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New species and records of Elateridae (Coleoptera)  
from Cuatrociénegas, Coahuila, Mexico

Paul J. Johnson  
Insect Biodiversity Lab., Box 2207A  
South Dakota State University  
Brookings, SD 57007

David C. Lightfoot  
Museum of Southwestern Biology  
University of New Mexico  
Albuquerque, NM 87131

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## New species and records of Elateridae (Coleoptera) from Cuatrociénegas, Coahuila, Mexico

Paul J. Johnson

Insect Biodiversity Lab., Box 2207A  
South Dakota State University  
Brookings, SD 57007  
Paul.Johnson@sdsstate.edu

David C. Lightfoot

Museum of Southwestern Biology  
University of New Mexico  
Albuquerque, NM 87131

**Abstract.** Eleven species of Elateridae (Coleoptera) were collected during a two-year arthropod inventory survey at the Cuatrociénegas Natural Protected Area, Coahuila, Mexico. *Aeolus cuatro* **new species**, *Horistonotus coahuila* **new species**, and *Megapenthes cienegas* **new species** are described for the first time. Additionally reported as **new state records** are *Conoderus athoides* (LeConte), *C. lividus* (De Geer), *Deilelater mexicanus* (Champion), *Esthesopus parvus* Horn, and *Dipropus rufulus* (Candèze). Sixteen species of click beetle are now recorded from Coahuila. The sampled habitats and the environmental setting are briefly described with images of each sampling site.

**Key words.** Click beetle, taxonomy, biosphere reserve, habitat, gypsum dunes, desert wetlands.

**Resumen.** Once especies de Elateridae (Coleoptera) fueron recolectadas durante una encuesta de inventario de artrópodos de dos años en la Área de Protección de Flora y Fauna, Cuatrociénegas, Coahuila, México. *Aeolus cuatro* **nueva especie**, *Horistonotus coahuila* **nueva especie**, y *Megapenthes cienegas* **nueva especie** se describen por primera vez. También se reportan a *Conoderus athoides* (LeConte), *C. lividus* (De Geer), *Deilelater mexicanus* (Champion), *Esthesopus parvus* Horn, y *Dipropus rufulus* (Candèze) como nuevos registros estatales. Ahora se registra un total de 16 especies de Coahuila. Los hábitats muestreados y el entorno ambiental se describen brevemente con imágenes de cada sitio de muestreo.

**Palabras clave.** Elateridos, taxonomía, reserva de la biosfera, hábitat, duna de yeso, humedales del desierto.

### Introduction

The click beetles (Coleoptera: Elateridae) of Coahuila, Mexico were never summarized. Champion (1895, 1896a, b) reported four species from the state. In 2010 and 2011, personnel from the Museum of Southwestern Biology conducted a two-year arthropod survey in the Cuatrociénegas basin (Fig. 1, 2) (Lightfoot et al. 2017). The click beetles collected during the inventory are reported here.

Cuatrociénegas was declared a Natural Protected Area in 1994, and is managed locally by the office of the Área de Protección de Flora y Fauna Cuatrociénegas (APFFCC) under the direction of the Comisión Nacional de Áreas Naturales Protegidas (CONANP), a unit of the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT - Secretary for the Environment and Natural Resources). We adopt the naming and spelling as used by the APFFCC.

The elaterid specimens recorded below were collected as part of an arthropod inventory of the APFFCC. The project was sponsored by the U.S. National Park Service (NPS) Sister Parks Program, in cooperation with CONANP, representing Cuatrociénegas. The overall study was an inventory of Cuatrociénegas (APFFCC), Coahuila, Mexico and White Sands National Monument (White Sands), New Mexico, U.S.A.

White Sands and Cuatrociénegas both represent extensive landscapes of gypsum and saline soils including sand dunes, and both are Chihuahuan Desert basins surrounded by uplifted limestone fault-block mountains. White Sands has the largest gypsum dune field in the world (1000 km<sup>2</sup>) and little surface water, while Cuatrociénegas has a small (20 km<sup>2</sup>) gypsum dune field, but extensive natural

springs, ponds, lakes, streams, marshes and other wetlands (Fig. 9–13). The University of New Mexico – Museum of Southwestern Biology, Division of Arthropods (UNM-MSB) conducted a series of field trips to Cuatrociénegas in 2010 and 2011 to sample arthropods, particularly for undescribed species.

