



The first Carventinae species in Miocene Dominican Amber (Hemiptera: Heteroptera: Aradidae)

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Abstract

The flat bug family Aradidae is represented to date in Dominican Amber only by two species: *Calisiopsis brodzinskyorum* Froeschner, 1992 and *Mezira scheveni* Heiss, 2000 belonging to the subfamilies Calisiinae and Mezirinae respectively. Now two fossil species sharing the characters of the extant genera *Nesoproxius* Usinger & Matsuda, 1959 (*N. latocanus* **n.sp.**) and *Carventus* Stål, 1865 (*C. bechlyi* **n.sp.**), and one tentatively assigned to *Acaricoris* Harris & Drake, 1944 (*A. robertae* **n.sp.**), are described and illustrated below. Another specimen cannot be placed into an extant genus, and *Proneoproxius* **n.gen.** is proposed to accommodate *P. cornutus* **n.sp.**

Key words: Hemiptera, Heteroptera, Aradidae, Carventinae, Miocene, Dominican Amber, new genus, new species

Introduction

The rich deposits of Miocene Dominican Amber contain a wealth of plant and animal inclusions (Poinar & Poinar, 1999) of which the insect fauna in particular demonstrates a high level of diversity and endemism (Arillo & Ortuño 2005).

Only two species of flat bugs or Aradidae belonging to the extant genera *Calisiopsis* (*C. brodzinskyorum* Froeschner, 1992) and *Mezira* (*M. scheveni* Heiss, 2000) have been recorded from this deposit. Recently examined material contains a new genus and 4 new species, which are described and illustrated below.

Comparison with extant taxa can be very difficult, since impurities or the sombre color of the amber can obscure essential structures. Therefore the assignment of single specimens to an extant genus is in some cases tentative unless further material allows a more detailed examination and comparison.

Material and methods

The Amber inclusions in this study are deposited in the collection of the second author, George O. Poinar Jr., Oregon State University, Corvallis, USA (CGPC) and the Staatliches Museum für Naturkunde, Stuttgart, Germany (G.Bechly, SMSG).

Photos were taken with a reflex camera and a digital camera Nikon Coolpix P 300.

Measurements were taken with a micrometer eyepiece, 40 units = one mm.

Abbreviations used: delgt = dorsal external laterotergite (connexivum), mtg = mediotergite, ptg = paratergite.

Subfamily Carventinae Usinger & Matsuda, 1959

Genus *Neoproxius* (Usinger & Matsuda, 1959)

Neoproxius was described as a subgenus of *Proxius* Stål, 1873 and later given generic rank by Kormilev & Froeschner, 1987. To date it comprises 13 species, all but one (*schwarzii* Heidemann, 1904) of Neotropical distribution. A key for 11 species was given by Kormilev, 1982 who also described 9 of the 13 taxa. Important characters for the separation of species are primarily the presence of a deep intraocular longitudinal groove to accommodate the antennae at rest, the position of the abdominal spiracles, and the conspicuous elevated dorsal structures on the pronotum and scutellum.

Based on these characters, the following amber inclusion described below represents a new species.

***Neoproxius latocanus* n. sp. Heiss & Poinar**

(Photo 1,2,11, Fig.1)

Holotype: Macropterous female in a brownish transparent oval piece of Dominican amber (30x13x10 mm); dorsal and ventral sides are visible, legs and antennae are complete, an air bubble is present on the anterior part of the membrane. This specimen is designated as holotype and deposited in the collection of G.O.Poinar (CGPC) no. HE-4-14H.

Diagnosis. *N.latocanus* n. sp. belongs to the group of species without intraocular grooves. Only *N. gypsatus* Bergroth, 1898 shares the lateral position of spiracles III–VIII with spiracle II in lateral and VIII in dorsolateral position while these are sublateral on II and lateral on VIII in *latocanus* n.sp. In addition, the elevated structures of the pronotum and scutellum are completely different from all described extant species.

