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Two new species of pseudoscorpions (Arachnida: Pseudoscorpiones) from a Mexican oak forest near Pico de Orizaba National Park

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Abstract. A faunistic inventory from an oak forest near Pico de Orizaba National Park revealed the presence of two new species of pseudoscorpions. *Atherochernes breviductus* sp. nov. of the family Chernetidae is represented by 286 mature specimens, and is the first record of this genus for the country; *Serianus orizabensis* sp. nov. of the family Garypinidae is represented by 44 adults and is the first record of the family for the State of Veracruz. Most individuals were collected by sifting leaf litter and processing with Berlese funnels. The new taxa are hereby described and documented with illustrations and high-quality microphotography. The relationships of *Atherochernes* Beier, 1954 with other chernetids was investigated with a molecular phylogeny. In addition, the species *Mexichelifer reddelli* Muchmore, 1973 and *Mundochthonius mexicanus* Muchmore, 1973 are recorded for the first time in the state of Veracruz.

Keywords: Chernetidae, Garypinidae, Neotropics, taxonomy.

ZooBank publication: http://zoobank.org/References/FD4009AD-2BA5-4A5F-B0EC-67A3600AEF28

The order Pseudoscorpiones is the fourth most diverse group of arachnids, comprising 26 extant families, 454 genera and more than 3,533 species (Coddington et al. 2004; Harvey 2013a). In Mexico, the pseudoscorpion fauna consists of 18 families, 66 genera and 169 species (Harvey 2013b; Harvey & Muchmore 2013; Villegas-Guzmán 2015), which represent less than 5% of the known species worldwide, indicating a paucity of studies of these arachnids for Mexico. For the state of Veracruz, the pseudoscorpion fauna consists of six families, 13 genera and 20 species (Ceballos 2004).

The new species described herein belong to the families Chernetidae and Garypinidae. Chernetidae are the most diverse family of the order with over 650 species included in more than 110 genera. Three subfamilies have been recognized, but their taxonomic ranks and interrelationships require a phylogenetic delimitation (Harvey 2013b). In Mexico, Chernetidae are represented by 23 genera and 53 species of which 12 are recorded from the state of Veracruz (Ceballos 2004; Harvey 2013b).

Garypinidae was considered a subfamily of Olpiidae by Chamberlin (1930) and all subsequent workers until Judson (2005) elevated the group to family rank. Garypinidae currently contains about 80 species and 21 genera, and the genus *Serianus* Chamberlin, 1930, is represented by 20 species distributed worldwide (Harvey 2013b; Mahnert 2014). In Mexico, the family is represented by two genera and six species (Harvey 2013b).

The present contribution describes and illustrates *Atherochernes breviductus* sp. nov. and *Serianus orizabensis* sp. nov. These two species were collected during an arachnid inventory in an oak forest in the vicinities of the Pico de Orizaba National Park, Veracruz, Mexico (Rivera-Quiroz & Alvarez-Padilla 2015). Additionally, *Mexichelifer reddelli* Muchmore, 1973 and *Mundochthonius mexicanus* Muchmore, 1973 are recorded from Veracruz for the first time. All these records raise to 171 the number of described species from Mexico and to 23 for Veracruz.

METHODS

Taxonomic sampling and identification.—All specimens were collected as part of an arachnid inventory in an oak forest near Pico de Orizaba National Park. Three expeditions over the course of one year (May 2012, October 2012 and February 2013) were conducted. Using the Coddington et al. (1991) collecting protocol, two plots of one hectare were sampled. The central coordinates and elevation were: Plot I 19°08′30.2″N, 97°12′21.5″W at 2,238 m., and Plot II 19°08′17.4″N, 97°12′16.2″W at 2,300 m. All specimens were preserved in 96% ethanol and processed in the Laboratorio de Aracnología of the Facultad de Ciencias, Universidad Nacional Autónoma de México (UNAM). The type material is deposited in the Colección Nacional de Arácnidos (CNAN) at the Instituto de Biología (IBUNAM). Additional congeneric specimens of *Serianus orizabensis* sp. nov. were examined in the California Academy of Sciences, California, USA (CAS).

The specimens were studied with temporary and permanent slide mounts of the left pedipalp, chelicera, first and forth legs, as well as the whole specimen. The temporary slides mounts were prepared by immersion of specimens in 10% potassium hydroxide (10% KOH) at room temperature for one or two days and mounted on microscope slides with clove oil following the protocol outlined by Coddington (1983). Permanent slide mounts were prepared following the protocol of Wirth & Marston (1968) and Kim et al. (1986) as follows: an incision was made to the abdomen of the specimen and the specimen was then left in 10% potassium hydroxide for one or two days for clearing. Then, the specimens were rinsed with distilled water for 30 minutes, and dehydrated through a graded ethanol series of 40, 70 and 96% for 30 minutes each. Finally, each specimen was transferred to lactophenol for 15–20 minutes and mounted with Canada balsam. External anatomy was observed using a Nikon SMZ1000 stereomicroscope and slide mounts with

a Nikon E200 microscope. Drawings were done with the drawing tube Nikon Y-IDT. All photographs were taken with a Nikon DS-Fi2 camera, captured using Nikon software NIS Elements 4.0 and montages done with Helicon Focus version 5.3.14. Scanning Electron Microscope images were taken in the Laboratorio de Microscopía Electrónica de Barrido of the Facultad de Ciencias, UNAM with a JEOL JSM-5310LV scanning equipment using standard protocols. All the illustrations and photographs are available at the Alvarez-Padilla Laboratory (2016) website (www.unamfcaracnolab.com).

Terminology and measurements follow Chamberlin (1931), except for the pedipalps and legs (Harvey 1992) and the term "rallum" is used instead flagellum (Judson 2007). Measurements were taken at the highest possible magnification using an ocular graticule. All measurements are given in mm, the ratio length/width (L/W) is abbreviated and given within parenthesis.

Molecular methods.—Complete preserved specimens were used for the extraction of DNA with the Qiagen DNeasy Blood & Tissue Kit (Qiagen, Valencia, CA, USA). Purified DNA was used to amplify a fragment of the mitochondrial protein-encoding gene cytochrome *c* oxidase subunit I (COI). This marker has been used in previous studies to investigate deep and shallow relationships among lineages of pseudoscorpions (e.g., Zeh et al. 2003; Moulds et al. 2007; Murienne et al. 2008; Cosgrove et al. 2016; Ohira et al. 2018). The genomic DNA was extracted incubating the whole animal in lysis buffer overnight. Purified DNA was used as template for polymerase chain reaction (PCR) amplification, using the primers VF1d (5′-TTCTCAACCAACCACAARGAYA TYGG-3′) and VR1d (5′-TAGACTTCTGGGTGGC-CRAARAAYCA-3′) (Ivanova et al. 2006). Each 15 µL PCR reaction contained 2 µL template DNA (concentration not measured); 0.25 µL of a 10 µM stock solution of each primer; 3µL of 5X My taq ™ Reaction Buffer (Bioline, Life Science, Memphis, USA) that includes 5 mM dNTPs and 15 mM $MgCl_2$; 0.12 µL (approximately 0.6 units) of My Taq ™ DNA polymerase (Bioline, Life Science, Memphis, USA) and 9.38 µL of water.

PCR amplification protocol comprised an initial denaturation step (5 min at 94°C) followed by 34 cycles including denaturation at 94°C for 40 s, annealing (44 s at 48°C) for 30 s, and extension at 72°C for 1 min, with a final extension step at 72°C for 7 min. The PCR products were verified by agarose gel electrophoresis (1.5% agarose). These products were sequenced with the same primer pairs used for amplification at the Laboratorio de Secuenciación Genómica de la Biodiversidad y de la Salud of the IBUNAM. The sequences were edited using Geneious version 7.1 (Kearse et al. 2012).

Phylogenetic analyses.—Sequences belonging to 16 exemplars of the family Chernetidae (JN018176, ACF08427, ACF08423, AY332244, EU559524, EU559522, EU559381, AEL96884, ACF08426, ACF08422, AAD09560, ACF08474, ACL00507, AAD09559, ACF08453, EU559499), were retrieved from GenBank. To test the position of *Atherochernes breviductus* sp. nov. within the family Chernetidae, two exemplars (GenBank numbers MH605522 and MH605523) were included. Although the phylogenetic relationships among families of pseudoscorpions are still in debate, we selected exemplars of *Caecatemnus* sp. of the family Atemnidae (EU559534), *Nannochelifer* sp. of the family Cheliferidae (EU559532) and *Withius* sp. (EU559572) of the family Withiidae, as these families have been retrieved as sister to the family Chernetidae (Murienne et al. 2008) and are all members of the superfamily Cheliferoidea (Harvey 1992). All these sequences were aligned with MAFFT online server version 7 (online at http://mafft.cbrc.jp/alignment/software/) using auto settings. The sections of the alignments with poor coverage among species were removed with Gblocks version 0.91 (Castresana 2000). Two sets of analyses were then performed, the alignments with the sections of poor coverage removed and complete alignments. Both data sets were analyzed with RaxML GUI version 1.5 (Michalak 2012) using the GTR-GAMMA model and 500 replicates of rapid bootstrap (Stamatakis et al. 2008), and with MrBayes 3.2.2. (Ronquist et al. 2012), prior selection of GTR+I+gamma, the best model for the matrix using jModelTest (Guindon & Gascuel 2003; Darriba et al. 2012). The parameters of Bayesian analysis comprised 2 million generations and 0.25 percent as burning fraction. The average standard deviation of split frequency was checked to be under 0.02 and effective sample size above 200 while inspection of the runs was visualized with tracer version 1.6.0 (Rambaut et al. 2014).

RESULTS

Sequencing and alignment of the genetic data.—Six exemplars of *A. breviductus* were processed for COI isolation, of which only two yielded enough DNA for amplification and sequencing. The length of these fragments was 461 (MH605523) and 510 (MH605522) bases. The other sequences retrieved from GenBank varied from 313 to 1,242 nucleotides, the aligned complete matrix comprised 1,249 positions and was reduced to 246 after culling.

Phylogenetic analyses.—The dataset of the complete and the alignments with the sections of poor coverage removed produced a similar topology in both ML and Bayesian analyses, of which we present only the Bayesian tree in Fig. 40. The topology retrieved only two relatively well-supported clades and two out of three outgroup exemplars as expected, outside Chernetidae. The first clade included four chernetids, recovered as sister or closely related in other studies (Zeh et al. 2003; Murienne et al. 2008). In the second clade, the two *A. breviductus* exemplars were recovered as sister taxa with the highest support, in a clade comprising *Dinocheirus* Chamberlin, 1929 and *Chernes* Menge, 1855 with 100 of posterior probability and a 95% of bootstrap support.

