hindleg; faded spot on apex of femora, subbasally and apically on femora, and apex of distal tarsomeres; pleura toward venter; spots below wing base; abdomen with sublateral, longitudinal band toward posterior margin; wing membrane without dark brown spots or dark brown suffusion; stigma whitish, venation mostly pale brown with some dark brown at vein and cross vein junctures, especially basally. **Chaetotaxy**: nota with moderate number of fairly short white bristles; forecoxa without outstanding white bristles posteriorly; femoral sense hair of foreleg less than 1/3 length of femur. **Structure**: antenna with weakly expanded clava; flagellomere 3 broader than long; distal palpomere of labium moderately swollen; forewing costal area about as high before stigma as above radial sector; radial sector arising well before midpoint of wing; hindwing not abruptly narrowed toward apex; medial area at highest point higher than wing area above it; forefemur slender and elongate, at widest point about equal at most to interantennal distance, with sparse pubescence; foretarsal claws longer than basitarsus of midleg; basitarsomere of hindleg about 3 times longer than wide; tibial spurs of hindleg reaching beyond tarsomere II; **male genitalia** (Fig. 128) with gonarcus moderately arcuate, broadened and twisted laterally, with short mediuncus; paramere complex, part near gonarcus about 4 times broader than long, strongly sculptured with small, elongate warts; more strongly sclerotized on anterior, medial and posterior margins; prominent elongate sclerite between parameres, about 5 times longer than wide, not reaching anterior margin of pointed paramere below which is a small rounded lobe; large, setose membrane posterior to parameres, much broader than long; **female terminalia** (Fig. 161-162) with pregenitale large with compressed dome-like projection, weakly extended laterally; posterior gonapophysis about 2.5 times longer than middle diameter, with some setae longer than gonapophysis; gonapophyseal plate pale brown, about 10 times longer than middle diameter, narrowing posteriorly; lateral gonapophyses transverse, contiguous but separated by furrow with about 8-10 elongate black setae, a little longer than those on ectoproct which is not produced ventrally; spermatheca sinuate, about 10 times longer than middle diameter, broader anteriorly than posteriorly.
Larva (Fig. 238-240). **Coloration**: pale (Fig. 238) with limited head markings and a couple of rows of small brown spots down the dorsal abdomen; ventrally pale with a couple of rows of small marking on abdomen (Fig. 239); ventral head unmarked. **Chaetotaxy**: dorsal head, thorax, and abdomen with simple setae; ventral head with sparse simple setae; ventral thorax and abdomen with simple setae; dorsal surface of mandibles devoid of setae. **Structure**: head long and narrow; basal length of mandible from basal tooth to dorsal head capsule about 10 percent longer than intertooth distance; mandible equal to length of ventral head capsule measured at midline; no visible spiracles on mesothorax.

Biology. Larvae of this species live in pockets of dust in decomposing calcium carbonate cliffs and caves. The larvae are coated with the white sticky dust. As with all antlion larvae living in very fine dust, the head and mandibles are rather elongate. They anchor their legs. They share their ecological niche with a second species of antlion which has mandibles indicating it is probably *Peruvenleon* Miller and Stange.

The body shape, elongate mandibles, and coloration of this second species are like that of *E. phasma,* but the placement of the mandibular teeth immediately sets it apart.

Material studied. 22 males, 17 females, 8 larvae. May.
DOMINICAN REPUBLIC: **Azua Province**: Playa Tortuguero, 23.XI.1986, **reared**, Miller and Stange (8 larvae, 15m, 10 f, FSCA); Puerto Tortuguero, **reared**, 29.XI.1986, Miller and Stange (lm, 2 f, FSCA). **Independencia Province**: Los Ríos, Lago Enriquillo, **reared**, 23.V.1986, Miller and Stange (4m, 3 f, FSCA); Monte Cristi: 9 km. N. Villa Elisa, 4.VI.1986, **reared**, R. Miller, L. Stange, (2m, FSCA)

Discussion. This is the largest *Eremoleon* in Hispaniola and is mostly of pale yellow color. The large dome-like pregenitale (Fig. 161) is distinctive.

Etymology. The name, phasma, is Greek for ghost. The relatively pale, slow flying nocturnal insects might appear as a fantasma to some observers.

femoralis group

Diagnosis: antennal flagellomere 3 broader than long; pronotum without elongate white setae sublaterally; mesoscutum without elongate white setae; forewing costal area narrow, cells above radial sector broader than long; hindwing slightly shorter than forewing which is about as long as body, in repose hindwing does not extend beyond apex of forewing; forewing costal area gradually expanded at base; hindwing medial area at highest point lower than wing area above it; forewing radial sector arises beyond midpoint of wings; costal cells above radial sector wider than high, both wings with several prominent dark brown spots or areas.

Discussion. This group contains only one species, which superficially appears as a *Purenleon*, but has longer legs. The peculiar larval habitat is unique in the genus. The male genitalia fit well with *Eremoleon*.

Eremoleon femoralis (Banks)
Fig. 23, 61, 99, 129, 164, 241-243

Psammoleon femoralis Banks 1942: 146, fig. 13, 17 (labial palp; hind tarsus). **Holotype**, 20 miles northwest of La Paz, Baja California, 16.VII.1938 (CASC)

Taxonomy. Stange 1970: 21 (in *Eremoleon*).

Distribution. Mexico; U.S.A. Arizona (Penny et al. 1997: 76).

Diagnosis: length of body about 20 mm, forewing length 19-21 mm, width 4-5 mm; hindwing length 18-19 mm, width 3-4 mm. **Coloration**: general body coloration dark brown; face mostly pale brown with dark brown band below antennae and dark brown marks ventrally; antennal flagellomeres pale brown with broad basal dark brown band; vertex (Fig. 23) with anterior scar row continuous and complete to ocular rim, weakly produced posteriorly at middle, middle scar row consists of two dark brown areas, posterior scar row consists of 5 dark brown areas; pronotum dark brown with pale brown at middle at anterior one half and pale brown sublaterally; nota dark brown with minor pale brown areas submedially; scutelli dark brown with median pale brown line; femora dark brown, narrow pale brown area apically; foretibia and midtibia pale brown with many dark brown setal spots and other dark brown markings; hindtibia mostly pale brown with dark brown subbasally, apically and on anterior face; tarsi with basitarsus and II mostly pale brown, III-IV mostly dark brown and distal tarsomere pale brown with dark brown apically; forewing (Fig. 99) with prominent diagonal stripe in cubital area and scattered dark brown marks along outer gradates; hindwing similar to forewing but without cubital area stripe; abdomen banded, mostly dark brown, tergites with small pale brown band near anterior margin, weakly

emarginated at anterior margin. **Chaetotaxy**: pronotum without elongate white setae sublaterally; mesoscutum without elongate white setae; forefemoral sense hair about 2 times length of femur and about equal to that of midfemur; femora mostly with white setae, foretibia and midtibia with white setae anteriorly, black setae posteriorly, hindtibia mostly black setae. **Structure**: antennal flagellomere 3 broader than long; pretarsal claws shorter than hind basitarsus (Fig. 61); foretibial spurs as long as basal three tarsomeres together; forewing slightly longer than hindwing and about same length as body; forewing costal cells much wider than high above radial sector; forewing radial sector arises beyond midpoint of wings; costal cells above radial sector longer than high; hindwing medial area at highest point lower than wing area above it (Fig. 98); **male genitalia** (Fig. 129) with broad, moderately arched gonarcus with meduncus, broadened and twisted laterally; paramere broad, lightly sculptured plate about 3 times wider than long, extending posteriorly; strongly sclerotized on anterior, mesal and posterior margins; sclerite between parameres; broad setose membrane posteriorly; **female terminalia** (Fig. 164) with small pregenitale transverse, about 5 times wider than long with small middle process; posterior gonapophysis about 3 times longer than middle diameter with several distal setae much longer than gonapophysis; lateral gonapophysis elongate about 5 times longer than wide, with many stout digging setae longer than gonapophyseal width and about equal to digging setae on ventral margin of ectoproct.

Larva (Fig. 241-243). **Coloration**: grey background color with dark brown patterns taking up majority of dorsal surface (Fig. 241); ventrally, more lightly marked with unmarked ventral head capsule; mandibles dark brown. **Chaetotaxy**: anterior dorsal head capsule with thick unexpanded dolichasters, grading to semi-simple setae posteriorly and laterally; ventral head with unexpanded dolichasters anteriorly and simple setae posteriorly; thorax and abdomen with unexpanded dolichasters dorsally and simple setae ventrally; no setae on dorsal surface of mandibles; setae on rastrum with inner pair short and outer three pair elongate and about equal (Fig. 242); setae on labrum elongate dolichasters. **Structure**: mandibles length 90 percent of ventral head capsule measured at midline; distance from base of first tooth to dorsal head capsule 75 percent of intertooth distance; mesothoracic spiracles twice as long as their basal width viewed dorsally.

Biology. Larvae were found living in termite frass in small rain protected holes in tree limbs and abandoned termite galleries, in dry hollow logs or limbs, with medium indirect light exposure. A few crumpled ants were found around them. They occupy a similar larval niche to North American *Dendroleon speciosus* Banks larvae and the authors have noted that they have never been found occurring together at the same locality. *Eremoleon femoralis* are found in dryer habitats. They live buried in loose material with their legs anchored to wood. They have a 12 month life cycle. Their dorsal coloration matches the weathered wood coloration in which they live, much like North American *Dendroleon speciosus*. A female from Baja California (1.5 mi. N. Punta Colorado) was fed and maintained alive when it appeared to have not laid eggs yet, but was obviously developing a full abdomen of eggs. After a few days it laid all of her eggs on a thin frass substrate, leaving her abdomen completely empty. It laid 14 fertile eggs. Four additional adults were produced from those eggs.

Material studied. 5 males, 8 females, 3 larvae, 8 hatched eggs. June to August.
MEXICO. **Baja California** 2.5 miles north Los Barriles, 25.VI.1983, **reared**, R. Miller and L. Stange (1m, 1f, FSCA); 1.5 miles north Punta Colorado, 25.VI.1983, **reared**, R. Miller and L. Stange (2 larvae, 1f captured, 2m, 2f, **reared** from eggs, FSCA); 7 miles southwest La Paz, 6.VIII.1968 (1f, FSCA); Juncalito Beach, 25.VII.1983, **reared**, R. Miller, L. Stange, (1f, FSCA). **Sonora**: Desemboque, 1.VIII.1952, B. Malkin (1f, CASC). U.S.A. **Arizona**: Sabino Canyon, 1.VI.1983, **reared**, R. Miller and L. Stange (1 larva, 2m, 2f, FSCA).

Discussion. This is a small, mostly dark brown species. The relatively narrow wing has the hindwing medial area at highest point lower than wing area above, and the forewing radial sector arises well beyond mid-point of wings with costal cells above radial sector wider than high.

gracile group

Diagnosis: antennal flagellomere 3 as long as wide; pretarsal claws shorter than hind basitarsus which is shorter than distal tarsomere; hindwing as long as forewing, in repose, does not extend beyond apex of forewing; forewing costal area gradually expanded at base; forewing costal cells above radial sector about wider than high; hindwing medial area at highest point lower than wing area above it; mesoscutellum with short, hair-like setae.

Discussion. The three species constituting this group are similar in adult characteristics. The hind basitarsus is about 4 times longer than middle diameter. The forewing costal cells above the cubital fork are wider than long. The female terminalia of *Eremoleon tanya* appears different from the other species. The vertex markings are different in *Eremoleon gracile* and *Eremoleon jacumba.* The larva of the latter two species are quite different in coloration and head length and live in different habitats. The larvae of *Eremoleon tanya* and *Eremoleon jacumba* live in similar ecological niches, but *Eremoleon tanya* is a species of higher elevations.

***Eremoleon gracile* Adams**
Fig. 24, 62, 100, 130, 165, 244-246

Eremoleon gracile Adams 1957: 90, fig. 3, 17, 29 (vertex, pronotum, wings, labial palp). **Holotype female**, Riverside, California, 31.VIII.1939, P. De Bach (CASC)

Distribution. Mexico; U.S.A.

Diagnosis: length of body about 21 mm, abdomen 15 mm; forewing 25-26 mm long; hindwing 22 to 24 mm. **Coloration**: labial palpus pale; scape and pedicel shiny black, flagellum reddish brown, apex darker; face pale; shiny dark inter-antennal band present, widely separated from first vertex row; which has a curved, dull black dash each side, and a pair of indistinct submedian brown dots; second two similar but fainter; behind a shiny black spot each side near eye, and an indistinct brown median mark; thorax mostly pale, notum marked as in Fig. 11; meso-and metepisterna largely infuscate, epimera largely pale; expansion of mesepimeral wing process light yellow; fore coxa pale with small basal fuscous spot; midcoxa and hindcoxa infuscate laterally; femora pale, faintly dotted at base of some setae, apical shiny black bands; tibiae dotted with dark, bearing basal and apical black bands; tarsi pale, distal tarsomere narrowly dark tipped; leg setae mostly black, many white ones on femora; first abdominal tergite pale with small dark brown preapical dot; second with pale basal band and apical dot; third to seventh dark fuscous, a large pale spot each side, broadly connected medially apical segments pale; first sternite with a black spot each, second, third and base of fourth pale, apex, of fourth, fifth, sixth and seventh fuscous; wings (Fig. 100) usually with some small dark brown areas; base of wing pale, venation largely pale, many cross veins dark brown wholly or at ends; longitudinal veins interrupted with dark brown at intersections of many cross veins. **Chaetotaxy**: forefemoral sense hair about 3 times longer than femur diameter; mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum. **Structure**: labial palpus short, not much swollen; antenna with about 41 flagellomeres, flagellomere 3 as long than wide; pronotum about as wide as long; pretarsal claws equal to basal three tarsomeres, shorter than hind basitarsus; hind tibial spurs equal to basal two tarsomeres; hind basitarsus at most 3 times longer than mean diameter, shorter than distal tarsomere (Fig. 61); forewing costal area gradually expanded at base; forewing costal cells above radial sector much wider than high (Fig. 100); hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing; **male genitalia** (Fig. 130) with gonarcus moderately arched, broad at middle, than narrowing laterally; but strongly broadened at lateral margin; no mediuncus; paramere simple, weakly sculptured plate, about 4 times longer than wide, narrower toward gonarcus, parameres widely separated with elongate membranous sac which is about 7 times longer than wide; broad setose membrane ventral to parameres; **female terminalia** (Fig. 165) with pregenitale small, with rounded sclerotized ridge at middle about 4 times wider than long; posterior gonapophysis about 3 times longer than middle diameter, no setae longer than gonapophysis; gonapophyseal

plate over 10 times longer than middle diameter, slightly narrowed at middle; lateral gonapophyses transverse, contiguous posteriorly with long, non- digging setae which are shorter than slightly stouter setae on ventral surface of ectoproct, and about 0.5 length of hair-like setae dorsally; ectoproct oval, not produced ventrally.

Larva (Fig. 244-246). **Coloration**: straw colored with two prominent sublateral rows of markings down the dorsal abdomen; dorsal head marked as in Fig. 244, with a single pair of small submedian marks centrally located; mandibles light brown; head and prothorax unmarked ventrally; ventral abdomen with two rows of small markings; ventral head unmarked. **Chaetotaxy**: dorsal head capsule with dolichasters, with some at center of head somewhat expanded; dorsal thorax and abdomen with unexpanded dolichasters; ventral abdomen with elongate, almost hair-like, simple setae; dorsal surface of mandibles without setae. **Structure**: mandibles same length as ventral head capsule measured at midline; distance from base of first tooth to dorsal head capsule 80 percent of intertooth distance; head width posterior to eye stalks 78 percent of ventral head length measured at midline; mesothoracic spiracles not visible.

Biology. This species is known to be coexisting with *Eremoleon jacumba* in two areas, but in separate, well separated, larval niches. The larvae do not occur together. *Eremoleon gracile* have only been found to date in lizard burrows shallow enough to have light, but deep enough to be out of the rain. In open desert they are likely to be found in this situation under creosote bushes. Adults are not typically collected near overhangs or large boulders like *Eremoleon jacumba*. They can be collected in areas where there are no rocks at all. This species, unlike *Eremoleon jacumba*, does not have the ability to lay eggs without prior feeding. Upon emergence from the cocoon, the female abdomen is quite slender and eggs need to develop after feeding.

Material studied. 1 male, 5 females, 5 larvae. July to August.
U.S.A. **California**: Covington Flat, Joshua Tree National Monument, no date, Knox (1f, FSCA); Deep Canyon, Riverside county (1 larva, FSCA); Riverside, 28.VIII.1957, E. Schlinger (1f, FSCA); Riverside,31.VIII.1939, P. De Bach (1f holotype, CASC); 10 miles east Indio, Riverside county, 10.V.1983, **reared**, R. Miller (1f, FSCA); Pinyon Wells, Joshua Tree National Monument, Riverside county, 27.VIII.1965, E. Sleeper and S. Jenkins (1m, CASC). MEXICO. **Baja California Norte**: Rancho Santa Ines, 29’43"N, 114’41"W,540 m., 30.VI.1979, W. Clark (1f, CASC).

***Eremoleon jacumba* Miller and Stange, new species**
Fig. 25, 63, 101, 131, 166, 247-249

Holotype male, 13 miles west Rosalita, Baja California, Mexico, 5.VII.1983, reared, R. Miller and L. Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Holotype male: length of body about 21 mm, abdomen 15 mm; forewing 25-26 mm long; hindwing 22 to 24 mm. **Coloration**: antenna with scape brown basally, pale apically, pedicel and flagellomere 1 mostly brown, other flagellomeres with mostly pale coloration; vertex (Fig. 25) mostly pale with submedian dark brown spot; pronotum mostly pale brown with scattered small brown areas; pteronotum mostly pale brown with scattered small brown areas; mesoscutellum pale with irregular submedian dark brown line; metanotum nearly all pale legs mostly pale brown with dark brown apical band on femora, tibiae and distal tarsomere; wings (Fig. 101) without dark brown spots, suffusion limited mostly to rhegma; abdomen banded, mostly pale anteriorly and darker brown posteriorly. **Chaetotaxy**: forefemoral sense hair about 3 times longer than femur diameter; mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum. **Structure**: labial palpus short, not much swollen; antenna with about 41 flagellomeres, flagellomere 3 as long than wide; pronotum about as wide as long; pretarsal claws equal to basal three tarsomeres, shorter than hind basitarsus; hind tibial spurs equal to basal two tarsomeres; hind basitarsus at most 3 times longer than mean diameter, shorter than distal tarsomere (Fig. 63); forewing costal area gradually expanded at base; forewing costal cells above radial sector much wider than high; hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing;

male genitalia (Fig. 131) with broad, moderately arched gonarcus, irregularly broadened at lateral 1/3, no mediuncus; paramere plate about 4 times longer than broad measured at middle, sculptured, with median elongate sclerite.

Female: similar to male except for the female terminalia (Fig. 166). Pregenitale sub-triangular, about 3 times wider than long with small central compressed process without apical hole; posterior gonapophysis about 2.5 times longer than median width with few distal setae longer than gonapophyseal length; gonophyseal plate elongate, over 10 times longer than middle width; lateral gonapophyses fused, transverse, about 4 times wider than long but weakly produced ventrally, with digging setae about as long as gonapophyseal length, longer than those on ventral margin of ectoproct.

Larva (Fig. 247-249). **Coloration**: color mostly pale (Fig. 247), with sparse rows of dark brown markings on the dorsal and ventral abdomen; central area of dorsal head capsule unmarked; ventral head unmarked, (Fig. 249). **Chaetotaxy**: dorsal head with dolichasters anteriorly, grading to stout simple setae posteriorly; dorsal thorax and abdomen with simple setae; ventral head, thorax, and abdomen with simple setae; digging setae from inner to outer on rastrum, become evenly longer. **Structure**: intertooth distance equal to distance from basal tooth to dorsal head capsule; greatest head width posterior of eye stalk 65 percent of ventral head capsule length measured at midline.

Biology. Larvae are restricted to rocky areas and live under rock overhangs in rock dust with their legs anchored. They rest in the walls and on the floor of the small caves or overhangs. They have a twelve month life cycle. They also have the ability to emerge from the cocoon with enough stored nutrients to produce numerous eggs without feeding first. They can do this a few days after emerging from the cocoon, and do not try to fly much before that. They presumably stay around their cave in safety until ovipositing, and venture out into danger to feed after securely depositing some of their eggs. Since feeding adult antlions to procure eggs is difficult in most species, this species would make an ideal lab culture. Neither sex would require adult feeding. Good habitats in which to look for this species are hills or mountainsides covered with huge round boulders, as is the case with *Eremoleon tanya*. In Baja California in Mexico, *Eremoleon jacumba* is parasitized by *Chrysanthrax junctura* (Coquillett). This fly has been observed by the authors laying eggs on horizontal patches of earth where antlions are likely to occur. It is a common parasite on a number of species of *Scotoleon* Banks.
Discussion. This species can be distinguished from the others in the group by the mostly pale brown vertex (Fig. 25). The species is notably larger than *Eremoleon gracile*. It has vertex markings distinctly different from *Eremoleon gracile*, but is about the same size as *Eremoleon tanya*.

Material studied. 2 male, 11 females, 4 larvae. July.
U.S.A. **California**: Jacumba, San Diego County, 1984, **reared**, R. Miller (1 larva, 1m, 3f, FSCA);
MEXICO. **Baja California**: 13 miles west Rosalita, 5.VII.1983, **reared**, R. Miller and L. Stange (4 larvae, 1m, 8f, FSCA).

Etymology. This species is named after the town of Jacumba, in the county of San Diego, in southern California, where many of the paratypes were collected.

Eremoleon tanya Miller and Stange, new species

Fig. 26, 64, 102, 167-168, 250-254

Holotype female, Cochise county, Arizona 32 03' 37.09" N, 110 04' 32.87" W, 1655 m. elev. May 1984 R. B. Miller (FSCA). Dissected terminalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: posterior gonapophysis about 4 times longer than middle diameter with all setae shorter than gonapophyseal length; lateral gonapophyses fused, transverse, about 5 times wider than long, abruptly narrowed laterally with short digging setae about equal to those at the posterior margin of the ectoproct.

Holotype female: length of body about 26 mm.; forewing 27 mm long, width 7 mm.; hindwing length 26 mm., width 6 mm. **Coloration**: face pale brown with dark brown band below antennae; antenna with scape and pedicel pale brown dorsally, flagellomeres 1-30 pale brown, with narrow brown bases, club darker brown; vertex pale brown with dark brown sublateral band, double coma-shaped marks at middle, rest of vertex (Fig. 26) with some darker brown at middle and elsewhere with dark brown posterior spot laterally; pronotum pale brown with many dark brown spots at setal bases, larger dark brown spot sublaterally on furrow; pteronotum and pteropleura nearly all pale brown with scattered dark brown spots and areas; wings (Fig. 102) with some small brown areas, forewing with suffused cross veins in medial area and rhegma; hindwing with small suffused area at rhegma; abdomen (Fig. 102) banded, tergites with broad pale brown band at middle. **Chaetotaxy**; antenna with short setae, much shorter than flagellomere diameter; pronotum with several long white setae sublaterally toward posterior margin; prescutum with several white setae; forefemoral sense hair about 3 times longer than femur diameter; forecoxa with long white setae posteriorly; pleura with some white setae. **Structure**: labial palpus short, not much swollen; antenna with about 41 flagellomeres, flagellomere 3 longer than wide; pronotum about as wide as long; pretarsal claws equal to basal three tarsomeres, shorter than hind basitarsus; hind tibial spurs equal to basal two tarsomeres; hind basitarsus at most 3 times longer than mean diameter, shorter than distal tarsomere (Fig. 63); forewing costal area gradually expanded at base; forewing costal cells above radial sector much wider than high (Fig. 101); hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing; **female terminalia** (Fig. 167-168) with pregenitale narrow and transverse with large round process at middle with apical hole; posterior gonapophysis about 4 times longer than middle diameter with all setae shorter than gonapophyseal length; gonapophyseal plate slender, over 12 times longer than middle width; lateral gonaophyses fused, transverse, about 5 times wider than long, abruptly narrowed laterally with short digging setae about equal to those at the posterior margin of the ectoproct; spermatheca over 10 times longer than middle diameter, curved basally and apically.

Larva (Fig. 250-254). **Coloration**: mostly pale (Fig. 250, 252), with rows of dark brown markings on the dorsal and ventral abdomen; central area of dorsal head capsule with double pairs of submedian spots; ventral head unmarked, (Fig. 253). **Chaetotaxy**: dorsal head with dolichasters only; dorsal prothorax with dolichasters and simple setae; remaining dorsal thorax and abdomen with simple setae; ventral head, thorax, and abdomen with simple setae; setae on ventral head extremely fine and small; digging setae (Fig. 253) from inner to outer on rastrum, become evenly longer (Fig. 254). **Structure**: intertooth distance equal to distance from basal tooth to dorsal head capsule; greatest head width posterior of eye stalk 70 percent of ventral head capsule length measured at midline.

Biology. The label refers to the larvae living in material in the dirt of the floor of a cave used by Native Americans. Examination of the area in June of 2016 produced 23 larvae living only in thin decomposed rodent feces or bat guano with their legs anchored to fallen rock flakes. Caves lacking organic matter contained no larvae. The specimens have not yet become adults at the time of this publication. The female holotype was spotted during the day resting on the face of a huge boulder in the shade.

Material studied. 1 female, 26 larvae. May.
U.S.A. **Arizona**: Cochise county, 32 03' 37.09" N, 110 04' 32.87" W, 1655 m. elev. May 1984, R. B. Miller (1f, FSCA); Cochise County, Chiricahua Mountains, Cave Creek Canyon, floor of Indian cave, December 1962 (26 larvae, FSCA).

Discussion. The female terminalia are different from the other species of the group, especially in the length of the posterior gonapophysis and shape of the lateral gonapophysis. The type specimen combines the larger body size of an *Eremoleon jacumba* with vertex markings similar to those of *Eremoleon gracile* but different from those of *Eremoleon jacumba.* Larvae are distinguishable from *Eremoleon macer* by their small inconspicuous mesothoracic spiracles, their dorsal head capsule having all dolichasters anteriorly and posteriorly, as opposed to *Eremoleon macer*, which has dolichasters grading to stout simple setae posteriorly. The proportional placement of the teeth on the mandibles also differs from *Eremoleon macer*. Larvae differ from *Eremoleon jacumba* by having the dorsal central head capsule well marked

with two pairs of submedian marks. They may occur above 1600 meters. The larvae of this species were not actually reared into adults, but the close proximity of the two collection sites, similar elevation, and the fact that the larvae key out as members of the gracile group, make it highly unlikely that they are anything else.

Etymology. This species is dedicated to Tatyana B. Miller in recognition of her assistance in antlion work.

capitatus group

Diagnosis: antennal flagellomere 3 as long as wide or longer than wide; pretarsal claws shorter than hind basitarsus which is shorter than distal tarsomere; hindwing as long as forewing, in repose, hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; forewing costal area gradually expanded at base; forewing costal cells above radial sector about as high as wide; hindwing medial area at highest point lower than wing area above it; hindwing medial area at highest point lower than wing area above it; mesoscutellum with short, hair-like setae; male genitalia highly modified with giant gonarcus engulfing smaller parameres which are bifurcate below.
Discussion. This group is restricted to *Eremoleon capitatus* in recognition of the highly modified male genitalia (Fig. 132-133) which are different from all other known species.

***Eremoleon capitatus* (Navás)**
Fig. 27, 65, 103, 132-133, 169

Formicaleo capitatus Navás 1913: 52, fig. 11 (forewing, vertex, pronotum). **Holotype**, Rio de Janeiro, Brasil, VI.1911, R. Silva Tavares (?MZBS).
=*Sosa conspicuus* Navás 1914b: 219, fig. 7 (forewing) (after Stange 2004: 169). **Holotype male**, Brasil (NHMW).

Taxonomy. Stange 1970: 21 (in *Eremoleon*)

Distribution. Peru; Venezuela; Brazil.

Diagnosis: length of body about 21-23 mm, forewing length 26-28mm, width about 7 mm; hindwing length 25-27 mm,; width about 6 mm. **Coloration**: mostly dark brown; antenna with pedicel and scape mostly dark brown; flagellomeres with basal 1/2 dark brown; vertex (Fig. 27) nearly all dark brown with anterior scar row narrow, posterior scar row broad; pronotum nearly all dark brown with pale spot at middle near anterior margin; nota nearly all dark, pale brown on posterior of nota; thoracic pleura nearly all dark brown; femora and tibiae mostly pale brown with many prominent dark brown setal bases, apices dark brown; mid femur dark brown on exterior face; abdomen not banded, nearly all dark brown, some tergites with small pale brown spot near anterior margin. **Chaetotaxy**: forefemur with numerous decumbent white setae. **Structure**: antennal flagellomere 3 as long as wide; hind basitarsus at most 3 times longer than mean diameter; forewing costal area gradually expanded at base; forewing costal cells above radial sector about as high as wide; forewing radial sector originates less than 2 times length of distal presectoral cross vein from cubital fork (Fig. 103); hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing; **male genitalia** (Fig. 132-133): giant gonarcus engulfing smaller parameres which are bifurcate below; **female terminalia** (Fig. 169) with pregenitale broad, about 3 times wider than long with strong medial spine posteriorly; posterior gonapophysis about 4 times longer than middle diameter, without setae longer than gonapophysis; lateral gonapophyses elongate, touching toward gonarcus, about 4 times longer than middle diameter; many stout, black digging setae, shorter than narrower setae on ventral margin of ectoproct; spermatheca at least 10 times longer than middle diameter, hooked apically.

Material studied. 1 male, 6 females. July to February.
BRAZIL. **Amazonas**: Parque Nacional Pau, Lg. Minatuca,157'8"S,6149'19"W., 14-28.VII.1993, W. Costa and L. Aquino (1m, 1f, INPA); Presidente Figueirado, Estacion de Balbina, Km. 4, 0201'05"S. 5949' 60" W, 01-12.IX.2002, F. Xavier and V. R. C. Barbosa (1f, INPA); Novo Airâo, AM 352, Ramal Km.10,0242'56.5" S, 6050'26.7"W, 28-29.VIII.2011, F. Xavier and A. Agudalo (1f, INPA). **Rio de Janeiro**: Botafogo, II.1958, M. Alvarenga (1f, FSCA). PERU. **Huallago**: Aguaytia, 400 m., 12.IX.1961 (1f, FSCA). VENEZUELA. **Amazonas**: Santa Lucia: 15.XI.1982, Yepez (1f, FSCA).

Discussion. The male genitalia of this species are diagnostic. This South American species shares with other South American species (*Eremoleon pygmaeus*; *Eremoleon tepuyiensis*) the predominant dark brown coloration and lack of abdominal banding. The hind basitarsus is shorter than the distal tarsomere, whereas in *Eremoleon pygmaeus* and *Eremoleon tepuyiensis* the basitarsus is at least 5 times longer than the middle diameter. The forewing costal cells above the radial sector are higher than wide and the radial sector originates at about twice the length of the distal presectoral cross vein from the cubital fork. The forefemur has numerous decumbent white setae. This is the only species of the genus known from Brazil.

triguttatus group

Diagnosis: antennal flagellomere 3 broader than long; pronotum without elongate white setae sublaterally; mesoscutum without elongate white setae; hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; forewing costal area as high or higher before stigma as above radial sector (Fig. 104, 105), costal cells wider than high or higher than wide (*E. inca*); forewing costal area gradually expanded at base; hindwing medial area at highest point lower than wing area above it; wings with several prominent dark brown spots or areas.
Discussion. The two species constituting this group have the antennal flagellomere 3 broader than long and the wings with conspicuous dark brown areas.

Eremoleon inca Miller and Stange, new species
Fig. 28, 66, 104, 134, 170, 255-256

Holotype male, Chosica, Lima, Peru, VII.1982, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: antennal flagellomere 3 as long as wide; hindwing medial area at highest point lower than wing area above it; pronotum without elongate white setae sublaterally; mesoscutum without elongate white setae; forewing costal cells above radial sector higher than wide (Fig. 104); distal palpomere of labius pale and slender, not much thicker than corresponding palpomere of maxillus palpus.

Holotype male: length of body about 27 mm, forewing length about 31 mm, width about 5 mm; hindwing length about 31 mm, width about 4 mm. **Coloration**: face and mouthparts mostly pale brown with dark brown band below antennae; antenna mostly pale brown, darkening toward apex, most flagellomeres with basal half dark brown; vertex (Fig. 28) with middle scar row nearly continuous, connected to margins anteriorly and posteriorly at middle by double dark brown stripes; pronotum mostly pale brown with submedian and sublateral brown stripes, mostly dark brown at anterior and posterior margins; thoracic pleura mostly brown with many elongate white setae; coxae pale brown with many elongate white setae; forefemur mostly dark brown, mid femur mostly brown dorsally, pale brown ventrally, hindfemur mostly pale brown with dark brown apical band and scattered dark based setal spots; foretibia and midtibia mostly brown with dark brown setal spots, hindtibia mostly pale brown; tarsi mostly pale brown; leg setae mostly black; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; wings (Fig. 104) without dark brown spots, limited suffusion on forewing near junction of posterior fork of CuA and rhegma; hindwing without outstanding dark brown spots; abdomen mostly dark brown, not banded, small pale brown areas at middle of basal tergites. **Chaetotaxy**:

pronotum without elongate white setae sublaterally; forefemoral sense hair about equal to midfemoral sense hair, about 3 times as long as femur diameter; mesoscutum without elongate white setae. **Structure**: antennal flagellomere 3 broader than long; some setae on femora and tibiae black; foretibial spurs as long as basal three tarsomeres together; distal palpomere of labius pale and slender, not much thicker than corresponding palpomere of maxillus, palpimacula near middle; pretarsal claws shorter than hind basitarsus (Fig. 66); hind tibial spurs reaching only to halfway point of tarsomere II; forewing costal area gradually expanded at base; forewing costal cells higher than wide above radial sector (Fig. 104); hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing; hindwing medial area at highest point lower than wing area above it; **male genitalia** (Fig. 134) with gonarcus broad, moderately arched, strongly twisted laterally; no mediuncus; paramere elongate, about 6 times longer than broad, nearly touching near gonarcus, strongly sclerotized along anterior, medial and posterior margins, strongly diverging posteriorly; setose membrane posteriorly.