Although a wide variety of arthropods was sampled in the survey and reported elsewhere (see below), only click beetles (Coleoptera: Elateridae) are reported here. Three of these species are regarded as new to science and are described here for the first time. A summary of click beetle species now known from Coahuila is provided, as is a generalized description of the environmental setting of the APFFCC.

## Materials and Methods

Specimens studied derived from the aforementioned survey conducted under permit numbers 03044 (2010) and 03994 (2011) from the Subsecretaría de Gestión Para la Protección Ambiental, Dirección General de Vida Silvestre, Mexico, D.F. The primary types of related species were examined. Occurrence records for click beetles reported from Coahuila were taken from an unpublished compilation of the species of these beetles for the Americas, and supplemented with a review of pertinent literature for notations of occurrence of species in Coahuila, especially from Champion (1894–1896), Leng (1920), or potential species listed by Schwarz (1906), Schenkling (1925, 1927), and Blackwelder (1944, 1957).

The survey targeted a variety of habitats in the APFFCC, and employed various standard arthropod sampling methods such as general collecting with aerial nets, portable lights, pitfall traps, UV and mercury vapor light traps, sand sifting and other similar arthropod collection techniques. Recovered specimens were returned to the UNM-MSB for processing, itemization, and identification.

Taxonomic measurements were made with an ocular micrometer at 0.1 and 0.01 mm increments between 10–50 magnifications. Body length was measured from the anterior margin of the frons to the elytra apices, and width was measured across the elytral humeri. The ocular index (Campbell and Marshall 1964; Fender 1972) was calculated and rounded to two decimal places. Antennomere length ratios for flagellomeres 2–11 were measured along the lateral midline from antennomere base to apex, and values rounded to one decimal place. The string of values is presented as a ratio of antennomeres 2–11, or 2–3 and 11 when antennomeres 4–10 are subequal to antennomere 3. Pronotal length was measured along the midline from anterior margin to the antescutellar emargination, and width at widest point at the base of the hind angles. Elytral length was measured from base to apex, and width across the humeri. Tarsomere lengths were measured along the dorsal midline, from base to apex, values rounded to one decimal place, and reported as a ratio string basally to apically. Aedeagus total lengths were measured from the median lobe apex to the anterior margin of the basal piece; paramere length from apex to the anterior-most point of the basal lobe; paramere tip along midline from apex to lateral spine; and basal piece length from basal lateral angle to apex of shoulder junction with paramere. Aedeagal ratios given are basal piece length/total length, paramere length/total length, paramere apex/paramere length.

Dissections were made as needed by soaking each specimen in ammonia for 1.0–1.5 hr, and genitalia extracted. Abdominal ventrites, if removed, were glued to the specimen point adjacent to the beetle or a card beneath. Dissected genitalia and lightly sclerotized terminal abdominal sclerites were glued to a card beneath the specimen or preserved in plastic microvials with a drop of glycerine and attached below each specimen.

Label data are presented as given on the specimens, except dates are standardized to the dd.mm.yyyy format, with the month in lower case Roman type. Information from separate labels is separated by a slash (/) bracketed by single spaces. Interpolated information is given in brackets as needed for clarity or supplementation.

Holotypes were deposited in the Museum of Southwestern Biology, University of New Mexico (UNM-MSB). Paratypes were distributed between the UNM-MSB and the Paul J. Johnson Collection (PJJC), as indicated under each species. Collection abbreviations used are from Evenhuis (2018).

## Taxonomy

### *Aeolus cuatro* Johnson, new species

(Fig. 3, 6)

**Description.** Agrypninae, Oophorini, *Aeolus* Eschscholtz, 1829 (Candèze 1859). Body (Fig. 3) short, subparallel in dorsal silhouette; 6.7–8.2 mm long, 2.0–2.7 mm wide. Integument with dense to moderately dense punctures throughout, finely microreticulate; yellowish-brown to reddish-yellow, ventrite margins brown. Pubescence glossy yellow.