These results support that *Atherochernes* belongs in the family Chernetidae and is closely related to a clade that includes the genera *Chernes* and *Dinocheirus*, all these nodes with high support measurements (Fig. 40). However, we consider that more evidence from other gene markers are needed to further test the inter- and intra-relationships of the family Chernetidae. Further sampling and deployment of multi-locus phylogenies are to be produced to establish a solid framework of its classification.

SYSTEMATICS

Family Chernetidae Menge, 1855
Subfamily Chernetinae Menge, 1855
Genus *Atherochernes* Beier, 1954

Atherochernes Beier 1954:140–141.

Type species.—*Atherochernes venezuelaus* Beier 1954, by original designation.

Diagnosis.—The genus *Atherochernes* is characterized by the following combination of characters: carapace with posterior furrow closer to the posterior margin than the anterior furrow, ocelli absent; each tergite divided except the last one; vestitural setae short, clavate-dentate; pleural membrane coarse but not granular, intersegmental membrane striate; chelicerae hand with 5 setae, *bs* dentate or acuminate, *sbs* dentate, *ls* very long, *es* very short (Fig. 18), rallum of 4 blades (Fig. 19); palps slender, trochanter hump weakly developed; fixed finger with some dentate setae at the base; trichobothria *ib* and *isb* of the fixed finger displaced distally and relatively close to *est*, *ist* distal to *est*, *it* almost opposite *et*; *st* of the movable finger barely closer to *t* than *sb*; tarsus IV without tactile seta (Fig. 16); claws simple (Beier, 1954). Female spermathecae paired, shaped as short thin tubules without terminal expansions (Fig. 15).

Remarks.—The type material of *A. venezuelaus* is deposited at the Museo civico di Storia Naturale of Verona and preserved in alcohol. Borrowing the type was impossible due to problems with the importation of goods into Mexico, but digital images of the type material was provided by museum staff. Unfortunately, the spermathecal morphology was not observed.

Distribution and species composition.—*Atherochernes* is known only from the type species *A. venezuelanus* Beier, 1954 from El Junquito, Distrito Federal, Venezuela.

Atherochernes breviductus Piedra-Jiménez & Alvarez-Padilla sp. nov.
http://zoobank.org/NomenclaturalActs/F629321A-6CFA-413B-B2A1-1659DE1CDC78
(Figs. 1–6, 13–22, 34–36)

Material examined.—*Holotype female*: MEXICO: *Veracruz*: Municipio Calcahualco, Atotonilco, vicinity of Pico de Orizaba National Park, Plot I (19°08′30.2″N, 97°12′21.5″W at 2,238 m), 15–24 February 2013, sifted leaf litter processed with Berlese funnels (CNAN-T1112).

Paratypes: MEXICO*: Veracruz*: 5 ♀, 5 ♂, 5 tritonymphs, 5 protonymphs, same data as holotype; 5 deutonymphs, same data as holotype except 21–30 May 2012 (CNAN-T1113).

Other material: 286 adults and 338 nymphs. MEXICO: *Veracruz*: Municipio Calcahualco, Atotonilco, Plot I (19°08′30.2″N, 97°12′21.5″W at 2,238 m), sifted leaf litter processed with Berlese funnels: 21–30 May 2012, 2 protonymphs, 13 deutonymphs, 13 tritonymphs, 44 ♂, 49 ♀; 4–14 October 2012, 29 protonymphs, 25 deutonymphs, 24 tritonymphs, 70 ♂, 42 ♀; 15–24 February 2013, 111 protonymphs, 18 deutonymphs, 19 tritonymphs, 39 ♂, 38 ♀; collected with pitfall traps: 15–24 February 2013, 2 deutonymphs, 2 tritonymphs, 2 ♂. Plot II (19°08′17.4″N, 97°12′16.2″W at 2,300 m), sifted leaf litter processed with Berlese funnels: 4–14 October 2012, 3 protonymphs, 2 deutonymphs, 2 tritonymphs; 15–24 February 2013, 3 protonymphs, 2 deutonymphs, 2 tritonymphs, 1 ♂, 1 ♀.

Diagnosis.—*Atherochernes breviductus* sp. nov. resembles the other species of the genus *A. venezuelanus* in the pedipalp measurements, rallum of 4 blades and chelicerae hand with 5 setae. However, this new species can be separated by the presence of cheliceral seta *bs* being acuminate (Fig. 18), while it is dentate in *A. venezuelanus*.

Description (adults).—Pedipalps, tergites and carapace dark-brown; legs, sternites and pleural membranes light yellowish brown (Figs. 1–6). Setae of carapace, trochanter and femur of palp and tergites stout and clavate-dentate, and remaining acuminate.

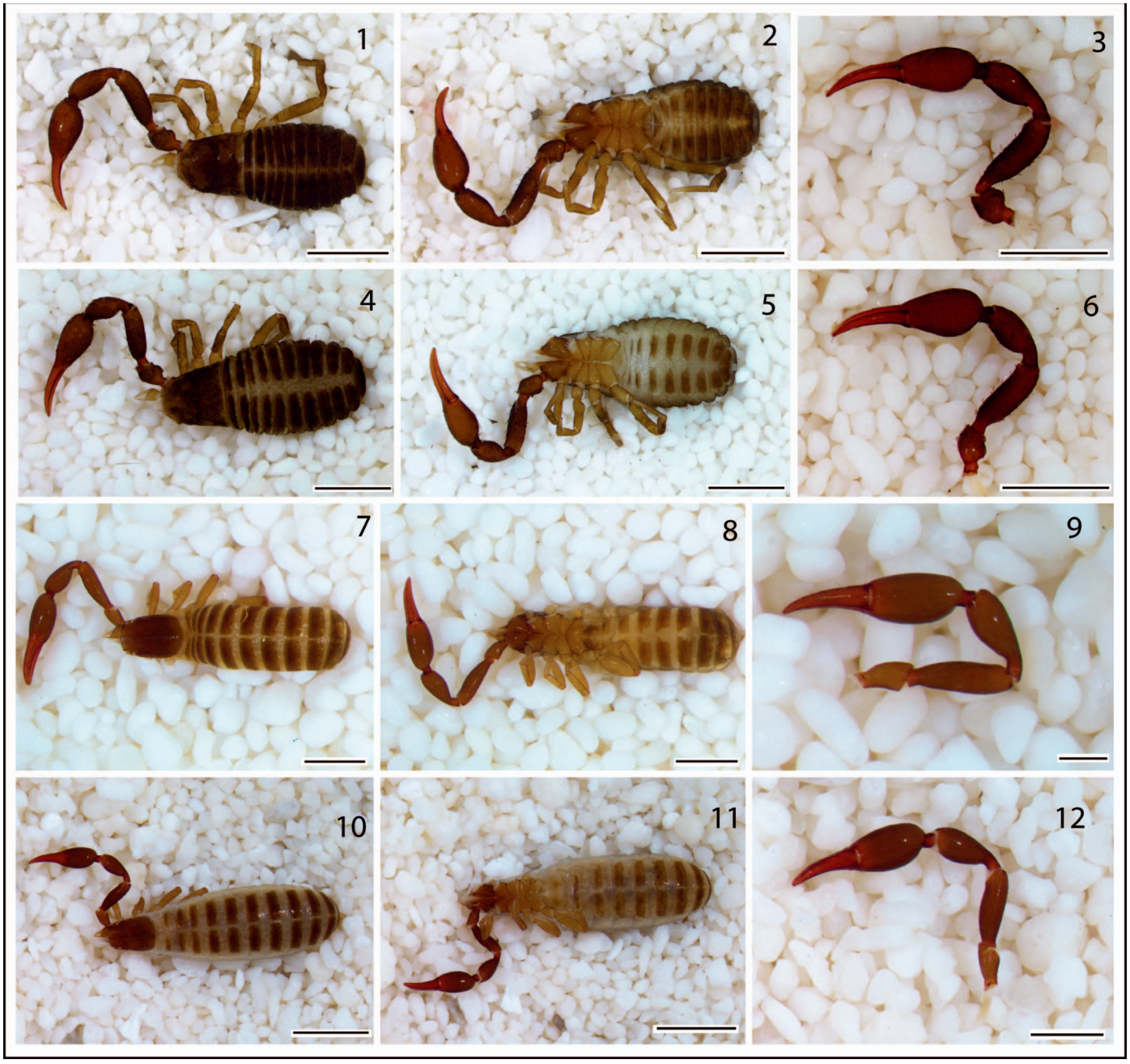
Chelicera (Figs. 18, 36): hand with 5 setae; *bs* acuminate and *sbs* finely dentate; 2 lyrifissures on dorsal face of hand and 1 on ventral face. Movable finger with 1 acuminate seta (*gs*), and 2 apical teeth. Galea moderately long and slender with 5–6 rami, 0.25–0.34 (♀), 0.23–0.32 (♂) x the length of movable finger. Rallum (Fig. 19) with 4 blades; the longest one dentate along the distal half, the remainder smooth. Serrula exterior with 15–19 lamellae.

Pedipalp (Figs. 3, 6, 17): surface granulate; relatively slender, with trochanter 1.41–1.60 (♂),1.44–1.84 (♀), femur 3.21–3.68 (♂), 3.16–3.60 (♀), patella 2.43–2.58 (♂), 2.37–2.83 (♀), chela (with pedicel) 3.54–4.01 (♂), 3.26–3.63 (♀), chela (without pedicel) 3.27–3.72 (♂), 3.02–3.40 (♀) x longer than wide; hand (without pedicel) 1.46–1.79 (♂), 1.37–1.69 (♀) x longer than wide; movable finger 0.92–1.27 (♂), 0.90–1.21 (♀) x as long as hand (without pedicel). Trochanter with rounded dorsal hump. Fixed finger with 49–55 (♀), 50–55 (♂) marginal teeth with the end of the dental row at *esb* level, plus 4–5 (♀, ♂) external accessory teeth and 0–2 (♀), 1–2 (♂) internal accessory teeth; movable finger with 57–62 (♀), 57–60 (♂) marginal teeth, with the end of the dental row at *sb* level, plus 5–8 (♀), 2–3 (♂) external accessory teeth and 0–1 (♀), 2–3 (♂) internal accessory teeth. Fixed finger with some dentate setae at the base and 8 trichobothria, movable finger with 4: distance between fingertip and *it* on fixed finger slightly longer than the distance between *ist* and *isb*; *it* much closer to *et* than to *est*; *ist* distinctly proximal to *isb*, *ist* at the level of *ib*; *st* on the movable finger about midway between *t* and *sb* or slightly closer to *t;* distance between *st* and *t* less than the distance of *t* from the fingertip; distance from *est* to *isb* more than 2 x as the distance between *esb* and *eb* (Figs. 14, 34, 35). Venom apparatus well developed in movable finger with nodus ramosus proximal to trichobothrium *t* and teeth 27–30 (counting from the finger tip) (Fig. 14).