Female terminalia (Fig. 170) with pregenitale small, about 4 times wider than long posteriorly with small medial spine posteriorly; posterior gonapophysis about 3 times longer than middle diameter, some setae a little longer than gonapophysis; gonapophyseal plate at least 10 times longer than wide; lateral gonapophyses transverse, fused, combined width about 6 times wider than long with black setae about as long as width of gonapophysis, about 8 setae each side, about equal to 5-6 setae on ventral part of ectoproct which are less than 1/3 length of hair-like setae dorsally; spermatheca elongate, hooked apically.

Larva (Fig. 255-256). **Coloration**: grey background with light and dark brown markings (Fig. 249); mandibles light brown; ventral head with a pair of submedian markings; dorsal abdomen with dark brown markings; both black and clear ocelli present. **Chaetotaxy**: dorsal head thorax and abdomen with short, unexpanded dolichasters; no setae on dorsal surface of mandibles; ventral head capsule with elongate, straight sided dolichasters; setae on labrum short and thick. **Structure**: mandible equal in length to ventral head capsule measured at midline; intertooth distance 85 percent of distance from base of first tooth to dorsal head capsule; mesothoracic spiracles not prominent.

Biology. The larvae are very mobile. When disturbed by being exposed by a blowing aspirator, they run up the walls of the cave or rock overhang. This is unusual behavior in the genus. They live in horizontal, pale dust-filled cracks and pockets in walls above the floor of hard rock caves. They bury themselves in the rock dust with their legs anchored. This dust is dry and not sticky. Their head capsule in the wild has pale dust stuck to it, making the head capsule difficult to see.

Material studied. **3** males, 9 females, 2 larvae. March to July.
PERU. **Lima**: Chosica, VII.1982, **reared**, R. Miller and L. Stange (1 larva, 1m, 3f, FSCA); San Geronimo, 3.VII.1982, **reared**, L. Stange and R. Miller (1 larva, 1m, 2f, FSCA); Sta. Eulalia, 1035 m., 30.III.2011, Heppner and Carrera (2m,5f, FSCA).

Discussion. Judging from the male genitalia, this species may be related to those of the anomalus group. However, the wing venation points to a stronger relationship with *Eremoleon triguttatus*.

Etymology. This species is named after the Inca people who live in the area.

***Eremoleon triguttatus* (Navás)**
Fig. 29, 67, 105, 135, 171, 257-261

Formicaleo triguttatus Navás 1914a: 19, fig 2 (wings). **Holotype female**, San Pedro de Sula, Honduras, Fruhstorfer (NHMW)

Taxonomy. Stange 1970:22 (in *Eremoleon*)

Distribution. Honduras; Mexico

Diagnosis: length of body about 21-23 mm, forewing length 26-28mm, width about 7 mm; hindwing length 25-27 mm; width about 6 mm. **Coloration**: general coloration dark brown; face mostly pale brown with large dark brown stripe below antennae; mouthparts mostly pale brown with dark brown palpimacula; antenna with scape, pedicel and most flagellomeres pale brown with darker brown basally; vertex (Fig. 29); with anterior dark brown row nearly complete, posterior row with double dark brown area at middle flanked by two round dark brown spots; pronotum pale brown with large submedial and lateral dark brown bands; pterothoracic nota mostly dark brown except pale brown medially; mesoscutellum pale brown with sublateral dark band at anterior margin, lateral dark brown area posteriorly; metascutellum mostly pale brown with dark brown laterally; thoracic pleura mostly dark brown with scattered pale brown areas (Fig. 67); coxae pale brown with dark brown bases; forefemur, midfemur and midtibia pale brown with dense dark brown spots at setal bases; hindfemur mostly dark brown except base and apex; hindtibia mostly pale brown except apex; tarsi mostly pale brown, dark brown at apex of distal tarsomere; abdomen most dark brown with small, medially emarginated pale brown area before anterior margin; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas; forewing (Fig. 105) with prominent dark brown stripe in cubital area and minor dark brown streaking on outer gradates near posterior margin; some distal forking at distal margin lightly suffused; hindwing with reduced markings, with smaller dark brown stripe in cubital area. **Chaetotaxy**: reduced brown setae on nota and anterior part of abdomen; pronotum without elongate white setae sub laterally; mesoscutum without elongate white setae; thoracic pleura with some white setae; forefemur and to a less degree midfemur with stout white setae on posterior, elsewhere on legs setae dark brown and shorter than femur diameter. **Structure**: antennal flagellomere 3 broader than long; pretarsal claws shorter than hind basitarsus (Fig. 67); distal palpomere of labius dark brown and moderately swollen, about twice as thick as corresponding palpomere of maxillus, palpimacula near distal end; hind pretarsal claw about equal to 1/2 length of basitarsus; foretibial spurs as long as basal three tarsomeres together; hind tibial spurs reaching to distal end of tarsomere II; forewing costal area gradually expanded at base; forewing costal cells above radial sector wider than high; hindwing as long as forewing, in repose hindwing does not extend beyond apex of forewing; hindwing medial area at highest point lower than wing area above it; **male genitalia** (Fig. 135) with gonarcus relatively broad, weakly arched; paramere nearly rectangular plate, weakly sculptured, about 2 times longer than wide, widely separated with setose structure between them; anterior, medial and posterior margins strongly sclerotized; **female terminalia** (Fig. 171) with pregenitale broad, about 2 times broader than long with very short median spine; posterior gonapophysis about 4 times longer than wide with some setae longer than gonapophysis; gonapophyseal plate broad at gonapophyseal base then narrowing toward apex, about 10 times longer than middle diameter; lateral gonapophyses broad, elongate, about 2 times longer than wide, broadly contiguous with many black digging setae which are shorter than about 8-10 black digging setae on ventral area of ectoproct which are about 1/2 as long as hair-like setae on dorsal surface; spermatheca about 10 times longer than middle diameter with broad posterior hook.

Larva (Fig. 257-261). **Coloration**: background color tan with medium brown markings; two rows of broad indistinct markings down dorsal abdomen (Fig. 257); rest of color pattern as in Fig. 258; ventral head unmarked; eyes with both clear and black ocelli. **Chaetotaxy**: dorsal head capsule with thick, slightly expanded, dolichasyers anteriorly, and straight sided dolichasters posteriorly; dorsal prothorax with stout simple setae; dorsal abdomen with simple setae and dolichasters; ventral abdomen with fine, elongate, simple setae (almost hair-like); mandibles with just a few setae dorsally; digging setae on rastrum with inner pair about one half length of next three pair which are similar in length (Fig. 261). **Structure**: distance from base of first tooth on mandibles to dorsal head capsule 75 percent of intertooth distance; mandible 87 percent length of ventral head capsule measured at midline; mesothoracic spiracles small but visible.

Biology. Larvae were found living under rock overhangs in slightly coarse material, some of which was organic and dark, but nevertheless dry and loose. Leg-anchoring was observed.

Material studied: 6 males, 7 females, 4 larvae. April to June.

HONDURAS. **Copan**: 22 km. north La Entrada, VI.1993, **reared**, Miller and Stange (1m, 1f, FSCA). **Francisco Morazan**: 25 km. South Talanca, 11.V.1993, **reared**. Miller and Stange (1 larva, 1f, FSCA). **Intibuca**: Santa Lucia, 6.V.1993, **reared**, Miller and Stange (1larva, 1m, 2f, FSCA). **Olancho**: Sierra Agalta, eight km. northeast Catacamas, 3000', 10.IV.1993, **reared**, Miller and Stange (2 larvae, 2m). **Santa Barbara**: 17 km. north Santa Barbara, 6.V.1993, Miller and Stange (1m, 3f, FSCA). San Pedro de Sula, Fruhstorfer (1f, NHMN). MEXICO. **Yucatán**: Chichén Itzá, 6.VI.2001, **reared**, Stange (1m, FSCA). **Discussion**: This is one of the few species of *Eremoleon* with flagellomere 3 broader than long and with prominent wing markings. The forewing radial sector arises before the midpoint of the wing with the costal cells above it wider than high. Like *Eremoleon inca,* the distal palpomere of the labium is moderately swollen, about twice as thick as the corresponding palpomere of the maxilla, with the palpimacula near the distal end.

adonis group

Diagnosis: antennal flagellomere 3 variable in length; pretarsal claws shorter than hind basitarsus which is shorter than distal tarsomere; hindwing as long as forewing, in repose, hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; forewing costal area gradually expanded at base; forewing costal cells above radial sector about as high as wide; hindwing medial area at highest point lower than wing area above it; mesoscutellum with short, hair-like setae; male genitalia with gonarcus broad, moderately arched, twisted laterally; no mediuncus; paramere elongate, about 7 times longer than wide, weakly sculptured; parameres approximate each other toward gonarcus.

Discussion. This is a poorly defined group. The placing together of *E. adonis* and *E. samne* is tentative, since only the female is known for *E. adonis*.

***Eremoleon adonis* Miller and Stange, new species**
Fig. 30, 68, 106, 172

Holotype female, Villavicencio, Colombia, 19.VI.1974. L. Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: forefemur mostly pale brown without decumbent white setae; forewing radial sector originates less than twice length of distal presectoral crossvein from cubital fork, costal cells above radial sector higher than wide; hind basitarsus at most 3 times longer than mean diameter, shorter than distal tarsomere.

Holotype female: length of forewing 33 mm, width 9 mm; hindwing length 33 mm, width 8 mm. **Coloration**: face mostly brown, large dark brown band below antennae; antennal scape mostly pale brown, pedicel mostly dark brown posteriorly, flagellomeres pale brown with basal dark brown; vertex (Fig. 30) with prominent, continuous scar rows; pronotum and nota with complex pale brown and dark brown markings, scutelli mostly dark brown; thoracic pleura (Fig. 68) mostly dark brown, pale brown ventrally; coxae mostly dark brown; femora and tibiae pale brown with numerous dark brown setal bases and apex, tibiae also with dark brown subbasally; tarsi mostly pale brown, some tarsomere apices dark brown especially distal tarsomere; forewing without dark brown spots but with suffusion mostly in apical field of both wings; abdomen banded, dark brown, with pale brown area at middle anteriorly. **Chaetotaxy**: forefemoral sense hair about equal in length to midfemoral sense hair, about 2 times length of femur; midfemur without decumbent white setae. **Structure**: antennal flagellomere 3 longer than wide; pretarsal claws shorter than hind basitarsus; hind basitarsus shorter than distal tarsomere, at most 3 times longer than mean diameter; forewing about same length as hindwing; forewing costal cells above radial sector about as high as wide; forewing radial sector originates more than twice length of distal presectoral cross vein from cubital fork; **female terminalia** (Fig. 172) with pregenitale broad, about 4 times wider than long, broader than medial posterior spine; posterior gonapophysis about 5

times longer than middle diameter, much broader basally, without setae that are longer than gonapophysis; lateral gonapophyses separated, elongate, about 1.5 times longer than middle diameter with many partially blunt-tipped setae that are a little longer than about 20 blunt-tipped digging setae on ventral surface of oval shaped ectoproct, dorsally with many hair-like setae about 2 times longer than ventral setae; spermatheca elongate, hooked posteriorly.

Material studied. 1 female.
COLOMBIA. **Meta**: Villavicencio, 19.VI.1974,L. Stange (1f, FSCA).

Discussion. This species has many characters in common with *Eremoleon samne*, but one distinguishing character is that the hind basitarsus is shorter than the distal tarsomere. The female terminalia are also different.

***Eremoleon samne* Miller and Stange, new species**
Fig. 31, 69, 107, 136, 173, 262-267

Holotype male, 9 km. west Samne, La Libertad, Peru, 28.VII.1982, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: pretarsal claws shorter than hind basitarsus which is longer than distal tarsomere; pedicel mostly pale brown posteriorly; forewing costal area gradually expanded at base, as high or higher before stigma as above radial sector, crossveins not interconnected; mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum; male parameres approximate each other toward gonarcus with strongly sclerotized mesal margin above, about 7 times longer than middle width; female pregenitale consisting mostly of large ventral spine.

Holotype male: length of body about 28 mm, forewing length 29 mm, width 8 mm; hindwing length 29 mm, width about 6 mm. **Coloration**: antenna with scape dark brown mesally, pedicel pale brown; flagellomeres mostly pale brown posteriorly; vertex (Fig. 31) with narrow anterior scar row, broadly interrupted medially, middle scar row with large submedian spot, posterior row with two small spots at middle; mesonotum mostly dark brown anteriorly, pale brown posteriorly; mesoscutellum pale brown with dark brown submedian stripe; metanotum nearly all dark brown; metascutellum mostly dark brown with pale brown at middle and laterally; coxae pale brown with dark brown base; forefemora and midfemora and midtibiae mostly pale brown with dark brown setal bases and dark brown apices; tibiae also with dark brown subbasal dark brown ring; hindfemur pale brown with dark brown apex; hindtibia pale brown with dark brown subbasal and apical markings; wings (Fig. 107) without dark brown spots, some suffusion in forewing cubital area and rhegma; abdomen with tergites I-III mostly pale brown, IV to VIII darker brown; sternites mostly pale brown. **Chaetotaxy**: mesoscutellum with short, hair-like setae, less than 1/4 length of scutellum; forefemoral sense hair about 4 times longer than femur diameter, about equal in length to midfemoral sense hair. **Structure**: antennal flagellomere 3 about as long as wide; pretarsal claws shorter than hind basitarsus; hind basitarsus longer than distal tarsomere (Fig. 69); hindwing same length as forewing, in repose hindwing apex coincides with forewing apex; forewing costal area gradually expanded at base; forewing costal area as high or higher before stigma as above radial sector (Fig. 107), crossveins not interconnected; **male genitalia** (Fig. 136) with gonarcus broad, moderately arched, twisted laterally; no mediuncus; paramere elongate, about 7 times longer than wide, weakly sculptured; parameres approximate each other toward gonarcus with strongly sclerotized mesal margin, above, below which paramere upturned mesally to ventral margin; small median sac between parameres above, about 6 times longer than wide.

Female terminalia (Fig. 173) with pregenitale consisting mostly of a large ventral spine; posterior gonapophysis about 3 times longer than middle diameter, some setae longer than gonapophysis; gonapophyseal plate relatively wide, at least 5 times longer than middle diameter; lateral gonapophysis

elongate, about 2.5 times longer than middle diameter with about 7-8 stout black digging setae about equal to those on ventral margin of ectoproct.

Larva (Fig. 262-267). **Coloration**: pale with brown patterning as in Fig. 262; ventral abdominal pattern irregular complex of spots (Fig. 263,267); ventral head with a pair of submedian spots (Fig. 265); ocelli a mixture of black and clear. **Chaetotaxy**: dorsal head capsule with a mixture of unexpanded dolichasters and simple setae (Fig. 264); mandible without dorsal setae; dorsal thorax and abdomen a mixture of short thick dolichasters and short thick simple setae; ventral abdomen and thorax with fine, thin, elongate simple setae; digging setae not exactly known due to breakage; anterior pointing setae on labrum elongate and about 10 times longer than width, unexpanded and flat ended. **Structure**: length of mandible equal to length of ventral head capsule measured at midline; intertooth distance equal to 90 percent of distance from base of first tooth to dorsal head capsule; mesothoracic spiracles barely visible.

Biology. Larvae bury and anchor themselves in pale, dry rock dust above the floor of stony caves. They coat themselves extensively with dust.

Material studied. 7 males, 5 females, 3 larvae. July.
PERU. **La Libertad**: 9 km. west Samne, VII.28.1982, **reared**, R. Miller and L. Stange (3 larvae, 7m, 5f, FSCA).

Discussion: This is one of four species of *Eremoleon* known from Peru. Three species belong to different species groups. *Eremoleon peterseni* has the forewing costal area broad with the hindwing longer than forewing in repose, and *Eremoleon inca* has the third antennal flagellomere broader than long. *Eremoleon adonis* may belong in the same group as *Eremoleon samne*, but differs in many characters, such as the length of the hind basitarsus, which is longer than the distal tarsomere in *Eremoleon samne*. *Eremoleon samne* has only been collected as larvae.

Etymology. This species is named after the type locality.

pygmaeus group

Diagnosis: antennal flagellomere 3 longer than wide; distal palpomere of labium moderately swollen, palpimacula oval situated near center; forefemoral sense hair about five time longer than femur diameter, about twice as long as midfemur; hind basitarsus 5 times or more longer than middle diameter; mesoscutum with several bristle-like white setae anterior to mesoscutellum; foretibia mostly infuscate with many decumbent and somewhat flattened white setae; hindwing same length as forewing, in repose hindwing apex coincides with forewing apex; forewing costal area gradually expanded at base; forewing costal area above origin of radial sector equal to or lower than greatest presectoral height, no interconnected cross veins; hindwing medial area at highest point lower than wing area above it; hindwing not abruptly narrowed toward apex; male tergite III with scale-like sculpturing**;** abdomen not banded, nearly all black dorsally; female terminalia with short posterior gonapophysis but with abundant large digging setae on the lateral gonapophysis and ectoproct.

Discussion. The two species constituting this group are unusual in the genus by having a nearly all black abdomen without banding. The posterior gonapophysis is short, but with many strong digging setae on the lateral gonapophysis and ectoproct.

Eremoleon pygmaeus Miller and Stange, new species

Fig. 32, 70, 108, 137, 174, 268-272

Holotype male, 11 km. west Dos Caminos, Guarico, Venezuela, 2.III.1986, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: forewing less than 25 mm long; distal palpomere and distal tarsomere mostly pale brown; pronotum with mostly erect setae white (Venezuela); forewing narrow, less than 25 mm long. wing veins (at least radial and forewing vein CuA) with alternating dark and pale brown areas; wings with spots; mesoscutum with several bristle-like white setae anterior to mesoscutellum; foretibia mostly infuscate with many decumbent and somewhat flattened white setae; antennal flagellomere 3 as long as wide or longer than wide; hind basitarsus 5 times or more longer than middle diameter; forewing costal area as high or higher before stigma as above radial sector.

Holotype male: length of body about 19 mm; forewing length 19 mm., width about 4.5 mm; hindwing length 18 mm., with 4.0 mm. **Coloration**: general coloration black; face pale brown with broad dark brown band below antennae; mouthparts mostly pale brown; vertex (Fig. 32) with nearly complete middle scar row to ocular rim, hind scar row nearly restricted to middle; pronotum nearly all black with some pale brown along middle and anterior and lateral margins; nota nearly all black, minor pale brown coloration posteriorly; forefemur nearly all black infuscated with short, appressed white setae; midfemur mostly dark brown with apical pale brown band; hindfemur nearly all pale brown with some dark brown streaking; foretibia and midtibia nearly all pale brown with dark brown setal bases and dark brown apex; hindtibia nearly all pale brown with dark brown apex; tarsomeres nearly all pale brown with dark brown apices; wings without dark brown spots, minor cross vein suffusion near junction of posterior fork of CuA and hind margin and outer gradates; abdomen not banded, dark brown. **Chaetotaxy**: forefemur with many decumbent and somewhat flattened white setae; forefemoral sense hair about 5 times longer than femur diameter, about twice as long as midfemoral sense hair; mesoscutum with several bristle-like white setae anterior to mesoscutellum. **Structure**: antennal flagellomere 3 longer than wide; distal palpomere of labius moderately swollen with oval palpimacula near center; hind basitarsus 5 times or more longer than middle diameter; forewing narrow (Fig. 108), costal area as high or higher before stigma as above radial sector; **male genitalia** (Fig. 137) with gonarcus moderately arched, narrowing laterally, mediuncus indistinct; paramere with weak sculpturing elongate, about 7 times longer than middle diameter, converging toward gonarcus, diverging ventrally, mesal margin strongly sclerotized beneath which a second sclerite which reaches about halfway toward apex parameter, below which a membranous area with few setae.

Female terminalia (Fig. 174) with pregenitale broad, about 4 times wider than long, small medial spine posteriorly; posterior gonapophysis about 2 times longer than middle diameter with many setae much longer than gonapophysis; gonapophyseal plate small; lateral gonapophysis elongate, about 2 times longer than wide with numerous large, black digging setae that are about equal in size to about 10 black setae on ventral margin of ectoproct arranged in 3 rows; spermatheca at least 10 times longer than middle diameter, hooked apically. .

Larva (Fig. 268-272). **Coloration**: ventral head with obvious submedian markings; abdomen with two sublateral rows of brown markings; larva dorsally well marked as in Fig. 268; mandible light brown; some ocelli clear, some black. **Chaetotaxy**: mandibles dorsally with short scattered dolichasters from base to middle tooth (Fig. 270); dorsal abdomen and thorax with mostly simple stout setae; dorsal head with mostly weakly expanded dolichasters with some straight sided; ventrally, posterior head capsule, thorax and abdomen with elongate simple setae; ventral anterior head capsule with straight sided dolichasters; inner pair of digging setae on rastrum about three quarters the length of next two pairs which are equal and about three quarters the length of the outer pair (Fig. 272). **Structure**: mesothoracic spiracles twice as long as basal width; length of mandible equal to length of ventral head capsule measured at midline; distance from base of first tooth to dorsal head capsule equal to intertooth distance

Biology. This species is common in the environment, and inhabits any type of overhang or cave that is dry and rain-protected and allows for leg-anchoring. They can be found in dirt, or in a combination of dirt and fine organic matter. They are not found in purely loose organic material, and live in areas of medium intensity light. Despite being abundant, this species appears to have never been collected as an adult. This suggests that the adult probably does not come to lights. The lack of a banded abdomen suggests that adults are not resting on rocks. *Neodiplocampta paradoxa* (Jaennicke) was reared from

Eremoleon pygmaeus in Venezuela (and also parasitizing species of *Dimarella* Banks and *Myrmeleon* Linnaeus). Other reared parasites of *Eremoleon pygmaeus* are *Chrysanthrax* near *ioptera* (Wiedermann) and the chalcid *Hockeria eriensis* (Wallace).

Material studied. 29 males, 27 females, 3 larvae. February to March.
VENEZUELA. **Aragua**: San Sebastian, Gruta de Lourdes, 12.II.1986, **reared**, Miller and Stange (5m, 1f, FSCA); N. Of San Juan de Los Morros, 19.III.1987, R. Miller, L. Stange, (1 larva, parasitized by Chalcid); 3 km. S. Rancho Grande, 17.II.1986, R. Miller, L. Stange, **reared**, (larva parasitized by *Neodiplocampta paradoxa* Jaennicke); **Bolivar**: Ciudad Bolivar, Río Orinoco, 3.III.1986, Miller and Stange, **reared** (1m, 3f, FSCA). **Falcon**: 13 km. south La Tabla, 13.III.1986, R. Miller and L. Stange, **reared** (1m, 1f, FSCA). **Guarico**: 11 km. west Dos Caminos, 2.III.1986, **reared**, Miller and Stange (7m, 2f, 3 larvae, FSCA). **Zulia**: La Sierra near Machiques, 22.II.1986, **reared**, Miller and Stange (16m, 20f, CASC. FSCA, TAMU).

Discussion. This is one of the smallest species of *Eremoleon*. Adults have only been obtained by rearing larvae, which were relatively abundant in Venezuela.

Eremoleon tepuyiensis Miller and Stange, new species
Fig. 33, 71, 109, 138, 175, 273-277

Holotype male, 2 km. east Kayanayan, Bolivar, Venezuela, 10.III.1987, Miller and Stange (FSCA). Dissected genitalia are stored beneath the specimen in a microvial with glycerin.

Diagnosis: distal palpomere mostly black; distal tarsomere mostly black; forewing more than 30 mm long; pronotum with mostly erect setae black; mesoscutum with several bristle-like white setae anterior to mesoscutellum; foretibia mostly infuscated with many decumbent and somewhat flattened white setae; hind basitarsus 5 times or more longer than middle diameter; forewing costal area as high or higher before stigma as above radial sector.

Holotype male: length of body about 23 mm, forewing length 23 mm, width 6 mm; hindwing length 22 mm, width 5 mm. **Coloration**: general coloration dark brown; face pale brown with broad dark brown band below; distal palpomere mostly black; antenna mostly dark brown except scape and base of club; vertex (Fig. 33) with nearly complete middle scar row to ocular rim, hind scar row nearly restricted to middle; pronotum nearly all black with some pale brown along anterior margin; nota nearly all black, minor pale brown coloration posteriorly; forefemur nearly all black infuscated with short, appressed white setae; midfemur mostly dark brown with apical pale brown band; hindfemur nearly all pale brown with some dark brown streaking; foretibia and midtibia nearly all pale brown with dark brown setal bases and dark brown apex; hindtibia pale brown with dark brown setal spots and dark brown apex; tarsomeres mostly pale brown on basitarsus, rest of tarsus mostly dark brown; wings (Fig. 109) without dark brown spots and weak cross vein suffusion; abdomen not banded, dark brown. **Chaetotaxy**: pronotum with most erect setae black; mesoscutum with several bristle-like white setae anterior to mesoscutellum; forefemur mostly infuscate with many decumbent and somewhat flattened white setae; male tergite III with scale-like sculpturing. **Structure**: antennal flagellomere 3 longer than wide; distal palpomere of labium moderately swollen, palpimacula oval situated near center; hind basitarsus about 5 times longer than middle diameter; forewing narrow (Fig. 109), costal area as high or higher before stigma as above radial sector; **male genitalia** (Fig. 138) with gonarcus moderately arched, narrowing laterally, mediuncus indistinct; paramere with weak sculpturing elongate, about 6 times longer than middle diameter, converging toward gonarcus, diverging ventrally, mesal margin strongly sclerotized beneath which a second sclerite which reaches about halfway toward apex, below which membranous area with few setae.

Female terminalia (Fig. 175) with pregenitale broad, about 4 times wider than long, without medial spine posteriorly; posterior gonapophysis about 2 times longer than middle diameter, with many setae

much longer than gonapophysis; gonapophyseal plate small; lateral gonapophysis elongate, about 2 times longer than wide with numerous large, black digging setae that are about equal in size to about 10 black setae on ventral margin of ectoproct arranged in 3 rows; spermatheca at least 10 times longer than middle diameter, hooked apically.

Larva (Fig. 273-277). **Coloration**: head capsule conspicuously marked ventrally (Fig. 276); ventral abdomen with two rows of dark brown markings (Fig. 274); dorsal color pattern of tan and dark brown as in Fig. 273; mandibles light brown. **Chaetotaxy**: dorsal head capsule with mostly expanded dolichasters; abdomen dorsally with sparse dolichasters and simple setae; pronotum dorsally with stout simple setae; ventral head capsule with short straight dolichasters except for expanded ones extremely anteriorly; digging setae with inner pair three quarters next two pairs, which are equal and three quarters the length of outer pair (Fig. 277); dorsal surface of mandibles with scattered short thick dolichasters to middle tooth. **Structure**: mandible length 85 percent of length of ventral head capsule measured at midline; distance from base of first mandibular tooth to dorsal head capsule 90 percent of intertooth distance; mesothoracic spiracles large (Fig. 273); eighth abdominal segment with small but visible slightly raised spiracles.

Biology. The ecological niche of the larvae of this species is similar to that of *Eremoleon pygmaeus*. They live in dark course material. *Eremoleon tepuyiensis* is much more heavily marked in coloration. The larvae differ physically by having proportionately shorter mandibles and small, but possible to find, spiracles on the eighth abdominal segment. They were found in shaded (but not dark) zones occurring in pockets of caves and overhangs separated from the damp parts of the forest. They anchor their legs.

Material studied. 7 males, 14 females, 1 larva. March.
VENEZUELA. **Bolivar**: 2 km. east Kavanayan, 10. III.1987, **reared**, R. Miller and L. Stange (1 larva, 7m, 14f, FSCA).

Discussion. This species is similar to *Eremoleon pygmaeus* although averaging larger in size. There are small differences in the male genitalia and female terminalia. The mandibles and color pattern differ in the larvae of the two species. Like *Eremoleon pygmaeus*, they are only known from reared specimens.

nigribasis group

Diagnosis: antennal flagellomere 3 broader than long or longer than broad; forewing costal area gradually expanded at base; hindwing as long as forewing, in repose, hindwing does not extend beyond apex of forewing; hindwing medial area at highest point about 80-90 percent of the wing area above it; pretarsal claws large.

Discussion. *Eremoleon nigribasis* is one of two members of the group and is distinctive in the larva which lives deep in mammal burrows, has all clear ocelli (only appreciated in non-alcohol preserved individuals), lacks dolichasters on the dorsal head capsule, and has mandibular dentition which has the distance between teeth longer than distance between the basal tooth and the dorsal head capsule. The middle tooth is slightly longer than the distal tooth, and the middle tooth is slightly closer to the distal tooth than the basal tooth. The adults in this group have large pretarsal claws compared to other groups, which is probably an adaptation for capturing other adult antlions in flight. Adults of *Eremoleon nigribasis* are attracted to lights more often than most adult *Eremoleon* whereas adults of *Eremoleon insipidus* are uncommon. Both species have been observed capturing other antlions.

***Eremoleon insipidus* Adams**
Fig. 3, 37, 76, 113, 142

Eremoleon insipidus Adams 1957: 88, fig. 19, 20, 28 (male genitalia, labial palp). **Holotype male**, 5 miles south of San Miguel, Baja California, 20.VII.1988 (MCZC).

Distribution. Mexico; U.S.A.

Diagnosis: length of body 24 to 28 mm; forewing length 30-35 mm, width 7-10 mm, hindwing length 28 -32 mm, width 7 to 8 mm. **Coloration**: general coloration insipid pale brown; head pale, faint indication of interantennal dark band; first row of vertex scars unpigmented, a dash on each side and double medial scar; behind is a pair of indistinct brown submedian spots; antenna pale, club infuscate; pronotum gray-brown, pair of small submedian spots before furrow; behind furrow a pair of wide median brown bands, broadly separated by pale posteriorly; short lateral dark brown stripe each side; nota mostly infuscate, pair of broad brown stripes on mesoscutellum; propleuron dark brown, mesanepisternum with brown stripe below, rest of pleura pale brown; mesepimeral wing process light ochraceous; coxae pale with a small basal brown spot; femora pale, faintly spotted with brown; large apical brown spot on anterior side; tibiae lightly brown dotted; tarsi pale; all setae, including long setae on femur, pale, darkest ones light yellow brown in color; venation largely pale; in forewing most cross veins dark brown at ends; longitudinal veins dark brown where intersected by dark brown cross veins; each dark brown intersection surrounded by a small gray cloud in membrane; larger spots at apex of hypostigmatic cell, rhegma and end of posterior fork of CuA; hindwing venation paler, membrane scarcely marked, dark brown spots at apex of hypostigmatic cell and rhegma; first abdominal tergite pale, second dark brown with apical pale spot, third to sixth with median pale spots at base and apex, and with large subbasal spot each side, broadly confluent medially and containing a dark brown spot on each side; apical tergites darker brown, with markings indistinct; sternites pale to middle of fourth segment, beyond darker brown; wings (Fig. 76) without dark brown spots. **Chaetotaxy**: midfemoral sense hair much shorter than forefemoral sense hair which is about 2 times as long as femur diameter; all setae on femora and tibiae reddish brown. **Structure**: labial palpus with distal palpomere strongly swollen, palpimacula near middle; antennal flagellomere broader than long; pronotum (Fig. 3) slightly longer than wide; foretibial spurs as long as tarsomere I and II together; forewing costal area as high or higher before stigma as above radial sector (Fig. 76), with 5-7 presectoral cross veins, last one usually connected to first cross vein from Rs + MA; 9-11 branches of Rs + MA; 9-10 cross veins between CuA and CuP+1A; 8-10 cross veins between CuP+1A. and wing margin; hindwing cubital area broad, with four rows of crossveins; hindwing medial area at highest point 90 percent of wing area above; hindtibial spurs reach to middle of tarsomere II; pretarsal claws as long as hind basitarsus (Fig. 37); **male genitalia** (Fig. 113) with gonarcus moderately curved, strongly excavated apically; mediuncus inconspicuous; parameres narrow, inner margin strongly concave, widely separated plates; **female terminalia** (Fig. 142) with pregenitale transverse, about 6 times wider than long with large median projection; posterior gonapophysis about 5 times longer than middle diameter, all setae shorter than gonapohyseal width; gonapophyseal plate uniformly narrow, more than 10 times longer than wide; lateral gonapophyses separated, elongate, strongly narrowing anteriorly, posterior part about 6 times wider than long with fewer than 10 digging setae which are less than 0.5 gonapophyseal width and 0.3 times as long as digging setae on ventral margin of ectoproct.

Biology. Adults were seen by the authors feeding on *Paranthaclisis* adults in Baja California. It is hypothesized that the large larvae live in animal burrows, since extensive cave mouth and rock overhang collecting in areas where the adults occur have produced no larvae.

