

**Revision and phylogeny of the genus *Pselaphomorphus* Motschulsky, 1855
(Staphylinidae, Pselaphinae: Jubini).**

by
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ABSTRACT

The Neotropical genus *Pselaphomorphus* Motschulsky, 1855 (Coleoptera: Staphylinidae: Pselaphinae: Jubini Raffray) is revised, including the redescription of *P. sculpturatus* Motschulsky, 1855 (Panama), *P. longiceps* Raffray, 1890 (Brazil) and *P. microphthalmus* Raffray, 1890 (Venezuela) and description of 19 new species: *P. breviantennis*, sp.n (Bolivia), *P. macrommatus*, sp.n (Ecuador), *P. difficilis*, sp.n (Costa Rica), *P. parkensis*, sp.n (Costa Rica), *P. chandleri*, sp.n (Panama), *P. incarum*, sp.n (Peru), *P. azuayensis*, sp.n (Ecuador), *P. raffrayi*, sp.n (Peru), *P. agametopus*, sp.n (Colombia), *P. longissimus*, sp.n (Panamá), *P. iguazuensis*, sp.n (Argentina), *P. santaecrucis*, sp.n (Bolivia), *P. melanosus*, sp.n (Costa Rica), *P. veracruzanus*, sp.n (Mexico), *P. wagneri*, sp.n (Mexico), *P. mayarum*, sp.n (Honduras and Belize), *P. carenobothrus*, sp.n (Ecuador and Peru), *P. acutispinosus*, sp.n (Peru) and *P. carltoni*, sp.n (Ecuador). A key to species and illustrations of external and internal structures of males is provided. *Pselaphomorphus* is characterized as a monophyletic group by two unreversed synapomorphies: the presence of an antennal tuberculum chordate basally and the head longitudinal sulcus complete, not bifurcated; additionally it can be recognized by the combination of diagnostic features as lateral pronotal lobes, the complete transversal sulcus and the presence of the basal discal foveae and the sutural fovea in the elytra. A phylogenetic reconstruction of 29 taxa (6 outgroup, 23 ingroup) and 33 morphological characters resulted in two equally parsimonious trees, from which the strict consensus tree is presented (L=76 steps, CI=44, RI=79) with the ingroup topology (*P. breviantennis*, *P. longiceps* (*P. macrommatus*, (*P. difficilis* (*P. parkensis*, (*P. chandleri*, *P. incarum*)))), (*P. microphthalmus*, ((*P. azuayensis*, *P. raffrayi*), (((*P. agametopus*, *P. longissimus*), (*P. iguazuensis*, (*P. breviantennis*, *P. santaecrucis*))), (*P. melanosus*, (*P. veracruzanus*, ((*P. carenobothrus*, *P. acutispinosus*), ((*P. mayarum*, *P. wagneri*), (*P. carltoni*, *P. sculpturatus*)))))))). The phylogeny indicates that *Phasmisus* Aubé (Pselaphinae: Jubini) is the most closely related sister genus for *Pselaphomorphus*. The altitudinal distributions of the species groups formed in the phylogenetic analysis suggest their potential use in biogeographical studies. However, many hypotheses remain to be tested in relation to the ecology and natural history of this group of Neotropical Pselaphines.

RESUMEN

Se revisa el género Neotropical *Pselaphomorphus* Motschulsky, 1855 (Coleoptera: Staphylinidae: Pselaphinae: Jubini Raffray) incluyendo redescriptiones de *P. sculpturatus* Motshulsky, 1855 (Panamá), *P. longiceps* Raffray, 1890 (Brazil) y *P. microphthalmus* Raffray, 1890 (Venezuela), y descripciones de 19 nuevas especies: *P. breviantennis*, sp.n (Bolivia), *P. macrommatus*, sp.n (Ecuador), *P. difficilis*, sp.n (Costa Rica), *P. parkensis*, sp.n (Costa Rica), *P. chandleri*, sp.n (Panamá), *P. incarum*, sp.n (Peru), *P. azuayensis*, sp.n (Ecuador), *P. raffrayi*, sp.n (Peru), *P. agametopus*, sp.n (Colombia), *P. longissimus*, sp.n (Panamá), *P. iguazuensis*, sp.n (Argentina), *P. santaecrucis*, sp.n (Bolivia), *P. melanosus*, sp.n (Costa Rica), *P. veracruzanus*, sp.n (México), *P. wagneri*, sp.n (México), *P. mayarum*, sp.n (Honduras y Belize), *P. carenbothrus*, sp.n (Ecuador and Perú), *P. acutispinosus*, sp.n (Perú) y *P. carltoni*, sp.n (Ecuador). Se provee una clave de las especies e ilustraciones de estructuras externas e internas de los machos. *Pselaphomorphus* se caracteriza como un grupo monofilético por dos sinapomorfias sin reversión: la presencia de un tubérculo antenal cordado basalmente y el sulco longitudinal de la cabeza completo, no bifurcado; además puede ser reconocido por la combinación de características diagnósticas como los lóbulos laterales del pronoto el sulco basal del pronoto completo y la presencia de las foveas basal discal y sutural de los élitros. Una reconstrucción filogenética de 29 taxa (6 outgroup, 23 ingroup) y 33 caracteres morfológicos produjeron dos árboles filogenéticos igualmente parsimoniosos, a partir de ellos se presenta un árbol de consenso estricto (L=76 pasos, CI=44, RI=79) con la topología del ingroup (*P. breviantennis*, *P. longiceps* (*P. macrommatus*, (*P. difficilis* (*P. parkensis*, (*P. chandleri*, *P. incarum*))))), (*P. microphthalmus*, ((*P. azuayensis*, *P. raffrayi*), (((*P. agametopus*, *P. longissimus*), (*P. iguazuensis*, (*P. breviantennis*, *P. santaecrucis*))))), (*P. melanosus*, (*P. veracruzanus*, ((*P. carenbothrus*, *P. acutispinosus*), ((*P. mayarum*, *P. wagneri*), (*P. carltoni*, *P. sculpturatus*)))))))). La filogenia indica que *Phasmisus* Aubé (Pselaphinae: Jubini), es el género más cercanamente relacionado con *Pselaphomorphus*. Las distribuciones altitudinales de los grupos de especies formados en el análisis filogenético sugieren su uso potencial en estudios biogeográficos, sin embargo, muchas hipótesis sobre la ecología e historia natural del grupo permanecen desconocidas.

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In memoriam Enrique Vélez García: you were always there, we did it together.

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Revision and Phylogeny of the genus *Pselaphomorphus* Motschulsky, 1855

(Staphylinidae, Pselaphinae: Jubini).

1. Introduction

The subfamily Pselaphinae (Coleoptera: Staphylinidae) contains more than 9000 species distributed worldwide (Newton & Chandler 1989; Thayer 2005). This species richness makes it the second largest subfamily within the hyperdiverse Staphylinidae (Newton 2009). Most species are small in size (0.7-4.5 mm) and can be found in leaf and wood litter of the forest floor (Newton & Chandler 1989; Chandler 1990; Thayer 2005). All species have well-developed mandibles and are predaceous on invertebrates such as annelids, collembolans, other insect larvae, mites and symphylans (Chandler 1990). Their high species richness and abundance in certain microhabitats suggest that pselaphines are ecologically important (Chandler 1990; Navarrete-Heredia et al. 2002). Thus, combining the diversity of this subfamily with a wealth of taxonomic characters can improve phylogenetic analyses and facilitate evolutionary studies at regional and global biogeographic scales (Newton & Chandler 1989; Carlton 1990).

Several key treatments have addressed the taxonomy of the Pselaphinae around the world. In the Neotropical region, Orlando Park worked on the fauna of pselaphines of the West Indies and Central America during the middle of the previous century (Park 1942; 1952). However, since that time, revisionary efforts have focused on the North American fauna, leaving a great part of the Neotropical fauna without modern systematic updates for more than 50 years.

Previous to this study, the genus *Pselaphomorphus* Motschulsky, 1855, was formed by 5 described species distributed from Panamá to Argentina (Park 1952): *P. sculpturatus* Motschulsky, 1855, which is the type species described for Panama; *P. longiceps* Raffray, 1890, described for Blumenau, Santa Catarina and Vicosá, Minas Gerais, in Brazil; *P. microphthalmus* Raffray, 1890, described for Tovar Colony, Venezuela; *P. bruchi* Raffray, 1908, described for Buenos Aires, Argentina, and *P. brevipennis* Raffray, 1917, described for Asunción, Paraguay. Beyond these short descriptions and a few sketches from some holotypes, there is a publication of a species key, in which *P. sculpturatus* is not included (Park 1952).

Here I present an inclusive revision of the genus, made as a step into an update of Neotropical Pselaphinae species that have been unexplored for several decades. Different museum loans and

visits to collections have resulted in the acquisition of specimens pertaining to 19 new species from different countries (Argentina, Belize, Bolivia, Colombia, Costa Rica, Ecuador, Honduras, Mexico, Panama, and Peru). We present a cladistics analysis of the hypothesis of phylogenetic relationships among *Pselaphomorphus* and the other genera within the Jubini, using external and internal morphological characters. Finally, we introduce a key to the 22 species of *Pselaphomorphus*.

1.1. Literature Revision

For many years Pselaphinae was considered a family apart from Staphylinidae (Latreille 1802); nonetheless, these families were considered to be closely related (Leach 1817). Through time, several authors saw that the relation between staphylinids and pselaphines was even closer through different subfamilies (Omaliinae, Euasthetinae, Steninae, etc.) in Staphylinidae and the Faronini in the former Pselaphidae (i.e. Raffray 1908). Newton and Thayer (1995) included the Pselaphinae as a subfamily within the Staphylinidae and part of the Omaliinae group, according to morphological characteristics.

The Neotropical tribe Jubini was first described by Raffray (1903, 1908). He recognized 10 genera (Raffray 1908) based on the presence of a Y or V shaped carina on the ventral face of the head and a developed mentum that covers the mouth parts except the laterally projected cardines (Raffray 1908; Park 1942). Females present shorter elytra than males and metathoracic wings less developed or absent. Parallel to these differences, females also can have smaller eyes than males from the same species (Park 1942). Currently the tribe contains 14 genera all distributed from Mexico to northern Argentina (Newton & Chandler 1989). The genus *Pselaphomorphus* was described by Motschulsky in 1855, based on material from Panama. In the same publication, he named the first species as *Pselaphomorphus sculpturatus*. In his words, the description of the species was as follows: “The rostrum is similar to that in *Pselaphus*, but the palps are short as in *Batrisus*, the head is elongated, about as in *Xantholinus*, with a deep longitudinal groove in the middle, the thorax is almost regularly hexagonal, having laterally lines longitudinal printed in the manner of *Batrisus*, legs and antennae long, slender”. Raffray (1893) mentioned the description given by Motschulsky as useful for identifying the genus with great probability, but it is not enough for the species (*P. sculpturatus*). Raffray then, considered that the species was not

completely described by Motschulsky. However, neither Raffray nor another morphologist made a complete description of *P. sculpturatus*. In 1952, Park gave a species key for the genus including only four of the five species. Since the holotype for *P. sculpturatus* was never revised he did not include the species in that key.

2. Materials and Methods

2.1. Taxonomic descriptions

The descriptive approach of this study follows Chandler (2001). The morphological terminology is in accordance with Park (1942) and Chandler (2001). All observations and dissections were performed using a Leica MZ16 stereomicroscope (magnifications 7-115X) and an Olympus BX41 compound microscope (magnifications 20-400X). Each scope was equipped with an ocular graticule for length measurements. The overall length was measured in lateral view from the apex of the head to the last visible tergite. Characters mentioned in the redescription at the genus level are not repeated in the individual species account unless they vary among species. The species descriptions focused on the diagnostic and phylogenetic relevant characters. They are based on male morphology. The species key, descriptions, and figures are for most part arranged in phylogenetic sequence.

A photograph of the dorsal habitus was taken for each species, except for *P. macrommatus* and *P. iguazuensis*, in which type specimens were unique, slide mounted after genitalia dissection; these two species are presented as line sketches of the dorsal habitus. The habitus photographs were taken using a BK Lab System (Visionary Digital, Palmyra, VA, USA) imaging system fitted with a Cannon EOS-7D camera. The line sketches of specimens, male genitalia and mouth parts were redrawn from drawing tube sketches and photographs taken on the Olympus compound microscope. An illustration software (Adobe® Illustrator) was used to highlight features with diagnostic and phylogenetic relevance.

2.2. Specimen material

The specimens examined include material from different temporal museum loans and visits to collections. Finally, these materials will be returned for permanent deposition to the following institutions:

FMNH - Field Museum of Natural History, Chicago, USA.

KSEM - Kansas University Division of Entomology, Snow Entomological Collections, Lawrence, Kansas, USA.

LSAM- Louisiana State Arthropod Museum, Louisiana State University, Baton Rouge, Louisiana, USA.

UNHC Chandler - Donald S. Chandler collection, Department of Zoology, University of New Hampshire, Durham, USA.

2.3. Phylogenetic Analysis

All 19 new species of *Pselaphomorphus* were differentiated as such through application of the phylogenetic species concept (*sensu* Wheeler and Platnick 2000). The species were included as ingroup taxa in the phylogenetic analysis. Suitable outgroup taxa (cf. Nixon and Carpenter 1993) include species from the tribe Jubini: *Arthophysis* Reitter, 1882, *Endytocera* Sharp, 1887, *Balega longiceps* Park, 1976, *Sebaga notonoda* Park, 1942 and *Phasmisus* Aubé, 1844. From the tribe Tyryni Reitter, 1882, the species *Circocerus batrisioides* LeConte, 1863, was used to root the phylogeny.

The character matrix was constructed and edited using ASADO (Nixon 2008). The characters were numbered following the sequence of taxonomic descriptions. Autapomorphies for species of *Pselaphomorphus* are shown in individual species accounts descriptions although they were excluded from the cladistic analysis. The most parsimonious cladograms and character optimizations were indentified in a comprehensive search strategy using the parsimony ratchet (Nixon 1999) as implemented in TNT (Goloboff et al. 2008; spawned out ASADO), based on the

following commands: (1) ratchet settings – 200 iterations per replication, 4% up-/down-weighted; (2) drift settings - 100 iterations per replication; (3) tree fusion settings – 10 rounds, 200 MB max RAM; (4) general settings – 1000 tree hold; (5) analysis – ratchet, drift, sectorial search, tree fusion, TBR-max; and (6) xmult settings – 3 hits, 5 consensus. The strict consensus tree and the character state transformations were examined in ASADO under various optimizations. Bremer branch support values (Bremer 1994) were calculated in NONA (Goloboff 1999) with the commands hold 20000, suboptimal 15, and bsupport 15.

3. Systematics

Pselaphomorphus Motschulsky, 1855: 15

Type species

Pselaphomorphus sculpturatus Motschulsky, 1855 by original designation

Diagnosis

The rostrum is similar to that in *Pselaphus*, but the palps are short as in *Batrisus*, the head is elongated, about as in *Xantholinus*, with a deep longitudinal groove in the middle, the thorax is almost regularly hexagonal, having lateral lines longitudinally printed in the manner of *Batrisus*, legs and antennae long, slender.

Type species information: one female from Obispo (Panama)

Redescription. Length 1.5-3.3 mm. Body flattened, light brownish, reddish to dark brown in coloration, with yellowish pillosity all along, tegument is shiny and smooth. Head shape triangular, pear-shaped or elongated, anteriorly truncate with an antennal tuberculum cordated at the base; always with a complete medial sulcus among eyes, its shape may vary from spindle shaped to wider than the diameter of the eyes in dorsal view. Eyes position may vary from anteriorly to a medially position. Clypeus rectangular, strongly attached to the labrum (Fig. 1A). The last one has 14 to 16 apical setae. Mandibles are dicondylous (Fig. 1B), with the internal face serrate. Maxillary palp four-segmented, second segment elongated, third segment triangular

and similar in length to the second, fourth segment acuminate and twice as long as the two previous (Fig 1C). Labial palps two-segmented (Fig. 1). Antennae 11-segmented, long and slender, with inconspicuous clava of five antennal segments in most species.

Pronotum. The shape is pentagonal, with two longitudinal sulci, forming two lateral lobes. Basally it has a transversal sulcus, forming a basal lobe. Union between pronotum and elytra is attenuated. Disc of the pronotum may vary from square or rectangular to oval. Between the lateral lobes and the basal lobe could be a spine or tooth on each side. The basal lobe can be surcated by a stria medially, and additionally can bear a couple of lateral punctures (Fig. 1).

Elytra. Elytra rectangular, longer in males than females. Humeral area may have a basal suture, with a complete stria. Humera may be dentated in females and tuberculated in males of some species. Subhumeral fovea is present in all the species, followed by a subhumeral stria. All the species have a couple of basal elytral foveae (bef) (Fig. 1). The sutural fovea located near the union between the two elytra, and always accompanied by a sutural stria. The basal discal fovea is located towards the sides, and can be accompanied by a discal depression. Membranous wings are only present in males, with poor venation, and the external margin is covered by long setae.

Pro-, Meso- and Metasternal Foveal System (sensu Chandler 2001) (Fig. 2-3). Prosternum with lateral procoxal foveae located in the anterior margins of the procoxal cavities, these are one of the last foveal pairs to be lost. Mesosternum with foveal system represented by the fusion of the median mesosternal foveae (**mmsf**); additionally, with lateral mesosternal foveae (**lmsf**) near anterior margin of mesosternum and obscured by posterolateral margins of the procoxae in some species; anterolateral mesosternal foveae (**almsf**) located between ventral margins of the elytra and anterior margin of the mesosternum; finally, lateral mesocoxal foveae (**lmsf**) located at lateral margins of the mesocoxae, just behind intersection of pleural sulcus with the mesocoxal cavities

Abdomen. Abdomen with five visible segments dorsally, first abdominal segment longer and wider than remaining segments in both sexes. Ventrally with six visible segments in males and five in females. Last segment in males (IX) with a variously round, elongated or absent depression. Legs long and slender, with femur thicker than other segments, tarsi 3-segmented (two segments apparent). Two equal tarsal claws.

Male genitalia. As in other Jubini, the male genitalia are asymmetric (Park 1942). They are constituted of a base (aedeagal base) that articulates with the abdominal segments, and a median lobe that extends outside the body. The aedeagal base varies from symmetric (presenting two arms that can be long or short), either can be present without arms and be triangular. This base, also can be asymmetrical with arms of different size, or/and present several sclerites that articulate to a membranous area. The shape of medial lobe of the aedeagus may vary from lineal, either divided or entire (basally, medially or apically); in some species the medial lobe is composed by two different lobes that articulate to the interior of the base. The size of the medial lobe varies from 0.1 mm to 1.0 mm. Some species present 1-2 accessory lobes that vary in shape, position and size.