Carapace (Fig. 13): sculpture granulated; 1.07–1.1 (♂), 1.02–1.09 (♀) x as long as wide; ocelli absent; with 6 (♂, ♀) setae on anterior margin and 6–7 (♂, ♀) on posterior margin; 2 transverse furrows well developed.

Coxal region: coxae of pedipalps with ca. 37 setae (♀), 30 (♂); chaetotaxy of coxae I–IV: ♂, 24: 26: 33: ca. 47; ♀, 24: 24: 39: ca. 55. Coxae I and IV approximately of same width.

Legs: sculpture slightly granulate. Setae acuminate and dentate. Leg I with trochanter 1.20–1.34 (♂), 1.20–1.35 (♀), femur 1.25–1.78 (♂), 1.23–1.80 (♀), patella 2.71–2.88 (♂), 2.78–3.21 (♀), tibia 3.27–4.00 (♂), 3.56–4.28 (♀), tarsus 5.37–6.28 (♂), 6.00–6.46 (♀) x longer than wide. Leg IV (Fig. 16)

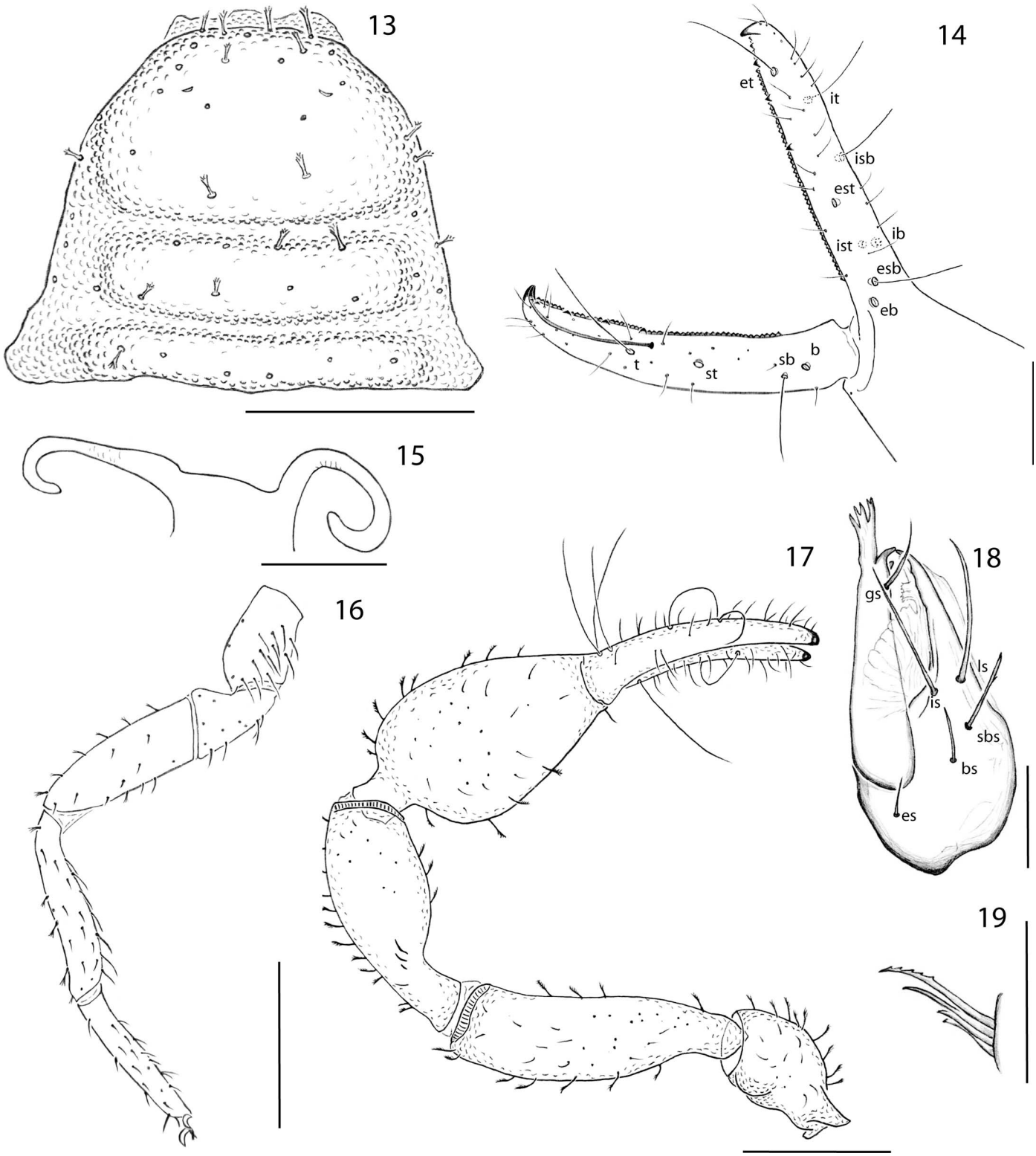


Figures 1–12.—1–3. *Atherochernes breviductus* gen. et. sp. nov., male: 1. Habitus, dorsal; 2. Habitus, ventral; 3. Left pedipalp, ventral. 4–6. *Atherochernes breviductus* gen. et. sp. nov., female: 4. Habitus, dorsal; 5. Habitus, ventral; 6. Left pedipalp, ventral. 7–9. *Serianus orizabensis* sp. nov., male: 7. Habitus, dorsal; 8. Habitus, ventral; 9. Left pedipalp, ventral. 10–12. *Serianus orizabensis* sp. nov., female: 10. Habitus dorsal; 11. Habitus, ventral; 12. Left pedipalp, ventral. Scale bars = 1.00 mm (Figs. 1, 2, 4, 5, 10, 11), 0.50 mm (Figs. 3, 6–8, 12), 0.20 mm (Fig. 9).

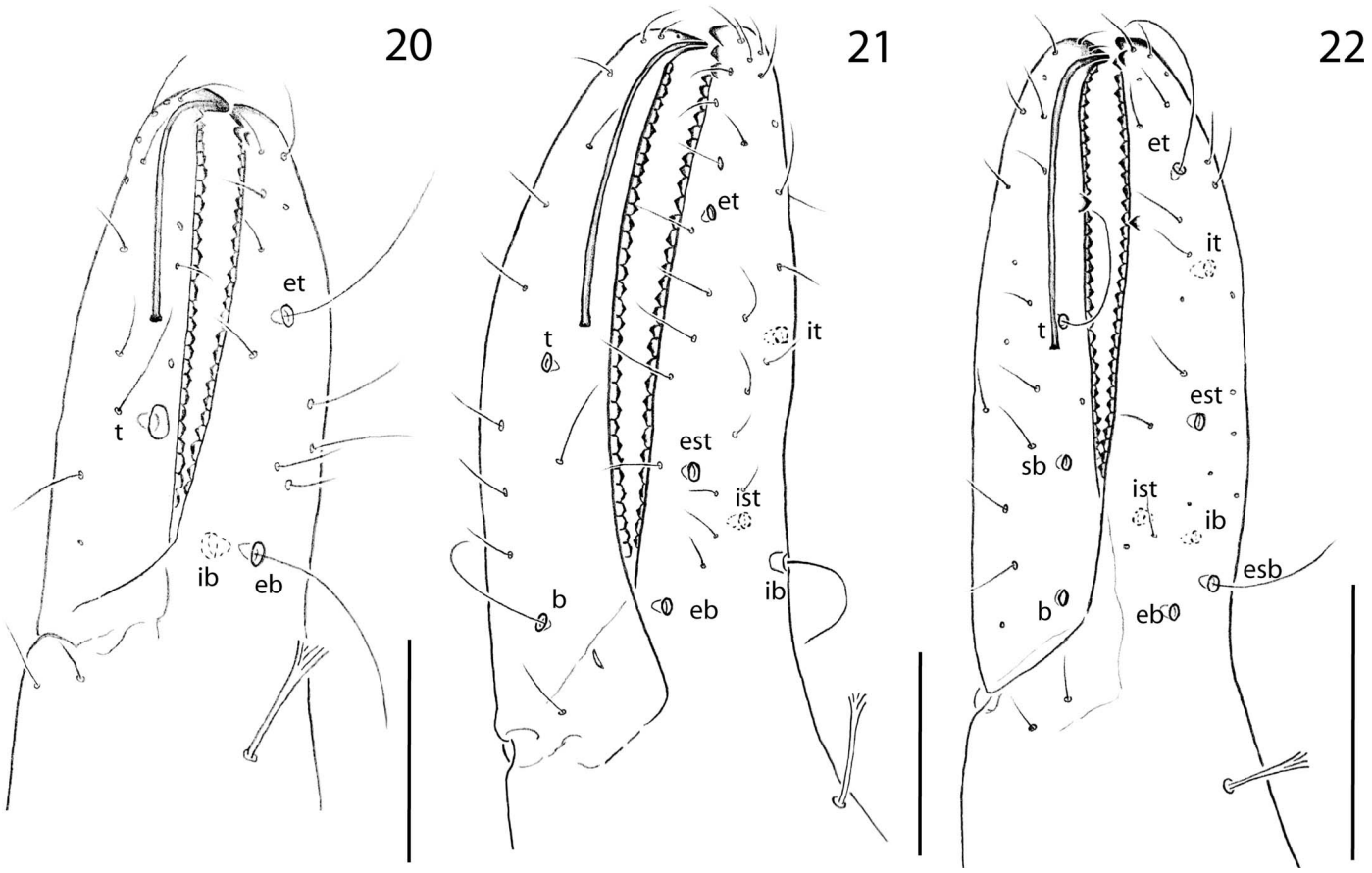
with trochanter 1.83–2.06 (♂), 1.42–1.86 (♀), femur + patella 3.95–4.16 (♂), 4.04–4.40 (♀), tibia 4.41–4.83 (♂), 4.64–5.41 (♀), tarsus 5.76–6.25 (♂), 5.78–6.33 (♀) x longer than wide. Tibia and tarsus of legs III and IV without tactile setae. Tarsi with single raised sensillum. Tarsal claws simple; arolium distinctly shorter than claws.