Material studied. 9 males, 9 females. June to August.
MEXICO. **Baja California**: Juncalito Beach, 22.VI.1983, with *Paranthaclisis* prey, Miller and Stange (1f, FSCA); Five miles south San Miguel, 20.VII.1938, Michelbacher and Ross (1m, CASC); Mejia Island, Angel de la Guardia, Gulf of California, 28.VI.1921, Van Duzee (1f, CASC). U.S.A. **California**: Amboy Crater, San Bernardino County, 6.VI.1967 (1m, 1f, FSCA); Borrego Valley, 6.VI.1940, C. Michener (1f, EMEC); Deep Canyon, 13.VI.1963 (3m, 4f, FSCA; TAMU); Lost Chance Canyon, El Paso Mountains, 31.VII.2002, G. Pratt (1m TAMU); Palm Desert, 10.VI.1961, D. Verity (1m, 1f, FSCA); Squaw Tank, Joshua Tree National Monument, 1.VIII.1959, L. Stange (1m, FSCA); Tahquitz Canyon, near Palm Springs, 20.VI.1963, L. Stange (1m, FSCA).

Discussion. These relatively large, robust, insipid, pale brown insects with all brown setae, are characterized by the strongly swollen labial palpus and the pretarsal claws, which are large and as long as the hind basitarsus. The foretibial spurs are as long as tarsomere I and II. Also, the pregenitale is unusually large.

***Eremoleon nigribasis* Banks**
Fig. 34, 72, 110, 139, 176, 292-293

Eremoleon nigribasis Banks 1920: 329. **Male**, **female**, **syntypes**, St. George, Utah, 5, 6, VI, T. Spalding (MCZC).
=*Eremoleon affine* Banks 1942: 144 (after Adams 1957: 91). **Holotype male**, Miraflores, Baja California, 8.VII. (CASC)

Further description. Banks 1927: 71, fig, 26 (vertex, pronotum); 1942: 143; Adams 1957: 91, fig. 24, 27 (male genitalia, labial palp).

Distribution. Mexico: Baja California (Banks 1942: 143). U.S.A.: Arizona (Banks 1927: 71); California; Nevada; Texas; Utah

Diagnosis: length of body 17-26 mm., forewing length 16-27 mm, width 5.0-8.0 mm; hindwing length 15-26 mm, width 4-7 mm. **Coloration**: general coloration pale brown; face pale brown with dark band below antennae; antenna mostly pale brown on scape, pedicel and basal flagellomeres, becoming darker distally with dark brown bases; vertex (Fig. 34) with anterior and middle scar rows fused, narrowly connected at middle not reaching ocular rim; posterior row with triangular brown mark at middle; pronotum pale brown with numerous dark brown setal bases, irregular dark brown markings submedially and laterally; nota pale brown, darker areas submedially and sublaterally; scutelli pale brown with large submedial mark near middle medial dark brown area at anterior margin; thoracic pleura (Fig. 72) pale brown with dark brown mostly dorsally and at middle; mesepimeral wing process dark umbraceous; femora pale brown with numerous dark brown setal bases, midfemora and hindfemora with subapical dark brown ring; tibiae pale brown with fewer dark brown setal bases than femora and with apical dark brown ring; tarsi nearly all pale brown; wings (Fig. 110) without dark spots, weakly suffused above stigma and elsewhere; wing base with deep black mark; abdomen banded with tergites with alternating dark brown and pale brown areas; sternites mostly pale brown. **Chaetotaxy**: midfemoral sense hair shorter than forefemoral sense hair which is about 3 times longer than femur diameter; mesonotum without bristles, only short hair. **Structure**: antennal flagellomere 3 longer than wide; pretarsal claws of foreleg and midleg longer than basitarsus, that of hindleg shorter than basitarsus; tibial spurs extend about to apex of tarsomere II; distal tarsomere more than 8 times longer than diameter, shorter than rest of tarsus; foreleg and midleg basitarsus about 2.5 times longer than middle diameter, that of hindleg about 4 times longer; forewing slightly longer than hindwing; forewing costal area as high or higher before stigma as above radial sector; 12 to 16 branches of CuP+1A in forewing; **male genitalia** (Fig. 139) with gonarcus strongly arched and twisted laterally; mediuncus broad; paramere broad plate, without sculpturing about 3 times wider than long, nearly touching toward gonarcus; anterior, medial and posterior margins strongly sclerotized; **female terminalia** (Fig. 176) with prominent broad pregenitale about 10 times wider than long with large median spine posteriorly which is about 3 times longer than wide; posterior gonapophysis about 2.5 times longer than middle diameter, setae shorter than gonapophysis; gonapophyseal plate at least 10 times longer than middle diameter, broadest basally; lateral gonapophyses transverse, contiguous with about 10 stout black setae about equal in size to black setae on ventral part of ectoproct, which is not produced ventrally; spermatheca about 9 times longer than middle diameter with wide hook posteriorly.

Larva (Fig. 292-293**)**. **Coloration**: all ocelli clear in living specimens; larva pale with a pair of dark brown streaks posteriorly on the dorsal head capsule and a few ventral markings; mandibles dark brown. **Chaetotaxy**: simple setae ventrally and dorsally; no setae on dorsal mandibles; digging setae on rastrum

with outer three pairs elongate and equal with inner pair being half as long, lateral setae on head capsule long, longer than mandibular width. **Structure**: length of ventral head capsule measured at midline equal to length of mandible; basal distance on mandible from base of first tooth to dorsal head capsule 75 percent of intertooth distance; mesothoracic spiracle not visible; middle tooth on mandible slightly longer than distal tooth and slightly closer to distal tooth.

Biology. The larvae live in pockets of fine, dry, decomposed organic matter, in the deep recesses of rodent nests in rocky areas. Collecting them is problematic using typical tools such as a shovel and screen or an aspirator. Collecting is more successful with more specialized tools such as flexible scoops or vacuum hoses, but is still further complicated by the path of the burrows, which weave through underground rocks. Adult *Eremoleon nigribasis* Banks were observed feeding on *Scotoleon longipalpis* (Hagen) in California. Their all clear ocelli and lack of interesting color pattern are indicative of living in continual darkness. The burrows in which they were collected contained numerous Dermestidae larvae, which may serve as one food source.

Material studied. 24 males, 33 females. June to October.
MEXICO. **Baja California**: Juncalito, south of Loreto, 22.VI.1983, R. Miller and L. Stange (1m, 1f, FSCA); 24 miles northwest La Paz, 28.VI.1983, R. Miller and L. Stange (1m, 1f, FSCA). U.S.A. **Arizona**: Bisbee, Cochise County, 27.VII, 1997, A. Menke (1f, FSCA); Brown Canyon, Baboquivari Mts., 5.IX. 1953, L. Martin (1f, LACM); Devil's Canyon, Pinal County, 26.VII.1989, Warner (1m, FSCA); near Magma Mine, 3.2 km. northeast Superior, 1189 m., 33.30526N 111.0597W, about 50 m., 16.VIII.2012, Oswald, Dietz and Machado (3f, TAMU); Organ Pipe National Monument, Pima County, 14.VI.1952, Gertsch (1m, AMNH); Sabino Canyon, Pima County, 31.VIII.1963, L. Stange (2m, 3f, FSCA); Santa Catalina mts, northeast Tucson, 13.VII.1984, reared, R. Miller (1f, FSCA); 3.2 km. northeast Superior, Pinal County, near Magma Mine, 1189 m., 33.30526, 111.0597W., 16.VIII.2012, Oswald, Diehl and Machado (1f, TAMU); Tucson, 2450', 6.VII.1962, E. MacLeod (1f, TAMU); Wahweap, Coconino County, 2.IX.1964, Parker (1m, FSCA); west Brown Bear Canyon Rd, Baboquivari Mountains, 1152 m, 3175973N 111.53296W, 13.VIII.2012, Oswald, Dietz and Machado (1f, TAMU); Sabino Pond, Sabino Canyon, Santa Catalina Mountains, Pima county, 2750', 25.VII.1962, J. Beatty, Palo Verde and Saguaro cactus habitat (1m, 1f, TAMU); Tanque Verde Canyon, Reddington, Coronado National Forest, Pima County, 3215'17N, 11139'53"W. 9.VIII.2003, J. Oswald, at mercury vapor light (1f, TAMU). **California**: 53 miles north Baker, IX.1991, L. Stange and R. Miller (1m, 1f. FSCA); 2 miles west Big Pine, 7.VII.1982 (1f, USMB); Borrego Springs, San Diego County, 22.VI.1958, L. Stange (1m, FSCA); China Lake NAWS, Seep Springs, San Bernardino County, 28.VIII.2004, Pratt and Pierce (1f, TAMU); Deep Canyon, Riverside County, 8.X.1963, Irwin (3m, 3f, FSCA, UCRC); 29 Palms Marine Base, San Bernardino County, Powerline Road, 26.VI.2003, G. Pratt and C. Pierce (1f, TAMU), 29 Palms Marine Base, Bullion mountains, 18.IX.2003, G. Pratt and C. Pierce (1f, TAMU); Palm Desert, Riverside County, 3.VIII.1975, R. Miller (2m, FSCA); Squaw Tank, Joshua Tree National Monument, 16.VI.1960, Sleeper (3m, 2f, FSCA); Surprise Canyon, Panamint mts., 5.VI.1956 (1m, USMB); Tahquitz Canyon, near Palm Springs, Riverside County, 20.VI.1962, eating *Scotoleon longipalpis*, L. Stange (2m, 2f, FSCA); southeast Valley Mountains, San Bernardino County, 10.IX.2040, Pratt and Pierce (1m, 1f, TAMU). **Nevada**: Pyramid Lake Indian Reservation, 9.VIII.1981, R. Miller (3f, FSCA). **Texas**: Ft. Davis, Jeff Davis County, 8.VIII.1983, Knudson (1m, FSCA). **Utah**: Calf Creek, Calf Creek campground, Junction Highway 12, Garfield County, 3747'58"N11124'92"W, 23.VI.2000, R. W. Baumann and D. J. Cavan (2f, TAMU), also 28.VI.2000, E.C. Green, W Mendel and M. Moody (1m, TAMU).

Discussion: Usually the black mark on the base of the forewing and dark umbraceous mesepimeral wing process will suffice to distinguish this species. Also, the pretarsal claws are larger than in most species.

punctipennis group

=*Incamoleon* Banks 1913: 229. **Type species**: *Psammoleon punctipennis* Banks, by original designation.

Taxonomy. Navás 1916: 232 (= *Formicaleo*); Stange 1967:57 (*Incamoleon* good genus); 1970: 20 (= *Eremoleon*).

Diagnosis: antenna long and slender, club weak; pronotum about as long as width; hindleg longer than other legs; tibial spurs reaching to at least apex of tarsomere II; pretarsal claws not capable of closing against distal tarsomere; distal tarsomere about equal in length to others together; hindwing same length as forewing, in repose, hindwing apex coincides with forewing apex; forewing costal area gradually expanded at base from slightly broadened base; subcostal area narrowing toward apex of wing; forewing radial sector originates well beyond forking of CuA; hindwing medial area at highest point lower than wing area above it; hindwing vein CuA extends somewhat beyond where posterior fork of MP2 reaches hind margin; male paramere in form of rigid plate; sexual dichromatism present, wings with brown spots in female, usually unmarked in male; female terminalia with posterior gonapophysis weakly inflated.

Discussion. This monobasic group contains a widespread South American species (Venezuela to Argentina), which is sexually dichromatic in having the female with brown spots on the wings and the male usually not having wing maculation. The wing venation is unusual in the genus, in that the subcostal area narrows toward the stigma. The microhabitat of the larva is unique in the genus, since the larvae were found living in beetle frass under elevated logs in exposed areas along rivers.

***Eremoleon punctipennis* (Banks)**
Fig. 35, 73, 111, 140, 177, 278-283

Psammoleon punctipennis Banks 1910: 147. **Syntype female**, San Antonio, Colombia, Fassl (MCZC)
=*Formicaleo tetrastictus* Navás 1913: 51 (after Banks 1943: 169). **Holotype**, Venezuela (not located)
=*Formicaleo stictopterus* Navás 1916: 233. **New name** for *Formicaleo punctipennis* Banks (after Stange 1967: 58)

Taxonomy. Banks 1913: 229 (in *Incamoleon*); Navás 1916: 233 (in *Formicaleo*); Stange 1970: 22 (in *Eremoleon*).

Further description. Navás 1916: 232; 1919: 298, fig. 4 (wings).

Distribution. Argentina (Stange 1968: 58); Colombia (Navás 1928: 110); Venezuela.

Diagnosis: length of body about 30-34 mm., forewing length 30-41 mm., width 8-9 mm.; hindwing length 29-40 mm, width 7-8 mm. **Coloration**: antennal with scape, pedicel and flagellomere 1 mostly black, most flagellomeres pale reddish with dark brown bases; vertex (Fig. 35) with anterior row mostly dark brown connected medially with broad dark brown middle row which is extended posteriorly to hind margin at middle and laterally; pronotum (Fig. 35) mostly dark brown with narrow median pale brown stripe and pale brown sublaterally; mesoscutellum mostly dark brown with median pale brown stripe and pale brown laterally; metascutellum mostly dark brown with some pale brown posteriorly; forefemur pale brown with dark brown stripe dorsally, midfemur pale brown with dark brown anteriorly, hindfemur pale brown with dark brown dorsally; tibiae mostly pale brown with many dark brown spots at setal bases; tarsi mostly pale brown with dark brown apices; female wings with prominent dark brown spots, male usually without such spots; wing veins (at least radial vein and forewing vein CuA) with alternating dark and pale brown areas. **Chaetotaxy**: frons with many long setae; body dorsally with short, sparse, mostly pale setae, longer hair on pronotum, prescutal lobes, usually mesoscutellum; midfemoral sense hair equal to forefemoral sense hair which is about 2.5 times longer than femur base; most leg setae black, longer than middle femur diameter. **Structure**: antenna with about 40 flagellomeres, club weak, flagellomere 1 about 2.0 times longer than wide, III about 1.5 times longer than wide; pronotum about as wide at middle as long; legs about equal in length, hindleg longest; distal tarsomere about 8 times longer than middle diameter, about equal in length to others together; pretarsal claws of foreleg and midleg

longer than basitarsus which is about 2.5 times longer than middle diameter, hind basitarsus about 4 times longer than middle diameter and little longer than claws; tibial spurs reaching to about apex of tarsomere II (foreleg and midleg) or ending before tarsomere II (hindleg); forewing (Fig. 111) gradually expanded from slightly broader base, with costal cells above radial sector about 1.5 times higher than wide, cells high or higher before stigma as above radial sector; cubital fork well before origin of radial sector; hindwing with CuA ending about where posterior fork of MP2 reaches hind margin; **male genitalia** (Fig. 140) with gonarcus broad, moderately arched, weakly twisted laterally; no mediuncus; paramere plate like, about 5 times longer than wide; anterior, mesal and posterior margins strongly sclerotized; parameres nearly touching toward gonarcus, below which small sclerite about 5 times longer than wide; **female terminalia** (Fig. 177) with pregenitale small; posterior gonapophysis somewhat swollen, about 5 times longer than middle diameter, with elongate setae but not exceeding length of gonapophysis; lateral gonapophysis elongate, about 2 times longer than wide with many stout black digging setae longer than those on ectoproct; many elongate hair-like setae on ventral margin of tergite IX and posterior margin of sternite VIII.

Larva (Fig. 278-283). **Coloration**: head and body dorsally heavily marked; ventral thorax and abdomen mostly tan with a couple of rows of light markings down ventral abdomen; ventral head with a couple of faint (Fig. 281) submedian spots; mandibles dark brown. **Chaetotaxy**: dorsal head with highly expanded dolichasters anteriorly grading to unexpanded dolichasters posteriorly; dorsal thorax with dolichasters verging on being simple setae; dorsal abdomen with short unexpanded dolichasters; ventral head, thorax, and abdomen with thin unexpanded dolichasters; labrum with anteriorly directed simple setae; mandibles with a few simple dorsal setae; digging setae (Fig. 283) with central pair about half the length of next two pair, which are about 3/4 the length of outer pair. **Structure**: mandibles 75 percent length of ventral head capsule measured at midline; distance on mandible from base of first tooth to dorsal head capsule 37 percent of intertooth distance; mesothoracic spiracle not visible; palpi about equal in length to width of mandibular base.

Biology. The larvae of this species live in piles of beetle or termite frass in rain-protected and shaded positions beneath the elevated trunks of large fallen trees. Under shaded forest canopy, however, this type of situation turned up no larvae, due to excessive moisture in the frass. Both locations where these larvae were found were along rivers where there was open air and sun exposure, lowering humidity, but which also provided daytime shade. In these areas, trees were observed that had fallen toward the river due to undermining by water erosion. The material in which the larvae lived was dry and loose. No larvae were present in dirt habitats. Their habitat needed to be mostly frass of low density. Larvae live without any anchoring to a substrate, and do not appear able to dig in actual dirt or dense material. In Venezuela, this species was parasitized by *Chrysanthrax* nr. *ioptera* (Wiedermann).

Material studied. 3 males, 16 females, 2 larvae. December to March.
ARGENTINA. **Catamarca**: El Rodeo, 28.I.1959, Golbach (1f, FSCA). **Jujuy**: Jujuy. 15.I.1966, Townes (1f, FSCA), Posta de Lozano 28.I.1972, Stange (1f, FSCA), San Salvador, 18.III.1965, Stange (1f, FSCA). **Salta**: Parque Nacional Finca el Rey, 4.II.1953, Kusnezov (1f, FSCA). **Tucumán**: Farallon Blanco, Burruyacu, 18.II.1961 (4f, FSCA); Horco Mollo, 700 m., l. Stange (1m, 3 f, FSCA); El Cadillal (1f, FSCA); Villa Nouques, 25.XII.1966, Townes (1f, FSCA). BOLIVIA. **Cochabamba**: Chapare, Alto Palmar, Steinbach (1f, FSCA), Chulumani, Sur Yungas, I. 1948 (1f, FSCA). PERU. Valle Cosniota, 1700 m, 15.II.1952, (1f, FSCA). TRINIDAD. Simlá, Arima Valley, 13.II.1966, Duckworth (1f, USNM). VENEZUELA. **Aragua**: El Limon, 26.III.1987, **reared**, Miller and Stange (2 larvae, 1f, FSCA); Rancho Grande, 6.II.1958, 1100 m, Rosales (1m, FSCA). **Lara**: EL Blanquito, 23.III.1979, 1500 m., Osorio (1f, FSCA). **Zulia**: near Marcaibo, 19.VI.1959, Rosales (1m, FSCA).

Discussion. This species has had a complex taxonomic history. Banks (1910) described the species in *Psammoleon* and then (1913) placed it in a new genus, *Incamoleon* which Navás (1916) synonymized with *Formicaleo*. Stange (1967) considered *Incamoleon* a valid genus based partly on wing venation (the narrowing subcostal region), but then (1970) synonymized *Incamoleon* with *Eremoleon*. The female terminalia have strong digging setae on the lateral gonapophyses and ectoproct, and the posterior

gonapophysis is large and somewhat swollen. Perhaps this is related to the microhabitat of the larvae, which live in loose organic material.

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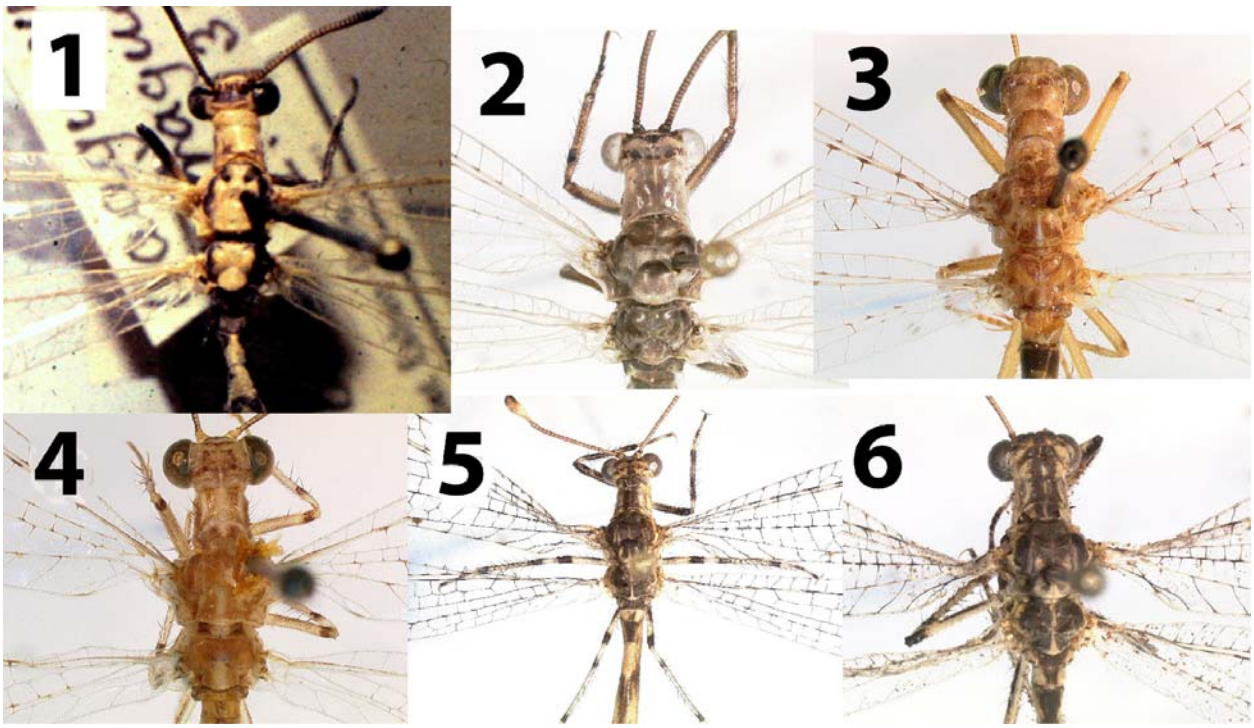
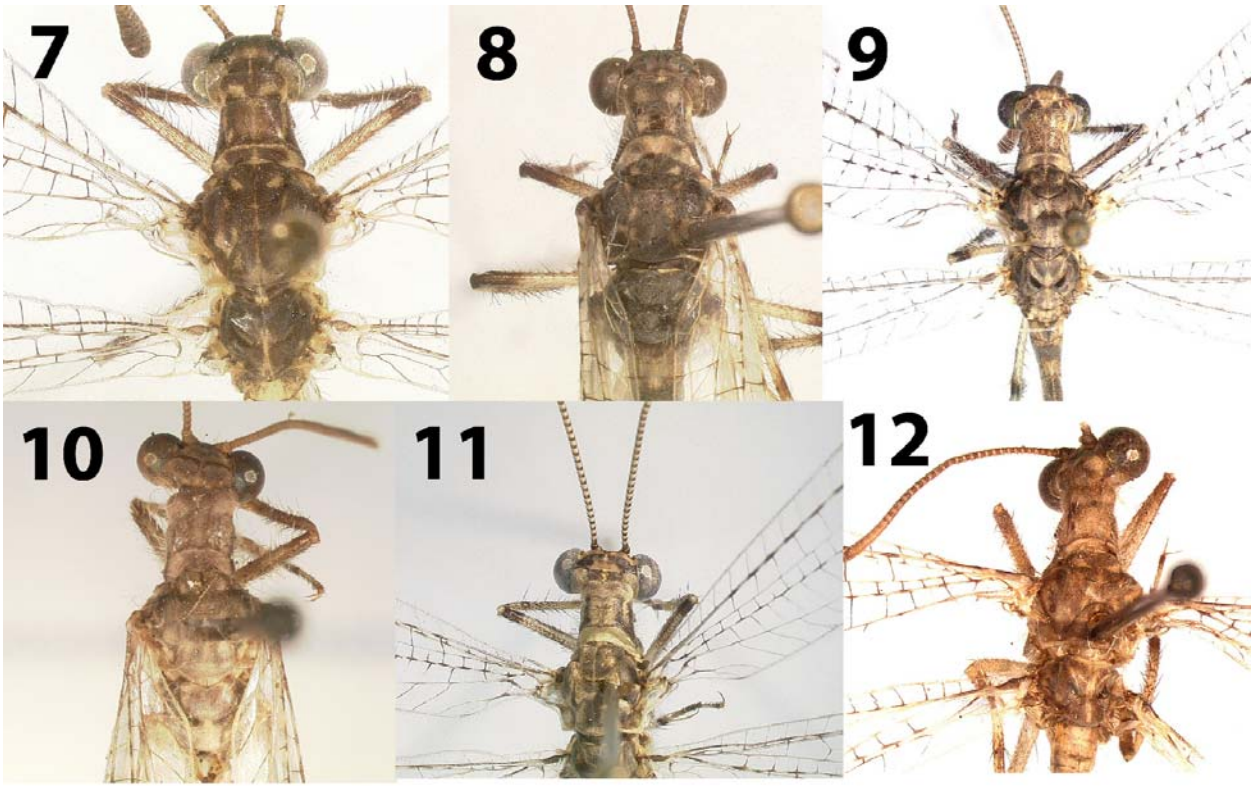
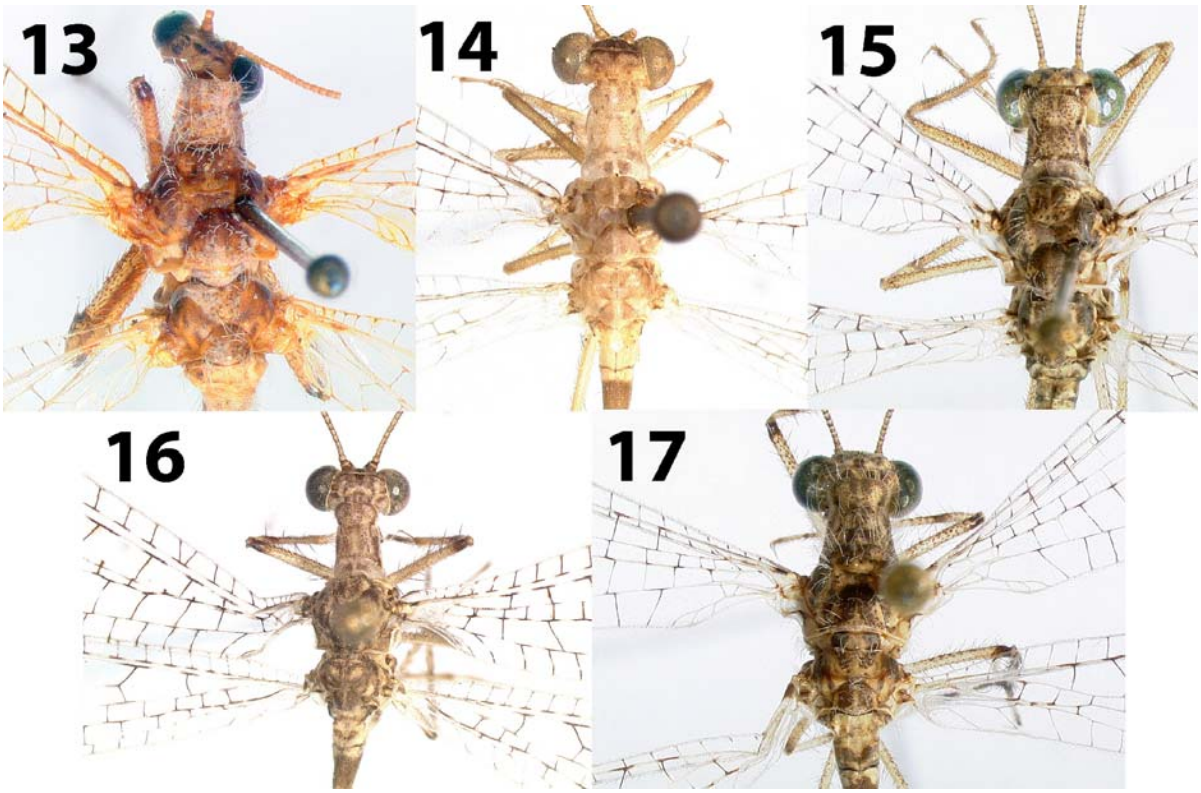


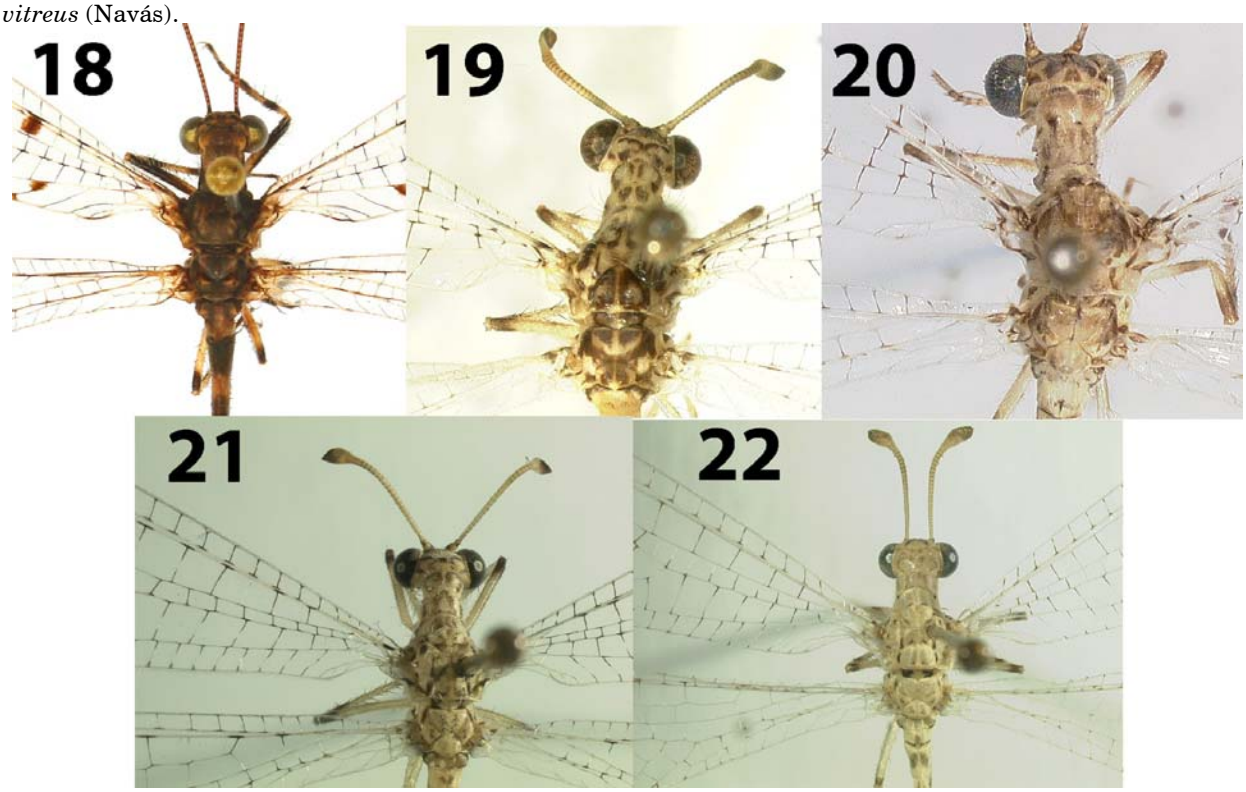
Figures 1-6. Dorsal view head and thorax. **1)** *Eremoleon pulcher* (Esben-Petersen); **2)** *Eremoleon venezolanus* Miller and Stange;. **3)** *Eremoleon insipidus* Adams; **4)** *Eremoleon pallens* Banks; **5)** *Eremoleon dunklei* Stange; **6)** *Eremoleon genini* (Navás).



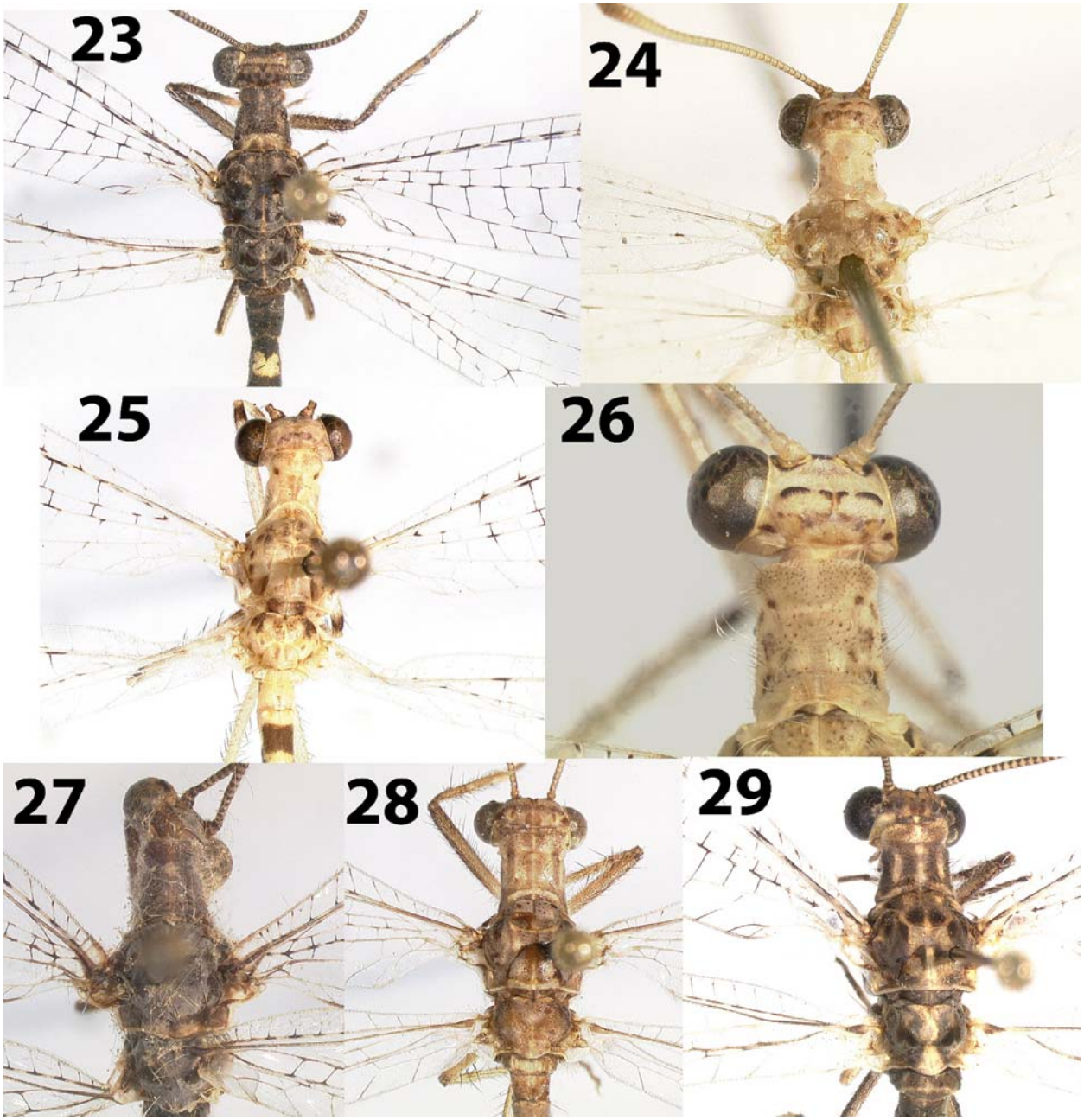
Figures 7-12. Dorsal view head and thorax. **7)** *Eremoleon anomalus* (Rambur); **8)**. *Eremoleon attenuatus* Miller and Stange; **9)** *Eremoleon dodsoni* Miller and Stange; **10).** *Eremoleon impluviatus* (Gerstaecker); **11).** *Eremoleon monagas* Miller and Stange; **12).** *Eremoleon peterseni* (Banks).



