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A revision of the genus *Purenleon* Stange (Neuroptera: Myrmeleontidae: Nemoleontini)

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Abstract. Twenty six species of the genus *Purenleon* Stange (Neuroptera: Myrmeleontidae: Nemoleontini) are recognized from the New World, of which ten are described as **new species**: *P. oaxacae*, *P. fernandezi*, *P. tibialis, P. adamsi, P. andinus, P. apache, P. aztecus, P. cavei, P. farri* and *P. toltecus*. **Neotypes** are designated for *Psammoleon banksi* Esben-Petersen 1933 and for *Formicaleo inaequalis* Navás 1913. The larvae of sixteen species have been reared and are described with data on their biologies. The genus is subdivided into three species groups based mostly on leg structure. The inscriptus group consists of five species, the tibialis group consists of two species and the rest of the species are in the bistictus group. Keys to the species based both on adults and larvae are provided and descriptions given.

Resumen. Se reconocen veinte seis especies de *Purenleon* Stange (Neuroptera: Myrmeleontidae: Nemoleontini) con las descripciones de diez **especies nuevas**: *P. oaxacae*, *P. fernandezi*, *P. tibialis,P. adamsi, P. andinus,P. apache, P. aztecus, P. cavei, P. farri* y *P. toltecus*. Se designan **Neotipos** para *Psammoleon banksi* Esben-Petersen 1933 y *Formicaleo inaequalis* Navás 1913. Se describen las larvas de diez y seis especies con datos sobre sus biologias. Se separan en tres grupos, grupo de inscriptus con cinco especies, grupo de tibialis con dos especies, y el grupo de bistictus con diez y ocho especies. Se incluyen en una clave para los adultos de veinte seis especies y para las larvas de quince especies. Se provee datos sobre distribución y biologia.

Introduction

Stange (2002) described the genus *Purenleon* based on many species formerly included in the genus *Psammoleon* Banks which was synonymized under *Euptilon* Westwood. *Euptilon* was restricted to the five known egg throwing species which have specialized setae on tergite VIII as part of the throwing behavior. The rest of the non-egg throwing species were included in *Purenleon*. Sixteen species now included in *Purenleon* were previousely described (Stange 2004) but no comprehensive treatment of the species was made with scattered descriptions from North America (Banks 1927, 1942), West Indies (Banks 1920, 1941; Alayo 1968; Miller and Stange 2011), Central America (Navás 1913, 1914; Banks 1935) and South America (Navás1914, 1917; Banks 1943). The present treatment provides keys and re-descriptions of the species. Twenty six species are recognized from the New World, of which ten are described as **new species**: *P. oaxacae*, *P. fernandezi*, *P. tibialis, P. adamsi, P. andinus, P. apache, P. aztecus, P. cavei, P. farri* and *P. toltecus*. **Neotypes** are designated for *Psammoleon banksi* Esben-Petersen 1933 and for *Formicaleo inaequalis* Navás 1913. **New combinations** are *Purenleon cubensis* (Alayo) and *Purenleon zayasi* (Alayo). One species from Cuba, *P. zayasi* (Alayo) cannot be clearly distinguished from other species because of the inadequate original description but appears to be valid.

There are three species groups. The inscriptus group is restricted to North America. The five known species of the inscriptus group have small pretarsal claws that are less than one-half the length of the basitarsus whereas those of the bistictus and tibialis groups are as long as the basitarsus. The tibialis group is known from Colombia and Venezuela and has the midtibia greatly swollen, much broader than

the foretibia and the basitarsus of the hindleg is about twice as long as greatest diameter. Nineteen species of the bistictus group are known and predominate in the West Indies and North America.

Species have distinctive shaped male genitalia and female pregenitale. The shape of the spermatheca is similar in each group. Chaetotaxy is important but sometimes setae (such as femoral sense hairs) are broken so that caution is recommended in using this character. Wing shape, venation and markings are important for identifications. However, wing markings can vary and three species (*P. cavei, P. minor, P. nunezi*) rarely have more fully wing maculated specimens (mostly in Hispaniola) with a dark brown spot near the posterior margin of the forewing where posterior fork of CuA reaches posterior vein and the dark brown rhegmal mark is often more pronounced (Fig. 108).

Larvae of sixteen species of *Purenleon* have been found in diverse habitats such as in cave mouths, in sand under Palm fronds (*P. minor*), sand tracts and living in loose soil around tree bases. New bombyliid parasite records are *Neodiplocampta mira* (Coquillett) reared from *Purenleon albovaria* and *Chrysanthrax gemella* (Coquillett) reared from *Purenleon parallelus*.

Methods

Larvae were preserved in 75% ethanol after treatment with KAAD larval fixative. Some photos of live larvae were made by camera. Most photos of larvae were made from preserved specimens that do not have the living coloration. Adult photos and most larval color photography were accomplished with AutoMontage. Adult antlions were photographed directly from specimens. Male genitalia, after clearing in KOH and dissection, were photographed under ethanol submerged cover slips to prevent movement. Female terminalia, after clearing in KOH, were placed in petri dishes and covered with a microscope slide and then photographed after correct positioning. 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 actual use of any dyes.

Materials

Six hundred fifty-seven adult and 38 larval specimens studied are deposited in the following institutions:

AMNH American Museum of Natural History, New York, NY, U.S.A.
ANSP Academy of Natural Sciences, Philadelphia, Pennsylvania, U.S.A.
BMNH The Natural History Mueum, London, England, U.K.
CASC California Academy of Sciences, San Francisco, CA, U.S.A.
EMAU Ernst-Moritz Arndt Universitat Greifswald, Zoologisches Institut und Museum, Greifswald, Germany.
EMEC Essig Museum of Entomology, University of California, Berkeley, CA, U.S.A.
FSCA Florida State Collection of Arthropods, Gainesville, FL, U.S.A.
IBAV Instituto de Biologia Agricola, Univerdad Central de Venezuela, Maracay, Venezuela.
INBC Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica.
IZAC Academia de Ciencias de Cuba, Havana, Cuba.
LACM Los Angeles County Museum of Natural History, Los Angeles, CA, U.S.A.
MCZC Museum of Comparative Zoology, Harvard University, Cambridge, MA, U.S.A.
MNHN Museum national d'Histoire naturelle, Paris, France.
NHMW Naturhistorisches Museum, Vienna, Austria.
TAMU Texas A & M University, College Station, TX, U.S.A.
USMB Upper Silesian Museum, Bytom, Poland.
USNM National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.

***Purenleon* Stange**

Purenleon Stange 2002: 285. **Type species**: *Purenleon abruptus* Stange, by original designation.
=*Diazus* Navás 1914: 220 (preoccupied by *Diazus* Leconte, 1859, Coleoptera: Scarabaeidae) by Stange 2002: 285.

Further description. Miller and Stange 2011: 17.

Further larval description. Miller and Stange 2011: 17.

Key to species. North America (Banks 1927: 60–61); Cuba (Alayo 1968: 65); Hispaniola (Miller and Stange 2011: 2–3); South America (Banks 1943: 169).

List of species. Stange 1970b: 23; 2004: 214–217.

Distribution. West Indies; North America; South America.

Diagnosis. Adult: foretarsus with basal tarsomere no longer than distal one, usually much shorter; basitarsus of hindleg at least 2.5 times longer than wide or midtibia swollen nearly twice as thick as foretibia; forefemur swollen, at widest point wider than interocular distance, with abundant pubescence especially on closing face; femoral sense hair of foreleg elongate, over one-half length of femur; midfemoral sense hair shorter or longer than forefemoral sense hair; tibial spurs present; pretarsal claws not capable of closing against ventral surface of distal tarsomere; forewing costal area narrow to moderately broad near coalescing of subcostal and radial wings, at most 1.5 times higher than at middle of wing, subcostal area not narrowed, at least 1.5 times as wide as radial vein diameter at narrowest point; hindwing not falcate; male ectoproct without postventral lobe; tergite VIII of female terminalia without stout elongate bristle row subapically.

Larva: mandible shorter or longer than head capsule length, with three evenly spaced teeth; basal tooth originates well before mid point of mandible; distance between teeth usually only little longer than distance between basal tooth and mandibular base; labial palpus three segmented; dorsal surface of head capsule usually with scattered dolichasters; mesothoracic spiracle usually borne on tubercle; abdominal spiracles sometimes borne on small tubercle; abdomen without lateral scoli; abdominal sternite VIII without submedian teeth.

Biology. Larvae of *Purenleon* have been found in diverse habitats such as in cave mouths and rock overhangs (mostly inscriptus group), in sand under Palm fronds (*P. minor*), in sand tracts, and living in loose soil around tree bases. Four species (*P. bistictus, P. minor, P. parallelus, P. reductus*) are found in coastal sand areas. Larvae have specific adaptations to different substrates. Spiracles borne on elongate tubercles are the norm for species living in coarse sand or a sand and organic matter combination. This type of substrate is favored also by species with dolichasters or thick shafted setae. Species in fine dust or sand tend to have shorter spiracular tubercles and finer simple setae. Careful sand testing of substrates by females utilizing the digging setae on their terminalia ensures that larvae hatch in close proximity to microhabitats suited to their physical adaptations, and temperature and light requirements.

Zoogeography. This genus is restricted to the Western Hemisphere although absent in Canada and the eastern United States (east of 100th meridian). The five species of the inscriptus group are found in the southwestern United States south to Costa Rica. Seven species are restricted to the West Indies with the preponderance of species in Cuba (4 species) and Hispaniola (4 species). Two of the West Indian species, *P. bistictus* and *P. minor* are widespread Caribbean species ranging from the Florida Keys to St. Kitts with the former species also found on the Yucatan Peninsula. One endemic species is found in the Cayman Islands and one in Jamaica. The tibialis group with two species is restricted to Venezuela and Colombia. Mexico has the most species, with all five species of the inscriptus group and with eight species of the bistictus group of which three appear to be endemic. *Purenleon parallelus* Banks is the most widespread species ranging from Mexico to Colombia. Except for the tibialis group in Colombia

and Venezuela and *P. clavatus* (Navás) from Brazil, no other species of this genus are found in South America.

Discussion: This strictly New World genus has three distinct species groups. The inscriptus group has small pretarsal claws that are less than one-half the length of the basitarsus whereas those of the bistictus and tibialis groups are as long as the basitarsus. It should be noted that P. abrupus is tentatively placed in this group based on it's pretarsal claws but the larvae are very different from other members of the P. inscirptus group. The tibialis group is known from Colombia and Venezuela and has the midtibia greatly swollen, much broader than foretibia and the basitarsus of hindleg is about twice as long as greatest diameter. Also, the posterior margin of sternite VIII of the female of the tibialis group have small lateral lobes. Species of the inscriptus and bistictus groups were originally included in the genus *Psammoleon* Banks. The adults of *Psammoleon* differ from those of *Purenleon* in having specialized setae on tergite VIII as part of the egg throwing behavior of this genus. Most of the larvae of *Purenleon* are known. In general, species in the genus *Euptilon* (formerly *Psammoleon*) have the rows of setae posterior to the lateral tentorial suture in three or more rows, and only about twice as long as wide, except *E. decipiens* Banks, which lacks this character altogether. In *Purenleon*, the setae are generally longer than this and occur in no more than two tows. The exception to this is *Euptilon normalis* of northern California, where they also occur in two rows and are as elongate as in *Purenleon*. The *Purenleon* in this area are members of the inscriptus group, and have no such setae. Only six known species of *Purenleon* have this character. These are P. *abruptus, P. apache, P. aztecus P. toltecus, P. cavei,* and *P. debilis*.

Check list of *Purenleon* Stange **larva known*

inscriptus group

Purenleon abruptus Stange*	Mexico to Costa Rica
Purenleon albovaria (Banks)*	U.S.A.; Baja California
Purenleon connexus (Banks)*	U.S.A.; Mexico
Purenleon inscriptus (Hagen)*	U.S.A.; Mexico
Purenleon oaxacae Miller and Stange*	Mexico

tibialis group

Purenleon fernandezi Miller and Stange	Venezuela
Purenleon tibialis Miller and Stange	Colombia

bistictus group

Purenleon adamsi Miller and Stange	Mexico
Purenleon andinus Miller and Stange	Venezuela
Purenleon apache Miller and Stange*	U.S.A.
Purenleon aztecus Miller and Stange*	Mexico
Purenleon bistictus (Hagen)*	Florida Keys; West Indies; Mexico
Purenleon cavei Miller and Stange*	Honduras
Purenleon clavatus (Navás)*	Venezuela; Brazil
Purenleon cubensis (Alayo)	Cuba
Purenleon debilis (Gerstaecker)*	Mexico to Costa Rica
Purenleon farri Miller and Stange	Jamaica
Purenleon imbellis (Banks)	Hispaniola
Purenleon iniquus (Navás)*	Mexico to Costa Rica
Purenleon minor (Banks)*	Florida Keys; West Indies
Purenleon nunezi Miller and Stange*	Dominican Republic
Purenleon parallelus (Banks)*	Mexico to Colombia
Purenleon reductus (Banks)	Cayman Islands
Purenleon toltecus Miller and Stange*	Mexico
Purenleon woodruffi Miller and Stange*	Dominican Republic
Purenleon zayasi (Alayo)	Cuba

Key to species of *Purenleon* Stange

Note: not in key: *P. zayasi* (Alayo)

1. Pretarsal claws small, those of foreleg not more than one-half length of basitarsus (Fig. 22) (inscriptus group) **2**
— Pretarsal claws moderately long, those of foreleg at least as long as basitarsus (Fig. 105) **6**

2(1). Forewing costal area with many crossveins interconnected especially at middle one third (Fig. 23) **3**
— Forewing costal area with few, usually no interconnected crossveins (Fig. 17) **4**

3(2). Pronotum broader than long as measured along midline dorsally; forewing relatively shorter and broader (less than 4.5 times longer than greatest width) with most crossveins margined with dark brown, basal stripe along radial vein ends before halfway point to cubital fork (Fig. 23); female ectoproct with somewhat stronger posterior projection, posterior gonapophysis longer (Fig. 25) (U.S.A.: Arizona-Sonora Desert) ..... ***Purenleon inscriptus* (Hagen)**
— Pronotum longer than broad as measured along midline dorsally; forewing relatively longer and slenderer (about 5.0 times longer than greatest width) with most crossveins not margined, dark basal stripe reaches almost to cubital fork (Fig. 11); female ectoproct with less prominent projection, posterior gonapophysis shorter (Fig. 14) (southern California and Baja California) ..... ***Purenleon albovaria* (Banks)**

4(2). Costal area of forewing abruptly broadened near base (Fig. 4); wings without prominent dark brown stripes or marks; small species, forewing length approximately 18 to 25 mm; (southern Mexico to Costa Rica) ..... ***Purenleon abruptus* Stange**
— Costal area of forewing gradually broadened near base (Fig. 17); larger species, forewing with prominent dark brown stripes or marks; length usually more than 25 mm **5**

5(4). Forewing with completely (rarely widely interrupted) serpentine dark brown stripe directed toward wing apex (Fig. 17); basitarsus mostly dark brown (Fig. 16) (western United States; Mexico) ..... ***Purenleon connexus* (Banks)**
— Forewing without serpentine dark brown stripe but with many scattered dark brown spots (Fig. 29); basitarsus mostly pale brown except apically (Fig. 28) (Mexico: Oaxaca) .... ***Purenleon oaxacae* Miller and Stange**

6(1). Midtibia greatly swollen, much broader than foretibia (Fig. 38); basitarsus of hindleg about twice as long as greatest diameter; posterior margin of sternite VIII in the female produced laterally as broad lobe or longer (twice as long as broad) (Fig. 41) like another gonapophysis (tibialis group) (Colombia; Venezuela) **7**
— Midtibia weakly swollen, about equal in breadth to foretibia (except *P. andinus* and *P. clavatus*); basitarsus of hindleg at least 2.5 times longer than greatest diameter; sternite VIII of female not produced laterally (bistictus group) **8**

7(6). Pronotum with several elongate white bristles at lateral margin, at least subequal in length to those on forecoxa (Fig. 37) (Colombia) ..... ***Purenleon tibialis* Miller and Stange**
— Pronotum without elongate white bristles at lateral margin (Fig. 32) (Venezuela) .... ***Purenleon fernandezi* Miller and Stange**

8(6). Mesoscutum with sublateral row of elongate white bristles (Fig. 69); pronotal disc with numerous elongate, erect bristles toward middle; male paramere divided into two strongly sclerotized sclerites densely covered with small wart-like bumps (Central America) **9**

– Mesoscutum without sublateral row of elongate white bristles; pronotal disc without elongate, erect bristles toward middle (Fig. 111); male paramere not covered with numerous small wart-like bumps **11**

9(8). Midfemoral sense hair about one-half length of forefemoral sense hair (Honduras) ..... ***Purenleon cavei* Miller and Stange**

– Midfemoral sense hair about equal in length to forefemoral sense hair **10**

10(9). Pretarsal claws much longer than hind basitarsus; hindwing much broader at about three fourths distance from base (Fig. 94) (Honduras to Costa Rica) ***Purenleon iniquus* (Navás)**

– Pretarsal claws shorter than hind basitarsus; hindwing not especially broadened toward apex (Fig. 81) (Mexico to Panama) ..... ***Purenleon debilis* (Gerstaecker)**

11(8). Pronotum with several elongate white bristles at lateral margin, at least subequal in length to those on forecoxa **12**

– Pronotum without elongate white bristles at lateral margin, sometimes one or two moderately long white setae **14**

12(11). CuP + 1A of forewing runs parallel to posterior fork of CuA for a long distance beyond origin of radial sector (Fig. 113) (Mexico to Colombia; littoral) ..... ***Purenleon parallelus* (Banks)**

– CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector (Fig. 49, 65) **13**

13(9). Midfemoral sense hair about one half length of forefemoral sense hair; male abdominal tergites with prominent scale-like sculpturing (Florida Keys; Cuba; Hispaniola; Jamaica; Yucatan) ..... ***Purenleon bistictus* (Hagen)**

— Midfemoral sense hair as long as forefemoral sense hair; male abdominal tergites without scale-like sculpturing (Venezuela) ..... ***Purenleon andinus* Miller and Stange**

14(11). Forewing costal area with many crossveins interconnected (Fig. 89) (Hispaniola) ..... ***Purenleon imbellis* (Banks)**

— Forewing costal area without interconnected crossveins except rarely toward stigma **15**

15(14). Forecoxa with some white bristles longer than coxal diameter; continental species **16**

— Forecoxa without white bristles, or if present, shorter than coxal diameter; West Indian species **20**

16(15). Forefemur without long setae on exterior face; forecoxa with elongate white setae restricted to posterior margin **17**

— Forefemur with numerous long setae on exterior face; forecoxa with numerous elongate and often distally swollen setae on lateral face in addition to elongate white setae on posterior margin (Mexico) **18**

17(16). Midfemoral sense hair about one-half as long as forefemoral sense hair; hindtibia with all black bristles shorter than tibial spurs (Fig. 43); hindtibial spurs not reaching apex of tarsomere II; forewing costal area expands abruptly near base (Mexico) ..... ***Purenleon adamsi* Miller and Stange**

— Midfemoral sense hair about same length as forefemoral sense hair; hind tibia with some elongate black bristles longer than tibial spurs; hindtibial spurs reach beyond tarsomere II forewing costal area expands gradually near base ..... ***Purenleon clavatus* (Navás)**

18(16). Hind margin of forewing from near base to well beyond midpoint of wing dark brown suffused (Fig. 60); tibial spurs of hindleg reaching only a little beyond apex of basitarsus (Mexico: Michoacan) ..... ***Purenleon aztecus* Miller and Stange**

— Hind margin of forewing not suffused; tibial spurs of hindleg reaches near to apex of tarsomere II **19**

19(18). Pronotum with one or two white setae laterally (Fig. 122); forewing costal area wider than high; elongate white setae near anterior margin of lateral face of forecoxa and on thoracic pleura weakly swollen distally; forewing costal area expands abruptly near base (Mexico: Jalisco; Puebla) ..... ***Purenleon toltecus*** **Miller and Stange**

— Pronotum without elongate white setae laterally; forewing costal area higher than wide; elongate white setae on lateral face of forecoxa not swollen distally; forewing costal area expands gradually near base (U.S.A.: Arizona; Mexico: Sonora) ..... ***Purenleon apache*** **Miller and Stange**

20(15). Scape all dark posteriorly except apex; forefemur nearly all dark brown with abundant white appressed setae; forewing vein CuP+1A reaches hind margin beyond origin of radial sector **21**

— Scape nearly all pale posteriorly; forefemur mostly pale brown with only scattered white appressed setae on exterior face; forewing vein CuP + 1A reaches hind margin nearly at origin of radial sector **23**

21(20). Forewing costa gradually broadened at base, with cells at middle at most about as high as wide (Fig. 78); forewing vein CuP+1A reaches hind margin slightly beyond origin of radial sector (Cuba) ..... ***Purenleon cubensis*** **Alayo**

— Forewing costa gradually or strongly broadened at base, with cells at middle higher than wide (Fig. 86, 118); forewing vein CuP+lA reaches hind margin well beyond origin of radial sector **22**

22(21). Hind basitarsus slightly shorter than tarsomeres II–IV together; forewing costal area gradually broadened at base, with costal cells at middle only slightly higher than wide (Fig. 118) (Cayman Islands) ..... ***Purenleon reductus*** **(Banks)**

— Hind basitarsus longer than tarsomeres II–IV together; forewing costal area strongly broadened at base, with cells at middle much higher than wide (Fig. 86) (Jamaica) ..... ***Purenleon farri*** **Miller and Stange**

23(20). Pronotum with only inconspicuous setae that never measure more than one third length of longest forecoxal setae; forewing subcostal area often narrowly dark suffused opposite some of the dark segments of radial vein (Fig. 108) (Hispaniola) ..... ***Purenleon nunezi*** **Miller and Stange**

— Pronotum with at least one or two conspicuous setae sublaterally near middle, sometimes black rather than white, that are at least one half length of longest setae on forecoxa; forewing subcostal area not suffused **24**

24(23). Basitarsus of hindleg at least three times longer than greatest diameter; nearly as long as pretarsal claws; interantennal area dark (transcaribbean littoral species; Florida Keys) ..... ***Purenleon minor*** **(Banks)**

— Basitarsus of hindleg at most 2.5 times longer than greatest diameter, much shorter than pretarsal claws; interantennal area pale brown; (interior Hispaniola) ..... ***Purenleon woodruffi*** **Miller and Stange**

Key to Third Instar Larvae of *Purenleon*

1. Abdominal spiracles on large papilliform tubercles beset with short dolichasters (Fig. 164) .. **2**

— Abdominal spiracles either not situated on tubercles or without dolichasters **5**

2(1). Mesothoracic spiracle borne on tubercle at least twice as long as wide; dorsal surface of abdomen with many bead-like setae **3**

— Mesothoracic spiracle borne on tubercle about as long as wide; setae on dorsal abdomen sausage-shaped about 2 to 3 times longer than thick **4**

3(2). Ventral surface of head capsule with sublateral dark brown spots near middle; abdominal spiracles II–VI usually longer than basal width; dorsal surface of head capsule with prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 150) (Honduras) ..... ***Purenleon cavei* Miller and Stange**

— Ventral surface of head capsule without sublateral dark brown spots; abdominal spiracles II–VI wider than basal width; dorsal surface of head capsule without prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 154) (Venezuela; Brazil) ..... ***Purenleon clavatus* (Navás)**

4(2). Abdominal spiracles II–VI symmetrical, with well-defined small nipple (Fig. 160); mesothoracic spiracle borne on tubercle smaller than biggest mesothoracic scolus; dorsal surface of head capsule with prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 158) (Mexico to Panama) ..... ***Purenleon debilis* (Gerstaecker)**

— Abdominal spiracles II –VI asymmetrical, without nipple; mesothoracic spiracle borne on tubercle larger than largest mesothoracic scolus; dorsal surface of head capsule without prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 163) (Honduras to Costa Rica) ..... ***Purenleon iniquus* (Navás)**

5(1). Abdominal spiracles II to VII longer than basal width, somewhat larger than abdominal spiracle I; spiracles IV–VI with prominent expanded nipples (Hispaniola) ..... ***Purenleon woodruffi* Miller and Stange**

— Abdominal spiracles shorter than high, shorter than dorsal abdominal spiracle; spiracles IV–VI without nipples **6**

6(5). Abdominal spiracles easily visible, but shorter than or equal to basal width **7**

— Abdominal spiracles not raised, quite flat and obscure **12**

7(6). Dorsal surface of head capsule with prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 178); mandible at least as long as length of ventral head capsule measured at center (mainland species) **8**

— Dorsal surface of head capsule without prominent sublateral row of large dolichasters posterior to lateral tentorial suture (Fig. 154); mandible about 30% shorter than ventral head capsule measured at center (transcaribbean species **11**

8(7). Dorsal abdominal segments IV–VII with bead-like setae; ventral head capsule with bead-like setae (Mexico to Honduras) ..... ***Purenleon abruptus* Stange**

— Dorsal abdominal segments IV–VIII with and ventral head capsule without bead-like setae; dorsal abdominal segments IV–VIII with many simple setae and some straight-sided dolichasters **9**

9(8). Ventral head capsule with elongate, highly expanded flat-ended setae (Arizona; Sonora) ..... ***Purenleon apache* Miller and Stange**

_ Ventral head capsule with elongate, unexpanded, flat-ended setae (Central Mexico) **10**

10(9). Head capsule dorsally dark brown with no orange overtones; mandible pale straw color (Fig. 178) ..... ***Purenleon toltecus* Miller and Stange**

— Head capsule dorsally paler orange-brown (Fig. 144); mandible darker (light brown) ..... ***Purenleon aztecus* Miller and Stange**

11(7). Ventral surface of head capsule with large round median dark brown spot (Fig. 167); head laterally rounded outward; mandible shorter than head capsule (transcaribbean littoral species) ..... ***Purenleon minor* (Banks)**

— Ventral surface of head capsule without large dark brown median spot, with sublateral or submedian dark brown spots; head laterally parallel; mandible longer than head capsule (Fig. 147) ..... ***Purenleon bistictus* (Hagen)**

12(6). Ventral head capsule medially with blunt-ended unexpanded setae **13**

— Ventral head capsule medially with short, thick expanded setae **14**

13(12). Abdomen ventrally with terminal digging setae on rastrum in groups of four with pair closest to midline much shorter than outer two setae ..... ***Purenleon oaxacae* Miller and Stange**

— Abdomen ventrally with terminal digging setae on rastrum in groups of four with only the most central seta much shorter than the other three setae ..... ***Purenleon connexus* (Banks)**

14(12). Metathorax with extensive brown coloration dorsally; ventral head capsule well marked with submedian dark brown markings medially and anteriorly (Fig. 176) .... ***Purenleon parallelus* (Banks)**

— Metathorax weakly marked with dark brown dorsally; ventral head capsule unmarked (Fig. 135) ..... ***Purenleon albovaria* (Banks)**

(inscriptus group)

Diagnosis. Pronotum with several elongate white bristles at lateral margin, at least subequal in length to those on forecoxa; midtibia weakly swollen, about equal in width to foretibia; basitarsus of hindleg at least 4 times longer than greatest diameter; pretarsal claws small, those of foreleg not more than one-half length of basitarsus; tibial spurs elongate, weakly hooked at apex, at least four times longer than pretarsal claws; posterior margin of sternite VIII not produced laterally, with many elongate setae; lateral gonapophyses of female terminalia much longer than wide, widely separated, usually with prominent stout setae posteriorly; spermatheca shaped as a broad C.

Discussion. The adult legs are distinctive since the small pretarsal claws contrast with the very long tibial spurs and hind basitarsus. The larvae of many of the species of this group live under rock overhangs or cave mouths. *Purenleon abruptus* is quite different in biology and not usually found under rock overhangs. The larva is quite different in chaetotaxy with the dorsal surface of head capsule with a prominent sublateral row of large dolichasters posterior to the lateral tentorial suture.

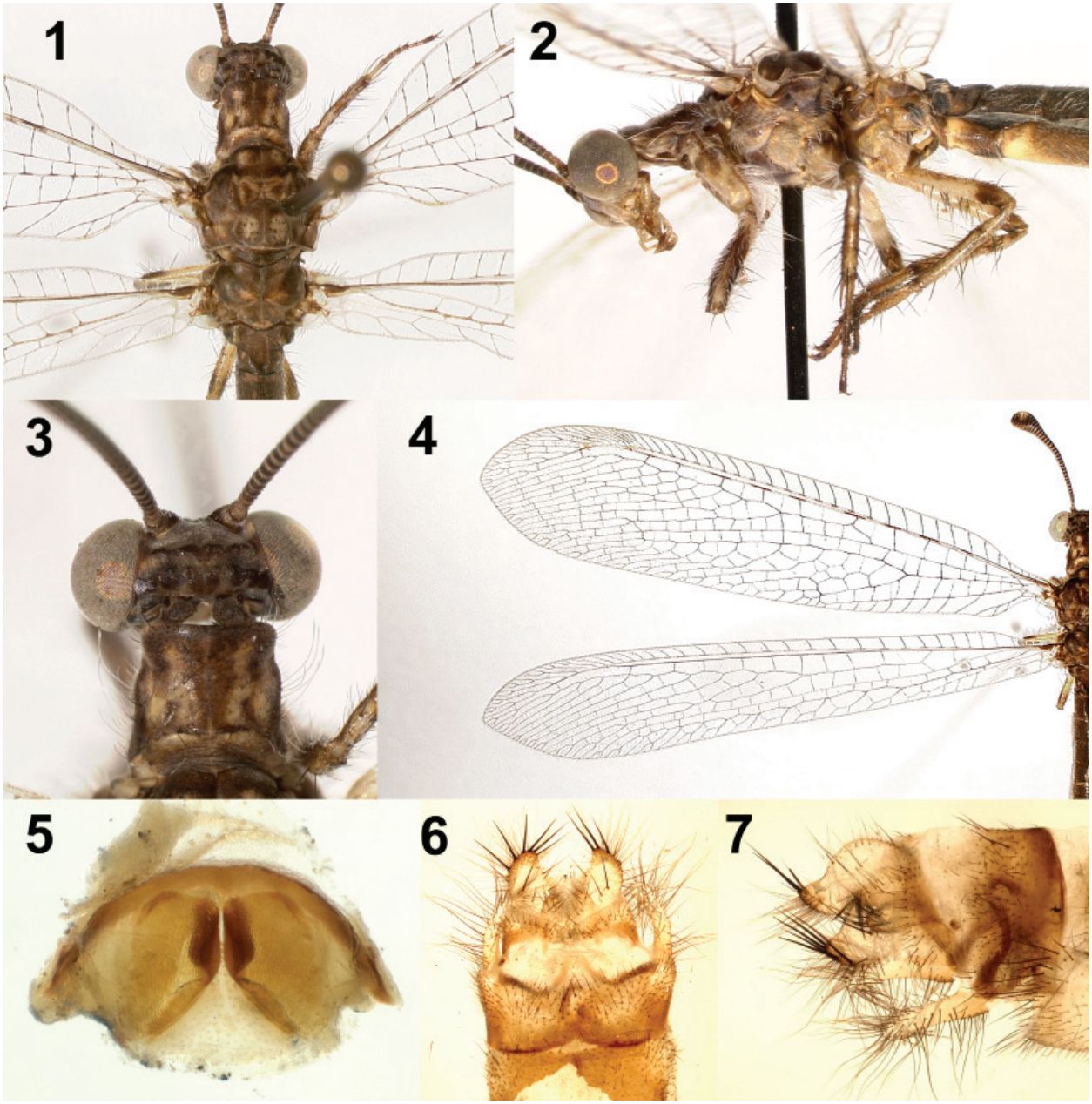
***Purenleon abruptus* Stange**
Figures 1–7, 132–133

Purenleon abruptus Stange 2002: 287, Fig. 638, 642 (wings; dorsal view head, thorax). **Holotype male**, 23 miles south Matías Romero, Oaxaca, Mexico, IV.5.1962, L. Stange (FSCA).

Distribution. Mexico; Honduras; Guatemala; Costa Rica.

Diagnosis. Length of body about 17–23 mm, length of forewing and hindwing from about 18 to 25 mm. **Coloration**: general coloration ligh brown; face pale brown with broad dark brown band above, between and below antennae, emarginate ventrally at middle; vertex mostly gray, pruinose with nearly black scars; mouthparts pale brown except for dark brown mandibles, stipes and distal palpomere of labium; antenna brown with pale brown at apices of scape and flagellomeres, pedicel nearly all brown; pronotum pale brown (Fig. 3) with extensive dark brown medially, laterally and anteriorly; mesoscutum mostly dark brown with pale spot on prescutum, irregularly on each side of mesoscutellum which is

paler posteriorly, small round pale spot laterally near wing base; metascutum darker with pale brown anteriorly and on posterior margin of metascutellum; thoracic pleura (Fig. 2) mostly darker brown dorsally, lighter brown ventrally with ventral area mostly dark brown; coxae and trochanters mostly pale except small basal darkening on coxae; femora mostly pale on closing face, dark brown on exterior face; foretibia mostly dark brown on closing face, mostly pale brown on exterior face with dark brown bands basally, distally and at middle; midtibia and hindtibia mostly pale brown on closing face except apically, mostly dark brown on exterior face; tarsi dark brown except pale brown basitarsus which is darker apically; wing membranes (Fig. 4) nearly without suffusion, white stigma and minor dark brown suffusion on crossveins near posterior margin where the posterior branch of cubital fork ends, and at rhegma; wing veins and crossveins mostly pale brown but with extensive dark brown coloring



Figures 1–7. *Purenleon abruptus* Stange, adult. **1)** head and thorax; **2)** lateral view; **3)** vertex; **4)** wings; **5)** male genitalia; **6)** female terminalia, ventral view; **7)** female terminalia, lateral view.

producing mostly an alternating pattern of light brown and dark brown; abdominal tergites mostly dark brown with pale distal ends, sternites with more pale brown, especially sternites VI to VIII; ectoproct and sternite IX nearly all light brown; female posterior gonapophysis with some dark brown coloration ventrally. **Chaetotaxy**: clypeus, labrum and postmentum with some outstanding, mostly white setae, elsewhere on head inconspicuous; setae very short on antennae and mouthparts except distal palpomere of labium with brown setae about as long as width of distal part of palpomere; pronotum with erect black setae**,** especially submedially and at posterior margin and three to four elongate white setae sublaterally which are slightly thickened toward apex; rest of notum with few inconspicuous black setae; thoracic pleura with numerous elongate, white setae, some which are slightly thickened toward apex; forecoxa with many elongate setae posteriorly that are longer than greatest coxal width and with many smaller white setae on lateral surface that are shorter than coxal width; forefemur without elongate white setae on closing surface, shorter decumbent ones on exterior surface and several elongate erect black setae on closing surface, and several subapically on exterior surface; midfemur with elongate white setae, basal half forming a comb with the setae thickened; hindfemur with elongate white setae on most of femur with a few erect ones on closing face; foretibia with many black erect white setae on exterior face and with mostly decumbent white setae, especially on base of exterior face but with few erect white setae on closing face; midfemur with scattered elongate, erect black setae, some of which are longer than midfemoral sense hair; midfemoral sense hair about one half as long as that of forefemur; hindfemur with fewest setae, all black, some short but with many very long black setae; wings with short setae, some exceeding twice the vein diameter abdomen with predominately short, white setae., semi-decumbent setae except for ectoproct which as elongate, mostly brown setae; male abdomen with small, rounded scale-like sculpture on tergites II–VIII. **Structure**: head with vertex slightly raised above eyes; greatest ocular width slightly greater than interocular distance at middle; antenna moderately long and clavate with about 36 flagellomeres; basal flagellomeres about twice as long as wide, others broader than long; distal palpomere of labium moderately swollen with long narrow apex, palpomacula oval, situated about midway; pronotum a little longer than wide measured along midline; legs similar in length, foreleg shorter than midleg which is shorter than hindleg; forefemur swollen, foretibia and midtibia swollen irregularly, slightly narrower at middle; basitarsus of foreleg about 3.5 times longer than middle diameter, shorter than distal tarsomere; basitarsus of midleg about four times longer than middle diameter, and that of hindleg about six times longer tha middle diameter, longer than distal tarsomere; tibial spurs of foreleg and midleg reaching to about apex of second tarsomere, that of hindleg to apex of basitarsus; pretarsal claws short, about as long as tarsomere II of hindleg; forewing (Fig. 4) the same length as hind wing; forewing costal area abruptly broadened at base, costal cells not interconnected by crossveins, those above radial sector about 1.5 times as high as wide; abdomen much shorter than forewing length; male ectoproct simple, not produced; **male genitalia** (Fig. 5) with moderately arched and broad gonarcus, sub-truncate apically, without evident mediuncus; paramere a broad plate about twice as long as broad with prominent sclerotized lip along medial margin which twists underneath near middle; **female terminalia** (Fig. 6, 7) with ectoproct strongly produced ventrally with row of about four elongate black setae ventrally, elsewhere many other setae which are finer; posterior gonapophysis about six times longer than middle diameter, not bowed, with many elongate setae, some of which are subequal in length to gonapophysis; gonapophyseal plate narrow, at least ten times longer than wide, abruptly bending posteriorly at middle; lateral gonapophysis without stout digging setae, usually well concealed in genital complex; pregenitale well developed; spermatheca shaped as a broad C.