Abdomen: sculpture slightly granulate. Tergites I–X and sternites IV–X divided (♀, ♂) (Figs. 1, 2, 4, 5). Tergal chaetotaxy: ♂, 7–8: 8: 7: 8–9: 7–9: 9: 8–9: 7–9: 7–8: 6–9: 6–8: 2; ♀, 8: 8–10: 8–9: 10–11: 11–12: 11–12: 10–12: 10–12: 10: 9–10: 6–8: 2. Sternal chaetotaxy: ♂, 22–24: (2–3) 10 [4] (2–3): (1) 8 (1): 17: 18–20: 15–16: 14–15: 13–14: 10–12: 7–8 (including 4 tactile setae): 2; ♀, 18–24: (2) 6–8 (2): (1–2) 6–7 (1–2): 12–15: 20–22: 14–19: 15–18: 12–14: 10–12: 7–9 (including 4 tactile setae): 2. Pleural membrane rugose.

Genitalia: male anterior operculum with ca. 22 long and acuminate setae and one pair of slit sensilla, posterior operculum with ca. 13 acuminate setae. Female anterior



Figures 13–19.—*Atherochernes breviductus* gen. et. sp. nov., female: 13. Caparace; 15. Spermathecae, ventral; 16. Left leg IV; 17. Left pedipalp, ventral; male: 18. Left chelicera; 19. Rallum; 14. Left chelal fingers, retrolateral. Scale bars = 0.50 mm (Figs. 13, 16), 0.20 mm (Figs. 14, 17), 0.10 mm (Figs. 15, 18, 19).



Figures 20–22.—*Atherochernes breviductus* gen. et. sp. nov.: 20. Left chelal fingers, retrolateral, protonymph; 21. Left chelal fingers, retrolateral, deutonymph; 22. Left chelal fingers, retrolateral, tritonymph. Scale bars= 0.20 mm (Fig. 22), 0.10 mm (Figs. 20, 21).

operculum with ca. 20 short and acuminate setae and one pair of slit sensilla, posterior operculum with 7 short and acuminate setae and one slit sensilla. Male genitalia of typical chernetid form (Vachon 1938). Spermathecae of female with 2 short tubules not terminally expanded (Fig. 15).

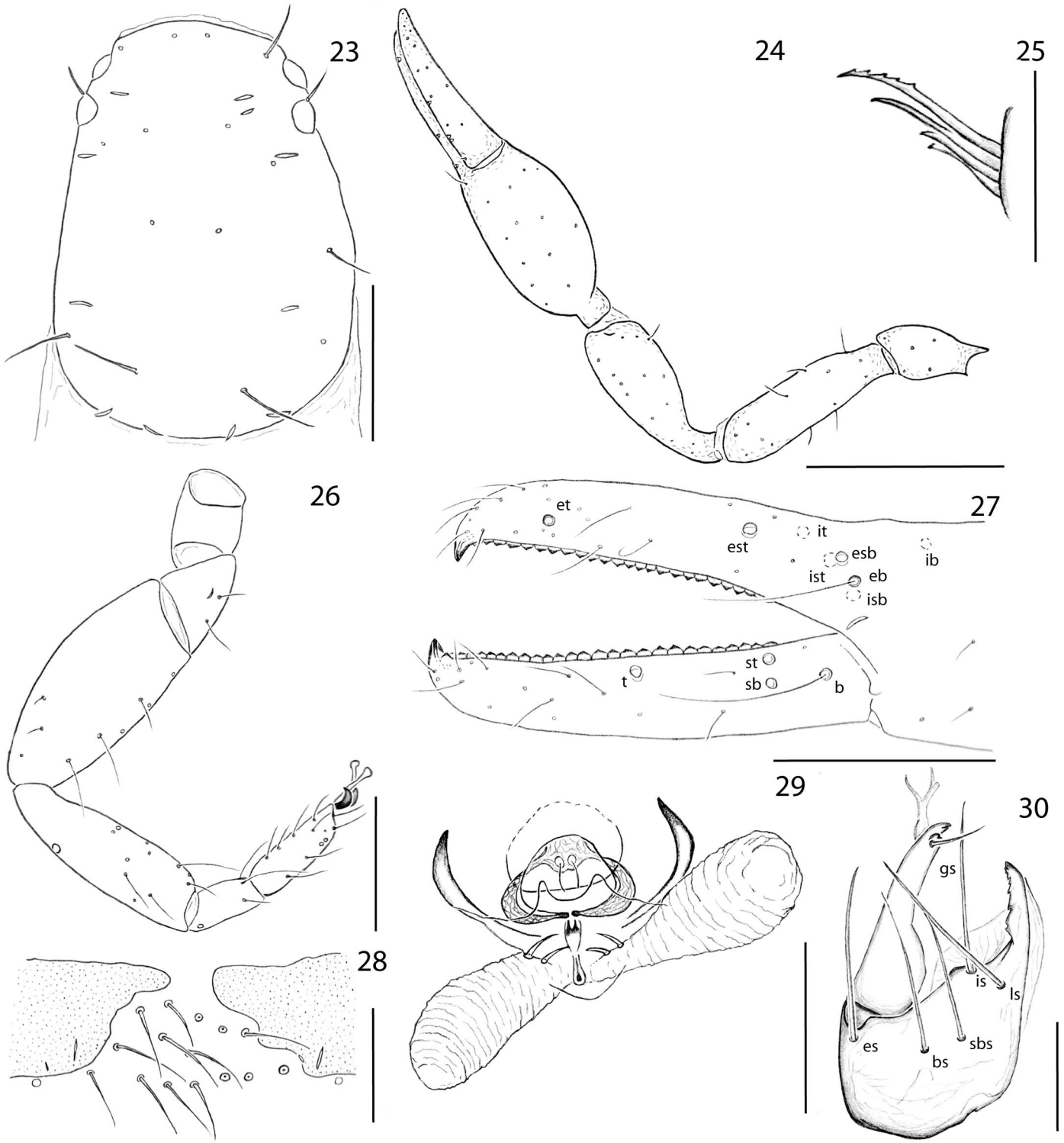
Dimensions: *Female holotype and five paratypes in parentheses*: Body length 3.08 (2.36–2.78). Pedipalps: trochanter 0.48/0.26 (0.43–0.48/0.27–0.30), femur 0.95/0.28 (0.82–0.94/0.25–0.27), patella 0.88/0.31 (0.70–0.80/0.25–0.31), chela (with pedicel) 1.63/0.50 (1.65–1.64/0.45–0.48), chela (without pedicel) 1.51 (1.45–1.53), movable finger length 0.80 (0.71–0.81). Chelicera 0.32/0.16 (0.30–0.35/0.17), movable finger length 0.22 (0.21–0.24). Carapace 0.91/1.00 (0.92–0.97/0.84–0.94). Leg I: trochanter 0.20/0.16 (0.19–0.23/0.14–0.17), femur 0.27/0.18 (0.23–0.31/0.17–0.21), patella 0.45/0.14 (0.42–0.48/0.14–0.15), tibia 0.45/0.105 (0.41–0.48/0.11–0.13), tarsus 0.48/0.07 (0.50–0.53/0.07–0.08). Leg IV: trochanter 0.30/0.20 (0.30–0.37/0.20–0.22), femur 0.30/0.21 (0.28–0.31/0.18–0.21), patella 0.60/0.19 (0.60–0.67/0.19–0.21), femur + patella 0.88/0.20 (0.84–0.91/0.20–0.22), tibia 0.65/0.12 (0.64–0.73/0.13–0.14), tarsus 0.57/0.09 (0.58–0.63/0.09–0.10).

Male paratypes ($n = 5$): Body length 1.98–2.46. Pedipalps: trochanter 0.39–0.42/0.24–0.29, femur 0.74–0.85/0.23–0.25, patella 0.67–0.75/0.26–0.29, chela (with pedicel) 1.41–1.51/0.37–0.41, chela (without pedicel) 1.30–1.40, movable finger length 0.63–0.75. Chelicera 0.30–0.32/0.13–0.16, movable finger length 0.18–0.23. Carapace: 0.84–0.88/0.76–0.80. Leg I: trochanter 0.18–0.20/0.14–0.16, femur 0.22–0.27/0.15–0.18, patella 0.41–0.44/0.14–0.16, tibia 0.40–0.45/0.11–0.13, tarsus 0.47–0.52/0.07–0.08. Leg IV: trochanter 0.33–0.36/0.16–0.20, femur 0.26–0.28/0.18–0.20, patella 0.56–0.60/0.18–0.20, femur + patella 0.77–0.85/0.18–0.21, tibia 0.58–0.65/0.13–0.14, tarsus 0.54–0.58/0.08–0.10.

Description (tritonymphs).—Morphology generally as in adults. Pedipalps, carapace and tergites pale brown, legs and sternites light yellow.

Chelicera: hand with 5 setae, *sb* finely dentate and the remainder acuminate; movable finger with 1 sub-distal seta (*gs*). Movable finger with 2 apical teeth. Galea long and slender with 3 or 4 rami. Rallum composed of 4 blades. 2 lyrifissures on the dorsal face of hand and 1 on ventral face. Serrula exterior with 16–18 lamellae.