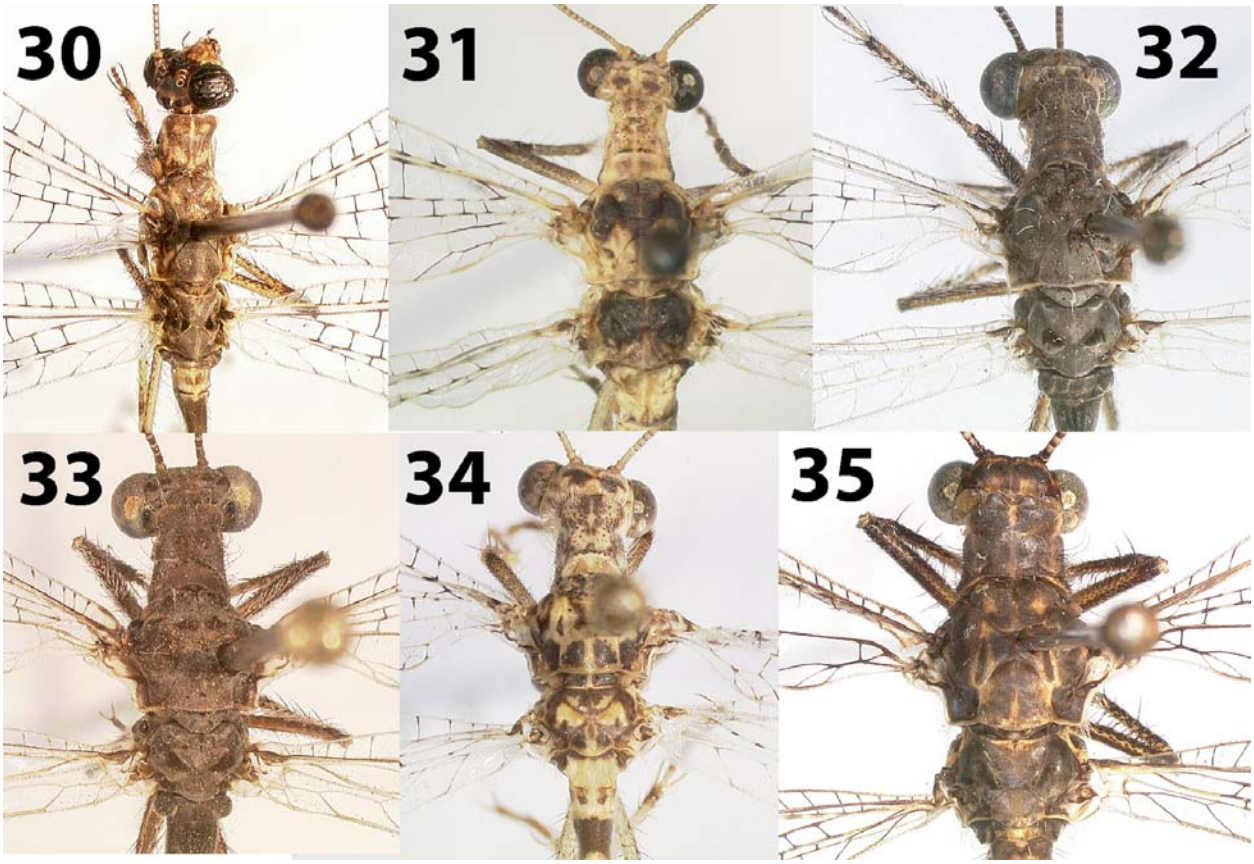
Figures 13-17. Dorsal view head and thorax. **13)** *Eremoleon durangoensis* Miller and Stange; **14)** *Eremoleon longior* Banks; **15)** *Eremoleon macer* (Hagen); **16).** *Eremoleon morazani* Miller and Stange; **17).** *Eremoleon vitreus* (Navás).



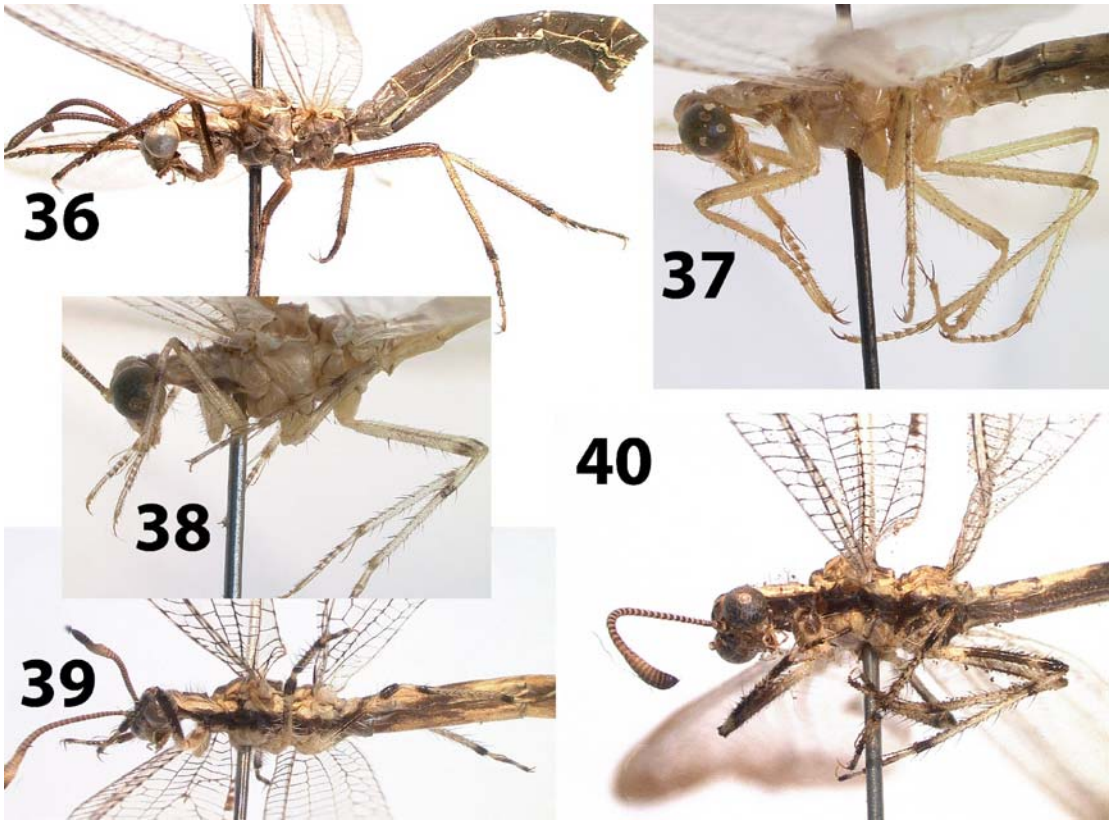
Figures 18-22. Dorsal view head and thorax. **18)** *Eremoleon cerverai* (Navás); **19)** *Eremoleon cerverinus* (Navás); **20)** *Eremoleon jamaica* Miller and Stange; **21).** *Eremoleon petrophila* Miller and Stange; **22).** *Eremoleon phasma* Miller and Stange.



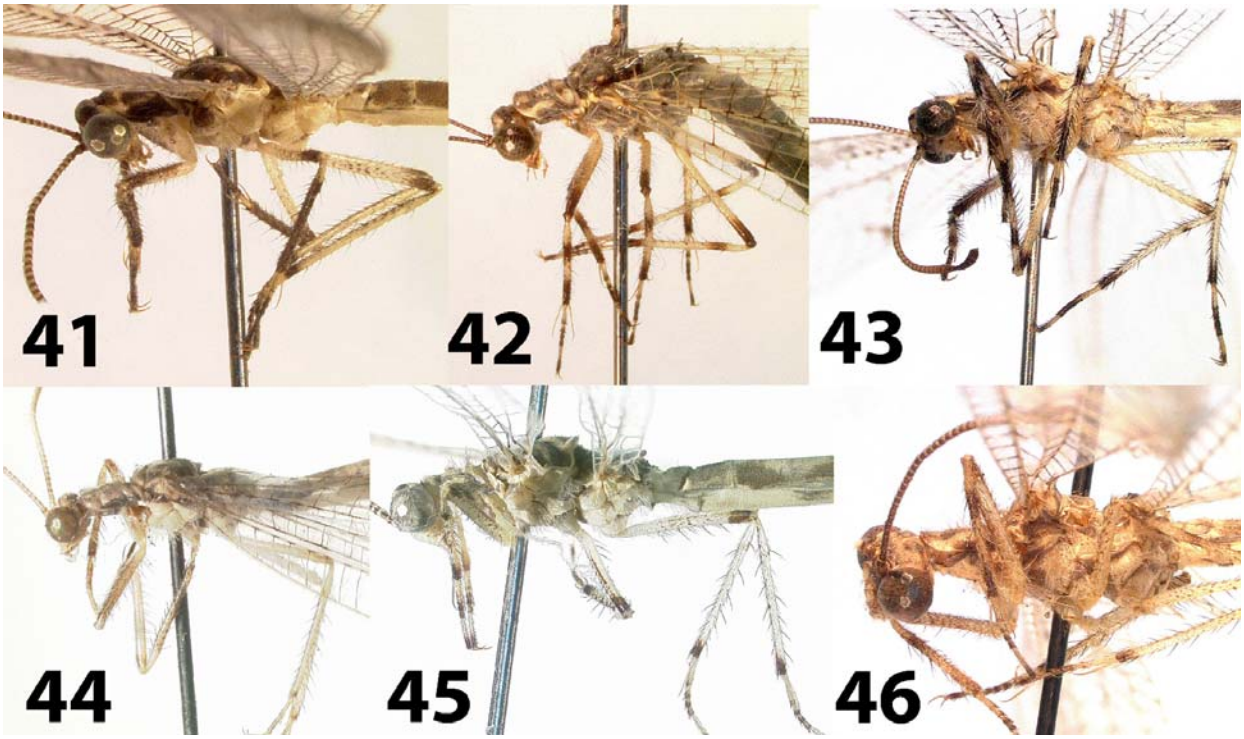
Figures 23-29. Dorsal view head and thorax. **23)** *Eremoleon femoralis* (Banks); **24)** *Eremoleon gracile* Adams; **25).** *Eremoleon jacumba* Miller and Stange; **26)** *Eremoleon tanya* Miller and Stange; **27)** *Eremoleon capitatus* (Navás); **28)** *Eremoleon inca* Miller and Stange; **29)** *Eremoleon triguttatus* (Navás).



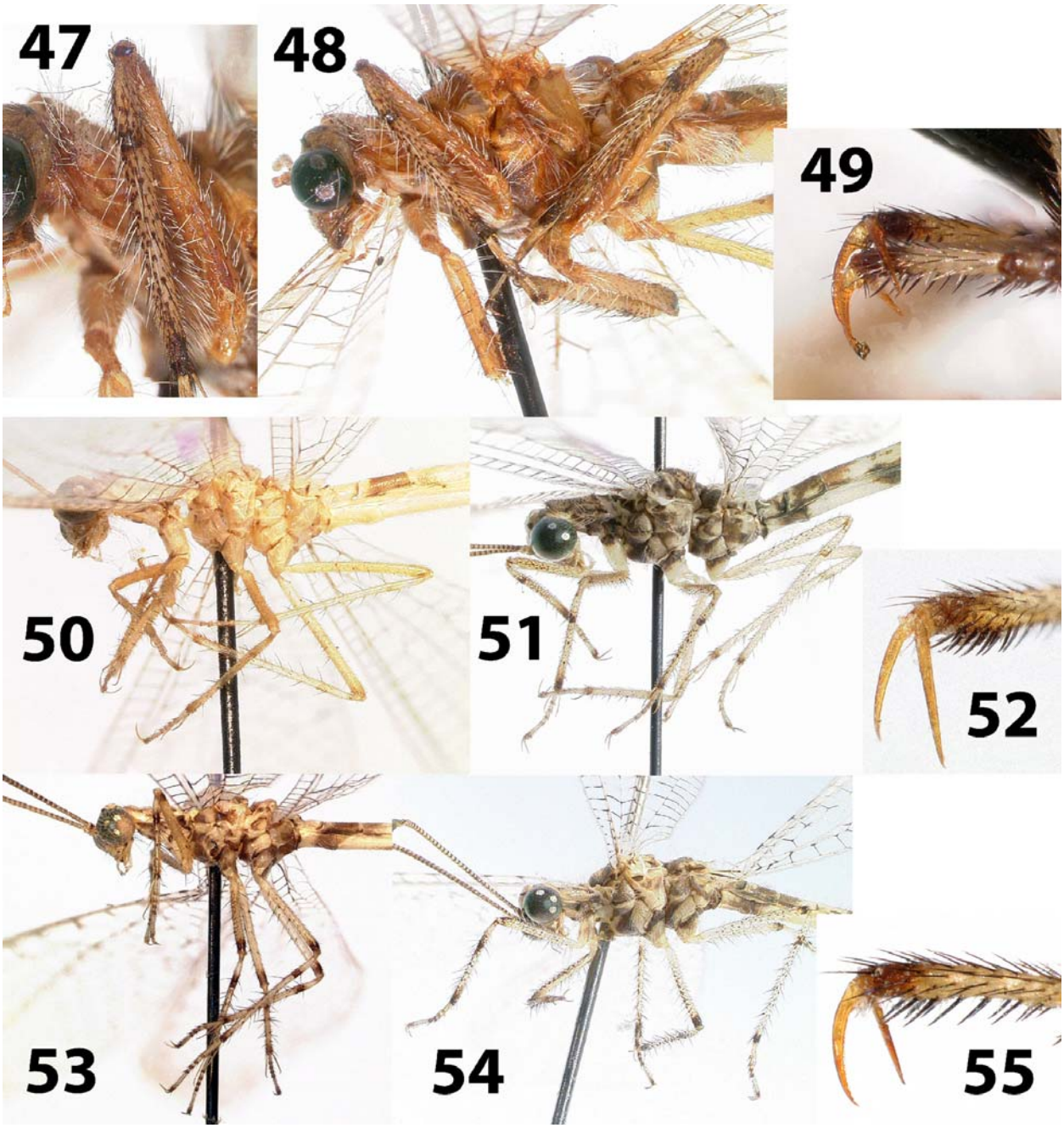
Figures 30-35. Dorsal view head and thorax. *30) Eremoleon adonis* Miller and Stange; **31)** *Eremoleon samne* Miller and Stange; **32)** *Eremoleon pygmaeus* Miller and Stange; **33)** *Eremoleon tepuyiensis* Miller and Stange; **34)** *Eremoleon nigribasis* Banks; **35)** *Eremoleon punctipennis* (Banks).



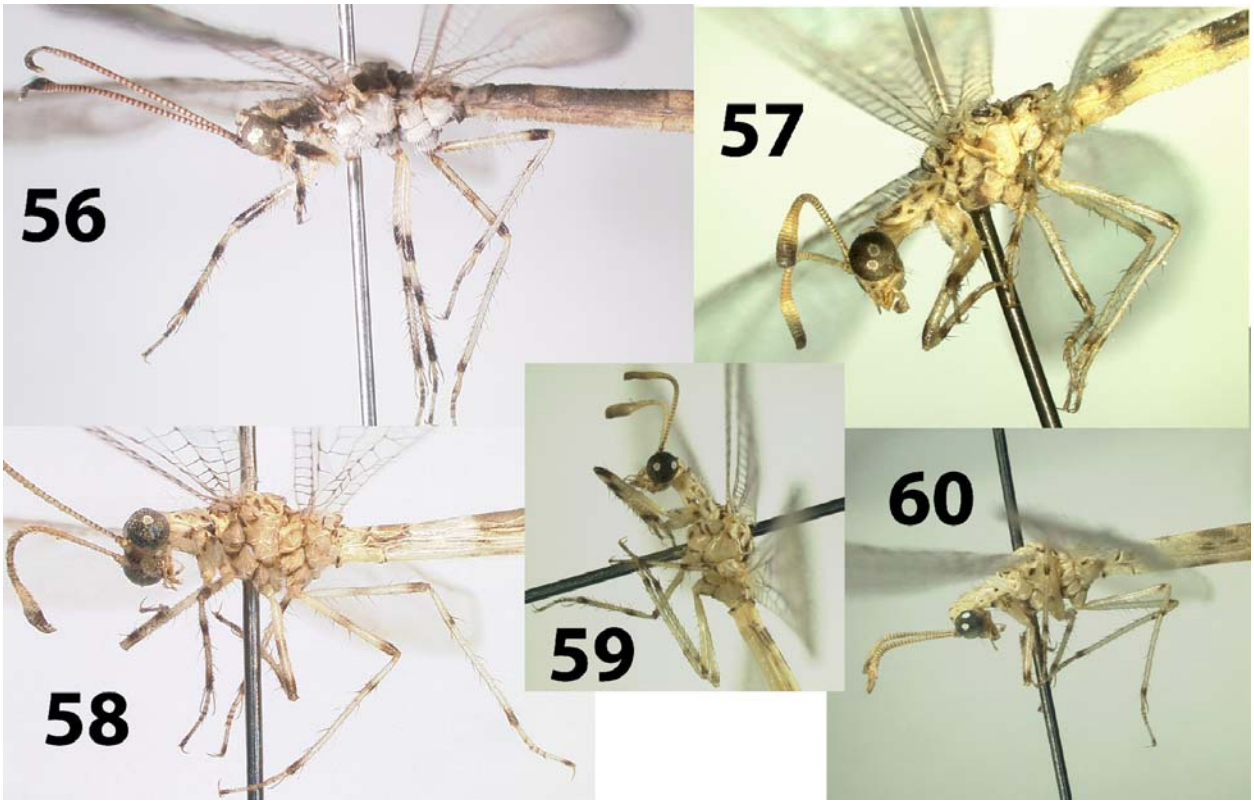
Figures 36-40. Lateral view showing legs. **36)** *Eremoleon venezolanus* Miller and Stange; **37)** *Eremoleon insipidus* Adams; **38)** *Eremoleon pallens* Banks; **39)** *Eremoleon dunklei* Stange; **40)** *Eremoleon genini* (Navás).



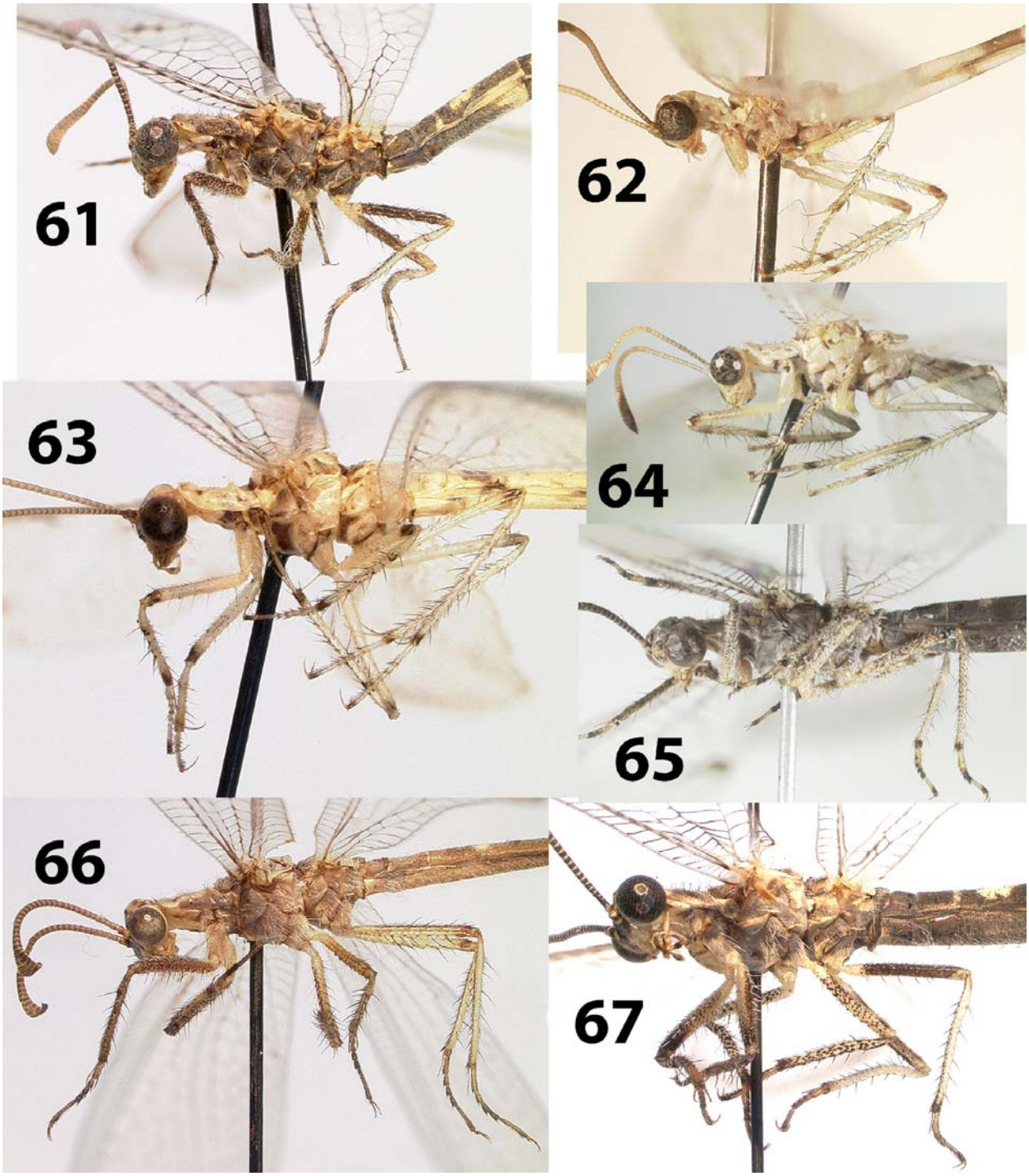
Figures 41-46. Lateral view showing legs. **41)** *Eremoleon anomalus* (Rambur); **42)**. *Eremoleon attenuatus* Miller and Stange; **43**) *Eremoleon dodsoni* Miller and Stange; **44)** *Eremoleon impluviatus* (Gerstaecker); **45)** *Eremoleon monagas* Miller and Stange; **46)** *Eremoleon peterseni* (Banks).



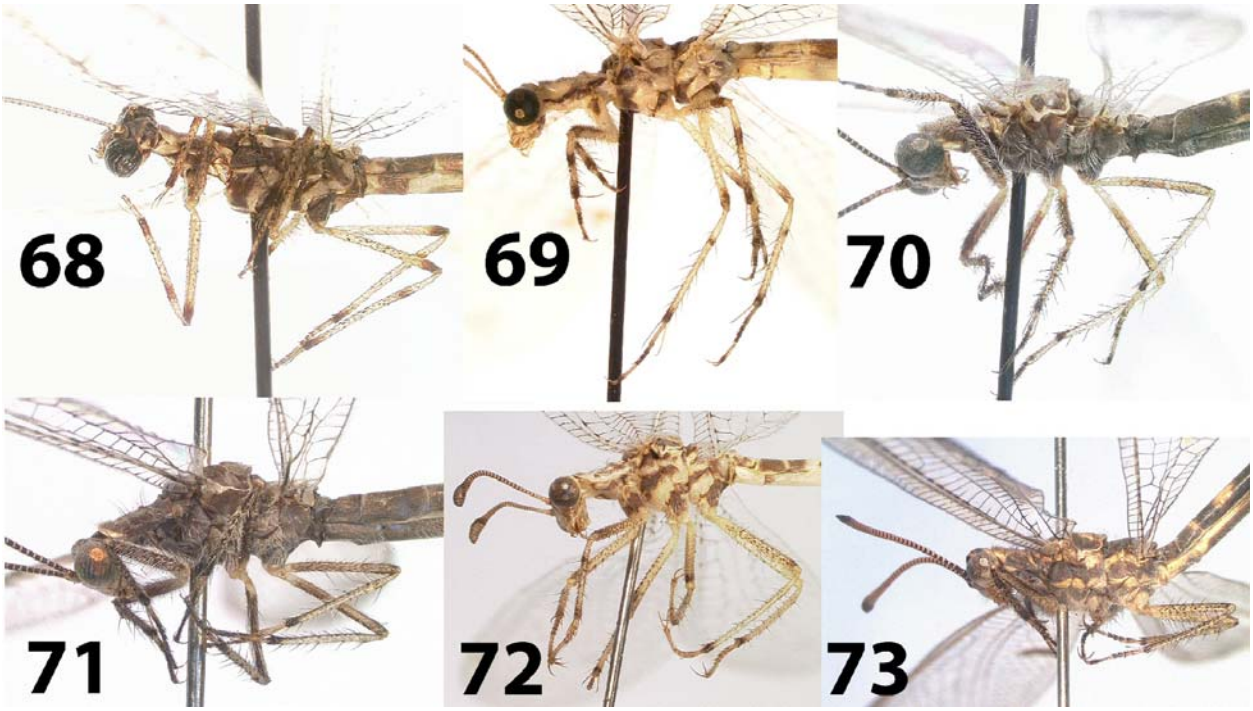
Figures 47-55. Lateral view showing legs **47-48)** *Eremoleon durangoensis* Miller and Stange; **49)** *Eremoleon durangoensis* Miller and Stange, distal tarsomere; **50)** *Eremoleon longior* Banks; **51)** *Eremoleon macer* (Hagen); **52)** *Eremoleon macer* (Hagen), distal tarsomere. **53)** *Eremoleon morazani* Miller and Stange; **54)** *Eremoleon vitreus* (Navás); **55)** *Eremoleon vitreus* (Navás**),** distal tarsomere**.**



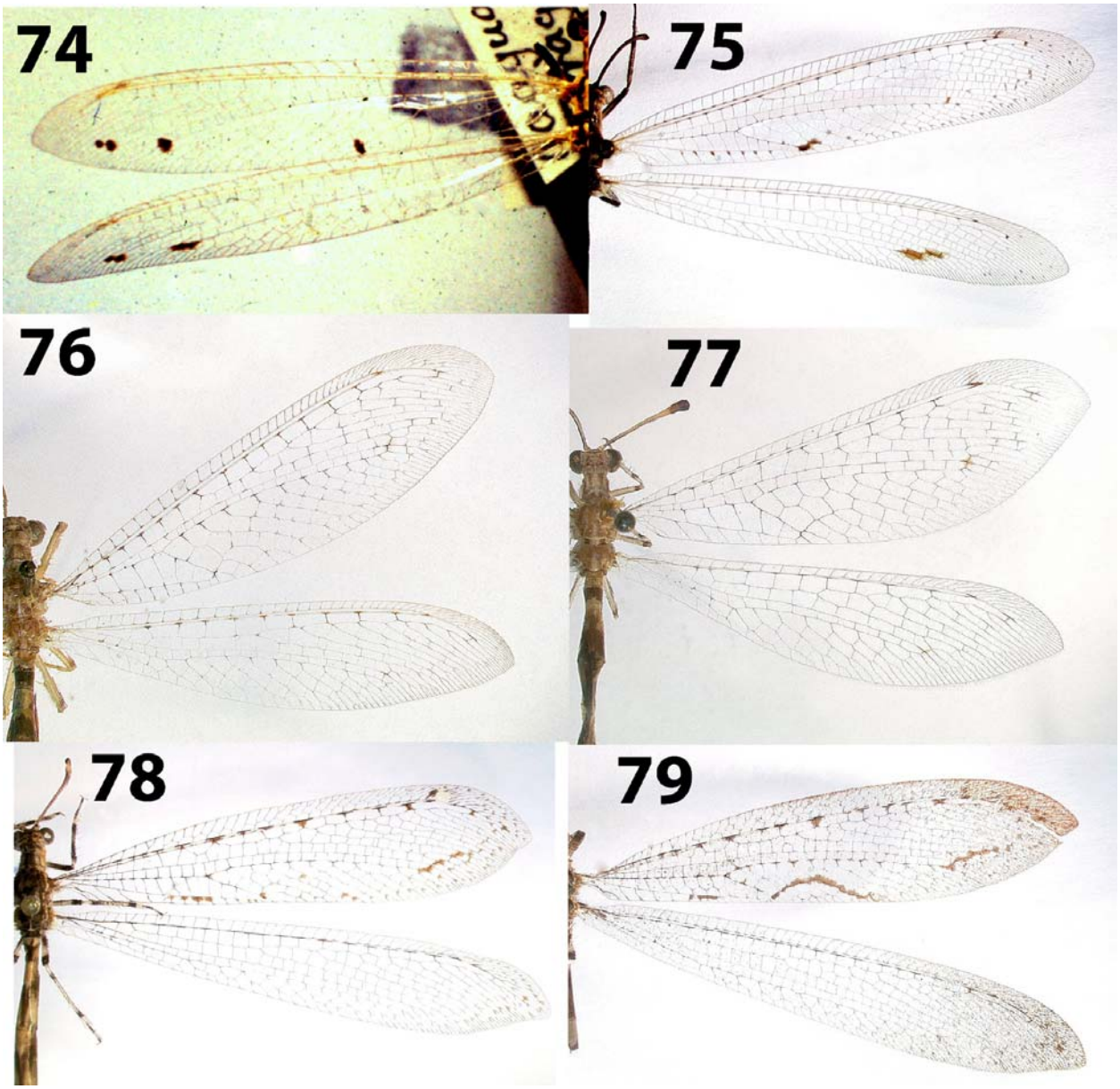
Figures 56-60. Lateral view showing legs. **56)** *Eremoleon cerverai* (Navás); **57)** *Eremoleon cerverinus* (Navás); **58)** *Eremoleon jamaica* Miller and Stange; **59)** *Eremoleon petrophila* Miller and Stange; **60)** *Eremoleon phasma* Miller and Stange.