Head convex dorsally; frons shallowly convex to depressed; strongly punctured. Ocular index 79. Antenna narrowly serrate, reaching pronotal posterior margin.

Pronotum median length equal to width, 0.5 times length of elytra, shallowly convex, often depressed to shallowly impressed on disc. Hind angles with lateral margins subparallel; dorsum bicarinate, ectal carina strong, subparallel to lateral margin, fused to apical margin; mesal carina short, 0.3 times length of ectal carina. Hypomerion polished between punctures.

Elytra short, 1.9–2.0 times longer than wide; apices conjointly rounded. Striae of serial, deep, subcircular punctures. Intervals shallowly convex, finely, moderately-densely punctured.

Aedeagus (Fig. 6) with median lobe narrow, attenuate, 0.62 times total length; parameres narrow, 0.40 times total length, lateral margin sinuate, subacute at apex, with two large lateral subapical setae; basal piece elongate, 0.54 times total length, broadening slightly posteriorly.

**Type specimens.** Holotype, male; **MÉXICO, Coahuila**, Cuatrociénegas Protected Area (APFFCC), Los Hundidos, near La Campana, 22.vii.2010, 26.87167°N, 102.01813°W, K. Miller, K. Wetherill et al. / Site E3, ~13 km SE Cuatrociénegas, Los Hundidos, near La Campana, gypsum flat with sinkholes, drift net, general collecting (UNM-MSB).

Paratypes. Same label as holotype (4, UNM-MSB); 21–23.vi.2011, 26.91851°N, 102.10211°W, D.C. Lightfoot et al., colrs. / Site C7, Rio Mesquites, basin floor, ponds, stream, general collecting (1, UNM-MSB); 18.ix.2011, 26.91851°N, 102.10211°W, D.C. Lightfoot et al., colrs. / Site C7, Rio Mesquites, basin floor, ponds, stream, general collecting (4, UNM-MSB); Rancho Pozos Azules, 24.vi.2011, 26.80562°N, 102.01695°W, D.C. Lightfoot et al., colrs. / Site F5, ~20.61 km S of Rancho Pozos Azules, wetlands, light trap (3, UNM-MSB); 21.ix.2011, 26.80562°N, 102.01695°W, D.C. Lightfoot et al., colrs. / Site F5, ~20.61 km S of Cuatro Poza, wetlands, general collecting (3, UNM-MSB; 1, PJJC); 23–24.vi.2011, outflow of Poza de la Becerra, 26.87756°N, 102.13855°W, D.C. Lightfoot et al., colrs. / Site B4, ~14.14 km SW of Cuatrociénegas, saline/alkaline/gypsum, limestone gravels, general collecting (1, UNM-MSB);

**Etymology.** The species epithet “*cuatro*” is taken from the primary community, Cuatrociénegas, in the basin from which the type series was collected. The name is treated as a noun in apposition.

**Distribution.** MEXICO, Coahuila.

**Notes.** Adults of this species are superficially similar to *A. livens* (LeConte). *Aeolus cuatro* differs by the transversely subconical scutellum, which is flat in *A. livens*, and the aedeagus with a narrow and attenuate median lobe, where this is subspatulate in *A. livens*.

### *Horistonotus coahuila* Johnson, new species

(Fig. 4, 7)

**Description.** Cardiophorinae, *Horistonotus* Eschscholtz, 1829 (Candèze 1860; Wells 2000); body (Fig. 4) elongate-ovoid, 7.1–8.2 mm long, 2.3–2.7 mm wide. Integument double punctured, dense minute punctures throughout, with scattered larger, moderately sparse punctures on pronotum, hypomerion, prosternum and metaventrite; light brown to reddish-brown. Pubescence of golden-yellow, short, hair-like setae.

Head convex dorsally, frons shallowly convex, densely punctured; frontal margin carinate, projecting, shallowly reflexed, carina divided at compound eye. Ocular index 67. Antenna narrowly serrate; antennomere 10 reaching apex of pronotal hind angle in male, antennomere 11 at hind angle apex in female.