Pedipalp: trochanter 1.36–1.57, femur 2.84–3.04, patella 2.28–2.59, chela (with pedicel) 3.68–3.71, chela (without pedicel) 3.48–3.66 x longer than wide. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 20): *esb* near *eb*; *est* much closer to *esb* than *et*; *ist* adjacent to *ib*; *st* about midway between *b* and *t*. Chelal teeth: fixed finger with 36–40 marginal teeth, 0–1 internal accessory

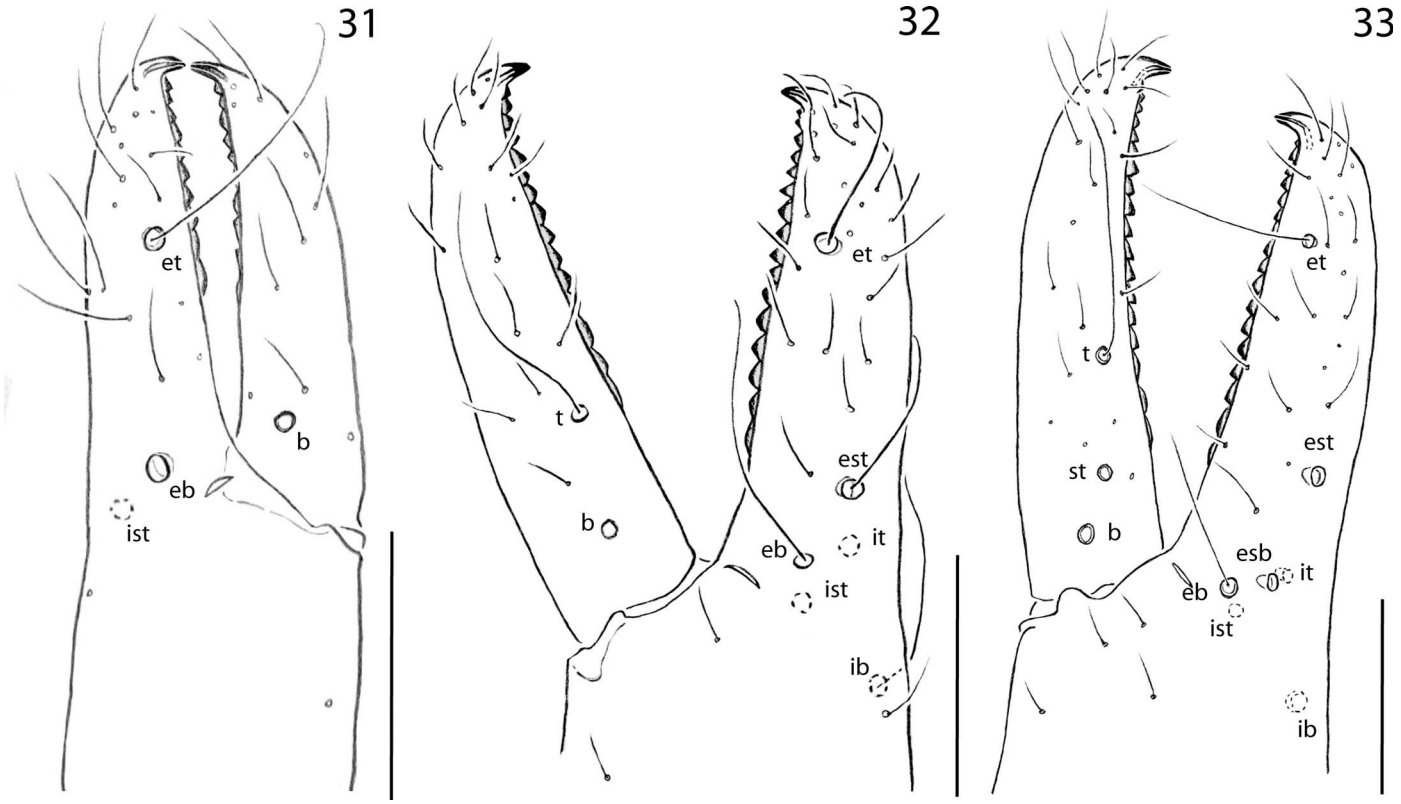


Figures 23–30.—*Serianus orizabensis* sp. nov., male: 23. Carapace; 24. Left pedipalp, ventral; 26. Left leg IV; 27. Left chelal fingers, retrolateral; 28. Sternite VI, ventral; 29. Genitalia, ventral; female: 30. Left chelicera; 25. Rallum. Scale bars = 0.20 mm (Figs. 23, 24, 26, 27), 0.10 mm (Figs. 25, 28–30).

teeth and 1–2 external accessory teeth; movable finger with 41–46 marginal teeth and 1 external accessory teeth. Venom apparatus present in movable finger with nodus ramosus near *t* and teeth 26.

Carapace: 0.98–1.14 x longer than wide; ocelli absent; with 4 setae on anterior margin and 6 on posterior margin; with 2 transverse furrows.

Legs: mostly as in adult.



Figures 31–33.—*Serianus orizabensis* sp. nov.: 31. Left chelal fingers, retrolateral, protonymph; 32. Left chelal fingers, retrolateral, deutonymph; 33. Left chelal fingers, retrolateral, tritonymph. Scale bars = 0.20 mm (Fig. 33), 0.10 mm (Figs. 31, 32).

Abdomen: Tergites I–X and sternites III–X divided. Tergal chaetotaxy: 6: 6: 6: 6: 8: 7–8: 7–8: 6: 6: 5–6: 8 (including 2 tactile setae): 2. Sternal chaetotaxy: 4: (2–3) 4 (2–3): (1) 5–6 (1): 10–11: 11–12: 9–10: 9–10: 8–10: 5–6: 6–7 (including 4 tactile setae): 2. Pleural membrane rugose.

Dimensions (n = 5)*:* Body length 1.96–2.13. Pedipalp: trochanter 0.25–0.34/0.18–0.22, femur 0.59–0.63/0.19–0.21, patella 0.52–0.57/0.22–0.24, chela (with pedicel) 1.11–1.19/0.29–0.32, chela (without pedicel) 1.05–1.12, movable finger length 0.52–0.57. Carapace 0.68–0.77/0.67–0.69.

Description (deutonymphs).—Morphology generally as in adults. Carapace light brown, the remaining pale yellow.

Chelicera: hand with 5 setae, *sb* finely dentate and the remainder acuminate; movable finger with 1 sub-distal seta (*gs*). Movable finger with 2 apical teeth. Galea long and slender with 3–4 rami. Rallum composed of four blades. 2 lyrifissures on the dorsal face of hand and 1 on ventral face. Serrula exterior with 14–16 lamellae.

Pedipalp: trochanter 1.58–2.00, femur 2.50–2.96, patella 2.08–2.25, chela (with pedicel) 3.22–3.76, chela (without pedicel) 2.97–3.55 x longer than wide. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 19): *est* closer to *eb* than to *et*; *ist* adjacent to *ib; ib* in the edge of the finger. Chelal teeth: fixed finger with 29–31; movable finger with 32–34 marginal teeth; both without accessory teeth. Venom apparatus present in movable finger with nodus ramosus near *t* and teeth 19.

Carapace: 1.22–1.31 x longer than wide; ocelli absent; with 4 setae on anterior margin and 6 on posterior margin; with 2 transverse furrows.

Legs: mostly as in adult.

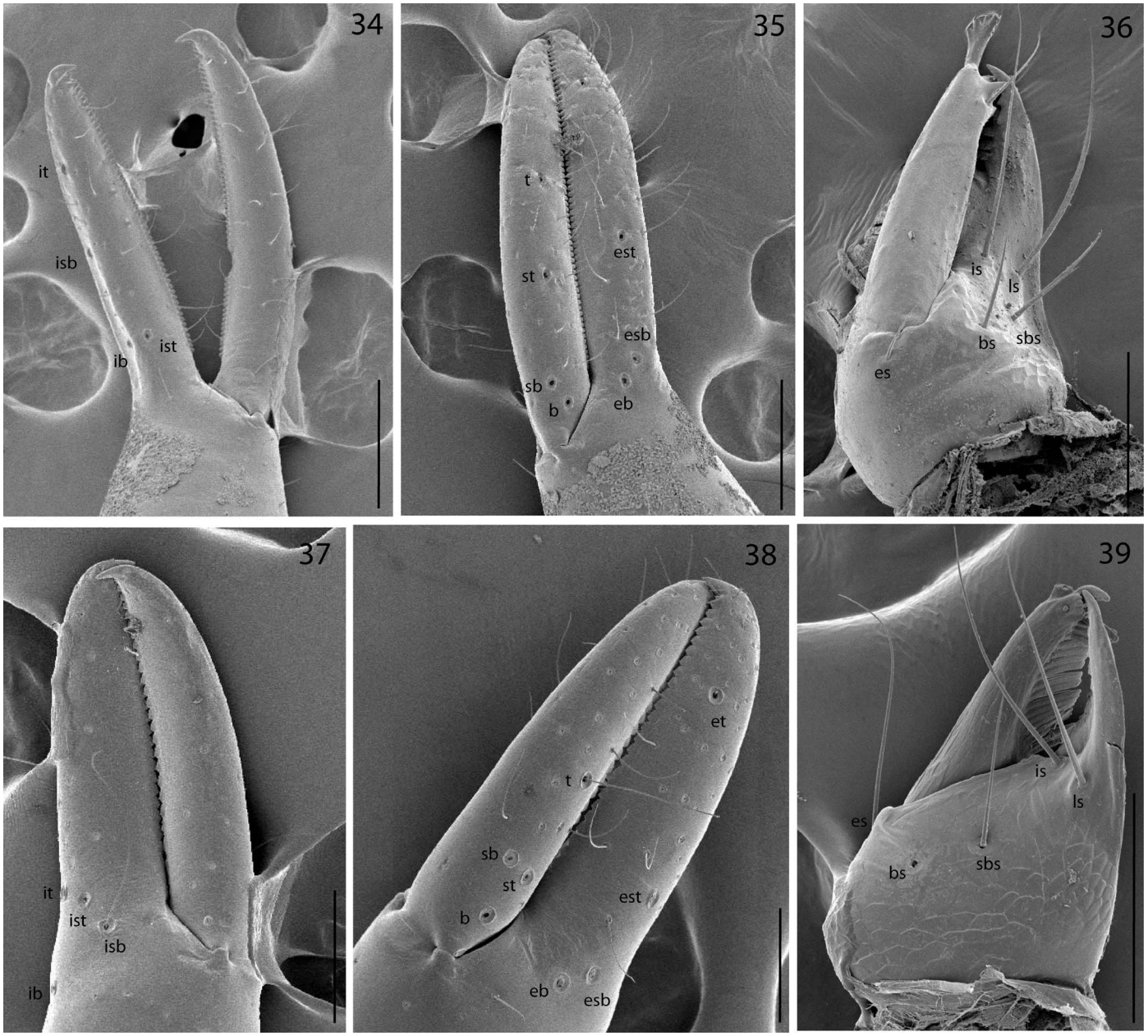
Abdomen: tergites I–X and sternites III–X divided. Tergal chaetotaxy: 6: 6: 6: 6: 6: 6: 6: 6: 6: 6: 6 (including 2 tactile setae): 2. Sternal chaetotaxy: 0: (1) 4 (1): (1) 4–5 (1): 6–8: 7–8: 6: 6: 6: 6: 6 (including 4 tactile setae): 2. Pleural membrane rugose.