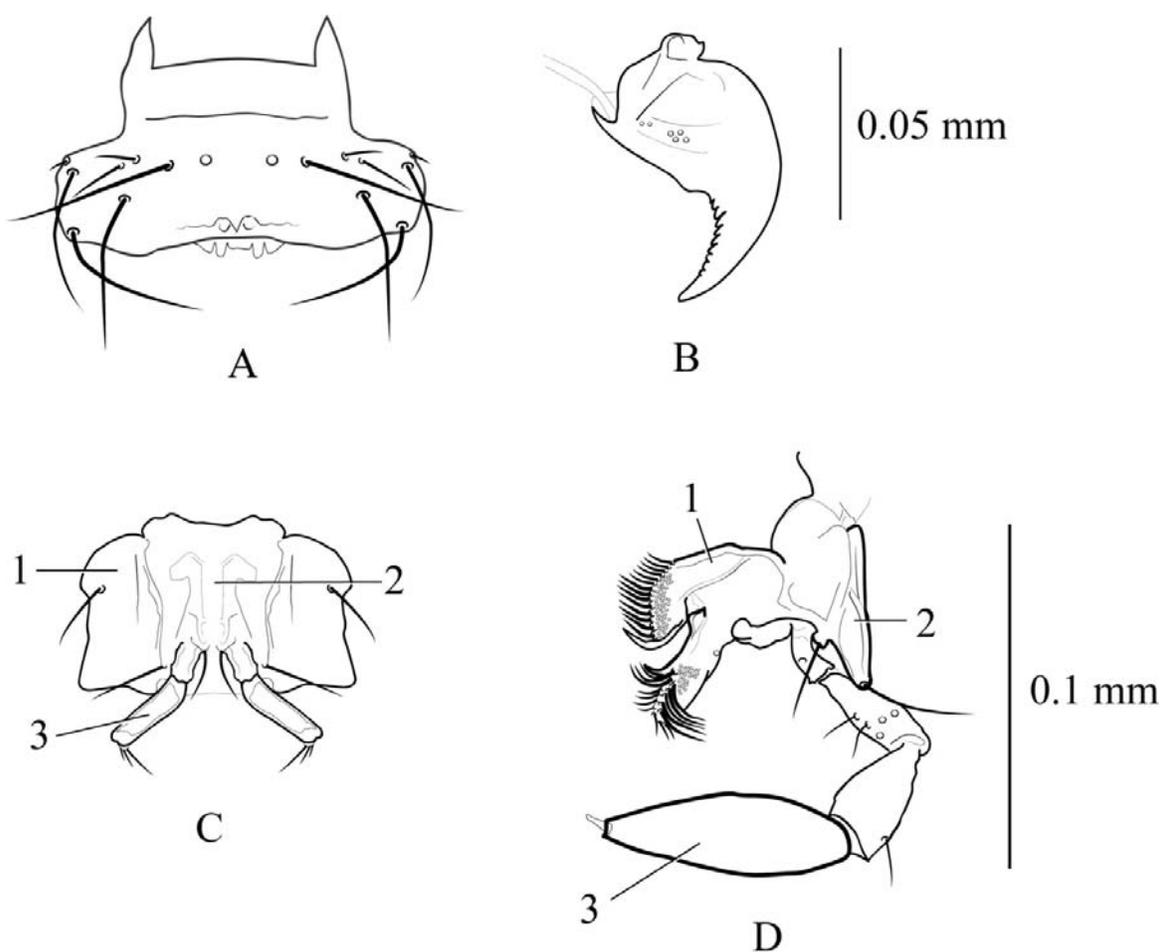


Figure 1. Mouthparts of *Pselaphomorphus sculpturatus*: A. labrum. B. inner face of the mandible. C. labium: 1. expanded mentum, 2. prementum, 3. labial palps. D. maxilla: 1. lacinia, 2. cardo, 3. maxillary palp.

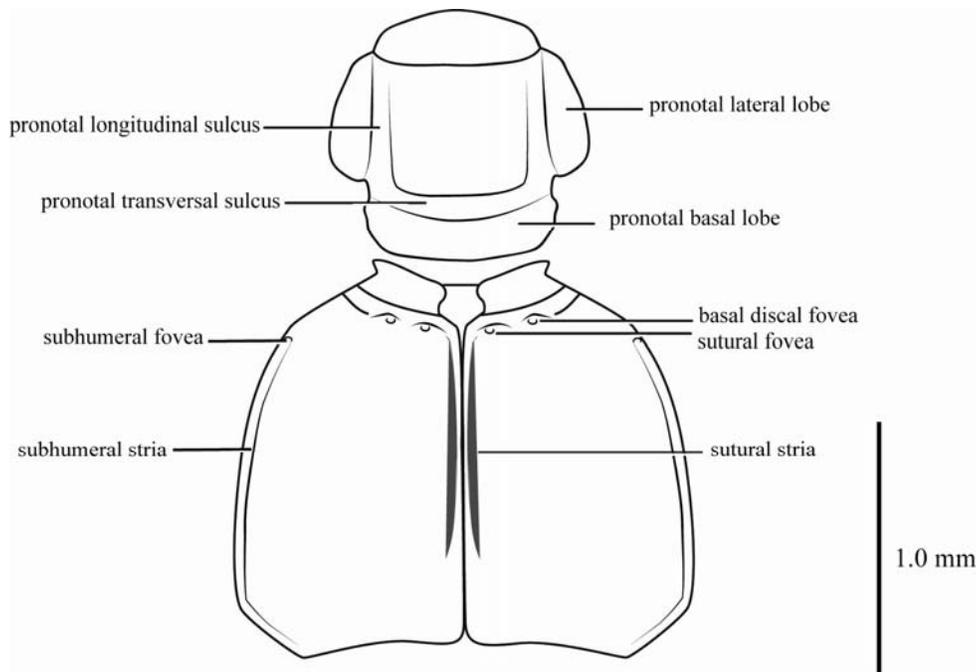


Figure 2. *Pselaphomorphus sculpturatus* male: dorsal sulci and foveae of pronotum and elytra.

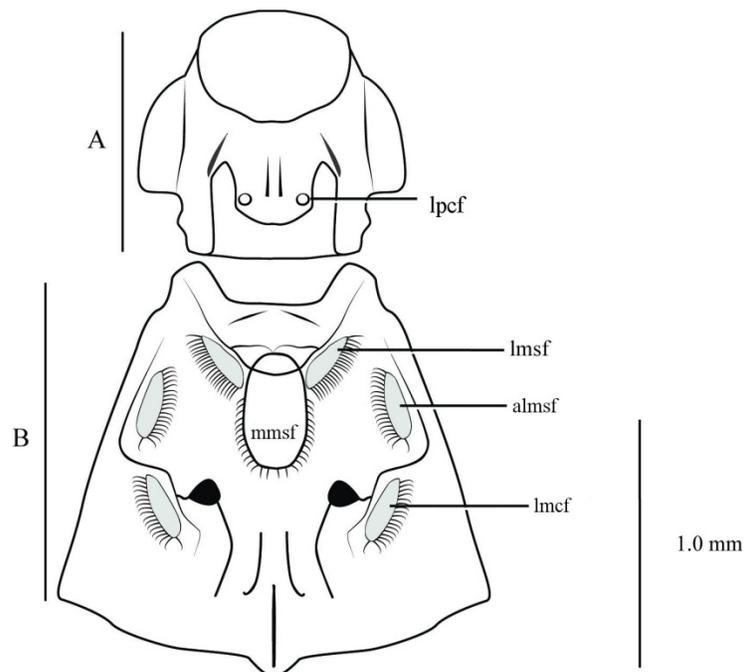


Figure 3. *Pselaphomorphus sculpturatus* male: ventral foveae of prosternum (A), mesosternum and metasternum (B); lpcf = lateral procoxal fovea, mmsf = median mesosternal foveae, lmsf = lateral mesosternal foveae, almsf = anterolateral mesosternal foveae, lmcf = lateral mesocoxal foveae.

4. Species Descriptions

Pselaphomorphus brevantennis sp.n.

Diagnosis. *Pselaphomorphus brevantennis* is characterized by the combination of a small body (less than 2.0 mm) and by having the antennomeres as long as wide. This species shares its body size with *P. chandleri*, *P. parkensis*, *P. macrommatus*, *P. difficilis* and *P. incarum*, but can be differentiated from these by virtue of its characteristic antennomeres and antennal length that is less than 1.0 mm.

Description. Male. Body length 1.7 mm. Body dorsally flattened, light brown with yellow pilosity. Head triangular (length: 0.4, wide: 0.3 mm), base of the antennal tuberculum shorter than the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.1 mm). Antennal length: 0.8 mm: antennomere 1 (0.06 mm) wider than antennomere 2 (0.06 mm) and the last one wider than antennomere 3 (0.04 mm) and 4 (0.04 mm), antennomeres 5 (0.04 mm) and 6 (0.03 mm) square, antennomere 7 (0.06 mm) to 10 (0.06 mm) wider and also square, antennomere 11 (0.18 mm) as wide as the previous, completing an evident clava. Maxillary palps yellowish with short and even pilosity. Pronotum square (length: 0.4, wide: 0.35 mm). Lateral lobes trapezoidal, basally with an obtuse angle and apically with a straight angle. Antebasal lobule rectangular, at least three times wider than long. Pronotal disc oval, longitudinal and transversal sulci wider towards the extremes. Membranous wings and elytra well developed (length: 0.5, wide: 0.5 mm): subhumeral fovea shallow, base of the subhumeral stria rounded. Humeral teeth and elevation absent. Sutural fovea transversal and shallow, sutural stria thin. Fovea basal discal transverse, shallow, discal depression absent. Abdominal segments I-VI dorsally with lengths of 0.25, 0.1, 0.1, 0.1, 0.1 mm, respectively; ventrally with segment V end circular, segment VI without depression, pigdial suture absent.

Male Genitalia. Aedeagal base irregular, globose and asymmetric. Medial lobe divided medially into four arms. Longer arm extending upward and curved from left to middle in dorsal view. Accessory lobes absent (Fig. 5 A and B).

Examined Material. Holotype male. **Bolivia**, Santa Cruz, 4-5 km SSE Buena Vista, Hotel Flora y Fauna. 440m. 17°29.9'S 63°39.1'W. XII-14 to 24-2003. FIT. S. & J. Peck [LSAM].

Etymology. Noun by apposition. Named after the characteristic small antennae of this species, with *brachy* meaning ‘short’.



Figure 4. *Pselaphomorphus breviantennis* sp.n. dorsal view.

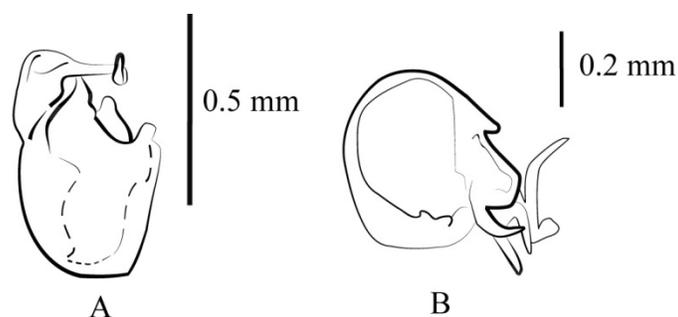


Figure 5. *Pselaphomorphus breviantennis* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus longiceps* Raffray, 1890: 193, 1893: 43**

Description. Elongated, depressed, light brown to reddish, antennae and legs are clear and bright, long and with pale hairs. Head oblong, with apex constrained forming an antennal tuberculum, only one longitudinal oblong fovea in the middle of the head. Antennae long and slender with segments oblong-squared, clava of 5 antennal segments, not so evident; first two segments squared, the others are rectangular, 1-7 compact, 8-10 pedunculated, 11 oblong, with the base truncated and the apex acuminate. Prothorax constrained posteriorly, lobed and

sulcated towards both sides, transversal sulcus with a tooth on each side. Small eyes, short elytra with the base attenuated, humerus dentate, basal suture of the humerus impressed, with a complete stria. First abdominal segment is larger than the following segments. **Male.** Eyes are big and prominent, medially located. Antennal segments 7-10 rectangular. Elytra covered by disperse punctures; prothorax is long, with the base shortened. Humera have an oblique tooth, subhumera is laterally sinuate. Elytral base is not carinated, but bears two foveae, posterior margin of the elytra is straight. Metasternum has a medial impression. Last abdominal sternite has a subquadrate impression. **Female.** Eyes are small, but prominent, located anteriorly. Antennal segments 7-10 are quadrate. Elytra are short, depressed, basally bear a transversal carina. Humera is oblique, ending in a strong spine, subhumera have a suture strongly impressed. Posterior angles are truncated, posterior margins are arcuate. Metasternum is simple. Long. **Male:** 1.90 mm; **Female:** 1.80 mm.

Type information: two specimens, male and female, from Blumenau (Brazil).

Diagnosis. *Pselaphomorphus longiceps* is characterized by the combination of a triangular head with antennae with five antennomeres clava and the presence of spines between the basal lobe and the lateral lobes in the pronotum.

Redescription. Male. Body length 2.3 mm. Body dorsally flattened, reddish to amber, with dispersed clear pilosity. Head triangular (length: 0.5 mm, width: 0.4 mm), head longitudinal sulcus wider between the eyes, shaped as tear drop with the wider part basally located. Eyes kidney-shaped (0.15 mm in diameter). Antennal length: 1.2 mm: antennomere 1 (0.08 mm) wider than segments 2 to 7; antennomere 2 (0.04 mm) wider than 3; antennomere 3 to 6 (0.04 mm) similar in width and length; antennomeres 7 (0.06 mm) to 10 (0.1 mm) longer and wider, forming a clava, antennomere 11 (0.2 mm) truncate basally and acuminate apically. Pronotum slightly rectangular (length 0.4 mm, wide 0.5 mm), pronotal lobes trapezoidal, basally with an oblique spine projection, that joins with the basal lobe; basal lobe medially surcated by a longitudinal ridge and laterally punctuated. Pronotal disc oval, longitudinal, and transversal sulci wider in the extremities. Membranous wings and elytra well developed (length 0.65 mm, width 0.8 mm), subhumeral fovea deep as well as the subhumeral stria, humeral tooth present and accompanied by a humeral elevation; sutural fovea rounded, followed by a complete sutural

stria; basal discal fovea rounded. Dorsally, abdominal segments I-V, respectively: 0.8, 0.3, 0.1, 0.1, 0.15 mm. Ventrally, segment V end circular, segment VI with a circular depression.

Male Genitalia. Aedeagus base regular, bilobed, and apically asymmetric. Medial lobe divided basally in two parts, the smallest projects below the whole structure, biggest goes upward and curves from left to right over the accessory lobe. Accessory lobe is divided medially into two arms.

Female. Body length 2.2 mm. Head triangular (length: 0.5, width: 0.35 mm). Longitudinal sulcus is wider between the eyes in a teardrop shape. Antennal length: 1.1 mm. Antennomer 1 rectangular (0.08 mm), antennomeres 2 to 10 with similar length (0.06 mm), but getting wider towards the apex, clava formed by antennomeres 7 to 11, and the last one is longer (0.2 mm) and wider, truncate at base and acuminate in the apex. Pronotum as in male (length: 0.35, width: 0.45 mm), except that the basal transversal lobe is not surcated by a longitudinal ridge. Elytra short (length: 0.45, width: 0.7 mm) without membranous wings. Subhumeral fovea round shaped and deep connected with the humeral spine toward the disc. Subhumeral stria evident. Sutural fovea wide; sutural stria short, shallow. Basal discal fovea wide, transversally oval; elytral disc with longitudinal depression. Dorsally abdominal segments, respectively: 0.35, 0.1, 0.1, 0.1, 0.05 mm. Sternites without modifications.

Lectotype male. **Brazil:** Nova Teutonia, Santa Catharina. II: 1957. Fritz Plaumann, berlese leaf litter [FMNH]. Paratypes: 9 ♂, 14 ♀, same information as lectotype, III-26-1945/X-1957 [FMNH]; 1 ♂, 1 ♀, Brazil, Santa Catharina, Chapecol, V-1957, Fritz Plaumann, under dead leaves [FMNH]; 3 ♀, Brazil, Rio de Janeiro, D.F. Corcovado, III-10/VI-1-1946, Bierig [FMNH]; 1 ♂, Brazil, Nova Friburgo, I-10/30-1946, Bierig [FMNH]; 1 ♂, 1 ♀, Brazil, Santa Catharina, Irani, VII-1958, Fritz Plaumann, leaf litter [FMNH]; 1 ♀, Brazil, Minas Geraes, Vicoso, VII-6-1933, E.J. Hambleton [FMNH]; 1 ♀, Brazil, Guanabara, Floresta de Tijuca, II-1960, C.A. Campos Seabra [FMNH]; 1 ♀, Brazil, Sao Paulo, Parque Jabaquara, XII-16-1945, Bierig [FMNH]; 3 ♂, 2 ♀, Brazil, Santa Catharina, VIII-1958, Fritz Plaumann [FMNH].



Figure 6. *Pselaphomorphus longiceps* Raffray, dorsal view.

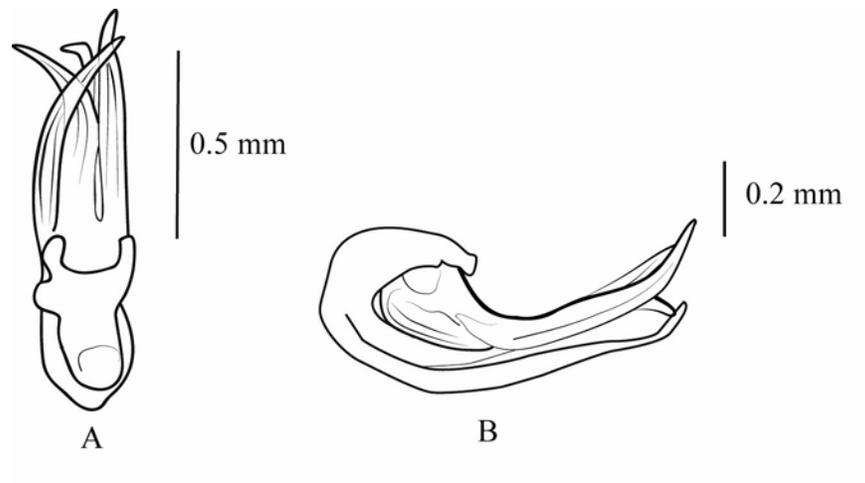


Figure 7. *Pselaphomorphus longiceps* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus macroommatus* sp.n.**

Diagnosis. *Pselaphomorphus macroommatus* is characterized by the combination of a small body size (less than 2.0 mm); yellow coloration and its eyes correspond to the third part of its head. Last five antennomeres form a clava, with the antennomeres 7 to 11 at least three times longer than wide. This species can be differentiated from *P. chandleri*, *P. parkensis*, *P. difficilis* and *P. incarum* by comparing male genitalia, which has a symmetrical base and is shorter than 0.5 mm.

Description. Male. Body length 1.7 mm. Body flattened dorsally, yellowish to light brown, with clear pilosity. Head triangular (length: 0.4, width: 0.3 mm), base of the antennal tuberculum short, no longer than the eye diameter. Head longitudinal sulcus wider between eyes, spindle shaped. Eyes round shaped (diameter: 0.1 mm). Antennal length: 1.0 mm: antennomer 1 (0.06 mm) and 2 (0.04 mm) wider than antennomeres 3 to 6 (0.04, 0.04, 0.06, 0.04 mm), the last are oval, antennomeres 7 (0.12 mm) to 11 (0.2 mm), at least two times longer than previous forming a clava. Maxillary palps yellowish, with short and even pilosity. Pronotum rectangular (length: 0.3, width: 0.35 mm): lateral lobes trapezoidal, basal angle round. Pronotal disc oval, longitudinal and transversal sulci wider in the extremities. Membranous wings and elytra well developed (length: 0.5, width: 0.6 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal discal fovea present and evident, framed by a basal carina. Sutural stria present. Dorsally abdominal segments I-VI, respectively: 0.3, 0.1, 0.1, 0.1, 0.06 mm. Ventrally, segment V end circular, segment VI round and depressed, pigidial suture present.

Genitalia. Aedeagus base regular, globose, and symmetrical. Medial lobe short divided into two small asymmetric arms. Accessory lobes absent.