Larva. Fig. 132–133. **Coloration**: mandible pale brown; ventral head capsule with six dark brown spots, largest submedial behind lateral tentorial suture, two close marks near middle, two submedial marks in posterior one-fifth. **Chaetotaxy**: dorsal surface of head capsule with prominent sublateral row of large dolichasters posterior to lateral tentorial suture (as in Fig. 150); dorsal abdominal segments IV–VII with bead-like setae; ventral head capsule with bead-like setae. **Structure**: mandible at least as long as length of ventral head capsule measured at center, distance between tooth 1 and 3 a little longer than that between tooth 1 and base of mandible; abdominal spiracles easily visible, but shorter than or equal to basal width.

Biology. Larvae were found living in loose soil under bark and other debris, in a shaded area, at the base of a large tree. Larvae do not favor well lighted habitats. The duration of pupation varied from 35 to 50 days under laboratory conditions.

Material studied. 10 males, 4 females. 5 larvae. February to May.

COSTA RICA. **Guanacaste**: 14 km. south Cañas, 23.II.1990, Parker (1f, BLCU); Santa Rosa National Park, 300 m., III.1984, D. Janzen, W. Hallwachs (1f, INBIO).

GUATEMALA. **Baja Verapaz**: Rabinal, 7.II.1965, G. O'Neal (1m, FSCA); 40 km. east Guatemala City (on train), 7.IV.1926, J. Aldrich (1f, USNM).

HONDURAS. **Francisco Morazan**: Talanga Hacinda, 28.IV.1993, Miller and Stange (1 larva, FSCA). **Olancho**: 8 km. northeast Catacamas, Sierra de Agalta, 3000', 26. IV. 1993, L. Stange & R. Miller (2m, 1f, FSCA).

MEXICO **Jalisco**: Chamela, 15.IV.1986 (3m, FSCA). **Oaxaca**: 7 mi. northeast Tepanatepec, 4.III.1985, L. Stange & R. Miller (1m, FSCA); 23 miles south Matías Romero, 5.V.1962, **reared**, L. Stange (1 larva, 1m, 1f, FSCA).

Discussion. This species is distinctive in the group by having the forewing costal area abruptly broadened near the base (Fig. 4). The midfemoral sense hair is about one-half as long as that of the forefemur, about one-fourth length of femur. The larva differs from others in the inscriptus group in having a prominent row of dolichasters posterior to the lateral tentorial suture which is duplicated in the bistictus group by *P. apache, P. aztecus, P. cavei, P. debilis,* and *P. toltecus*.

Etymology. The specific name refers to the costal area of forewing which is abruptly narrowed near the base.

***Purenleon albovaria* (Banks)**
Figures 8–14, 134–135

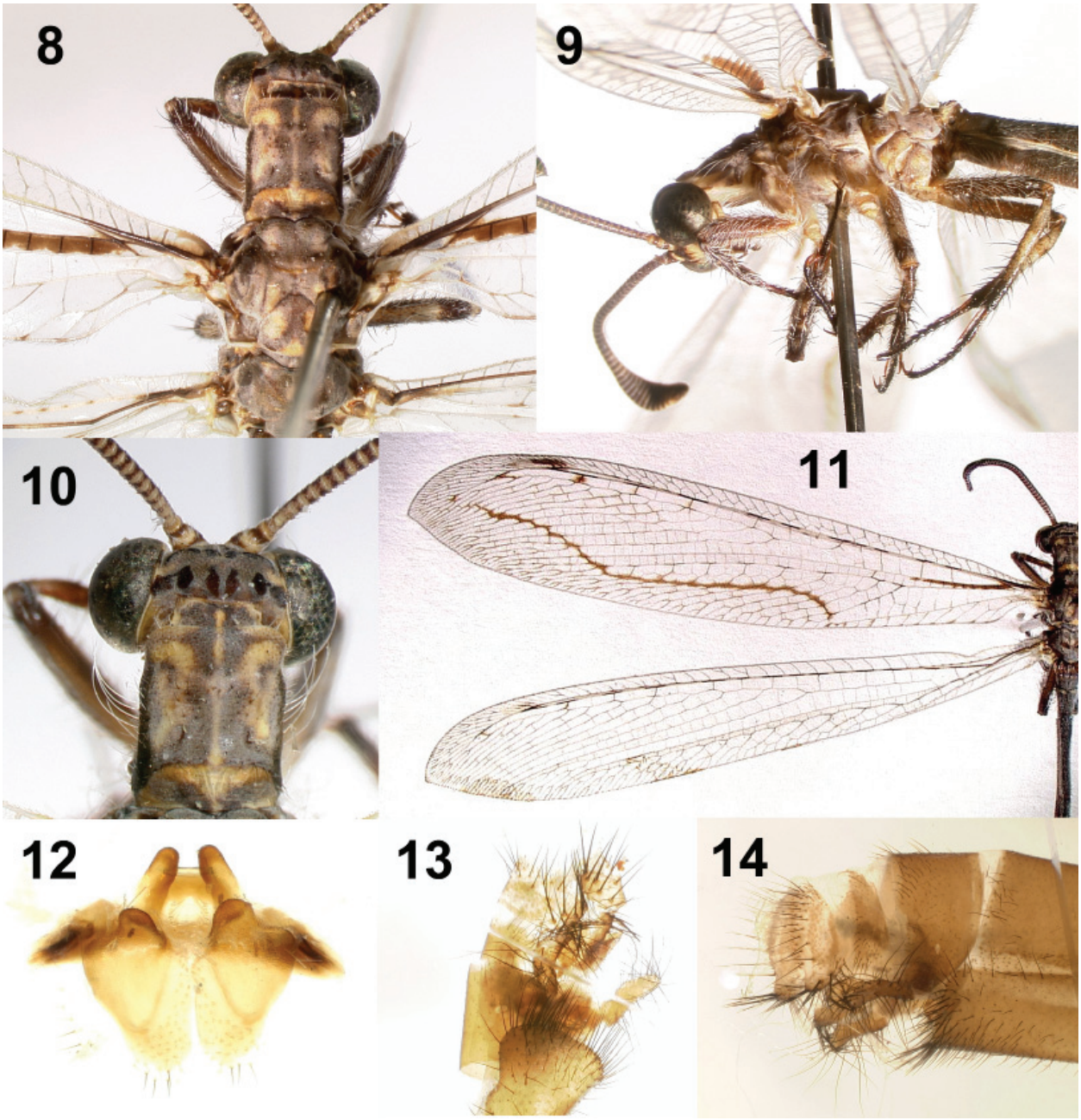
Puren albovaria Banks 1942: 146, Fig. 3, 6 (pronotum; hind tarsus). **Holotype**, Venancio, Lower California, 17.VII.1938, Michelbacher & Ross (CASC).

Taxonomy. Stange 1970: 23 (in *Psammoleon*); 2002: 286 (in *Purenleon*).

Distribution. Mexico; U.S.A. (California) (Penny et al. 1997: 77).

Diagnosis. Length of body about 26 to 28 mm, forewing and hindwing 28 to 36 mm. **Coloration**: face pale brown with dark brown band below and between antennal fossae; mouthparts with dark brown on apical palpomeres of labius and maxilla; antenna mostly dark brown with pale brown spot laterally on clava; scape and pedicel dark brown ventrally, pale brown dorsally, flagellomere I dark brown with pale brown laterally; other flagellomeres with pale brown base and large dark brown apices; pronotum with several long white setae laterally, few shorter white setae anteriorly near lateral margin and few erect bristles on disc; metanotum with few erect setae; forecoxa mostly dark brown with extensive pale brown at middle; femur and tibia mostly dark brown; tarsi all black; forewing with most crossveins not margined, dark basal stripe reaches almost to cubital fork.; abdomen nearly all dark brown, male sternite IX and ectoproct mostly pale brown. **Chaetotaxy**: antennal scape, pedicel and flagellomere I with several short white setae; forecoxa with many long white weakly swollen apically setae especially posteriorly; femora and foretibia with many white, appressed setae; femur with few bristles, mostly white; foretibia and midtibia with white and black bristles, hindtibia nearly all black bristles; midfemoral sense hair shorter than forefemoral sense hair which is about one-half length of femur; thoracic pleura with many long, white setae that are weakly swollen distally; abdomen with many short white setae on tergites and sternites overlapping pleural membrane. **Structure**: antenna moderately long and clavate with about 45 flagellomeres; basal flagellomeres longer than wide, others broader than long; pronotum longer than wide measured along midline; hind basitarsus about seven

times longer than middle diameter, tibia spurs reach middle of tarsomere II; foreleg basitarsus about six times longer than middle diameter, tibial spurs reaching middle of tarsomere II; pretarsal claws short, about one fifth as long as tibial spurs; forewing costal area gradually broadened, with many crossveins interconnected especially at middle one third; forewing relatively long and slender (about 5.0 times longer than greatest width); **male genitalia** (Fig. 12) with weakly arched gonarcus with weak ridge at posterior end, mediuncus prominent, broader than long; paramere complex divided into three sectons: elongate process (about five times longer than broad) near gonarcus, below which is prominent erect process broadly rounded apically below which is a flat, non-sculptured triangular plate which is a little longer than wide; **female terminalia** (Fig. 13, 14) with ectoproct with small, broad lobe ; posterior gonapophysis about four times longer than greatest diameter, bowed at middle with some lateral setae



Figures 8–14. *Purenleon albovaria* (Banks), adult. **8)** head and thorax; **9**), lateral view; **10)** vertex; **11)** wings; **12)** male genitalia; **13)** female terminalia, ventral view; **14)** female terminalia, lateral view.

longer than gonapophysis; gonapophyseal plate about six times longer than wide, becoming narrower posteriorly; lateral gonapophysis about four times longer than median diameter with prominent digging setae posteriorly; pregenitale a broad rectangular plate with short lateral projection that is about three times wider than long; spermatheca shaped as a broad C.

Larva. Fig. 134–135. **Coloration**: mandible brown; ventral head capsule unmarked; metathorax weakly marked with dark brown dorsally. **Chaetotaxy**: dorsal surface of head capsule with dolichasters but without prominent sublateral row of large dolichasters posterior to lateral tentorial suture; ventral head capsule medially with short, thick expanded setae; mesothoracic spiracle borne on tubercle that is about as long as greatest width; abdomen without spiracular tubercles. **Structure**: mandible about 30% shorter than ventral head capsule measured at center, distance between teeth 1 and 3 longer than that between base of mandible and tooth 1; abdominal spiracles not raised, quite flat and obscure, without nipples.

Biology. *Purenleon albovaria* larvae inhabit rain and sun protected habitats beneath rock overhangs, The soil needs to be fine and pale. They avoid direct sun exposure at all times of the day. They are buried and leg anchored (they avoid being pulled out of the soil by prey by resting in shallow soil with their legs anchored to a solid surface beneath them). In Baja California they are parasitized by *Neodiplocampta mira* (Coquillett). The parasite identification was made by Jack C. Hall.

Material studied. 4 males, 6 females. 2 larvae. May to August.

U.S.A. **California**: Fallbrook, San Diego Co. (1m, FSCA).

MEXICO. **Baja California**: Catavina, 3.VII. 1983. **reared**, Miller and Stange (1 larva, 2m, 2f, FSCA); Juncalito Beach, 14.VII.1983, R. Miller & L. Stange (1f, FSCA); 24 miles northwest La Paz, 1.VII.1983, **reared**, Miller and Stange (1 larva, 1m, 1f, FSCA); Cedros Island, 6.V.1931 (1m, FSCA).1.5 miles north Punta Colorado, VI.6.1983, Miller, & Stange (1f, FSCA); Venancio, 17.VII.1938, Michelbacher & Ross (1f, CASC). **Sonora**: Desemboque, 8.VIII.1953, B. Malkin (1f, CASC).

Discussion. This species shares with *P. inscriptus* the interconnected crossveins. It differs in having the pronotum longer than broad (broader than long in *P. inscriptus*) and in forewing shape and markings. It appears to be mainly distributed in Baja California.

***Purenleon connexus* (Banks)**
Figures 15–20, 136–139

Puren connexus Banks 1920: 329. **Holotype male,** San Jacinto Mountains, California. 25. VI (MCZC).

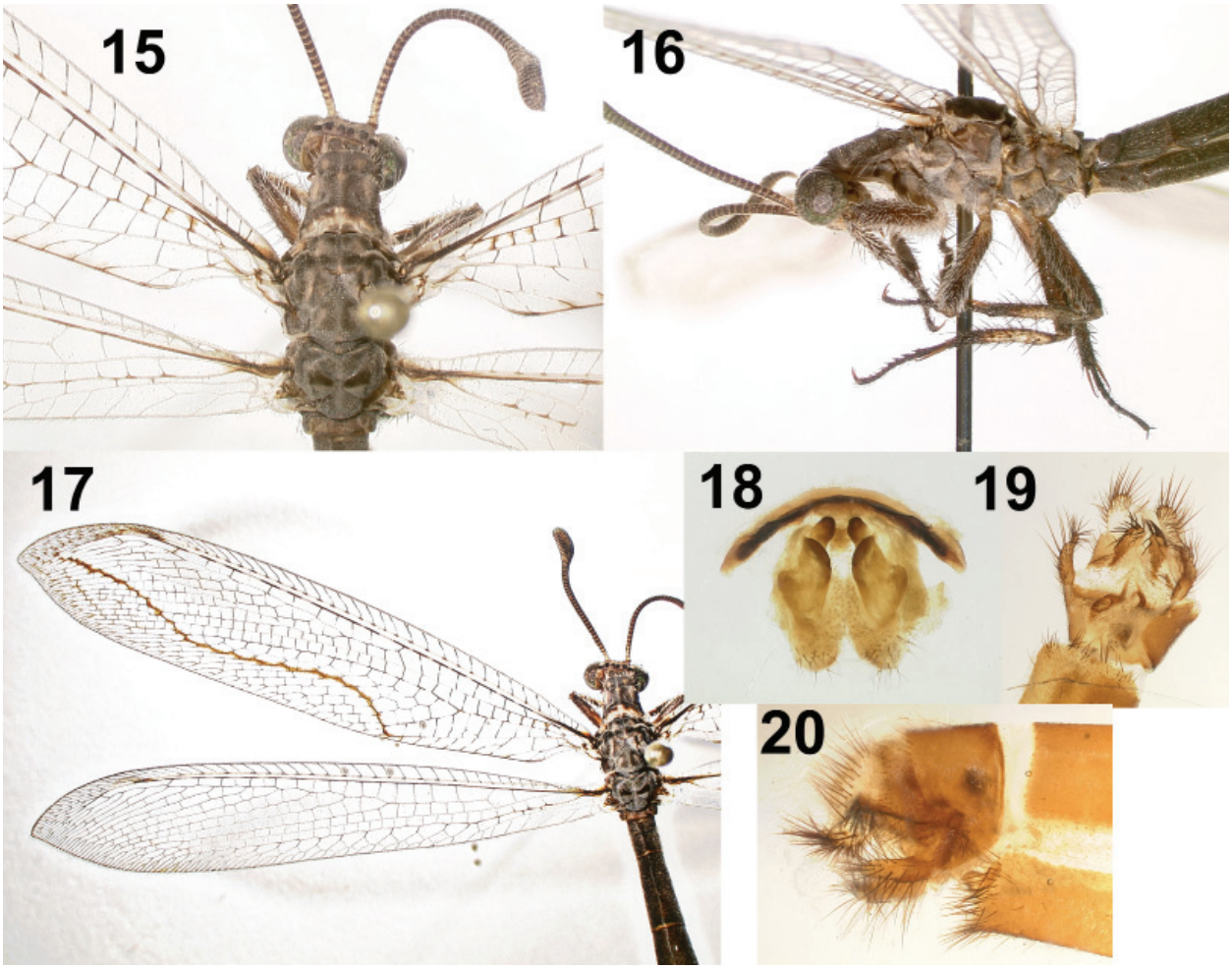
Taxonomy. Banks 1927: 64 (in *Psammoleon*); Poole and Gentili 1996: 734 (in *Lemolemus*); Stange 2002: 286 (in *Purenleon*).

Further description. Banks 1927: 64, Fig. 35, 44 (tibial spurs; female terminalia); Miller 1990: 173, Fig. 7 (female terminalia).

Distribution. U.S.A. (Banks 1927: 65). Arizona, California, Texas; Mexico (Baja California, Coahuila, Colima, Nuevo Leon).

Diagnosis. Length of body 23 to 26 mm, length of forewing 26 to 33 mm, hindwing 25 to 32 mm. **Coloration**: face pale brown with broad dark brown band below and between antennal fossae, sometimes extended weakly below at lateral margin; mouthparts mostly pale brown but extensively dark brown on distal palpomere of labius and maxillus; antenna dark brown with pale brown at apices of scape and flagellomeres, flagellomeres mostly dark brown with very narrow pale brown apices; forecoxa mostly dark brown with pale brown at middle on lateral margin; femora and tibiae mostly dark brown; tarsi black colored; forewing with completely (rarely widely interrupted) serpentine dark brown stripe directed toward wing apex; abdomen mostly dark brown with some pale brown on female terminalia and

male tergite IX and ectoproct. **Chaetotaxy**: few short white setae on scape, pedicel, and flagellomere I; pronotum with few long white setae laterally and erect setae on disc but usually none on mesonotum; thoracic pleura with many long white setae; forecoxa with many long white setae, especially posteriorly; femora with many appressed, white setae; midfemoral sense hair short, about twice as long as femur diameter, much shorter than forefemoral sense hair which is about one half as long as forefemur; abdomen with many short white setae on tergites and sternites. **Structure**: antenna moderately long and clavate with about 43 flagellomeres; basal flagellomeres longer than wide, others broader than long; pronotum longer than wide measured along midline; hind basitarsus about seven times longer than middle diameter, tibial spurs reach middle of tarsomere II; foreleg basitarsus about six times longer than middle diameter, tibial spurs reaching middle of tarsomere II; pretarsal claws short, about one fifth as long as tibial spurs; wings longer than body, forewing slightly longer than hindwing; forewing costal area gradually broadened basally, without interconnected crossveins; **male genitalia** (Fig. 18) with gonarcus weakly arched, mediuncus prominent, about four times wider than long; paramere complex with well-defined process near gonarcus that is about twice as long as wide, irregularly shaped near apex, below which is an elongate, non-sculptured hollow structure strongly sclerotized dorsally, about three times longer than wide, strongly curved anteriorly, abruptly produced laterally near middle, and narrowing posteriorly; **female terminalia** (Fig. 19, 20) with ectoproct without evident postventral lobe; posterior gonapophysis about six times longer than median diameter, strongly bowed at middle, with longest setae at middle on exterior face; gonapophyseal plate elongate (more than six times longer than broad), broadest starting at base of gonapophysis, then abruptly narrowing and bending at pos-



Figures 15–20. *Purenleon connexus* (Banks), adult. **15)** head and thorax; **16)** lateral view; **17)** wings; **18)** male genitalia; **19)** female terminalia, ventral view; **20)** female terminalia, lateral view.

terior one-fourth; lateral gonapophysis about four times longer than median diameter with prominent digging setae posteriorly; pregenitale broad, about five times broader than long, narrowing laterally; spermatheca shaped as a broad C.

Larva. Fig. 136–139. **Coloration**: mandible pale brown; ventral head capsule variable in coloration, usually two submedial brown spots behind lateral tentorial suture. **Chaetotaxy**: head capsule without dolichasters; abdomen ventrally with terminal digging setae in groups of four with the most central seta short and the other three setae longer. **Structure**: mandible as long as length of head capsule (ventral view), distance between teeth 1 and 3 longer than that between base and tooth 1; mesothoracic spiracle on tubercle broader than long; abdominal spiracles not borne on elongate tubercles.

Variation. The coloration of larvae varies from very light (Redding, CA, Fig. 136, 138) to very dark brown (Colima, Mexico, Fig. 137, 139).

Biology. Larvae live in low light areas at the back of caves or rock overhangs where high temperatures or light levels are avoided. They live in rock dust or fine wind-blown sand. The habitat must be free of dampness or rain exposure. They are leg anchorers.

Material studied. 35 males, 39 females. 7 larvae. May to October.

MEXICO. **Baja California**: El Progresso, Sierra de Juarez, 3.VII.1960, Sleeper (1m, FSCA). **Coahuila**: Saltillo, 1980, reared, R. Miller (1m, 1f, FSCA). **Colima**: Rio Salado, 7 km. south Colima, III.14.1985, **reared**, Miller & Stange (1 larva, 1f, FSCA); Salado, **reared** (1larva, 1 m, 1f, FSCA). **Nuevo Leon**: Huasteca Canyon, 11.VI1.1982, **reared**, R. Miller & L. Stange (1 larva, FSCA); 8 km. west Santiago, 2500', 10.VII.1952, F. Werner (1f, Tucson).

U.S.A. **Arizona**: Brown Canyon, Baboquivari Mts., 6.IX.1959, Menke & Stange (1f, FSCA); Gates Pass, 5 miles west Tucson, 15.IX.1963, V. Vesterby (1f, UCDC); Mount Lemmon Road, 13 miles marker, Santa Catalina Mts, 3.VII.1983, **reared**, Miller and Stange (1larva, 1m, 2f, FSCA); Oak Creek Canyon, 12.VI, Sperry (1m, MCZC); Organ Pipe National Monument, 13.X.1963, V. Vesterby (1m, UCDC); Palmerlee (3f, MCZC); Sabino Canyon, Pima Co., 31.VIII.1963, Stange (2m,1f, FSCA); Texas Canyon, 18 miles west Wilcox, Cochise Co., 14.VI.1981, **reared**, R. Miller (1f, FSCA). **California**: 5 miles west Bishop, Inyo Co., 7.VIII.1962, Smith (1f, FSCA); 6 miles east Coalinga, Fresno Co., 28.VIII.1977, Snelling (1f, FSCA); Covington Flat, Joshua Tree National Monument, 24.VI.1960, Sleeper (4m. 6f, FSCA); Deep Canyon, Riverside Co., 8.X.1963, Schlinger (1f, Riverside); Mint Canyon, 31.VII.1935, R. Beamer (1f, Lawrence); 14 miles west Patterson, Stanislaus Co., 13.V.1985, E. Miller, reared (3m, FSCA); 10 miles north Redding, Shasta Co., 1.VIII.1979, **reared from laid eggs**, Miller (4 larvae, 5m, 4f, FSCA); Woody, Kern Co., 19.VIII.1958,Stange (1f, FSCA).**Nevada**: 10 miles southwest Gerlach, Washoe Co., IX.1985, **reared**, Miller and Stange (1 larva, 1f, FSCA); Pyramid Lake, Washoe Co., 14.VIII.1981, **reared**, R. Miller (5m, 4f, FSCA); Pyramid Lake, 40°12', 34"N, 119°, 32', 45"' W, 15.V.1984, **reared**, R. Miller (l m, 2f, FSCA). **Texas**: Big Bend National Park, Brewster Co., 12.VII.1991, Vogtsberger (1m, FSCA); Brownwood, 16.VI.1927 (2f, USNM); Ft. Davis, Davis Mts., 8.VIII.1983, Knudson (2m, FSCA); Kennedy, V.1944, Weyrauch (1m, FSCA); Stephenville, Erath Co., 28.VI.1982, Agnew (1m, FSCA); Uvalde, 21.VI.1961, R. Westcott (1m, FSCA). **Utah**: Leeds Canyon, Washington Co., 14.VIII.1960, Knowlton (1m, FSCA); Moab, Grand Co., 18.VIII.1929, L. Gloyd (1f, UMMZ); Shootering Canyon, Garfield Co., 1.VIII.1978, Voight (1f, FSCA); Snow Canyon, Washington Co., 8.IX.1989, Nye (1m, FSCA).

Discussion. This appears to be the commonest species of the group with the greatest distribution from California to western Texas and south to Colima, Mexico. Also, it is the most variable species especially the wings markings and larval pigmentation.

***Purenleon inscriptus* (Hagen)**
Figures 21–25

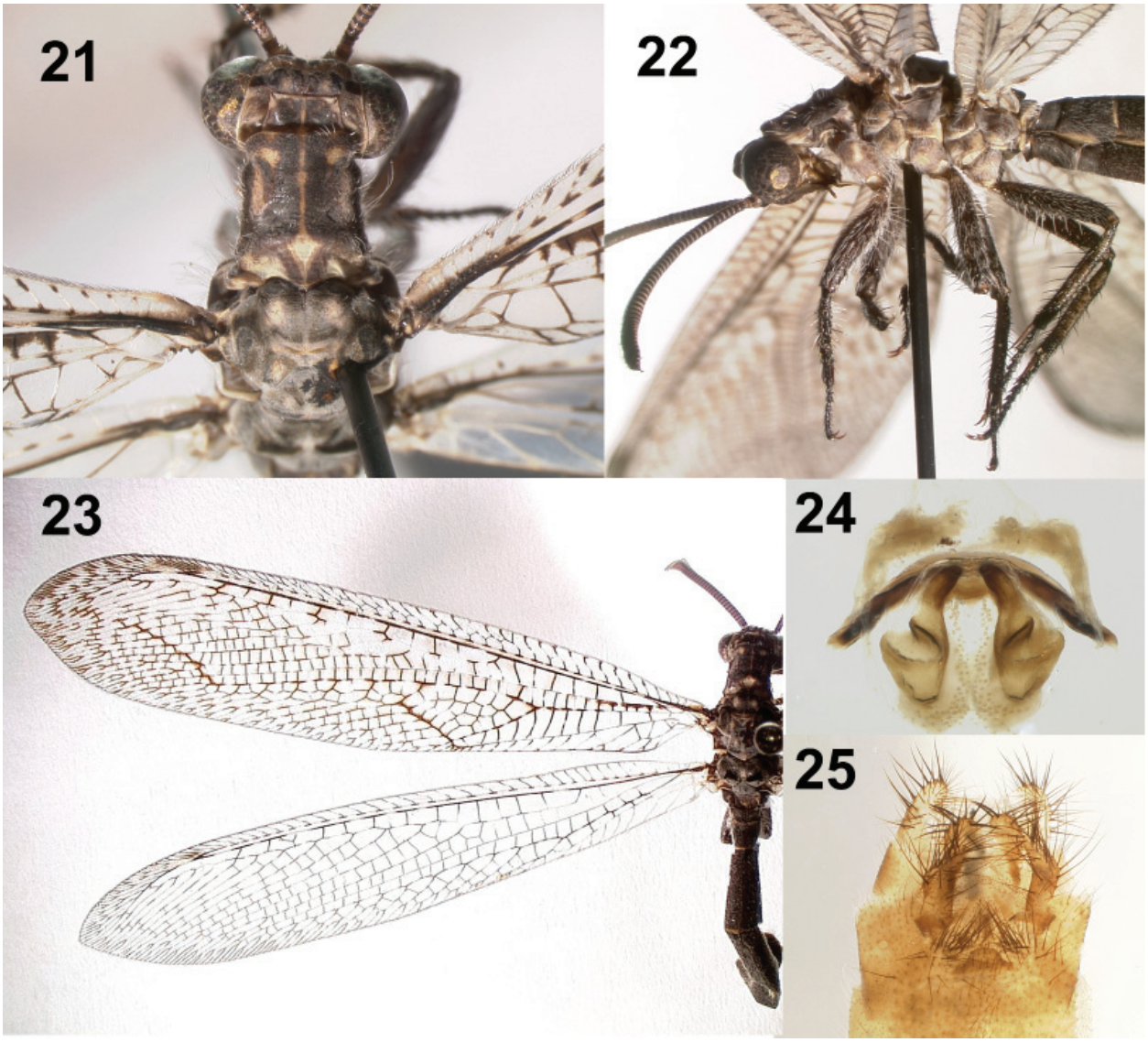
Myrmeleon inscriptus Hagen 1861: 230. **Holotype male,** Pecos River, Western Texas, Pope (MCZC).

Taxonomy. Banks 1904: 106 (in *Psammoleon*); 1927 (in *Puren*); Poole and Gentili 1996: 734 (in *Lemolemus*); Stange 2002: 286 (in *Purenleon*).

Further description. Banks 1904: 105; 1927: 66, Fig. 80, 93 (pronotum; hind tarsus).

Distribution. U.S.A. (Banks 1927: 66). California (Penny et al. 1997: 78), Nevada, New Mexico, Utah.

Diagnosis. Length of body 23 to 27 mm, forewing 29 to 33 mm, hindwing 27 to 31 mm. **Coloration**: face pale brown with broad dark brown band below and between antennal fossae; mouthparts mostly pale brown but with dark brown on distal palpomeres of labius and maxilla; antenna dark brown with narrow pale brown at apices of scape and flagellomeres, pedicel pale brown above, dark brown ventrally; pronotum mostly dark brown with median pale line, submedian pale area anteriorly and sublateral light brown area; femora and tibiae mostly dark brown; tarsi mostly black colored; forewing with most crossveins margined with dark brown, basal stripe along radial vein ends before halfway point to cubital fork; abdomen mostly dark brown with some pale brown areas, especially on female posterior gonapophy-



Figures 21–25. *Purenleon inscriptus* (Hagen), adult. **21)** head and thorax; **22)** lateral view; **23)** wings; **24)** male genitalia; **25)** female terminalia, ventral view.

sis, male tergite IX and ectoproct. **Chaetotaxy**: pronotum with several long white setae laterally, few white setae anteriorly, usually no erect setae on pronotum or mesonotum; thoracic pleura with many long white setae, not swollen distally; femora with many appressed, white setae; femora and foretiba mostly with white bristles, other tibia mostly black bristles; midfemoral sense hair shorter than twice as long as femur diameter; forefemoral sense hair much longer, about one-fourth length of forefemur; abdomen with long white setae on sternite and tergite II, elsewhere abundant but shorter. **Structure**: distal palpomere swollen; antenna moderately long and clavate with about 43 flagellomeres; basal flagellomeres about twice as long as wide, others broader than long; pronotum a little broader than long measured along midline; hind basitarsus about seven times longer than middle diameter, tibia spurs reach middle of tarsomere II; foreleg basitarsus about six times longer than middle diameter, tibial spurs reaching middle of tarsomere II; pretarsal claws short, about one fifth as long as tibial spurs; forewing costal area gradually broadened, with many crossveins interconnected, especially at middle one third; forewing relatively short and broad (less than 4.5 times longer than greatest width) but longer than body; **male genitalia** (Fig. 24) with weakly arched gonarcus, broad mediuncus; paramere complex, non-sculptured, narrowing toward gonarcus, abruptly excavated at posterior one-third with large rounded pocket below; **female terminalia** (Fig. 25) with ectoproct nearly as long as broad, posterior gonapophysis about five times longer than greatest diameter, bowed at middle; gonapophyseal plate elongate (about six times longer than broad), broadest starting at base of gonapophysis, then abruptly narrowing and bending at posterior one-fourth; lateral gonapophysis about four times longer than median diameter with prominent digging setae posteriorly; pregenitale broad, about four times broader than long, broadly produced at middle; spermatheca shaped as a broad C.

Material studied. 2 males, 13 females. May to September.

MEXICO. **Baja California**: Las Arrastras, 25.V.1989, R. Westcott (1f, FSCA). **Sonora**: Desemboque, 1.VIII.1953, B. Malkin (3f, CASC, FSCA).

U.S.A. **Arizona**: Mohawk Dunes, Yuma Co., 1.V.1988, (2f, FSCA); Portal, Cochise Co., 17.VI.1983, A. Raske (1f, FSCA); Wickenberg, Maricopa Co., 29.VIII.1959, R. Westcott (1m, 3f, FSCA); Wittman, Maricopa Co., 2.IX.1959, R. Westcott (1f, FSCA). **California**: 1.5 miles north Baker, dry lake bed, 1.IX.1991, R. Miller & L. Stange (1f, FSCA). **Texas**: Matador, Cottle Co., 20.VII.1983, E. Knudson (1m, 2f, FSCA).

Discussion. *Purenleon inscriptus* shares with *P. albovaria* in the inscriptus group by having forewing costal crossveins interconnected, especially at middle one third. Forewing is relatively shorter and broader (Fig. 23) than in *P. albovaria* and the wing markings are different with most crossveins margined with dark brown and the basal stripe along radial vein ends before halfway point to cubital fork.