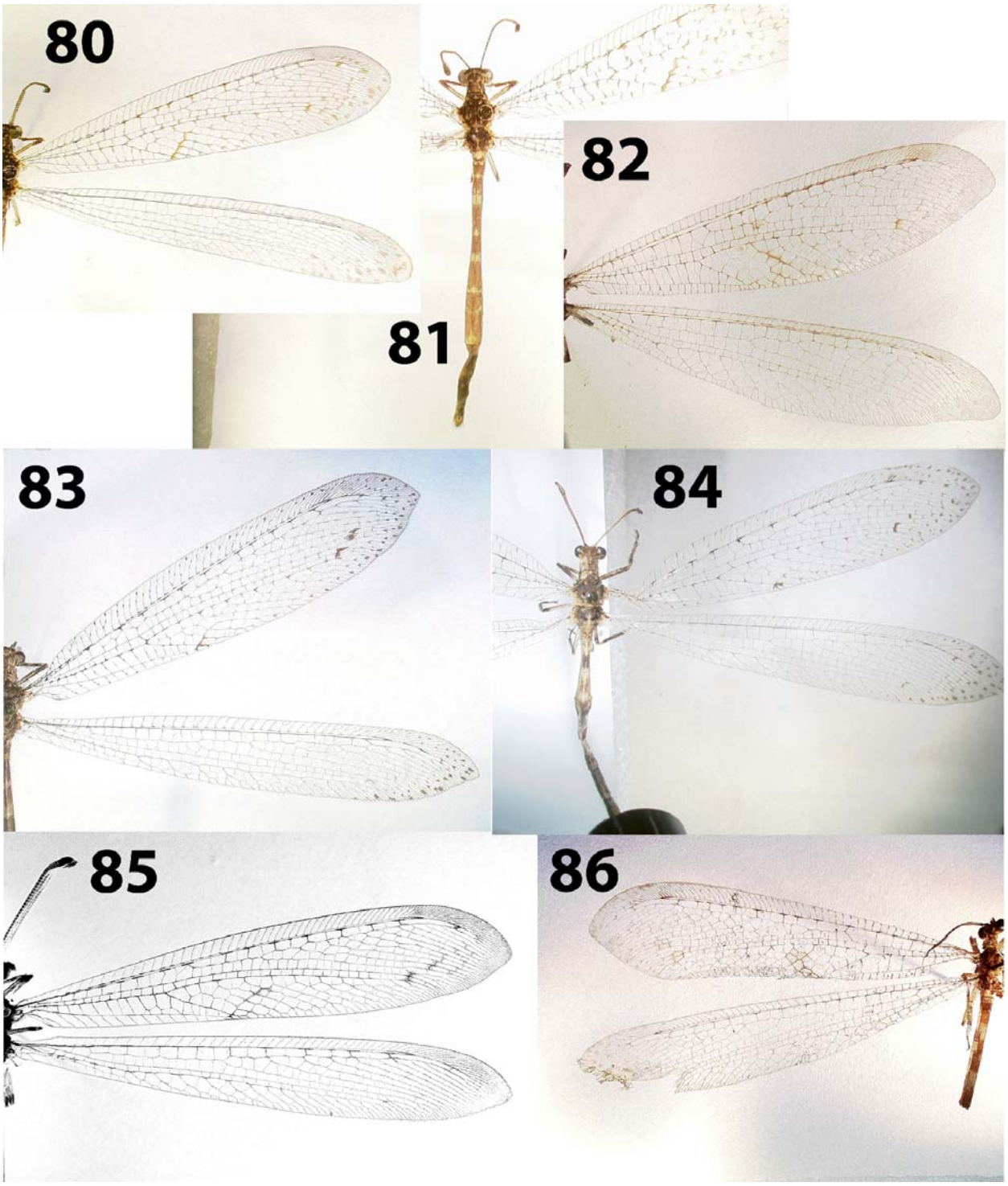
Figures 61-67 Lateral view showing legs. **61)** *Eremoleon femoralis* (Banks); **62)** *Eremoleon gracile* Adams; **63)** *Eremoleon jacumba* Miller and Stange; **64)** *Eremoleon tanya* Miller and Stange; **65)** *Eremoleon capitatus* (Navás); **66)** *Eremoleon inca* Miller and Stange; **67)** *Eremoleon triguttatus* (Navás)



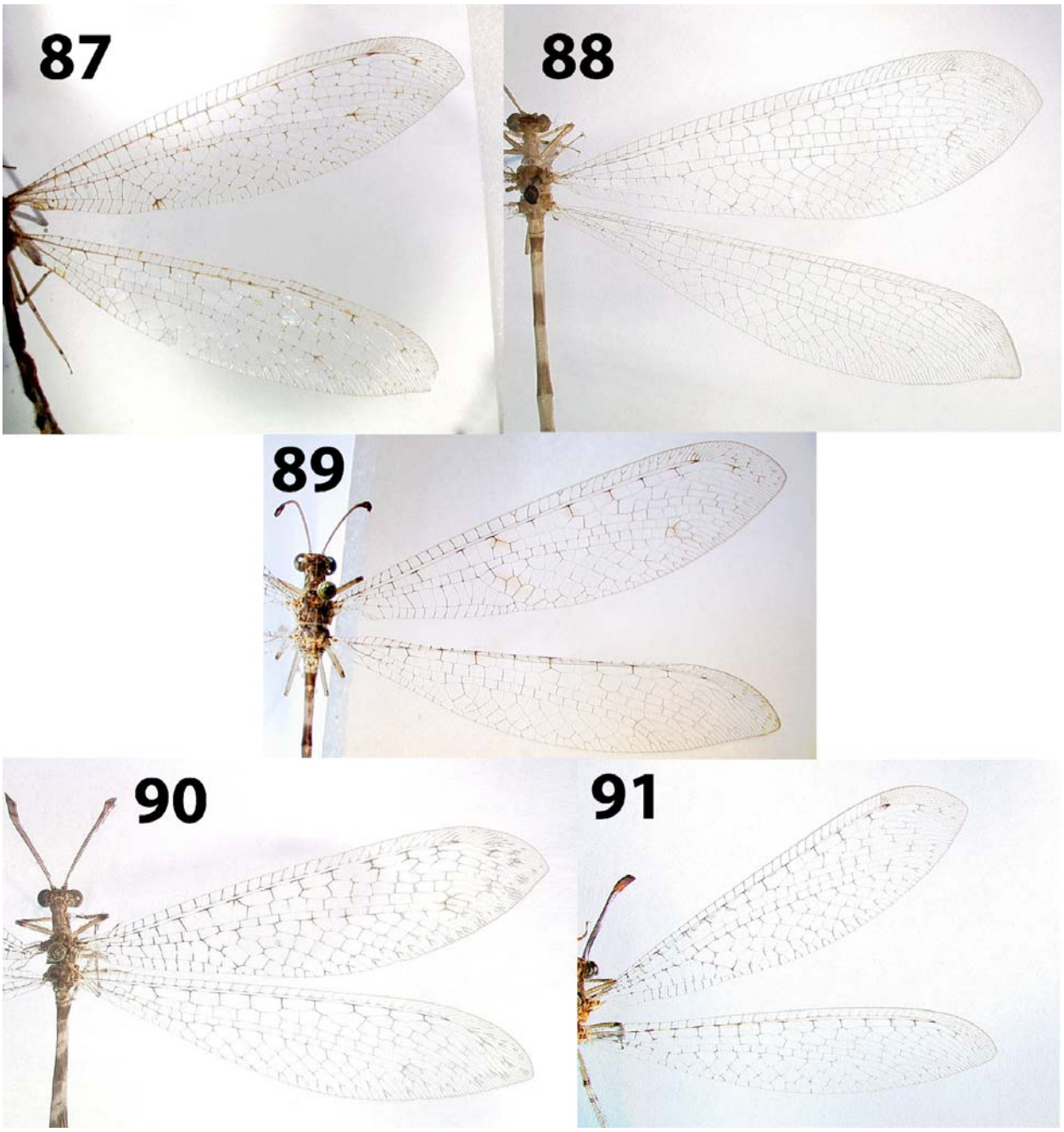
Figures 68-73. Lateral view showing legs. **68)** *Eremoleon adonis* Miller and Stange; **69)** *Eremoleon samne* Miller and Stange; **70)** *Eremoleon pygmaeus* Miller and Stange; **71)** *Eremoleon tepuyiensis* Miller and Stange; **72)** *Eremoleon nigribasis* Banks; **73)** *Eremoleon punctipennis* (Banks).



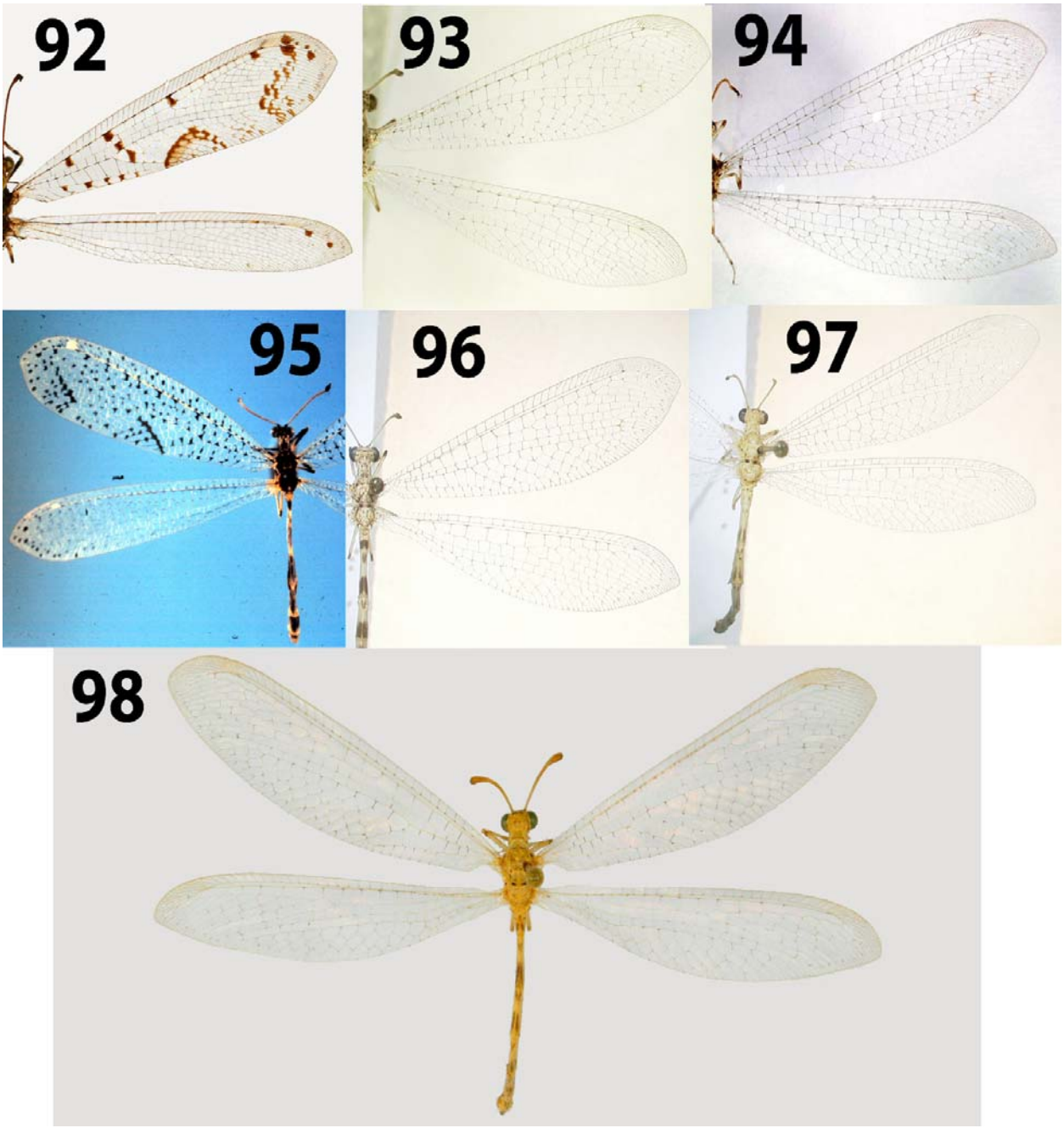
Figures 74-79. Wings. **74)** *Eremoleon pulcher* (Esben-Petersen); **75)** *Eremoleon venezolanus* Miller and Stange; **76)** *Eremoleon insipidus* Adams; **77)** *Eremoleon pallens* Banks; **78)** *Eremoleon dunklei* Stange; **79)** *Eremoleon genini* (Navás)



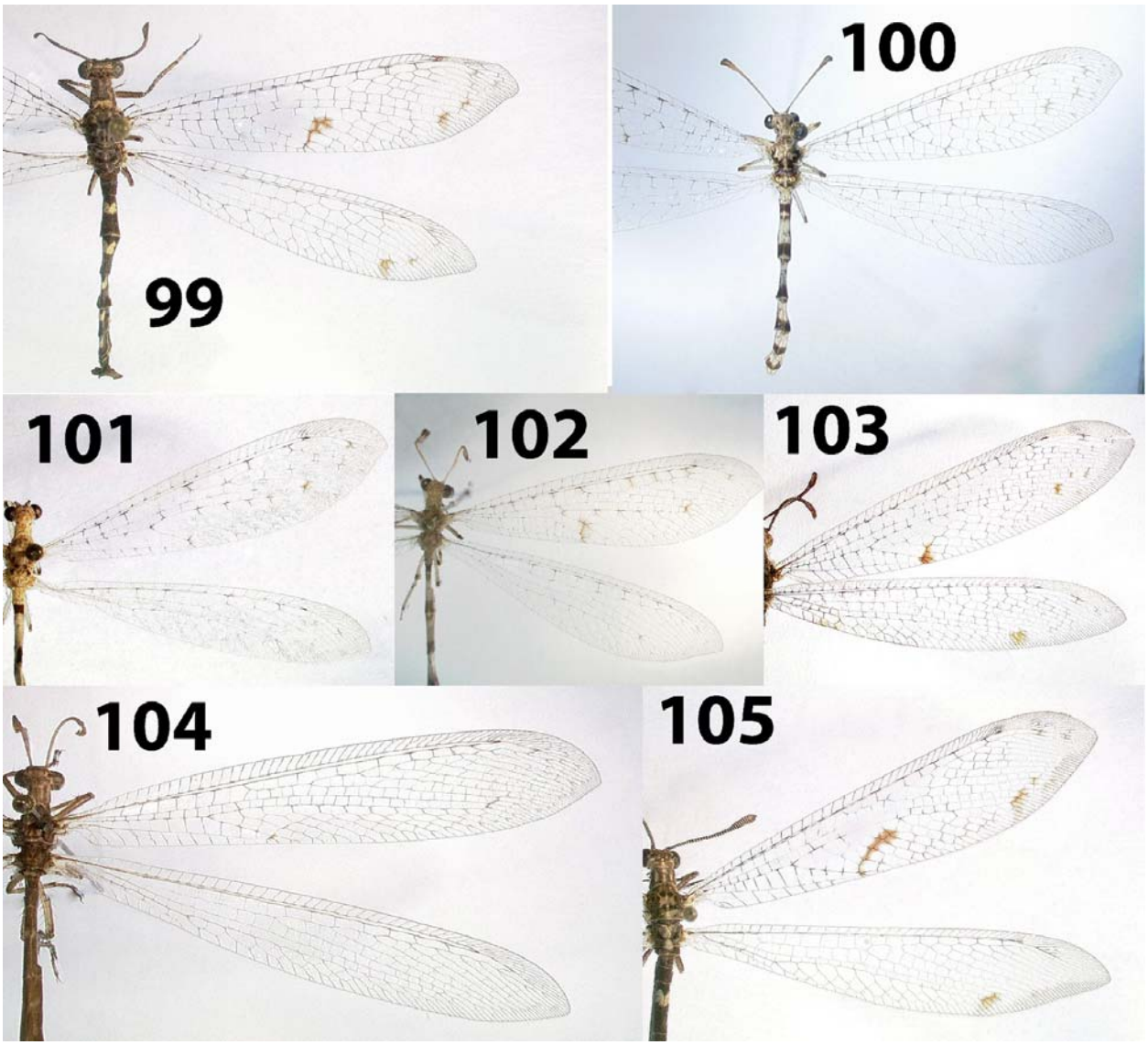
Figures 80-86. Wings. **80)** *Eremoleon anomalus* (Rambur); **81)** *Eremoleon anomalus* (Rambur), whole body; **82)** *Eremoleon attenuatus* Miller and Stange; **83)** *Eremoleon dodsoni* Miller and Stange; **84).** *Eremoleon impluviatus* (Gerstaecker); **85)** *Eremoleon monagas* Miller and Stange; **86)** *Eremoleon peterseni* (Banks).



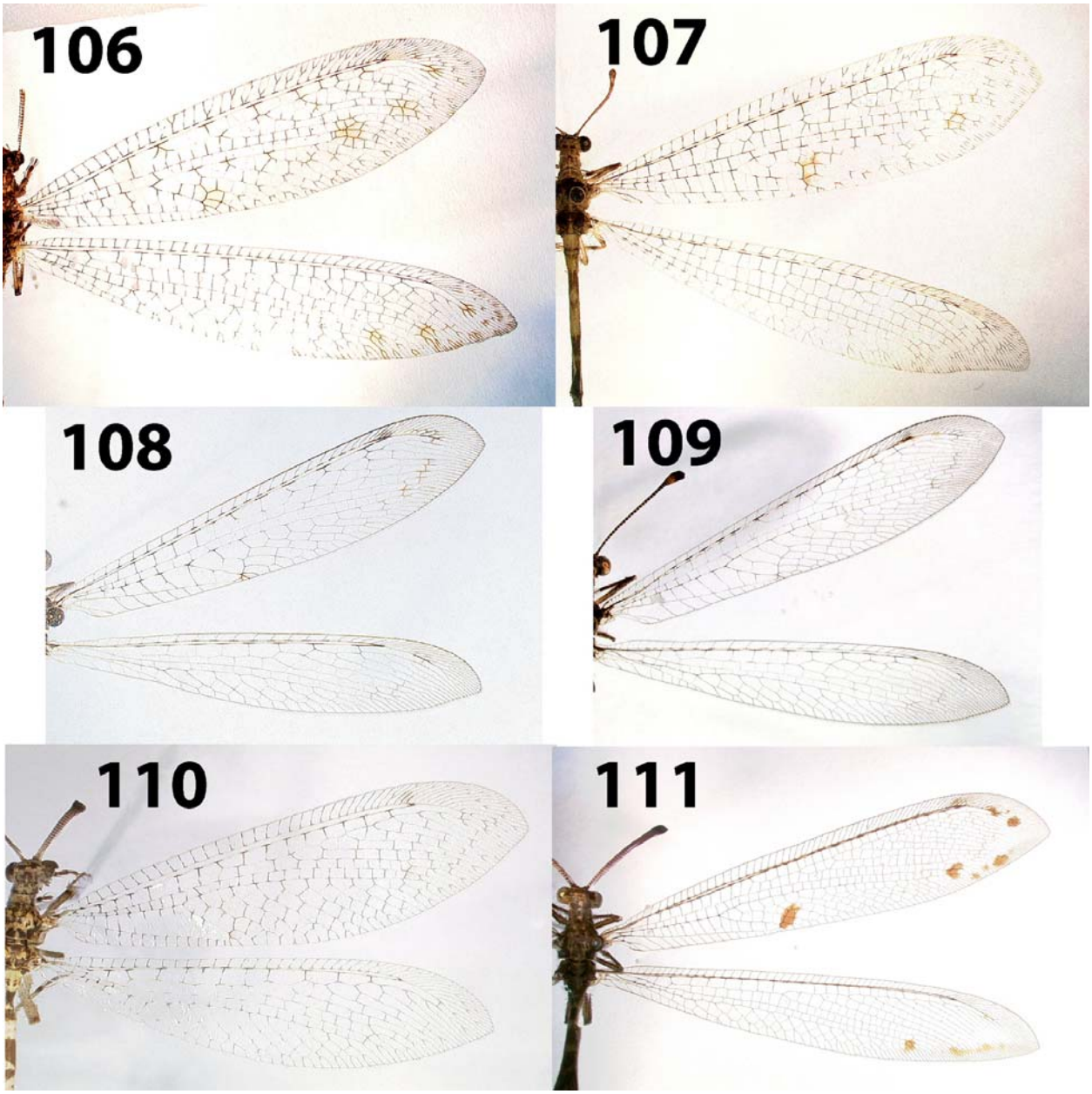
Figures 87-91. Wings. **87)** *Eremoleon durangoensis* Miller and Stange; **88)** *Eremoleon longior* Banks; **89)** *Eremoleon macer* (Hagen); **90)** *Eremoleon morazani* Miller and Stange; **91)** *Eremoleon vitreus* (Navás).



Figures 92-98. Wings. **92)** *Eremoleon cerverai* (Navás); **93)** *Eremoleon cerverinus* (Navás); **94)** *Eremoleon jamaica* Miller and Stange; **95)** *Eremoleon ornatipennis* (Alayo); **96)** *Eremoleon petrophila* Miller and Stange; **97)** *Eremoleon phasma* Miller and Stange. **98)** *Eremoleon phasma* Miller and Stange**,** whole body.

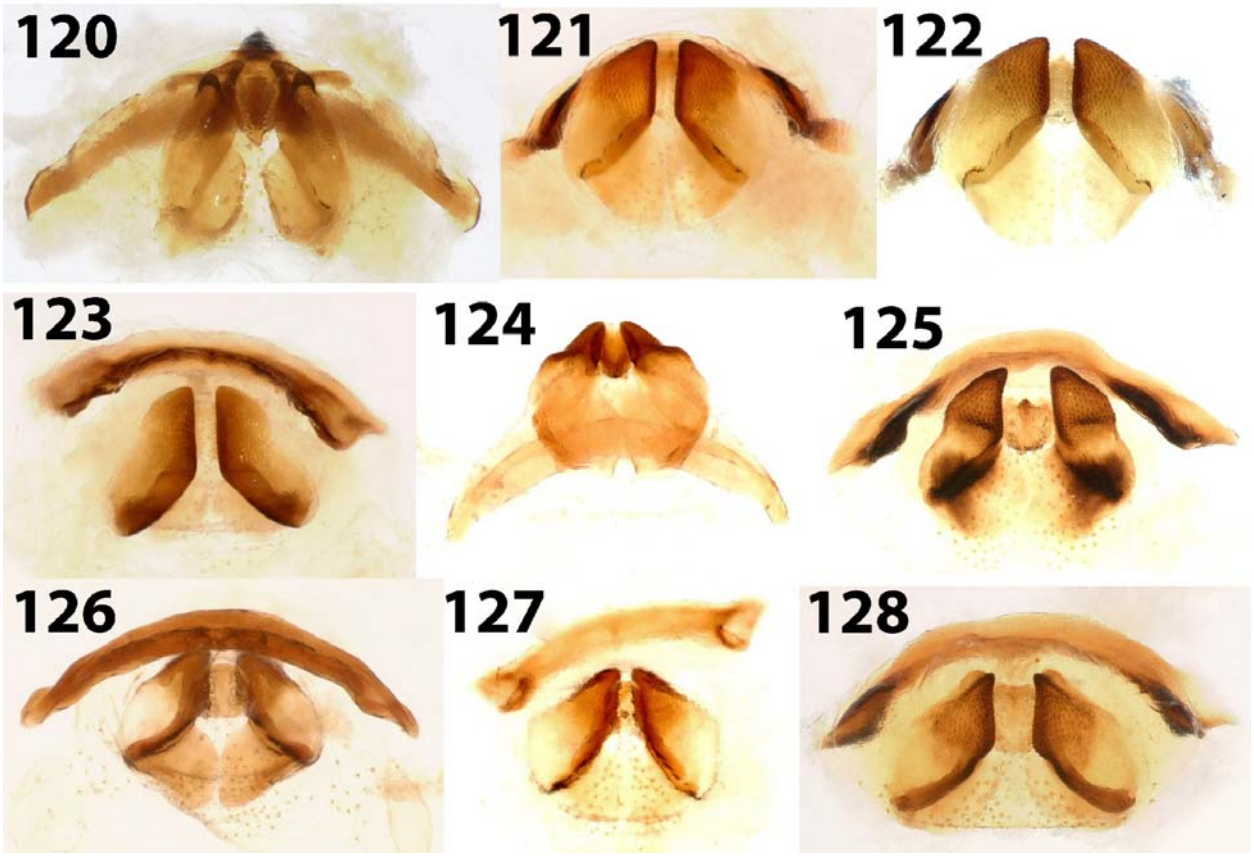


Figures 99-105 Wings. **99)** *Eremoleon femoralis* (Banks); **100)** *Eremoleon gracile* Adams; **101)** *Eremoleon jacumba* Miller and Stange; **102)** *Eremoleon tanya* Miller and Stange; **103)** *Eremoleon capitatus* (Navás); **104)** *Eremoleon inca* Miller and Stange; **105)** *Eremoleon triguttatus* (Navás).

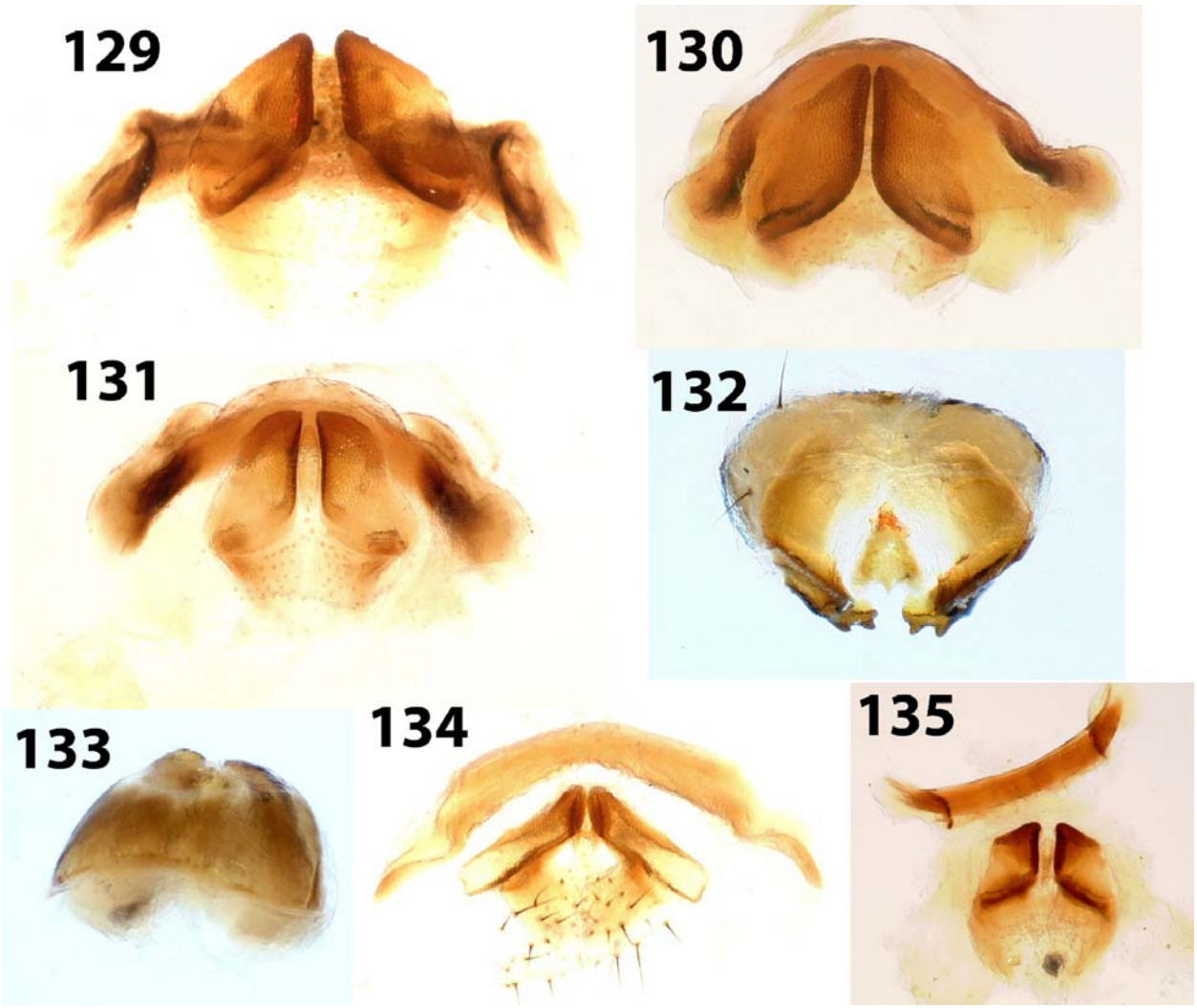


Figures 106-111. Wings. **106)** *Eremoleon adonis* Miller and Stange; **107)** *Eremoleon samne* Miller and Stange; **108)** *Eremoleon pygmaeus* Miller and Stange; **109)** *Eremoleon tepuyiensis* Miller and Stange; **110** *Eremoleon nigribasis* Banks; **111)** *Eremoleon punctipennis* (Banks).

Figures 112-119. Male genitalia. .**112)** *Eremoleon venezolanus* Miller and Stange;. **113)** *Eremoleon insipidus* Adams; **114)** *Eremoleon pallens* Banks; **115)** *Eremoleon anomalus* (Rambur); **116)** *Eremoleon attenuatus* Miller and Stange; **117)** *Eremoleon dodsoni* Miller and Stange; **118)** *Eremoleon impluviatus* (Gerstaecker); **119)** *Eremoleon monagas* Miller and Stange.

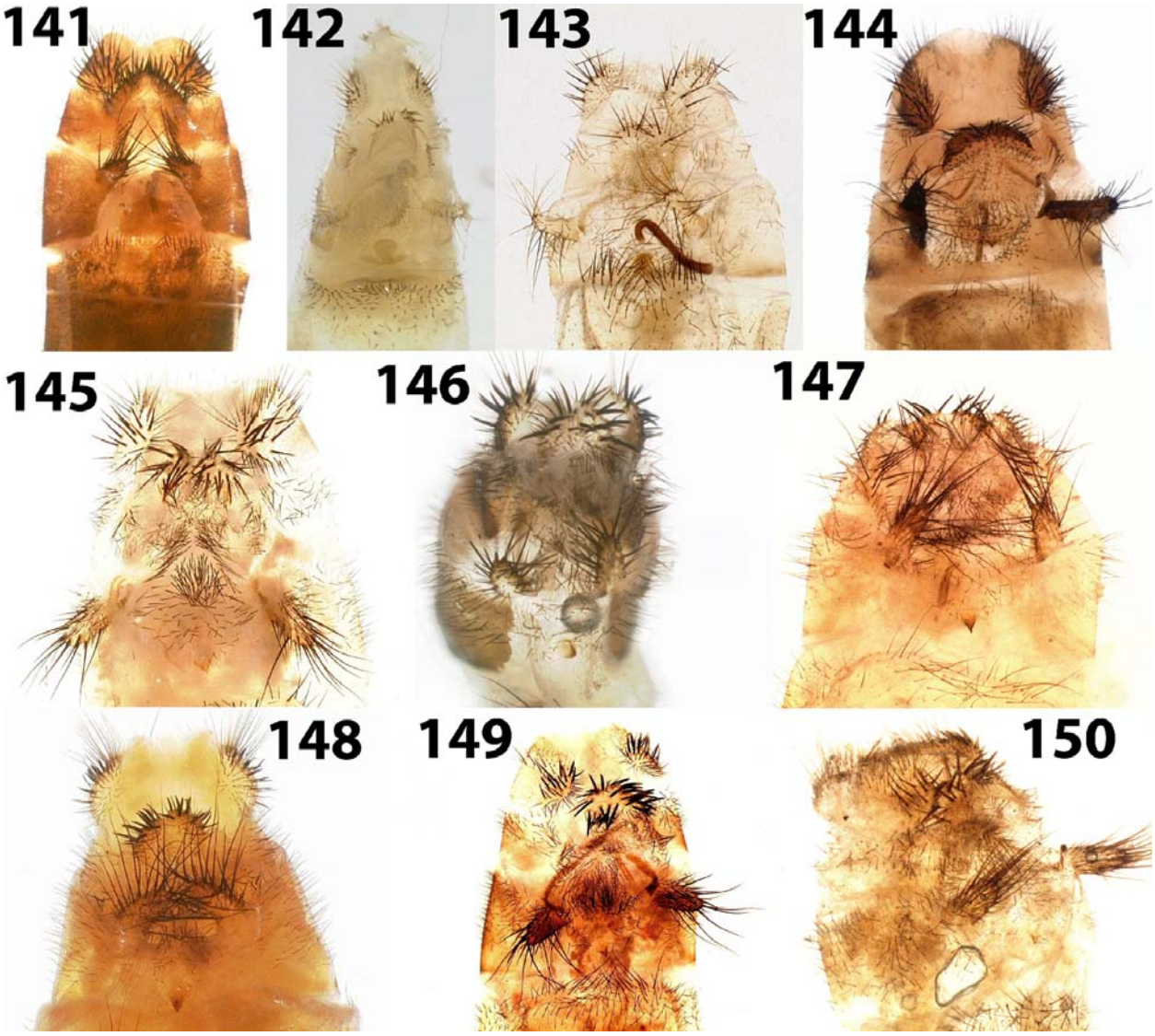


Figures 120-128. Male genitalia. **120)** *Eremoleon longior* Banks; **121)** *Eremoleon macer* (Hagen); **122)** *Eremoleon morazani* Miller and Stange; **123)** *Eremoleon vitreus* (Navás); **124)** *Eremoleon cerverai* (Navás); **125)** *Eremoleon cerverinus* (Navás); **126** *Eremoleon jamaica* Miller and Stange; **127)** *Eremoleon petrophila* Miller and Stange; **128)** *Eremoleon phasma* Miller and Stange.

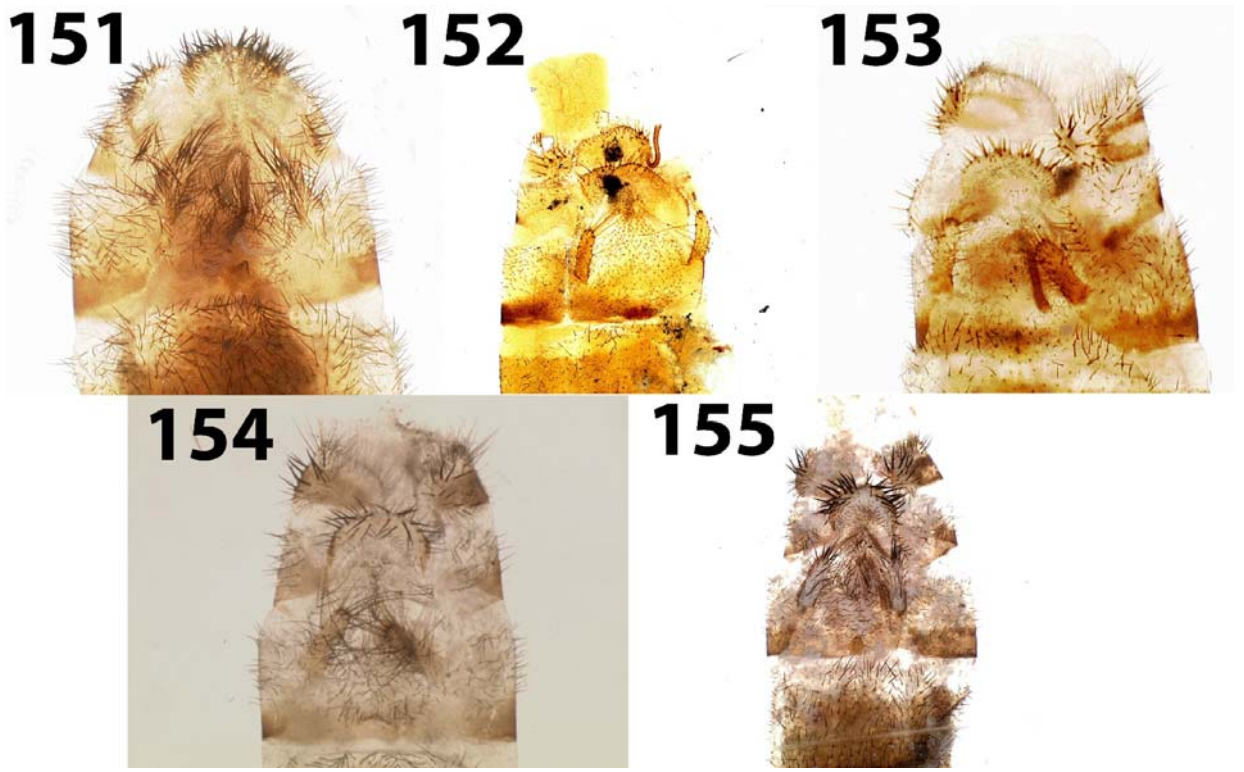


Figures 129-135. Male genitalia. **129)** *Eremoleon femoralis* (Banks); **130)** *Eremoleon gracile* Adams; **131)** *Eremoleon jacumba* Miller and Stange; **132-133)** *Eremoleon capitatus* (Navás); **134)** *Eremoleon inca* Miller and Stange; **135)** *Eremoleon triguttatus* (Navás).