Type Material. Holotype male. **Ecuador**, Orellana Tiputini Biological Station, Flight intercept trap H34. VII-30 to 31-2008. LSAM team [LSAM].

Etymology. Name in apposition. Named after the Greek *macros* meaning ‘large’ and *omma* meaning ‘eyes’ (Brown 1956), thus referring to the characteristic big eyes of this species.

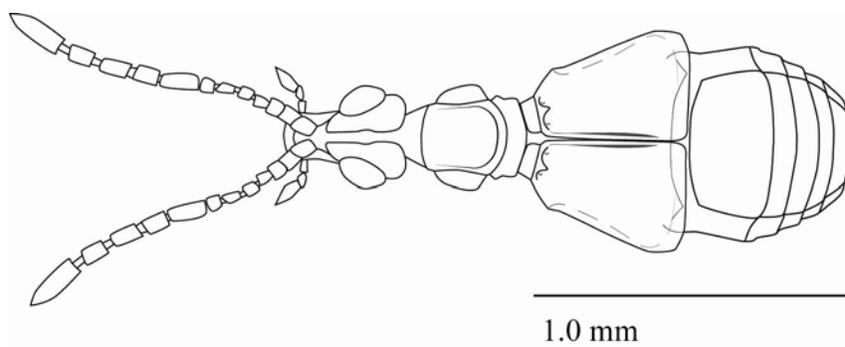


Figure 8. *Pselaphomorphus macrommatus* sp.n, dorsal view

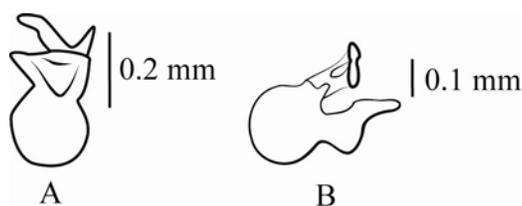


Figure 9. *Pselaphomorphus macrommatus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus difficilis* sp.n.**

Diagnosis. *Pselaphomorphus difficilis* is characterized by the combination of small body (less than 2.0 mm). It differentiates from *P. parkensis* and *P. chandleri* in the length of the antennomeres 7 to 11 which are shorter, and twice as long as wide, squadrate. Additionally, the male genitalia are divided apically into two small arms.

Description. Male. Body length 1.7 mm. Body dorsally flattened, yellowish to light brown, with clear pilosity. Head triangular (length: 0.45, wide: 0.3 mm), base of the antennal tuberculum short, no longer than the eye diameter. Head longitudinal sulcus wider in front of the eyes. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.0 mm: antennomere 1 (0.06 mm) and 2 (0.06 mm) wider than antennomeres 3 to 6 (0.04, 0.04, 0.04, 0.03 mm), the last are square. Antennomeres 7 (0.06 mm) to 11 (0.12 mm) square, wider than previous forming a clava. Maxillary palps yellowish, with short and even pilosity. Pronotum rectangular (length: 0.35, width: 0.4 mm): lateral lobes triangular, basal angle round. Pronotal disc square, longitudinal and transversal sulci with the same width throughly. Membranous wings and elytra well developed

(length: 0.6, width: 0.8 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth and elevation are absent. Sutural fovea transversally elongated, basal discal fovea round, basal ridge weak. Sutural stria present. Dorsally abdominal segments I-VI, respectively: 0.2, 0.06, 0.06, 0.1, 0.06 mm. Ventrally, segment V end circular, segment VI round depressed, pigdial suture present.

Male Genitalia. Aedeagus base regular, globose, bilobed symmetrical. Medial lobe short, apically divided into two short arms. Accessory lobes absent.

Holotype male. **Costa Rica**, Santo Domingo de Heredia, INBio Cafetal, 1100m. VI-25/28-1997. S & J. Peck. CR1P97 027, flight intercept trap [KSEM]; Paratypes: 2 ♂, 1 ♂ (cleared and dissected), same information as holotype; 1 ♂, Costa Rica, Heredia 16 km SSE La Virgen, Braulio Carrillo Natural Park, 10°16'N, 84°05'W, 1050-1150m, IV-12-2001 INBio-OET-ATLAS transect [UNHC].

Etymology. Named in reference to the difficulty for its differentiation from *P. chandleri* and *P. parkensis*, from the Latin *difficilis* that means difficult, hard, complicated.



Figure 10. *Pselaphomorphus difficilis* sp.n., dorsal view.

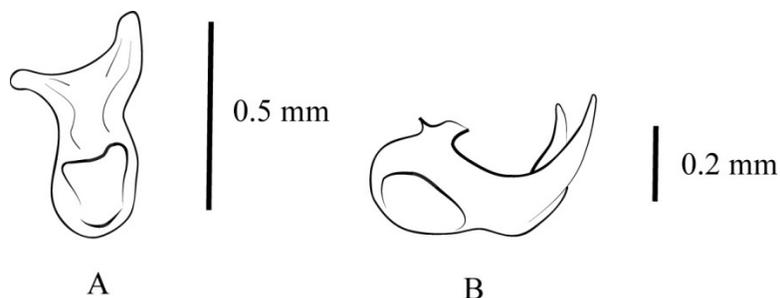


Figure 11. *Pselaphomorphus difficilis* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus parkensis* sp.n.**

Diagnosis. *Pselaphomorphus parkensis* is characterized by the combination of small body (less than 2.0 mm), yellow coloration and even pilosity. The head is triangular and the antennae with five-segmented clava. This species can be differentiated from *P. chandleri* by its even pilosity, the basal ridge of the elytra is normal, and the absence of humeral teeth. Additionally, male genitalia apically asymmetrical and not constricted dorso-ventrally in lateral view.

Description. Male. Body length 1.7 mm. Body dorsally flattened, yellowish to light brown, with clear even pilosity. Head triangular (length: 0.45, wide: 0.3 mm), base of the antennal tuberculum short, no longer than the eye diameter. Head longitudinal sulcus wider between eyes, spindle shaped. Eyes round shaped (diameter: 0.1 mm). Antennal length: 1.1 mm: antennomer 1 (0.1 mm) and 2 (0.06 mm) wider than antennomers 3 to 6 (0.04, 0.04, 0.04, 0.02 mm), the last is oval shaped. Antennomers 7 (0.08 mm) to 11 (0.2 mm), at least twice longer than previous forming a clava. Maxillary palps yellowish with short and even pilosity. Pronotum rectangular (length: 0.4, width: 0.4 mm): lateral lobes trapezoidal, basal angle round. Pronotal disc oval, longitudinal, and transversal sulci wider in the extremities. Membranous wings and elytra well developed (length: 0.6, width: 0.7 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural fovea transversally elongated, basal discal fovea round followed by a discal depression that ends before the limit of the humeral teeth. Sutural stria present. Dorsally abdominal segments I-VI, respectively: 0.2, 0.06, 0.06, 0.1, 0.06 mm. Ventrally, segment V end circular, segment VI with a round depression, pigidial suture present.

Male genitalia. Aedeagus base regular, globose, bilobed, symmetrical. Medial lobe short, apically asymmetrical, with a transversal lobe, medially narrowed; ventrally with membranous area. Accessory lobes absent.

Holotype male. **Costa Rica**, Heredia 16 km SSE La Virgen, Braulio Carrillo Natural Park 10°16'N, 84°05'W. 1050-1150 m. IV-20-2001. INBio-OET-ATLAS transect [UNHC]; Paratypes: 42 ♂, 3 ♀: 17 ♂, same information as the holotype [16 UNHC, 1 LSAM]; 13 ♂, 2 ♀, Costa Rica, Heredia, 11 km SE La Virgen, 10°20'N, 84°04'W, 450-550 m, II-20/VI-20-2003, INBio-OET-ATLAS transect [UNHC]; 8 ♂, Costa Rica, Heredia, 9 km NE Vara Blanca, 10°14'N, 84°07'W, 1450-1550m, III-8/IV-17-2005, INBio-OET-ATLAS transect [UNHC]; 2 ♀, Costa Rica, Heredia, 7 km NE San Isidro, Rio Para Blanco, P. N. Braulio Carrillo, 10.050°N, 84.018°W, 1740m, III-24-2002, D.S. Chandler, leaf litter, trail cut [UNHC]; 1 ♂, Costa Rica, Puntarenas, Monte Verde, 1400m, V-7-1989, J. Asher, R. Brooks, R. Leschen, berlese, fruit fall and litter [KSEM]; 1 ♂, Costa Rica, Puntarenas-Guanacaste border, Monte Verde, 1760m, V-10-1989, J. Asher, R. Brooks, R. Leschen, flight intercept trap [KSEM]; 1 ♂, Costa Rica, Alajuela E.B. San Ramon, R.B. San Ramon, 27 km N & 8 km W, San Ramon, 10°13'30"N, 84°35'30"W, 900m, VI-29/VII-6-1999, R. Anderson, wet premontane forest litter [KSEM]; 2 ♂, Costa Rica, San Jose, km 113 Pan-Am. Highway, 23 km N San Isidro, 2000m, 9°28'0"N, 83°42'20"W, VI-20-1997, R. Anderson, berlese forest litter [KSEM]; 2 ♂, Costa Rica, Heredia, La Selva, 3.2 km SE Puerto Viejo, 100m, II-17/III17-1992, W. Bell, flight intercept trap [KSEM].

Etymology. Patronymic, named after the Pselaphinae taxonomist and morphologist Orlando Park. The neotropical fauna of these beetles was largely explored by this remarkable scientist.



Figure 12. *Pselaphomorphus parkensis* sp.n., dorsal view.

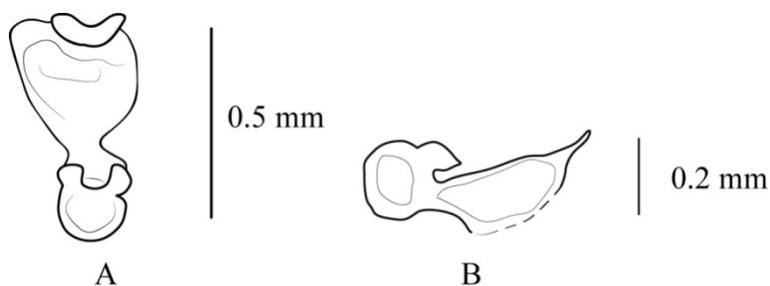


Figure 13. *Pselaphomorphus parkensis* sp.n. aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus chandleri* sp.n.**

Diagnosis. *Pselaphomorphus chandleri* is characterized by the combination of small size (less than 2.0 mm), the strong elytral basal ridge and the presence of humeral teeth. Additionally, male genitalia are apically symmetrical and dorso-ventally constricted in lateral view.

Description. Male. Body length 1.6 mm. Body flattened dorsally, yellowish to light brown, with clear pilosity. Head triangular (length: 0.5, wide: 0.3 mm), base of the antennal tuberculum short, no more than the eye diameter. Head longitudinal sulcus wider between eyes, spindle shaped. Eyes kidney shaped (diameter: 0.2 mm). Antennal length: 1.25 mm: antennomer 1 (0.1 mm) and 2 (0.06 mm) wider than antennomers 3 to 6 (0.04, 0.04, 0.04, 0.02 mm), the last are oval. Antennomers 7 (0.1 mm) to 11 (0.2 mm) at least twice longer than previous forming a clava. Maxillary palps yellowish, with short and even pilosity. Pronotum rectangular (length: 0.3, width: 0.4 mm): lateral lobes trapezoidal, basal angle round. Pronotal disc oval, longitudinal, and transversal sulci wider in the extremities. Membranous wings and elytra well developed (length: 0.5, width: 0.7 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal discal fovea present and evident, framed by a strong basal carina. Sutural stria present. Dorsally abdominal segments I-VI, respectively: 0.2, 0.06, 0.06, 0.1, 0.06 mm. Ventrally, segment V end circular, segment VI with a round depression, pigidial suture present.

Male genitalia. Aedeagus base regular, globose, bilobed, symmetrical. Medial lobe short, symmetrical, ventrally membranous. Apically with a narrow transversal sublobe. Accessory lobes absent.

Holotype male. **Panama**, Chiriqui Province, 8°44'N, 62°15'W. Fortuna, N. Wolda UV lt, VII-3-1974 [UNHC]. Paratypes: 10: 1 ♂, Panama, Chiriqui Province, La Fortuna “Hydro trail”, 08°42'N, 82°14'W, 1150m. V-9-1995, J. Ashe, R. Brooks, flight intercept trap [KSEM]; 7 ♂, Panama, 16 km W Almirante, Bocas de Toro, II-24/IV-29-1980, H. Wolda, UV light [UNHC]; 1 ♂, Panama, Chiriqui, 8.4 km NW Boquete Vocan Baru, 1860m, 8°48'0''N, 82°28'0''W, VI-16-1995, R. Anderson, dry oak forest litter [KSEM]; 1 ♂, Panama, Chiriqui, 20 km N Gualaca, 08°39'N, 82°12'W, V-24/VI-9-1995, J. Ashe, R. Brooks, flight intercept trap [KSEM].

Etymology. Patronymic; named after Pselaphinae taxonomist Dr. Donald Chandler (New Hampshire University) whose strong support is gratefully acknowledged.



Figure 14. *Pselaphomorphus chandleri* sp.n., dorsal view.

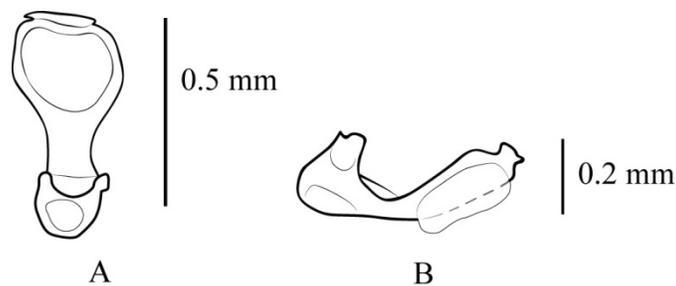


Figure 15. *Pselaphomorphus chandleri* sp.n. aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus incarum* sp.n.**

Diagnosis. *Pselaphomorphus incarum* is characterized by the combination of small body size (less than 2.0 mm) and antennae with five antennomeres clava, with the last antennomere wider than the other; additionally the pronotal lateral lobes are triangular and with the basal ending obtuse.

Description. Male. Body length 1.8 mm. Body dorsally flattened, amber, with yellow pilosity. Head triangular (length: 0.4, width: 0.3 mm), base of the antennal tuberculum short, no more than the eye diameter. Head longitudinal sulcus wider behind the eyes, spindle shape. Eyes kidney shaped (diameter: 0.1 mm). Antennal length: 1.0 mm: antennomere 1 (0.08 mm) and 2 (0.06 mm) wider than antennomeres 3 to 6 (0.04, 0.04, 0.04, 0.03 mm), the last are square. Antennomeres 7 (0.06 mm) to 11 (0.2 mm), at least twice longer than previous forming a clava. Maxillary palps light brown, with short and even pilosity. Pronotum square (length: 0.35, width: 0.35 mm). Lateral lobes broad, triangular, basally and apically round. Antebasal lobule oval, at least three times wider than long. Pronotal disc oval, longitudinal, and transversally wider towards the extremes. Membranous wings and elytra well developed (length: 0.5, width: 0.6 mm): subhumeral fovea deep, base of the subhumeral stria rounded. Humeral teeth absent, humeral elevation present. Sutural fovea round and deep, sutural stria prolonging beyond the middle of elytra. Basal discal fovea rounded followed by a discal depression. Dorsally abdominal segments I-VI, respectively: 0.3, 0.1, 0.1, 0.1, 0.1 mm. Ventrally, segment V end projected, segment VI without round depression, pigdial suture not evident.

Male Genitalia. Aedeagus base regular, bilobed, asymmetrical. Medial lobe short, slender, asymmetrical. Two accessory lobes shorter than medial lobe.

Holotype male. **Peru**, Junin, Puerto Ocopa Los Olivos 11°3.00'S, 74°15.52'W. 1200 m. III-29 to IV-1-2009. Flight intercept trap. A.K. Tischechkin. [LSAM]. Paratype 1♂, same data as holotype.

Etymology. Named after the Inca civilization that occupied the Andean territories to the south of Colombia, and parts of Ecuador, Peru and Bolivia.



Figure 16. *Pselaphomorphus incarum* sp.n., dorsal view.

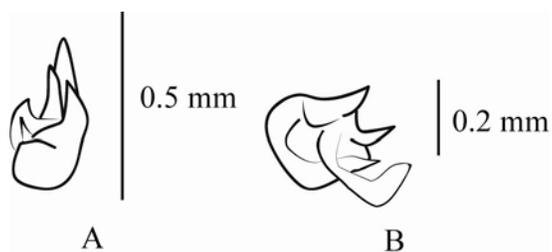


Figure 17. *Pselaphomorphus incarum* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus microphthalmus* Raffray, 1890: 298, 1893: 44**

Original Description. Long and depressed, red to light brown, antennae and palps pale. Head big, apex laterally constrained forming an antennal tuberculum, longitudinally surcated by a spindle shaped sulcus. Antennae long, with rectangular antennomeres, inconspicuous clava formed by last five antennomeres, 1-7 compact, 8-11 pedunculated, 11 acuminated. Prothorax oblong posteriorly and attenuated anteriorly, lobulated, sulcated longitudinally, posterior angles of the lateral lobes obtuse, transversal sulcus evident. The elytra vary in both sexes, sutural stria not visible dorsally **Male.** Head elongated, eyes big and prominent, medially located. Antennomeres 8-10 similar, 11 slightly longer. Prothorax and elytra union is attenuated, elytral base bears a transversal carina and two foveas. Humeral area not elevated, humeral teeth small. Posterior angles obtuse, posterior end straight. First abdominal segment three times longer than other segments. Metasternum projected, medial sulcus obsolete. Last sternite with asymmetrical depression. Length: 1.60 mm. **Female.** Head oval, with the posterior end rounded, eyes very small, anteriorly located. Antennomeres before 8 shorter, 11 short and thick like in the male. Prothorax and elytra union short, depressed, humeral base elevated and carinated, humerus obliquous and dentated, base with two fovea; posterior angles truncated, emarginated and arcuated. Metasternum and abdomen simple. 1.80 mm.

Diagnosis. *Pselaphomorphus microphthalmus* is characterized by the combination of medium body size (more than 2.0 mm), antennae with five segment clava and lateral lobes of the pronotum ending in an obtuse angle with pronotal disc.

Redescription. Male. Body length 2.4 mm. Ambar coloration with yellowish pilosity. Head: pear-shaped (length: 0.7, width: 0.4 mm). Longitudinal sulcus spindle shaped. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.2 mm, all antennomeres rectangular. Antennomer 1 (0.1 mm) and 2 (0.06 mm) wider than four following antennomeres (0.06 mm each). Antennomeres 7 (0.1 mm) to 11 (0.24 mm) larger than previous forming a clava. Maxillary palps yellowish, with short and even pilosity. Pronotum square (length: 0.5, wide: 0.5 mm): lateral lobes triangular, basal angle obtuse. Basal lobe rectangular with two truncated projections in both sides. Pronotal disc rounded, longitudinal and transversal sulci wider in the extremities. Membranous wings and elytra well developed (length: 0.7, width: 0.8 mm): subhumeral elytral

fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal dical fovea present and evident, framed by a basal carina. Sutural stria present. Dorsally abdominal segments I-VI respectively: 0.4, 0.2, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI plane and small, without depression, pigdial suture present.

Male genitalia. Aedeagus base regular, globose and symmetrical, bilobed. Medial lobe divided apically into two small teeth. Center of the medial lobe elevated. Accessory lobes absent.