Pronotum 1.1 times wider than long, moderately convex, widest at midlength; lateral margins narrow, broadly arcuate. Hind angle outer margins subparallel; dorsum unicarinate, carina short, fine, fused with lateral margin. Metatarsomere length ratio 1.0:0.8:0.7:0.5:0.8; claw broadly toothed at base, tooth apex produced, acute.

Elytra 2.0 times longer than wide; apices narrow, conjointly rounded. Striae serially punctured; intervals shallowly convex basally, flattened apically.

Aedeagus (Fig. 7) with median lobe gradually attenuate 0.40 times total length; parameres 0.35 times total length, narrowly attenuate, apically incurved, apex acute; basal piece 0.63 times total length, anterior two-thirds with in-rolled lateral margins.

Female slightly larger; antenna shorter, antennomere 11 just reaching pronotal hind angle apex.

**Type specimens.** Holotype, male, **MÉXICO, Coahuila**, Cuatrociénegas Protected Area (APFFCC), 16.v.2010, Rancho El Anteojioto, 26.9717N, 102.1224°W, colr. K.R. Wetherill / Site A1, ~6 km W Cuatrociénegas, lower bajada, general collecting (1, UNM-MSB); 18.v.2010, along road to Las Dunas de yeso, 26.833°N, 102.162°W, ~20 km SW Cuatrociénegas, colr. D.C. Lightfoot, K.R. Wetherill et al. / Site B1, light trap, gypsum dunes (UNM-MSB).

Paratypes. Same labels as holotype (1, UNM-MSB; 1, PJJC); 18.v.2010, 26.8336°N, 102.1620°W, D. Lightfoot, K. Wetherill et al. / Site B1, ~19 km SW Cuatrociénegas, gypsum dune, light trap, oatmeal line, general collecting (2, UNM-MSB).

**Etymology.** The species epithet “*coahuila*” is taken from the indigenous name for the region and the common name for the Estado Libre y Soberano de Coahuila de Zaragoza, the state of Mexico in which the type series was collected. The name is treated as a noun in apposition.

**Distribution.** MEXICO, Coahuila.

**Notes.** This species resembles *H. simplex* LeConte in overall facies and keys to this species in Wells (2000). *Horistonotus simplex* was described from Cabo San Lucas, Baja California Sur, and is a highly variable species throughout its range (Wells 2000, Johnson 2018). *Horistonotus coahuila* differs from *H. simplex* and other similar North American *Horistonotus* species by the combination of aedeagal form, larger size, brown color, subparallel elytra sides, the mixed minute and even-sized pronotal punctures, and distribution. *Horistonotus coahuila* also keys to *H. rotundicollis* Champion (1895), described from Tepetlapa, Guerrero, but also differs in aedeagal structure, color, and distribution.

### ***Megapenthes cienegas* Johnson, new species**

(Fig. 5, 8)

**Description.** Elaterinae, Megapenthini, *Megapenthes* Keisenwetter, 1863; similar to *M. texanus* Becker, 1971. Body (Fig. 5) elongate, narrowly subcylindrical; 7.0–9.3 mm long, 1.7–2.1 mm wide. Integument with moderate to large punctures, umbilicate on pronotum and hypomeron; reddish-brown, sometimes with yellowish-brown antennae or leg highlights. Pubescence golden-yellow.

Head convex dorsally; frons shallowly convex to depressed; strongly punctured. Ocular index 59. Antenna narrowly serrate; antennomere 10 reaching apex of pronotal hind angle.

Pronotum 1.2 times longer than wide, moderately convex; punctures umbilicate, round to slightly ovoid, dense on disc, <0.5 times own diameter, denser laterally. Hind angle slightly divergent; dorsum unicarinate, carina strong, slightly arcuate. Hypomeron with punctures umbilicate.

Elytra 2.9 times longer than wide; striae thin and shallow; intervals flat; apices conjointly rounded.

Aedeagus (Fig. 8) with median lobe gradually attenuate, length 0.60 times total length; parameres narrowly sagittate apically, broadly shouldered at base, 0.54 times total length, apex length 0.22 times paramere length and unisetose dorsally subapically; basal piece length 0.34 times total length.