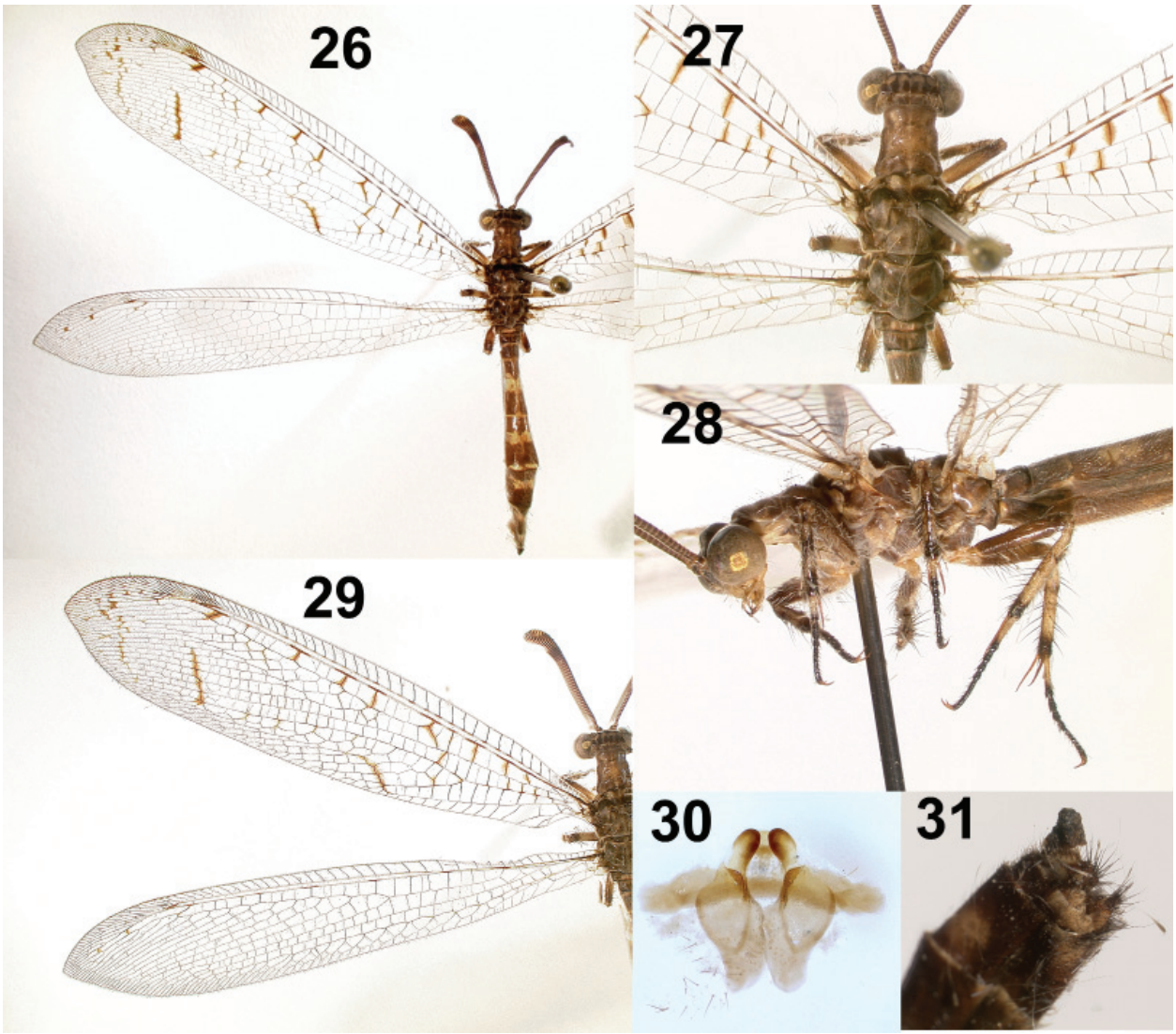
***Purenleon oaxacae* Miller and Stange, new species**
Figures 26–31, 140–141

Holotype male, 27 miles south Matías Romero, Oaxaca, Mexico, 3.X.1986, reared, Miller and Stange (FSCA).

Diagnosis. Pronotum longer than wide; basitarsus mostly pale brown except apically; forewing without serpentine dark brown stripe but with many scattered dark brown spots, costal cells not interconnected; paramere complex, non-sculptured, narrowing as small process (about twice as long as wide) toward gonarcus, below which a strongly sclerotized area, medially with short setae, below which abruptly expanded plate medially, posterior margin broadly rounded; female pregenitale short and triangular, about three times wider than long.

Holotype male. Length of body 24 mm, forewing 37 mm, hindwing 28 mm. **Coloration**: general coloration brown (Fig. 27, 28); face pale brown with broad dark brown band below and between antennal fossae; mouthparts mostly pale brown except dark brown on apex of distal palpomere of labius and maxilla; antenna brown with pale brown at apices of scape and flagellomeres, pedicel narrowly pale brown above, dark brown ventrally; forecoxa mostly pale brown; tarsi mostly black colored except for

pale brown basitarsus except apically; forewing without serpentine dark brown stripe but with many scattered dark brown spots; abdomen reddish brown with many pale brown areas mostly toward anterior end of tergites; pale brown on sternite IX and ectoproct. **Chaetotaxy**: pronotum with some long white lateral setae and few erect setae on disc; no erect bristles on mesonotum; thoracic pleura with many long white setae; forecoxa with many long white setae, especially posteriorly; leg bristles mostly black; forefemur and midfemur with many white, appressed setae lacking in hindfemur; midfemoral sense hair shorter than forefemoral sense hair which is about one-fourth as long as forefemur; abdomen with long white hair on sternite II, elsewhere on abdomen abundant but shorter. **Structure**: distal palpomere of labius weakly swollen; antenna moderately long and clavate with about 43 flagellomeres; basal flagellomeres about twice as long as wide, others broader than long; pronotum a little longer than wide measured along midline; hind basitarsus about seven times longer than median diameter, tibial spurs reach to apex of tarsomere II; foreleg basitarsus about four times longer than median diameter, tibial spurs reaching to apex of tarsomere II; forewing costal area gradually broadened near base, with few, usually no interconnected crossveins; **male genitalia** (Fig. 30) with nearly straight gonarcus which has small process toward apex; paramere complex, non-sculptured, narrowing as small process (about twice as long as wide) toward gonarcus, below which a strongly sclerotized area, medially with short setae, below which abruptly expanded plate medially, posterior margin broadly rounded.



Figures 26–31. *Purenleon oaxacae* Miller and Stange, adult. **26)** full dorsal view; **27)** head and thorax; **28)** lateral view; **29)** wings; **30)** male genitalia; **31)** female terminalia, lateral view.

Female. Fig. 31. About as described for male except female terminalia which has the ectoproct with short (nearly as long as wide) postventral lobe; posterior gonapophysis widely separated and arched near middle, about five times longer than median diameter, with longest setae laterally toward base; gonapophyseal plate long, narrowed apically; lateral gonapophysis about twice as long as broad with long, stout setate longer than gonapophysis; pregenitale narrow and transverse, about four times longer than wide with large circular area at middle; spermatheca short, circular C-shaped; posterior margin of sternite VIII with elongate setae submedially.

Larva. Fig. 140–141. **Coloration**: ventral head capsule with six dark brown spots, submedial pair anteriorly, two close marks submedially at middle and dark brown spot sublateral near posterior margin. **Chaetotaxy**: mandible dorsally with scattered small dolichasters; dorsal head capsule with scattered small dolichasters, without prominent sublateral row of large dolichasters posterior to lateral tentorial suture; ventral head capsule medially with blunt-ended un-expanded setae abdomen ventrally with terminal digging setae in groups of four with pair closest to midline much shorter than outer two setae. **Structure**: mandible about as long as length of ventral head capsule; distance between mandibular teeth 1n and 3 about equal to that between base and tooth 1; mesothoracic spiracle borne on tubercle about as long as wide; abdominal spiracles not raised, quite flat and obscure.

Variation. Length of body ranges from about 23 to 25 mm, forewing 24 to 30 mm, hindwing 23 to 29 mm.

Biology. The larvae are found in rain protected in cuts into the stony walls of canyons. They live in decomposing rock dust with their legs anchored to stones. They live in zones of medium filtered light.

Types. 12 males, 4 females. 1 larva. October to March

MEXICO. **Morelia**: Yautepec, 26.III.1962, L. Stange (2m, FSCA). **Oaxaca**: 23 miles south Matías Romero, 3.X.1986, **reared**, R. Miller & L. Stange (1 larva, 10m, 4f, FSCA).

Discussion. The southern Mexican *P. oaxacae* appears to be most closely related to *P. connexus* differing in wing maculation, shape of male genitalia and female terminalia (posterior gonapophysis much shorter and pregenitale larger in *P. oaxacae*).

Etymology. Named after the Mexican state of Oaxaca where the holotype was collected.

(tibialis group)

Diagnosis. Pronotum with or without several elongate white bristles at lateral margin; midtibia greatly swollen, much broader than foretibia; basitarsus of hindleg about two times longer than greatest diameter; pretarsal claws moderately long, those of foreleg at least as long as basitarsus; female sternite VIII with lateral lobe which is gonapophysis-like in *P. fernandezi* and broader than long in *P. tibialis*; female lateral gonapophyses widely separated; female spermatheca long tube, strongly bent apically.

Discussion. This group is distinctive by having the midtibia greatly swollen, asymmetrical and in having a small lateral lobe on posterior margin of female sternite VIII. Interestingly enough, *P. clavatus* and *P. andinus,* also found in Venezuela, are similar in having the midtibia somewhat more swollen than foretibia.

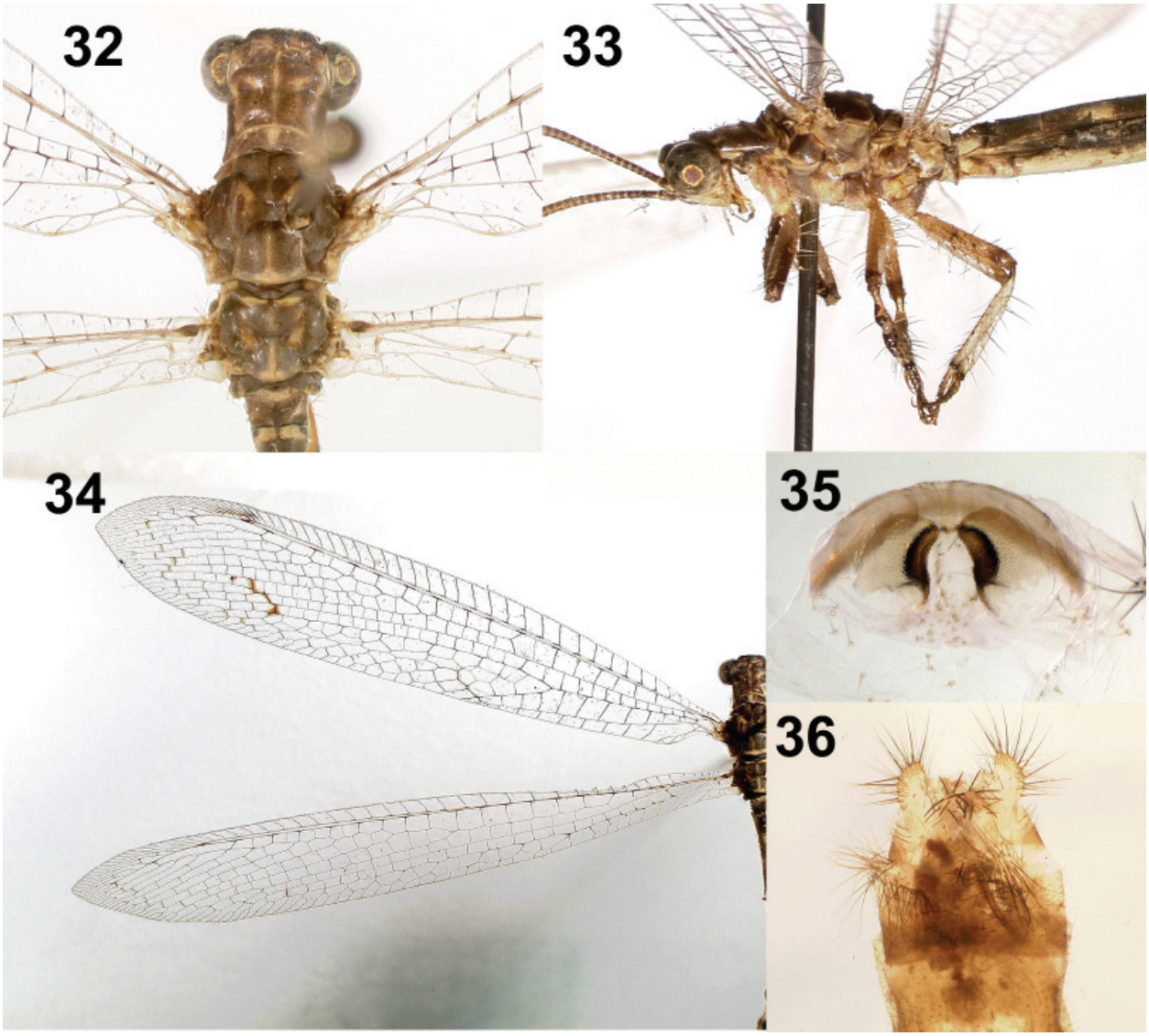
***Purenleon fernandezi* Miller and Stange, new species**
Figures 32–36

Holotype male, Bolivar, Venezuela, 450 m., 27.II.1983 (FSCA).

Diagnosis. Pronotum without elongate white bristles at lateral margin; paramere a broad plate, serrate medially, with strongly sclerotized medial margin with is narrowly recurved posteriorly and

narrowly produced laterally; female sternite VIII with long lobe (about twice as long as wide) laterally on posterior margin.

Holotype male. Length of body 24 mm, forewing and hindwing 29 mm. **Coloration**: mostly brown (Fig. 32); forefemur mostly dark brown, other femora mostly pale brown; foretibia and midtibia pale brown with large dark brown subbasal and subapical dark brown areas, hindtibia mostly pale brown (Fig. 33); tarsi mostly pale brown; wings with limited markings (Fig. 34); abdomen mostly dark brown dorsally with light brown spots near middle on most tergites, light brown ventrally. **Chaetotaxy**: pronotum (Fig. 32) without elongate white bristles at lateral margin; midfemoral sense about as long as femur, equal in length to forefemoral sense hair. **Structure**: pronotum broader than long; legs short, hindleg longer than others; tibial spurs extending to apex of tarsomere IV; forewing and hindwing same length, forewing costal area gradually broadened basally, costal cells at middle higher than wide, not interconnected; forewing vein CuP+1A runing to hind margin at level of origin of radial sector. **male genitalia** (Fig. 35) with broad, arched gonarcus with broad mediuncus that is broader than long; paramere a broad plate, serrate medially, with strongly sclerotized medial margin, which is narrowly recurved posteriorly and narrowly produced laterally.



Figures 32–36. *Purenleon fernandezi* Miller and Stange, adult. **32)** head and thorax; **33)** lateral view; **34)** wings; **35)** male genitalia; **36)** female terminalia, ventral view.

Female. Fig. 36. About as described for male except for female terminalia. Posterior margin of sternite VIII with gonapophysis like structure about twice as long as wide originating laterally; posterior gonapophyses widely separated, about four times longer than broad, strongly curved at middle with many elongate setae; gonapophyseal plate broad, about twice as long as wide; lateral gonapophyses widely separated, about twice as long as median diameter, with stout black setae nearly as long as gonapophysis; pregenitale longer than broad, median process broader than long and broadest apically; spermatheca elongate, tubular (at least 20 times longer than diameter), abruptly bent downward apically, apical end about six times longer than wide.

Types: 2 males, 2 females. February to April.

TRINIDAD. Mount Saint Benedict Monastery, 14.III.1994 (1m, FSCA).

VENEZUELA. **Bolivar**: 450 m., 27.II.1983 (1m, 1f, FSCA). **Sucre**: San Bonfacio, 12.IV.1964, Ronderos (1f, FSCA)

Discussion. *Purenleon fernandezi* shares with *P. tibialis* the greatly swollen midtibia. The lack of elongate white bristles at the lateral margin of the pronotum is one distinguishing character from *P. tibialis*. The lateral lobe from the posterior margin of sternite VIII is about twice as long as broad in *P. fernandezi* appearing like a gonapophysis whereas it is broader than long in *P. tibialis*.

Etymology. This species is named for the distinguished Venezuelan entomologist, Fernández Yépez.

***Purenleon tibialis* Miller and Stange, new species**
Figures 37–41

Holotype male, Cumaral, Meta, Colombia, 20.I.1959, Walz (FSCA).

Diagnosis. Pronotum with several elongate white bristles at lateral margin; paramere very large, nearly rectangular plate with weak scallop-like sculpture; female sternite VIII with short lobe (broader than long) laterally on posterior margin.

Holotype male. Length of body 24 mm; forewing and hindwing length 27 mm. **Coloration**: pronotum dorsally with broad submedial stripe, mostly dark brown laterally, pale brown area with several dark brown areas; pterothorax similar in pattern, mostly dark brown laterally and medially, submedian pale brown area with long brown stripe; scutelli dark brown with median pale brown line; forefemur and midfemur brown, hindtibia pale brown; foretibia and midtibia mostly dark brown, hindtibia mostly pale brown with several dark brown spots at setal bases and dark brown apex; tarsi mostly pale brown with dark brown apex, especially the basal tarsomere forewing suffusion limited, small dark brown spot near posterior margin where posterior fork of CuA reaches posterior vein, rhegmal dark brown area, dark brown area above stigma and scattered, minor dark brown spots in apical field. **Chaetotaxy**: pronotum with several elongate white bristles at lateral margin, at least subequal in length to those on forecoxa; forefemoral and midfemoral sense hair equal and long, about as long as tarsus and three fourths length of forefemur . **Structure**: pronotum about as long at midline as wide; legs short, hind leg longer than others; tibial spurs extending to apex of tarsomere IV; forewing and hindwing same length; forewing costal area moderately broadened at base, costal cells higher than wide at middle, not interconnected by crossveins; forewing vein CuP+1A running to hind margin at level of origin of radial sector. **male genitalia** (Fig. 40) with very broad, strongly arched gonarcus that is broadest at middle; paramere very large, nearly rectangular plate with weak scallop-like sculpture.

Female. Fig. 41. About as described for male except female terminalia. Posterior margin of sternite VIII produced sublaterally as broad lobe; ectoproct with postventral lobe about as long as broad with long apical setae; posterior gonapophyses widely separated, about six times longer than median diameter, bowed, with many long setae as long or longer than gonaophysis; gonapophyseal plate elongate, more than six times longer than broad; lateral gonapophyses widely separated, about four times longer than wide with digging setae concentrated toward apex; pregenitale small, triangular, strongly sclerotized, apex of triangle tooth-like; spermatheca long tube (at least ten times longer than median diameter),

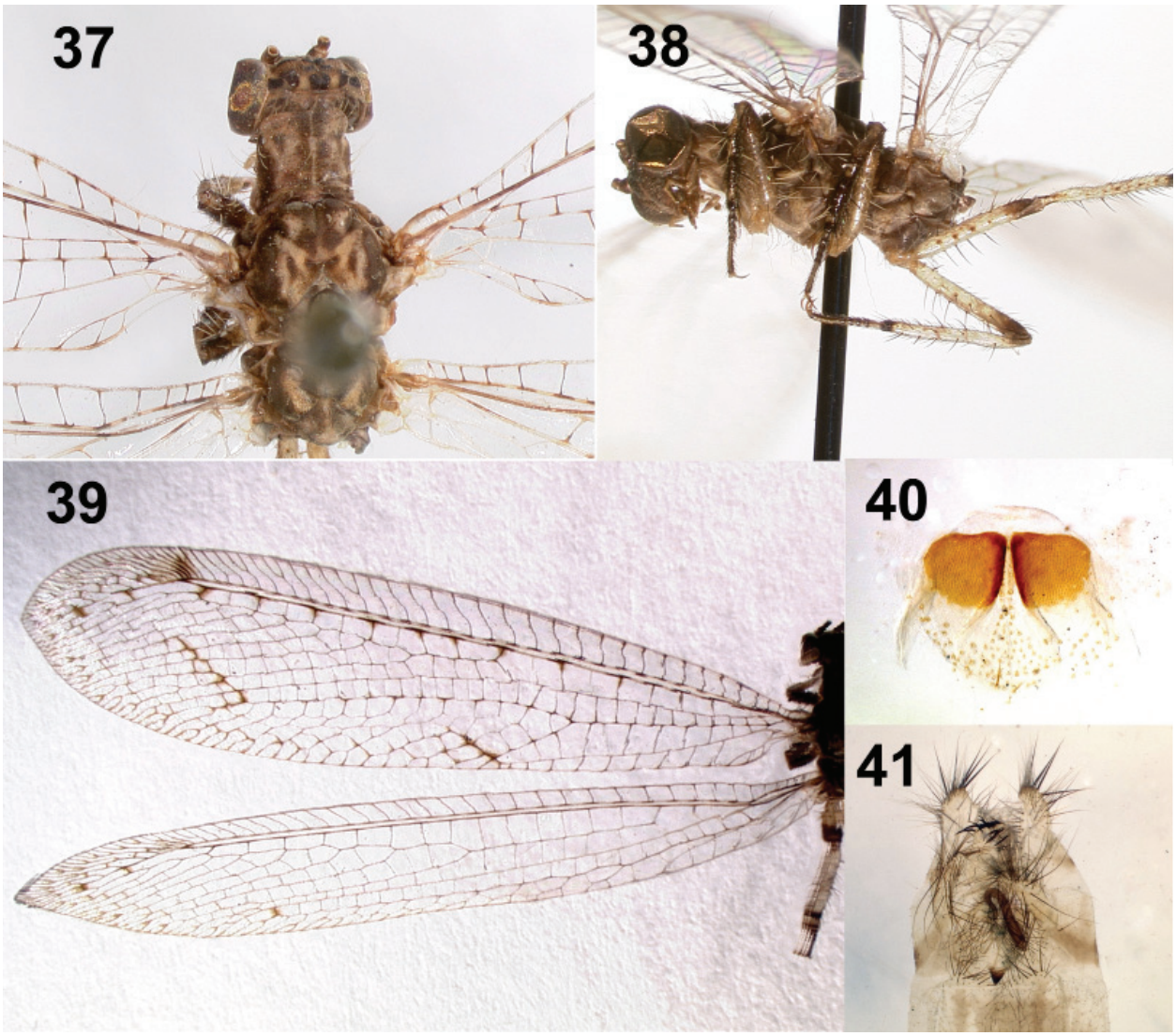
widest at base, strongly bent apically, then weakly bent again at apex, length of apical segment about six times longer than greatest diameter.

Variation. Forewing and hindwing length 24–38 mm.

Types. 1 male, 3 females. January.
COLOMBIA. **Meta**: Cumaral, 20.I.1959, Walz (1m, 3f, FSCA).

Discussion. *Purenleon tibialis* shares with *P. fernandezis* the greatly swollen midtibia. The presence of elongate white bristles at lateral margin is one distinguishing character from *P. fernandezi*. The male genitalia of *P. tibialis* is different from *P. fernandezi* as well as the small triangular pregenitale. The lateral lobe from the posterior margin of sternite VIII in the female is broader than long compared to the more elongate lobe of *P. fernandezi*.

Etymology. This species is named after the unusually enlarged midtibia.



Figures 37–41. *Purenleon tibialis* Miller and Stange, adult. **37)** head and thorax; **38)** lateral view; **39)** wings; **40)** male genitalia; **41)** female terminalia, ventral view.

(bistictus group)

Diagnosis. Pronotum with or without several elongate white bristles at lateral margin; midtibia weakly swollen, about equal in width to foretibia; basitarsus of hindleg at least 2.5 times longer than greatest diameter; pretarsal claws moderately long, those of foreleg at least as long as basitarsus; posterior margin of sternite VIII of female with short setae, not produced laterally; posterior gonapophyses usually widely separated, bases sometimes close together; lateral gonapophyses usually separated, sometimes fused, much longer than wide; spermatheca usually elongate and tubular, strongly bent or curved at apex.

Discussion. This is the largest group in the genus with most species in the West Indies and Mexico. Three species are found in northern South America. The more elongate pretarsal claws (about as long as hind basitarsus) separates the group from the inscriptus group and the weakly swollen midtibia (except for *P. andinus and P. clavatus*) separates it from the tibialis group which has the unusual character of lobe like projections laterally from the posterior margin of female sternite VIII. Chaetotaxy is important in separating the species with differences in the lengths of the midfemoral sense hair and the presence or absence of long white setae on the lateral margin of the pronotum. Caution should be used in the case of femoral sense hair which sometimes is broken.

***Purenleon adamsi* Miller and Stange, new species**
Figures 42–46

Holotype male, 3 miles east Izucar de Matamoras, Puebla, Mexico, 1.IV.1962, L. Stange (FSCA)

Diagnosis. Pronotum without long setae laterally; hindtibial spurs not reaching apex of tarsomere II; paramere complex, elongate, with well-developed dark sclerotized area at median edge extending toward gonarcus where it extends laterally to end of paramere plate; also, small dark brown sclerotized area extending laterally at middle; lower one third of paramere widened with small process laterally defined by a U-shaped area; female pregenitale (Fig. 46) a broad plate (about five times wider than long) with short median extension which is acuminate.

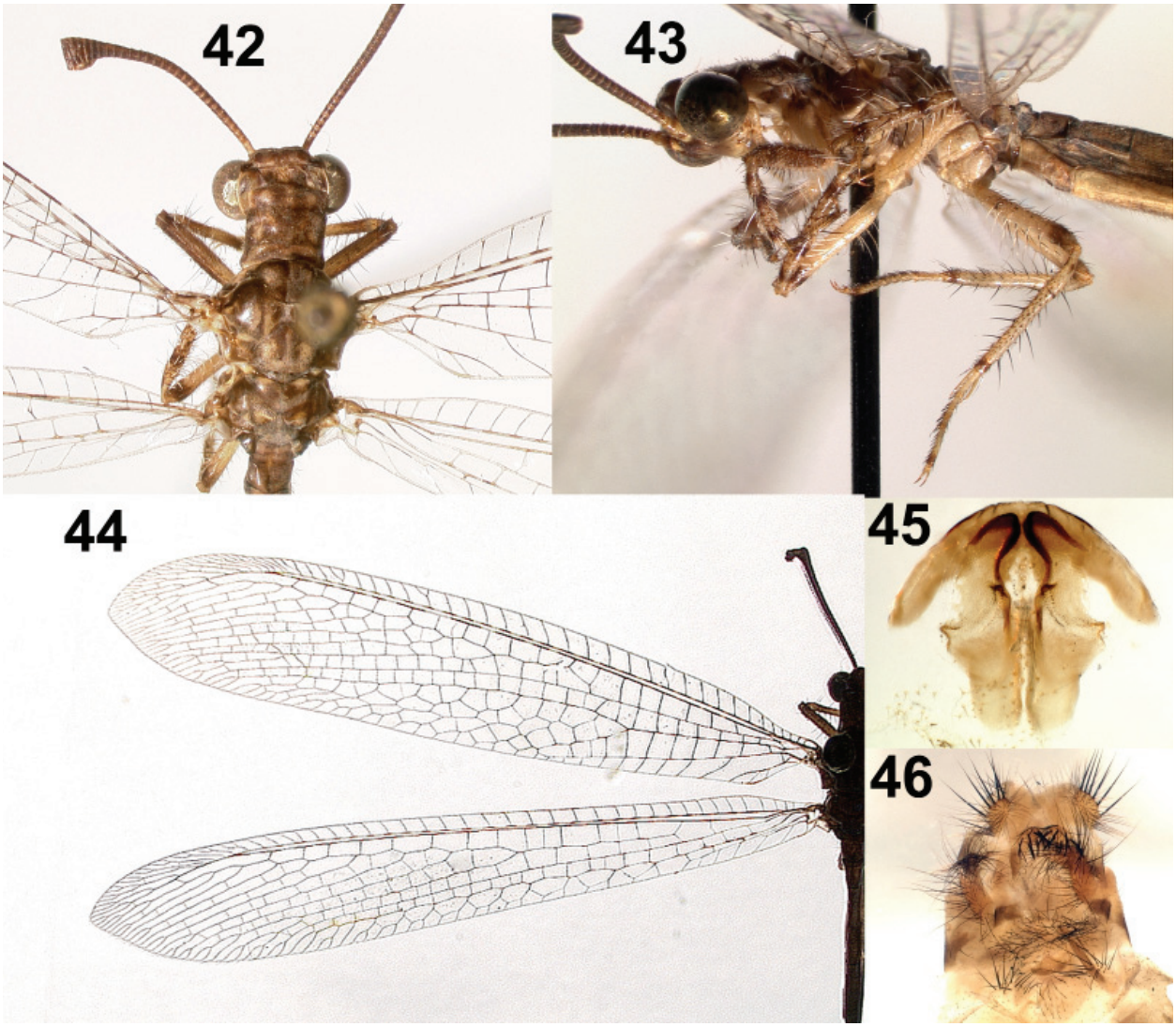
Holotype male. Length of forewing and hindwing about 26 mm. **Coloration**: face pale brown with dark brown band below and between antennal fossae; mouthparts mostly pale brown, distal palpomere of labius with dark brown; antenna mostly dark brown with narrow pale brown apices; pronotum and thorax (Fig. 42), mostly brown, incomplete light brown median line on pronotum, mostly complete on scutelli; forecoxa mostly pale brown except basally; forefemur mostly dark brown, other femora mostly pale brown; foretibia and midtibia pale brown with large dark brown area subbasally, at middle and subapically; hindtibia mostly pale brown with some dark spots at setal bases, inconspicuous dark brown area toward base and narrow apical dark brown spot (Fig. 43); tarsi mostly light brown with dark brown apex on distal tarsomere and at middle; wings (Fig. 44) without conspicuous suffusion; abdominal tergites mostly dark brown with large pale brown spot anteriorly, sternites mostly pale brown. **Chaetotaxy**: pronotum without elongate white bristles at lateral margin, sometimes shorter, usually black, setae present which are much shorter than those on forecoxa; forecoxa with some white bristles longer than coxal diameter, restricted to posterior margin; forefemur without long setae on exterior face but with short decumbent white and brown setae; femora mostly with white bristles, tibiae mostly with black bristles; midfemoral sense hair about one-half as long as forefemoral sense hair. **Structure**: distal palpomere of labius weakly swollen; antenna with about 40 flagellomeres, weakly clavate, flagellomere I longer than broad, rest broader than long; pronotum a little broader than long measured along midline; hind basitarsus about six times longer than wide; foreleg basitarsus about four times as long as as median diameter, foretibial spurs reaching to middle of tarsomere III; pretarsal claws shorter than forebasitarsus; forewing costal area expands fairly abruptly from near base, without interconnected crossveins; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; hindleg longer than others; hindtibial spurs not reaching apex of tarsomere II; **male genitalia** (Fig. 45) with strongly arched gonarcus, thick, widest at middle, no mediuncus; paramere complex with elongate, with well-developed dark sclerotized area at median

edge extending toward gonarcus where it extends laterally to end of paramere plate; also, small dark brown sclerotized area extending laterally at middle; lower one third of paramere widened with small process laterally defined by a U-shaped area.

Female. Fig. 46. About as described for male except terminalia with ectoproct with short posventral lobe which is much broader than long, slightly bent upward; posterior gonapophyses widely separated, about five times longer than median diameter, strongly curved inward at middle; lateral gonapophyses separated, about five times longer than greatest width with digging setae concentrated toward apex; pregenitale a broad plate (about five times wider than long) with short median extension which is acuminate; spermatheca a long tube (at least ten times longer than median diameter), strongly curved apically into relatively short apical segment.

Types. 1 male, 2 females. April to May.
MEXICO. **Chiapas**: 28 miles west Cintalapa, 6.V.1962. L. Stange (1f, FSCA). **Puebla**: 3 miles east Izucar de Matamoras, 1.IV.1962, L. Stange (1m, 2f, FSCA).

Discussion. The lack of long white setae laterally on the pronotum and presence of elongate white bristles on the forecoxa distinguishes this species in the group. Also, the short hindtibial spurs which



Figures 42–46. *Purenleon adamsi* Miller and Stange, adult. **42)** head and thorax; **43)** lateral view; **44)** wings; **45)** male genitalia; **46)** female terminalia, ventral view.

do not reach apex of tarsomere II is an important discriminating character. The male genitalia are diagnostic.

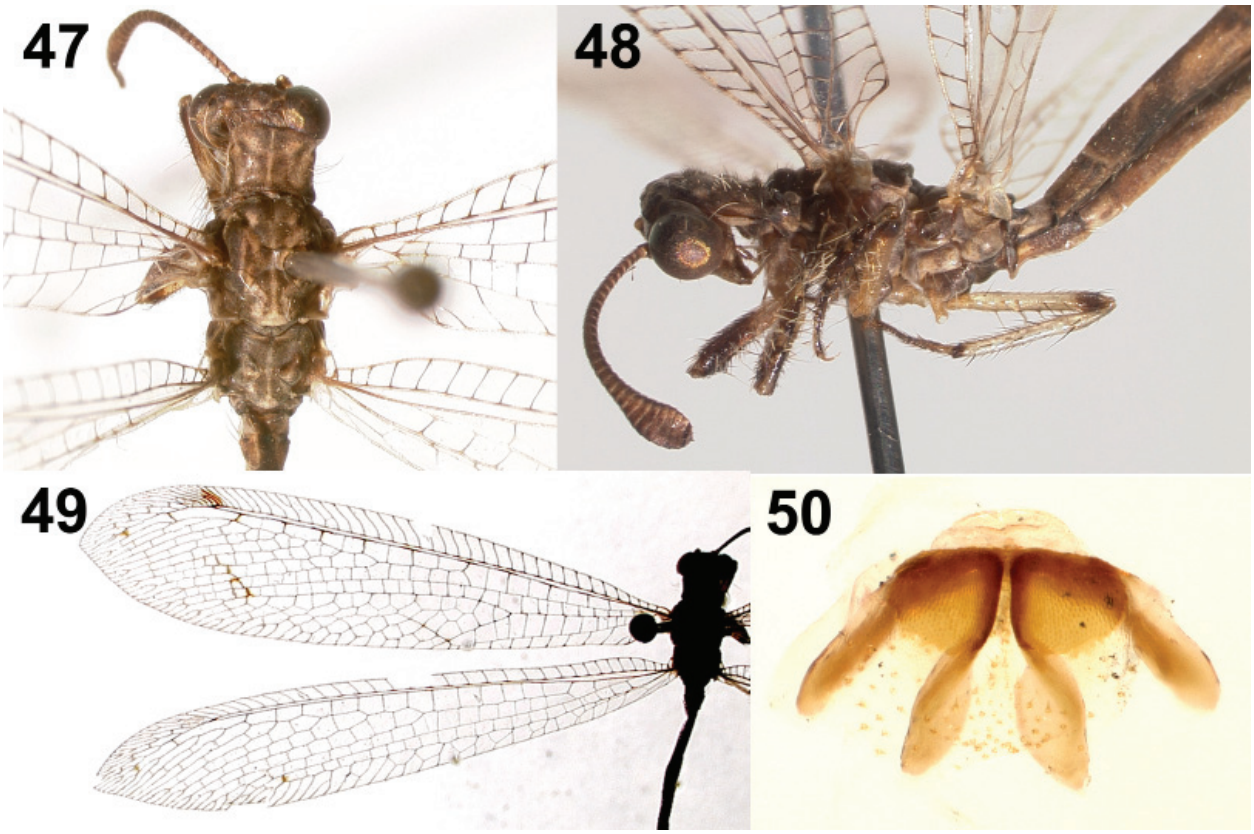
Etymology. This species is dedicated to Phillip Anthony Adams, noted American Neuropterist.