Dimensions (n = 5*)*: Body length 1.32–1.59. Pedipalp: trochanter 0.23–0.28/0.12–0.14, femur 0.35–0.40/0.13–0.14, patella 0.32–0.35/0.15–0.17, chela (with pedicel) 0.72–0.84/0.21–0.22, chela (without pedicel) 0.67–0.79, movable finger length 0.32–0.39. Carapace 0.50–0.56/0.38–0.45.

Description (protonymphs).—Morphology generally as in adults. Carapace yellowish brown, the remaining pale yellow.

Chelicera: hand with 4 acuminate setae; movable finger without seta. Movable finger with 2 apical teeth. Galea long and slender with apparently 3 rami. Rallum composed of four blades. Two lyrifissures on the dorsal face of hand and 1 on ventral face. Serrula exterior with 12–14 lamellae.

Pedipalp: trochanter 1.33–2.04, femur 2.19–2.48, patella 1.85–2.11, chela (with pedicel) 3.40–3.54, chela (without pedicel) 3.27–3.42 x longer than wide. Fixed chelal finger with 3 trichobothria, movable chelal finger with 1 trichobothrium (Fig. 21): *et* situated sub-distally, *eb* and *ib* situated basally, and *t* situated medially. Chelal teeth: fixed finger with 22–24 marginal teeth; movable finger with 24–26 marginal teeth,



Figures 34–39.—34.–36. *Atherochernes breviductus* gen. et. sp. nov., male: 34. Left chelal fingers, prolateral; 35. Left chelal fingers, retrolateral; female: 36. Left chelicera. 37–39. *Serianus orizabensis* sp. nv., male: 37. Left chelal fingers, prolateral; female: 38. Left chelal fingers, retrolateral; 39. Left chelicera. Scale bars = 0.20 mm (Figs. 34, 35), 0.10 mm (Figs. 36–39).

both without accessory teeth. Venom apparatus present in movable finger with nodus ramosus near *t* and teeth 14.

Cephalothorax: carapace 0.95–1.29 x longer than wide; ocelli absent; with 4 setae on anterior margin and 6 on posterior margin; with 2 transverse furrows.

Legs: mostly as in adult.

Abdomen: tergites I–X and sternites III–X divided. Tergal chaetotaxy: 6: 6: 6: 6: 6: 6: 6: 6: 6: 6: 4 (including 2 tactile setae): 2. Sternal chaetotaxy: 0: (0) 2 (0): (1) 4–6 (1): 6: 6: 6: 6: 6: 4: 4: 2. Pleural membrane rugose.

Dimensions (n = 5)*:* Body length 1.16–1.82. Pedipalp: trochanter 0.16–0.22/0.10–0.13, femur 0.26–0.31/0.11–0.12, patella 0.24–0.27/0.13–0.14, chela (with pedicel) 0.60–0.64/0.17–0.18, chela (without pedicel) 0.57–0.61, movable finger length 0.26–0.30. Carapace 0.38–0.57/0.36–0.49.

Life history.—All specimens of *Atherochernes breviductus* sp. nov. were collected in a *Quercus* forest with secondary plant growth. Most specimens were found in sifted leaf litter processed with Berlese funnels; only two males were collected with pitfalls. Despite the difficulties in interpreting the seasonal changes based on the number of pseudoscorpions obtained (Gabbutt 1969), it is possible to make some inferences about the life history of this species of pseudoscorpion: The breeding season is marked by the presence of females with eggsacs in May. The new generation of free living protonymphs appears in October with a peak of abundance

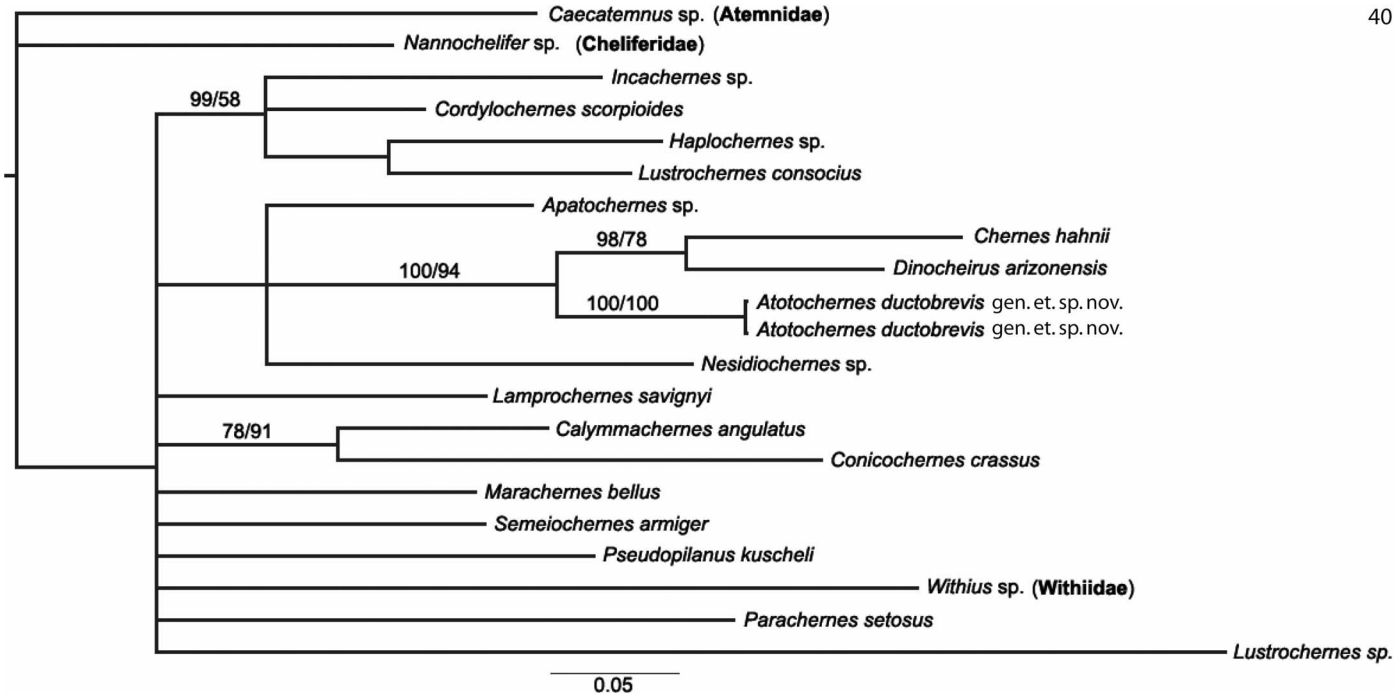


Figure 40.—Phylogeny of chernetid pseudoscorpion exemplars based on Bayesian analysis of the mitochondrial COI gene. Support values on branches indicate posterior probability and bootstrap value.

during February. This is followed by an increase of deutonymphs in May. The tritonymphal density is higher in May and February. Adult specimens were found with similar densities during all three expeditions (Table 1). Taking together these observations, it can be inferred that only one generation is produced each year.

Remarks.—The pseudoscorpion family Chernetidae is the most speciose and one of the most misunderstood regarding its evolutionary history and is in need of urgent revision, especially the relationships among the genera included in the subfamily Chernetinae. This is the first record of the genus in Mexico.

Etymology.—The specific epithet is derived from the Latin noun *ducto* (duct) and adjective *brevis* (short), and refers to the short tubes of the spermathecae.

Family Garypinidae Daday, 1888
Genus *Serianus* Chamberlin, 1930

Serianus Chamberlin, 1930:594; Beier 1932:211; Hoff 1956:34–35; Hoff 1964:35; Muchmore 1979:207; Tooren 2002:185.
Paraserianus Beier, 1939:288; Roewer, 1940:345; Mahnert, 1988: 7–8.

Type species.—*Serianus*: *Garypinus serianus* Chamberlin, 1923, by original designation. *Paraserianus*: *Paraserianus bolivianus* Beier, 1939, by original designation.

Diagnosis.—The genus *Serianus* is characterized by the following combination of features: chelicera with rallum of 4 blades (Fig. 25); at least anterior tergites and sternites completely divided (Figs. 7, 8, 10, 11); some sternites of the male exhibiting a medial group of glandular setae (Fig. 28); chelal fixed finger with *it, ist* and *isb* located near base, close together, and distinctly distal to *ib*; *it* and *ist* closer to level of *esb* than to level of *est;* movable finger with *st* and *sb* closely paired (Figs. 27, 37, 38); patella of both forelegs distinctly longer than femur; arolia of legs bifurcate (Chamberlin 1930; Hoff 1956; Tooren 2002).

Distribution and species composition.—This genus includes 20 species all over the world, but is best represented in the United States and Mexico (Harvey 2013b; Mahnert 2014).

Serianus orizabensis Piedra-Jiménez & González-Santillán, sp. nov.
http://zoobank.org/NomenclaturalActs/CCB8421F-CDC4-4058-92BA-B64CEE6B18AF
(Figs. 7–12, 23–33, 37–39)

Material examined.—*Holotype male*: MEXICO: *Veracruz*: Municipio Calcahualco, Atotonilco, near the Pico de Orizaba National Park, Plot II (19°08′17.4″N, 97°12′16.2″W at 2,300 m.), 15–24 February 2013 by sifted leaf litter processed with Berlese funnels (CNAN-T1114).

Paratypes: MEXICO: *Veracruz*: 1 ♀, 4 ♂ same data as holotype; 3 ♀, 1 ♂ with same data as holotype except Plot I (19°08′30.2″N, 97°12′21.5″W at 2,238 m); and 1 ♀ with same data but collected with pitfall traps (CNAN-T1115).

Table 1.—Seasonal abundance changes of each stage of *Atherochernes breviductus* sp. nov.