Description. Head. Wider than long (21/18); genae flat and anteriorly expanded surpassing elevated clypeus, leaving a small cleft at middle; antenniferous lobes slightly diverging anteriorly, apex rounded, reaching ½ of antennal segment I; antennae slender, 1.24x as long as width of head (26/21), segment I thickest, constricted at base, II shortest, III longest and thinnest, IV fusiform with pilose apex; length of antennal segments I/II/III/IV = 7/5/8/6; eyes oval, inserted in head; vertex with a posteriorly widening elevated ridge and 2 (1+1) lateral ovate depressions; postocular lobes triangularly projecting laterally, apices rounded then strongly converging posteriorly to constricted collar. Rostrum arising from a slit-like opening shorter than head, rostral groove distinct but shallow.

Pronotum. Wider than long (36/24), lateral margins bi-sinuate, anterolateral angles blunt and rounded then converging straight to concave anterior margin; anterior disk with cross-shaped median ridge flanked by 4 (2+2) ovate smooth depressions, these delimited laterally by incrustations running along lower lateral margins; posterior disk with a transverse carina followed by a median ovate smooth depression, posterior margin convex and incised at base of scutellum, laterally projecting posteriorly, humeri elevated and incrustate.

Scutellum. Triangular, wider than long (21/13); median elevation, basal and lateral margins incrustate and carinate, the latter not reaching depressed, narrowly rounded apex; disk smooth and depressed laterally of median carina.

Hemelytra. Corium short, carinate anterolaterally; membrane fully developed with transverse rugosities reaching of tergite VII.

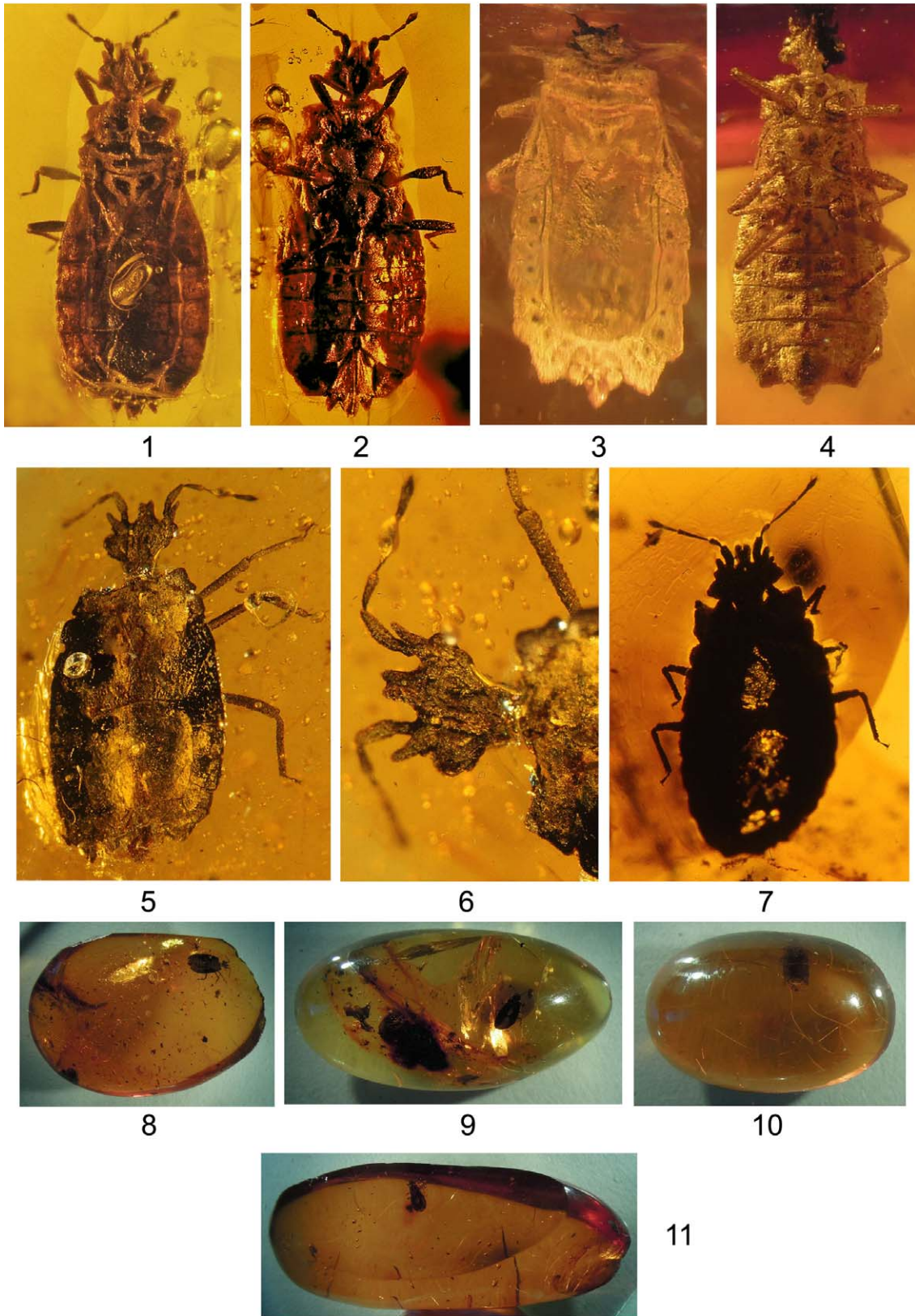
Abdomen. Lateral margins evenly rounded; triangular deltg II+III fused, posterolateral angles of deltg VII truncate, its posterior margin straight; ptg VIII triangular shorter than tricuspidate tergites IX+X; spirales II sublateral, III–VIII lateral, all visible from above; tergal plate longitudinally elevated at middle.