Female. Body length 2.1 mm. Amber coloration with yellowish pilosity. Head elongated (length: 0.5, wide: 0.3 mm). Longitudinal sulcus spindle shaped. Eyes small and rounded (radio: 0.02 mm). Antennal length: 1.0 mm, all antennomers rectangular. Antennomer 1 (0.08 mm) and 2 (0.06 mm) wider than four following antennomers (0.04 mm each). Antennomers 7 (0.08 mm) to 11 (0.2 mm) larger than previous forming a clava. Maxillary palps yellowish with short and even pilosity. Pronotum square (length: 0.4, width: 0.4 mm): lateral lobes triangular, basal angle obtuse. Pronotal disc square, longitudinal and transversal sulci lineal. Elytra small, slightly rectangular (length: 0.5, width: 0.6 mm): subhumeral elytral fovea circular and deep, connected apically by a stria with the humeral spine. Sutural and basal dical fovea present and evident, framed by a strong basal carina. Sutural stria present, short. Dorsally abdominal segments I-VI, respectively: 0.4, 0.1, 0.1, 0.15, 0.1 mm. Abdomen with no modifications in the last sternite.

Lectotype male. **Venezuela:** Merida, Merida, 34 km NW, 2350m, 8°37'0"N, 71°20'12"W, V-22-1998. R. Anderson, montane forest litter [KSEM]; Paratypes: 4 ♂, 1 ♀: 1 ♂ same information as the holotype; 1 ♂, Venezuela, Merida 42.4 km NW Merida, near La Carbonera, 8°37'38"N, 74°21'10"W, 2360 m, V-22/25-1998, J. Ashe, R. Brooks, R. Hanley, flight intercept trap [KSEM]; 1 ♂ (cleared and dissected), Venezuela, Merida, Tabay 7 km E. La Mucuy Station Sierra Nevada National Park, 2300-2700m, 8°37'41"N, 71°2'26"W, V-26/27-1998, J. Ashe, R. Brooks, R. Hanley, flight intercept trap [KSEM]; 1 ♂, Venezuela, Aragua, Rancho Grande Biological Station, 10°21'N, 67°41'W, 1450m, "La Cumbre", II-28-1995, Robert W, Brooks, berlese leaf litter [KSEM].

Etymology. The name refers to the small size of the female eyes, which Raffray dicribed initially. He also found the male, but he named it as a different species *P. muticus*. In 1893 he realized that the two specimes were the same species



Figure 18. *Pselaphomorphus microphthalmus* Raffray, male dorsal view.

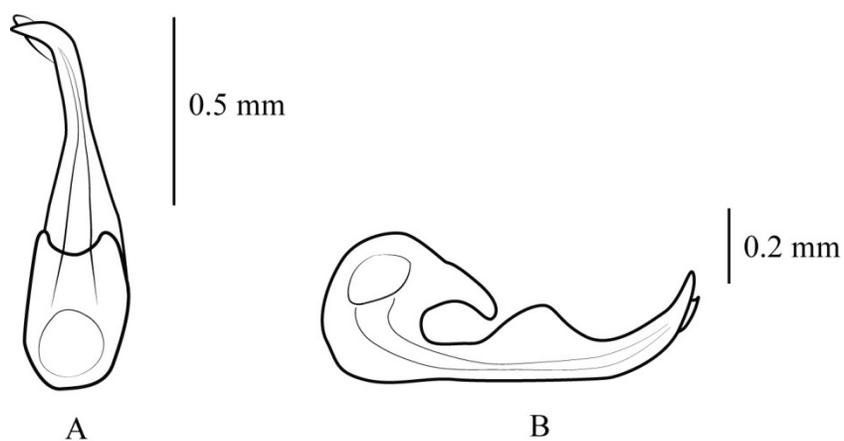


Figure 19. *Pselaphomorphus microphthalmus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus azuayensis* sp.n.**

Diagnosis. *Pselaphomorphus azuayensis* is characterized by the combination large body size (more than 3.0 mm), elongated head and antennae with 5 antennomeres clava.

Description. Male. Body length 3.1 mm. Body dorsally flattened, pale brown, with same shade pilosity. Head elongated (length: 0.8, wide: 0.5 mm), base of the antennal tuberculum broad, at least once and a half the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.16 mm). Antennal length: 1.9 mm: antennomer 1 (0.12 mm) and 2 (0.08 mm) wider than antennomer 3 (0.06 mm), antennomers 4 and 5 (0.1 mm) as wide as 6 but slightly longer (0.08 mm), antennomers 7 (0.14 mm) to 10 getting thicker towards the end, forming a clava, antennomer 11 (0.32 mm) truncated basally and acuminate apically. Maxillary palps light brown with short and even pilosity. Pronotum square (length: 0.5, wide: 0.5 mm). Lateral lobes triangular, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc oval, longitudinal and transversal sulci wider in the extremes. Membranous wings and elytra well developed (length: 0.95, width: 1.0 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal dical fovea present and evident, framed by a basal carina. Sutural stria present. Dorsally, abdominal segments I-VI, respectively: 0.3, 0.1, 0.1, 0.2, 0.1 mm. Ventrally, segment V end circular, segment VI with a depression and an V-shaped impression, pigidial suture present.

Male Genitalia. Aedeagus base regular, symmetrical. Medial lobe is complete, curved up apically. Accessory lobe projecting below the medial lobe, broader than it, asymmetric. Apically, accessory lobe with three spines unto left side.

Holotype male. **Ecuador**, Azuay Province 23 Km NW Cuenca, Cajas. 3650 m. Succession forest, Berlese. I-1-1992. C. Carlton and R. Leschen. Paratypes, 2 ♂, same information as the holotype [LSAM].

Etymology. Named after the Province of Azuay in Ecuador where the holotype and paratypes were collected.



Figure 20. *Pselaphomorphus azuayensis* sp.n. dorsal view.

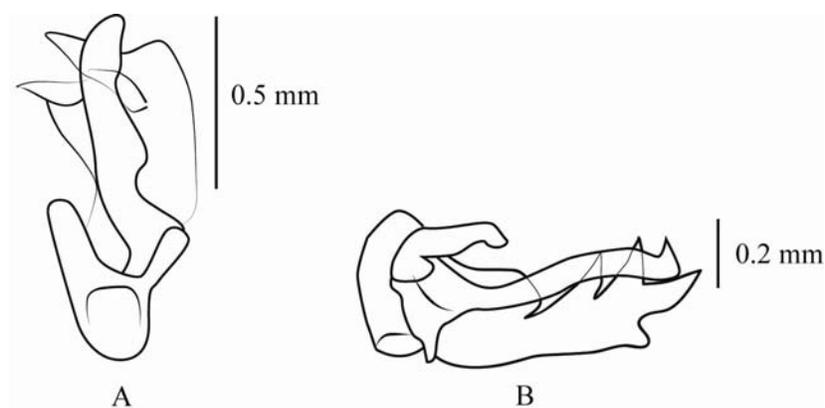


Figure 21. *Pselaphomorphus azuayensis* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus raffrayi* sp.n.**

Diagnosis. *Pselaphomorphus raffrayi* is characterized by the combination of medium body size (between 2.0 and 3.0 mm), antennae with five-segmented clava and the presence of spines between the antebasal lobe and the lateral lobes.

Description. Male. Body length 2.6 mm. Body dorsally flattened, reddish, with yellow pilosity. Head pear-shaped (length: 0.6, wide: 0.55 mm), base of the antennal tuberculum as long as the

diameter of the eyes. Head longitudinal sulcus wider behind the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.6 mm: antennomer 1 (0.1 mm) wider than antennomer 2 (0.08 mm) and the last one wider than antennomer 3 (0.08 mm) and 4 (0.06 mm), antennomers 5 (0.08 mm) and 6 (0.06 mm) square, antennomer 7 (0.12 mm) to 10 (0.12 mm) wider, rectangular, antennomer 11 (0.24 mm) as wide as the previous completing an evident clava. Maxillary palps light brown, with short and even pilosity. Pronotum slightly rectangular (length: 0.6, width: 0.65 mm). Antebasal lobe rectangular, at least five times wider than long. Pronotal disc oval, longitudinal and transversal sulci wider in the extremes. With spines between the antebasal lobe and the lateral lobes. Membranous wings and elytra well developed (length: 0.55, width: 1.0 mm): subhumeral fovea deep, base of the subhumeral stria rounded. Humeral teeth absent, humeral elevation present. Sutural fovea round and deep, sutural stria prolonging beyond the middle of elytra. Basal discal fovea rounded, followed by a discal depression. Dorsally, abdominal segments I-VI, respectively: 0.3, 0.1, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI with a round depression, pigdial suture present in V shape.

Genitalia. Aedeagus base irregular, globose, asymmetrical. Medial lobe curved up and to the right. Accessory lobe narrow, curved spirally, located toward the medial lobe right.

Holotype male: **Peru**, Junin, Province Satipo Upper River Pampa Hermosa basin, Calabazas. 11°30.62'S, 74°49.23'W. 2400-2500m. IV- 6 to 7-2009. Flight intercept trap. A.K. Tishechkin [LSAM]

Etymology. Patronymic. Named after the French taxonomist and morphologist Aquille Raffray who described four of the original five species of *Pselaphomorphus* and many other species of insects from around the world.



Figure 22. *Pselaphomorphus raffrayi* sp.n., dorsal view.

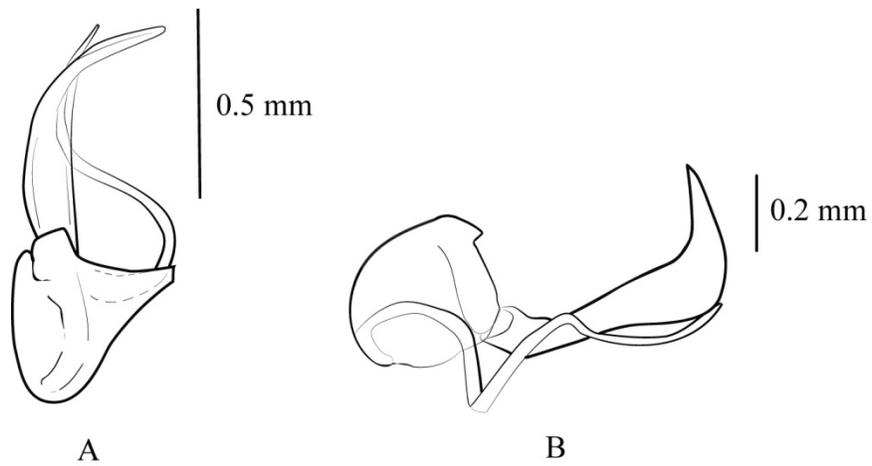


Figure 23. *Pselaphomorphus raffrayi* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus agametopus* sp.n.**

Diagnosis. *Pselaphomorphus agametopus* is characterized by the combination of particular head (at least four times as long as wide), antennae, legs and overall body. The base of the antennal tuberculum is not chordate. This species can be distinguished from *P. longissimus* by being lighter in coloration, and its aedeagus is accompanied by two accessory lobes, one of them divided in two.

Description. Body length 2.9 mm. Body dorsally flattened, amber, with yellow pilosity. Head elongated (length: 0.9, width: 0.4 mm), base of the antennal tuberculum broad, at least once and a half the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes rounded shaped (diameter: 0.2 mm). Antennal length: 2.4 mm: antennomer 1 (0.14 mm) and 2 (0.08 mm) wider than antennomer 3 (0.1 mm), antennomers 4 (0.2 mm) and 5 (0.2 mm) as wide as 6 (0.18 mm) but slightly longer, antennomers 7 (0.26 mm) to 10 (0.26 mm) just as wide as previous but longer, antennomer 11 (0.32 mm) truncated basally and acuminate apically. Maxillary palps amber, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes triangular, basally and apically round. Antebasal lobule medially depressed, transversal sulcus wider in the middle, with a projection towards the pronotal disc. Longitudinal sulci wider towards the basal end. Membranous wings and elytra well developed (length: 0.95, width: 0.95 mm): subhumeral fovea deep as well as the subhumeral stria. Humeral teeth and elevation present. Sutural fovea transversally elongated and deep, followed by the sutural stria. Basal discal fovea rounded. Dorsally, abdominal segments I-VI, respectively: 0.35, 0.1, 0.1, 0.1, 0.15 mm. Ventrally, segment V end circular, segment VI with an elongated depression, pigdial suture not visible.

Male genitalia. Aedeagus base regular, bilobed, with long arms. Medial lobe divided into two pieces that articulate with the base interior. Dorsal piece is straight and slender, ventral piece is straight and gets weaker unto the apex. Two accessory lobes are articulated to both sides of the base and surrounds the medial lobes. The right part of the accessory lobe is divided medially into another short branch.

Holotype male. **Colombia**, Antioquia, above Rio Anori. 550 m. IX-15-1970 [FMNH].

Etymology. Noun in apposition. Named after the Greek *agan* signifying ‘much’ and *metopus* meaning ‘face’ (Brown 1956), thus referring to the characteristic long head of this species.



Figure 24. *Pselaphomorphus agametopus* sp.n., dorsal view.

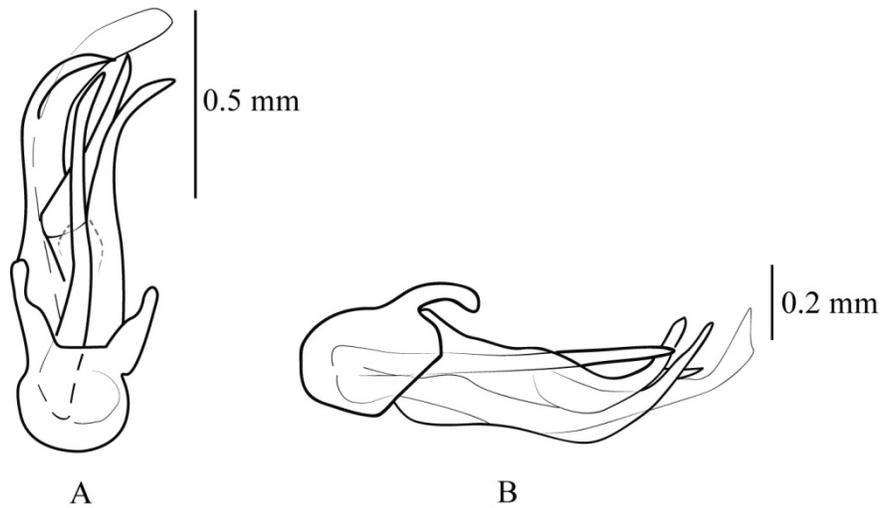


Figure 25. *Pselaphomorphus agametopus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus longissimus* sp.n.**

Diagnosis. *Pselaphomorphus longissimus* is characterized by the combination of relatively big size and very long and slender legs and antennae, as well as the head. This species can differentiate from *P. agametopus* by its darker coloration and because its aedeagus presents only one accessory lobe that surrounds the medial lobes.

Description. Male. Body length 3.0 mm. Body dorsally flattened, amber, with yellowish pilosity. Head elongated (length: 1.0, width: 0.4 mm), base of the antennal tuberculum broad, at least once and a half the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes round shaped (diameter: 0.2 mm). Antennal length: 2.4 mm: antennomer 1 (0.14 mm) and 2 (0.08 mm) wider than antennomer 3 (0.08 mm), antennomers 4 (0.18 mm) and 5 (0.18 mm) as wide as 6 (0.16 mm) but slightly longer, antennomers 7 (0.22 mm) to 10 (0.2 mm) just as wide as previous but longer, antennomer 11 (0.32 mm) truncated basally and acuminate apically. Maxillary palps amber, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes triangular, basally and apically round. Antebasal lobule medially depressed, transversal sulcus wider in the middle, with a projection towards the pronotal disc. Longitudinal sulci wider towards the basal end. Membranous wings and elytra well developed (length: 0.6, width: 0.8 mm): subhumeral fovea deep, as well as the subhumeral stria. Humeral teeth and elevation present. Sutural fovea transversally elongated and deep, followed by the sutural stria. Basal discal fovea rounded. Dorsally, abdominal segments I-VI, respectively: 0.55, 0.1, 0.1, 0.15, 0.05 mm. Ventrally, segment V end circular, segment VI with an elongated depression, pigdial suture not visible.

Genitalia. Aedeagus base regular, bilobed, with long arms. Medial lobe divided into two pieces that articulate unto the base interior. Dorsal piece is narrow and apically curved towards right; ventral piece is flat and medially divided into two short curved arms. One accessory lobe is articulated toward the left side of the base and ventrally surrounds the medial lobe; the right side of the accessory lobe is broader than the left side, which is narrow and long, as long as the medial lobes.

Holotype male. **Panama**, Chiriqui Province. 8°44'N, 82°15'W Fortuna. X-26-1978. N. Wolda. U.V. light [UNHC]; Paratype 1 ♂, Panama, Veraguas Province, 8 km W. Santa Fe Cerro Tute, 900m, 08°30'26"N, 81°6'49"W, VII-24/26-1999, YPT, J.B. Wooley [LSAM].

Etymology. Named after its characteristic long legs, head and antennae with the Latin word *longissimus* meaning 'the longest'.



Figure 26. *Pselaphomorphus longissimus* sp.n., dorsal view.

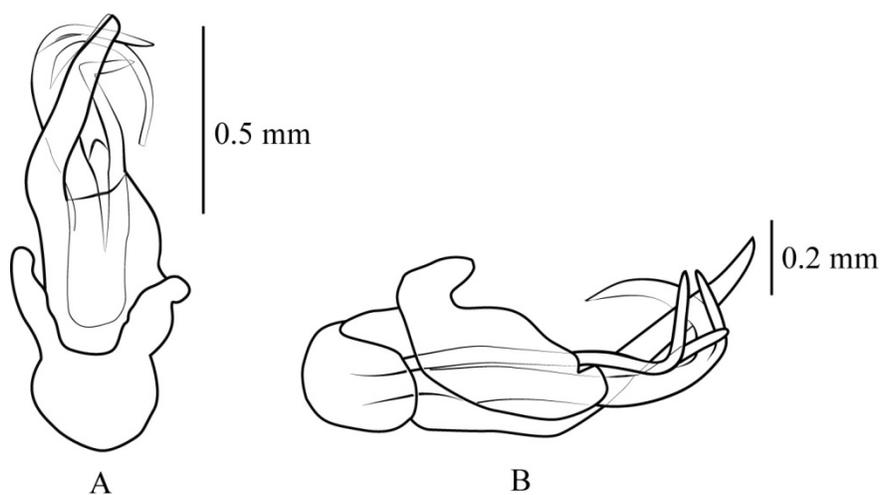


Figure 27. *Pselaphomorphus longissimus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus iguazuensis* sp.n.**

Diagnosis. *Pselaphomorphus iguazuensis* is characterized by the combination of reddish coloration and yellow pilosity. This species can be differentiated from *P. santaecrucis* because the accessory lobe of the aedeagus is dorsally flattened, basally is rounded and apically has a curved spine (fig. 24A).