Female not known.

**Type specimens.** Holotype, male: **MEXICO, Coahuila**, Cuatrociénegas Protected Area (APFFCC), 24.vi.2011, 26.80562°N, 102.01695°W, D.C. Lightfoot et al., colrs. / Site F5, ~20.61 km SSE of Rancho Pozos Azules, wetlands, general collecting (UNM-MSB). Paratypes (4, UNM-MSB; 1, PJJC) with labels identical to the holotype; 21.ix.2011 (1, UNM-MSB).

**Etymology.** The species epithet “*cieneegas*” is taken from Spanish and is a regional term for the spring-fed wetlands that characterize the environmental setting in the Cuatrociénegas basin from which the type series was collected. The name is treated as a noun in apposition.

**Distribution.** MEXICO, Coahuila.

**Notes.** This new species is closely related to *Megapenthes texanus* Becker, 1971, with regard to general aspect and the gross similarity of the aedeagus. *Megapenthes cieneegas* differs from *M. texanus* by a larger size, shorter antenna in the male, pronotal punctation simple and moderately dense, the aedeagal median lobe with a straight-sided attenuation of the apex, parameres with a longer membranous apex and stronger basal sinuation, thicker struts, and broader dorsal overlap of the basal piece.

### Classificatory Checklist of Elateridae Species of Coahuila

(references are first reports of taxon from the state)

#### Agrypninae

##### Oophorini

*Aeolus cuatro* Johnson, **new species**

*Aeolus livens* (LeConte) (Champion 1895)

*Conoderus athoides* (LeConte), **new state record**

*Conoderus lividus* (De Geer), **new state record**

##### Pseudomelanactini

*Lanelater schotti* (LeConte) (Spilman 1985)

##### Pyrophorini

*Deilelater mexicanus* (Champion), **new state record**

*Deilelater physoderus* (Germar) (Champion 1896a)

#### Cardiophorinae

*Esthesopus parvus* Horn, **new state record**

*Horistonotus coahuila* Johnson, **new species**

#### Elaterinae

##### Ampedini

##### Dicrepidini

*Dicrepidius corvinus* Candèze (Champion 1894)

*Dipropus rufulus* (Candèze), **new state record**

*Dipropus warneri* Johnson (Johnson 2016)

##### Megapenthini

*Megapenthes cieneegas* Johnson, **new species**

##### Synaptini

*Glyphonyx championi* Smith and Balsbaugh (Smith and Balsbaugh 1984)

*Glyphonyx nanus* Smith and Balsbaugh (Smith and Balsbaugh 1984)

#### Cebrioninae

*Scaptolenus palpalis* Champion (Champion 1896b)

## Discussion

The new species and six new state records given above compiled with those of other click beetle species previously reported bring a total of 16 species now known from Coahuila. Although the click beetle diversity reported here represents only eight genera, the faunal affinities of these are interesting and suggest a much higher diversity than documented.

The species represented, except that of *Lanelater* Arnett, have their faunal affinities and diversities in the tropical regions of the Americas. The species of *Aeolus*, *Conoderus* Eschscholtz, *Esthesopus* Candèze, *Horistonotus*, and *Megapenthes* are assignable to species groups that have their taxonomic relationships to the Sonoran–Chihuahuan fauna. In contrast, the species of *Deilelater* Costa and

*Dipropus* Germar have their more immediate affinities with congeners in the tropical lowlands and lower montane areas of coastal and southern Mexico. *Lanelater* is atypical, with the entirety of American species in the southern and southeastern United States. Only *L. schotti* occurs into northern Mexico, with most other *Lanelater* in the Oriental and Afrotropical realms.