Purenleon andinus **Miller and Stange, new species**
Figures 47–50

Holotype male, 15 km. southeast Barinitas, Barinas, Venezuela, II.26.1986, R. Miller & L. Stange (FSCA).

Diagnosis. Pronotum with elongate white bristles laterally but without numerous elongate, erect bristles toward middle; midtibia slightly more swollen than foretibia; paramere in two continuous sections, section near gonarcus large, sub-rectangular, with scallop-like sculpture on surface, lower section twisted laterally, similar in shape to upper part, somewhat smaller, without projections or sculpture.

Holotype male. Length of body about 22 mm, forewing 21 mm, hindwing 22 mm. **Coloration**: face pale brown with dark brown band below and between antennal fosse, slightly emarginate ventrally at middle; pronotum and thorax as in Fig. 47, mostly brown with narrow median light brown stripe on pronotum and scutelli; bristles on foreleg and midleg mostly white, those on hindleg mostly black. **Chaetotaxy**: pronotum with elongate white bristles at lateral margin at least subequal in length to elongate white setae on forecoxa, without numerous elongate erect bristles toward middle; midfemoral sense hair about as long as midfemur, equal in length to forefemoral sense hair; leg bristles moderately developed, those of hindtibia less than two times longer than tibial diameter; thoracic pleura with moderate elongate white setae. **Structure**: antenna with about 30 flagellomeres, basal three or four



Figures 47–50. *Purenleon andinus* Miller and Stange, adult. **47)** head and thorax; **48)** lateral view; **49)** wings; **50)** male genitalia.

flagellomeres longer than wide, rest broader than wide; pronotum a little broader than long measured along midline;distal palpomere of labius weakly swollen; midtiibia slightly more swollen than foretibia; hind basitarsus about four times longer than median diameter, tibial spurs extend to tarsomere III; foreleg basitarsus about three times longer than median diameter, tibial spurs extending about to apex of tarsomere III; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector*;* **male genitalia** (Fig. 50) with broad gonarcus, strongly arched, with large broad mediuncus which is about five times broader than long; paramere in two continuous sections, section near gonarcus large, sub-rectangular, with scallop-like sculpture on surface, lower section twisted laterally, similar in shape to upper part, somewhat smaller, without projections or sculpture. **Female**. Unknown.

Types. 2 males, February to May.

VENEZUELA. **Barinas**: 15 km. southeast Barinitas, II.26.1986, R. Miller & L. Stange (2m, FSCA).

Discussion. This rarely collected species agrees with *P. clavatus* in having the midtibia slightly more swollen than the foretibia and this separates these two species from others in the group. The male genitalia are distinctive with the paramere in two continuous sections, section near gonarcus large, sub-rectangular, with scallop-like sculpture on surface, lower section twisted laterally, similar in shape to upper part, somewhat smaller, without projections or sculpture.

Etymology. Named for the Andes Mountains which lie to the west of the type locality.

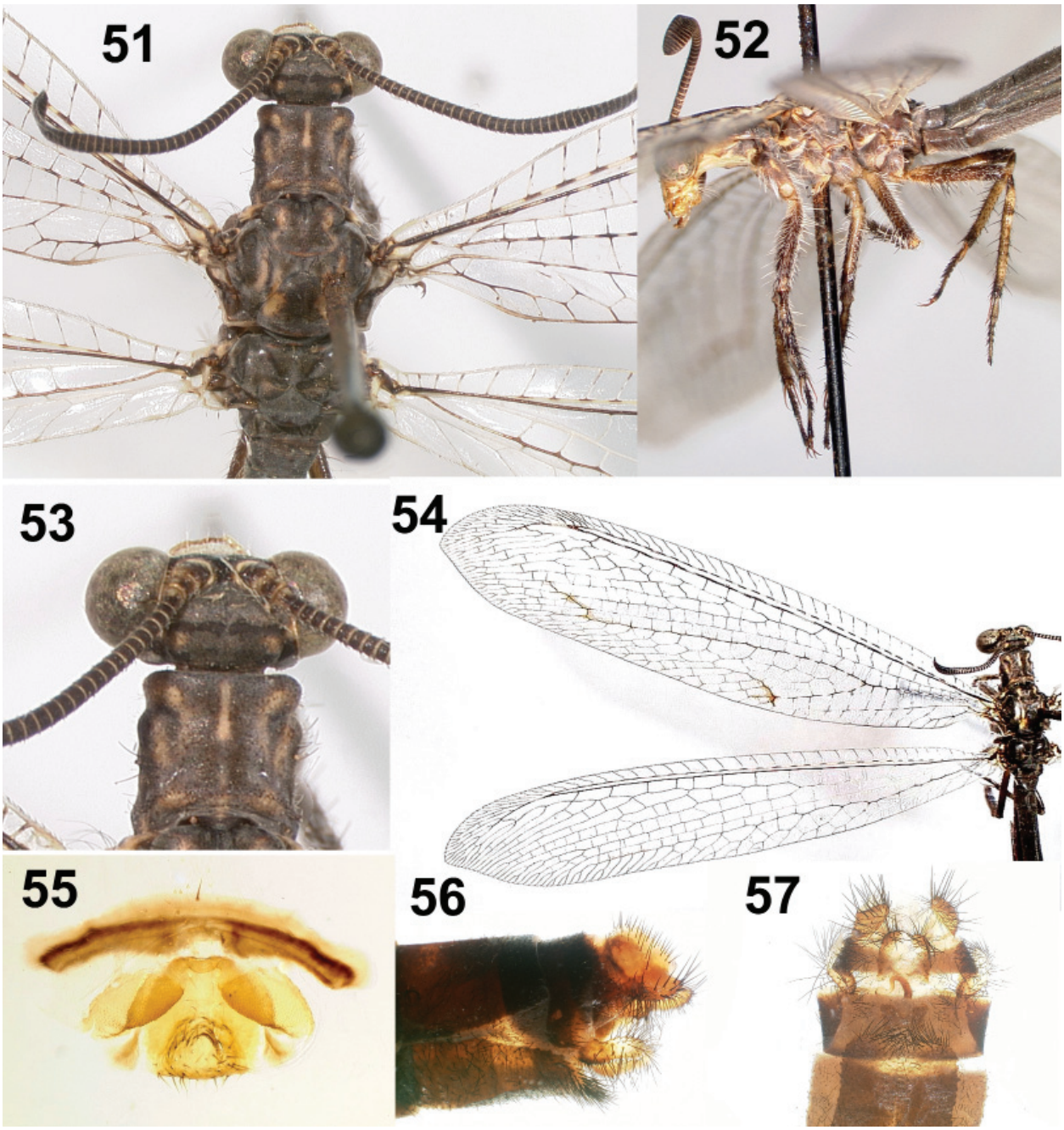
***Purenleon apache* Miller and Stange, new species**
Figures 51–57

Holotype male, Madera Canyon, Santa Rita Mts., Arizona, 1518 meters, III.25.1985, **reared**, Miller and Stange (FSCA).

Diagnosis. Hind margin of forewing not suffused; pronotum without elongate white bristles laterally; tibial spurs of hindleg reaching only a little beyond apex of basitarsus.

Holotype male: Length of body 25 mm; forewing 32 mm; hindwing 31 mm. **Coloration**: face pale brown with narrow dark brown band below and between fossae; mouthparts mostly pale, distal palpomere of labius dark brown, apex of distal maxillary palpomere with some dark brown; apex of mandible dark brown; antenna mostly dark brown, scape pale brown distally, flagellomere I with long white pale brown area on anterior face, other flagellomeres with narrow pale brown apices; hind margin of forewing not dark brown suffused from near base to well beyond midpoint; abdominal tergites and sternites dark brown. **Chaetotaxy**: pronotum without elongate white bristles; forecoxa with elongate white bristles longer than coxal diameter on lateral face in addition to elongate white setae on posterior margin; forefemur with numerous long setae on exterior face; forecoxa, forefemur and thoracic pleura with long white setae not swollen distally; midfemoral sense hair same length as forefemoral sense hair, about one half length of forefemur. **Structure**: pronotum a little broader than long measured along midline; hind basitarsus about five times longer than median diameter; tibial spurs of hindleg extend to apex of tarsomere II; forebasitarsus about four times longer than median diameter; foretibial spurs extend to apex of tarsomere III; forewing costal area expands gradually from base, without interconnected crossveins; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; hindlegs longer than others; tibial spurs of hindleg reaching only a little beyond apex of basitarsus; **male genitalia** (Fig. 55) with thick, weakly arched gonarcus which is emarginate at middle, no mediuncus; paramere very complex with short narrow (about twice as long as wide) process toward gonarcus united with similar process from other paramere by a broad (three times as wide as long), curved, mediuncus-like sclerite; below this a broadly triangular (about three times wider than long) plate with scallop-like sculpture which curves under and expands into bigger plate which curves again below into small process (about as broad as long) toward base; genital membrane below parameres unusually large, circular with many prominent setae especially dorsally.

Female (Fig. 56, 57): about as described for male except terminalia with ectoproct with postventral lobe about as broad as long, with long, apical setae; posterior gonapophyses well separated, about six times longer than median diameter, bowed; gonapophyseal plate narrow, mostly straight, about six times longer than wide; lateral gonapophyses widely separated, about five times longer than width, without digging setae but with elongate setae; pregenitale prominent, broad V-shaped sclerite, lateral process about one-half as long as pregenitale width; spermatheca at least seven times longer than greatest diameter, weakly curved, then strongly bent at about one-fourth apical distance, then weakly recurved apically.



Figures 51–57. *Purenleon apache* Miller and Stange, adult. **51)** head and thorax; **52)** lateral view; **53)** vertex; **54)** wings; **55)** male genitalia; **56)** female terminalia, lateral view; **57)** female terminalia, ventral view.

Larva: **Chaetotaxy**: dorsal surface of head capsule with prominent submedial row of large dolichasters posterior to lateral tentorial suture; ventral head capsule with elongate, highly expanded flat-ended setae; dorsal abdominal segments IV–VIII with and ventral head capsule without bead-like setae; dorsal abdominal segments IV–VIII with many simple setae and some straight-sided dolichasters. **Structure**: mandible longer than head capsule, distance between teeth 1 and 3 about equal to that between base and tooth; mesothoracic spiracle borne on tubercle about as long as wide; abdominal spiracles shorter than high, shorter than dorsal abdominal spiracle; spiracles IV–VI without nipples.

Biology. Larvae were found in small rock overhangs in dark decomposed rock material thinly covered with small leaves. They were in rain protected locations. *Purenleon apache* larvae have more debris cemented to their heads than larvae of *P. aztecus* but similar to the larva of *P. toltecus*. This debris is difficult to remove.

Types. 2 males, 3 females, June to July.

MEXICO. **Sonora**: 7 miles south Alamos, 20.III.1985, Miller and Stange **reared** (1f, FSCA).

U.S.A. **Arizona**: Madera Canyon, Santa Rita Mts., 4980', 9.VII.1963, Vesterby (1m, FSCA); Madera Canyon, 25.III.1985, Miller and Stange **reared** (1m, FSCA); 5 miles west Portal, Chiricahua Mts., 8.VI.1956, Stratham (2f, FSCA).

Discussion. *Purenleon apache* is related to *P. toltecus* and *P. aztecus* in having the forefemur with numerous long setae on exterior face and the forecoxa has numerous elongate and often distally swollen setae on lateral face in addition to elongate white setae on posterior margin. *Purenleon apache* differs from *P. aztecus* in not having the hind margin of forewing suffused and the tibial spurs reach near to apex of tarsomere II. From *P. toltecus*, the absence of elongate white setae laterally on the pronotum, those of the lateral face of forecoxa not swollen distally and in having the forewing costal area higher than wide are distinguishing characters. The larva of *P. apache* agrees with *P. aztecus* and *P. toltecus* in having the dorsal surface of the head capsule with a prominent sublateral row of large dolichasters posterior to the lateral tentorial suture. Also, the abdominal spiracles are easily visible, although shorter than or equal to basal width in these three species. Characters for the larval key were taken from larval skins in cocoons since no preserved larvae are available.

Etymology. Named for the Apachean people which lived in the habitat area of this species.

Purenleon aztecus Miller and Stange, new species

Figures 58–62, 142–145

Holotype male, Ixtapontango, Mexico, III.10.1985, **reared**, R. Miller & L. Stange (FSCA)

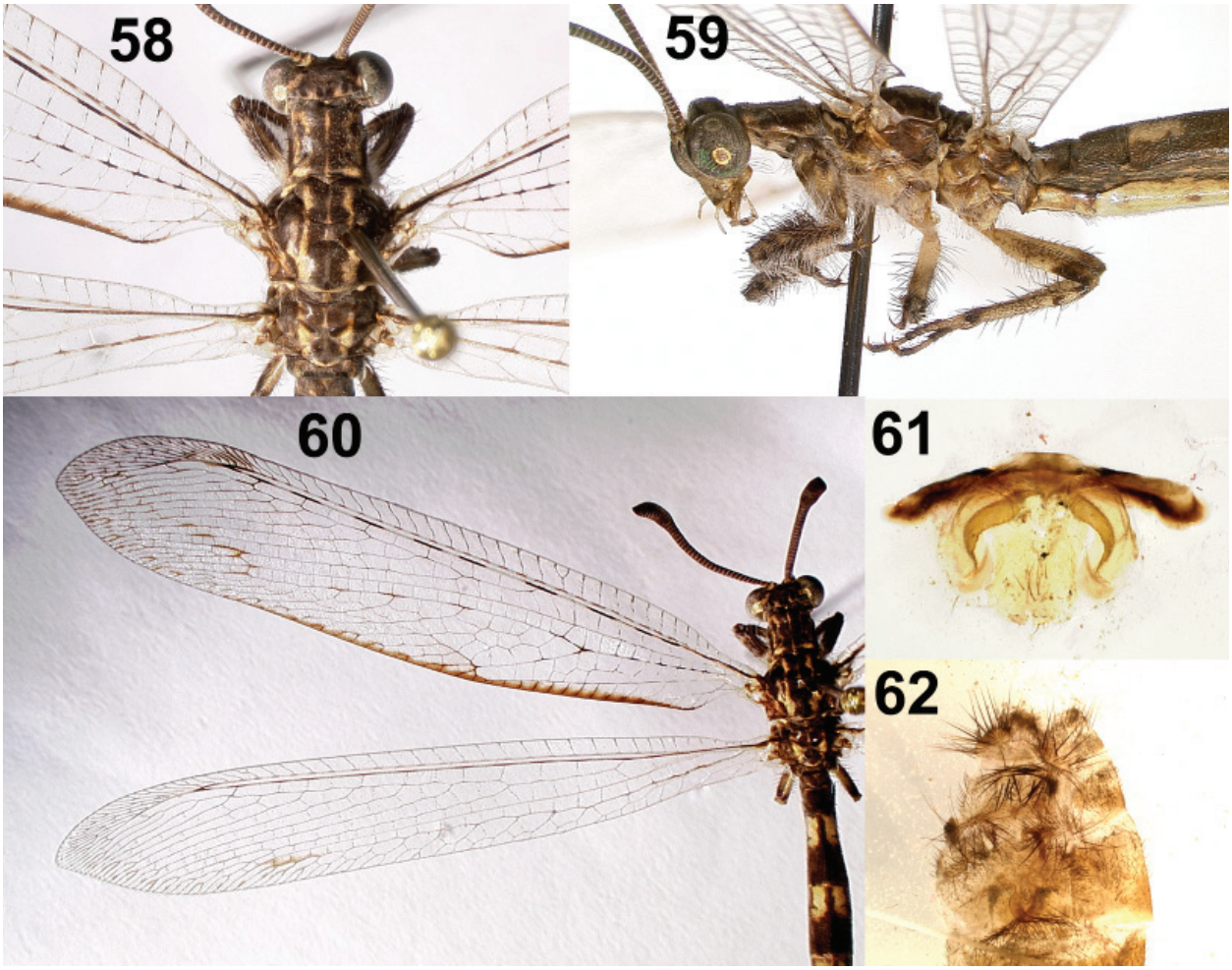
Diagnosis. Hind margin of forewing suffused from near base to well beyond midpoint of wing; pronotum with elongate white bristles laterally; tibial spurs of hindleg reach near apex of tarsomere II.

Holotype male. Length of body 25 mm, forewing and hindwing about 27 mm. **Coloration**: face mostly pale brown except narrow dark brown band below and between antennal fossae; mouthparts mostly pale brown except distally; antenna with scape mostly pale brown except basally; flagellomeres dark brown except pale brown apices; hind margin of forewing from near base to well beyond midpoint of wing dark brown suffused (Fig. 60); abdomen dark brown with pale brown areas apically and laterally on tergites III–VII; ectoproct and tergite IX pale brown; sternites mostly pale brown in anterior one-half, dark brown posteriorly. **Chaetotaxy**: pronotum with elongate white, distally swollen setae at lateral margin, sometimes shorter, usually black setae also present; thoracic pleura with many long, white, distally swollen setae; forecoxa with elongate white, distally swollen bristles longer than coxal diameter on lateral face in addition to elongate white setae on posterior margin; forefemur with numerous white, distally swollen long setae on exterior face in addition to a dense group of dark brown setae; midfemoral sense hair shorter than forefemoral sense hair, about three-fourths as long as femur. **Structure**: antenna with about 45 flagellomeres, weak clavus; flagellomere I longer than broad, rest

broader than long; pronotum a little broader than long measured along midline; hindleg longer than others; hind basitarsus about five times longer than median diameter; tibial spur reaching to tarsomere II; foreleg basitarsus about 2.5 times longer than median diameter, spur reaching to tarsomere III; forewing costal area (Fig. 58) expands abruptly from base, without interconnected crossveins, with cells near middle higher than wide; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; **male genitalia** (Fig. 61) with weakly arched gonarcus, mediuncus broad; paramere simple, unsculptured plate about five times longer than wide, slightly curved with sclerotized broad band medially narrowing posteriorly.

Female (Fig. 62): about as described for male except for terminalia with ectoproct with broad postventral lobe; posterior gonapophyses broadly separated, about six times longer than median width, strongly bowed at middle; gonapophyseal plate elongate (more than six times longer than broad), broadest starting at base of gonapophysis, then abruptly narrowing and bending at posterior one-fourth; lateral gonapophyses broadly separated, short, about twice as long as wide, narrowing a little anteriorly , with strong digging setae that are longer than gonapophysis; pregenitale consists of two mostly separated and very broad (about four times broader than long) plates, narrowly joined at base, with very narrow pointed apex; spermatheca about nine times longer than wide, nearly completely straight except strongly recurved at apex.

Larva (Fig. 142–145): **Coloration**: mandible light brown; head capsule dorsally pale orange-brown; ventral head capsule with four longitudinal dark brown stripes. **Chaetotaxy**: dorsal surface of head capsule with prominent submedial row of large dolichasters posterior to lateral tentorial suture; ven-



Figures 58–62. *Purenleon aztecus* Miller and Stange, adult. **58)** head and thorax; **59)** lateral view; **60)** wings; **61)** male genitalia; **62)** female terminalia, ventral view.

tral surface of head capsule with elongate, unexpanded, flat-ended setae; dorsal surface of abdominal segments IV–VII with many simple setae and some straight-sided dolichasters. **Structure**: mandible longer than head capsule, distance between teeth 1 and 3 about equal to that between base and tooth 1, without dolichasters but with short setae; head capsule tapers evenly toward posterior of head capsule without flaring out posterior to eye stalk bases; abdominal spiracles visible but shorter than basal width of tubercle.

Variation. Length of body ranges from 23 to 29 mm, forewing and hindwing 27 to 34 mm.

Biology. The larvae of this species inhabit small caves and rock overhang habitats with a mixture of somewhat coarse and fine loose earth and organic matter lying thinly over a hard base. This excludes species requiring a finer material. At Ixtapantango, *P. aztecus* larvae co-exist with *P. toltecus* larvae in the same small caves and overhangs. During collecting in the late afternoon it was observed that larvae with paler heads and darker mandibles (*P. aztecus*) occurred only in the dark back of the cave with low ceiling, low light, and lower temperatures. Larvae with darker heads and paler mandibles (*P. toltecus*) occurred only in the rain protected, warmer, and better lighted areas exposed to the late afternooon sun. *Purenleon aztecus* has less debris strongly attached to their head capsules than does *P. toltecus*. Most of the specimens came from one small overhang with a horizontal depth of about a meter. The two species were not competing for living space or resources. The *P. aztecus* larvae were, however, co-existing in the same habitat in the best cave with a single larva of *P. abruptus*. The habitat preferences of *P. aztecus* and *P. toltecus* remained constant in other localities where they did not co-exist. *Purenleon aztecus* is a leg anchoring species.

Types: 4 males, 4 females. 2 larvae. March, September.
MEXICO. **Mexico**: Ixtapontango, III.10.1985, **reared**, R. Miller & L. Stange (1 larva, 4m, 3f, FSCA). **Michoacan**: 6 km. south Santa Tome, IX.30.1986, **reared**, R. Miller & L. Stange (1 larva. 1f, FSCA).

Discussion. *Purenleon aztecus* is related to *P. toltecus* and *P. apache* in having the forefemur with numerous long setae on exterior face and the forecoxa has numerous elongate setae on lateral face in addition to elongate white setae on posterior margin *P. aztecus* differs from both *P. toltecus* and *P. apache* in having the hind margin of forewing from near base to well beyond midpoint of wing dark brown suffused (Fig. 60) and the tibial spurs of hindleg reach only a little beyond apex of basitarsus; also the thoracic pleura of *P. aztecus* and *P. toltecus* have numerous, distally swollen white setae which is diagnostic in the group The larva agrees with *P. apache* and *P. toltecus* in having having a prominent sublateral row of dolichasters posterior to the lateral tentorial suture on the dorsal head capsule. Also, the abdominal spiracles are easily visible, although shorter than or equal to basal width in these three species.

Etymology. This species is named after the Aztec people of Mexico.

***Purenleon bistictus* (Hagen)**
Figures 63–67, 146–147

Myrmeleon bistictus Hagen 1861: 235. **Holotype**, Cuba, Poey (not located)
=*Psammoleon bictichus* Wolcott 1950: 91 (subsequent misspelling)

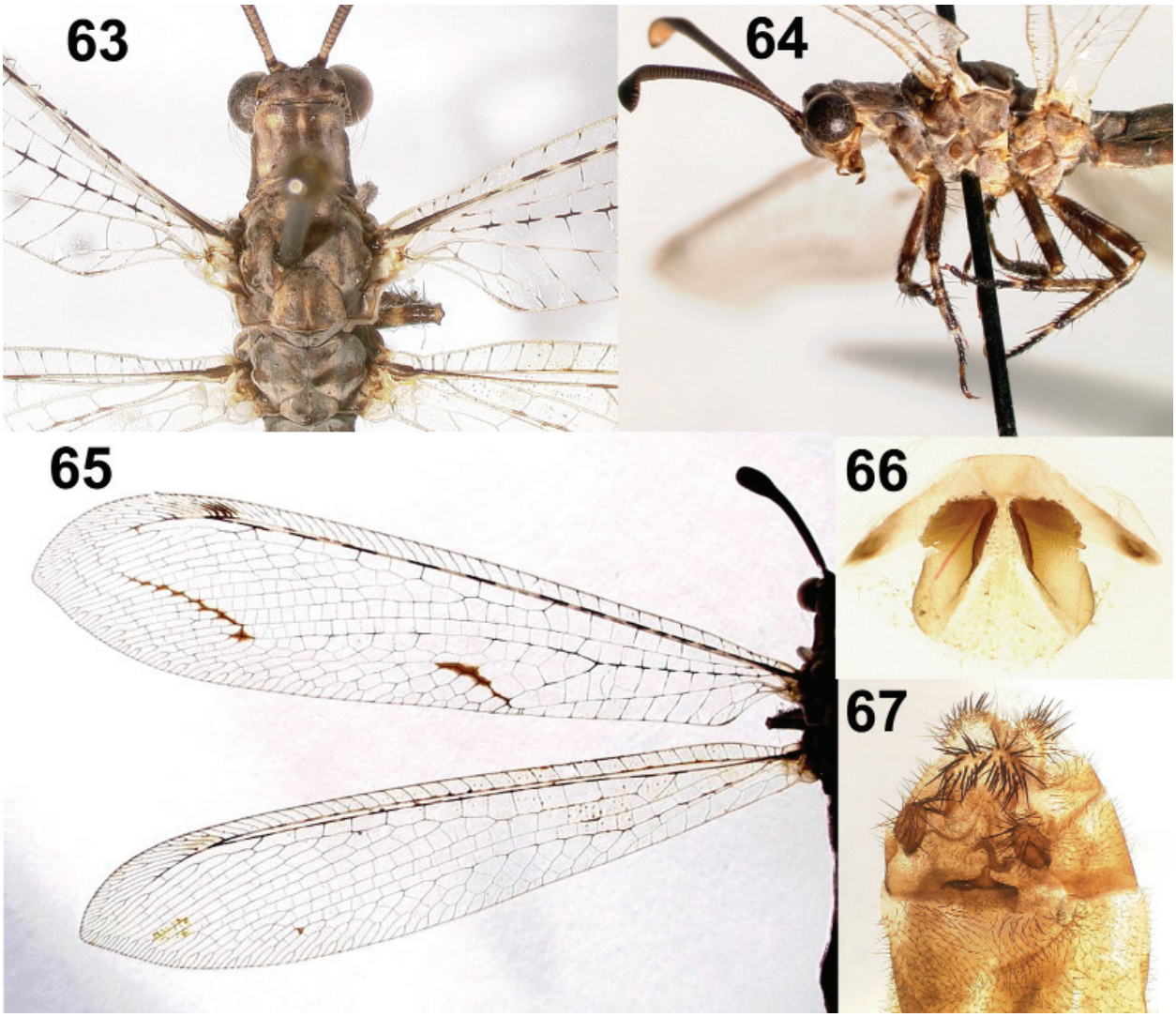
Taxonomy. Navás 1921a: 117 (as *Nelees*); Banks 1927: 61 (as *Psammoleon*); Stange 2002: 286 (in *Purenleon*).

Further description. Gundlach 1886: 201; Banks 1927: 61, Fig. 33 (female terminalia); Smith 1931: 815, Fig. 14 (wings); Alayo 1968: 67, Fig. 24 (wings), Plate V, Fig. 2 (head; nota); Plate VII, Fig. 1 (female terminalia); Miller and Stange 2011: 18, Fig. 15 (color photo adult).

Biology. Miller and Stange 2011: 19, Fig. 30, 31 (color photos larva).

Distribution. U.S.A. (Florida) (Banks 1927: 62; Stange 1980: 3); Cayman Islands (Banks 1941c: 176; Kirby and Askew 1979: 125); Cuba (Alayo 1968: 66); Haiti (Smith 1931: 815); Mexico (Stange 1970: 24); Puerto Rico (Wolcott 1950: 91)

Diagnosis. Length of body 25–29 mm, forewing length 28–32 mm, hindwing length 26 to 30 mm. **Coloration**: face pale brown with interantennal dark brown mark large, extending well below antennae and becomes sericeous above antennae; vertex markings black; antenna weakly annulated with brown; pronotum (Fig. 63) dull black, sericeous, with pale brown median line and broader pale brown streaks on each side; rest of notum dull black with pale brown areas especially at middle; legs (Fig. 64) predominantly black, forefemur pale brown in front, midfemur and hindfemur with pale band or spot beyond middle; tibiae pale brown at base and with pale brown spot or streak on outerside; tarsi mostly wholly black; abdomen dull black, sericeous, each dorsal tergite with long pale brown streak on either side, sometimes divided into two spots; wings (Fig. 65) with oblique streak from anal area and from rhegma; pterostigma with dark brown spot at base; venation dark brown and pale brown in streaks, mostly dark brown at junctures with crossveins. **Chaetotaxy**: pronotum with elongate white bristles



Figures 63–67. *Purenleon bistictus* (Hagen), adult. **63)** head and thorax; **64)** lateral view; **65)** wings; **66)** male genitalia; **67)** female terminalia, ventral view.

at lateral margin, at least subequal in length to those on forecoxa; midfemoral sense hair about one half length of forefemoral sense hair; femora and tibia with white setae and many black setae; abdomen with mostly white setae; posterior margin of sternite VIII with short setae. **Structure**: pronotum a little broader than long measured along midline; basitarsus of hindleg over five times longer than greatest diameter, nearly twice as long as pretarsal claw; hindtibial spurs about equal to l.5 times as long as basitarsus; forewing costal area expands gradually from base with only one series of cells, narrow gradually at base, costal cells wider than long at middle; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point below origin of radial sector; abdominal tergites with numerous scale-like sculpturing; **male genitalia** (Fig. 66) with gonarcus relatively broad and broadly arched, with mediuncus broad, longer than median diameter; paramere a broad plate, about four times longer than broad with narrow sclerotized lip on median margin at basal one-half; **female terminalia** (Fig. 67) with ectoproct with short postventral lobe; posterior gonapophyses well separated, short and broad, about twice as long as wide; gonapophyseal plate narrow and long (over 13 times longer than diameter); lateral gonapophyses well separated, about three times as long as broad with many stout black digging setae on apical one-half; pregenitale with transverse bar about eight times wider than long, narrowing laterally, with median projection about 2.5 times longer than median width; spermatheca elongate and sigmoid.

Larva. Fig. 146–147. Ventral surface of head capsule with broadly separated dark brown spots near posterior one-fifth, dark brown spots closely separated at about middle, and large pair of brown spots near anterior margin; mandible with basal tooth close to base, distance between teeth 1 and 3 much longer than that between tooth 1 and base, distal tooth as long as or longer than middle tooth, all teeth parallel and usually equidistant, without dolichasters; dorsal head capsule with short, tubular setae that are open ended apically; mesothoracic spiracle borne on tubercle that is about twice as long as median diameter, pointed apically; abdominal spiracle VIII borne on tubercle about as long as wide, without dolichasters, longer than other spiracles.

Biology. *Purenleon bistictus* larvae live rather in the open on coastal sand dunes and beaches. They feed when temperatures are cool enough, and thermoregulate by digging deep in the sand or going beneath small bushes during the heat of the day. Early morning is a good time to find their trails in the open sand before it gets too hot. When it rains, they wait for the sand to dry out before digging. The larvae do not anchor their legs.

Variation. Specimens examined from the Cayman Islands have the lateral white setae on the pronotum shorter than normal.

Material studied. 45 males, 116 females. 6 larvae. May to November.

BAHAMAS. **Eleuthera**: Rainbow Bay, 15.V.1984. J.Wiley (16 m, 80f, FSCA). **Long Island**: 1.VII.1994 (1f, FSCA). **North Bimini Island**: 12.VI.1950, M. Cazier & Ringe (3m, 3f, AMNH, FSCA); South Bimini Island: no further data, VI.1951, M. Cazier (6m, 15f, AMNH; USNM).

CAYMAN ISLANDS. **Cayman Brac**: The Creek, 4.X.1996, E. Dilbert (1f, FSCA); Bight Road at Maj. Douglas Rd., 23.V.2009, M. Thomas & R. Turnbow (1m, FSCA). **Little Cayman Island**: 3 km. south Spot Bay, 8.VII.2013, M. Thomas, at blacklight (2m, 3f, FSCA).

CUBA. **La Habana**: Jibacoa (IZAC); Playa del Chivo (IZAC). **Oriente**: Daiquiri (IZAC).

GUANA ISLAND. 13.VII.1986, S. Miller (1f, FSCA).

HAITI. no further data (1f, MCZC).

MEXICO. **Quintana Roo**: Cancun, 4.V.1976, Pletsch (1f, FSCA); Puerto Sam, 21.XI.1981, **reared**, L. Stange & J. Lotti (1 larva, FSCA). **Yucatan**: Alacran Reef, 1.VII.1961. F. Fosberg (1f, FSCA).

PUERTO RICO. **Mona Island**: Camp Correy, 18.X.1955, W. Cross (1f, FSCA).

ST. KITTS. Major's Bay, 3.IX.1991, R. Woodruff, at light (2m, 7f, FSCA).

U.S.A. **Florida**: Bahia Honda Key, Monroe Co., 29.III.1987, **reared**, L. Stange (5 larvae, 6m, 2f, FSCA); Bush Key, Dry Tortugas, 1.VII.1962, H. Weems (1m, 2f, FSCA); Dry Loggerhead Key, Dry Tortugas, 11.VI.1962, H. Weems (5m, 8f, FSCA); Garden Key, Dry Tortugas, 31.VIII.1962, H. Weems (4m, 3f, FSCA); Key West, Monroe Co., 26.V.1978, L. Stange (1f, FSCA); Upper Matecumbre Key, Monroe Co., 30.VI (1m, FSCA).

Discussion. This transcaribbean species has been found at lights near coastal areas. This species appears closely related to *P. parallelus* which also inhabits coastal areas including the western side of Mexico and Central America.. Both species agree in having several elongate white bristles at the lateral margin of the pronotum and also in having the midfemoral sense hair much shorter than the forefemoral sense hair. These species differ in wing venation with *P. parallelus* having CuP+1A of the forewing running parallel to posterior fork of CuA for a long distance beyond origin of radial sector (CuP+1A runs to posterior vein near level of origin of radial sector in *P. bistictus*). Also, the basitarsus of the hindleg is longer in *P. bistictus* (about five times longer than greatest diameter) than in *P. parallelus*.

***Purenleon cavei* Miller and Stange, new species**
Figures 68–72, 148–151

Holotype male, Playa Perú, Atlantida, Honduras, V.4.1993, R. Miller & L. Stange (FSCA).

Diagnosis. Pronotum without elongate white bristles at lateral margin, sometimes shorter, often black bristles present which are much shorter than those on forecoxa with some white bristles longer than coxal diameter, restricted to posterior margin; scutum without elongate, white bristles; forefemur without long setae on exterior face; hindtibia with some elongate black bristles longer than tibial spurs; hindtibial spurs reach beyond tarsomere II; midfemoral sense hair about same length as forefemoral sense hair.