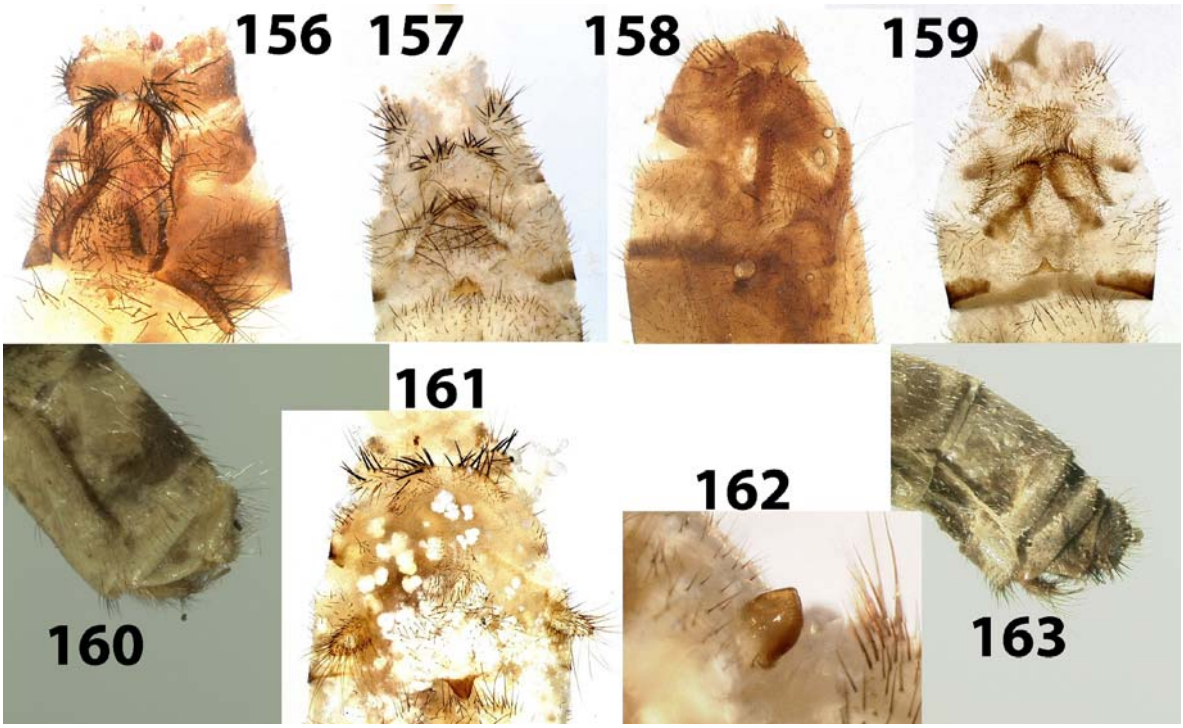
Figures 136-140. Male genitalia. **136)** *Eremoleon samne* Miller and Stange; **137)** *Eremoleon pygmaeus* Miller and Stange; **138)** *Eremoleon tepuyiensis* Miller and Stange; **139** *Eremoleon nigribasis* Banks; **140)** *Eremoleon punctipennis* (Banks).



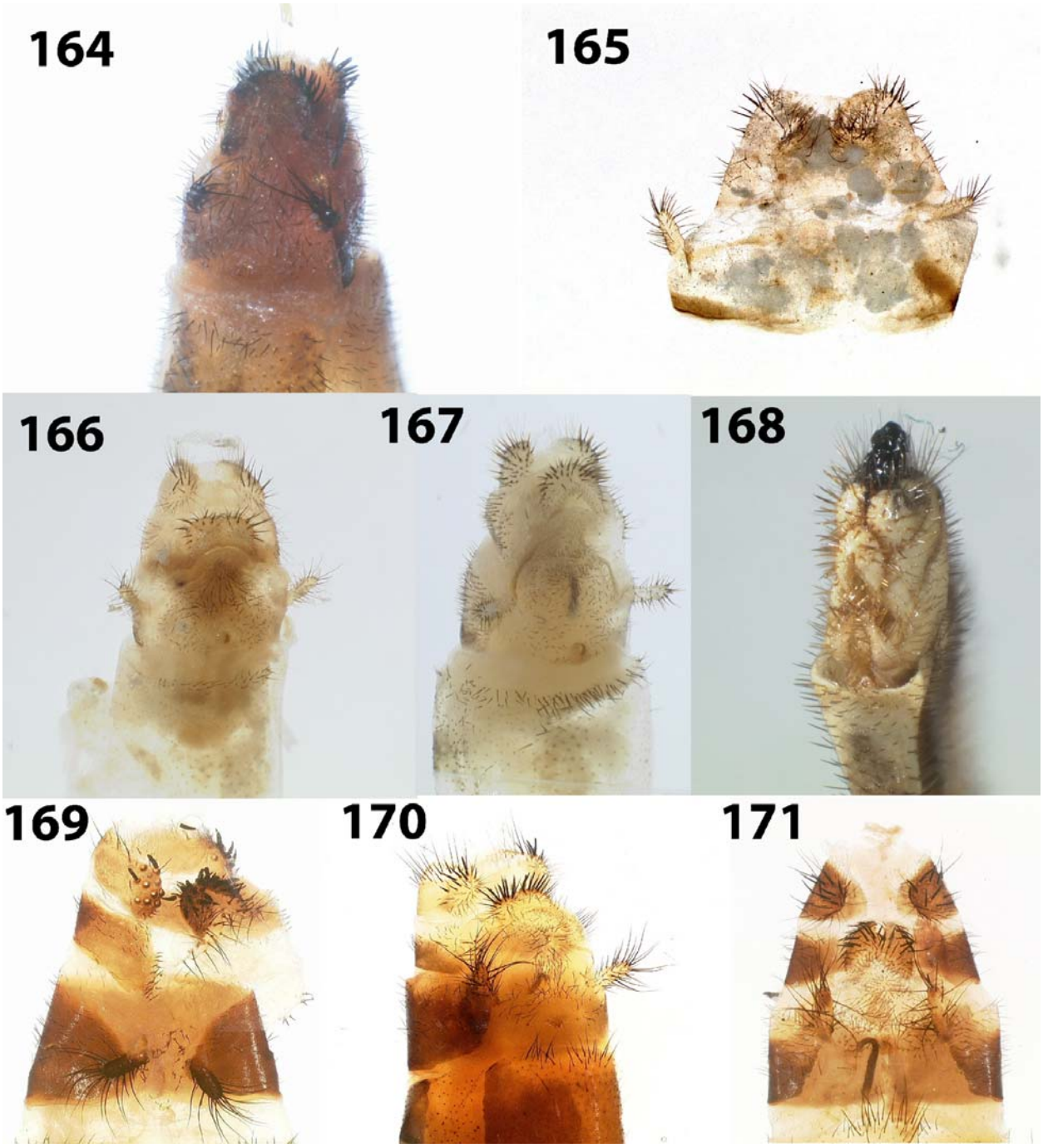
Figures 141-150. Female terminalia, ventral view. **141)** *Eremoleon venezolanus* Miller and Stange;. **142)** *Eremoleon insipidus* Adams; **143)** *Eremoleon pallens* Banks; **144)** *Eremoleon genini* (Navás)**; 145)** *Eremoleon anomalus* (Rambur); **146)** *Eremoleon attenuatus* Miller and Stange; **147)** *Eremoleon dodsoni* Miller and Stange; **148)** *Eremoleon impluviatus* (Gerstaecker); **149)** *Eremoleon monagas* Miller and Stange; **150)** *Eremoleon peterseni* (Banks).



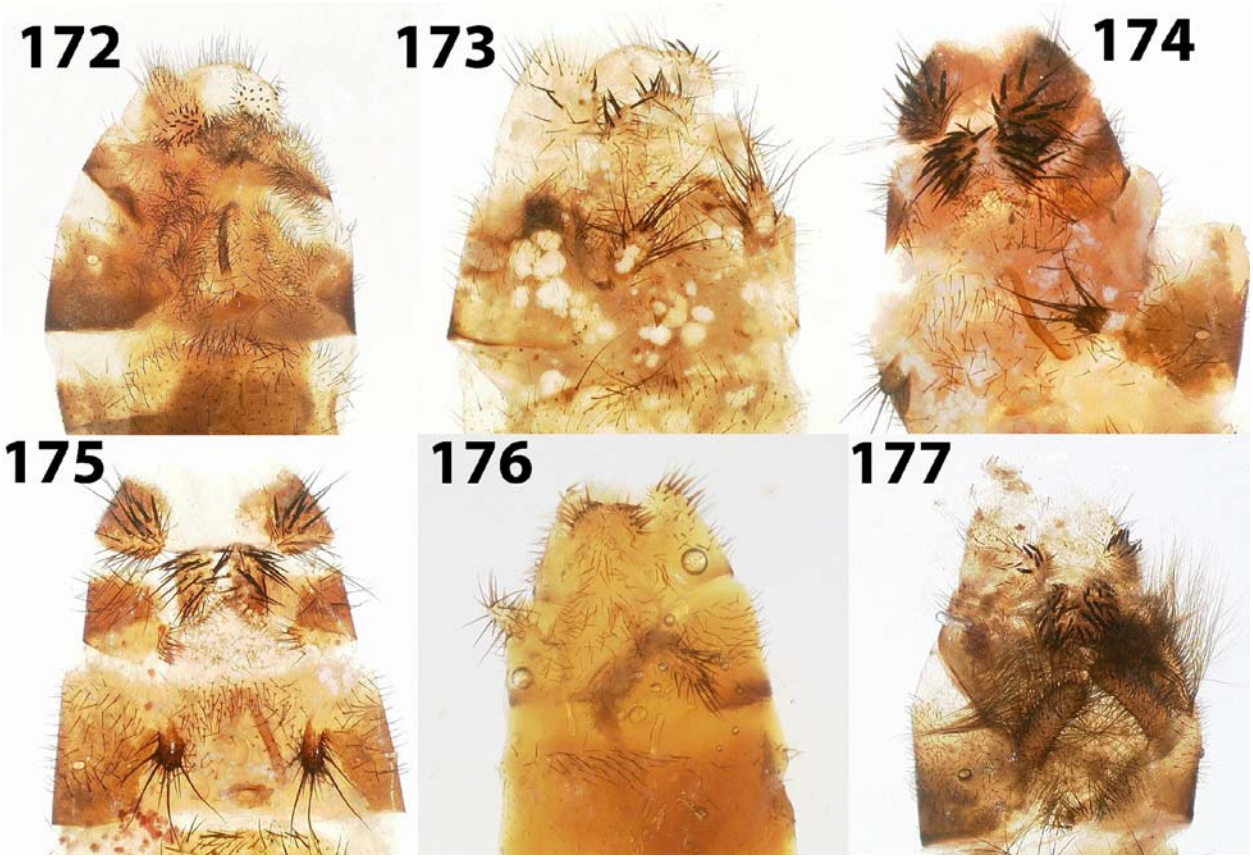
Figures 151-155. Female terminalia, ventral view. **151)** *Eremoleon durangoensis* Miller and Stange; **152)** *Eremoleon longior* Banks; **153)** *Eremoleon macer* (Hagen); **154)** *Eremoleon morazani* Miller and Stange; **155)** *Eremoleon vitreus* (Navás).



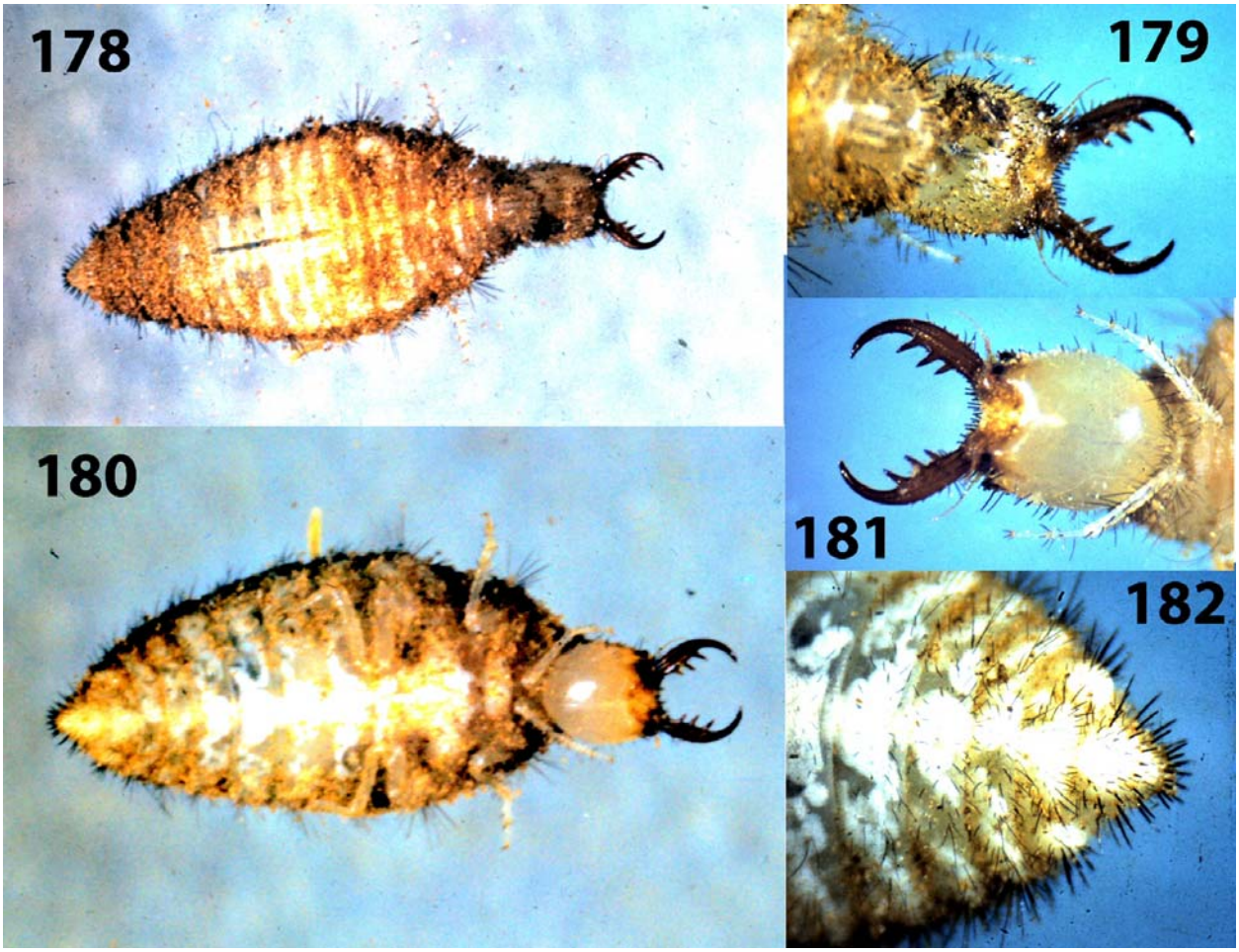
Figures 156- 163. Female terminalia, ventral view. **156)** *Eremoleon cerverai* (Navás); **157)** *Eremoleon cerverinus* (Navás); **158)** *Eremoleon jamaica* Miller and Stange; **159)** *Eremoleon petrophila* Miller and Stange; **160** *Eremoleon petrophila* Miller and Stange, lateral view; **161)** *Eremoleon phasma* Miller and Stange; **162)** *Eremoleon phasma* Miller and Stange, close-up of pregenitale; **163)** *Eremoleon phasma* Miller and Stange, lateral view.



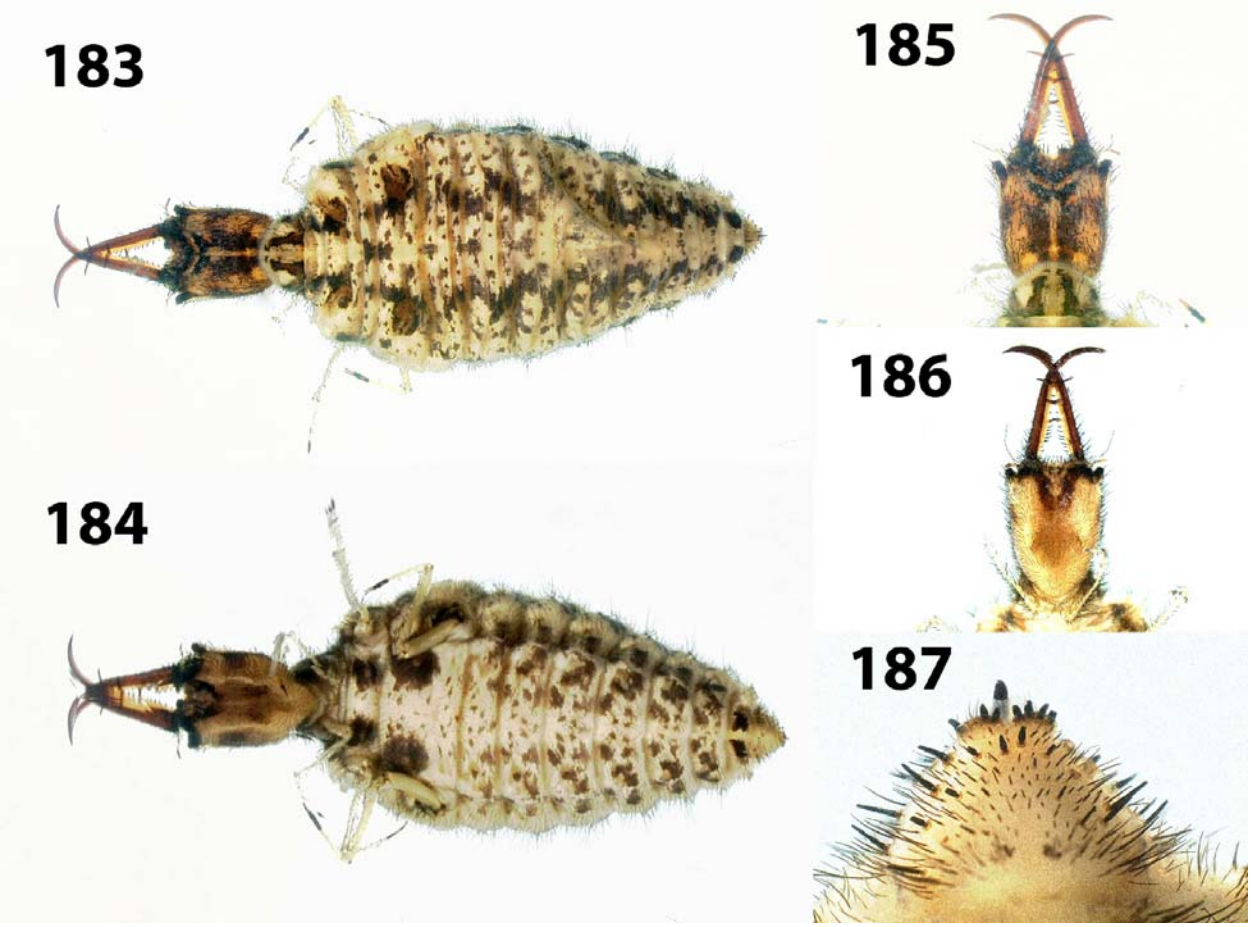
Figures 164-171. Female terminalia, ventral view **164)** *Eremoleon femoralis* (Banks); **165)** *Eremoleon gracile* Adams; **166)** *Eremoleon jacumba* Miller and Stange; **167-168)** *Eremoleon tanya* Miller and Stange; **169**) *Eremoleon capitatus* (Navás); **170)** *Eremoleon inca* Miller and Stange; **171)** *Eremoleon triguttatus* (Navás).



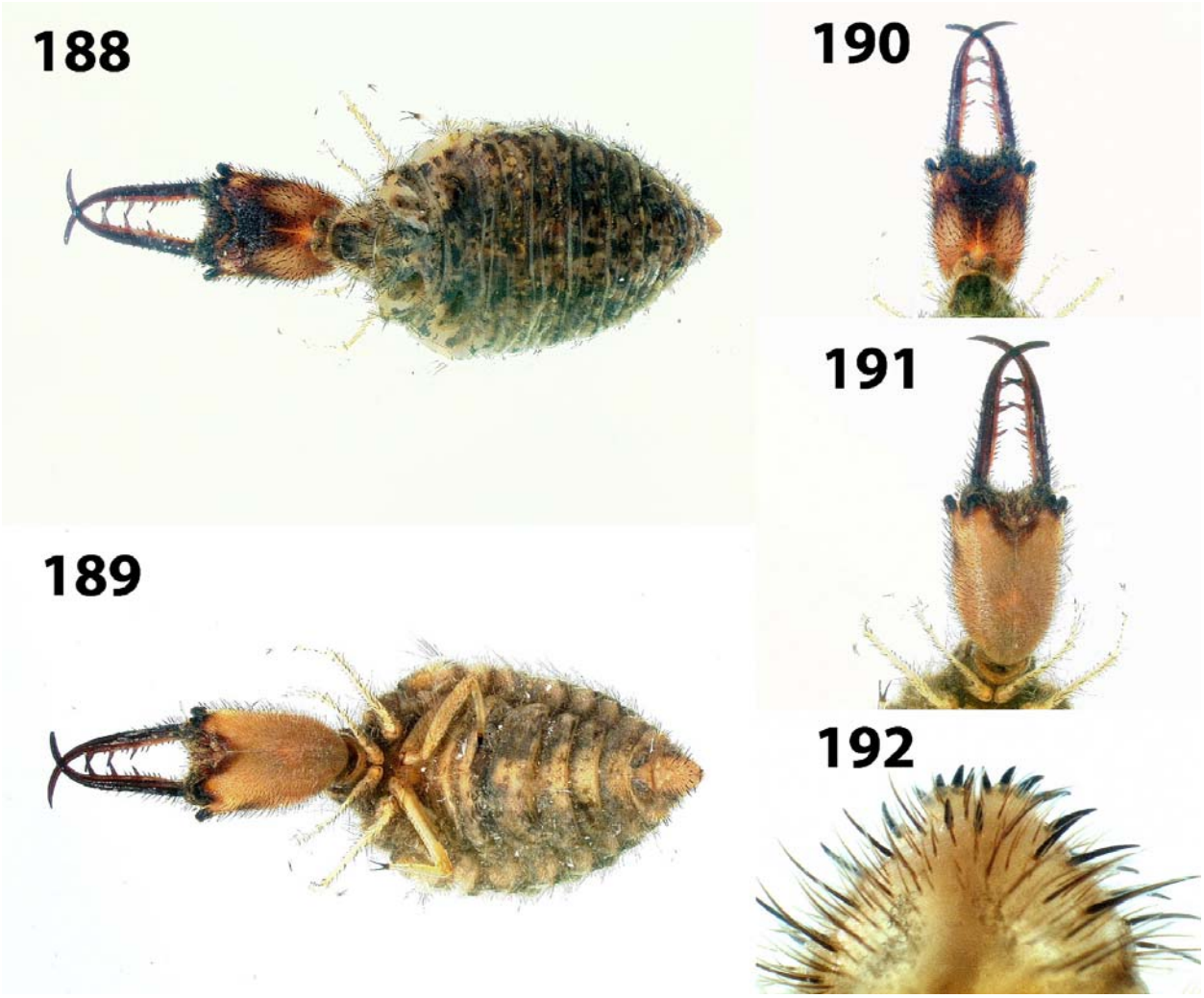
Figures 172-177 Female terminalia, ventral view. **172)** *Eremoleon adonis* Miller and Stange; **173)** *Eremoleon samne* Miller and Stange; **174)** *Eremoleon pygmaeus* Miller and Stange; **175)** *Eremoleon tepuyiensis* Miller and Stange; **176)** *Eremoleon nigribasis* Banks; **177)** *Eremoleon punctipennis* (Banks).



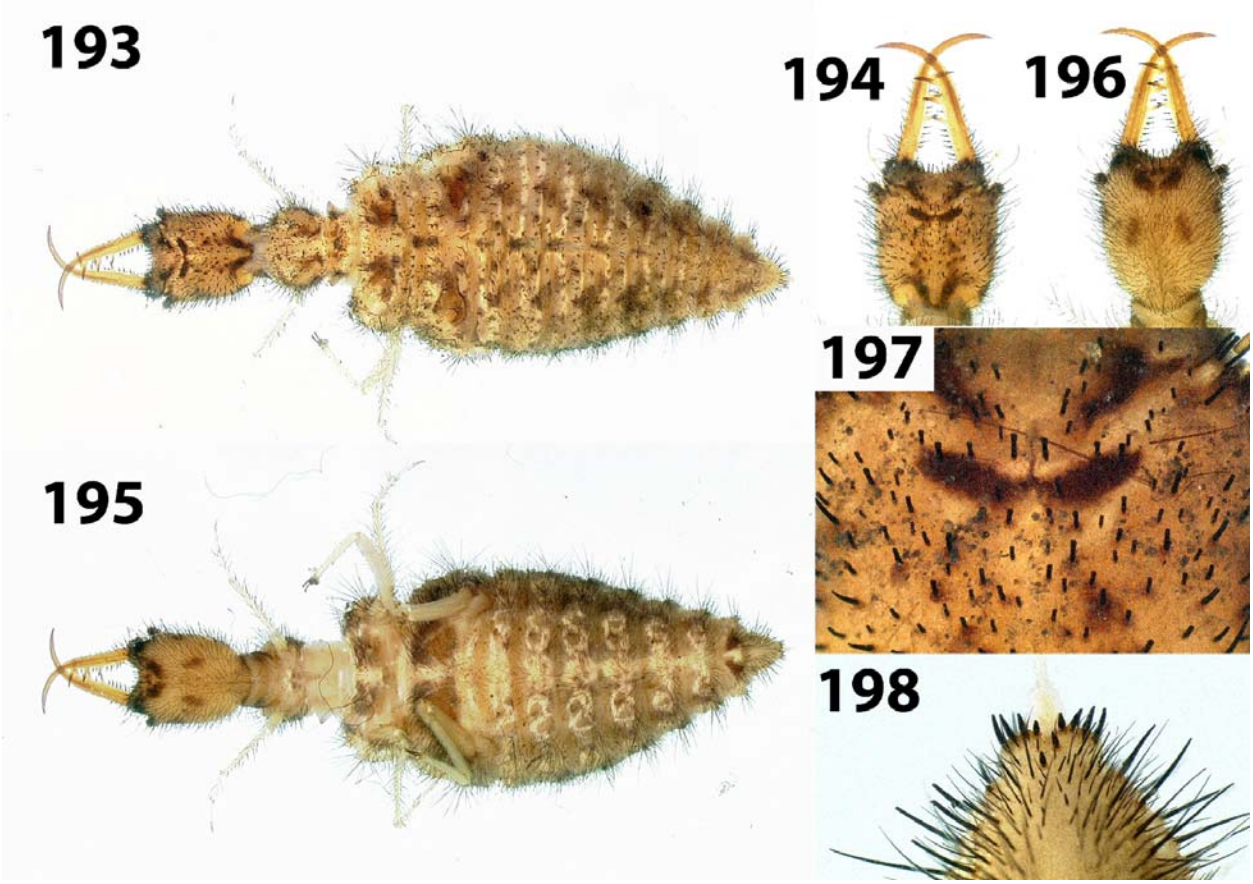
Figures 178-182. *Eremoleon pallens* Banks, larva. **178)** dorsal view; **179)** dorsal view of larval head capsule; **180)** ventral view of larva; **181)** ventral view of larval head capsule; **182)** posterior digging setae of larva.



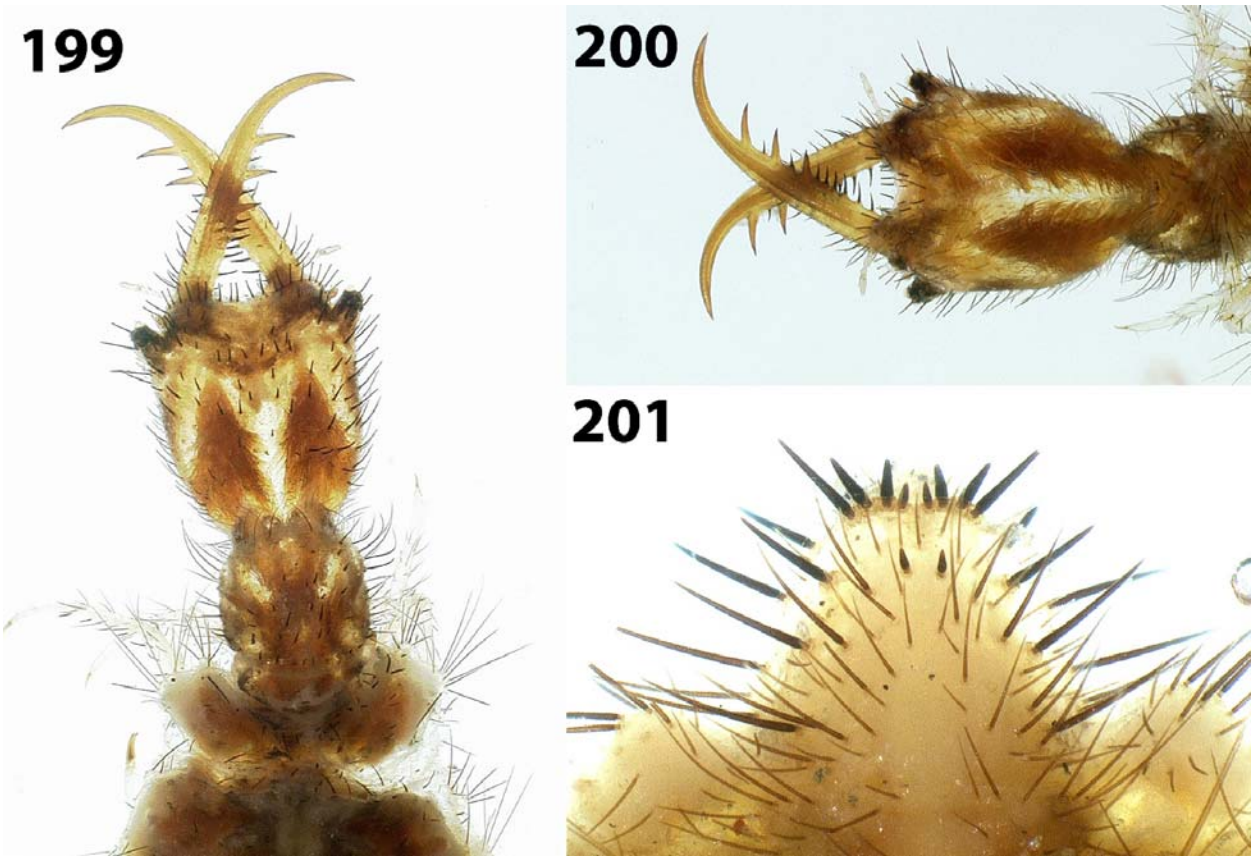
Figures 183-187. *Eremoleon anomalus* (Rambur), larva. **183)** dorsal view; **184)** ventral view; **185)** dorsal view of head capsule; **186)** ventral view of head capsule; **187)** Ventral view of digging setae.