Month	Protonymphs	Deutonymphs	Tritonymphs	Females	Males
February	114	0	62	39	42
May	2	36	62	49	44
October	32	1	29	42	70
Total	148	37	153	130	156

Other material: 44 adults and 39 nymphs. MEXICO: *Veracruz*: Municipio Calcahualco, Atotonilco, Plot I (19°08′30.2″N, 97°12′21.5″W at 2,238 m), sifted leaf litter processed with Berlese funnels: 21–30 May 2012, 1 protonymph, 1 tritonymph, 1 ♂, 2 ♀; 15–24 February 2013, 5 protonymphs, 6 deutonymphs, 11 tritonymphs, 8 ♂, 10 ♀; Pitfall trap: 15–24 February 2013, 1 deutonymph, 1 ♀, 1 ♂. Plot II (19°08′17.4″N, 97°12′16.2″W at 2,300 m), sifted leaf litter processed with Berlese funnels: 21–30 May 2012, 2 protonymphs, 2 deutonymphs, 1 ♀; 15–24 February 2013, 1 protonymph, 4 deutonymphs, 3 tritonymphs, 9 ♂, 8 ♀; Pitfall trap: 15–24 February 2013, 1 ♀ (CNAN).

Comparative material examined.—*Serianus serianus* Chamberlin, 1923, male holotype from Pelican Island, Golfo de California, Baja California, Mexico (CASENT 9067540); *S. solus* Chamberlin, 1923, male holotype from South Santa Inez, Golfo de California, Baja California, Mexico (CASENT 9067541); *S. litoralis* Chamberlin, 1923, male holotype from Isla Monserat, Golfo de California, Baja California, Mexico (CASENT 9067542); *S. arboricola* Chamberlin, 1923, male holotype from Isla San Esteban, Golfo de California, Baja California, Mexico (CASENT 9067543).

Diagnosis.—*Serianus orizabensis* sp. nov. resembles other species of the genus but it can be easily separated by the presence of a patch of 9–15 glandular setae in the sternites VI–VIII of the male (Fig. 28), meanwhile *S. dolosus* Hoff, 1956 have 2–6 setae, *S. litoralis* (Chamberlin, 1923), *S. serianus* (Chamberlin, 1923), *S. solus* (Chamberlin, 1923) and *S. gratus* Hoff, 1964 have 3–5 setae, *S. carolinensis* Muchmore, 1968 have 2–5 setae, *S. minutus* (Banks, 1908) and *S. argentinae* Muchmore, 1981 have 4 setae, and *S. arboricola* (Chamberlin, 1923), *S. bolivianus* Beier, 1939 and *S. patagonicus* (Ellingsen, 1904) have only one pair (Chamberlin 1923; Beier 1932, 1939, 1959; Hoff 1956; Muchmore 1968, 1981; Tooren 2002). Additionally, the fixed finger of pedipalpal chela shorter than hand (Fig. 24) segregates *S. orizabensis* sp. nov. from *S. arboricola* and *S. litoralis,* which have the fingers as long as hand (Chamberlin 1923). The uniform sclerotization of the carapace (Figs. 7, 10) separates this species from *S. gratus* and *S. minutus,* which has the anterior half darker than the posterior (Banks 1908; Hoff 1964). Finally, *S. orizabensis* sp. nov. differs from *S. birabeni* Feio, 1945 in the ratio of pedipalpal patella (patella of male 1.5 and female 2.1 x longer than wide in *S. birabeni* and 2.36–2.56 x in males and females of *S. orizabensis* sp. nov.) (Feio 1945).

Description.—*Adult:* Carapace, pedipalps and tergites brown; finger of the chela slightly reddish, sternites yellowish brown to brown, legs light yellow (Figs. 9, 12, 24). Setae mostly acuminate, long and slender.

Chelicera (Fig. 30): hand with 5 setae, all acuminate; *es* as long as fixed finger; 2 lyrifissures on the dorsal face of hand and 2 on ventral face. Movable finger with 1 acuminate seta (*gs*), and one apical tooth. Galea moderately long and slender with 2–3 rami, 0.41–0.43 (♀), 0.30–0.32 (♂) x the length of movable finger. Rallum with 4 blades, the fourth a little shorter, the first and third laterally dentate, the others acuminate (Fig. 25). Serrula exterior with 17–19 lamellae.

Pedipalp (Figs. 9, 12, 24): surface smooth; relatively slender, with trochanter 1.83–2.18 (♂), 1.85–2.16 (♀), femur 2.69–3.76 (♂), 2.93–3.53 (♀), patella 2.37–2.56 (♂), 2.36–2.52 (♀), chela (with pedicel) 3.63–4.00 (♂), 3.03–3.69 (♀), chela (without pedicel) 3.45–3.75 (♂), 2.76–3.44 (♀) x longer than wide; hand 1.72–1.97 (♂), 1.57–1.78 (♀) x longer than wide; movable finger 0.89–1.13 (♂), 0.75–0.95 (♀) x as long as hand. Dorsal view with not observable tactile setae. Fixed finger with 23–25 (♀), 25–27 (♂) marginal teeth with the end of the dental row between *est* and *it* level; movable finger with 22–24 (♀), 23–25 (♂) marginal teeth with the end of the dental row at *st* level. Fixed finger with 8 trichobothria, movable finger with 4: *eb* and *esb* of the fixed finger situated basally; *est* closer to *eb* and *esb* tan to *et*; *isb, ist* and *it* grouped sub-basally; *ib* much posterior to the other three members of the series; *t* about midway of movable finger; *sb* at the same level of *st* (Figs. 27, 37, 38). Fixed finger with 13–16 chemosensorial setae, movable finger with 3–7. Venom apparatus in both fingers of chela, venom ducts very short, nodus ramosus almost at the claw base, no further than 3rd tooth (counting from the finger tip) (Fig. 27).

Cephalothorax: carapace (Fig. 23). Smooth without furrows; 1.15–1.44 longer than wide, 2 pairs of well-developed ocelli, the anterior one removed from the anterior margin by less than one-half of the diameter of the ocelli; anterior margin with 4 setae, posterior margin with 2 (♂, ♀). Coxae of pedipalps with 11 setae and 2 tactile setae (♂, ♀); chaetotaxy of coxa I–IV: ♂, ♀, 6: 7: 5–6: 3–4. Coxae I and IV approximately of same width.

Legs: sculpture smooth. Leg I with trochanter 1.12–1.42 (♂), 1.12–1.37 (♀), femur 1.12–1.66 (♂), 1.13–1.50 (♀), patella 1.66–2.50 (♂), 1.90–2.22 (♀), tibia 3.16–4.00 (♂), 3.28–4.16 (♀), metatarsus 1.08–2.00 (♂), 1.60–1.80 (♀), tarsus 1.50–2.86 (♂), 2.20–3.25 (♀) x longer than wide. Leg IV (Fig. 26) with trochanter 1.60–2.12 (♂), 1.11–1.80 (♀), femur 0.17–1.45 (♂) 1.30–1.45 (♀), patella 2.00–2.31 (♂), 2.37–2.53 (♀), femur + patella 2.52–2.90 (♂), 2.84–3.06 (♀),tibia 3.44–3.75 (♂), 3.10–3.60 (♀), metatarsus 1.83–2.20 (♂), 1.83–2.00 (♀), tarsus 3.15–3.4 (♂), 3.00–3.60 (♀) x longer than wide. Legs III and IV with 1 tactile seta in tibia, 1 in metatarsus and 2 in tarsus. Tarsal claws simple; arolium bifurcate and longer than claws.

Abdomen: tergites I–VIII divided, IX divided or partially divided, and X–XI complete (Figs. 7, 10), sculpture smooth; tergal chaetotaxy: ♀, 4: 4: 4–5: 6: 6: 7–8: 7–8: 8: 8: 10 (including 4 tactile setae): 4 tactile setae: 2; ♂, 4: 4–5: 4–6: 5–7: 6–7: 6–8: 8: 8: 8: 12 (including 4 tactile setae): 4 tactile setae: 2. Sternites IV–IX divided and X–XI partially divided (Figs. 8, 11), sculpture smooth; sternites VI–VIII of male with a median cluster of 9–15 glandular setae (Figs. 8, 28); sternal chaetotaxy: ♀, 7–8: (3) 6 (3): (1) 6 (1): 8: 8 (2 glandular setae): 8 (2 glandular setae): 8 (2 glandular setae): 8: 10 (including 2 tactile setae): 8 (including 4 tactile setae): 2; ♂, 8: (2) 4 (2) :(1) 6 (1): 8: 6 (9–15 glandular setae): 8 (10–14 glandular setae): 6 (9–11 glandular setae): 6: 10 (including 2 tactile setae): 6–8 (including 4 tactile setae): 2. Male genitalia with a pair of dorsal anterior glands (Fig. 29).

Dimensions: *Male holotype and five paratypes in parentheses:* Body length 2.20 (1.62–1.99). Pedipalps: trochanter 0.25/0.13 (0.22–0.25/0.11–0.13), femur 0.49/0.13 (0.35–0.49/0.13–0.14), patella 0.45/0.18 (0.38–0.41/0.15–0.17), chela (with pedicel) 0.95/0.24 (0.80–0.87/0.20–0.23), chela (without pedicel) 0.90 (0.75–0.81), movable finger length 0.42 (0.38–0.43). Chelicera 0.22/0.11 (0.19–0.21/0.10–0.11), length of movable

finger 0.14 (0.11–0.14). Carapace 0.59/0.43 (0.46–0.52/0.35–4.00). Leg I: trochanter 0.12/0.08 (0.09–0.10/0.07–0.08), femur 0.14/0.09 (0.09–0.12/0.06–0.08), patella 0.20/0.09 (0.15–0.20/0.08–0.09), tibia 0.23/0.06 (0.19–0.21/0.05–0.06), metatarsus 0.10/0.09 (0.06–0.08/0.04–0.05), tarsus 0.13/0.04 (0.06–0.11/0.04–0.05). Leg IV: trochanter 0.21/0.11 (0.16–0.20/0.08–0.10), femur 0.12/0.10 (0.14–0.16/0.11–0.13), patella 0.32/0.14 (0.34–0.37/0.16–0.17), femur + patella 0.40/0.14 (0.43–0.45/0.15–0.17), tibia 0.30/0.08 (0.30–0.32/0.08–0.09), metatarsus 0.10/0.05 (0.11–0.12/0.05–0.06, tarsus 0.16/0.05 (0.16–0.17/0.05).