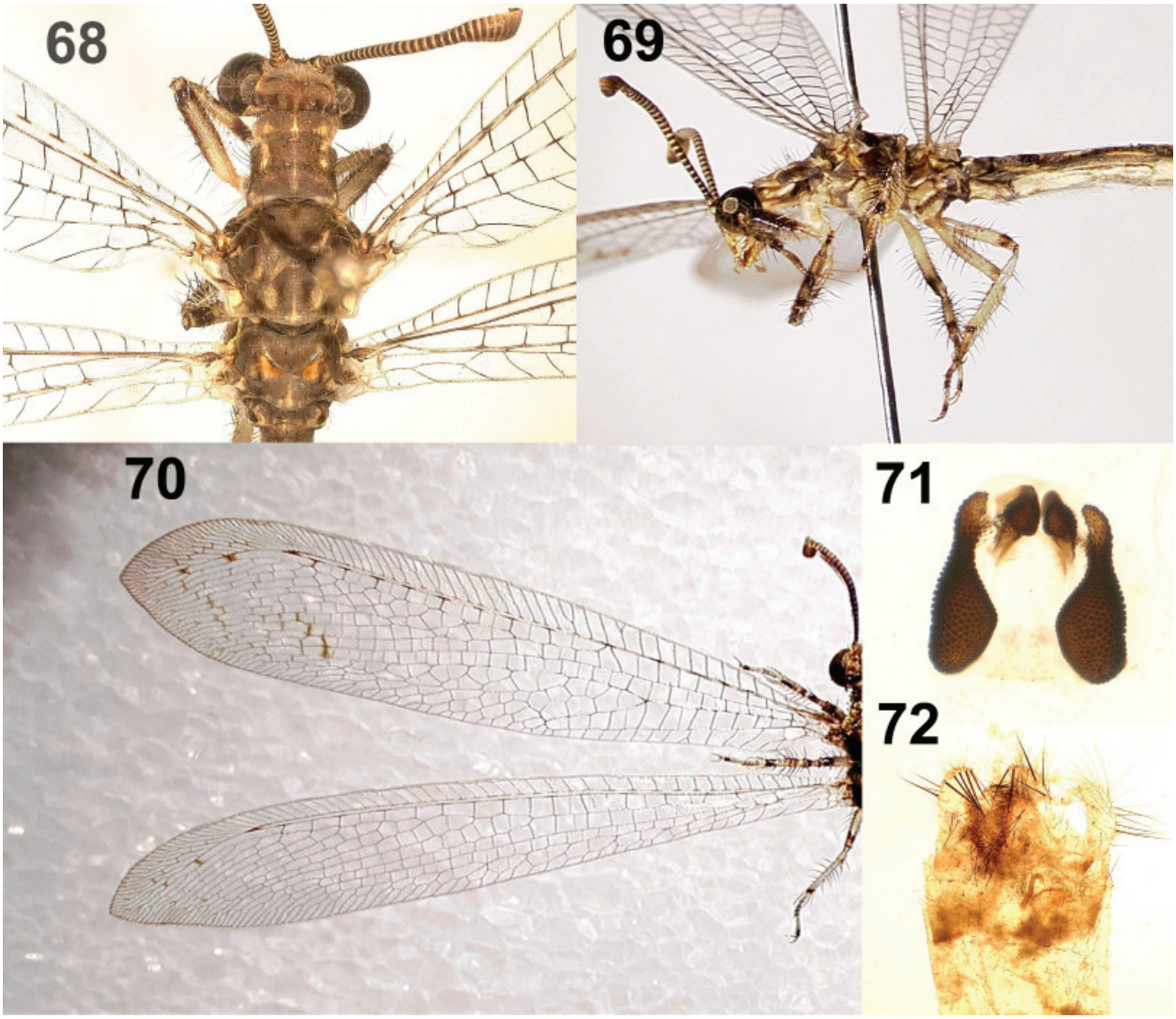
Holotype male. Length of body to tergite IX 22 mm, forewing and hindwing about 25 mm. **Coloration**: head with vertex scars (two rows of four scars each) dark brown; no defined epicranial mark; broad dark brown interantennal band which extends slightly below; frons and clypeus pale brown; postgena dark brown; mouthparts pale brown except dark brown cardo and darker sensorial area on distal labial palpomere; antenna with scape and pedicel dark brown basally, laterally and mesally, light brown apically; flagellomeres with basal half dark brown medially, rest light brown; clava mostly dark brown; pronotum (Fig. 68) mostly dark brown, with light brown median line anteriorly, light brown area sublaterally and at anterior lateral margin; mesonotum and metanotum mostly dark brown with pale brown mostly at trans-scutal suture and somewhat laterally on mesonotum; metanotum with reddish scars submedially near middle; scutelli mostly dark brown with pale brown line medially, some pale brown sublaterally and subapically; legs as in Fig. 69, forecoxa mostly pale brown; abdominal tergites mostly dark brown,with prominent pale brown spot submedially at basal one-fourth of tergites II–VIII; sternites mostly pale brown with elongate dark brown stripe submedially; ectoproct mostly pale brown. **Chaetotaxy**: head with fine setae mostly, prominent, mostly pale setae on frons, clypeus and labrum; pronotum with some elongate white bristles at lateral margin, often with dark brown setae laterally and posteriorly; mesonotum with curved row of about 12 outstanding white bristles near middle; mesoscutellum with small dark brown setae posterior and submedial white setae; thoracic pleura with many long white setae but not distally swollen; abdomen with very small setae except posteriorly with many light brown setae; forefemur without long setae on exterior face; forecoxa with elongate white setae restricted to posterior margin; femora and tibiae with mostly dark brown bristles; forefemur and midfemur with white bristles anteriorly; midfemoral sense hair about one half as long as forefemoral sense hair, about three fourths as long as femur; hindtibia with some elongate black bristles longer than tibial spurs. **Structure**: antenna with about 33 flagellomeres, flagellomere I longer than broad, rest broader than long; distal palpomere of labius weakly swollen; pronotum broader than long measured along midline; hind basitarsus about four times longer than median diameter, hindtibial spurs reach beyond tarsomere II; foreleg basitarsus about 2.5 times longer than median diameter, tibial spurs reach tarsomere IV; forewing and hindwing same length, hindwing narrower; forewing costal area expands gradually from base, without interconnected crossveins except rarely toward stigma; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; **male genitalia** (Fig. 71) with strongly arched gonarcus, no mediuncus; paramere divided into two dark brown sclerites densely covered with small wart-like bumps; sclerite most medial curves strongly from gonarcus to near articulation with other sclerite, shape complex, broadest toward other sclerite; other sclerite much larger than medial sclerite, pear-shaped with area near gonarcus narrow about twice as wide as long, lower extension expanded two to four times toward lower end.

Female (Fig. 72): about as described for male except for terminalia with ectoproct with short post-ventral which has very long setae apically; posterior gonapophyses well separated, about four times longer than median diameter, longest setae near middle of exterior face; gonapophyseal plate elongate; lateral gonapophyses well separated, about three times longer than greatest diameter; spermatheca elongate (at least 12 times longer than diameter), strongly bent apically.

Variation. Length of body ranges between 18 to 24 mm, that of forewing and hindwing 22 to 29 mm.

Larva. Fig. 148–151. Ventral surface of head capsule with sublateral dark brown spot near middle; distance between teeth 1 and 3 longer than that between base and tooth 1, dorsal surface covered with small dolichasters; dorsal surface of head capsule with many large dolichasters, including submedial row posterior to lateral tentorial suture; mesothoracic spiracle borne on tubercle about twice as long as wide abdominal spiracles on large (usually longer than basal width) papilliform tubercles beset with short dolichasters; dorsal surface of abdomen with many bead-like setae.

Biology. The larvae of this species are associated with rock overhangs with loose soil beneath and protected against moisture. This is a leg anchoring species.



Figures 68–72. *Purenleon cavei* Miller and Stange, adult. **68)** head and thorax; **69)** lateral view; **70)** wings; **71)** male genitalia; **72)** female terminalia, ventral view.

Types. 5 males, 11 females. 3 larvae. December to May.

HONDURAS. **Atlantida**: Playa Perú. V.4.1993, **reared**, Miller and Stange (3 larvae, 5m, 6f, FSCA). **La Ceiba**: El Sauce, 7.III.1987, R. Cave (3f, FSCA); La Ceiba, 1500', 3.V.1993, Miller and Stange (1f, FSCA); Posta 2.XII.1988 (2f, FSCA).

Discussion. This species is similar to two others that occur in Honduras, *P. debilis* and *P. iniquus*, in having the paramere divided into two, strongly sclerotized sclerites densely covered with small wart-like bumps and also in having many erect bristles on the pronotum and mesonotum.

Etymology. This species is named for Rodney D. Cave who has contributed much to our knowledge of the Honduran entomofauna.

***Purenleon clavatus* (Navás)**
Figures 73–77, 152–155

Diazus clavatus Navás 1914b: 22l. **Holotype male**, Amazones, 1860, Stevens (NHMW)
=*Psammoleon parvulus* Banks 1920: 331(after Stange 2004: 214). **Holotype male,** Chapada, Brazil (MCZC).
=*Formicaleo serrei* Navás 1920: 201 (after Stange 2004: 214). **Holotype male**, La Trinité, 1914, Serre (MNHN).
=*Formicaleo chaperi* Navás 1922: 256 (after Stange 1970: 25). **Holotype male**, Venezuela, 885, Chaper (MNHN).

Taxonomy. Stange 1970: 24 (*D. clavatus* and *F.serrei* in *Psammoleon*); Stange 2002: 286 (in *Purenleon*)

Distribution. Brazil; Trinidad; Venezuela (Banks 1943: 170).

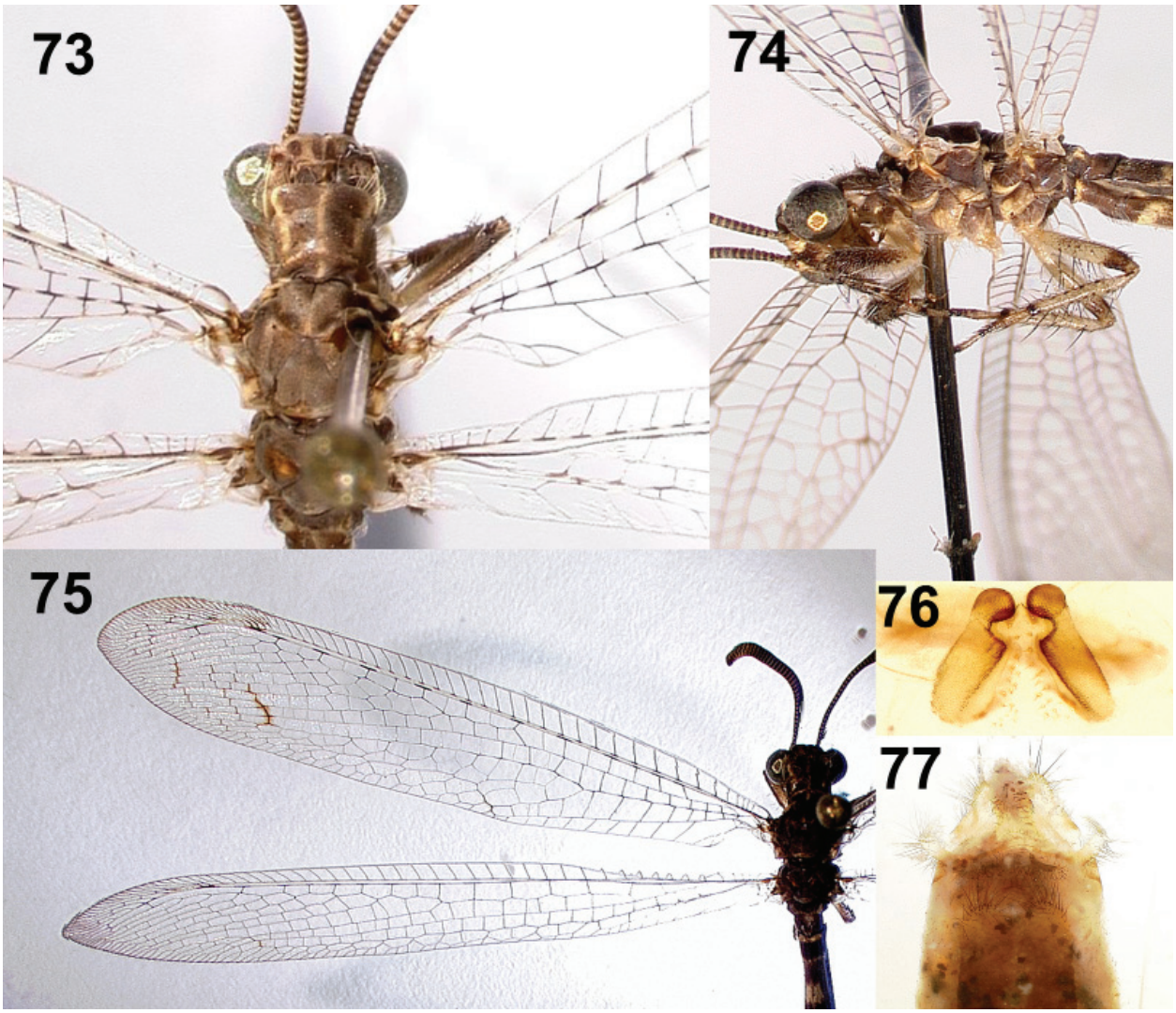
Diagnosis. Length of body 18–21 mm, forewing and hindwing 20–23 mm. **Coloration**: face pale brown with dark brown band below and between antennal fossae; maxillary and labial palps mostly pale brown but with some dark brown markings, especially distally; antenna with scape mostly pale brown, pedicel pale brown except apically, flagellomere I mostly pale brown except apically, other flagellomeres dark brown with pale brown apices; pronotum mostly brown with narrow median line, dorsal surface of pterothorax mostly brown with some light brown areas laterally, scutelli brown; legs as in Fig. 74; wings (Fig. 75) weakly suffused, some areas near rhegmal area; abdominal sternites mostly dark brown anteriorly becoming paler brown posteriorly, with narrow pale brown median line; abdominal tergites dark brown with pale brown areas anteriorly, at middle and posteriorly on tergites II–VIII; male ectoproct and tergite IX pale brown. **Chaetotaxy**: pronotum without elongate white bristles at lateral margin, sometimes shorter, often black bristles present which are much shorter than those on forecoxa, few short white setae anteriorly near lateral margin; forefemur with some white bristles, hindfemur mostly with black bristles; tibia mostly with black bristles; mesoscutum without erect setae; forecoxa with some white bristles longer than coxal diameter; midfemoral sense hair equal in length to forefemoral sense hair which is about one-half length of forefemur; sternite VIII of female with long setae submedially at posterior margin. **Structure**: antenna with about 38 flagellomeres, flagellomere I longer than broad, rest broader than long, clava moderatately large; distal palpomere of labius weakly swollen; pronotum a little broader than long measured along midline; legs short, hindleg longest; midtibia slightly more swollen than foretibia; hind basitarsus about five times longer than median diameter, tibial spurs reaching to tarsomere III; foreleg basitarsus about three times longer than median diameter with spurs reaching to tarsomere IV; forewing costal area expands gradually from base, without interconnected crossveins except rarely toward stigma, costal cells near middle higher than wide, gradually narrowed basally; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; **male genitalia** (Fig. 76) with broad, arched gonarcus, mediuncus broader than long; paramere elongate with spicules along medial margin, strongly bent near middle, lower part strongly excavated below which is rounded lobe; **female terminalia** (Fig. 77) with ectoproct with short postventral lobe; posterior gonapophyses widely separated, about five times longer than wide; gonapophyseal

plate at least 12 times longer than greatest width, not narrowing posteriorly; lateral gonapophyses well separated, about four times longer than wide, with digging setae on at least anterior one-half; pregenitale a transverse plate about eight times wider than long with median extension about two times longer than wide; spermatheca short, about nine times longer than diameter, weakly surved apically.

Larva. Fig. 152–155. **Coloration**: ventral surface of head capsule without sublateral dark brown spots near middle. **Chaetotaxy**: dorsal surface of mandible covered with small dolichasters, no submedial row row posterior to lateral tentorial suture; dorsal surface of head capsule with many large dolichasters; dorsal surface of abdomen with many bead-like setae.**Structure**: mandible longer than head capsule, distance between teeth 1 and 3 longer than that between base and tooth 1; mesothoracic spiracle borne on tubercle that is four times longer than median diameter; abdominal spiracles on large papilliform tubercles beset with short dolichasters; dorsal surface of abdomen with many bead-like setae.

Biology. The larvae of this species were found in rain protected areas of thin soil at the base of trees and under a bridge. They anchor their legs.

Material studied. 18 males, 17 females. November May.



Figures 73–77. *Purenleon clavatus* (Navás), adult. **73)** head and thorax; **74)** lateral view; **75)** wings; **76)** male genitalia; **77)** female terminalia, ventral view.

BRAZIl. **Ceara**: Barbalha, V.1969, M. Alvarenga (3f, FSCA). **Goias**: 24 km. east Formoso, 19.III, 1956, F. Truxal (2m, FSCA, LACM); Isabel de Morro, Isla da Bananal, VI.1961, M. Alvarenga (1f, FSCA). **Roraima**: Rio Uraricoera, 30.XI.1987 (1m, FSCA).

TRINIDAD. St. Agustine, III.1959, F. Bennett (2f, FSCA).

VENEZUELA. **Aragua**: Cagua, 14.XI.1972, Fernández Yépez (2m, FSCA; IBAV); El Limon. 480 m., 15.II.1986, R. Miller & L. Stange (3m, 2f, FSCA). **Guarico**: 15 km. south Calabozo, 15.VI.1993, **reared**, R. Miller & L. Stange (1 larva, 10m, 9f, FSCA, TAMU).

Discussion. This relatively small species is unusual (except for *P. andinus*) in the group by having the midtibia somewhat more swollen than the foretibia approaching the condition found in the tibialis group.

***Purenleon cubensis* (Alayo)**
Figure 78

Psammoleon cubensis Alayo 1968: 67, Fig. 25 b (drawing wings), Plate V, Fig. 4 (head and thorax), Plate VII, Fig. 4 (lateral view female terminalia). **Holotype female**, Tortuguilla, Guantanamo, Oriente, Cuba, VI. 1964 (IZAC).

Taxonomy. Stange 2002: 286 (in *Purenleon*).

Distribution. Cuba.

Diagnosis (based on original description). Length of body 26–28 mm, forewing 32–36 mm, hindwing 32–36 mm, width of wings forewing 6.5–7.6 mm, hindwing 5.5–6 mm. **Coloration**: general coloration dark brown, somewhat greyish especially on ventral and lateral margins of thorax and abdomen; man-

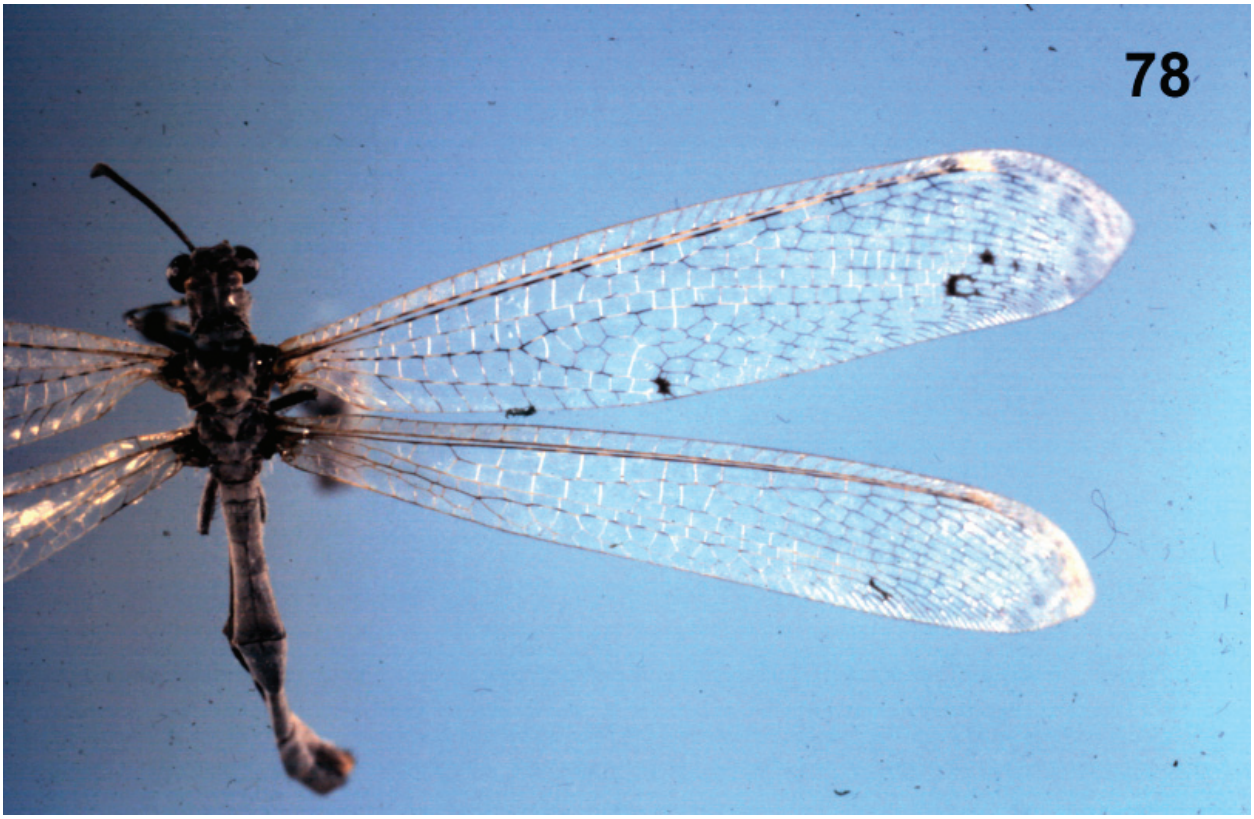


Figure 78. *Purenleon cubensis* (Alayo), adult.

dible, clypeus and frons light brown, rest of face mostly dark brown; antenna dark brown with apices of flagellomeres light brown; tibia with two light brown areas and two dark brown areas; tarsi with dark brown and light brown areas; pretarsal claws dark honey colored; abdomen mostly uniformly dark brown; forewing with two dark brown spots, one one on posterior fork near posterior margin, triple spots near rhegma. **Chaetotaxy**: pronotum without elongate white setae laterally; forefemur with many white, decumbent setae; forecoxa without long white bristles. **Structure**: pronotum about as long along center as broad; forefemur thicker than hindfemur; tibial spurs extend to apex of tarsomere III of foreleg and midleg and to apex of tersomere II of hindleg ; costal area of forewing with cells at middle wider than high; forewing vein CuA extends to posterior margin slightly beyond origin of radial sector.

Material studied. 1 female, June.
CUBA. **Guantánamo**: Tortuguilla, VI.1964 (1f, IZAC).

Discussion. The holotype female was briefly examined and a photo of the whole insect was made. Based on this photograph, some notes, and the description of Alayo we believe this is a distinct species. It appears similar in coloration to *P. farri* but the costal cells at the middle are wider than high rather than higher than wide as in *P. farri*. Also, forewing vein CuP+1A reaches the hind margin only slightly beyond the level of the radial sector in *P. cubensis*.

***Purenleon debilis* (Gerstaecker)**
Figures 79–83, 156–160

Formicaleo debilis (Gerstaecker) 1893: 136. **Holotype**, Chiriquí (EMAU).

Taxonomy. Banks 1943: 179 (in *Psammoleon*); Stange 2002: 286 (in *Purenleon*).

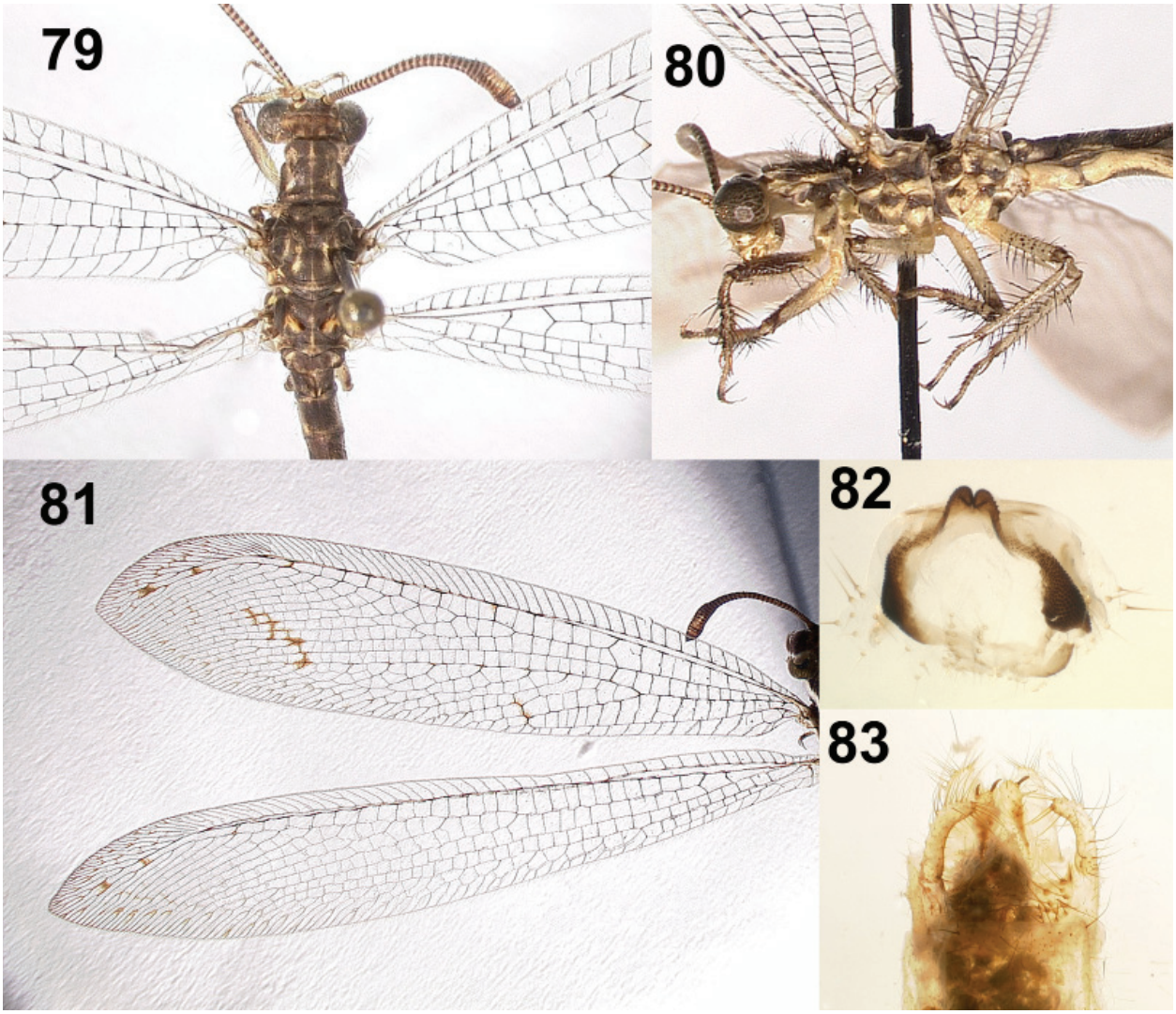
Further description. Stange 2002: 289, Fig. 639 (wings), 643 (dorsal view head, thorax).

Distribution. Mexico; Guatemala; Honduras; Panama; Colombia (Banks 1943: 170).

Diagnosis. Length of body 20–28 mm, forewing 26–31 mm, hindwing 27–32 mm. **Coloration**: face pale brown with broad dark brown band below and between antennal fossae; mouthparts mostly pale brown with distal palpomere of labium dark brown; antenna with flagellomeres mostly dark brown with narrow pale brown apices; forefemur mostly pale brown with dark brown toward apex; midfemur and hindfemur pale brown with dark spots at setal bases and subbasal area; midtibia with pale brown, with many dark brown spots at setal bases; foretibia and midtibia mostly dark brown dorsally; forefemur and midfemur with mostly white bristles, tibia mostly with black setae; tarsus mostly pale brown with dark brown at apex of distal tarsomere; abdomen mostly dark brown with large pale brown areas posteriorly, male sternite IX and ectoproct pale brown; sternites of male mostly pale brown anteriorly.becoming darker brown posteriorly; female terminalia dark brown and pale brown. **Chaetotaxy**: pronotum with several elongate white bristles at lateral margin, at least subequal in length to those on forecoxa; pronotum and mesonotum with elongate, white erect setae; midfemoral sense hair as long as forefemoral sense hair which is about one-half length of forefemur. **Structure**: distal palpomere of labius not swollen; antenna weakly clavate with about 40 flagellomeres, flagellomere I longer than white, rest broader than long; pronotum a little broader than wide measured along midline; pretarsal claws shorter than hind basitarsus; hind basitarsus about five times longer than median diameter, tibial spurs reaching to apex of tarsomere II; foreleg with basitarsus about four times longer than median diameter, tibial spurs reaching to about apex of tarsomere IV; forewing costal area gradually broadened near base, costal cells three times higher than wide at middle, CuP+1A runs to posterior vein well distad of origin of the radial sector; forewing slightly shorter than hindwing which is not especially broadened toward apex; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point near origin of radial sector; **male genitalia** (Fig. 82) with moderately arched gonarcus, no mediuncus; paramere divided into two dark brown sclerites densely covered with small, elongate bumps; sclerite most medial

curves strongly from gonarcus to near articulation with other sclerite, shape complex, narrowing (about seven times longer than wide)below and overlapping other sclerite; other sclerite much larger than medial sclerite, with anterior part narrow and posterior part much broader; **female terminalia** (Fig. 83) with ectoproct short postventral lobe, fine elongate setae; posterior gonapophyses widely separated, about seven times longer than median diameter, bowed; lateral gonapophyses widely separated, about five times longer than wide with only few large digging setae toward apex; pregenitale broad transverse plate; spermatheca elongate, strongly bent apically.

Larva. Fig. 156–160. **Coloration**: ventral head capsule with three spots near middle, anterior pair close, posterior spot double. **Chaetotaxy**: dorsal head capsule with many dolichasters of varying lengths, no submedial row of dolichasters behind lateral tentorial suture; ventral head capsule with many dolichasters, longer laterally and anteriorly; setae on dorsal abdomen sausage-shaped about 2 to 3 times longer than thick; abdominal spiracles with short dolichasters. **Structure**: mandible about as long as dorsal head capsule; mandible with distance between teeth 1 and 3 much longer than that between base and tooth 1, surface with small dolichasters; mesothoracic spiracle borne on tubercle about as long as wide, smaller than biggest mesothoracic scolus; abdominal spiracles II–IV symmetrical, with well defined small nipple.



Figures 79–83. *Purenleon debilis* (Gerstaecker), adult. **79)** head and thorax; **80)** lateral view; **81)** wings; **82)** male genitalia; **83)** female terminalia, ventral view.

Biology. Larvae were found under a rock overhang in a well rain protected position in dark loose soil lightly covered with leaves. They are leg anchored. They live in strong indirect light.

Material studied. 9 males, 8 females. 1 larva. August to November.

MEXICO. **Colima**: Tepanes, 12.III.1985, **reared**, R. Miller & L. Stange (1 larva, 2m, 2f, FSCA). **Guerrero**: Rincon, 2800', H. Smith (1f, BMNH). **Jalisco**: 3 miles northeast Plan de Barrancas, 25.VIII.1964, L. Stange (1m, FSCA), **Nayarit**: Campostelia, 16.IX.1957, Dreisbach (1m, FSCA); Tepic, 1.IX.1957, R. Dreisbach (1m, 1f, FSCA). Oaxaca: 7 miles northeast Tepanatepec, 4.III.1985, **reared**, Miller and Stange (1m, FSCA).

BELIZE: **Cayo**: Pine Ridge, 25.I(I.1937, J. Van Tyne (1f, USNM).

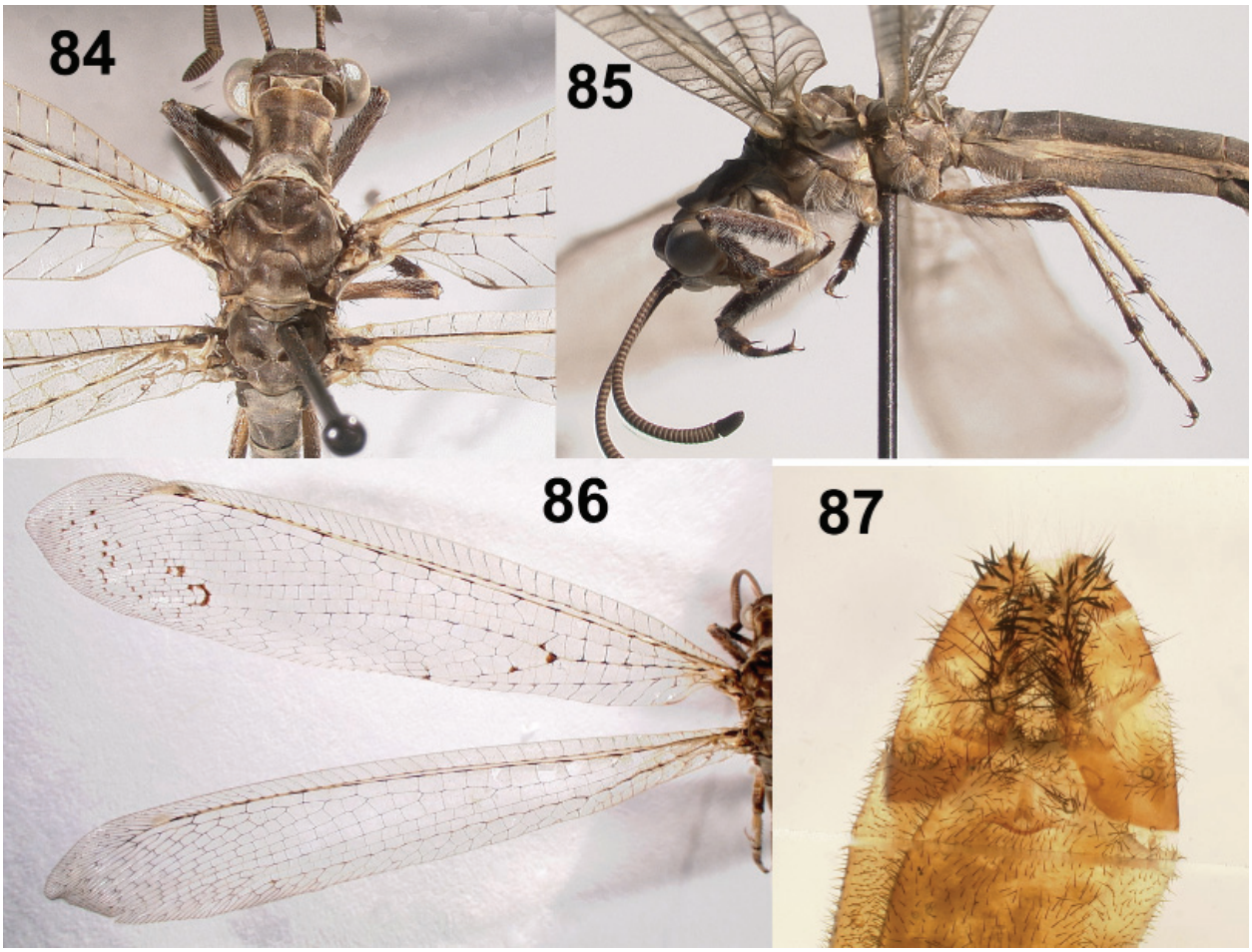
GUATEMALA. **El Progresso**: La Cajeta, 12.VIII.1965, O. Flint (1f, USNM).