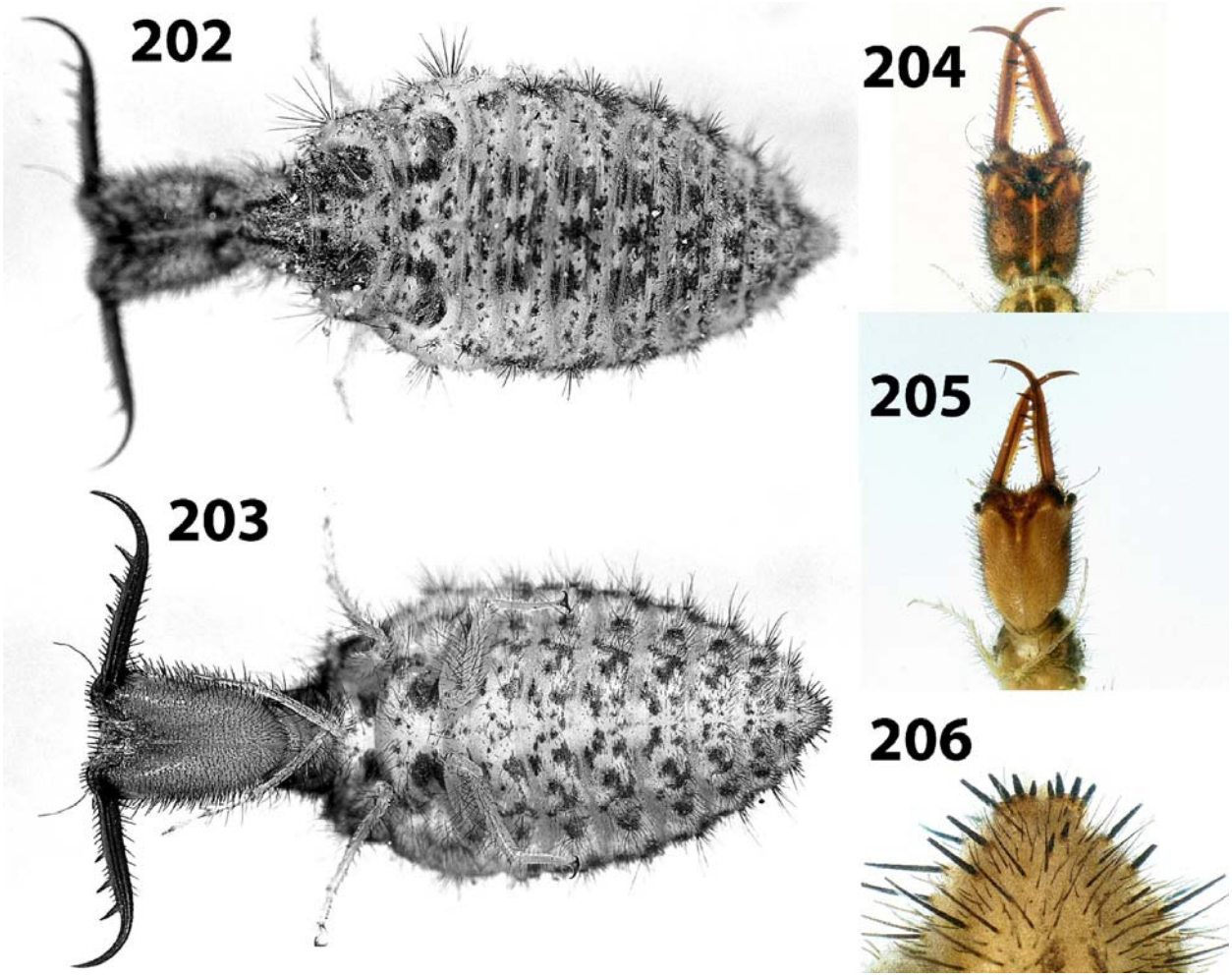
Figures 188-192. *Eremoleon attenuatus* Miller and Stange, larva. **188)** dorsal view; **189)** ventral view; **190)** dorsal view of head capsule; **191)** ventral view; **192)** Ventral view of digging setae.



Figures 193-198. *Eremoleon dodsoni* Miller and Stange, larva. **193)** dorsal view; **194)** dorsal view of head capsule; **195)** ventral view; **196)** ventral view of head capsule; **197)** close-up of dorsal view of head capsule; **198)** Ventral view of digging setae.

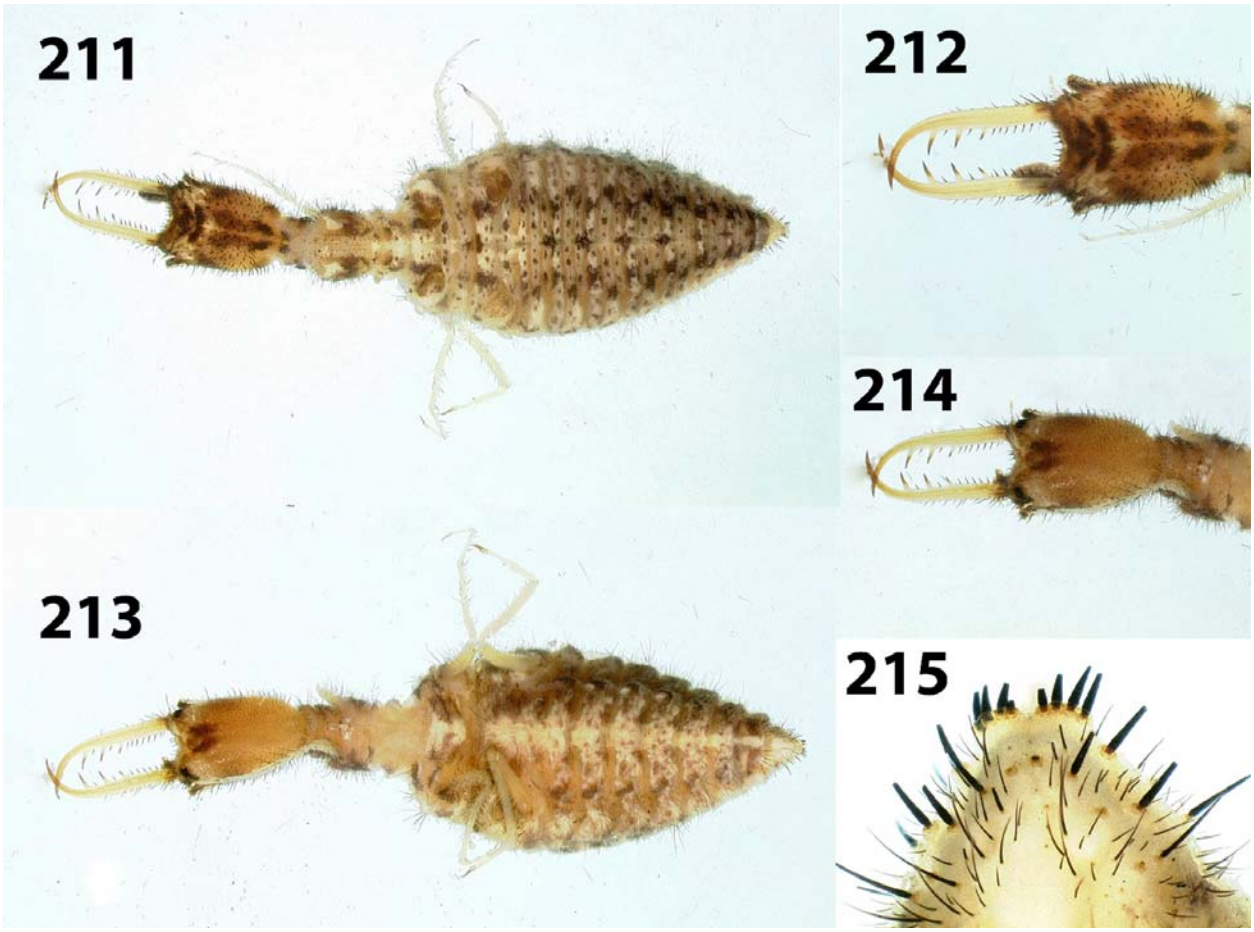


Figures 199-201. *Eremoleon impluviatus* (Gerstaecker), larva. **199)** dorsal view; **200)** ventral view; **201)** posterior digging setae.

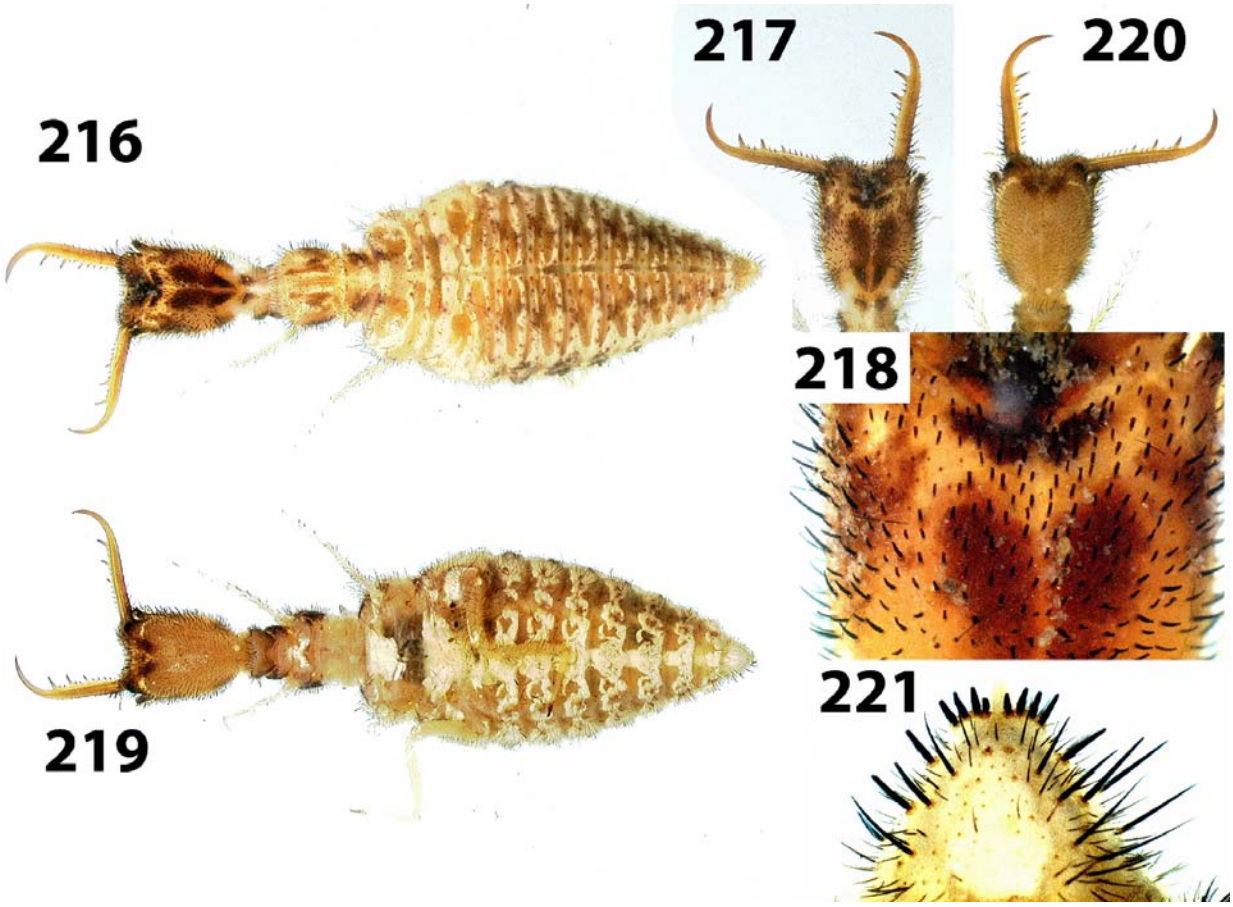


Figures 202-206. *Eremoleon monagas* Miller and Stange, larva. **202)** dorsal view; **203)** ventral view; **204)** close-up of dorsal view of head capsule; **205)** ventral view of head capsule; **206)** Ventral view of digging setae.

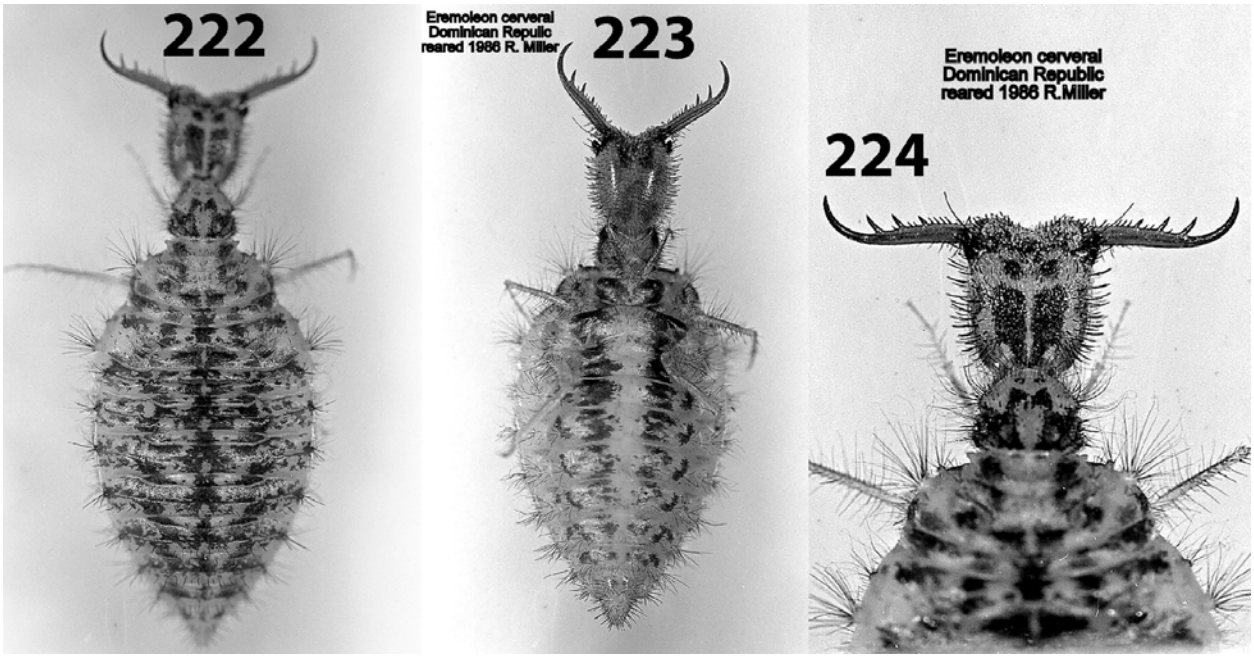
Figures 207-210. *Eremoleon longior* Banks, larva. **207)** dorsal view; **208)** ventral view; **209)** dorsal view of head capsule; **210)** ventral view of larval head capsule.



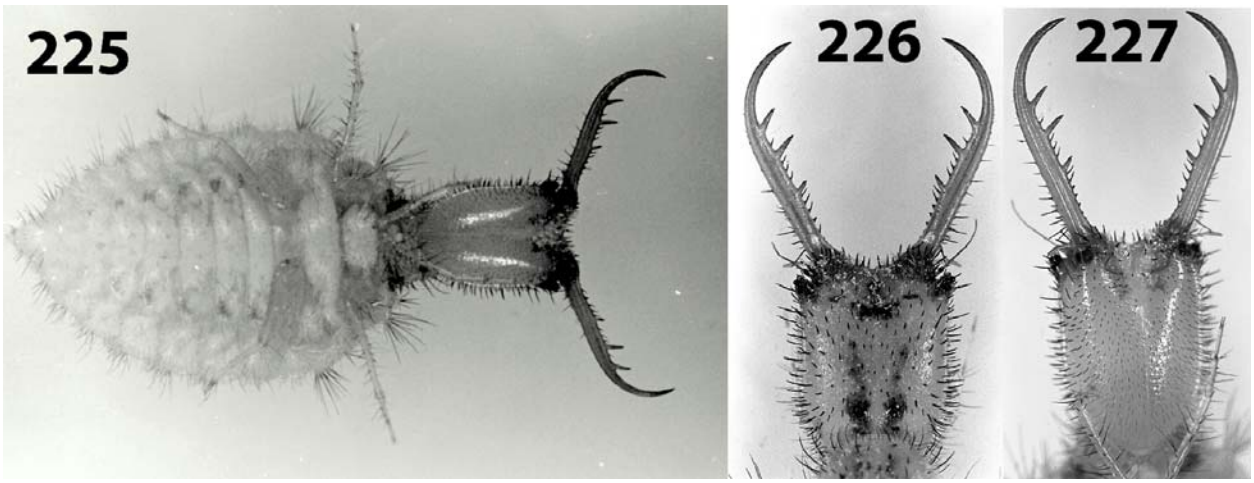
Figures 211-215. *Eremoleon macer* (Hagen), larva. **211)** dorsal view; **212)** dorsal view of head capsule; **213)** ventral view; **214)** ventral view of head capsule; **215)** Ventral view of digging setae.



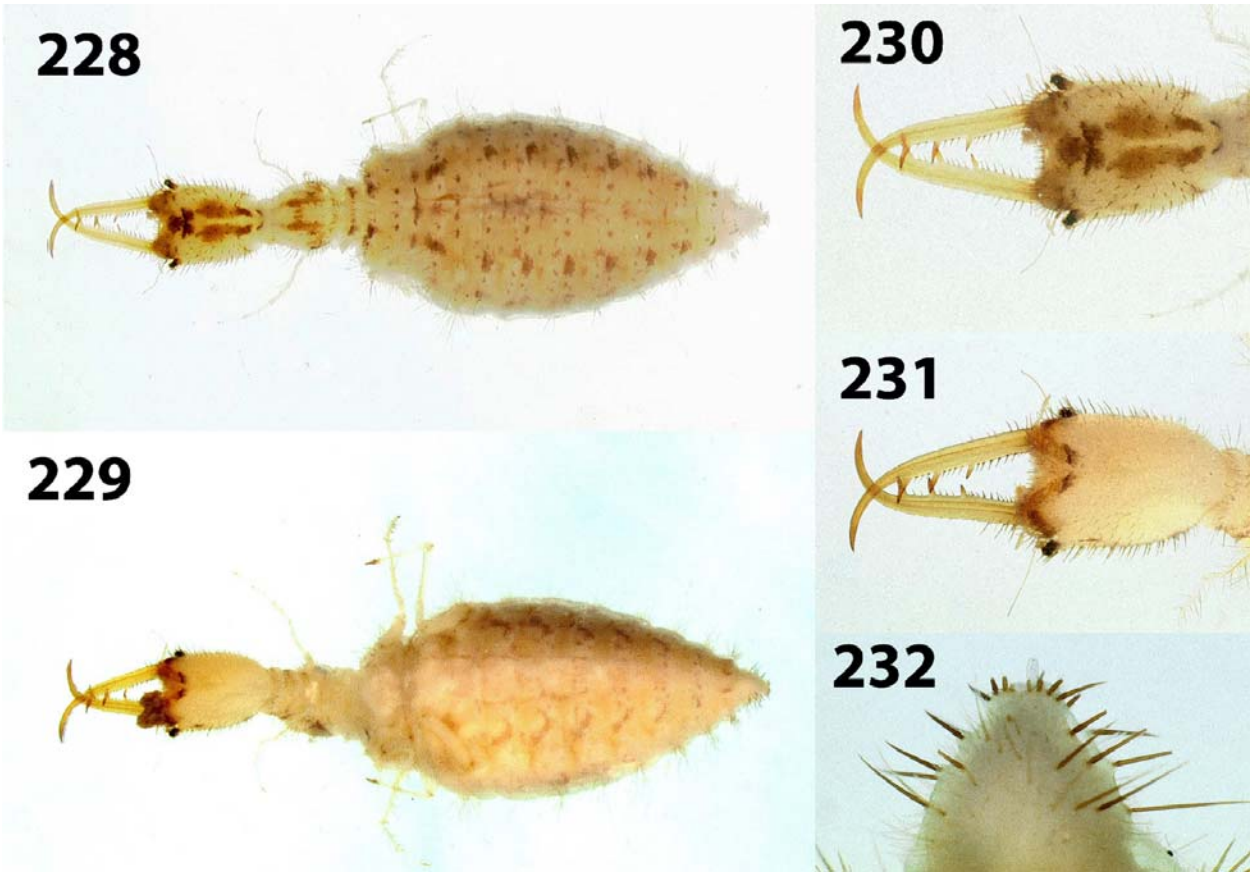
Figures 216-221. *Eremoleon vitreus* (Navás), larva. **216)** dorsal view; **217)** dorsal view of head capsule; **218)** close-up of dorsal view of head capsule; **219)** ventral view; **220)** ventral view of head capsule; **221)** Ventral view of digging setae.



Figures 222-224. *Eremoleon cerverai* (Navás), larva. **222)** dorsal view; **223)** ventral view; **224)** dorsal view head capsule.

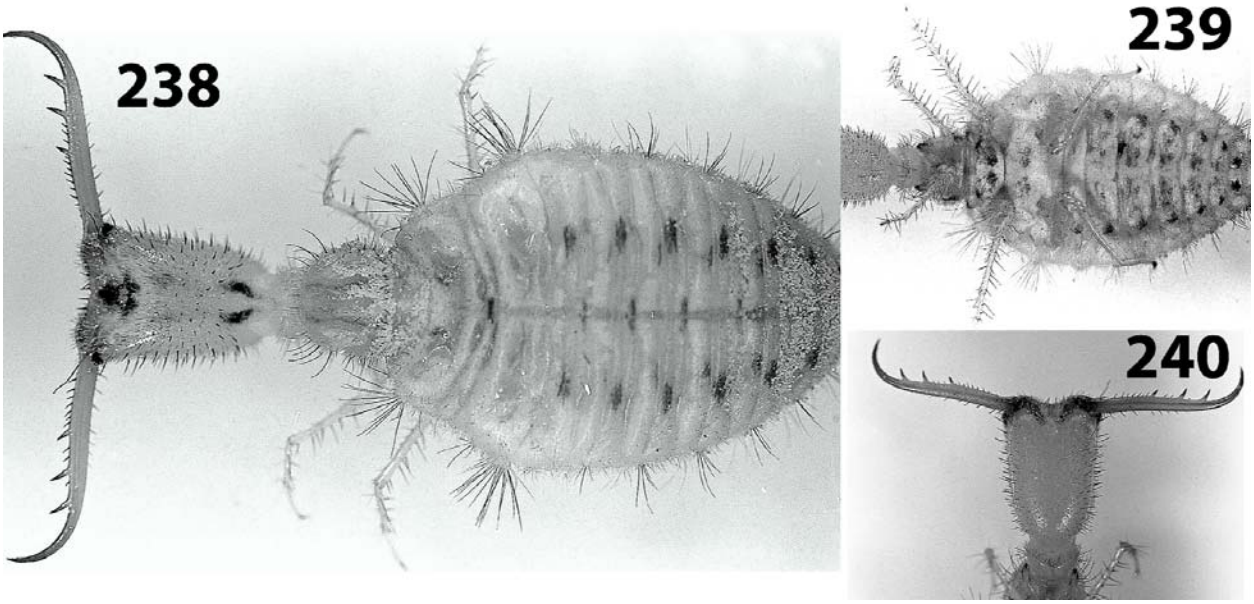


Figures 225-227. *Eremoleon cerverinus* (Navás), larva. **225)** ventral view; **226)** dorsal view; **227)** ventral view of larva.

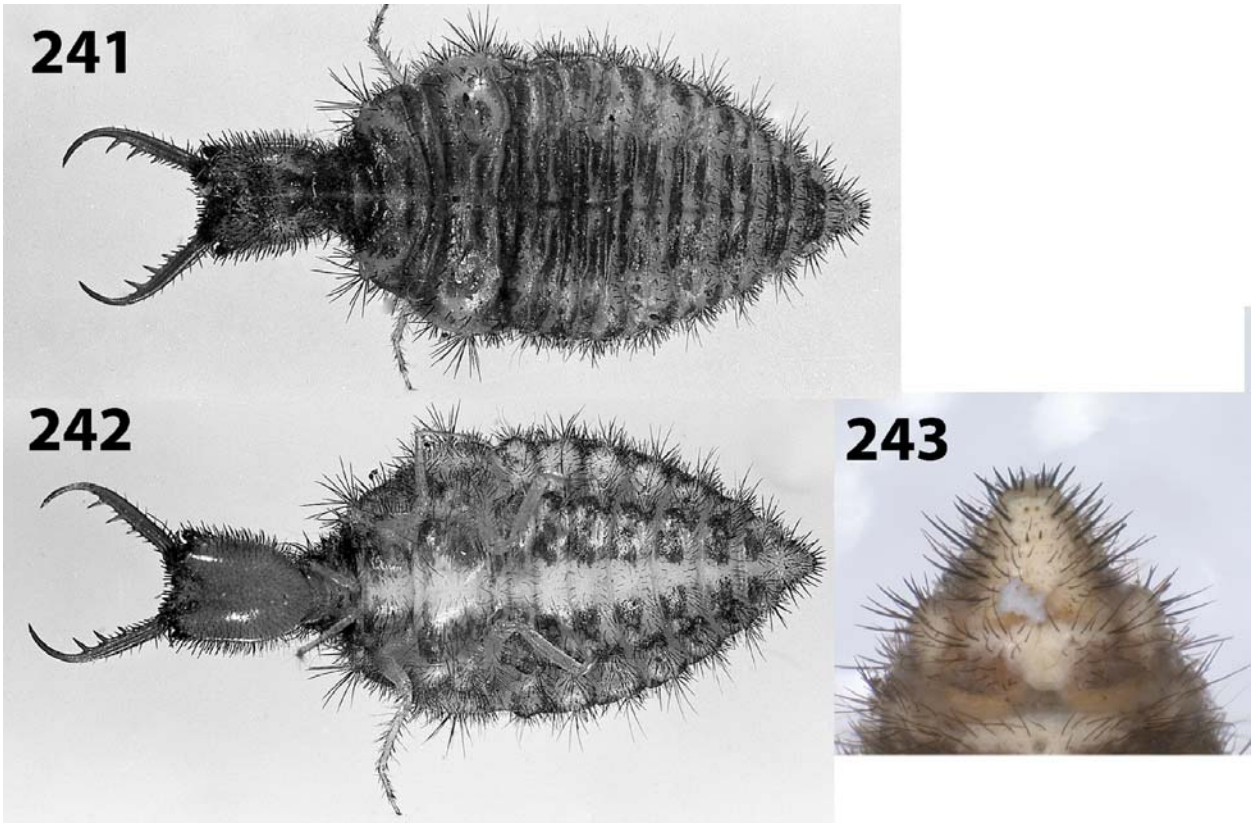


Figures 228-232. *Eremoleon jamaica* Miller and Stange, larva. **228)** dorsal view; **229)** ventral view; **230)** dorsal view of head capsule; **231)** ventral view of head capsule; **232)** Ventral view of digging setae.

Figures 233-237. *Eremoleon petrophila* Miller and Stange, larva**. 233)** dorsal view; **234)** ventral view; **235)** dorsal view of head capsule; **236)** ventral view of head capsule; **237)** Ventral view of digging setae.



Figures 238-240. *Eremoleon phasma* Miller and Stange, larva. **238)** dorsal view; **239)** ventral view; **240)** ventral head



Figures 241-243. *Eremoleon femoralis* (Banks), larva. **241)** dorsal view; **242)** ventral view; **243)** Ventral view of digging setae.

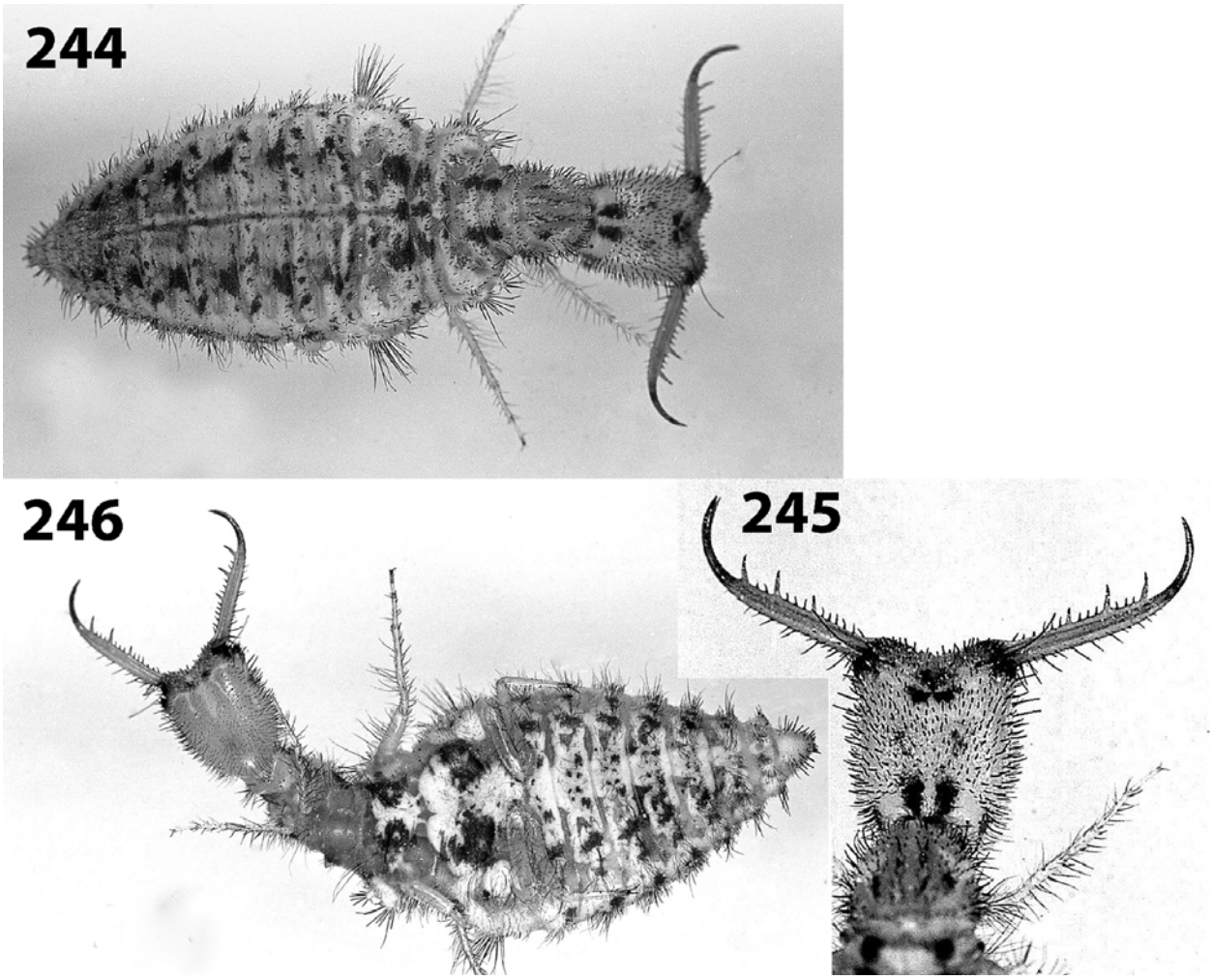
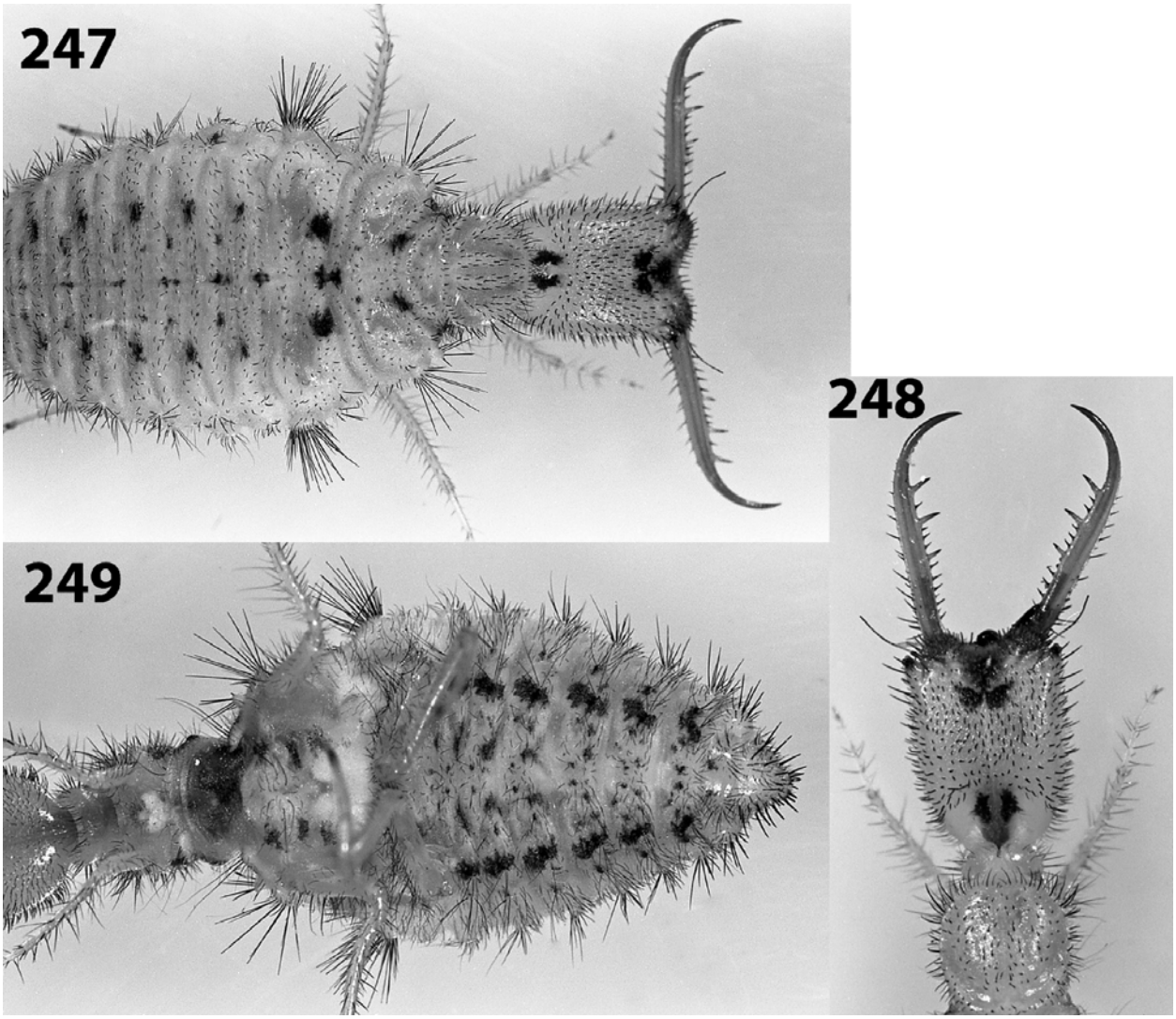
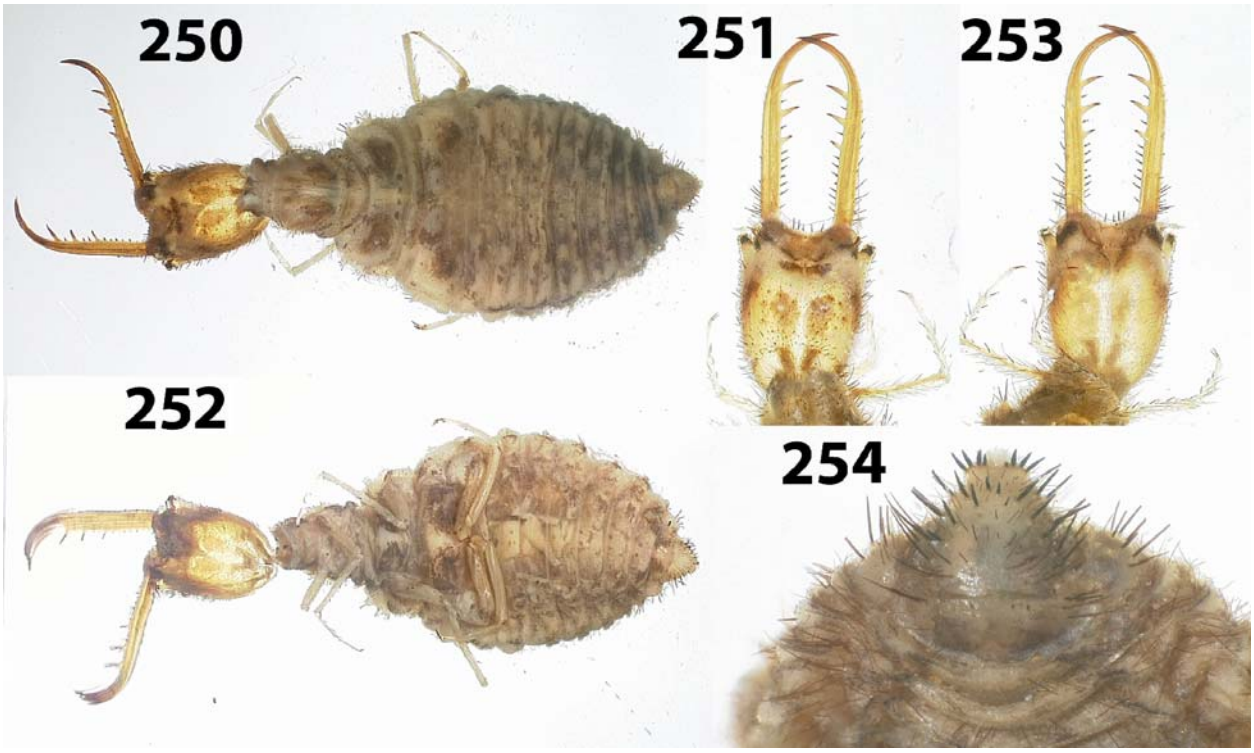