Venter. Prosternum with I-shaped elevation, meso- and metasternum flat with longitudinal smooth depression medially; sternites II–VII separated by transverse sutures, sternite VII deeply concave posteriorly.

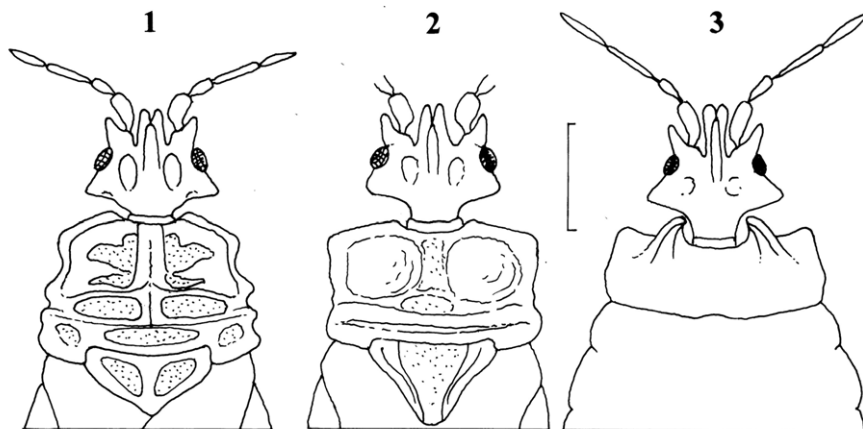
Legs. Femora slightly incrassate, tapering toward base, trochanters fused but distinct; tibiae cylindrical, slightly curved, tarsi bi-segmented, claws with thin pulvilli.

Measurements. Length 2.9mm, width of abdomen across tergite IV = 1.25mm.

Etymology. Named after La Toca in Dominican Republic, the locality of origin of this and many other Amber inclusions.



PHOTOS 1–11 Dominican Amber Carventinae. 1—*Neoproxius latocanus* **n.sp.** holotype female, dorsal view; 2—ditto, ventral view; 3—*Carventus bechlyi* **n.sp.** holotype male, dorsal view; 4—ditto, ventral view; 5—*Acaricoris robertae* **n.sp.** holotype male, dorsal view; 6—ditto, head and pronotum; 7—*Proneoproxius cornutus* **n.gen., n.sp.** holotype, dorsal view; 8—Inclusion of *Acaricoris robertae* **n.sp.**; 9—Inclusion of *Proneoproxius cornutus* **n.gen., n.sp.**; 10—Inclusion of *Carventus bechlyi* **n.sp.**; 11—Inclusion of *Neocarventus latocanus* **n.sp.**



FIGURES 1–3 Reconstruction of head and pronotum. 1—*Neoproxius latocanus* n.sp.; 2—*Carventus bechlyi* n.sp.; 3—*Proneoproxius cornutus* n.gen., n.sp.