Description. Male. Body length 2.6 mm. Body dorsally flattened, reddish, with yellow pilosity. Head pear-shaped (length: 0.6, width: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.1 mm). Antennal length: 1.3 mm: antennomer 1 (0.12 mm) and 2 (0.06 mm) wider than antennomer 3 (0.06 mm), antennomers 4 (0.08 mm) and 5 (0.1 mm) as wide as 6 but slightly longer (0.08 mm), antennomers 7 (0.12 mm) to 10 (0.12 mm) getting thicker towards the end, forming an inconspicuous clava, antennomer 11 (0.2 mm) truncated basally and acuminate apically. Maxillary palps amber, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes triangular, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc square, longitudinal and transversal sulci with same width thoroughly. Membranous wings and elytra well developed (length: 0.6, width: 0.8 mm): subhumeral fovea deep, as well as the subhumeral stria. Humeral teeth and elevation present. Sutural fovea transversally elongated and deep, followed by the sutural stria. Basal discal fovea rounded. Dorsally, abdominal segments I-VI, respectively: 0.5, 0.2, 0.2, 0.2, 0.1 mm. Ventrally, segment V end circular, segment VI with round depression, pigdial suture not visible.

Genitalia. Aedeagus base irregular. Medial lobe is divided basally into two pieces. Ventral piece subdivides into two arms; major arm is long and slender, minor short and curved. Dorsal piece is as long as and wider than the major arm in the ventral piece. An accessory lobe articulates to the base arm, ventrally, and descends to be in contact with the dorsally located medial lobe. The accessory lobe is flat over the medial lobe, round shaped basally and apically turns narrowly unto right.

Holotype male (cleared and dissected). **Argentina**, Misiones Province, National Park Iguazu Puerto Canoas. 200 m. XII-8-1990 to I-6-1991. Hill forest. S. & J. Peck [FMNH].

Etymology. Named after the after the Iguazu National Park in Misiones, Argentina, where the holotype was collected

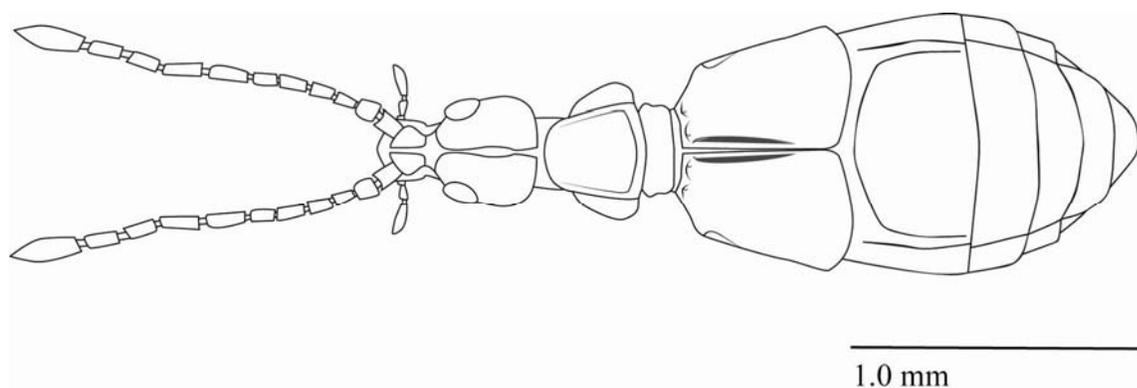


Figure 28. *Pselaphomorphus iguazuensis* sp.n., dorsal representation.

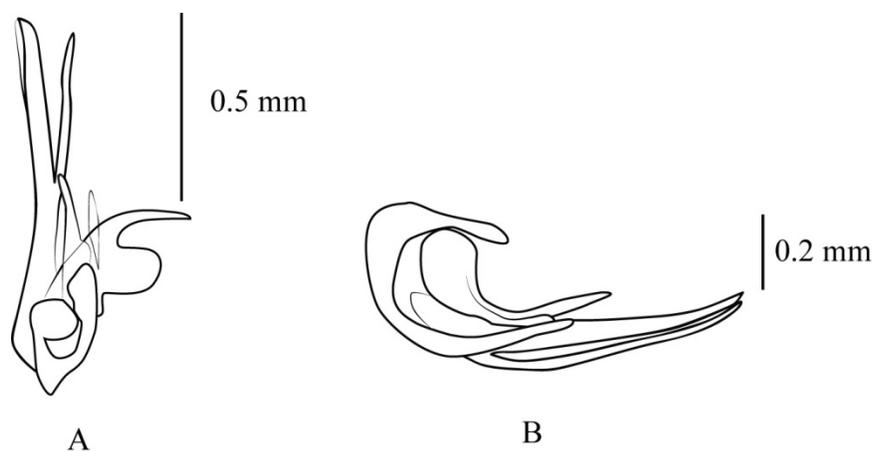


Figure 29. *Pselaphomorphus iguazuensis* aedeagus in dorsal (A) and lateral (B) views.

Pselaphomorphus brevipennis Raffray, 1917

Original description. Elongated, anteriorly attenuate, red long pilosity, scattered. Head elongated, pear-shaped, anteriorly attenuate, totally sulcate by medial fovea; antennal tuberculum chordate, base of the tuberculum with one transversal sulcus, genae rounded. Eyes strong, black, anteriorly located. Antennae long, slender with cylindrical antennomers, longer than wide, 5th elongated, 11th more elongated and acuminate. Prothorax shorter than head, anteriorly narrow and blunt, sides longitudinally sulcated, shorted and lobed, posterior region transversally sulcated, posterior lobe shorted. Elytra short and subtriangular, base attenuate, laterally with dentate, oblicous humera, posterior margin hairy. First abdominal segment longer than the other, lateral margin broad, hard. Legs long and slender, femora elongate, tibiae straight and thin, tarsi long and filiform. Length 2.16 mm.

Paraguay: Asuncion



Figure 30. *Pselaphomorphus brevipennis* Raffray, 1917 (Holotype, MNHN Paris, courtesy C. Carlton).

***Pselaphomorphus santaecrucis* sp.n.**

Diagnosis. *Pselaphomorphus santaecrucis* is characterized by the combination of reddish coloration and yellow pilosity. This species can be differentiated from *P. iguazuensis* because the accessory lobe of the aedeagus is cylindrical and elongated.

Description. Male. Body length 2.1 mm. Body dorsally flattened, reddish with yellow pilosity. Head pear-shaped (length: 0.6, width: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.1 mm). Antennal length: 1.5 mm: antennomer 1 (0.12 mm) and 2 (0.08 mm) wider than antennomer 3 (0.06 mm), antennomers 4 (0.06 mm) and 5 (0.08 mm) as wide as 6 but slightly longer (0.08 mm), antennomers 7 (0.12 mm) to 10 (0.1 mm) getting thicker and longer towards the end, forming a clava, antennomer 11 (0.2 mm) truncated basally and acuminate apically. Maxillary palps amber, with short and even pilosity. Pronotum square (length: 0.4, width: 0.4 mm). Lateral lobes trapezoidal, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc oval, longitudinal and transversal sulci wider in the extremes. Membranous wings and elytra well developed (length: 0.5, width: 0.8 mm): subhumeral fovea deep, base of the subhumeral stria rounded. Humeral teeth present. Sutural fovea round and deep, sutural stria extending beyond the middle of elytra. Basal discal fovea rounded. Dorsally, abdominal segments I-VI, respectively: 0.4, 0.2, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI without depression, pigidial suture not visible.

Genitalia. Aedeagus base irregular. Medial lobe is divided basally into two pieces. Ventral piece is long, slender and complete. Dorsal piece is short and less evident than ventral piece, surrounding it. An accessory lobe articulates to the base arm, ventrally, and descends to be in contact with the longest piece of the medial lobe. The accessory lobe is cylindrical and the end is acute.

Holotype male. **Bolivia**, Santa Cruz, 4-5 km. SSE Buena Vista, Hotel Flora y Fauna. 440 m. 17°29.95'S, 63°39.1'W. Flight intercept trap. XII-14 to 24-2003. S. & J. Peck [LSAM].

Etymology. Named after the region of Santa Cruz in Bolivia where the holotype was collected



Figure 31. *Pselaphomorphus santaecrucis* sp.n., dorsal view.

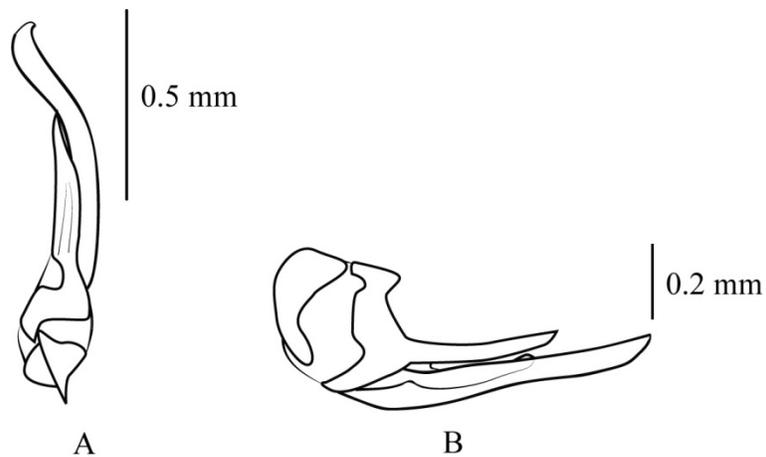


Figure 32. *Pselaphomorphus santaecrucis* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus melanosus* sp.n.**

Diagnosis. *Pselaphomorphus melanosus* is characterized by the combination of filiform antennae, without clava, and a dark brown coloration with bright yellow pilosity.

Description. Male. Body length 2.4 mm. Dark brown, with yellowish pilosity. Head elongated (length: 0.7, width: 0.4 mm). Longitudinal sulcus spindle shaped. Eyes kidney shaped (diameter: 0.1 mm). Antennal length: 1.8 mm Antennal length: 1.5 mm: antennomer 1 (0.12 mm) wider than antennomer 2 (0.08 mm) and the last one wider than following antennomer 3 (0.08 mm), antennomers 4 to 10 (0.1 mm) similar in length and width, antennomer 11 (0.24 mm) acuminate, clava absent. Maxillary palps light brown, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm): lateral lobes triangular, basally square and round apically. Basal lobe rectangular, with two truncated projections in both sides. Pronotal disc oval; longitudinal sulci wider in the extremities. Membranous wings and elytra well developed (length: 0.7, width: 0.8 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal discal fovea present and evident, framed by a basal carina. Sutural stria present. Dorsally, abdominal segments I-VI, respectively: 0.4, 0.2, 0.15, 0.2, 0.1 mm. Ventrally, segment V end circular, segment VI with an elongated depression, pigidial suture present.

Genitalia. Aedeagus base regular, bilobed. Medial lobe straight in lateral view, not going upward. Apical end membranous. Medially with a small spine projected unto left. Accessory lobes absent.

Etymology. The name refers to the darker color of the body, from Greek *melanos* meaning 'dark'.

Holotype male: **Costa Rica**, Puntarenas, Osa Penninsula. Neotropical Fundacion 10 km W Rincon. 20 m. 8°45'30"N, 83°25'00"W. VI-21-1997. R. Anderson. Berlese forest litter [KSEM]. Paratypes: 3 ♀, same information as holotype, 1 ♂, Costa Rica, Puntarenas Province, 4 km W Rancho Quemado, 8°41'32"N, 83°35'32"W, VI-25-2001, 300m, R. Anderson, leaf litter [UNHC]; 1 ♂, Costa Rica, Puntarenas, Osa Penninsula, Fundacion Neotropical 10 km W Rincon, 200m, 8°42'30"N, 83°31'30"W, VI-23-2001, low land forest litter [KSEM]; 2 ♀, Costa Rica, Puntarenas, Las Cruces Biological Station, San Vito 4 km S, 110m, 8°47'3"N, 82°57'36"W, VI-19-1998, R. Anderson, berlese leaf litter [KSEM]; 1 ♀, Costa Rica, Puntarenas, Osa Penninsula, 5 km W Rincon de OSA, 8°42'N, 83°31'W, 50m, III-24-30-1973, J. Wagner, J. Kethley, forest floor [FMNH].



Figure 33. *Pselaphomorphus melanosus* sp.n., dorsal view.

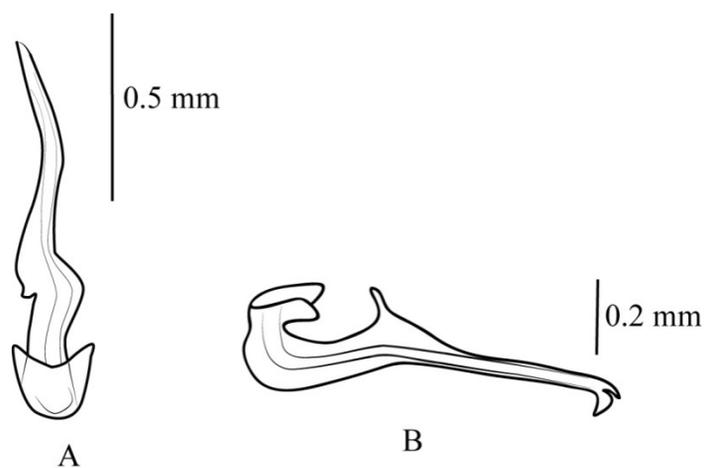


Figure 34. *Pselaphomorphus melanosus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus veracruzanus* sp.n.**

Diagnosis. *Pselaphomorphus veracruzanus* is characterized by the combination of a reddish body, with yellow pilosity, and triangular pronotal lateral lobes. This species can be

distinguished from *P. wagneri* and *P. mayarum* by observing at the genitalia, which is broader and laterally flat, not curving up, and apically presents three small spines.

Description. Male. Body length 2.4 mm. Body flattened dorsally, reddish, with yellowish pilosity. Head pear-shaped (length: 0.6, width: 0.4 mm). Head longitudinal sulcus wider behind the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.7 mm: antennomer 1 (0.12 mm) wider than antennomer 2 (0.06 mm) and the last one wider than antennomer 3 (0.06 mm), antennomers 4 and 5 (0.12 mm) as wide as 6 but slightly longer (0.1 mm), antennomers 7 (0.14 mm) to 10 getting thicker towards the end, forming an inconspicuous clava, antennomer 11 (0.3 mm) truncated basally and acuminate apically. Maxillary palps light brown, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes triangular, squared basally, forming an acute angle. Antebasal lobule rectangular, at least five times wider than long. Longitudinal and transversal sulci have similar width thoroughly. Membranous wings and elytra well developed (length: 0.7, width: 0.9 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal discal foveae present and evident, framed by a basal carina. Sutural stria present. Dorsally, abdominal segments I-VI, respectively: 0.4, 0.15, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI with a elongated depression, pigdial suture present.

Genitalia. Aedeagus base regular, with short arms. Medial lobe long and flat, not projecting up. Apically, it divides into three small spines: two in the apex and one medially unto right. Accessory lobes absent.

Holotype male. **Mexico**, Veracruz 33 km. NE Catemaco, Los Tuxtlas Biological Station. 160 m. VII-1 to VIII-1-1983. S. & J. Peck. Ridge rain forest. Flight intercept trap [UNHC].

Etymology. Named after the State of Veracruz in Mexico where the holotype was collected.



Figure 35. *Pselaphomorphus veracruzanus* sp.n. dorsal view.

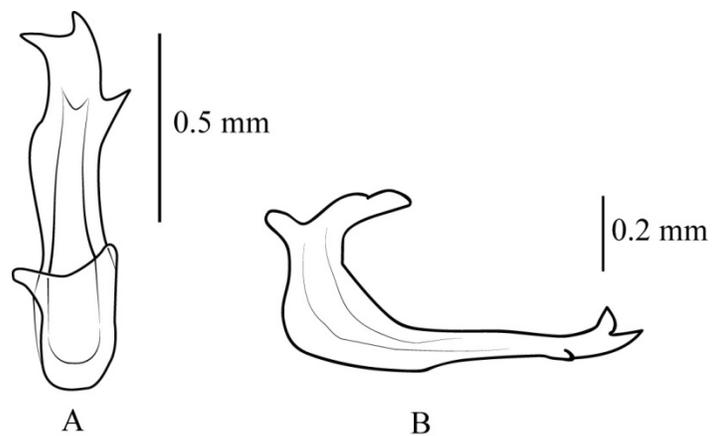


Figure 36. *Pselaphomorphus veracruzanus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus carenobothrus* sp.n.**

Diagnosis. *Pselaphomorphus carenobothrus* is characterized by the combination of antennae without evident clava and a cephalic longitudinal sulcus broader than eye diameter.

Description. Male. Body length 2.5 mm. Body flattened dorsally, brown, with yellow pilosity. Head pear-shaped (length: 0.7, wide: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Longitudinal sulcus of head broad, wider than the diameter of the eyes in dorsal view. Eyes kidney shaped (diameter: 0.2 mm). Antennal length: 1.7 mm: antennomer 1 (0.12 mm) wider than antennomer 2 (0.06 mm) and the last one wider than antennomer 3 (0.08 mm), antennomers 4 (0.1 mm) and 5 (0.12 mm) as wide as 6 but slightly longer (0.08 mm), antennomer 7 (0.14 mm) to 10 (0.14 mm) with similar width, antennomer 11 (0.3 mm) as wide as the previous, clava absent. Maxillary palps light brown, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes broad, triangular, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc square, longitudinal and transversal sulci have the same width thoroughly. Membranous wings and elytra well developed (length: 0.8, width: 0.9 mm): subhumeral fovea deep, base of the subhumeral stria rounded. Humeral teeth absent, humeral elevation present. Sutural fovea round and deep, sutural stria extending beyond the middle of elytra. Basal discal fovea rounded, followed by a discal depression. Dorsally, abdominal segments I-VI, respectively: 0.3, 0.1, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI with a round depression, pigidial suture present.

Genitalia. Aedeagus base regular with short arms. Medial lobe long and slender, not projecting up. One accessory lobe articulates to the base arms and spirally surrounds the medial lobe. The accessory lobe is flattened.

Holotype male. **Peru**, Loreto 1.5 km. N. Teniente Lopez. 210-240m. 2°35.66'S, 76°06.92'W. VII-22-1993. Richar Leschen. Flight intercept trap [KSEM]. Paratype: 1 ♂: **Ecuador**, Orellana, Yasuni Res. Station. VII-11-2008. Chris Carlton. Berlese. [LSAM].

Etymology. Name in apposition. Named for the characteristic broad headal sulcus, from the Greek *kareno* meaning 'head' and *bothros* meaning 'pit' or 'trench'.



Figure 41. *Pselaphomorphus carenbothrus* sp.n., dorsal view.

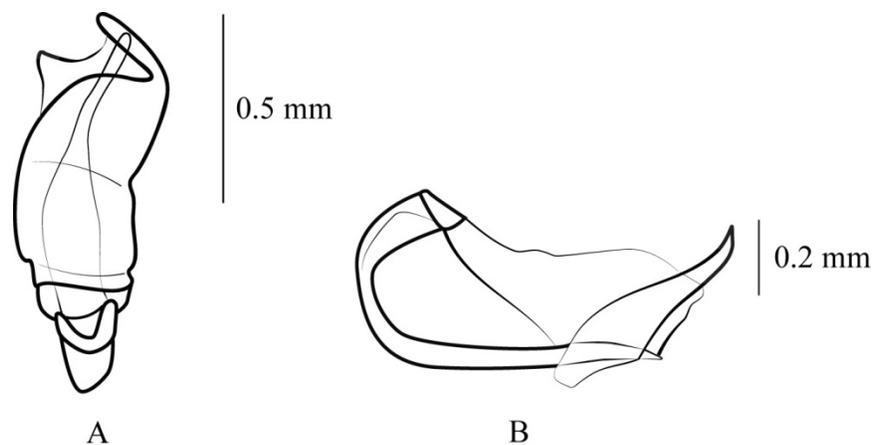


Figure 42. *Pselaphomorphus carenbothrus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus acutispinosus* sp.n.**

Diagnosis. *Pselaphomorphus acutispinosus* is characterized by the combination of a reddish coloration and mesothrocanthers armed with a vertical spine.