PANAMA. **Coclé**: El Valle, Cerro Panama, XI.1946, Krause (1f, FSCA).

COLOMBIA. **Meta**: Villavicencio, Fass (4m, 2f, MCZC).

Discussion. This is one of three known species which have the male paramere strongly sclerotized, divided into two separate sclerites and covered with conspicuous bumps. The shape of the bumps (elongate) differs from the rounded wart-like bumps of *P. cavei* and *P. iniquus*.

***Purenleon farri* Miller and Stange, new species**
Figures 84–87



Figures 84–87. *Purenleon farri* (Miller and Stange), adult. **84)** head and thorax; **85)** lateral view; **86)** wings; **87)** female terminalia, ventral view.

Holotype female, Stewart Town, Jamaica (FSCA).

Diagnosis. Pronotum without elongate white bristles at lateral margin; forecoxa without long white bristles; hind basitarsus longer than tarsomeres II–IV together; forewing vein CuP+1A reaches hind margin well beyond origin of raial sector; female terminal with posterior gonapophysis close together at base (separated by about 3.5 gonaphysis base diameters), about five times longer than median diameter; lateral gonapophyses fused together at middle.

Holotype female. Length of body 34 mm; forewing 40 mm; hindwing 39 mm. **Coloration**: antennal flagellomeres mostly pale brown except narrow dark brown ring at base, scape all dark posteriorly except apex; pronotum with broad dark brown submedial band, dark brown laterally; pterothoracic nota nearly all dark brown with limited light brown areas; forefemur nearly all dark brown ; hindtibia mostly pale brown except apically; tarsi with basitarsus mostly pale brown, tarsomeres II–IV mostly dark brown, distal tarsomere mostly pale brown except apically; abdomen nearly entirely dark brown. **Chaetotaxy**: pronotum without elongate white bristles at lateral margin, sometimes shorter, often black bristles present which are much shorter than those on forecoxa; thoracic pleura with many elongate white setae ventrally; forefemur with many white, decumbent setae; forecoxa without long white bristles; abdominal sternite II with elongate white setae in contrast to sternites III–VII; midfemoral sense hair about one-half as long as forefemoral sense hair; sternite VIII of female with long setae submedially at posterior margin. **Structure**: pronotum a little broader than long measured along midline; hind basitarsus somewhat longer than tarsomeres II–IV together; forewing longer than hindwing; forewing costal area abruptly broadened at base, crossveins more than twice as high as wide at middle, not interconnected; forewing vein CuP+1A reaches hind margin well beyond origin of radial sector; **female terminalia** (Fig. 87) with ectoproct with short postventral lobe with many stout digging setae; posterior gonapophysis close together at base (separated by about 3.5 gonapophysis base diameter), about five times longer than median diameter with long setae toward apex nearly as long as gonapophysis; gonapophyseal plate about four times longer than wide; lateral gonapophyses fused at middle, about three times as long as broad with many short digging setae; pregenitale a transverse sclerite much broader at middle where elongate posterior process exists which is about four times longer than median diameter, narrows apically.

Material studied. Only the holotype female.

JAMAICA. **Trelawny**: Stewart Town (1f, FSCA).

Discussion. The female terminalia differ from other species by having the posterior gonapophyses very close together at base (similar only to *P. reductus*), lateral gonapophyses fused at middle and in the shape of the pregenitale which has a long posterior process (about four times longer than median diameter).

Etymology. This species is dedicated to Thomas Farr who contributed greatly to our knowledge of Jamaican insects.

***Purenleon imbellis* (Banks)**
Figures 88–91

Puren imbellis Banks 1941a: 102. **Holotype female**, Port au Prince, Haiti, 20.XI., Smith (MCZC).

Taxonomy. Stange 1970: 24 (in *Psammoleon*); Stange 2002: 286 (in *Purenleon*).

Further description. Miller and Stange 2011: 19.

Distribution. Hispaniola.

Diagnosis. Length of body 16 mm. (male) or 20 mm (female), forewing 19 (male) or 22 mm. (female), width about 5 mm; hindwing 20 mm (male) or 23 mm.(female), width about 4 mm. **Coloration**: head

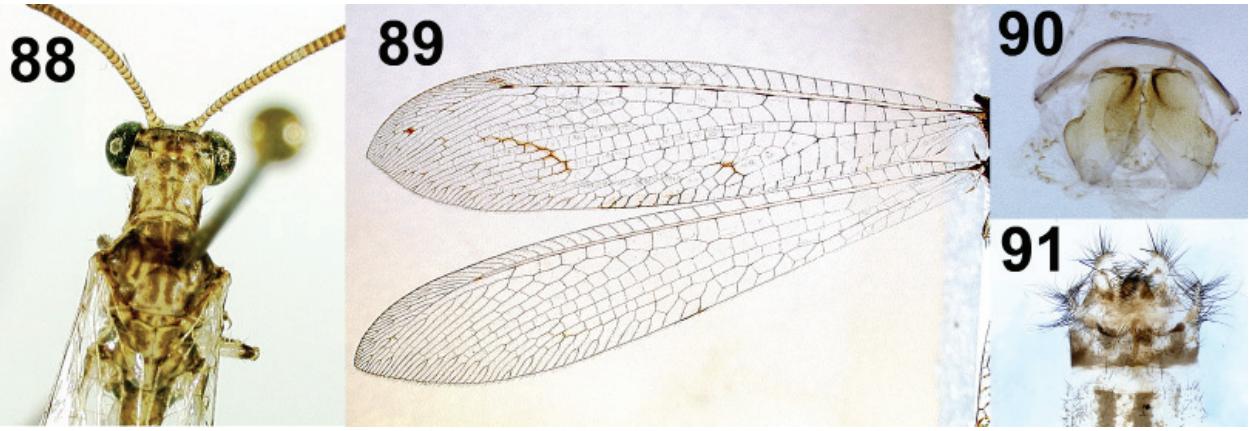
and thorax yellowish brown; dark brown interantennal mark truncate below antennae and dorsally extending nearly to verex but with a median pale yellowish spot; vertex with anterior row of velvety brown band, broken medially by thin slit, preceeded by pale spot; markings consisting of four almost connected black stripes, middle row consists of brown spots, posterior row consisting of pair of dark brown spots extending posteriorly; antenna pale brown on basal one-half with weak brown bases becoming dark apically, club dark brown; pronotum pale brown with median white line and lateral dark brown stripes laterally; abdomen brown with pale median line or spots that on tergite II is a line, elongately enlarged at middle and slightly enlarged posteriorly; tergite III with broad pale area at basse partly divided and followed by a line which is widened at tip; tergite IV with large pale brown spot at base which tapers toward tip; legs mostly pale brown, apices of femora dark brown, foretibia and midtibia mostly dark brown, hindtibia dark brown at apex only; tarsi mostly dark brown at base and apex; forewing with subcosta much interrupted with brown areas, radius with longer brown streaks, cubitus with more separated streaks; crossveins usually dark brown at ends; brown line from near end of anal vein and oblique brown line at rhegma. **Chaetotaxy**: pronotum with only short black setae; foretibia and midtibia with both white and black setae, hindtibia mostly with black setae; midfemoral sense hair shorter than forefemoral sense hair. **Structure**: distal palpomere of labius slightly swollen; pronotum about as long as broad; foretibial spurs extending nearly to base of distal tarsomere; hindtibial spurs about equal to basal two tarsomeres; forewing slightly shorter than hindwing; forewing costal area expands gradually from base, high with two series of cells reaching from near stigma to about origin of radial sector; CuA of hindwing ends before medial fork; **male genitalia** (Fig. 90) with narrow, strongly curved gonarcus with broad mediuncus; paramere mostly broad plate which is strongly expanded laterally near middle, with minor scalloping; **female terminalia** (Fig. 91) with ectoproct weakly produced apically with several elongate black setae that are about as long as ectoproct; lateral gonaophyses transverse, separate, with dense setae that are no longer than basal width of gonapophysis; posterior gonapophysis elongate, over six times longer than greatest diamer, strongly curved toward middle, with numerous elongate setae; gonapophyseal plate broadest near base of posterior gonaopoysis, becoming narrower toward middle; spermatheca elongate, sinuate, strongly curved apically; pregenitatel transverse, broadest at middle.

Material studied. 3 males, 4 females. June to November.

DOMINICAN REPUBLIC. **Monte Cristi**: 9 miles north Villa Elisa, 4.VI.1986, Miller and Stange, at light (3m, 3f, FSCA

HAITI. **Ouest**: Port au Prince, 20.XI, Smith (1f, MCZC).

Discussion. The partially biareolate forewing costal area appears to be the best distinguishing character known for this species. This species resembles *P. minor* in size and coloration. Both have been collected in Monte Cristi province of the Dominican Republic where *P. minor* is found near the coast and *P. imbellis* more inland.



Figures 88–91. *Purenleon imbellis* (Banks), adult. **88)** head and thorax; **89)** wings; **90)** male genitalia; **91)** female terminalia, ventral view.

***Purenleon iniquus* (Navás)**
Figures 92–96, 161–164

Formicaleo iniquus Navás 1914a: 206. **New name** for *Formicaleo inaequalis* Navás 1913.
Formicaleo inaequalis Navás 1913: 51. **Preoccupied** by *Formicaleo inaequalis* Navás 1912. **Holotype**, Amapola, Honduras, XI (not located). **Neotype male**, 4.5 miles southeast El Zamorano, Francisco Morazan, Honduras, IV.25.1993, R. Miller & L. Stange (FSCA).
=*Psammoleon banksi* Esben-Petersen 1933: 115, Fig. 6 (wings)(after Stange 2004: 216). **Holotype male,** Amapola, Honduras, 12.XI.1907, Paessler (ZMUH, destroyed). **Neotype male**, 4.5 miles southeast El Zamorano, Francisco Morazan, Honduras, IV.25.1993, R. Miller & L. Stange (FSCA).

Taxonomy. Stange 2002: 286 (in *Purenleon*).

Further description. Navás 1924: 74; Stange 2002: 289, Fig. 640 (wings), 644 (dorsal view head, thorax).

Distribution. Costa Rica; Honduras; Panama.

Diagnosis. Length of body 24 to 29 mm; forewing 30 to 36 mm, hindwing 31 to 37 mm. **Coloration**: vertex pale brown with dull black vertex rows; pronotum pale brown with broad submedian dark brown stripe, dark brown irregular stripe sublaterally; femora and tibiae pale brown, with extensive dark brown spotting; tarsi pale brown except dark brown apex of distal tarsomere. **Chaetotaxy**: pronotum with many erect, elongate, dark brown setae on pronotal shield, but without elongate white bristles at lateral margin; mesoscutum with many erect, elongate, dark brown setae and also with 3 or 4 elongate white bristles submedially near anterior margin; midfemoral sense hair as long as forefemoral sense hair which is about 3/4's as long as femur. **Structure**: pronotum a little broader than long measured along midline; pretarsal claws much longer than hind basitarsus which is about three times as long as greatest tarsomere diameter; tibial spurs reach to about tarsomere IV, much longer than pretarsal claws; distal tarsomere long, longer than basal four tarsomeres; wing much broader at about three fourths distance from base; forewing somewhat longer than hindwing, longer than body; forewing costal area gradually broadening basally, costal cells above radial sector about three times as high as wide; with CuP+1A running oblique to hind margin along posterior fork of CuA well beyond origin of radial sector; **male genitalia** (Fig. 95) with strongly arched gonarcus, mediuncus broad; paramere divided into two dark brown sclerites densely covered with small, wart-like bumps; sclerite most medial curves strongly from gonarcus to near articulation with other sclerite, shape complex, narrowing (about four times longer than wide)below; other sclerite much larger than medial sclerite, very elongate with anterior part narrow and posterior part much broader; **female terminalia** (Fig. 96) with small postventral lobe without digging setae; posterior gonapophyses a little swollen, widely separated, about six times longer than median diameter, strongly bowed; gonapophyseal plate elongate, at least eight times longer than greatest breadth, broadest at base of gonapophysis; lateral gonapophyses well separated, about five times longer than greatest width, with strong setae toward apex; pregenitale about five times wider than long with median extension.

Larva. Fig. 161–164. **Coloration**: ventral head capsule with five dark brown spots, double spot at middle and two submedial dark brown spots. **Chaetotaxy**: mandible with small dolichasters on surface; dorsal head capsule with many dolichasters of varying lengths, no submedial row of dolichasters behind lateral tentorial suture; ventral head capsule with many dolichasters, longer laterally and anteriorly; setae on dorsal abdomen sausage-shaped about 2 to 3 times longer than thick; abdominal spiracles with short dolichasters. **Structure**: mandible about as long as dorsal head capsule; mandible with distance between teeth 1 and 3 much longer than that between base and tooth 1; mesothoracic spiracle borne on tubercle larger than largest mesothoracic scolus; abdominal spiracles II–VI asymmetrical, without nipple (Fig. 164).

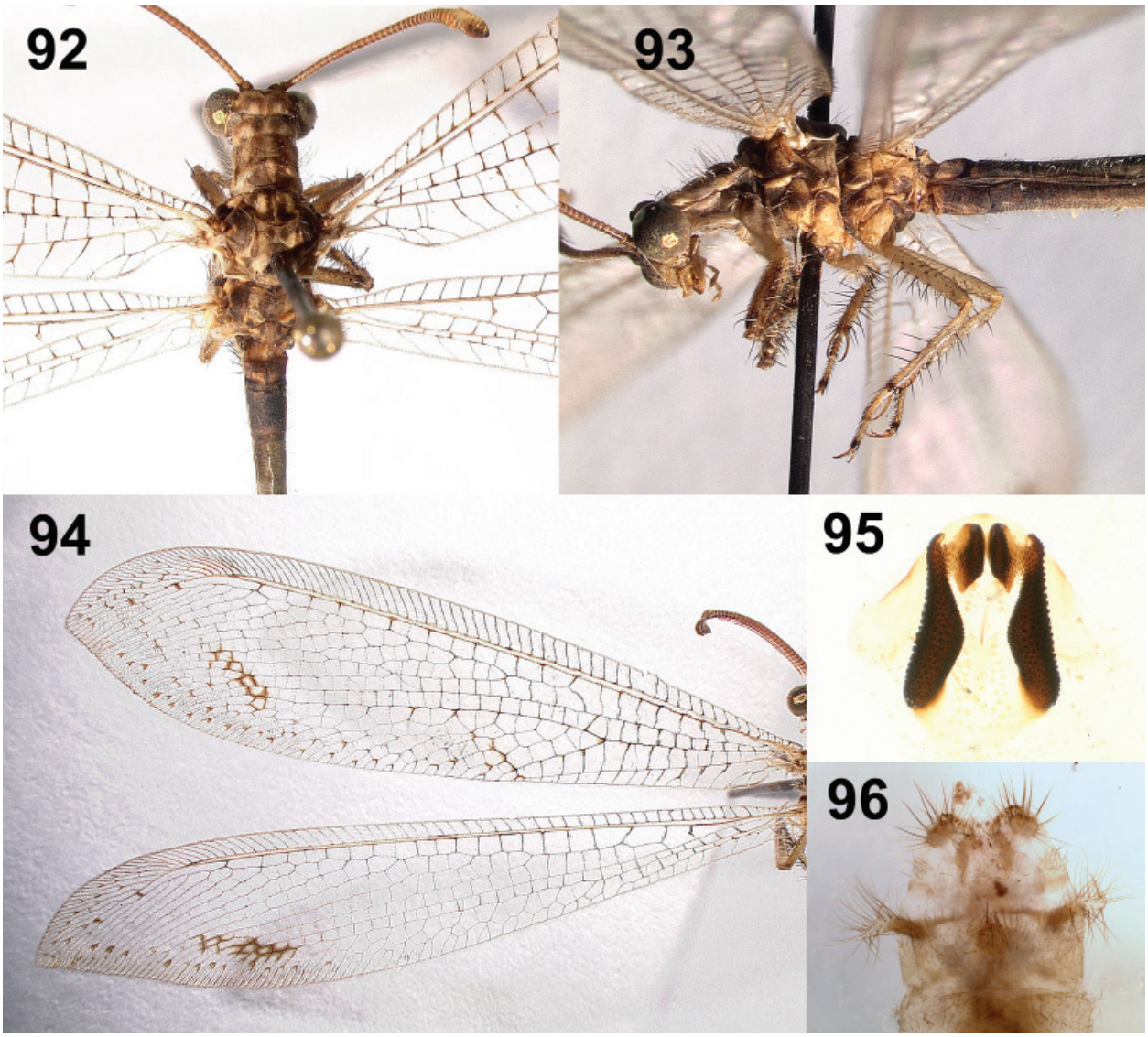
Biology. The larvae live under rock overhangs in fine dry soil. These larvae are found in a well lighted zone under the rock overhang.

Synonymy. The wing figure of *Psammoleon banksi* Esben-Petersen 1933 agrees with *P. iniquus* in shape and pattern of markings except the markings are somewhat more dense in *P. banksi*. The holotype of *P. banksi* was described from the same locality as *P. iniquus*. Since the holotype of *P. banksi* was destroyed, a neotype is designated.

Material studied. 4 males, 9 females. 3 larvae. September to December.

COSTA RICA. **Guanacaste**: Caldera, 1913 (1f, FSCA); Santa Rosa National Park, 4.XII.1977, D. Janzen (2f, FSCA). HONDURAS. Comayagua: Comayagua, 6.II.1975 (1m, FSCA); **El Paraiso**: Yuscaran, 2800', 12.V.1993, **reared**, R. Miller & L. Stange (2 larvae, 1m, 2f, FSCA). **Francisco Morazan**: 4.5 miles southeast El Zamorano, 25.IV.1993, **reared**, R. Miller & L. Stange (1 larva, 2m, 3f, FSCA); El Zamorano, 27.IX.1962, Bogran (1f, FSCA).

Discussion. This species is closely related to *P. debilis*. The pretarsal claws are much longer than the hind basitarsus in *P. iniquus* whereas they are shorter than the hind basitarsus in *P. debilis*. Also, the hindwing is much broader at about three fourths distance from base than in *P. debilis*. Also, the larvae



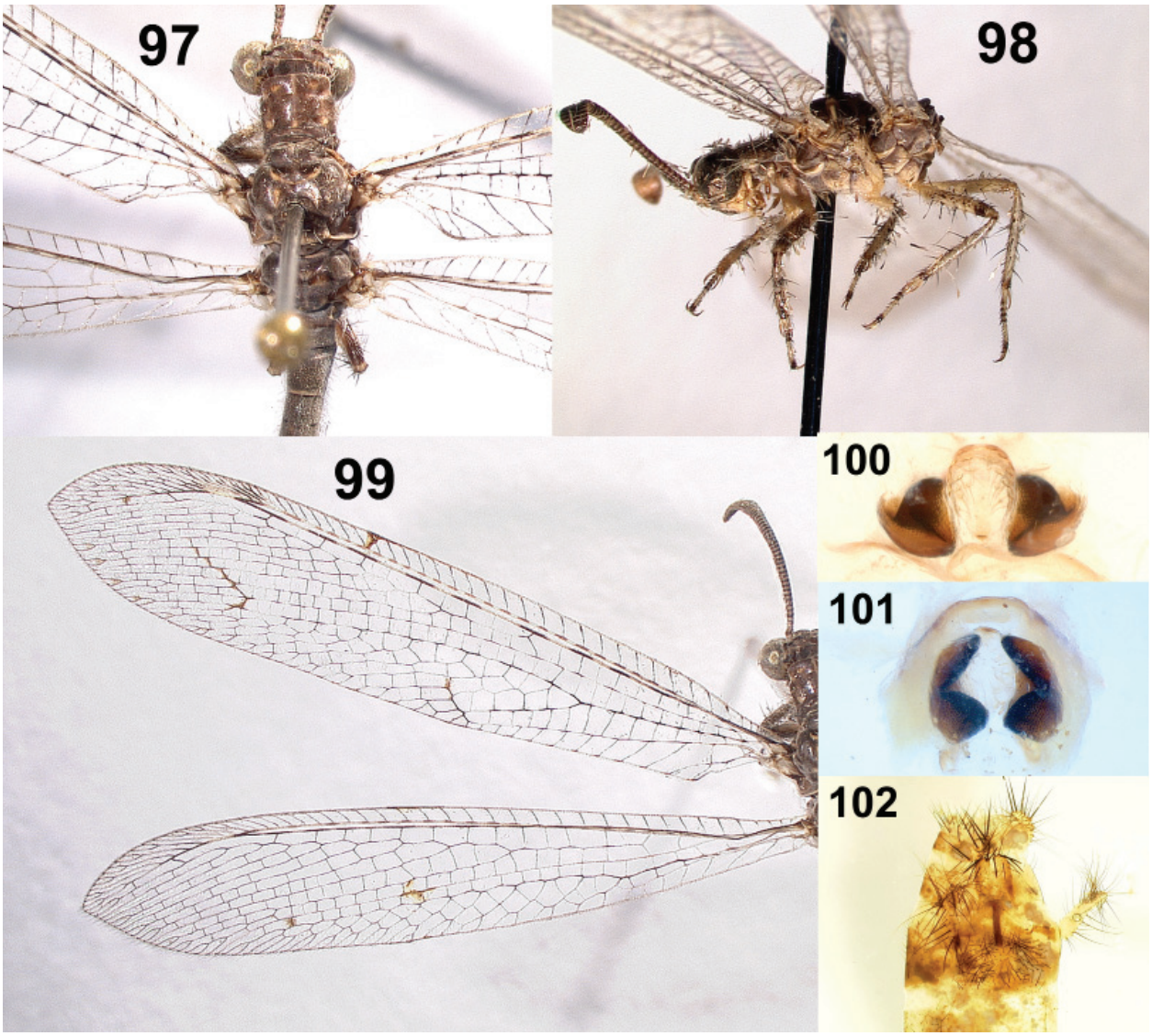
Figures 92–96. *Purenleon iniquus* (Navás), adult. **92)** head and thorax; **93)** lateral view; **94)** wings; **95)** male genitalia; **96)** female terminalia, ventral view.

are similar in the two species in having the abdominal spiracles born on large papilliform tubercles beset with short dolichasters and the mesothoracic spiracle borne on a tubercle that is about as long as wide. This species is similar to *P. cavei* and *P. debilis* in having heavily sclerotized paramere divided into two sclerites and heavily sculptured with bumps.

***Purenleon minor* (Banks)**
Figures 97–102, 165–172

Psammoleon minor Banks 1927: 62, Fig. 32, 42 (tibial spurs; female terminalia). **Lectotype female**, Dry Tortugas, Loggerhead Key, Florida, VI.1917 (MCZC), designated by Stange 1961: 674.
=*Psammoleon minora* Wolcott 1950: 91 (subsequent misspelling)

Taxonomy. Stange 2002: 286 (in *Purenleon*)



Figures 97–102. *Purenleon minor* (Banks), adult. **97)** head and thorax; **98)** lateral view; **99)** wings; **100)** male genitalia, non-standard aspect; **101)** male genitalia, standard aspect; **102)** female terminalia, ventral view.

Further description. Alayo 1968: 66, Fig. 24b, Plate V, Fig. 3, Plate VII, Fig. 3 (wings; head; nota; female terminalia); Miller and Stange 2011: 20 , Fig. 16 (color photo adult).

Biology. Stange and Miller 1990: 158, Fig. 11 (photo of larva); Miller and Stange 2011: 20 , Fig. 32–35 (larva). Larva lives in sand under Palm fronds.

Distribution. Bahamas; Cayman Islands (Banks 1941c: 176); Cuba (Alayo 1968: 66); Florida Keys (Stange 1980: 3); Hispaniola (Miller and Stange 2011: 20); Jamaica; Puerto Rico (Wolcott 1950: 91).

Diagnosis. Length of body from 15 to 21 mm, wings equal in length, from 18 to 25 mm. **Coloration**: face pale brown with dark brown band below and between antennal fossae; antenna with scape nearly all pale posteriorly, flagellomeres with dark brown basally, narrowly pale brown at apex; forefemur mostly pale brown; forewing subcostal area not suffused.**Chaetotaxy**: forecoxa with white bristles (if present) shorter than coxal diameter; pronotum without elongate white bristles at lateral margin (sometimes with black setae laterally which are shorter than those on forecoxa); midfemoral sense hair equal to that of forefemur which is about one-half as long as forefemur; thoracic pleura without abundant elongate white setae; forefemur with only scattered white appressed setae on exterior face. **Structure**: antenna with about 40 flagellomeres, flagellomere I longer than wide, rest wider than long; pronotum a little broader than long measured along midline; forewing and hindwing about equal in length, longer than body; forewing costal area expands gradually from base, without interconnected crossveins except rarely toward stigma, costal cells near middle broader than high; forewing vein CuP + 1A reaches hind margin at a point below origin of radial sector; basitarsus of hindleg at least 3.0 times longer than greatest diameter, nearly as long as pretarsal claws; **male genitalia** (Fig. 100–101) with narrow gonarcus strongly arched, no mediuncus but mediuncus-like sclerite connecting parameres anteriorly; paramere complex, strongly scerotized elongate, rectangular and three diminisional, upper part strongly emarginated at middle; **female terminalia** (Fig. 102) with ectoproct with postventral lobe about as long as wide, not upturned, with very long setae; posterior gonapophyses well separated, about six times longer than greatest diameter, bowed, with longest setae toward base on exterior face; gonapophyseal plate long (at least seven times longer than wide), broadest near base, bent near mid point; lateral gonapophyses separated, narrow, elongate (about five times longer than greatest width), very large digging setae concentrated toward apex; pregenitale sub-rectangular, about five times wider than long with small median projection; spermatheca elongate (at least 11 times longer than diameter), reflexed at apex.

Larva. Fig. 165–172. **Coloration**: ventral head capsule with large median dark brown spot. **Chaetotaxy**: dorsal surface of mandible with small dolichasters; dorsal head capsule with many dolichasters, small to large, but without submedial row posterior to lateral tentorial suture; ventral head capsule with many dolichasters; **Structure**: head laterally rounded outward; mandible shorter than ventral length of head capsule, distance between tooth 1 and 3 much longer than between base and tooth 1; head capsule about as wide as long; mesothoracic spiracle borne on tubercle that is longer than median diameter; abdominal spiracles easily visible, but shorter than or equal to basal width.

Variation. Adult color pattern is similar in the different islands except for some abdominal coloration and one specimen from Hispaniola which has a dark brown spot near the posterior margin of the forewing where posterior fork of CuA reaches posterior vein and the dark brown rhegmal mark is more pronounced.

Biology. Larvae were found under dead palm fronds on the sand near the sea. The larvae do not anchor themselves.

Material studied. 17 males, 21 females. 3 larvae. July to October.

U.S.A. **Florida**: Bahia Honda Key, III.29.1987, **reared**, R. Miller & L. Stange (3 larvae, 1m, 2f, FSCA); Windley Key, VI.11.1982, T. Dickel (1f, FSCA); Loggerhead Key, Dry Tortugas, VI.5.1952, H. Weems (3m, 2f, FSCA).

BAHAMAS. **Gun Cay**: no further locality, 15.VI.1971, Cazier (1f, USNM). **Eleuthera Island**:

Rainbow Bay, 1,VII.1987, J. Wiley (8m, 8f , FSCA). **North Bimini Island**: 4.VI.1950, Cazier & Ringe (3m, 2f, AMNH; FSCA; USNM). **South Bimini Island**: no further locality, 13.VI.1930, Cazier & Ringe (1m, 1f, AMNH).

CUBA. **La Habana**: Jibacoa (IZAC). **Oriente**: Daiquiri (IZAC).

DOMINICAN REPUBLIC. **Independencia**: Los Rios, Lago Enriquillo, 25.V,1886, R. Miller & L. Stange (1f, FSCA). **Monte Cristi**: 10 km. south Monte Cristi, 2.X.1985, Miller and Stange (2f, FSCA).

JAMAICA. **St. Thomas**: Morant Point, 10.VI.1956, R. Bengry (1f, FSCA); 12.VI.1983. Farr & Miller (1f, FSCA).

ST. KITTS: **Basseterre**: Bottom of Mattingley Heights, 1.X,1991, R. Woodruff (1m, FSCA).

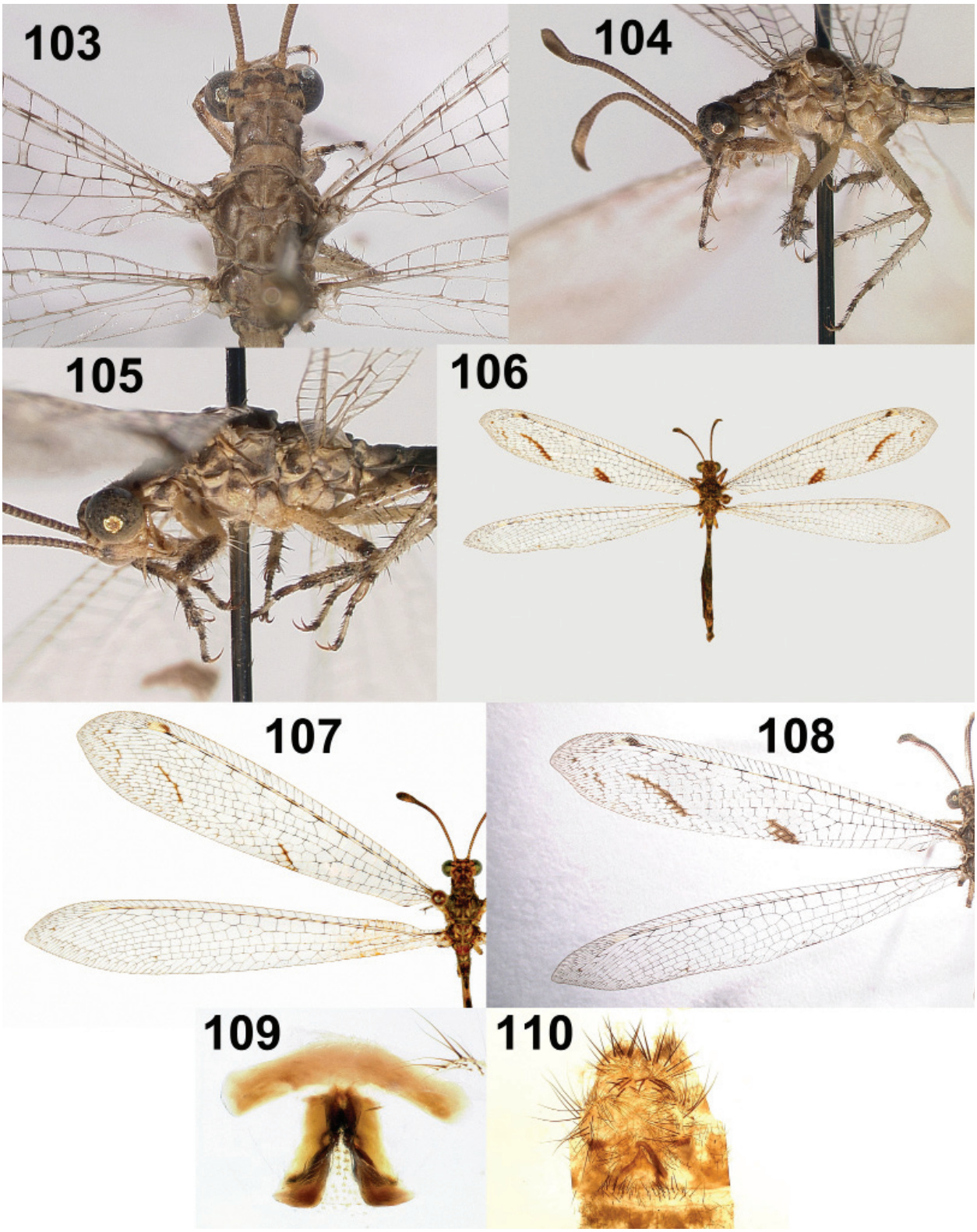
Discussion. This is one of the smallest known species of *Purenleon* easily recognized by the narrow wings and elongate hind basitarsus except for *P. imbellis* which has the partially biareolate forewing costal area. Also, the male genitalia is distinctive. The short mandible and head capsule and the large median dark brown spot on the ventral head capsule distinguishes the larva from other known larvae. This is a transcaribbean species found near the coast.

***Purenleon nunezi* Miller and Stange**
Figures 103–110

Purenleon nunezi Miller and Stange 2011: 20, Fig. 16–18 (color photos of adult).
Holotype male, El Capa, 10 miles 17 km. northeast of Vallejuelo, 27.V.1986, Miller and Stange (FSCA).

Further larval description. Miller and Stange 2011: 23.