The primary landscape of Cuatrociénegas includes gypsum/salt flats, gypsum dunes, and many surface water features including ephemeral playas, permanent springs, ponds, lakes, streams, and canals (Fig. 9–13). Many of the surface water features were altered by humans such that canals drain most of the springs and ponds. Lower piedmont alluvial slopes (Fig. 9) are present, with rocky and gravelly soils. The gypsum dune (Fig. 10) areas of Cuatrociénegas cover only about 20 square kilometers, and were historically impacted by mining the gypsum and grazing of livestock. The principal vegetation types (Fig. 11–13) of the basin include halophytic and gypsum adapted associations, mesquite shrublands, rosetofilous/succulent (*Agave*, *Yucca*, *Acacia*, *Prosopis*, *Larrea* and cacti) shrublands, microphyllus desert shrublands, and a variety of anthropogenic vegetation types including irrigated and non-irrigated croplands. All landscape environments of Cuatrociénegas have been impacted by humans, primarily from water diversions for agricultural use outside of the basin, and intense year-round domestic livestock (cattle, horses, burrows) grazing throughout the basin, with concentrations adjacent to open water. Cuatrociénegas is particularly well known for the extensive aquatic environments, and for supporting a large array of oases surrounded by desert and mountains. The spring-fed surface waters are unusually low in nutrients, especially nitrogen and phosphorus, and support unique and ancient microbial communities including stromatolites (Souza et al. 2012).

No comprehensive surveys of arthropods were conducted at Cuatrociénegas prior to the 2010–2011 UNM inventory study, yet 14 endemic arthropod species, mostly crustaceans and scorpions, were reported. A number of studies of particular arthropod groups were conducted, focusing on aquatic crustaceans and terrestrial scorpions. Dinger et al. (2005) conducted a survey of aquatic invertebrates from a number of springs, ponds, lakes, and streams at Cuatrociénegas, but did not report finding any new or endemic species. Cole (1984) reported that 12 species of aquatic crustaceans were known from Cuatrociénegas, six of which were endemic to Cuatrociénegas, including two recently described endemic genera (*Paramexiweckelia* Holsinger and *Sphaerolana* Cole and Minckley) consisting of six newly described species. These two genera were the only arthropod taxa known to be endemic to Cuatrociénegas previous to the UNM inventory study.

In addition to endemic aquatic arthropods, a number of endemic terrestrial arthropods also are known. Cazier (1982) described two new species of endemic apiocerid flies from Cuatrociénegas, *Apiocera minckleyi* and *A. bigelowi*. Smith and Paulsen (2017) described two endemic species of *Podalasia* (Coleoptera: Scarabaeidae) restricted to dune habitats. Six species of scorpions were described from Cuatrociénegas, and five of those species are apparently endemic. Williams (1968) described five species of scorpions of the genus *Vejovis* (*V. gilvus*, *V. pallidus*, *V. casieri*, *V. coahuilae*, and *V. minckleyi*) from the Cuatrociénegas basin, and all but *V. coahuilae* appear to be endemic. Soleglad (1974) described another endemic species of *Vejovis* (*V. calidus*) from Cuatrociénegas. Haradon (1985) described the scorpion *Paruroctonus coahuilanus* from Cuatrociénegas, and the species appears to be endemic there. In total, eight species of scorpions are currently known to occur only in the Cuatrociénegas basin. The UNM arthropod inventory study recognized 22 new species of terrestrial arthropods at Cuatrociénegas, including the three new species of elaterid beetles reported here; three grasshoppers (Orthoptera), three katydids (Orthoptera), three crickets (Orthoptera), one cockroach (Blattodea; Hopkins et al. 2014), six other beetles (Coleoptera), two moths (Lepidoptera) and one spider (Aranea) (Lightfoot et al. 2017). Additionally, two of the new species at Cuatrociénegas also represent one new genus of katydid and one new family and new genus of spider. Two of the other six new species of beetles found in the UNM inventory survey include darkling beetles (Tenebrionidae) that were recently described (Smith et al. 2011; Wirth and Smith 2017).