Description. Male. Body length 2.6 mm. Body flattened dorsally, reddish, with yellow pilosity. Head pear-shaped (length: 0.55, width: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Head longitudinally wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.9 mm; antennomer 1 (0.1 mm) wider than antennomer 2 (0.06 mm) and the last one wider than antennomer 3 (0.08 mm), antennomers 4 (0.08 mm) as wide as 3, antennomers 5 (0.12 mm) to 10 (0.14 mm) similar, antennomer 11 (0.28 mm) as wide as the previous, clava absent. Maxillary palps light brown, with short and even pilosity. Pronotum square (length: 0.5, width: 0.5 mm). Lateral lobes triangular, basal angle square, edges rounded. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc oval, longitudinal and transversal sulci wider towards the extremes. Membranous wings and elytra well developed (length: 0.8, width: 0.9 mm): subhumeral fovea deep rounded, base of the subhumeral stria squared. Humeral teeth and elevation present. Sutural fovea round and deep, sutural stria broad proximally. Basal discal fovea rounded, discal depression absent. Dorsally, abdominal segments I-VI, respectively: 0.7, 0.15, 0.1, 0.1, 0.15 mm. Ventrally, segment V end circular, segment VI with a round depression, pigdial suture present. Mesothrocanter armed with a spine.

Genitalia. Aedeagus base regular, triangular, without evident arms. Medial lobe long, basally divided into two unequal arms. Right arm is short, semi-cylindrical, with membranous apex. Left arm is long and cylindrically triangular, apex truncated and membranous. Accessory lobes absent.

Holotype male. **Peru**, Junin, 3 km S. Satipo, Ricardo Palma. 780 m. 16°52.0'S, 74°58.52'W. III-19 to 21-2009. Forest litter. A. K. Tishechkin [LSAM]. Paratype: 1 ♂, same information as the holotype.

Etymology. Name in apposition. The name refers to the acute spine this species bears in the mesotrocanter.



Figure 43. *Pselaphomorphus acutispinosus* sp.n., dorsal view.

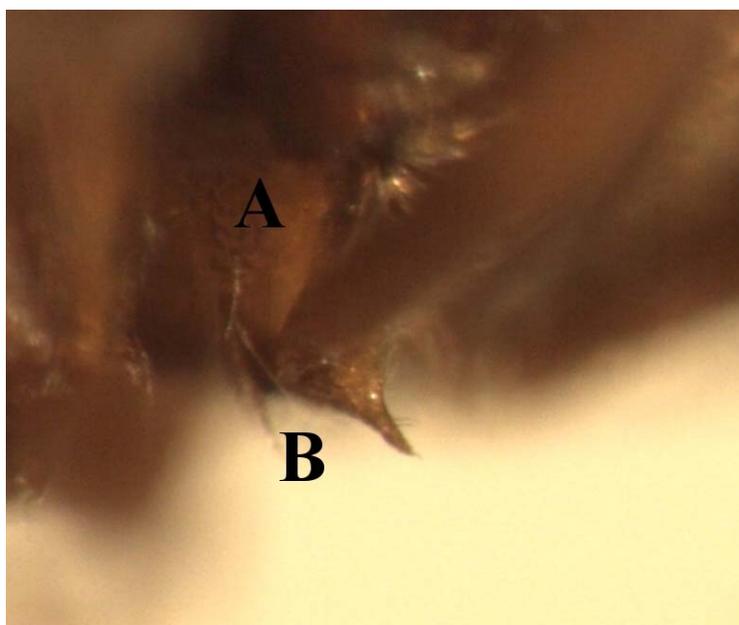


Figure 44. Detail of the middle leg: A. coxa and B. spiny mesotrocanter

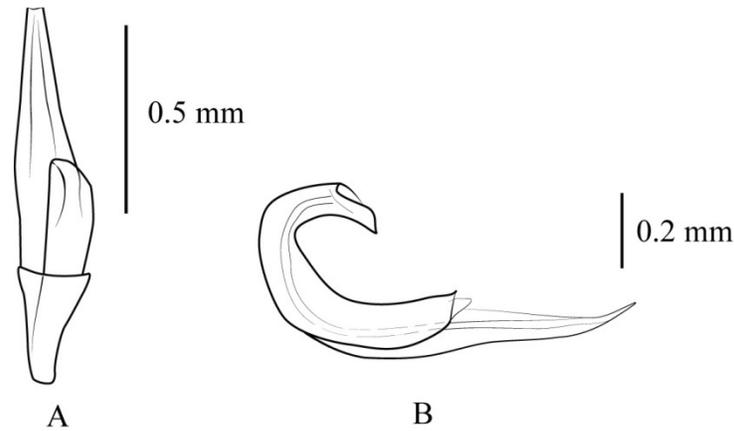


Figure 45. *Pselaphomorphus acutispinosus* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus wagneri* sp.n.**

Diagnosis. *Pselaphomorphus wagneri* is characterized by the combination of a reddish body with yellow pilosity and triangular pronotal lateral lobes. This species can be distinguished from *P. veracruzanus* and *P. mayarum* by observing at the genitalia, which is slender and slightly curved in S shape.

Description. Male. Body length 2.6 mm. Body flattened dorsally, reddish, with yellow pilosity. Head pear-shaped (length: 0.65, width: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.15 mm). Antennal length: 1.4 mm: antennomer 1 (0.12 mm) and 2 (0.08 mm) wider than antennomer 3 (0.08 mm), antennomers 4 (0.1 mm) and 5 (0.12 mm) as wide as 6 (0.1 mm) but slightly longer, antennomers 7 (0.14 mm) to 10 (0.14 mm) getting thicker towards the end, forming an inconspicuous clava, antennomer 11 (0.2 mm) truncated basally and acuminate apically. Maxillary palps amber, with short and even pilosity. Pronotum rectangular (length: 0.45, width: 0.5 mm). Lateral lobes triangular, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc square, longitudinal and transversal sulci with same width thoroughly. Membranous wings and elytra well developed (length: 0.75, width: 0.9 mm): subhumeral fovea deep, as well as the subhumeral stria. Humeral teeth present. Sutural fovea transversally elongated and deep, followed by the sutural stria. Basal

discal fovea transversally elongated. Dorsally, abdominal segments I-VI, respectively: 0.5, 0.1, 0.1, 0.1, 0.15 mm. Ventrally, segment V end circular, segment VI with elongated depression, pigdial suture present.

Genitalia. Aedeagus base regular, with short arms. Medial lobe long and slender, curved medially unto left and apically unto right. Apical end membranous. Median lobe projects up, not further than base. Accessory lobes absent.

Holotype male. **Mexico**, Oaxaca 7.3 mi. S. Valle Nacional. 700 m. VIII-15-1973. A. Newton. U.V. blacklight [FMNH].

Etymology. Patronymic. Named after the North American Pselaphinae expert John Wagner (1945-2012) who worked for many years in the Field Museum of Natural History.



Figure 37. *Pselaphomorphus wagneri* sp.n., dorsal view.

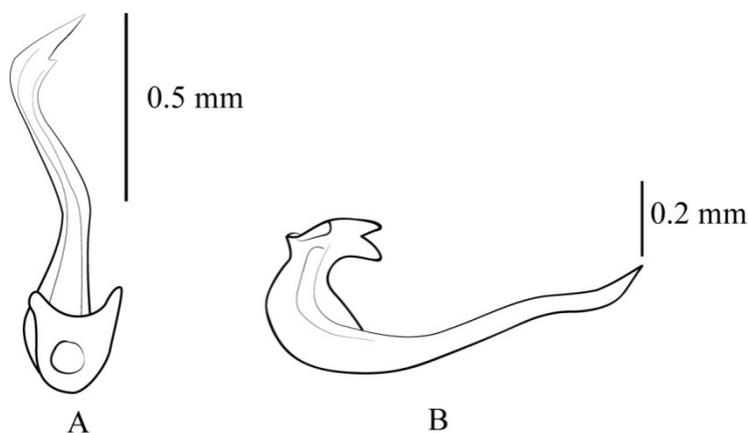


Figure 38. *Pselaphomorphus wagneri* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus mayarum* sp.n.**

Diagnosis. *Pselaphomorphus mayarum* is characterized by the combination of a reddish coloration and triangular pronotal lateral lobes. It can be distinguished from *P. wagneri* and *P. veracruzanus* by observing the genitalia that is long, slender and straight, curving up in lateral view.

Description. Male. Body length 2.6 mm. Body flattened dorsally, reddish, with yellowish pilosity. Head pear-shaped (length: 0.7, width: 0.4 mm). Head longitudinal sulcus wider behind the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.12 mm). Antennal length: 1.5 mm: antennomer 1 (0.12 mm) wider than antennomer 2 (0.06 mm) and the last one wider than antennomer 3 (0.06 mm), antennomers 4 and 5 (0.12 mm) as wide as 6 but longer (0.08 mm), antennomers 7 (0.14 mm) to 10 getting thicker towards the end, forming an inconspicuous clava, antennomer 11 (0.28 mm) truncated basally and acuminate apically. Maxillary palps light brown with short and even pilosity. Pronotum slightly rectangular (length: 0.5, width: 0.4 mm). Lateral lobes triangular, basally square, forming an acute angle. Antebasal lobule rectangular, at least five times wider than long. Longitudinal and transversal sulci have similar width thoroughly. Membranous wings and elytra well developed (length: 0.7, width: 0.9 mm): subhumeral elytral fovea deep, followed apically by the subhumeral stria. Humeral teeth present. Sutural and basal discal foveae present and evident, framed by a basal carina. Sutural stria

present. Dorsally, abdominal segments I-VI, respectively: 0.35, 0.2, 0.1, 0.1, 0.1 mm. Ventrally, segment V end circular, segment VI with a circular depression, pigdial suture present.

Genitalia. Aedeagus base regular, with short arms. Medial lobe long and slender, linear apically turns slightly towards left. In lateral view, projects up beyond the highest part of the base. Accessory lobes absent.

Holotype male. **Honduras**, Cortez, National Park Cerro Azul-Meamber Los Pinos. 800 m. 14°52.4'N, 87°54.7'W. V-10 to 16- 2002. S. Peck. Flight intercept trap [KSEM]. Paratypes: 2 ♂ (1 dissected): **Belize**, Cayo District Chiquibul N.P. Doyle's Delight, near Campground. 1100 m. VIII-19-28-2007. P.W. Kovarik. Flight intercept trap. [LSAM].

Etymology. Named after the Maya civilization that lived in the countries where this species was collected.



Figure 39. *Pselaphomorphus mayarum* sp.n., dorsal view.

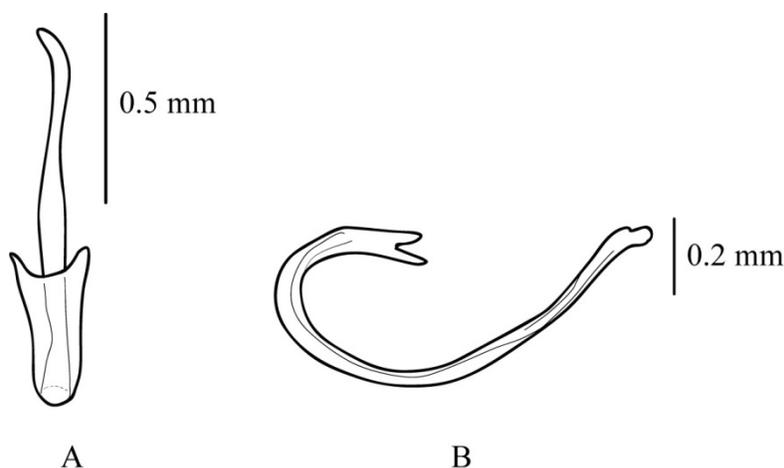


Figure 40. *Pselaphomorphus mayarum* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus carltoni* sp.n.**

Diagnosis. *Pselaphomorphus carltoni* is characterized by the combination of the rust body coloration and yellow pilosity; additionally presents humeral elevation without teeth. This species can be differentiated from *P. sculpturatus* by the darker coloration and the aedeagus almost symmetrical, without apical arms.

Description. Male. Body length 2.5 mm. Body dorsally flattened, rust, with yellow pilosity. Head pear-shaped (length: 0.7, width: 0.4 mm), base of the antennal tuberculum as long as the diameter of the eyes. Head longitudinal sulcus wider between the eyes, spindle shaped. Eyes kidney shaped (diameter: 0.2 mm). Antennal length: 2.1 mm.: antennomer 1 (0.16 mm) wider than antennomer 2 (0.06 mm) and the last one wider than antennomer 3 (0.1 mm), antennomers 4 (0.14 mm) and 5 (0.16 mm) as wide as 6 but slightly longer (0.12 mm), antennomer 7 (0.2 mm) to 10 (0.18 mm) with similar wide, antennomer 11 (0.32 mm) as wide as the previous, clava absent. Maxillary palps light brown, with short and even pilosity. Pronotum rectangular (length: 0.7, width: 0.5 mm). Lateral lobes broad, triangular, basally and apically round. Antebasal lobule rectangular, at least five times wider than long. Pronotal disc square, longitudinal and transversal sulci have the same width thoroughly. Membranous wings and elytra well developed (length:

0.8, wide: 0.9 mm): subhumeral stria covered by long, golden, even pilosity; subhumeral fovea rounded and deep. Humeral elevation present, humeral teeth absent. Sutural fovea rounded, followed by the sutural stria that goes until half of the elytra. Basal discal fovea present, rounded and followed by a discal depression. Dorsally, abdominal segments I-VI, respectively: 0.3, 0.15, 0.1, 0.15, 0.15 mm. Ventrally, segment V end circular, segment VI with an elongated depression, pigdial suture present, U-shaped.

Male genitalia. Aedeagus base regular, with short arms. Medial lobe grows wider in the apex, where it divides into two opposite truncated arms. The arms are similar in length and width, projected up at the same level of the base, apically are joined by a membranous plate. Accessory lobes absent.

Holotype male. **Ecuador**, Pichincha, Tinalandia, Sto. Domingo 16 km E. 750 m. 0°16'53" S, 79°3'39" W. III-26 to 27-1999. FIT. R. Brooks and D. Brzoka [KU]; Paratype 1 ♂, Ecuador, Pichincha, Tinalandia Province, 680m. 16 km SE Santo Domingo, VI-15-1975, S. Peck, berlese, leaf litter and soil [FMNH].

Etymology. Patronymic; named after Pselaphinae taxonomist, Dr. Christopher Carlton (Louisiana State Arthropod Museum), whose strong support is gratefully acknowledged.



Figure 46. *Pselaphomorphus carltoni* sp.n., dorsal view.

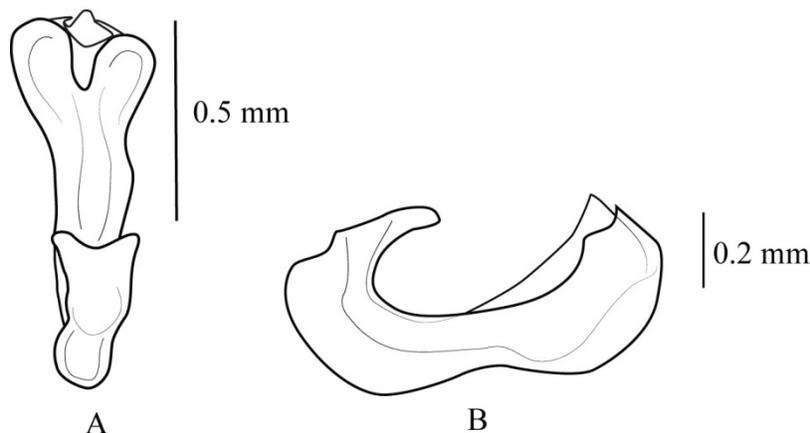


Figure 47. *Pselaphomorphus carltoni* aedeagus in dorsal (A) and lateral (B) views.

***Pselaphomorphus sculpturatus* Motschulsky, 1855**

Redescription. Female. Body length 2.4 mm. Body is flattened dorsally. Coloration is reddish to brownish, with yellow pilosity along the body. Head is pear-shaped (length 0.6 mm, width 0.4 mm). Antennal tuberculum has its base at least as long as the diameter of the eyes. Dorsal longitudinal sulcus wider between eyes, spindle shaped. Eyes are kidney-shaped (diameter 0.075 mm). Antennae length: 1.2 mm: antennomere 1 (0.1mm) wider than segments 2 to 7; antennomere 2 (0.05mm) wider than 3 to 6; antennomere 3 (0.075 mm) similar in wide to 4, but shorter; antennomere 4 (0.1 mm) as long and wide as 5 (0.1 mm), and both are longer than 6 (0.085 mm), but similar in wide; antennomeres 7 (0.15 mm) to 10 (0.12 mm) longer and wider forming an inconspicuous clava, antennomere 11 (0.2 mm) truncate basally and acuminate apically. Pronotum is rectangular, slightly longer (0.5 mm) than wide (0.45 mm). Lateral lobes triangular, basally rounded. Antebasal lobule rectangular, at least five times wider than long. Longitudinal and transversal sulci have similar width thoroughly. Elytra are small, rectangular (length 0.5 mm, width: 0.45 mm), without membranous wings. The elytral base has a ridge that ends laterally in a strong spine in both sides. Each elytra with two similar deep basal foveae and a subhumeral fovea. Dorsally, abdominal segments I to V are 0.5, 0.05, 0.05, 0.05, and 0.05 mm, respectively.

Description. Male. Body length 2.4 mm (fig. 39). Body dorsally flattened, brownish, with yellow pilosity along the body. Head pear-shaped (length: 0.6 mm, width: 0.4 mm). Base of the antennal tuberculum at least as long as the diameter of the eyes. Head longitudinal sulcus wider between eyes, spindle shaped. Eyes kidney-shaped (diameter 0.1 mm). Antennal length: 1.25 mm: antennomere 1 (0.1 mm) is wider than segments 2 to 7; antennomere 2 (0.075 mm) wider than 3 to 6; antennomere 3 (0.075 mm) similar in width to 4, but shorter; antennomere 4 (0.1 mm) as long and wide as 5 (0.1 mm), and both are longer than 6 (0.085 mm), but similar in width; antennomeres 7 (0.1 mm) to 10 (0.15 mm) longer and wider, forming an inconspicuous clava, antennomere 11 (0.25 mm) truncate basally and acuminate apically. Pronotum is quadrate (length 0.5 mm, wide 0.5 mm). Lateral lobes are triangular and basally rounded. Antebasal lobule rectangular, at least five times wider than long. Longitudinal and transversal sulci have similar width thoroughly. Membranous wings and elytra well developed (length 0.6 mm, width: 0.75 mm). Subhumeral elytral fovea is shallow, followed by an also shallow subhumeral stria; humera without tooth, sutural fovea and basal discal fovea (basal elytral foveae) are transversally elongated. Dorsally, abdominal segments I to V are 0.4, 0.05, 0.05, 0.05, and 0.06 mm, respectively; ventrally, segment V end is circular, segment VI has an elongated depression.

Genitalia. Aedeagus base regular (fig. 40), with short arms. Medial lobe grows wider unto the apex, where it divides into two opposite arms. The right arm subdivides into two slender branches that project up beyond the highest part of the base. The left arm is shorter and turns towards right crossing with the two branches of the right arm, at their base. Accessory lobes absent.