Discussion. Although the aradid fauna of the Caribbean Islands is rather rich and diverse and partly well documented, to date no member of *Neoproxius* is known from that region. *N. latocanus* n.sp. represents therefore the first record of this genus in the Caribbean, as all extant taxa were described from mainland countries.

Genus *Carventus* Stål, 1865

The numerous members of the genus *Carventus* are predominantly of Oriental and Australian distribution. Only two species are known to date from the New World: *Carventus mexicanus* Bergroth, 1895 from Mexico, Panama, and Colombia, and *Carventus chilensis* Kormilev, 1981 from Chile.

Carventus bechlyi n. sp. Heiss

(Photo 3,4,10, Fig.2)

Holotype: Macropterous male in a brownish transparent piece of cabochon shaped Dominican amber (15x9x5mm); view of dorsal surface is partly obscured by the round surface of the stone, the head at middle by a piece of detritus, the ventral side is clearly visible; antennal segments II–IV cut and lacking on both sides. This specimen is designated as holotype and deposited in the collection of the Staatliches Museum für Naturkunde, Stuttgart, Germany (SMSG) no. Do-4940-H.

Diagnosis. This fossil species resembles the extant *C. mexicanus* and shares the ventral position of spiracles II–IV ventral and V–VIII lateral, which are visible from above. However, it is distinguished by a smaller size (3.6–4.45mm) and by the different structure of the pronotum with lateral and anterolateral margins not strongly concave and with reduced anterolateral lobes.

Description. Head. Wider across postocular lobes than long (26/24); genae flattened, contiguous and enlarged anteriorly, longer than clypeus but shorter than antennal segment I; antenniferous lobes with blunt apices; antennal segment I club-shaped, the following ones missing; eyes oval inserted in head; postocular lobes triangularly produced laterally, their posterior margin converging straight toward constricted collar; rostrum arising from a slit-like opening, shorter than head, rostral groove flat but distinct.

Pronotum. Twice as wide as long (40/20), lateral margins slightly concave at middle, anterolateral angles nearly rectangular, anterolateral margins converging to concave anterior margin; anterior lobe of disk with large sublateral incrustate elevations depressed at middle with a lower transverse ridge posteriorly; posterior lobe of disk separated from anterior one by a transverse depression followed by a raised transverse carina connecting the elevated humeri; posterior margin incised and convex at base of scutellum.

Scutellum. Triangular, twice as long as wide (25/12), lateral margins sinuate, apex narrowly rounded, surface with 2 (1+1) sublateral curved incrustations with a triangular depression between them.

Hemelytra. Corium shorter than scutellum, its anterolateral margins expanded and carinate; membrane fully developed covering of tergite VII, surface with distinct longitudinal veins anteriorly, irregularly wrinkled elsewhere.

Abdomen. Lateral margins with slightly produced posterolateral angles on deltg III–V, these angularly produced on deltg VI and VII; deltg II+III fused to a triangular sclerite, its surface with a longitudinal ridge; deltg III–VII separated by distinct sutures; tergal plate consisting of mtg III–VI laterally delimited from deltg II–VII by a longitudinal carina.

Venter. Prosternum flat with 2 (1+1) ovate smooth depressions anterolaterally; meso- and metasternum flat at middle, separated from each other and from prosternum and fused sternites II+III by a transverse suture; sternites III–VII with 2:2:1 pattern of apodemal impressions (glabrous spots sensu Usinger & Matsuda, 1959); spiracles II–IV ventral, V–VIII lateral and visible from above.

Legs. Femora thickened at middle tapering toward base and apex, fused to trochanters but fusion line distinct; tibiae cylindrical, slightly curved basally, tarsi bi-segmented, claws with large pulvilli.

Measurements. Length 3.6 mm; width of abdomen across tergite IV 1.4mm, across tergite V 1.42mm, across tergite VI 1.35mm.

Etymology. It is a pleasure to dedicate this species to Dr. Günter Bechly, scientific researcher and head of the Amber section in the Department of Palaeontology at the Staatliches Museum für Naturkunde in Stuttgart, Germany, who made available this and other Dominican Amber aradid inclusions for study.