Female paratypes ($n = 5$): Body length 1.89–2.52. Pedipalps: trochanter 0.26–0.27/0.12–0.14, femur 0.44–0.50/0.13–0.15, patella 0.41–0.45/0.17–0.19, chela (with pedicel) 0.79–0.92/0.23–0.26, chela (without pedicel) 0.72–0.86, movable finger length 0.31–0.42. Chelicera (0.21–0.23/0.11–0.12), length of movable finger (0.13–0.15). Carapace: 0.48–0.54/0.35–0.43. Leg I: trochanter 0.09–0.12 /0.08–0.10, femur 0.10–0.12/0.08–0.09, patella 0.19–0.21/0.09–0.10, tibia 0.22–0.23/0.06–0.07, metatarsus 0.08–0.09/0.05, tarsus 0.11–0.13/0.04–0.05. Leg IV: trochanter 0.10–0.18/0.09–0.11, femur 0.13–0.16/0.10–0.11, patella 0.37–0.39/0.15–0.16, femur + patella 0.45–0.50/0.15–0.16, tibia 0.31–0.33/0.09–0.1, metatarsus 0.11–0.12/0.06, tarsus 0.15–0.18/0.05.

Description (tritonymphs).—Morphology generally as in adults. Pedipalps, carapace and tergites brown, legs and sternites light yellow.

Chelicera: hand with 5 setae, all acuminate; movable finger with one sub-distal seta (*gs*). Movable finger with 1 apical tooth. Galea with 2 to 3 rami. Rallum composed of 4 blades. 2 lyrifissures on the dorsal face of hand and 2 in the ventral face. Serrula exterior with 16–18 lamellae.

Pedipalp: trochanter 1.88–2.05, femur 3.00–3.21, patella 1.75–2.27, chela (with pedicel) 3.41–3.86, chela (without pedicel) 3.29–3.56 x longer than wide. Femur with one dorsal tactile seta. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 30): *eb* and *esb* situated basally; *est* closer to *eb* and *esb* than to *et*; *ist* and *it* grouped sub-basally; *ib* much posterior to the series; *t* closer to *b* than to the fingertip; *st* closer to b than to *t*. Chelal teeth: fixed finger with 16–18 marginal teeth; movable finger with 17–19 marginal teeth. Venom apparatus in both fingers of chela, venom ducts very short, nodus ramosus almost at the claw base.

Cephalothorax: carapace 1.29–1.40 x longer than wide; 2 pairs of corneate ocelli; with 4 setae on anterior margin and 4 to 5 on posterior margin; without transverse furrows.

Legs: much as in adult.

Abdomen: tergites I–VIII divided, IX partially divided, and X–XI complete; sternites IV–IX divided and X–XI partially divided. Tergal chaetotaxy: 4: 4: 4: 6: 6: 6: 4: 6: 6: 10: 4 (including 2 tactile setae): 2. Sternal chaetotaxy: 2: (2) 4 (2): (1) 4 (1): 6: 6 (2 glandular setae): 6 (4 glandular setae): 6 (2 glandular setae): 8: 10 (including 4 tactile setae): 5–6 (including 4 tactile setae): 2. Pleural membrane longitudinally striate.

Dimensions ($n = 5$): Body length 1.75–2.17. Pedipalp: trochanter 0.21/0.10–0.11, femur 0.33–0.38/0.11, patella 0.31/0.13–0.18, chela (with pedicel) 0.66–0.72/0.18–0.19, chela (without pedicel) 0.63–0.68, movable finger length 0.28–0.33. Carapace 0.44–0.46/0.31–0.35.

Description (deutonymphs).—Morphology generally as in adults. Pedipalps, carapace and tergites pale brown, legs and sternites light yellow.

Chelicera: hand with 4 setae, all acuminate; movable finger with 1 sub-distal seta (*gs*). Movable finger with 1 apical tooth. Galea with 3 rami. Rallum composed of 4 blades. 2 lyrifissures on the dorsal face of hand and 2 in the ventral face. Serrula exterior with 14–16 lamellae.

Pedipalp: trochanter 1.68–1.94, femur 2.63–3.05, patella 1.95–2.38, chela (with pedicel) 3.62–3.78, chela (without pedicel) 3.42–3.57 x longer than wide. Femur with one dorsal tactile seta. Fixed chelal finger with 6 trichobothria, movable chelal finger with 2 trichobothria (Fig. 29): *eb* and *esb* situated basally; *est* closer to *eb* tan to et; *isb* and *it* grouped sub-basally; *ib* posterior to the series; *t* closer to *b* than to fingertip. Chelal teeth: fixed finger with 15–17 marginal teeth; movable finger with 14–16 marginal teeth. Venom apparatus in both fingers of chela, venom ducts very short, nodus ramosus almost at the claw base.

Cephalothorax: carapace 1.21–1.34 x longer than wide; 2 pairs of corneate ocelli; with 4 setae on anterior margin and 2–4 on posterior margin; without transverse furrows.

Legs: much as in adult.

Abdomen: tergites I–VIII divided, IX partially divided, and X–XI complete; sternites IV–IX divided and X–XI partially divided. Tergal chaetotaxy: 4: 2: 4: 4: 4: 6: 6: 6: 6: 7–8 (including 4 tactile setae): 8 (including 4 tactile setae): 2. Sternal chaetotaxy: 0: (1) 2 (1): (1) 2 (1): 4: 4 (2 glandular setae): 4 (2 glandular setae): 4 (2 glandular setae): 4: 8 (including 4 tactile setae): 6 (including 4 tactile setae): 2. Pleural membrane longitudinally striate.

Dimensions ($n = 5$): Body length 1.20–1.79. Pedipalp: trochanter 0.14–0.17/0.08–0.09, femur 0.24–0.28/0.08–0.09, patella 0.21–0.25/0.10–0.11, chela (with pedicel) 0.49–0.55/0.13–0.14, chela (without pedicel) 0.47–0.51, movable finger length 0.23–0.25. Carapace 0.33–0.39/0.27–0.30.

Description (protonymphs).—Morphology generally as in adults. Body, pedipalps and legs light yellow.

Chelicera: hand with 4 setae, all acuminate; movable finger without seta. Movable finger with 1 apical tooth. Galea with 3 rami. Rallum composed of 4 blades. 2 lyrifissures on the dorsal face of hand and 2 on ventral face. Serrula exterior with 11–13 lamellae.

Pedipalp: trochanter 1.3–2.06, femur 2–2.81, patella 1.89–2.15, chela (with pedicel) 3.21–3.69, chela (without pedicel) 3.07–3.53 x longer than wide. Femur with 1 dorsal tactile seta. Fixed chelal finger with 3 trichobothria, movable chelal finger with 1 trichobothrium (Fig. 31): *et* closer to fingertip than to *eb*; *ist* and *b* basal in position. Chelal teeth: fixed finger with 11–13 marginal teeth; movable finger with 9–11 marginal teeth. Venom apparatus in both fingers of chela, venom ducts very short, nodus ramosus almost at the claw base.

Cephalothorax: carapace 1.18–1.35 x longer than wide; two pairs of corneate ocelli; with 4 setae on anterior margin and 2 on posterior margin; without transverse furrows.

Legs: much as in adult.

Abdomen: tergites I–VIII divided, IX partially divided, and X–XI complete; sternites IV–IX divided and X–XI partially divided. Tergal chaetotaxy: 2: 2: 2: 2: 4: 4: 4: 4: 4: 4: 4: 4 (including 2 tactile setae): 2–3. Sternal chaetotaxy 0: (0) 0 (0):

(1) 2 (1): 3–4: 3–4: 3–4: 3–4: 3–4: 3–4: 4 (including 2 tactile setae): 2. Pleural membrane longitudinally striate.

Dimensions ($n = 5$): Body length 1.25–1.42. Pedipalp: trochanter 0.10–0.12/0.061–0.82, femur 0.16–0.21/0.07–0.08, patella 0.16–0.17/0.07–0.09, chela (with pedicel) 0.38–0.43/0.10–0.11, chela (without pedicel) 0.36–0.40, movable finger length 0.17–0.20. Carapace 0.30–0.31/0.22–0.26.

Life history.—Because the low density of this species it is not possible to make inferences about its life history. All specimens of *Serianus orizabensis* sp. nov. were also collected in a *Quercus* forest with secondary plant growth, mainly in leaf litter.

Remarks.—Most of the descriptions of species belonging to this genus are prior to 1988, and most are very brief and do not include illustrations of taxonomically important characters like the male genitalia. The last garypinid recorded for Mexico was *Serianus dolosus* in 1956 (Hoff 1956). This is the first record of the family in the state of Veracruz.

Etymology.—The species epithet is a Latin adjective based on the type locality, the Pico de Orizaba Volcano.

OTHER SPECIES

The present work raises to 171 the number of described species from Mexico and 23 for Veracruz including the following records.

Family Chthoniidae Daday, 1888
Tribe Chthoniini Daday, 1888
Genus *Mundochthonius* Chamberlin, 1929
Mundochthonius mexicanus Muchmore, 1973

Mundochthonius mexicanus Muchmore, 1973: 48–50, figs. 2–5.

Prior distribution.—This species was previously recorded only in Mexico, from the states of Chiapas, Nuevo León, Monterrey and Tamaulipas (Ceballos 2004).

New material examined.—MEXICO: *Veracruz*: Municipio Calcahualco, Atotonilco, Plot I (19°08′30.2″N, 97°12′21.5″W at 2,238 m), sifted leaf litter processed with Berlese funnels: 21–30 May 2012, 2♀; 15–24 February 2013, 3 protonymphs, 16 tritonymphs, 9 ♂, 12 ♀; direct collecting: 15–24 February 2013, 1 ♀. Plot II (19°08′17.4″N, 97°12′16.2″W at 2,300 m), sifted leaf litter processed with Berlese funnels: 15–24 February 2013, 1 tritonymph, 1 ♂, 1 ♀ (CNAN-UNAM).

Family Cheliferidae Risso, 1827
Subfamily Cheliferinae Risso, 1827
Tribe Cheliferini Risso, 1827
Genus *Mexichelifer* Muchmore, 1973
Mexichelifer reddelli Muchmore, 1973

Mexichelifer reddelli Muchmore 1973: 60–62, figs. 39–46.

Prior distribution.—*Mexichelifer reddelli* was recorded in the state of San Luis Potosí, Mexico (Muchmore 1973).

New material examined.—MEXICO: Veracruz: Municipio Calcahualco, Atotonilco, Plot II (19°08′17.4″N, 97°12′16.2″W at 2,300 m), direct collecting: 4–14 October 2012, 2 ♂, 2 ♀, 1 tritonymph (CNAN-UNAM).

Remarks.—The specimens examined in this study increase the variation range for the setiferous tubercles on the carapace from 85–100 to 50–100.

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