Lectotype male. **Panama**, Panama, Las Cumbres. VII-18 to 24-1982. U.V. light. H. Wolda. Paratypes: 121 ♂, 7 ♀: 33 ♂ (1 cleared and dissected, 1 dissected), 2 ♀ (1 cleared and dissected), same data except, XII-1974/XI-1-1983 [UNHC]; 15 ♂, 1 ♀, Panama, Canal Zone, Barro Colorado Island, H. Wolda, UV trap, VII-27-1977/IX-28-1982 [UNHC]; 2 ♂, Panama, Panama, Barro Colorado Island, 09°11'N, 79°51'W, VII-15-1994, D. Banks, flight intercept trap [UNHC]; 1 ♂, Panama, Panama, Barro Colorado Island, 09°11'N, 79°51'W, S. Chatzimanolis, flight intercept trap [UNHC]; 1 ♂, Panama, Canal Zone, Barro Colorado Island, II-25-1976, A. Newton [FMNH]; 1 ♂, Panama, Canal Zone, Cerro Ancon, XI-24-1975, D.S. Chandler, sift leaf litter [UNHC]; 1 ♀, Panama, Canal Zone, Frijoles train stop, X-25-1975, D.S. Chandler, sift leaf litter [UNHC]; 1 ♂, 2 ♀, Panama, Panama Province, Altos de Maje, X-6/15-1975, D.S. Chandler, berlese litter, [UNHC]; 4 ♂, Panama, Colon Parque Nacional Soberania, Pipeline Road, Km 2.0, 09°07'N 79°45'W, V-23/27-1995, J. Jolly, C. Chaboo, fit flight intercept trap

[KSEM]; 1 ♂ 1 ♀, Panama, Colon Parque Nacional Soberania, Pipeline Road, Km 2.0, 09°07'N 79°45'W, V-20/29-1995, J. Jolly, C. Chaboo, leaf litter [KSEM]; Panama, Colon, 5 km SE Piña, ca 20 m., VI-11-1996, R. Anderson, PAN2A96 96-122A, forest litter [KSEM]; 2 ♂, Panama, Colon 14 km N jct. Escobal & Piña roads, VI-02/11-1996, J. Ashe, R. Brooks, PAN1AB96 181B, flight intercept trap [KSEM]; 2 ♂, Panama, Panama 09°05'N, 79°40'W, Plantation road, 6.9 km S Gamboa, 80m, VI-7/22-1995, J. Ashe, R. Brooks, flight intercept trap [KSEM]; 4 ♂, Panama, 16 km W Almirante Bocas de Toro, X-18-1979/IV-29-1980, H. Wolda, UV. Lit [UNHC]; 44 ♂ (1 dissected), Panama, Colon Province, San Lorenzo Forest, STRI crane site, 09°17'N, 79°58'W, X-8-2003/V-24-2004, A.K. Tishechkin, flight intercept trap [LSAM]; 6 ♂, Panama, Colon Province, San Lorenzo Forest, 09°17'N, 79°58'W, X-13/XI-30-2003, R. Kitching, UV light [LSAM]; 3 ♂, Panama, Colon Province, San Lorenzo Forest, 09°17'N, 79°58'W, IX-27-2003, A. Dejean, G. Orivel, B. Cobrara, H.P. Aberlenc & M. Leponce, forest litter, winkler extraction [LSAM]; 1 ♂, Panama, Colon Province, San Lorenzo Forest, 09°17'N, 79°58'W, X-4-2003, microhabitat berlese, litter [LSAM]; 2 ♂, 9 ♀, Panama, Canal Zone, IX/X-1938, A. Bierig [FMNH].



Figure 48. *Pselaphomorphus sculpturatus* Motschulsky, dorsal view.

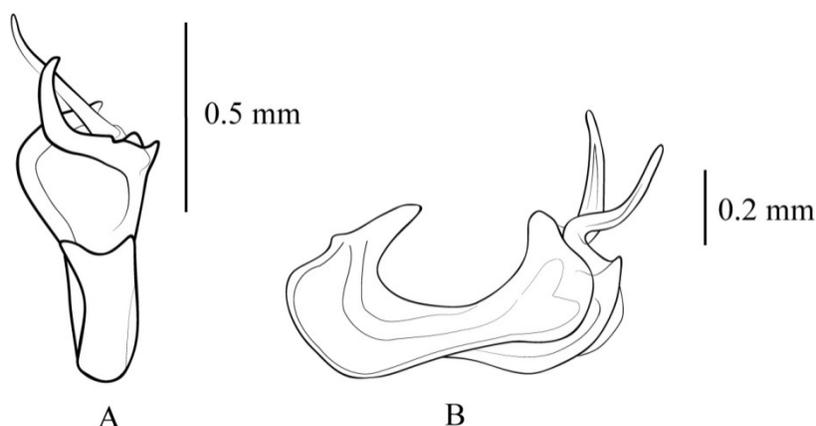


Figure 49. *Pselaphomorphus sculpturatus* aedeagus in dorsal (A) and lateral (B) views.

Key to species of *Pselaphomorphus*

1. Head triangular, base of the antennal tuberculum not longer than eye diameter; antennae with an evident five-segmented clava**2**
- 1'. Head pear-shaped to elongated, base of the antennal tuberculum longer than the eye diameter, antennae with or without clava.....**8**
2. All antennomers squared; antennal length less than 1.0 mm.....*Pselaphomorphus brevantennis*
- 2'. Clava antennomers rectangular, antennae length more than 1.0 mm.....**3**
3. Obtuse spines between the lateral lobes and the basal lobe of the pronotum; elytral discal depression strong and projecting beyond the humeral teeth.....*Pselaphomorphus longiceps*
- 3'. Pronotum without spines.....**4**
4. Antennomer 11 wider than all other antennal segments; pronotal lateral lobes triangular, with the basal ending obtusely.....*Pselaphomorphus incarum*
- 4'. Antennomer 11 as wide as the previous six antennal segments; pronotal lateral lobes trapezoidal, if they are triangular basal ending is rounded.....**5**

5. Pronotal lobes triangular with the basal end rounded; antennomer 6 small and squared, 7 rectangular; elytra with the basal ridge weak, discal depression and humeral teeth absent.....*Pselaphomorphus parkensis*
- 5'. Pronotal lobes trapezoidal; antennomer 6 small and rectangular, antennomer 7 rectangular and at least three times longer than 6; elytra with strong basal ridge discal depression and humeral teeth present.....6
6. Discal depression extending slightly beyond the humeral tooth; body pilosity long and dispersed.....*Pselaphomorphus chandleri*
- 6'. Discal depression not extending beyond the humeral tooth; body pilosity long and even.....7
7. Pronotal disc oval; genitalia short (0.3 mm) with base rounded and globose, medial lobe divided into two asymmetrical arms.....*Pselaphomorphus macrommatus*
- 7'. Pronotal disc rectangular; genitalia short (0.6 mm) and symmetrical, ventrally membranous, medial lobe complete, not divided.....*Pselaphomorphus difficilis*
8. Head elongated, base of the antennal tuberculum longer than the eye diameter;9
- 8'. Head pear-shaped, base of the antennal tuberculum as long as the eye diameter;11
9. Antennae with five segment clava, body covered with thick pilosity.....*Pselaphomorphus azuayensis*
- 9'. Antennae filiform, body covered with long and thin pilosity.....10
10. Body coloration and pilosity amber; aedeagus with two accessory lobes, one of them divided in two.....*Pselaphomorphus agametopus*
- 10'. Body coloration reddish and pilosity bright yellow; aedeagus with one accessory lobe that surrounds the medial lobes.....*Pselaphomorphus longissimus*

- 11.** Antennae with five-segmented clava, antennomer 7 twice as long as antennomer 6 and distinctively wider.....**12**
- 11'.** Antennae without evident clava, antennomer 7 not twice as long as 6 and with similar width.....**13**
- 12.** Pronotal lateral lobes triangular, with the basal region ending obtusely; pronotal disc oval.....*Pselaphomorphus microphthalmus*
- 12'.** Pronotal lateral lobes triangular, with the basal region ending round; obtuse spines between the lateral lobes and the basal lobe of the pronotum.....*Pselaphomorphus raffrayi*
- 13.** Aedeagus base irregular, without arms or with only one arm.....**14**
- 13'.** Aedeagus base regular, with two similar arms on each side.....**15**
- 14.** Accessory lobe of the aedeagus, in dorsal view, basally round shaped and apically acute, turning unto the right.....*Pselaphomorphus iguazuensis*
- 14'.** Accessory lobe of the aedeagus, in dorsal view, is long and cylindrical, with the apex acute.....*Pselaphomorphus santaecrucis*
- 15.** Body coloration reddish, pilosity clear or light yellow; antennomers' length increasing after antennomer 6.....**16**
- 15'.** Body coloration dark brown, pilosity bright yellow; antennomers' length increasing toward the antennal apex.....*Pselaphomorphus melanosus*
- 16.** Head sulcus not wider than the eye radius, spindle shaped.....**17**
- 16'.** Head sulcus wider than eye radius (in dorsal view), lineal.....*Pselaphomorphus carenbothrus*
- 17.** Mesotrocanter triangular, without projection; if it has a projection, it is not longer than the throcanter width.....**18**

- 17'. Mesothrocanter armed with an acute spine that projects vertically, longer than the throcanter width.....*Pselaphomorphus acutispinosus*
18. Aedeagus with the same wide thoroughly.....**19**
- 18'. Aedeagus getting wider from the middle part unto the apex.....**21**
19. Aedeagus complete, not divided; in lateral view, curved up beyond the aedeagal base.....**20**
- 19'. Aedeagus divided apically into three short spines; in lateral view, flat, not curved up.....*Pselaphomorphus veracruzanus*
20. Aedeagus, in dorsal view, straight, slightly curved in the apex....*Pselaphomorphus mayarum*
- 20'. Aedeagus, in dorsal view, curved medially unto the right and apically unto the left.....*Pselaphomorphus wagneri*
21. Aedeagus apically with two long arms projecting up.....*Pselaphomorphus sculpturatus*
- 21'. Aedeagus apically rounded, without arms.....*Pselaphomorphus carltoni*

4. Phylogenetic Analysis

4.1. Characters List for *Pselaphomorphus* genus

An informative matrix of 33 parsimony-informative characters was produced for 29 terminal taxa, including six outgroup species and 23 ingroup species (Table 1). Achievement of a comprehensive search strategy (parsimony ratchet as implemented in TNT), yielded two equally parsimonious trees, from which the strict consensus tree is presented (Fig. 50). It has a length of 76 steps, a consistency index (CI) of 44, and a retention index (RI) of 79. The characters states and inferred optimizations are presented simultaneously in this section, and the consistency and retention indices for individual characters (ci and ri, respectively) are provided in cases of homoplasy. Characters 19 to 32 were coded as missing for *P. brevipennis* because of the lack of male specimens. The subsequent discussion of synapomorphies is restricted to the ingroup taxa.

1. Body size: (0) less than 2.0 mm, (1) more than 2.0 mm. Fast optimization chosen. Convergetly present in *Arthophysis* – *Endytocera* clade and the *Pselaphomorphus longiceps* – *P. wagneri* clade with a reversion in the *P. macrommatus* – *P. incarum* clade (ci = 33; ri = 77).
2. Antennal tuberculum: (0) absent, (1) present. Synapomorphy for the *Sebaga notonoda* - *Pselaphomorphus* clade (ci = 100; ri = 100).
3. Antennal tuberculum cordate at base: (0) absent, (1) present. Synapomorphy for the genus *Pselaphomorphus* (ci = 100; ri = 100).
4. Head shape: (0) triangular (base of the antennal tuberculum, less than eye diameter in latera view), (1) pear-shaped (base of the antenal tuberculum similar to the eye diameter in lateral view), (2) elongated (base of the antennal tuberculum broader than the eye diameter in lateral view). Coded as additive, thus presuming a phylogenetic transition sequence. State (1) is a synapomorphy for the *P. microphthalmus* – *P. sculpturatus* clade and state (2) is a synapomorphy for *P. agametopus* – *P. longissimus* clade (ci = 100; ri = 100).

5. Head longitudinal sulcus: (0) absent, (1) present. Synapomorphy for *Sebaga notonoda* - *Pselaphomorphus* clade (ci = 100; ri = 100).
6. Shape of the cephalic longitudinal sulcus: (0) bifurcated (V or Y shape), (1) complete. Synapomorphy for the genus *Pselaphomorphus* (ci = 100; ri = 100).
7. Antennal clava: (0) evident, (1) absent or not evident. Synapomorphy for the *P. agametoponi* - *P. sculpturatus* clade (ci = 100; ri = 100).
8. Antennomeres width in non-clavate antennae: (0) getting wider toward the apex, (1) same width thoroughly. Synapomorphy for the *P. agametopus* – *P. longissimus* clade. Coded as inapplicable for the *Arthophysis* – *P. raffrayi* clade since this group has clavate antennae (ci = 100; ri = 100).
9. Antennal segment 3 length and width ratio: (0) similar to 4, (1) different to 4. Synapomorphy for *P. azuayensis* - *P. sculpturatus* clade with a subsequent reversion in *P. brevipennis* - *P. santaecrucis* clade (ci = 50; ri = 91).
10. Antennal segment 4 to 6 length ratio: (0) similar or growing in size, (1) 4 and 5 longer than 6. Synapomorphy for *P. macrommatus* - *P. sculpturatus* clade (ci = 100; ri = 100).
11. Pronotal lobes (lateral longitudinal sulci): (0) absent, (1) present. Synapomorphy for the *Phasmisus* - *Pselaphomorphus* clade (ci = 100; ri = 100).
12. Pronotal lobes shape: (0) trapezoid, (1) triangular. Synapomorphy for the *P. azuayensis* - *P. sculpturatus* clade with a subsequent reversion in *P. santaecrucis* (ci = 50; ri = 90).
13. Pronotal lateral lobes projected laterally: (0) absent, (1) present. Fast optimization chosen. Synapomorphy for the *P. raffrayi* – *P. sculpturatus* with a subsequent independent reversion in *P. azuayensis* and the *P. iguazuensis* – *P. santaecrucis* clade (ci = 33; ri = 80).

14. Pronotal transversal sulcus shape: (0) modified, (1) complete. Convergetly present in *Arthophysis* and the *Balega* - *Pselaphomorphus* clade (ci = 50; ri = 50).
15. Pronotal disc shape: (0) oval, (1) rectangular/square. Slow optimization chosen. Synapomorphy for *P. breviantennis* - *P. brevipennis* clade with a subsequent reversion in *P. melanosus* - *P. sculpturatus* clade, *P. santaecrucis*, *P. iguazuensis*, and *P. macrommatus* (ci = 20; ri = 63).
16. Elytral sutural fovea: (0) absent, (1) present. Synapomorphy for the *Sebaga nototonda*-*Pselaphomorphus sculpturatus* clade (ci = 100; ri = 100).
17. Elytral basal discal fovea: (0) absent, (1) present. Synapomorphy for the *Sebaga nototonda*-*Pselaphomorphus sculpturatus* clade (ci = 100; ri = 100).
18. Humeral elevation: (0) absent, (1) present. Convergetly present in *Phasmisus*, and the *P. macrommatus* - *P. veracruzanus* clade with a subsequent reversion in the *P. brevipennis* - *P. santaecrucis* clade and the *P. carenbothrus*-*P. sculpturatus* clade (ci = 25; ri = 76).
19. Humeral tooth (0) absent, (1) present. Synapomorphy for the *P. longiceps* - *P. wagneri* clade with a subsequent reversion in *P. azuayensis* (ci = 25; ri = 66).
20. Elytral discal depression (0) absent, (1) present. Slow optimization chosen. Convergetly present in *Endytocera*, *Phasmisus*, and the *P. longiceps* - *P. melanosus* clade with subsequent independent reversion in *P. breviantennis*, *P. microphthalmus*, and the *P. veracruzanus* - *P. sculpturatus* clade (ci = 20; ri = 66).
21. Projection in the elytral base between the sutural fovea and the basal discal fovea: (0) absent, (1) present. Convergetly present in the *P. chandleri* - *P. incarum* clade, the *P. azuayensis* - *P. iguazuensis* clade, *P. santaecrucis* and the *P. veracruzanus* - *P. carltoni* clade with a subsequent reversion in *P. sculpturatus* (ci = 20; ri = 60).

22. IX sternite depression: (0) absent (1) present. Fast optimization chosen. Synapomorphy for the *Arthropysis* - *P. sculpturatus* clade with subsequent reversal in *P. breviantennis* and the *P. macrommatus* – *P. incarum* clade (ci = 33; ri = 66).
23. Metasternum projection: (0) broad, (1) narrow. Fast optimization chosen. Synapomorphy for the *P. azuayensis* – *P. sculpturatus* clade with a subsequent reversion in *P. raffrayi* (ci = 50; ri = 91).
24. In lateral view, medial lobe curved up apically: (0) absent, (1) present. Convergently present in *P. parkensis* – *P. chandleri* clade, *P. microphthalmus*, and *P. mayarum* – *P. sculpturatus* clade. With a reversion in *P. incarum* and the *P. melanosus* – *P. acutispinosus* clade. Coded as inapplicable for the *P. breviantennis* – *P. longiceps* clade and the *P. azuayensis* – *P. santaecrucis* clade since these taxa present accessory lobes (ci = 25; ri = 57).
25. Base of the aedeagus: (0) irregular, (1) regular. Synapomorphy for the *P. longiceps* – *P. sculpturatus* clade, with an independent reversion in *P. raffrayi* and in the *P. iguazuensis* – *P. santaecrucis* clade (ci = 33; ri = 60).
26. Irregular base of the aedeagus: (0) covered, (1) naked. Slow optimization chosen. Synapomorphy for *P. iguazuensis* – *P. santaecrucis* clade. Convergently present in *P. breviantennis* and *P. raffrayi*. Coded as inapplicable for the *P. longiceps* – *P. azuayensis* clade, *P. agametopus* – *P. longissimus* clade, and *P. melanosus* – *P. sculpturatus* clade, since these taxa present a regular base of the aedeagus (ci = 100; ri = 100).
27. Arms in the regular base of the long medial lobe: (0) present, (1) absent. Synapomorphy for the *P. carenbothrus*– *P. acutispinosus* clade (ci = 100; ri = 100).
28. Accessory lobes: (0) absent, (1) present. Convergently present in *P. longiceps*, *P. incarum* and in the *P. azuayensis* – *P. santaecrucis* clade, with a subsequent reversion in the *P. melanosus* – *P. sculpturatus* clade and a re-acquisition in *P. carenbothrus* (ci = 20; ri = 50).
29. Accessory lobes position related to the medial lobe: (0) not surrounding, (1) surrounding. Synapomorphy for the *P. agametopus* – *P. longissimus* clade (ci = 100; ri = 100)

- 30.** Medial lobe shape: (0) complete (1) divided. Synapomorphy for the *P. breviatennis* – *P. sculpturatus* clade, with a reversion in *P. parkensis* – *P. incarum* clade, *P. azuayensis* – *P. raffrayi* clade, *P. carenbothrus*, and the *P. mayarum* – *P. wagneri* clade (ci = 20; ri = 55).
- 31.** Medial lobe length: (0) more than 5 times longer than wide, (1) at least 3 times longer than wide. Convergently present in *P. breviatennis*, and the *P. macrommatus* – *P. incarum* clade (ci = 50; ri = 80).
- 32.** Long medial lobe wider toward the apex: (0) absent, (1) present. Synapomorphy for the *P. carltoni* – *P. sculpturatus* clade. Coded as inapplicable for the *P. breviatennis* – *P. santaecrucis* clade, since these taxa present either a short medial lobe or the medial lobe is accompanied by accessory lobes (ci = 100; ri = 100).
- 33.** Long medial lobe projecting up: (0) absent, (1) present. Synapomorphy for the *P. carltoni* – *P. wagneri* clade. Coded as inapplicable for the *P. breviatennis* – *P. santaecrucis* clade, since these taxa present either a short medial lobe or the medial lobe is accompanied by accessory lobes (ci = 100; ri = 100).