Diagnosis. Length of body 22–24 mm, forewing and hindwing length 26–29 mm. **Coloration** dark brown; mouthparts pale brown with dark spot on stipes; clypeus and labrum pale brown; large dark brown band under antennal bases, which fuses with smaller epicranial mark and encircles antennal bases laterally; anterior row of the vertex has dark brown scars consisting of dark brown sublateral band narrowly separating it from double dark brown spot at middle; middle row with broad submedial spot which is extended narrowly to posterior margin; antenna with scape pale brown with dark brown basal ring which is weak anteriorly, petiole with dark brown basal band interrupted anteriorly; flagellomeres with basal half or more dark brown, becoming nearly all dark brown before clava; pronotum dark brown with weak median pale stripe, pale brown area submedially in furrow, pale brown sublaterally at middle extending to anterior margin, pale area posterolaterally; nota mostly dark brown with dark spot sublaterally on prescutum, scattered irregular pale areas, venter nearly all pale brown; forecoxa pale brown with two small dark brown areas on posterior face; mera dark brown; forefemur with broad subbasal dark area and apical dark brown area, closing face mostly pale brown; other femora with dark brown mostly restricted to apical area; foretibia and midtibia with three dark brown rings, subbasally, near middle and apically; femora and tibiae with some dark brown spots, especially at setal bases; tarsus with tarsomeres III and IV mostly dark brown, distal tarsomere dark brown apically; wing membrane with prominent rhegmal and cubital streaks, white stigma preceeded by dark brown spots; subcostal area with some dark brown streaking; hindwing without suffusion; wing veins with alternate dark and pale brown areas; abdomen with tergites mostly dark brown with double pale brown spot posteriorly on tergite I, reduced pale brown areas on tergite II, tergites III to VIII with prominent pale streak submedially from near base to near middle, weakly connected at middle on tergites III and IV; sternites and terminalia mostly pale brown. **Chaetotaxy**: pronotum and mesonotum without bristles, all setae much shorter than those on forecoxa which has a few elongate white bristles posteriorly nearly equal in length to greatest coxal diameter; midfemoral sense hair as long as forefemoral sense hair which is about 3/4's length of femur; posterior margin of sternite VIII of female with many elongate setae. **Structure**: pronotum a little broader than long measured along midline; forewing expands gradually from base, with costal cells simple, not interconnected, higher than wide above origin of radial sector, those at middle higher than wide, gradually narrowing basally; CuP + 1A runs obliquely to hind margin along posterior fork of CuA at a point below origin of radial sector; midtibia slightly more swol-



Figures 103–110. *Purenleon nunezi* Miller and Stange, adult. **103)** head and thorax; **104–105** lateral view; **106)** full dorsal view, unusual specimen; **107)** wings; **108)** wings, unusual specimen; **109)** male genitalia; **110)** female terminalia, ventral view.

len than foretibia; basitarsus of hindleg about 3.0 times longer than greatest diameter, shorter than pretarsal claws which are shorter than tibial spurs which extend beyond apex of hind tarsomere II; abdomen shorter than wings; **male genitalia** (Fig. 109) with broad, weakly arched gonarcus, broadest at middle, no mediuncus; paramere elongate plate about seven times longer than wide with wide, sclerotized lip at middle which bends laterally at posterior end in front of similar angled area of main paramere plate; **female terminalia** (Fig. 110) with ectoproct postventral lobe upturned; posterior gonapophyses well separated, about six times longer than median diameter, strongly curved with very long setae on exterior face (longer than gonapophysis); gonapophyseal plate elongate, broadest at base; lateral gonapophyses well separated, about five times longer than greatest width, very strong digging setae toward apex; pregenitale triangular, about five times wider than long with gradually narrowing median process which is about as long as wide; spermatheca a long tube (at least ten times longer than median diameter), strongly recurved at apex.

Larva: **Coloration**: head capsule light reddish; labial palpus longer than basal width of mandible; head much longer than wide with dolichasters; ventral head capsule with one pair of dark brown sublateral spots; **Chaetotaxy**: mandible with several pale dolichasters on mesal margin near base. **Structure**: mandible longer than ventral head capsule, distance between teeth 1 and 3 longer than between base and tooth 1; labial palpus longer than basal width of mandible; head much longer than wide with dolichasters; mesothoracic spiracle borne on tubercle; abdominal spiracles II to VII higher than basal width, somewhat larger than abdominal spiracle I; spiracles IV–VI with prominent expanded nipples.

Biology. At El Capa after sunset, many dozens of adults began to fly together and were concentrated in a small forest opening. This might have been a reproductive swarm. This has not been observed in other species of *Purenleon*. The only discovered larva of *P. nunezi* (reared) came from an elevated water eroded area created in a deep gully which was filled with pale white sand. In average rain years, the incut probably remains relatively dry.

Material studied. 25 males, 34 females. June to October.

DOMINICAN REPUBLIC: **San Juan Province**: El Capa, 10 miles 17 km. northeast of Vallejuelo, 27.V.1986, Miller and Stange (8m, 9 f, FSCA). 13m, 20f, El Capa, 1 km. on road to Vallejuelo, 21.V.1985, Núñez, Woodruff and Stange (13m, 20f, FSCA); **Monte Cristi Province**: 3 km. north Villa Elisa, 17.VII.1986, Woodruff and Stange (1f, FSCA); 9 Km. north Elisa, 6.IV.1986, Miller and Stange (3m, lf, FSCA); 1m, 3f, 10 miles south Monte Cristi, 2.X.1985, Woodruff and Stange, at blacklight (1m. 3f. f, FSCA).

Discussion. This species can be distinguished from other *Purenleon* in Hispaniola except *P. woodruffi* by the complete lack of elongate bristle-like setae on the pronotum. The elongate midfemoral sense hair relates it to *P. minor* and *P. woodruffi* which lack suffusion in the subcostal area. The hind basitarsus is about three times as long as middle diameter which is found also in *P. minor* but not in *P. woodruffi* which has the hind basitarsus about 2.5 times longer than middle diameter. The female terminalia, especially the shape of the pregenitale, are distinctive. Also, at the El Capa locality three females were collected which have different wing markings (Fig. 106) than other specimens. In particular, the cubital stripe of most of the specimens is replaced by a large round dark brown spot. This might be a different species but male material is needed to resolve the problem.

Etomology. This species was named for the Dominican Republic entomologist, Carmelo Núñez, who assisted in field work.

***Purenleon parallelus* (Banks)**
Figures 111–115, 173–176

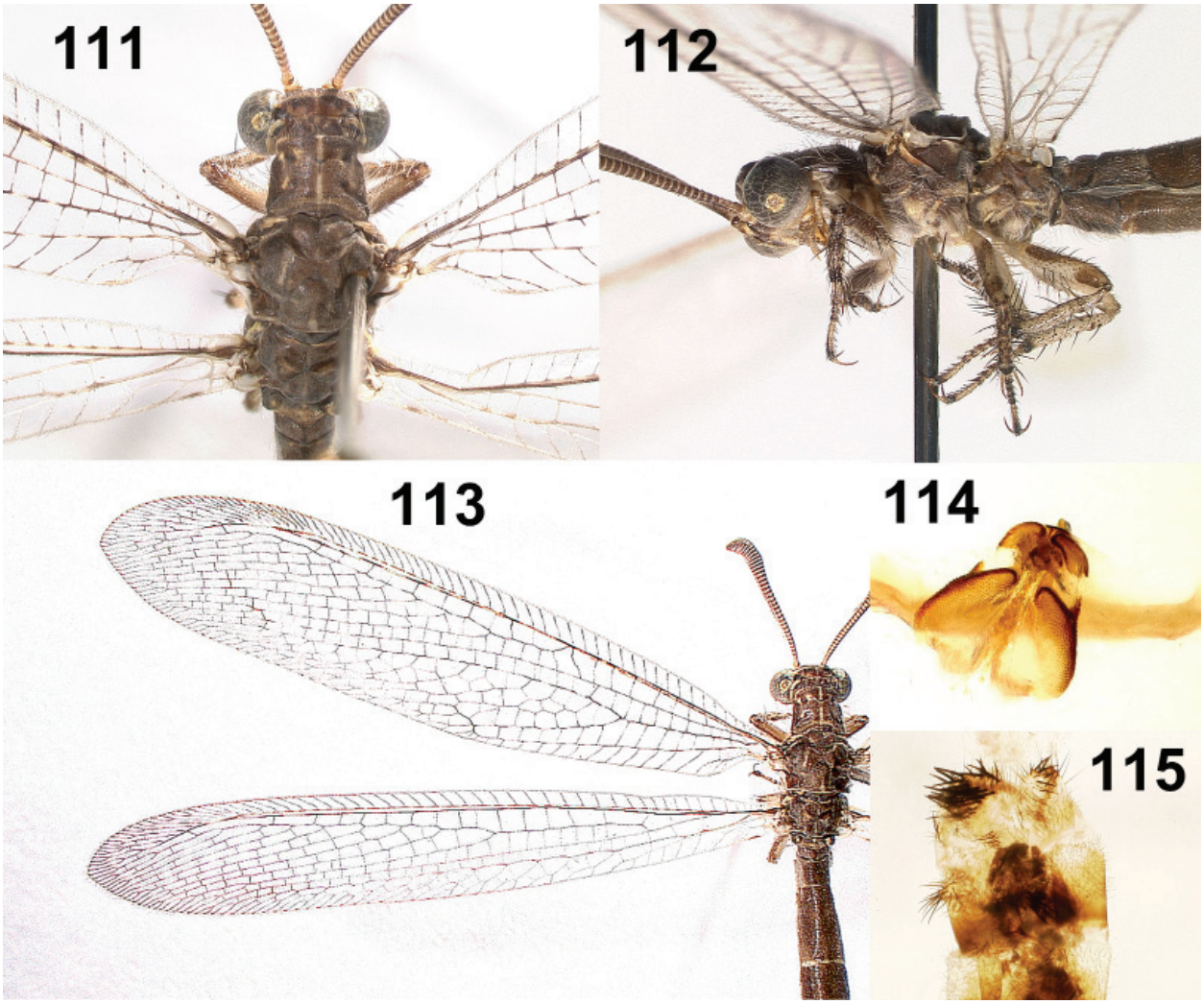
Psammoleon parallelus Banks 1935: 54. **Syntypes**, Puerto Castillo, Honduras, Bequaert (MCZC); Puntarenas, Costa Rica, l11.1908, Biolley (ANSP).
=*Psammoleon posticatus* Banks 1941a: 3 (after Stange 2004: 217). **Holotype**, Colombia (AMNH).

Taxonomy. Stange 2002: 286 (in *Purenleon*)

Further description. Miller 1990: 177, Fig. 8 (female terminalia); Stange 2002: 289, Fig. 641, 645 (wings; dorsal view head, thorax)

Distribution. Mexico; Honduras; Costa Rica (Stange 2002: 289); Panama; Colombia.

Diagnosis. Length to apex of tergite IX about 20–26 mm; forewing 24–33 mm, hindwing length 25–34 mm. **Coloration**: pronotum mostly dark brown, with some stripes; forefemur nearly completely dark brown, midfemur and hindfemur with mostly dark brown on exterior face, pale brown on closing face; tibiae pale brown with many dark brown spots especially on exterior face; tarsus with base of basitarsus and most of distal tarsomere pale brown, other tarsomeres and apex of distal tarsomere dark brown. **Chaetotaxy**: pronotum with elongate white bristles at lateral margin, at least subequal in length to those on forecoxa; midfemoral sense hair about one half length of forefemoral sense hair; mesoscutum without elongate, white bristles. **Structure**: pronotum a little broader than long measured along midline; basitarsus of hindleg about 3.5 times longer than greatest diameter, nearly equal in length to pretarsal claws; tibial spurs of foreleg reaching to about tarsomere III, that of hindleg to about tarsomere II, longer than pretarsal claws; forewing costal area expands gradually from base; CuP + 1A of forewing



Figures 111–115. *Purenleon parallelus* (Banks), adult. **111)** head and thorax; **112)** lateral view; **113)** wings; **114)** male genitalia; **115)** female terminalia, ventral view.

runs parallel to posterior fork of CuA for a long distance beyond origin of radial sector; abdominal tergites with scale-like sculpturing; **male genitalia** (Fig. 114) with arched gonarcus and mediuncus; paramere very complex, part near gonarcus laterally produced (about three times longer than wide), large elongate plate below, heavily sculptured with bumps, small lateral project toward apex; **female terminalia** (Fig. 115) with ectoproct not produced postventrally but with several prominent digging setae; posterior gonapophysis about twice as long as middle diameter; gonapophyseal plate about three times longer than wide; lateral gonapophyses separated, about twice as long as wide, with many prominent digging setae; pregenitale elongate transverse sclerite at least seven times wider than long, with small median projection; spermatheca not observed.

Larva. Fig. 173–176. **Coloration**: ventral head capsule well marked with elongate submedian dark brown markings medially and dark brown stripe from near mandible base laterally to touch that from other side; metathorax with extensive brown coloration dorsally. **Chaetotaxy**: dorsal surface of head capsule with numerous dolichasters of varying sizes but without prominent sublateral row of large dolichasters posterior to lateral tentorial suture; ventral head capsule medially with short, thick expanded setae. **Structure**: mandible about 30% shorter than ventral head capsule measured at center, distance between teeth 1 and 3 longer than that between base and tooth 1; mesothoracic tubercle not developed; abdominal spiracles not raised, quite flat and obscure, without nipples.

Biology. Larvae live in coastal sand tracts under the shade of plants. They do not anchor their legs. The Bombyliid *Chrysanthrax gemella* (Coquillett) was reared from specimens from Honduras.

Material studied. 7 males, 14 females. 3 larvae, February to July.

MEXICO. **Baja California Sur**: Playa Los Cerritos, 11.2 miles south Todos Santo, 28.IX,.1981, Andrews & Faulkner, at light (1f, FSCA). **Chiapas**: 8 km. south Puerto Arista, 28.II.1985, R. Miller & L. Stange (1 larva, 1f, FSCA); Puerto Arista, 28.II.1985, R. Miller & L. Stange (1 larva, 1f, FSCA); **Guerrero**: Acapulco, VII1.1951, H. Evans (1m, MCZC). **Oaxaca**: 10 km. south Salinas Cruz, 5.III.1985, R. Miller & L. Stange (1 larva, 1f, FSCA); **Veracruz**: 2 miles south Santa Ana, 20.II.1985, Miller and Stange, **reared** (1m, 1f, FSCA); **Tamaulipas**: La Pesca, beach, 19.II.1985, R. Miller and L. Stange, **reared** (1 larva, 4m, 2f, FSCA).

GUATEMALA. **Guatemala**: Santa Fe, 18.III.1992, P. Hunzker (1m, FSCA); Jacarandas de Cayala. 1155 m., 26.III.1991, A. Rosel (1f, FSCA); Mixco, 13 km. south Santa Rita, 1500 m.,16.II.2000, L. Arevalo (2f, FSCA).

HONDURAS. **Atlantida**: Tela, 25.V.1938, Hubbell (1f, FSCA); **Colon**: Puerto Castillo, 2.X, J. Bequaert (1f, MCZC).

COSTA RICA. **Puntarenas**: Puntarenas (1f, MCZC).

PANAMA. **Los Santos**: 1.5 km. north Pedasi, 21.VI.1973, Hevel (1f, FSCA)

Discussion. *Purenleon parallelus* can be distinguished from other species in the genus by the wing venation. CuP + 1A of forewing runs parallel to posterior fork of CuA for a long distance beyond origin of radial sector. This species appears closely related to *P. bistictus* which also inhabits coastal areas but mostly on the east side of Mexico and West Indian islands whereas *P. parallelus* inhabits coastal Mexico from Tamaulipas state in the east and Guerrero state in the west, extending to Central America and Colombia. Both species agree in having several elongate white bristles at the lateral margin of the pronotum and peculiar scale-like sculpturing on the male tergites. Also, the midfemoral sense hair is much shorter than the forefemoral sense hair in both species. The basitarsus of the hindleg is shorter in *P. parallelus* (about four times longer than greatest diameter) than in *P. bistictus* (hind basitarsus over five times longer than greatest diameter).

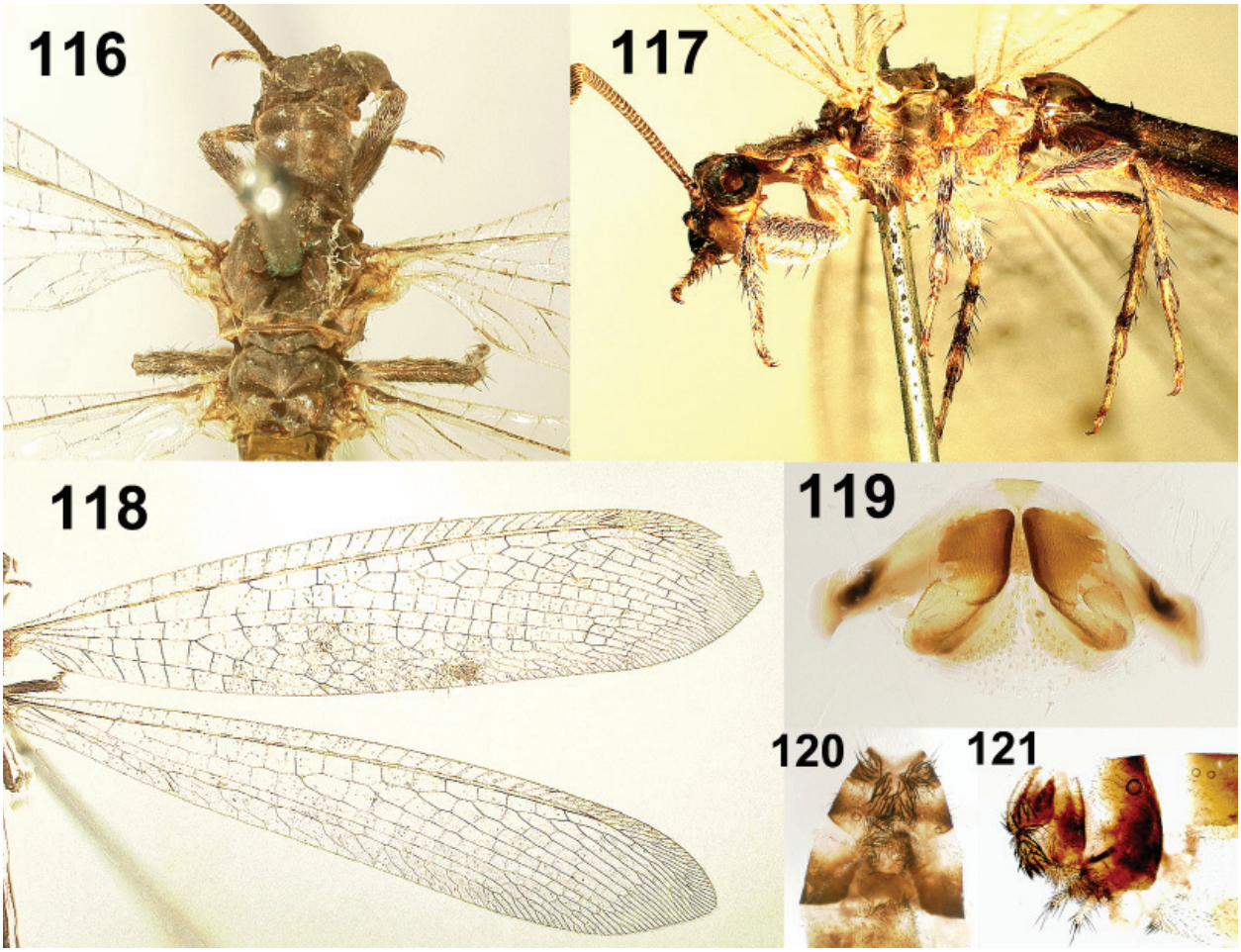
***Purenleon reductus* (Banks)**
Figures 116–121

Psammoleon reductus Banks 1941b: 177. **Holotype male,** Stakes Bay, Cayman Brac, Cayman Islands (BMNH).

Taxonomy. Stange 2002: 286 (in *Purenleon*).

Distribution. Cayman Islands (Kirby and Askew 1979: 125).

Diagnosis. Length of body 24–25 mm; forewing and hindwing length 28–30 mm. **Coloration**: general coloration dark brown; face mostly pale brown with broad dark brown band under and between antennal fossae; antenna dark brown with narrow apical pale brown, scape all dark posteriorly except apex; vertex nearly all dark brown; pronotum nearly all dark brown except narrowly at anterior margin and median pale brown line; forecoxa mostly pale brown laterally, dark brown basally; femora nearly all dark brown; foretibia and midtibia pale brown but with extensive dark brown areas at middle and apically, and elsewhere on exterior face; hindtibia mostly pale brown except apically. **Chaetotaxy**: pronotum without elongate white bristles at lateral margin, sometimes shorter, often black bristles present which are much shorter than those on forecoxa; thoracic pleura with many white setae; forecoxa with white bristles (if present) shorter than coxal diameter; femora with abundant white appressed setae; femora and tibiae with mostly black bristles; abdominal sternite II with several white setae. **Structure**: pronotum a little broader than long, measured along midline; forewing costal area expands fairly gradually from base, costal cells about 1.5 times as high as wide at middle, without interconnected crossveins except rarely toward stigma; forewing vein CuP+1A reaches hind margin beyond origin of radial sector; forewing costal area not as high as presectoral area at origin of radial sector; hind basitarsus slightly shorter than tarsomeres II–IV together; **male genitalia** (Fig. 119) with very broad gonarcus, weakly arched with elongate mediuncus which is pointed at apex; paramere appears to be two possibly hinged



Figures 116–121. *Purenleon reductus* (Banks), adult. **116)** head and thorax; **117)** lateral view; **118)** wings; **119)** male genitalia; **120)** female terminalia, ventral view; **121)** female terminalia, lateral view.

sclerites of similar, nearly rectangular shape, large, flat and sculptured with small scallop-like areas on surface, plate near gonarcus larger and more sclerotized; **female terminalia** (Fig. 120–121) with ectoproct without posventral lobe but with many digging setae; posterior gonapophyses close together (distance about four times gonapophysis base), about five times longer than wide; lateral gonapophyses appear partially fused together, wide (about three times longer wide) with many large digging setae; pregenitale large, sub-rectangular plate; spermatheca short (about 7 times longer diameter), strongly curved.

Material studied. 3 males, 3 females. May to August.

CAYMAN ISLANDS. **Cayman Brac**: Bight Road, Brac Parrot Preserve, 25.V.2009, M. Thomas & R. Turnbow (1m, FSCA); Hemmington Rd.at Songbird Dr., 24.V.2009, M. Thomas & R. Turnbow (1m, 1f, FSCA); Stakes Bay, VI–VIII,1938, L. Thompson (2f, BMNH). **Little Cayman Island**: 3 km. south Spot Bay, 8.VII.2013, M. Thomas, at blacklight (1m, FSCA).

Discussion. This species co-exists with *P. bistictus* in the Cayman Islands. The female terminalia are distinctive in having the elongate posterior gonapophyses close together at base and in having a large, sub-rectangular pregenitale.

***Purenleon toltecus* Miller and Stange, new species**
Figures 122–126, 177–180

Holotype male, Ixtapontango, Mexico, III.10.1985, R. Miller & L. Stange (FSCA).

Diagnosis. Costal area of forewing abruptly expanding near base; hind margin of forewing not suffused; pronotum without elongate white bristles laterally; forecoxa with distally swollen setae; tibial spurs of hindleg reaching only a little beyond apex of basitarsus.

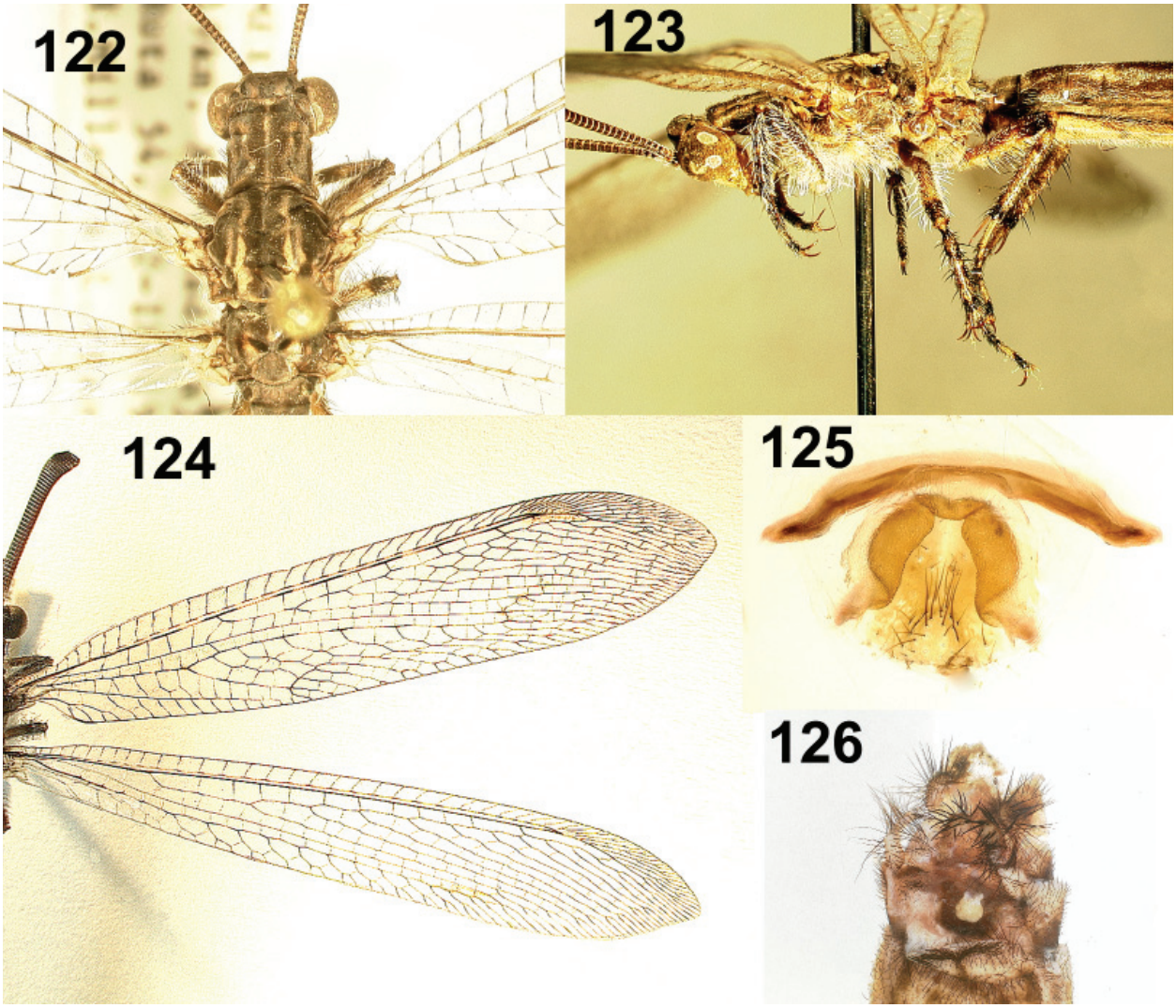
Holotype male. Length of body 25–31 mm; forewing and hindwing length 30–37 mm. **Coloration**: face mostly pale brown, with narrow dark brown band below and between antennal fossae; distal palpomere of labius mostly pale brown but with some dark brown especially at sensory area and at apex; antenna with scape and pedicel mostly pale brown but much darker laterally; flagellomeres mostly pale brown, rest of flagellomeres mostly dark brown with narrow pale brown apex; hindtibia pale brown with basal, subbasal and apical dark brown rings; pronotum mostly dark brown with median pale line, submedial pale area enclsoing short dark brown stripe hind margin of forewing not suffused from near base to well beyond mid point; abdominal tergites dark brown with pale brown spots anteriorly on tergites I–VI; ectoproct and tergite IX pale brown . **Chaetotaxy**: pronotum without elongate white bristles; forecoxa with elongate white bristles longer than coxal diameter on lateral face, weakly swollen distally, in addition to elongate white setae on posterior margin; forefemur with numerous long, white, distally swollen setae on exterior face; thoracic pleura with many long, white, distally swollen setae; midfemoral sense hair about equal to foremoral sense hair which is about one half as long as forefemur; abdomen with very short setae. **Structure**: distal palpomere of labius weakly swollen; antenna with about 40 flagellomeres, flagellomere I longer than wide, rest broader than long; pronotum broader than long measured along midline; forewing costal area expands abruptly from base, without interconnected crossveins, cells near middle about as broad as high; CuP + lA of forewing runs obliquely to hind margin along posterior fork of CuA at a point a little beyond origin of radial sector; tibial spurs of hindleg reaching only a little beyond apex of basitarsus which is about five times longer than median diameter; **male genitalia** (Fig. 125) with broad, weakly arched gonarcus, with large mediuncus, which is broader than long; paramere with two levels, upper level sculptured, about five times longer than wide, curving underneath medially to larger, broader plate which is abruptly narrowed at posterior margin; parameres joined at mediuncus.

Female. Fig. 126. About as described for male except for terminalia with ectoproct with broad, upturned postventral lobe; posterior gonapophyses well separated, about six times longer than median width, strongly bowed at middle; gonapophyseal plate elongate (more than six times longer than broad),

broadest starting at base of gonapophysis, then abruptly narrowing and bending at posterior one-fourth; lateral gonapophysis short, about twice as long as wide, narrowing a little anteriorly, with strong digging setae that are longer than gonapophysis; pregenitale huge, broadly U-shaped; spermatheca about eight times longer than wide, nearly completely straight except strongly recurved at apex; terminalia mostly dark brown except tergites and ectoproct laterally and posterior gonapophysis pale brown.

Larva. Fig. 177–180. **Coloration**: mandible pale, straw colored; head capsule dorsally dark brown with no orange overtones; ventral head capsule with four longitudinal dark brown stripes. **Chaetotaxy**: dorsal surface of head capsule with many dolichasters of varying sizes including prominent submedial row of large dolichasters posterior to lateral tentorial suture; ventral surface of head capsule with elongate, unexpanded, flat-ended setae; dorsal surface of abdominal segments IV–VII with many simple setae and some straight-sided dolichasters. **Structure**: mandible longer than head capsule, distance between teeth 1 and 3 about equal to that between base and tooth 1, without dolichasters but with short setae; head capsule flares out and becomes slightly wider posterior to eye stalks; mesothoracic spiracular tubercle not developed; abdominal spiracles easily visible, but shorter than or equal to basal width.

Variation. Length of body ranges from 21 to 23 mm, forewing 28 to 35, hindwing 27 to 34 mm.



Figures 122–126. *Purenleon toltecus* Miller and Stange, adult. **122)** head and thorax; **123)** lateral view; **124)** wings; **125)** male genitalia; **126)** female terminalia, ventral view.

Biology. This species lives under rock overhangs in rain protected, well lit and warmer habitats. Larvae were collected in microhabitats where they could be exposed to some afternoon sun. In some localities they are the only antlion larva in the caves. At Ixtapontango, they share their overhang with *P. aztecus*, which live in a less well lit and cooler microhabitat. *Purenleon toltecus* larvae did not compete with *P. aztecus* for space or resources. *Purenleon toltecus* larvae have more debris cemented to their heads than larvae of *P. aztecus* but are similar to the larva of *P. apache*. This debris is difficult to remove.

Types. 5 males, 8 females. 2 larvae. April, September.

MEXICO. **Jalisco**: 19 km. north Guadalajara, 22.IX.1986, **reared**, R. Miller & L. Stange (1 larva, 1m, 2f, FSCA). **Mexico**: Ixtapontango, 10.III.1985, **reared**, R. Miller & L. Stange (1 larva, 3m, 3f, FSCA). **Oaxaca**: 11 miles north Miltipec, 3.III.1972, F. Parker & D. Miller (1f, FSCA; USNM); 23 miles south Matías Romero, 3.X.1986, reared, Miller and Stange (1m, FSCA). **Puebla**: Cascaloapan, 26.IV.1962, L. Stange (1m, FSCA); 3 miles east Izucar de Matamoros, 1.IV.1962, L. Stange (1f, FSCA).

Discussion. *Purenleon toltecus* is related to *P.apache* and *P. aztecus* in having the forefemur with numerous long setae on exterior face and the forecoxa has numerous elongate and often distally swollen setae on lateral face in addition to elongate white setae on posterior margin. It can be distinguished from *P. aztecus* in having the tibial spurs of hindleg reaching near the apex of tarsomere II and the hindmargin of the forewing is not suffused. From *P.apache*, the elongate white setae laterally on the pronotum and distally swollen setae on forecoxa as well as having the forewing costal area wider than high are diagnostic features. The larva agrees with *P. apache* and *P. aztecus* in having having a prominent sublateral row of dolichasters posterior to the lateral tentorial suture on the dorsal head capsule. Also, the abdominal spiracles are easily visible, although shorter than or equal to basal width in these three species.

Purenleon woodruffi **Miller and Stange**

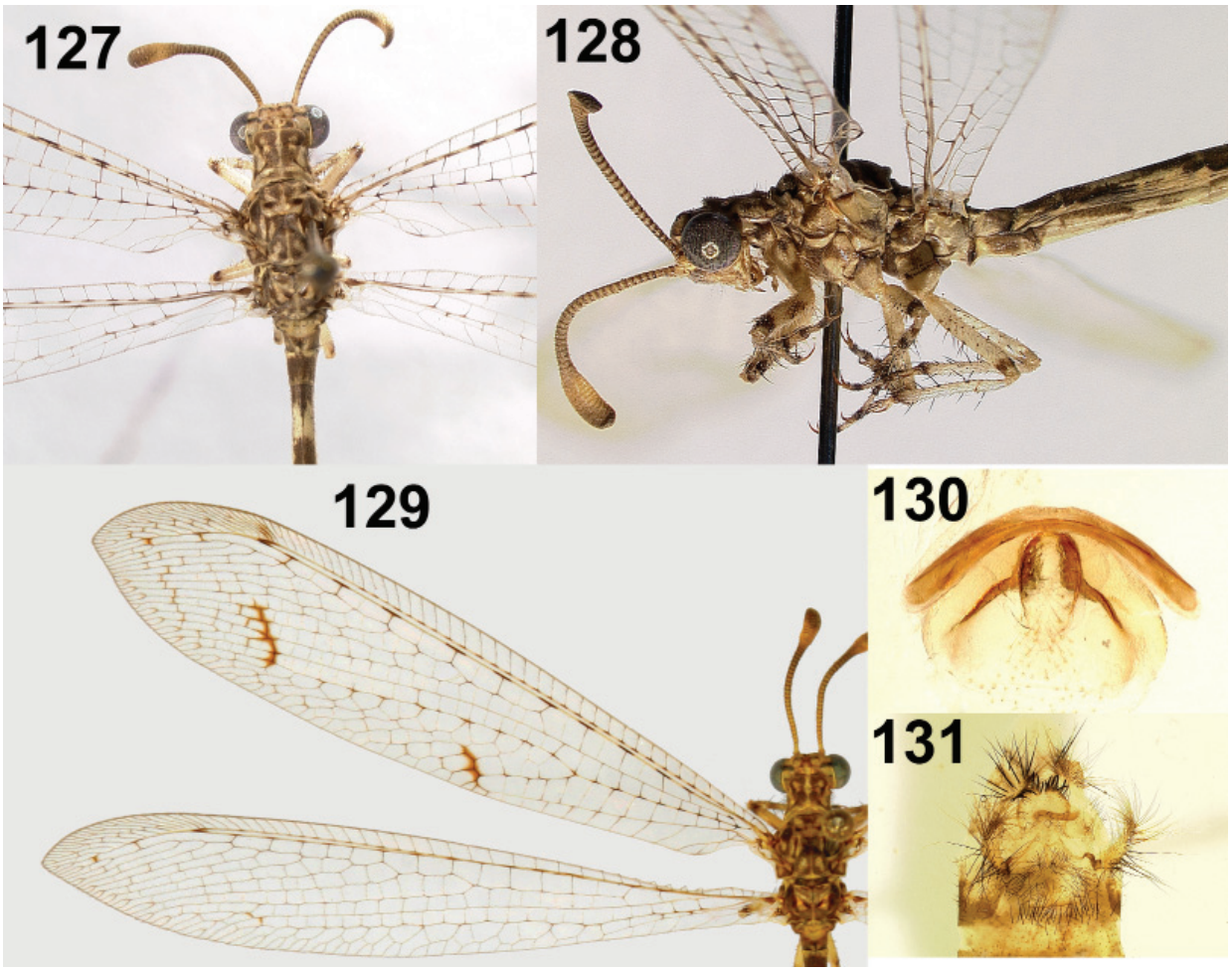
Figures 127–131, 181–183

Purenleon woodruffi Miller and Stange 2011: 25, Fig. 18 (color photo adult). **Holotype male,** 9 km. north of Villa Elisa, Monte Cristi Province, Dominican Republic, 24.VI.1986, R. Miller and L. Stange collectors (FSCA).