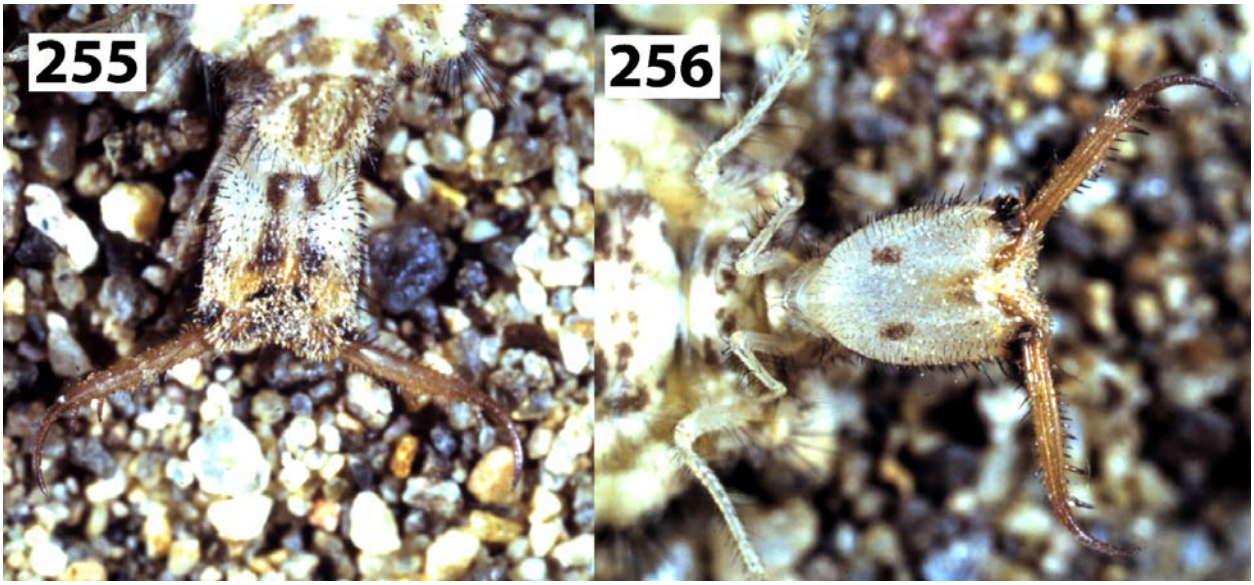
Figure 244-246. *Eremoleon gracile* Adams, larva. **244)** dorsal view; **245)** dorsal view of head; **246)** ventral view of head.



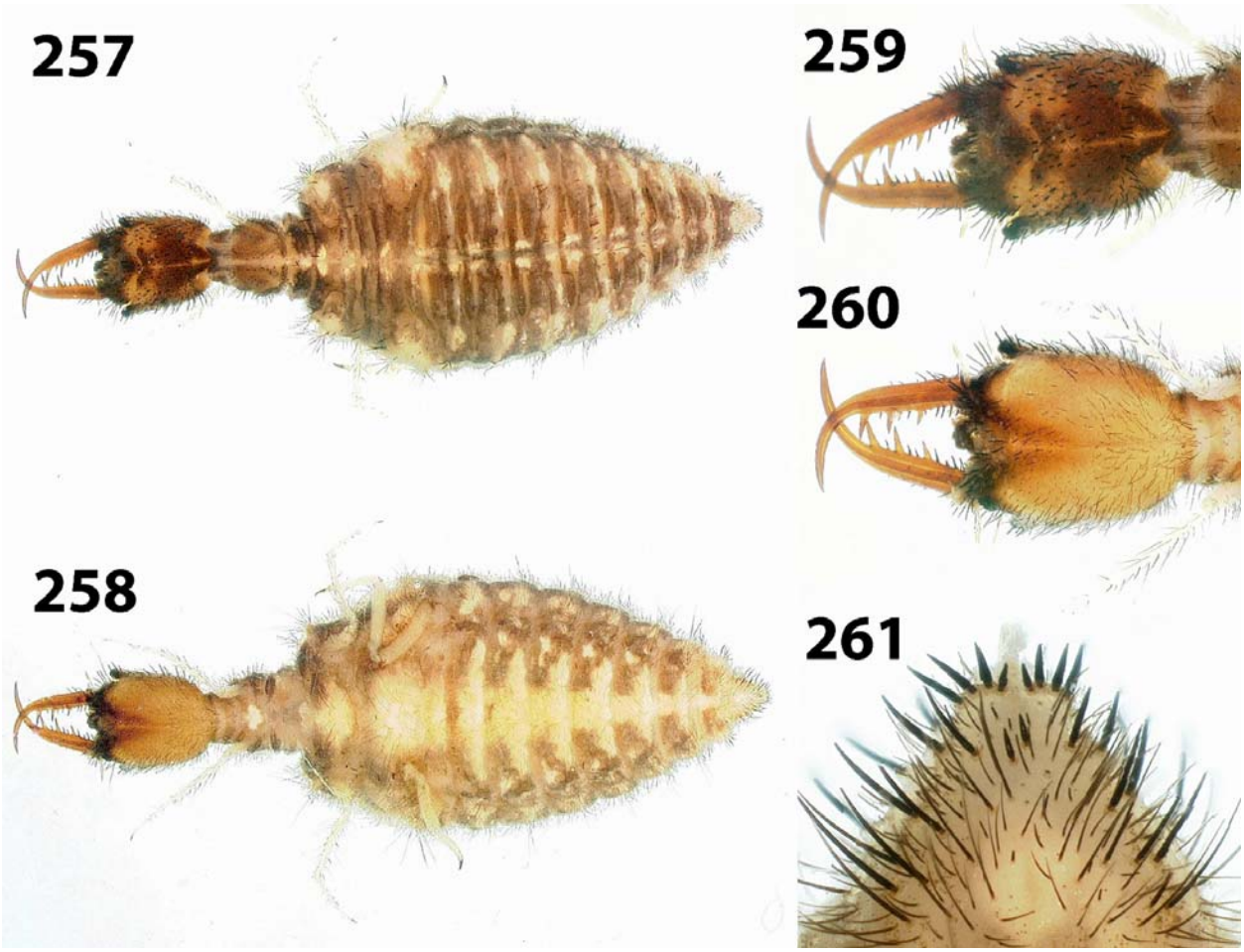
Figures 247-249 *Eremoleon jacumba* Miller and Stange, larva. **247)** dorsal view; **248)** dorsal view of head; **249)** ventral view of head.



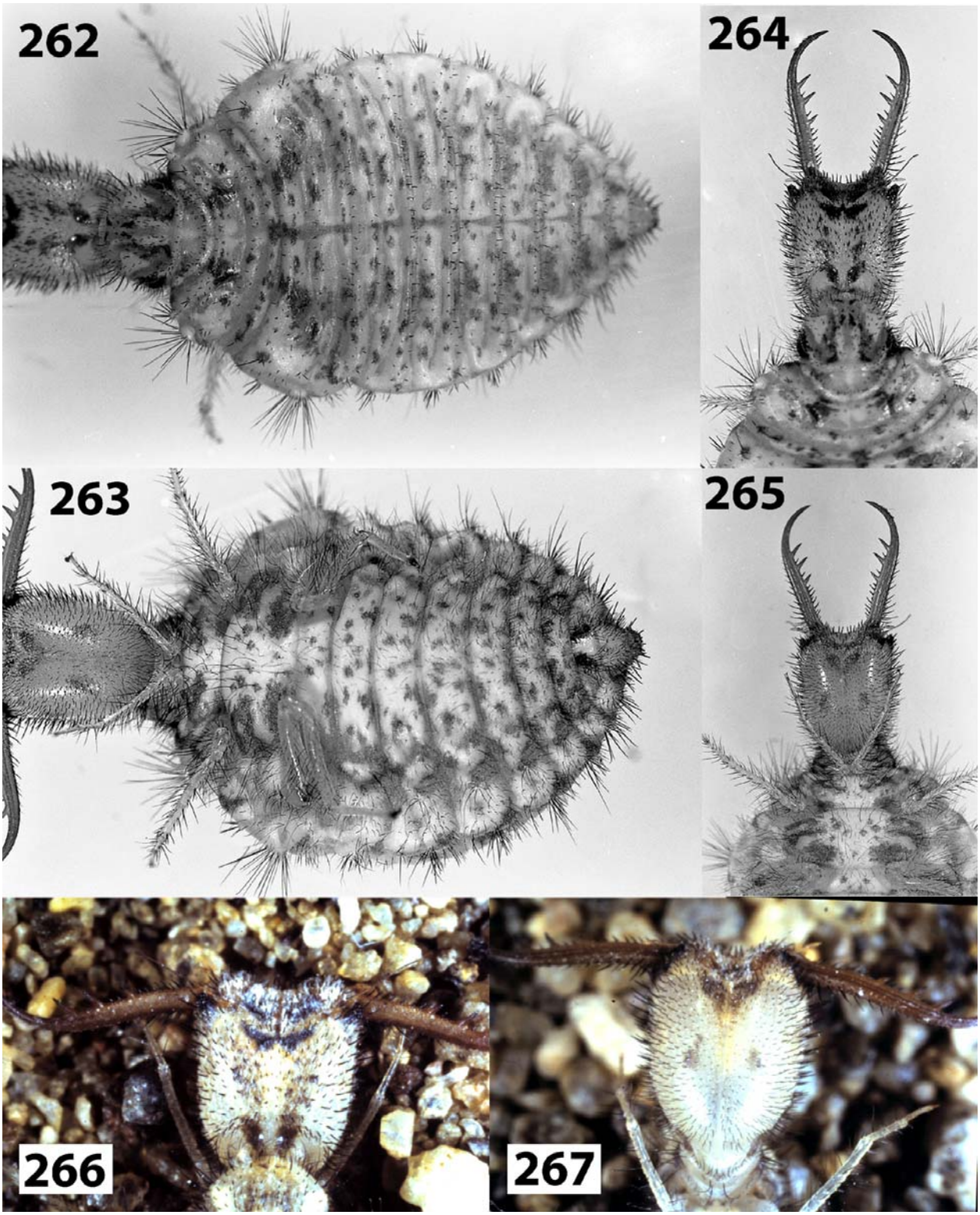
Figures 250-254. *Eremoleon tanya* Miller and Stange, larva. **250)** dorsal view; **251)** head; **252**) ventral view; **253)** head, ventral view; **254)** Ventral view of digging setae.



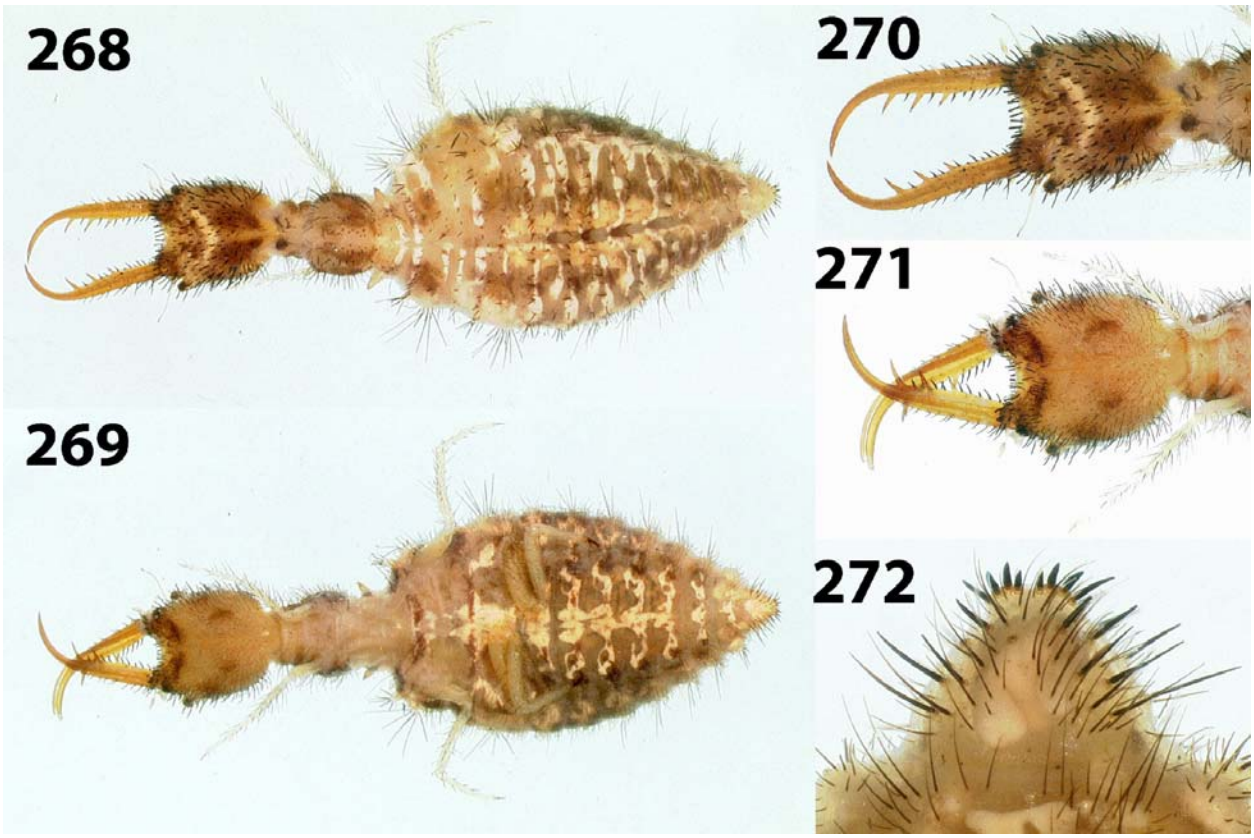
Figures 255-256. *Eremoleon inca* Miller and Stange, larva. **255)** dorsal view; **256)** ventral view.



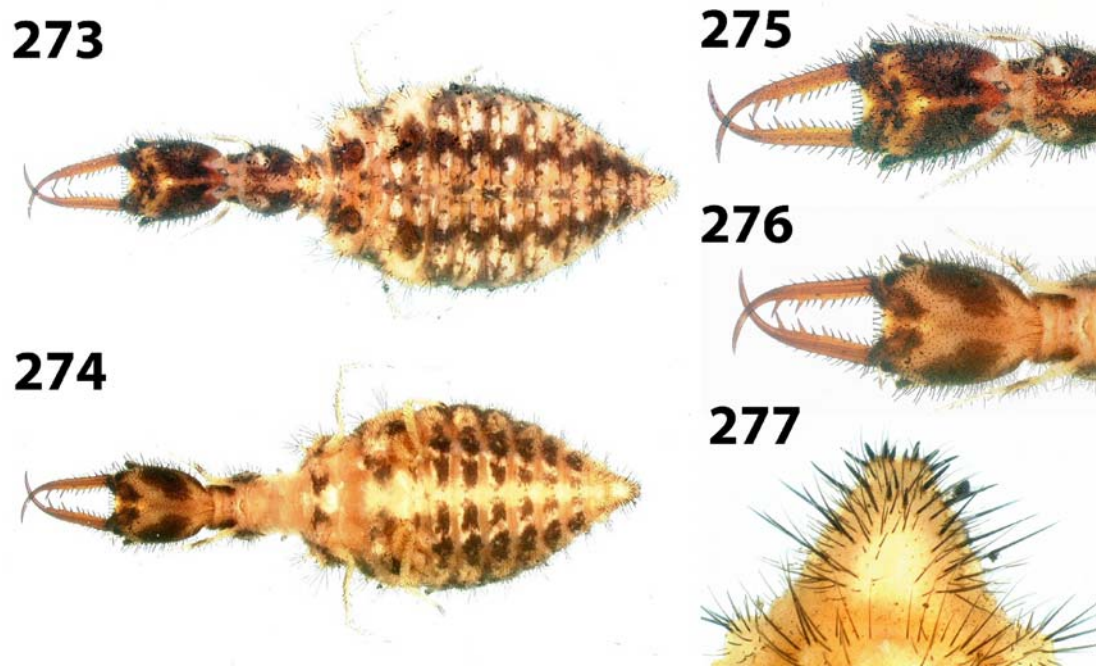
Figures 257-261. *Eremoleon triguttatus* (Navás), larva. **257)** dorsal view; **258)** ventral view; **259)** dorsal view of head; **260)** ventral view of head; **261)** Ventral view of digging setae.



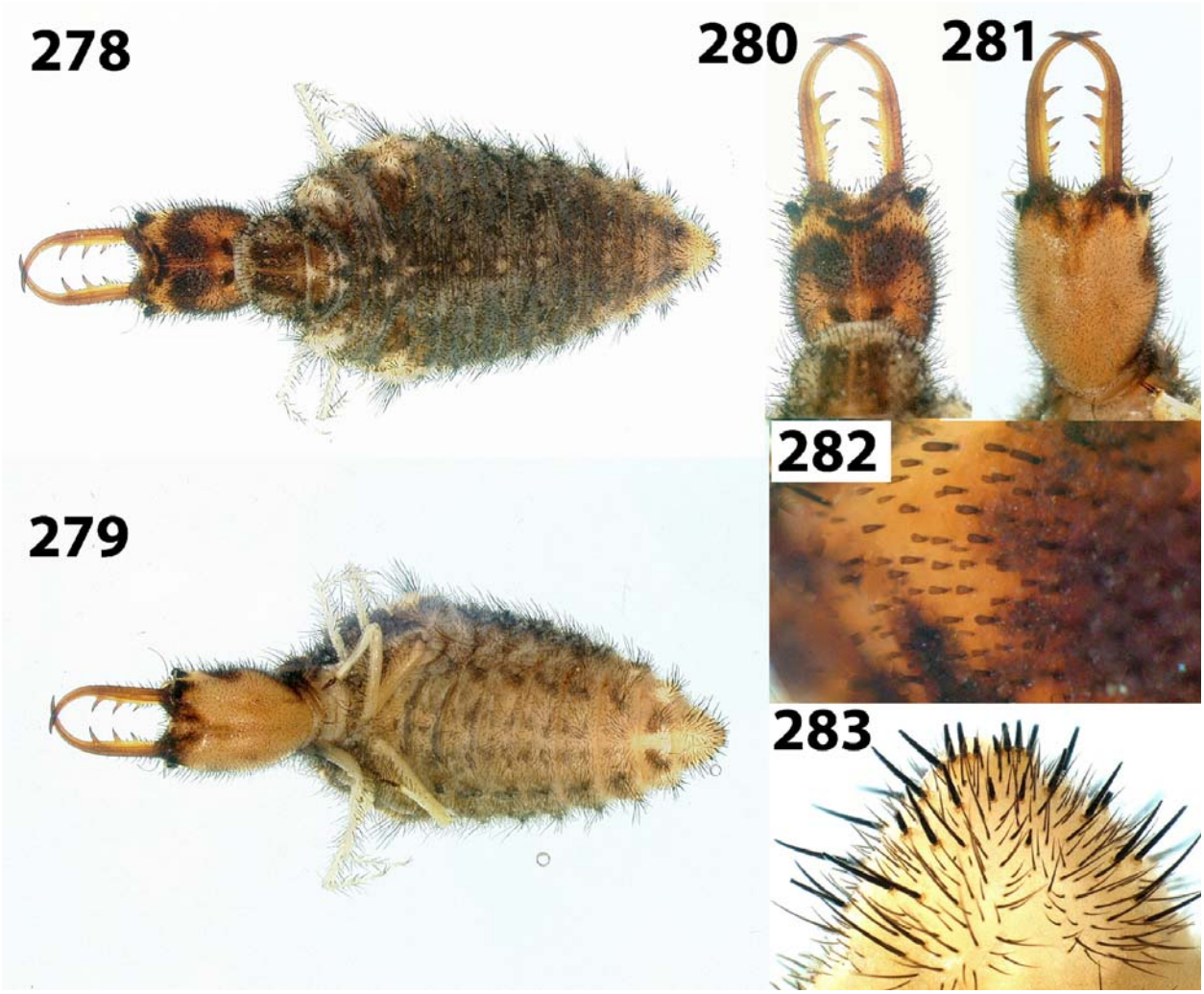
Figures 262-267. *Eremoleon samne* Miller and Stange, larva. **262)** dorsal view; **263)** ventral view; **264)** dorsal view of head; **265)** ventral view of head; **266)** dorsal view of live larva; **267)** ventral view of live larva.



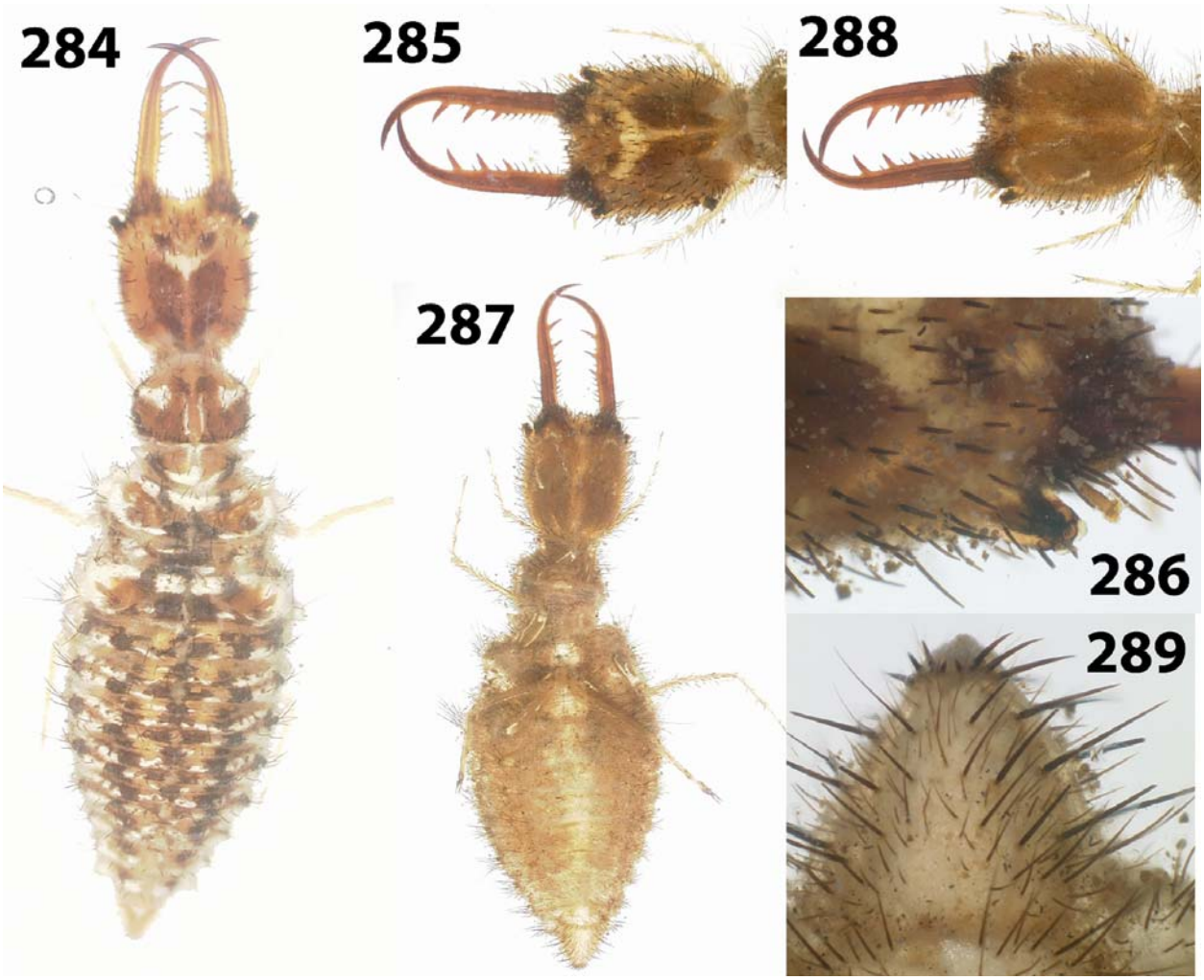
Figures 268-272. *Eremoleon pygmaeus* Miller and Stange, larva. **268)** dorsal view; **269)** ventral view; **270)** dorsal view of head; **271**) ventral view of head; **272)** posterior digging setae.



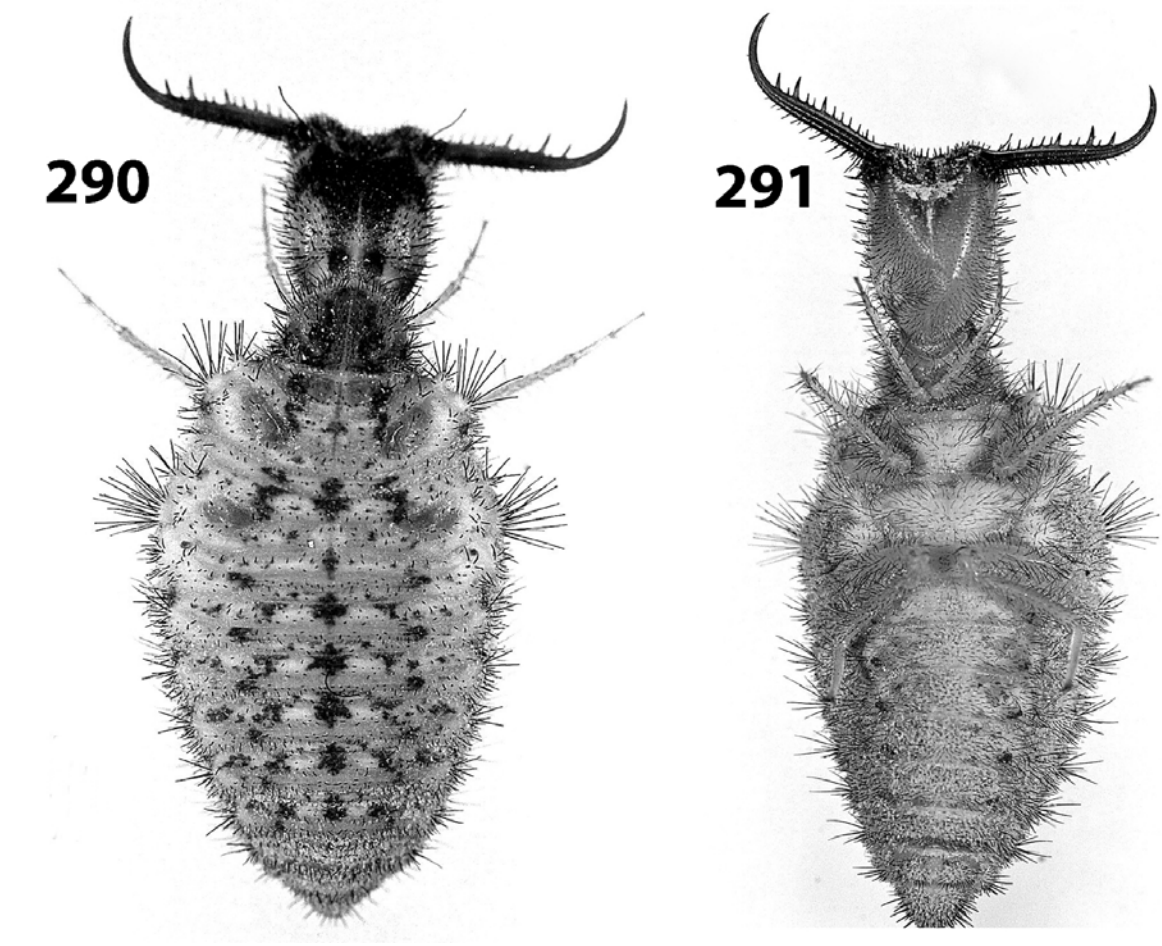
Figures 273-277. *Eremoleon tepuyiensis* Miller and Stange, larva. **273)** dorsal view; **274)** ventral view; **275)** dorsal view of head; **276)** ventral view of head; **277)** posterior digging setae.



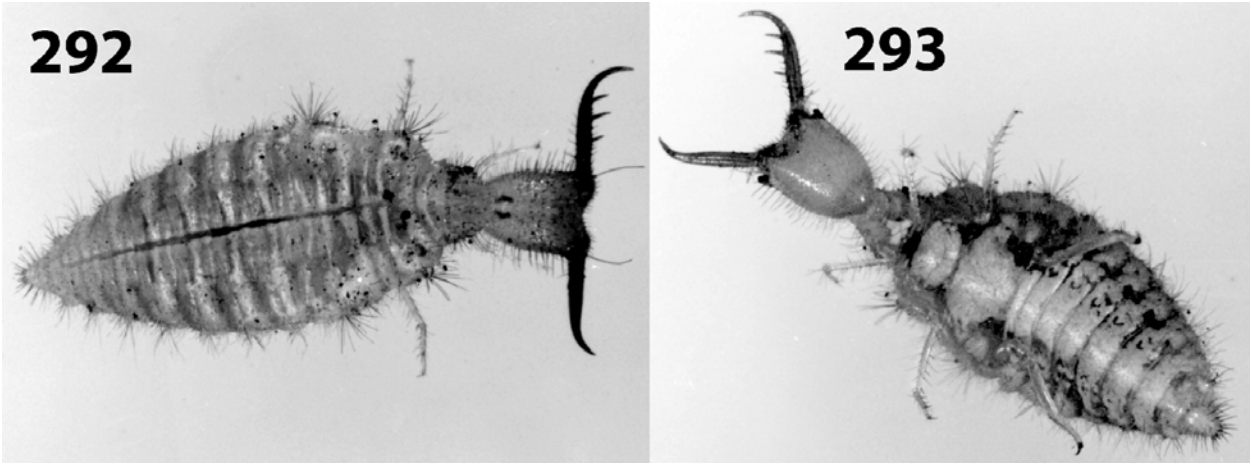
Figures 278-283. *Eremoleon punctipennis* (Banks), larva. **278)** dorsal view; **279**) ventral view; **280)** dorsal view of head; **281)** ventral view of head; **282)** close-up dorsal surface of head; **283)** Ventral view of digging setae.



Figures 284-289. *Eremoleon* sp. (Hispaniola, *Hutia* burrow) **284)** dorsal view; **285)** dorsal view head capsule; **286)** close-up head capsule; **287)** ventral view; **288)** ventral view head capsule; **289)** Ventral view of digging setae.



Figures 290-291. *Sericoleon paessleri* Esben-Petersen, larva. **290)** dorsal view; **291)** ventral view.



Figures 292-293. *Eremoleon nigribasis* Banks, larva. **292)** dorsal view, **293)** ventral view.