Table 1. Character matrix for the cladistic analysis of the species of *Pselaphomorphus*, with selected outgroup taxa; all multistate characters are coded as additive; “-” represent inapplicable character states (see also text); “?” represents missing values that could not be observed due to lack of specimens.

Taxon/ Character	5	10	15	20	25	30	
<i>Circocerus batrisioides</i>	00-00	00-00	00000	00000	00000	--0-0	0--
<i>Arthophysis</i> sp.	10-00	-0-00	0--1-	00000	010--	-----	---
<i>Balega longiceps</i>	01001	00-00	0--1-	11000	010--	-----	---
<i>Endytocera</i> sp.	10-00	-0-00	0--0-	00001	010--	-----	---
<i>Sebaga notonoda</i>	01001	00-00	0--0-	11000	010--	-----	---
<i>Phasmisus</i> sp.	01001	00-00	10010	11101	01000	--000	0--
<i>Pselaphomorphus breviaantennis</i>	01101	10-00	10011	11010	000-0	0-0-1	1--
<i>Pselaphomorphus longiceps</i>	11101	10-00	10011	11011	010-1	--101	0--
<i>Pselaphomorphus macrommatus</i>	01101	10-01	10010	11111	00001	--0-1	1--
<i>Pselaphomorphus parkensis</i>	01101	10-01	10011	11111	00011	--0-1	1--
<i>Pselaphomorphus difficilis</i>	01101	10-01	10011	11111	00011	--0-0	1--
<i>Pselaphomorphus chandleri</i>	01101	10-01	10011	11111	10011	--0-0	1--
<i>Pselaphomorphus incarum</i>	01101	10-01	10011	11111	10001	-0100	1--
<i>Pselaphomorphus microphthalmus</i>	11111	10-01	10011	11110	01011	-00-1	0--
<i>Pselaphomorphus azuayensis</i>	11111	10-11	11011	11101	111-1	-0100	0--
<i>Pselaphomorphus raffrayi</i>	11111	10-11	11111	11111	110-0	0-100	0--
<i>Pselaphomorphus agametopus</i>	11121	11111	11111	11111	011-1	-0111	0--
<i>Pselaphomorphus longissimus</i>	11121	11111	11111	11111	011-1	-0111	0--
<i>Pselaphomorphus iguazuensis</i>	11111	11011	11010	11111	011-0	1-101	0--
<i>Pselaphomorphus brevipennis</i>	11111	11100	11?11	11011	0????	?????	???
<i>Pselaphomorphus santaecrucis</i>	11111	11100	10010	11011	111-0	1-101	0--
<i>Pselaphomorphus melanosus</i>	11111	11011	11110	11111	01101	-00-1	000
<i>Pselaphomorphus veracruzanus</i>	11111	11011	11110	11110	11101	-00-1	000
<i>Pselaphomorphus carenbothrus</i>	11111	11011	11110	11010	11101	-1100	000
<i>Pselaphomorphus acutispinosus</i>	11111	11011	11110	11010	11101	-10-1	000
<i>Pselaphomorphus mayarum</i>	11111	11011	11110	11010	11111	-00-0	001
<i>Pselaphomorphus wagneri</i>	11111	11011	11110	11010	11111	-00-0	001
<i>Pselaphomorphus carltoni</i>	11111	11011	11110	11010	11111	-00-1	011
<i>Pselaphomorphus sculpturatus</i>	11111	11011	11110	11000	01111	-00-1	011

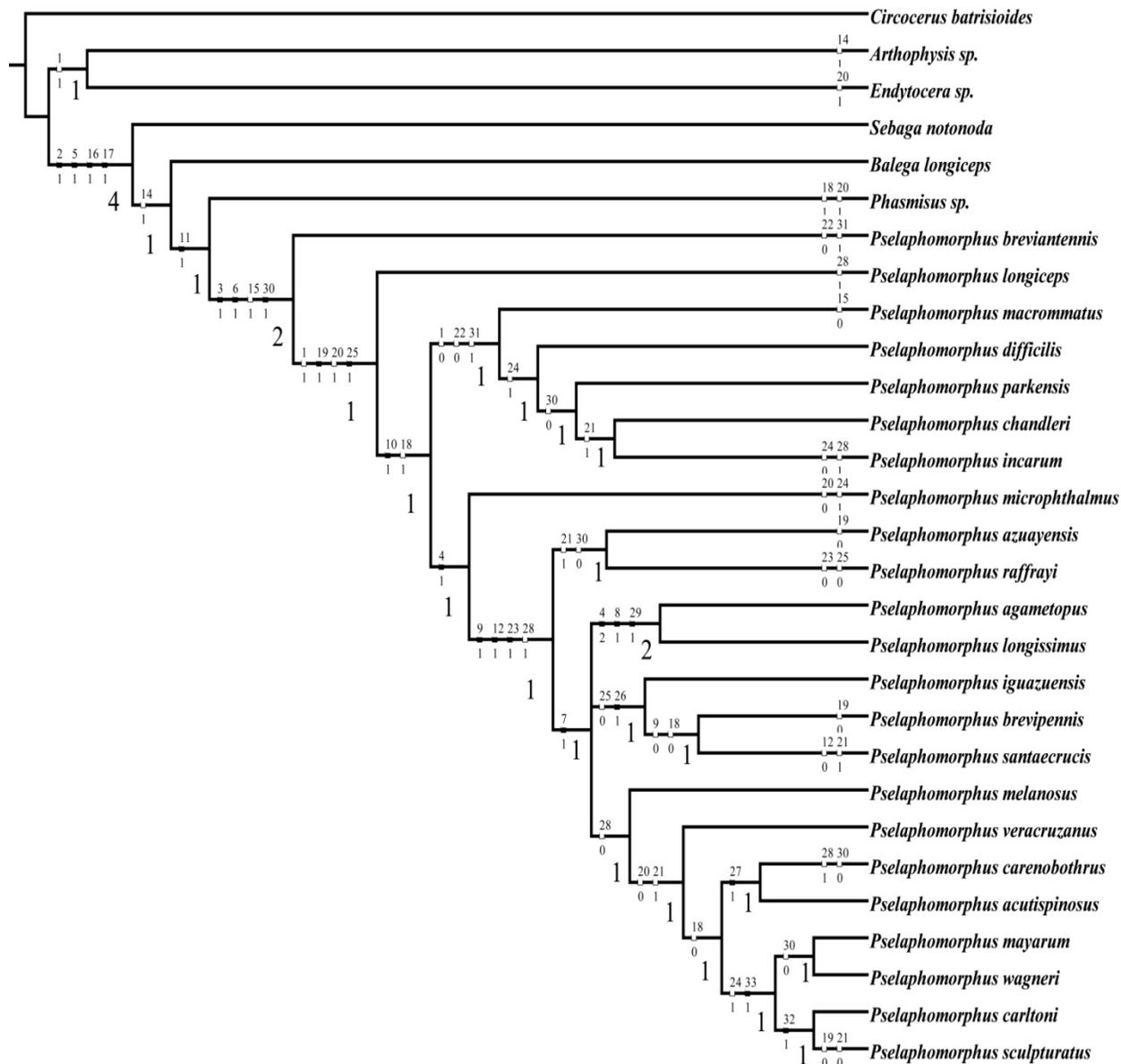


Figure 50. Phylogeny of the species of *Pselaphomorphus* and selected outgroup taxa, according to the strict consensus tree (L=76, CI=44, RI=79) of two equally parsimonious trees. Characters 1, 13, 22 and 23 are mapped under ACCTRAN optimizations, whereas characters 15, 20 and 26 are mapped under DELTRAN optimization (Agnarsson and Miller 2008). All other characters have unambiguous optimizations. Black rectangles represent single, non-homoplastic character states transformations, and white rectangles represent multiple, homoplastic character states transformations. The numbers above and below each rectangle correspond to character number and states, respectively; the numbers displayed at the left end of each branch represent Bremer support values.

5. Discussion

According to the strict consensus tree (Fig. 50), the monophyly of *Pselaphomorphus* is supported by the presence of an antennal tuberculum chordate at the base (char. 3), the presence of the vertexal sulcus shaped as complete, and not bifurcated (char. 6). Additional homoplasious traits that characterize the genus include the pronotal lateral lobes (char. 11), and the complete transversal sulcus of the pronotum (char. 14). This redefinition of *Pselaphomorphus* is more comprehensive than Motschulsky's (1855) and Raffray's (1893), since it includes mouth parts, foveal, and male genitalia characteristics. The relationship of *Pselaphomorphus* with other genera from the Jubini tribe, as *Sebaga*, *Balega* and *Phasmisus*, is supported by the presence of the antennal tuberculum (char. 2), the elytral sutural fovea (char. 16) and the elytral basal discal fovea (char. 17). From these three genera, *Phasmisus* appears as the most closest related to *Pselaphomorphus* since they share, in addition to the previously mentioned characters, the presence of pronotal lateral lobes.

Within the genus *Pselaphomorphus*, early diverged species suggested by the phylogenetic analysis is *P. breviantennis*. The relation between the antennomers 4, 5 and 6 strongly supports the position of the taxa as sister to *Phasmisus*; for this species, these three segments of the antennae are about the same size, versus a reduction of the 6th for the other species of the genus reported in this work. Besides this observation supported by the tree, *P. breviantennis* possess small antennomers, almost square, that are not often seen in the other species of the genus but so in some other Jubini (Park 1942, 1952). In the clade *P. longiceps*-*P. sculpturatus*, *P. longiceps* is the following species early diverged. It is a species with many unique features among other *Pselaphomorphus* species: the elytral foveae are rounded in shape, accompanied by conspicuous depressions; additionally it presents the characteristic pronotal spines, between the lateral lobes and the basal lobe, which at the same time is crossed by a vertical thin ridge. The pronotal spines are seemingly convergent, since it is also present in *P. raffrayi*. The phylogenetic analysis additionally reflects two main clades: the *P. makroommatus* – *P. incarum* clade and the *P. microphthalmus* – *P. sculpturatus* clade. The first of these groups is formed by species of small body size (less than 2.0 mm) (char. 1, state 0) with triangular head (char. 4, state 0); also the members of this clade bear antennae with conspicuous clava (char. 4), their coloration is for most of them pale, and related to the internal morphology, the male genitalia is short (less than 0.3 mm char. 31). From this clade, *P. difficilis* and *P. parkensis* are reported for Costa Rica, and *P.*

chandleri for Panama, which may explain the obvious similarities among these species. Beside to the geographic location, altitude seems to be playing an important role in the physical similarities found in the entire clade, since all of them were collected between 1050 and 1200 m, what would put the similarity of *P. makroomatus* (Ecuador) and *P. incarum* (Peru) as an example of independent evolution of the features shared by these species with their counterparts in Central America.

The second clade in the phylogenetic tree (*P. microphthalmus* – *P. sculpturatus*) is formed by specimens with a body size between the 2.1 and 3.1 mm; they may have a pear-shaped or elongated type of head. Inside this group of species, *P. microphthalmus* has the characteristic of the shape of its pronotal lateral lobes that end in an acute angle. It surely came apart given its third and fourth antennomers are similar in length. Additionally, it presents antennal clava (char. 7), feature that is shared with the *P. azuayensis* – *P. raffrayi* clade. These three species were collected between 2400 and 3650 m, another observation that may support the hypothesis of altitudinal speciation. The *P. agametopus* – *P. sculpturatus* clade is characterized by the absence of clava in the antennae, trait that is more obvious in *P. agametopus* and *P. longissimus*; this last group of species seems to be closely related, since they share several synapomorphies. For example, the genitalia of these two species are, in general, very different from the other species of *Pselaphomorphus* reported in this work: they bear two lobes working as a unique medial lobe, articulated to the base of the aedeagus. Along with the last mentioned clade, the *P. melanosus* – *P. sculpturatus* clade and *P. iguazuensis* – *P. santaecrucis* clade form a polytomy. A possible explanation for this result is the amount of convergent characters in the *P. melanosus* – *P. sculpturatus* group, which shares some characters with taxa that are represented basally in the phylogenetic tree: as the pronotal disc shape (char. 15) and the presence of accessory lobes (char. 28). The *Pselaphomorphus* species in this clade are more widely distributed than those of other clades in the analysis. They are present from northern Peru through Ecuador and then again in Panama, through Costa Rica, Honduras, Belize until Mexico; they all were collected below the 2300 m.a.s.l. Overall external appearance is very similar among them, and the inner clades are supported by male genitalia characteristics (chars. 27, 30, 32 and 33).

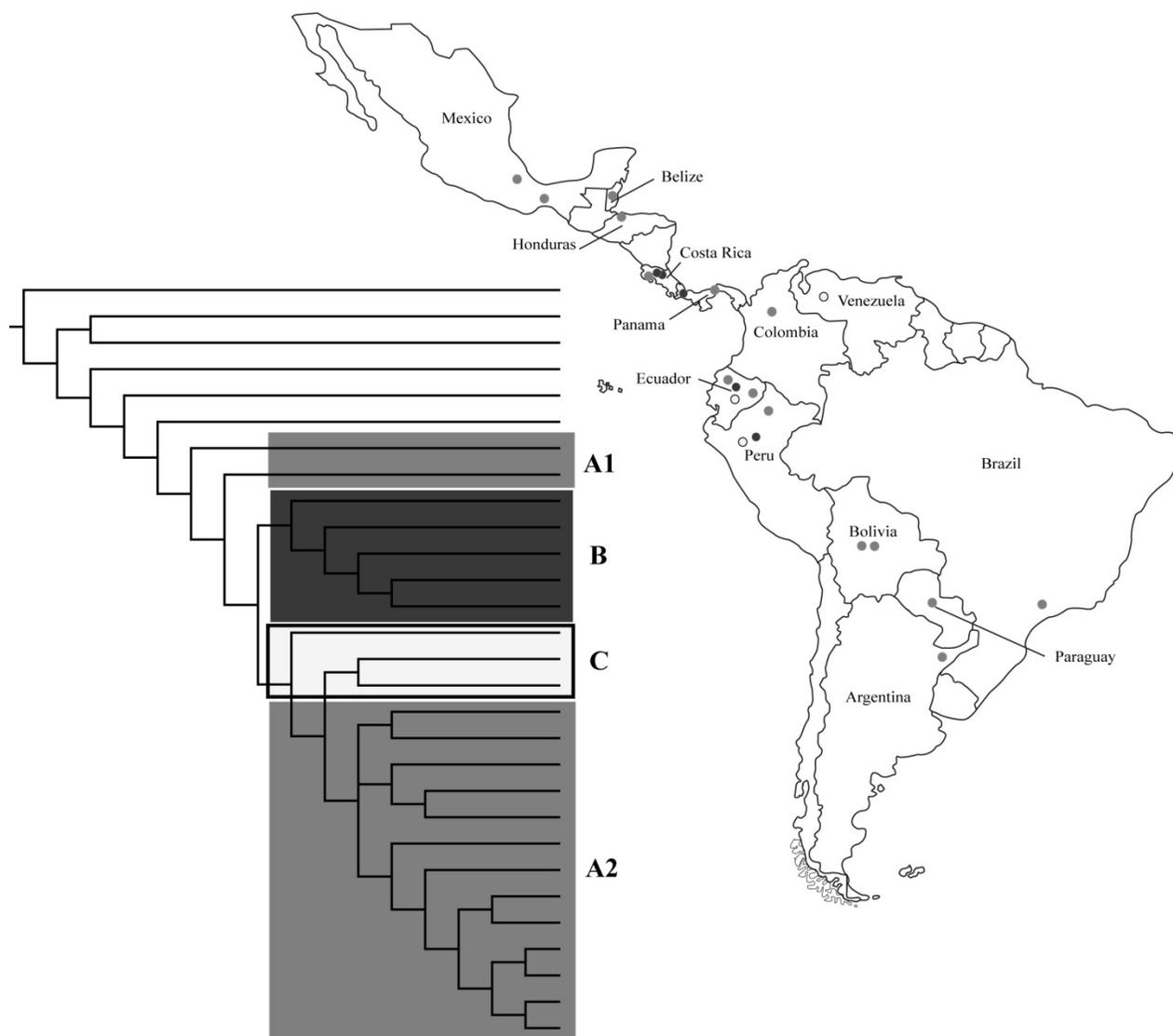


Figure 51. Distribution of *Pselaphomorphus* species in Central and South America. A1, B, C, and A2 correspond to the species distributed in each of the three altitudinal ranges: A: 40 to 900 m.a.s.l.; B: 1050 to 1200 m.a.s.l.; and C: 2400 to 3650 m.a.s.l. Each one of the species of *Pselaphomorphus* is represented by a dot in the map showing their geographical distribution. The shade of the dot correspond to the altitudinal ranges presented in the cladogram.

On the other side, *P. iguazuensis* – *P. santaecrucis* aggrupation is sustained by the presence of the irregular base of the aedeagus (char. 25), and an extra sclerite covering the same (char. 26).

The clade formed by *P. brevipennis* and *P. santaecrucis* is sustained by the likeness between antennomers 3 and 4, and the secondary loss of humeral elevations.

About the distributional patterns and altitudinal speciation of *Pselaphomorphus* species (Fig. 51), three different altitudinal ranges seem to correspond with the species groups formed in the phylogenetic tree. First, there is a wide altitudinal range from 40 to 900 m.a.s.l. (Fig. 51: A1 and A2), where most of the species of the genus are distributed. Second, the altitudinal ranges from 1050 to 1200 m.a.s.l. (Fig. 51: B), where most of the species of less than 2.0 mm in body size are distributed. Third, the higher altitudinal range from 2400 to 3650 m.a.s.l. (Fig. 51: C) where *P. azuayensis* – *P. raffrayi* clade are distributed, along with *P. microphthalmus*.

According to these findings about the species distribution, it is possible that the altitudinal ranges along Central and South America, framed many of the morphological characteristics found in each clade, as the result of different events of independent evolution. However, many of the consequential conclusions can be an artifact of the rarely collection of these beetles. They seem to be present in restricted areas, since only a couple of species groups are sympatric, but again, it just can be that the collecting effort was higher in those places versus other places where the genus is also present. According to Hodkinson (2005), there is not a established pattern that explains how morphological features work for the terrestrial insects. In some cases they are small in body size while are distributed higher, or body size increase with altitude.

Related to this subject, no further conclusion can be made with the information gathered in the present work. Only when more information about the biology, ecology and natural history of these beetles is available, deeper observations are going to be the starting point for mayor conclusions.

Conclusions and expectations

The number of *Pselaphomorphus* species was increased to 24 species with the addition of 19 new species to the five previously described ones. The genus is distributed from Mexico to northern Argentina, from 20 to 3650 m.a.s.l. There is a correspondence between the altitudinal ranges and the clades that resulted in the phylogenetic analysis. This may be reflecting convergent evolution.

According to the phylonetic analysis, *Pselaphomorphus* is a monophyletic group and more closed related to *Phasmsisus* than to other genera from the Jubini tribe. This result opens the doors for revisions for the other genera in this tribe.

Pselaphomorphus species distribution suggest their potential use in biogeographical studies; however, many hypothesis remain to be tested in relation to the ecology and natural history of this group of Neotropical Pselaphines.

6. Cited literature

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