Biology. Miller and Stange 2011: 35, Fig. 36–37 (photos of larva).

Diagnosis. Length of body 20–26 mm.; forewing length 27–30 mm; hindwing 26–29 mm. **Coloration**: pale brown;. face pale brown with reduced dark brown band below antennal fossae, extending narrowly along mesal margin to merge with small dark brown area above antennal fossae; anterior row of vertex markings with sublateral dark band narrowly separated from double mesal mark; middle row of markings fainter, extending weakly to posterior margin, small dark spot at posterolateral margin; mouthparts pale brown except dark brown spot on stipes; antenna pale brown with small anterior mark on scape, dark brown marks on lateral and mesal margins of pedicel; basal dark brown band on flagellomeres (except basal one)before clava, more pronounced on lateral margins; pronotum pale brown with with prominent double mark submesally enclosing completely pale area, small sublateral streak on basal one half; mesonotum about equally dark and pale brown with complex pattern; mesoscutellum with large mesal area enclosing pale brown spot, not reaching posterior margin; metanotum predominately dark brown; pleura mostly pale brown except mostly dark brown ventrally; forecoxa with two small dark brown areas near base and subapically; femora with dark brown subapical band, forefemur also with dark streak on lateral face; tibiae with apical dark brown band, foretibia and midtibia also with subbasal and medial bands; tarsus mostly pale brown with tarsomeres III and IV dark brown and distal tarsomere dark brown apically; forewing costal area not suffused; wing membrane with prominent dark brown streak at rhegma, smaller one at cubitus; stigma whitish preceded by small dark brown area; wing veins and crossveins alternating pale and dark brown; abdomen with tergites mostly dark brown, pale brown on tergite II at anterior and posterior margins, tergites III–VI with double pale stripe at

middle extending laterally toward posterior margin; apices narrowly pale brown. **Chaetotaxy**: pronotum with only inconspicuous setae that measure less than 1/2 length of forecoxal white setae which are restricted to ventral half of lateral margin and which are shorter than coxal width; midfemoral sense hair as long as that of forefemur which is over 3/4's length of femur; posterior margin of female sternite VIII with many setae. **Structure**: pronotum a little broader than long measured along midline; hindwing slightly longer than forewing; forewing with costal area gradually expanding from base, with only one series of cells, those above radial sector higher than wide; forewing costal area with crossveins not interconnected, costal cells at middle higher than wide, gradually narrowing basally; forewing radial sector orignates about at basal one-third; CuP + 1A runs to posterior margin a little beyond level of origin of radial sector; hind basitarsus about 2.5 times longer than greatest diameter, shorter than pretarsal claws; hindtibial spurs reach beyond apex of tarsomere II; abdomen much shorter than wings, ectoproct simple; **male terminalia** (Fig. 130) with strongly arched gonarcus, no apparent mediuncus; paramere at two levels, upper level is narrow elongate at least ten times longer than wide and below this is a larger sclerite, at least 10 times longer than wide which is strongly diverging laterally near middle; **female terminalia** (Fig. 131) with ectoproct with short postventral lobe not upturned; posterior gonapophyses well separated, at least six times longer than median width, bowed, with many fine light brown hair-like setae; gonapophyseal plate elongate (at least ten times longer than greatest width), basal one third broadest, then strongly bending to much narrower apical part; lateral gonapophyses well separated, about four tmes longer than wide with many strong digging setae concentrated toward apex; pregenitale elongate narrow sclerite about ten times wider than long; spermatheca long tube (at least 8 times longer than diameter), recurved apically.



Figures 127–131. *Purenleon woodruffi* Miller and Stange, adult. **127)** head and thorax; **128)** lateral view; **129)** wings; **130)** male genitalia; **131)** female terminalia, ventral view.

Larva. Fig. 181–183. **Coloration**: ventral head capsule with dark brown stripe near mandible base extending posteriorly and laterally approach stripe from other side; small dark brown spot submedially near posterior margin. **Chaetotaxy**: mandible with several pale dolichasters on mesal margin near base; dorsal head capsule with many dolichasters but without submedial row posterior to lateral tentorial suture. **Structure**: mandible longer than ventral head capsule, distance between teeth 1 and 3 longer than between base and tooth 1; labial palpus longer than basal width of mandible; head much longer than wide;; mesothoracic spiracle borne on tubercle that is about as broad basally as long; abdominal spiracles II to VII higher than basal width, somewhat larger than abdominal spiracle I; spiracles IV–VI with prominent expanded nipples.

Biology. The larvae of this species live in fine sandy soil under rock overhangs away from strong direct sun and rain.

Material studied. 3 males, 6 females. 1 larva. June, October.

DOMINICAN REPUBLIC. **Monte Cristi Province**: 9 km. north of Villa Elisa, 4.VI.1986, **reared**, R. Miller and L. Stange collectors (2m, 3f, 1 larva, FSCA);. 3 km. north of Villa Elisa, 1.X.1985, Woodruff and Stange (1m, 3f, FSCA).

Discussion. This species is structurally similar to *C. nunezi* but is lighter in coloration.

Etomology. This species was named for Robert E. Woodruff in recognition of his contributions to our knowledge of the antlions of the Dominican Republic.

Purenleon zayasi (Alayo)

Psammoleon zayasi Alayo 1968: 67, Fig. 25a, Plate V, Fig. l (head and thorax); Plate VII, Fig. 2 (female terminalia, lateral view).

Holotype female (not male!)**,** Peninsula de Gunahacabibes, Pinar del Rio, Cuba, 1956, (not located, Zayas collection).

Taxonomy. Stange 2002: 286 (in *Purenleon*)

Distribution. Cuba.

Diagnosis (from original description): length of forewing and hindwing 24 mm. **Coloration**: general coloration brown with pale brown markings; antenna with scape mostly dark brown, flagellomeres dark brown with light brown apex; legs mostly pale brown, femora with dark brown apex and dorsal dark spot at middle; foretibia and midtibia with three dark brown rings, hindtibia with only apical dark brown area; tarsi light brown with with dark brown at middle and apically; pretarsal claws and tibial spurs honey colored; forewing mostly without suffusion, with three dark brown stripes, one in area between forks of Cua near posterior margin, another near rhegma, and a third one beyond; area above stigma with small dark area; hindwing without suffusion except two very small dark brown spots in apical field. **Structure**: antenna somewhat shorter than the length of thorax; pronotum a little longer than wide; tibial spurs long and curved, extending to tarsomere III of foreleg; wings long and narrow, forewing costal area with cells higher than long at middle; CuA extending to above level of radius sector; female ectoproct with small postventral lobe.

Material studied. No specimens available.

Discussion. The description by Alayo does not provide enough diagnostic characters to provide key characters. However, *P. zayasi* appears to be a distinct species.

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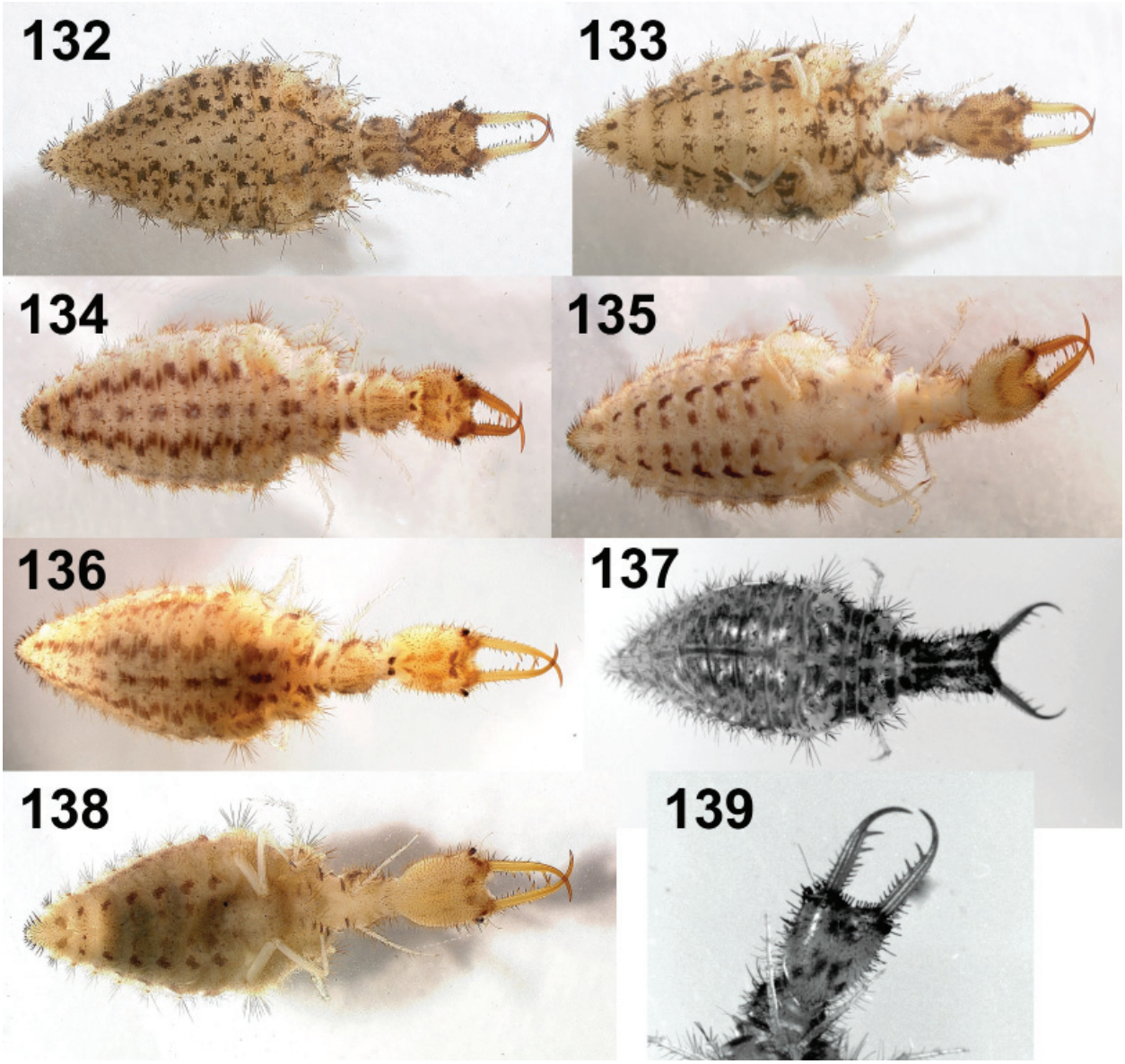
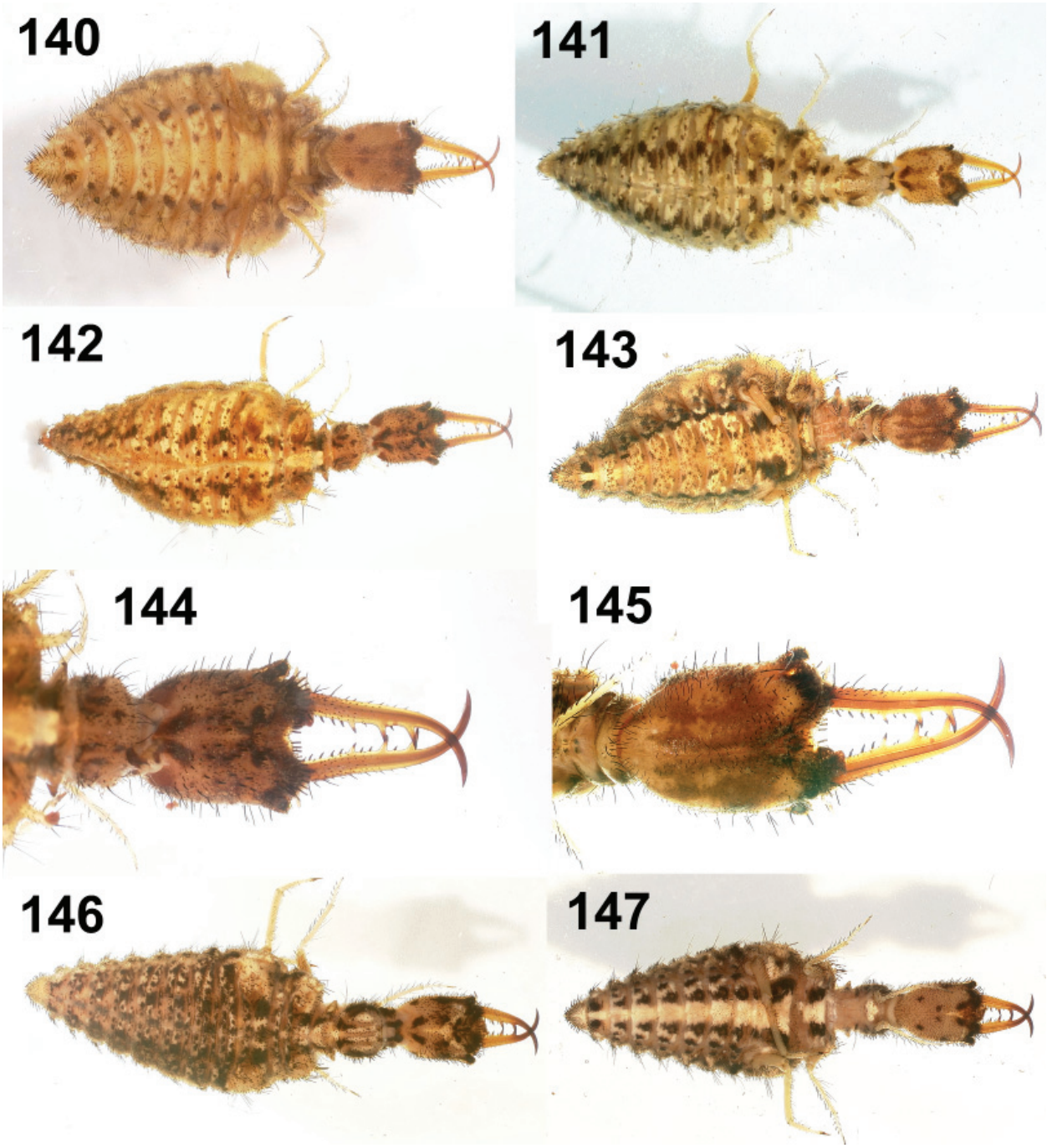
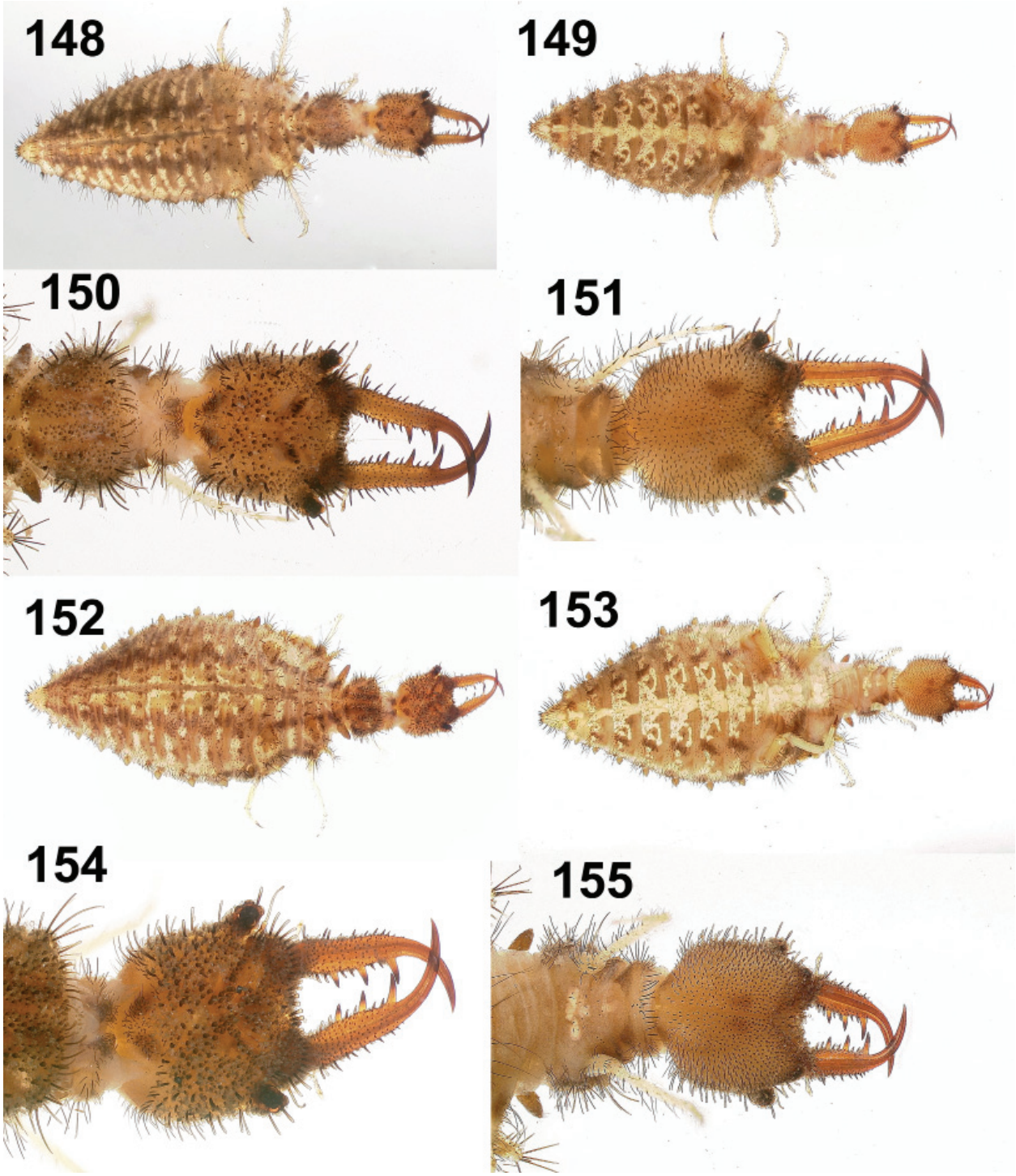


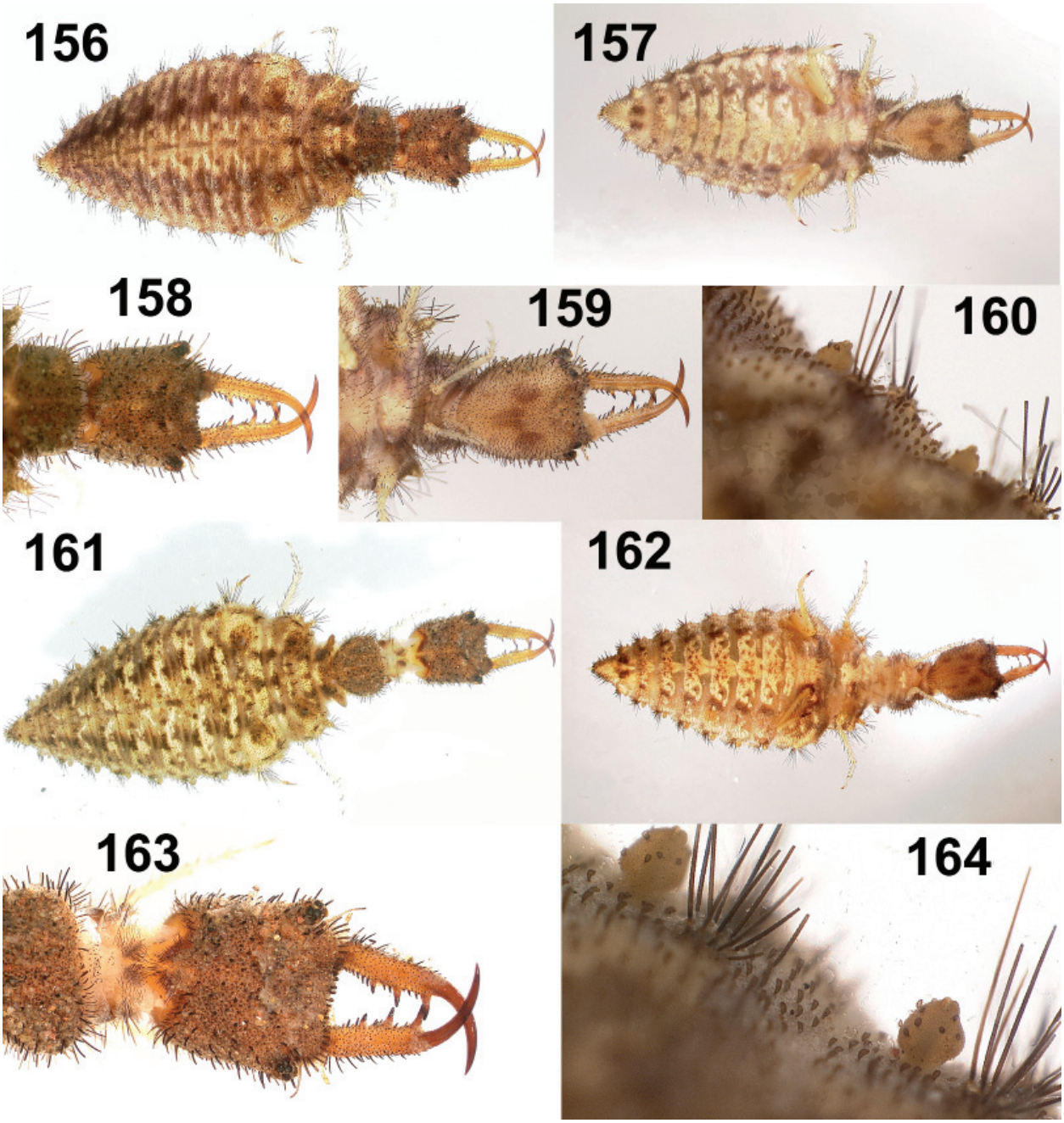
Figures 132–133. *Purenleon abruptus* Stange, larva. **132)** dorsal view; **133)** ventral view. **Figures 134–135**. *Purenleon albovaria* (Banks), larva. **134)** dorsal view; **135)** ventral view. **Figures 136–139**. *Purenleon connexus* (Banks), larva. **136)** dorsal view, California, USA; **137)** dorsal view, Colima, Mexico; **138)** ventral view, California, USA; **139)** ventral view of head, Colima, Mexico.



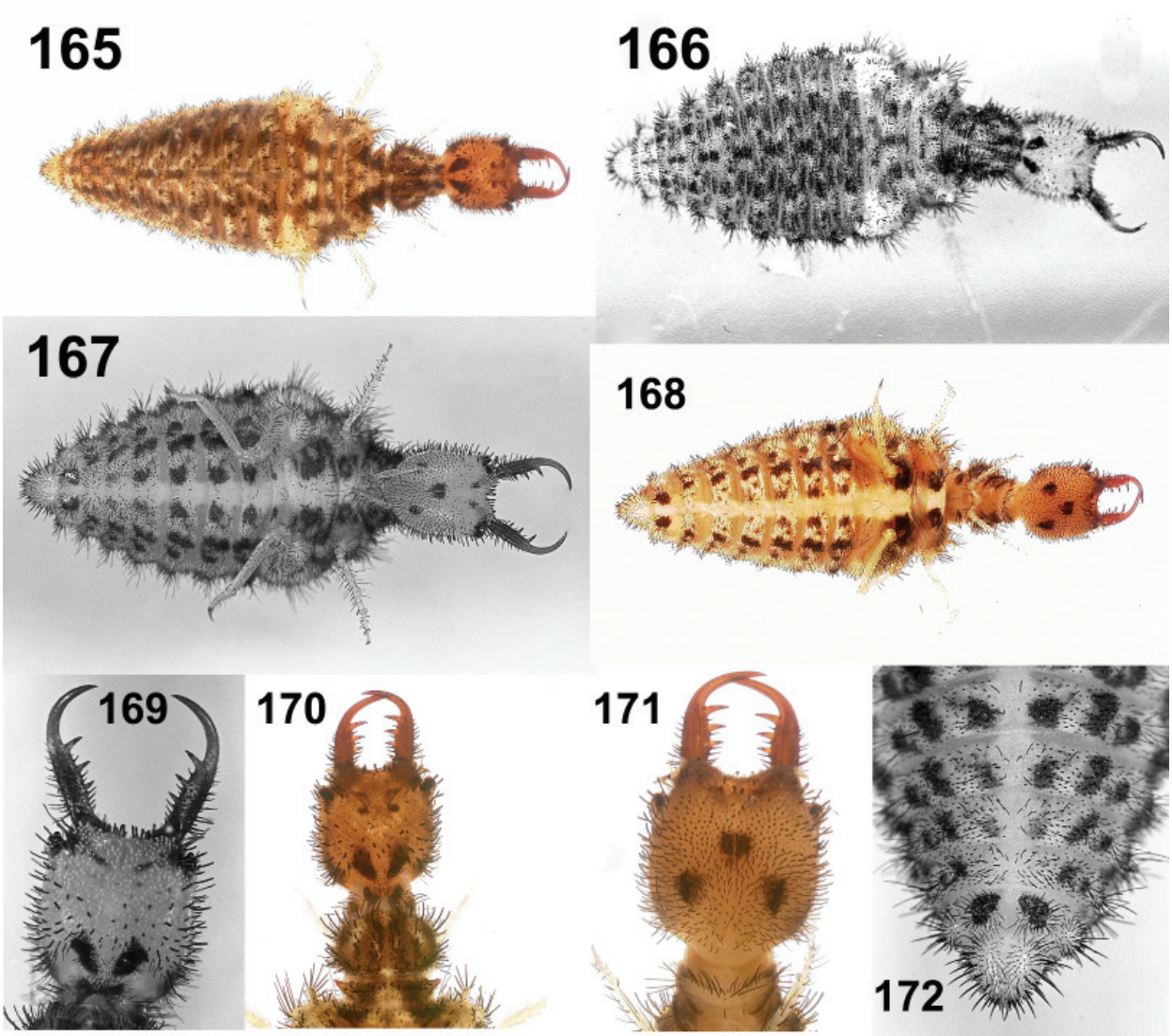
Figures 140–141. *Purenleon oaxacae* Miller and Stange, larva. **140)** ventral view; **141)** dorsal view. **Figures 142–145**. *Purenleon aztecus* Miller and Stange, larva. **142)** dorsal view; **143)** ventral view; **144)** dorsal view of head; **145)** ventral view of head. **Figures 146–147**. *Purenleon bistictus* (Hagen), larva. **146)** dorsal view; **147)** ventral view.



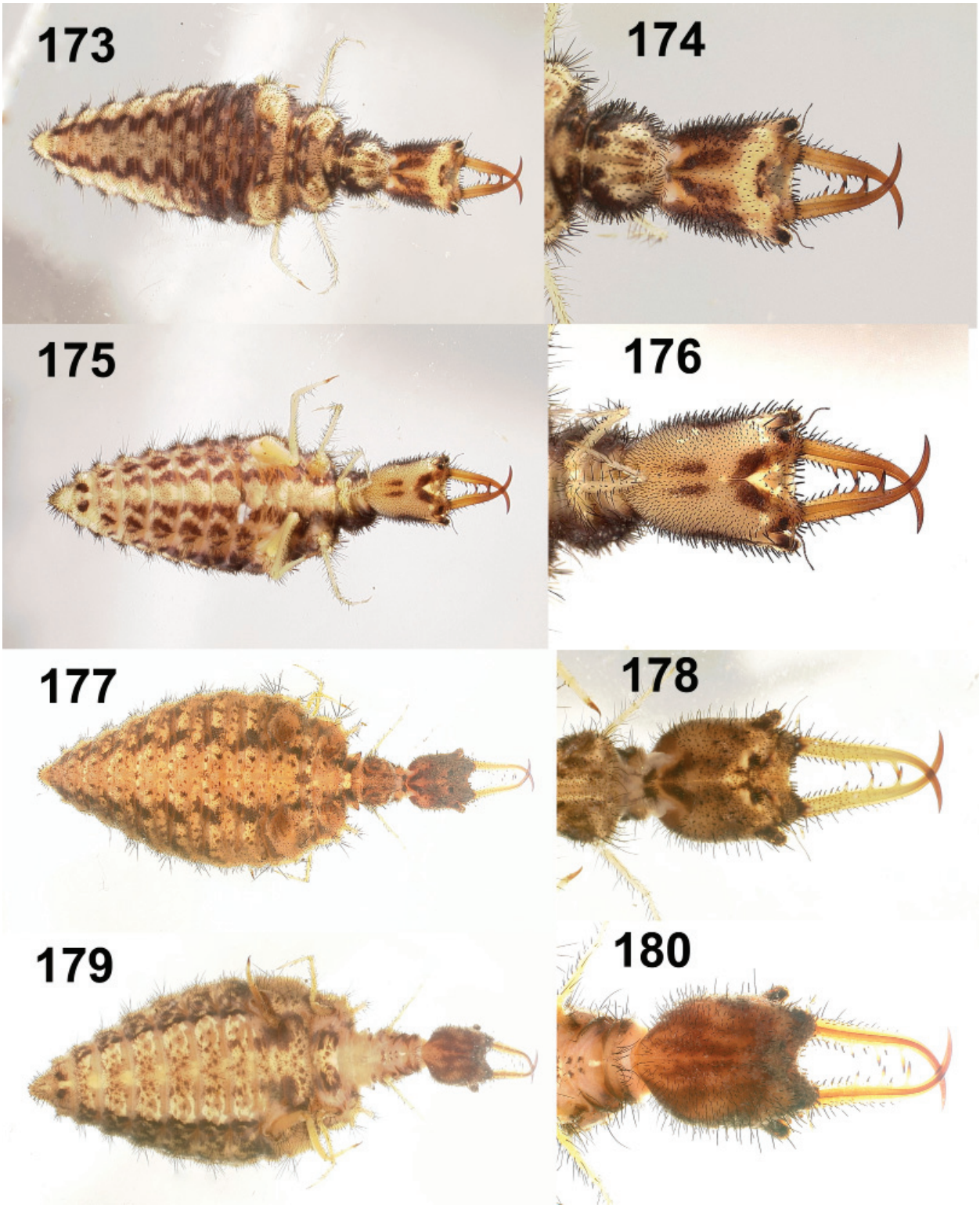
Figures 148–151. *Purenleon cavei* Miller and Stange, larva. **148)** dorsal view; **149)** ventral view; **150)** dorsal view of head; **151)** ventral view of head. **Figures 152–155**. *Purenleon clavatus* (Navás), larva. **152)** dorsal view; **153)** ventral view; **154)** dorsal view of head; **155)** ventral view of head.



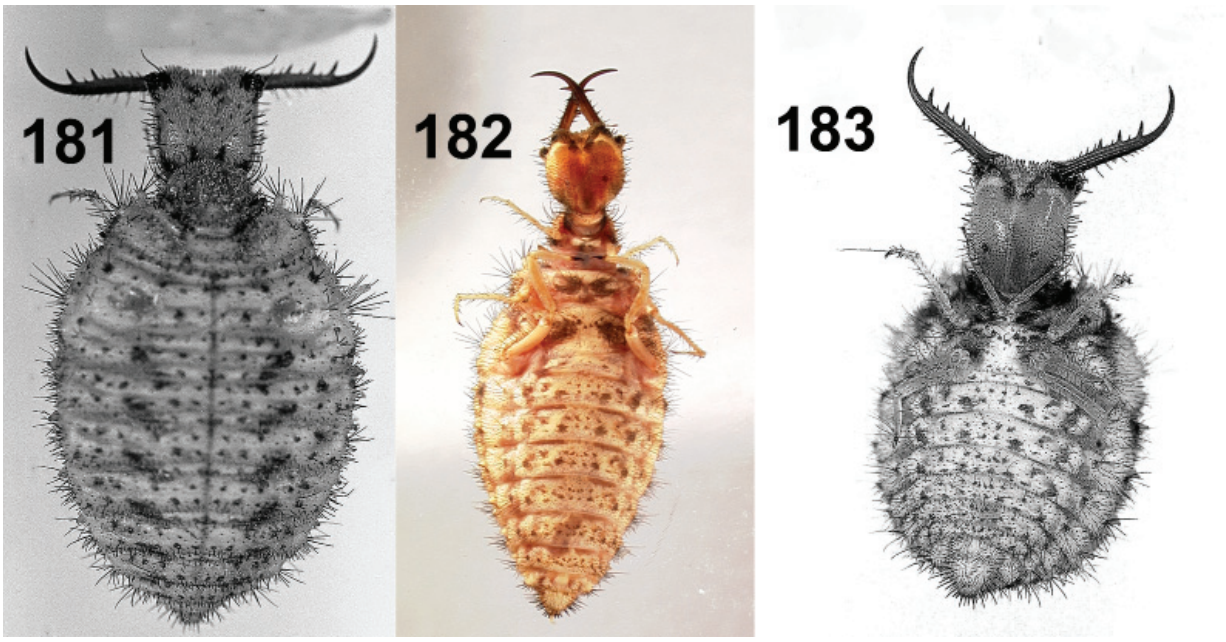
Figures 156–160. *Purenleon debilis* (Gerstaecker), larva. **156)** dorsal view; **157)** ventral view; **158)** dorsal view of head; **159)** ventral view of head; **160)** abdominal spiracles. **Figures 161–164**. *Purenleon iniquus* (Navás), larva. **161)** dorsal view; **162)** ventral view; **163)** dorsal view of head; **164)** abdominal spiracles.



Figures 165–172. *Purenleon minor* (Banks), larva. **165–166)** dorsal view; **167–168)** ventral view; **169–170)** dorsal view of head; **171)** ventral view of head; **172)** ventral view of abdomen.



Figures 173–176. *Purenleon parallelus* (Banks), larva. **173)** dorsal view; **174)** dorsal view of head; **175)** ventral view; **176)** ventral view of head. **Figures 177–180**. *Purenleon toltecus* Miller and Stange, larva. **177)** dorsal view; **178)** dorsal view of head; **179)** ventral view; **180)** ventral view of head.



Figures 181–183. *Purenleon woodruffi* Miller and Stange, larva. **181)** dorsal view; **182–183)** ventral view.