***Acaricoris robertae* n. sp. Heiss & Poinar**

(Photo 5, 6, 8)

Holotype: Male apterous specimen in an oval piece of yellowish-brownish amber from the Dominican Republic (23x15x6mm); dorsal and ventral side plainly visible, legs and antennae are complete. It is designated as holotype and deposited in the collection of G.O.Poinar (CGPC) no. HE-4-64.

Diagnosis. Small apterous taxon that seems closest to *Acaricoris haitiensis* Kormilev, 1968 from Haiti, the western part of the same island (Hispaniola) and of which only the single holotype is known. The new species is distinguished from the latter species by longer and thinner antenniferous lobes and different outlines of the pro-, meso-, and metanotum.

Description. Holotype male, apterous, of blackish coloration, surface finely granular and partly covered by a thin ochraceous incrustation obscuring body structures.

Head. Wider than long (35/32); clypeus ridge-like, elevated with a dorsal preapical tubercle; genae flattened, longer than clypeus, apex rounded leaving a cleft at middle; antenniferous lobes long and slender, diverging anteriorly, apices blunt; antennae 1.43x as long as width of head (50/35), segment I longest and thickest, II shortest and thinner tapering toward base, III second longest but thinner and with a distinct basal pedicel, IV fusiform with pilose apex; length of antennal segments I/II/III/IV = 15/10/14/11; eyes globose protruding; vertex medially raised and carinate, flanked by 2(1+1) ovate depressions laterally; postocular lobes not reaching outer margin of eyes and separated by a notch, then strongly converging posteriorly to a constricted collar, the latter with ill-defined transverse carina; rostrum arising from a slit-like opening, shorter than head, rostral groove wide with carinate lateral borders.

Thorax. Pronotum. Subrectangular, nearly 4x as wide as long at middle (58/15), lateral margins slightly concave, converging anteriorly, anterolateral angles rounded, anterior margin nearly straight; posterior margin sinuate at middle for the reception of a triangular lobe protruding from pronotum across meso- and metanotum and fused mtg I+II this widening posteriorly; this lobe is not clearly separated laterally from thoracic plates and moderately elevated at midline.

Mesonotum. Wider than pronotum, lateral lobes roundish, expanded and raised, a transverse suture on both sides of median lobe separates it from metanotum.

Metanotum. Fused to mtg I+II, anterolateral margins wider than mesonotum converging anteriorly, posterolateral margin delimited by posteriorly converging suture separating fused deltg II+III; lateral lobes of disk raised, their surface granulate.

Abdomen. Tergal plate raised along midline, highest on mtg IV; lateral margins subparallel on deltg II+III, then posteriorly converging, deltg VII triangularly produced; deltg III–VII separated by distinct sutures; pygophore pyriform constricted posteriorly, ptg VIII small and rounded shorter than pygophore.

Venter. Pro-, meso-, and metasternum fused to each other and posteriorly to sternites II+III; sternites III–VII separated by transverse sutures; spiracles II+III seemingly ventral, IV–VIII lateral and visible from above.

Legs. Long and slender, femora cylindrical fused to trochanters, tibiae straight, tarsi bisegmented, claws with pulvilli.

Measurements. Length 3.95mm; width of abdomen across metanotum 1.87mm, across tergite III 1.8mm, across tergite V 1.77mm.

Etymology. It is a particular pleasure to dedicate this new species to Mrs. Roberta Poinar recognizing her strong scientific interest in biological inclusions in Amber and her publications in this field. She also first illustrated this specimen in the wonderful book “The Amber Forest” (p.65 and photo 82) (Poinar & Poinar, 1999).

Discussion. This new species shares all characters indicated in the key to genera of American Carventinae by Usinger & Matsuda, 1959: 103–104 (e.g., rostral atrium closed, eyes not stalked, postocular lobes without a projecting tubercle, male sternite VII without a glabrous pair of tubercles) leading to *Acaricoris* Harris & Drake, 1944 and separating this genus from the similar genera *Eretmocoris*, *Aglaocoris*, *Rhysocoris*, and *Kolpodaptera*.

However, as three of the seven species assigned to date to *Acaricoris* (Kormilev & Froeschner, 1987; Heiss 2008) were described from single specimens, mostly without illustrations and sometimes with contradictory descriptions, it is difficult to recognize these taxa. This genus needs a revision based on type material.

Therefore whereas *A. robertae* n.sp. is at present tentatively assigned to *Acaricoris*, it may represent another genus.

***Proneoproxius* n. gen. Heiss & Poinar**

Type species: *Proneoproxius cornutus* n.sp.

Diagnosis. Although the head structure corresponds to that of *Neoproxius* species, which lack intraocular grooves for the reception of antennae at rest (including the new species described above), it differs by the apterous condition (all extant *Neoproxius* taxa are macropterous) and the peculiar structure of the pronotum and other thoracic sclerites.

Description. Apterous, small, about 3mm, coloration black with silvery shining patches of incrustation at middle of meso- and metanotum and tergal plate.

Head. Wider than long, genae lobulately produced and far surpassing apex of clypeus nearly reaching apex of antennal segment I; antenniferous lobes finger-like; antennae about 1.4x as long as width of head, segment I thickest, II shortest, III thinnest and longest, IV fusiform.

Thorax. Pronotum. Distinctly wider than long, lateral margins subparallel, disk on anterior lobe with 2 (1+1) elevated anteriorly converging and produced ridges.

Meso- and Metanotum slightly wider than pronotum, their lateral margins rounded and apparently fused to each other and to mtg I+II, depressed at middle.

Abdomen. Of ovate outline, apex and right posterior part of abdomen up to deltg V missing; lateral margins of deltg III–VI raised; tergal plate depressed with a feeble longitudinal elevation at middle.

Legs. Long and slender, unarmed; claws with pulvilli.

Etymology. From <pro> (Latin) = before and *Neoproxius* the closest related genus.

Discussion. As the terminal segments are partly cut off, the sex of the specimen cannot be determined. Although detailed body structures such as the fusion lines of the thorax and abdomen and the position of the spiracles are not clearly discernible because of impurities in the amber piece and the black coloration of the specimen, the visible structures differ from all extant *Neocoris* and a new genus is proposed to accommodate this fossil taxon.

Holotype: Specimen of unknown sex in a cabochon-shaped yellowish-brown piece of Dominican Amber (22x11.5x6mm) together with some syninclusions of detritus. It is designated as holotype and deposited in the collection of G.O.Poinar (CGPC) no. HE-4-14F.

Description. Head. Wider than long (27/21), clypeus thin, enclosed by anteriorly produced and dilated genae leaving a cleft at apex, these nearly reaching apex of antennal segment I; antenniferous lobes finger-like reaching of antennal segment I, antennae 1.37x as long as width of head (37/27), segment I thickest and slightly bent outward at base, II smallest and club shaped, III thinnest and longest tapering toward base, IV elongate fusiform with pilose apex; length of antennal segments I/II/III/IV = 9/5/12/11; eyes small, inserted in head (right eye displaced); postocular lobes triangularly produced and dilated laterally, posterior margin sinuate, converging to the constricted collar.

Thorax. Pronotum. Subrectangular, distinctly wider than long (40/14); lateral margins subparallel anteriorly, slightly convex on posterior half, anterolateral angles rounded, anterolateral margins straight; disk medially depressed, lateral lobes raised, anterior lobe with 2 (1+1) elevated ridges, these produced and converging anteriorly nearly reaching postocular lobes, their apices rounded.

Meso- and metanotum. Lateral margins raised and rounded, disks deeply depressed at middle, this depression apparently triangularly widening and posteriorly extending over fused mtg I+II to meet the depressed tergal plate; no surface structure is discernible.

Abdomen. Tergal plate depressed with a shallow longitudinal elevation medially; deltg II+III seem to be fused, deltg III–VII separated by sutures, their surface elevated above tergal plate with deep apodemal impressions and a longitudinal carina along inner margin. Structures of ventral side not discernible, only lateral position of spiracle VI can be recognized.

Legs. Slender, femora only slightly incrassate at middle, fused to trochanters; tibiae straight, tarsi two-segmented, claws with thin pulvilli.

Measurements. Length (of damaged specimen) 3.0mm; width of mesonotum 1.1mm, of metanotum 1.2mm, across tergite IV 1.3mm.

Etymology. Referring to the conspicuous projections of pronotum, <cornutus> (Latin) = bearing horns.

Acknowledgments

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