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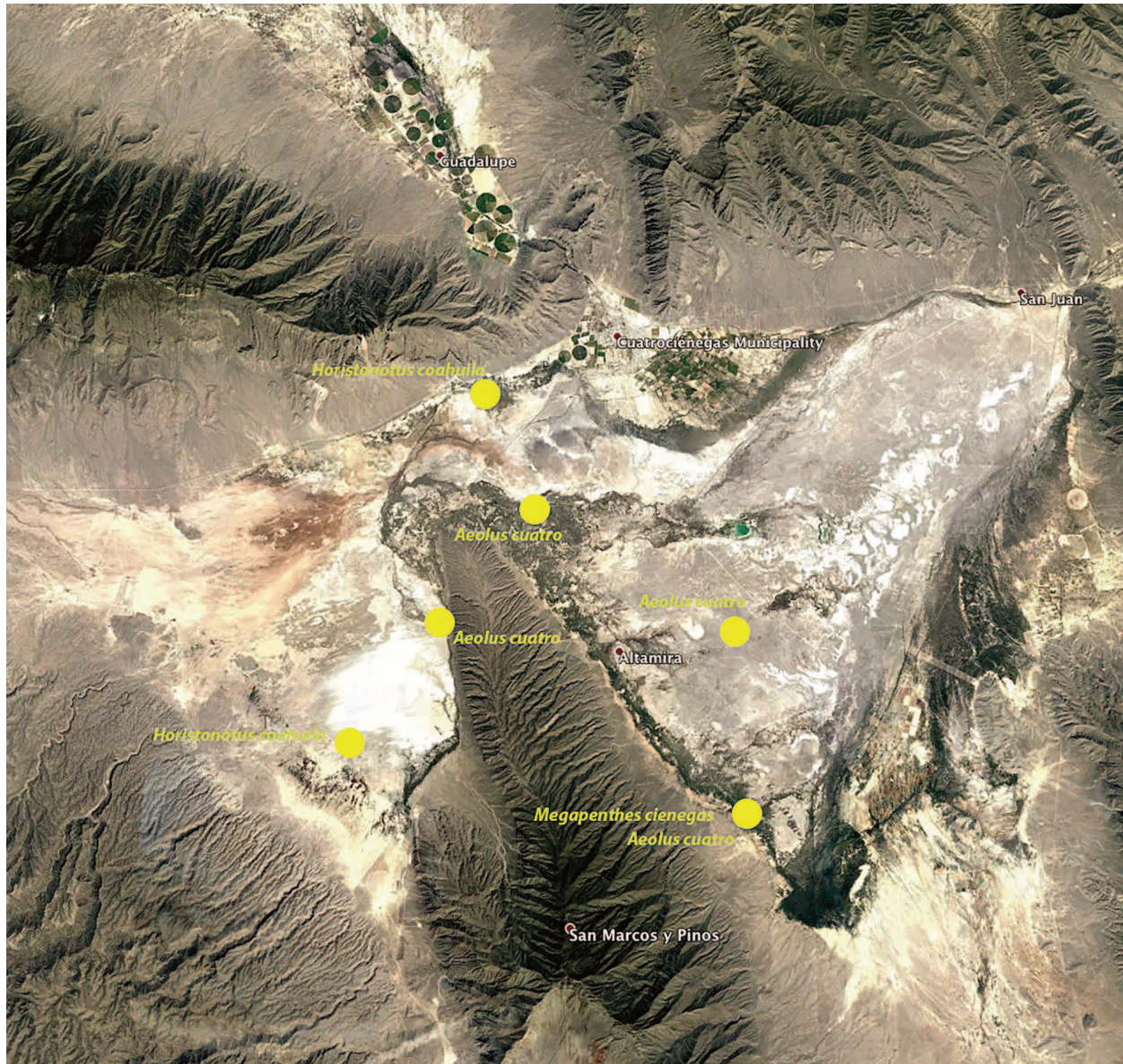
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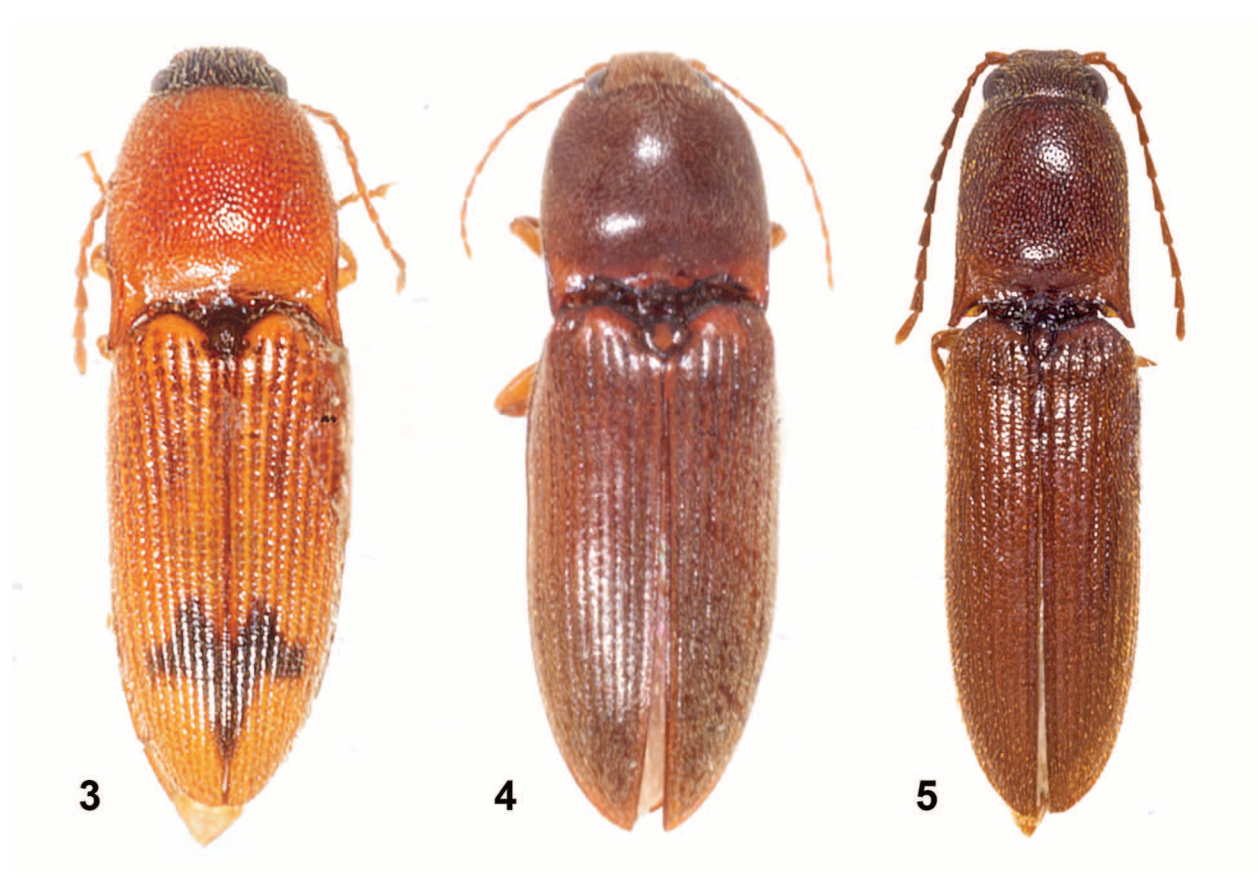


Figure 1. Google Earth® map showing Cuatrociénegas location in northern Mexico.





**Figure 2.** Google Earth® map showing the Cuatrociénegas Valley with collection localities indicated by yellow dots and names of species collected.



**Figures 3–5.** Dorsal habitus of new species of Elateridae from Cuatrociénegas. 3) *Aeolus cuatro*, **new species.** 4) *Horistonotus coahuila*, **new species.** 5) *Megapenthes cienegas*, **new species.**





**Figures 6–8.** Dorsal images of aedeagi of new species of Elateridae from Cuatrociénegas. **6)** *Aeolus cuatro*, **new species.** **7)** *Horistonotus coahuila*, **new species.** **8)** *Megapenthes cienegas*, **new species.**





**Figure 9.** Cuatrociénegas Valley, Site A1. Rocky lower piedmont slope with cacti, creosote bush and mesquite.



**Figure 10.** Cuatrociénegas Valley, Site B1. Gypsum dunes with scattered mesquite and other shrubs.





**Figure 11.** Cuatrociénegas Valley, Site C7. Freshwater stream with saline rush and grass wetlands.



**Figure 12.** Cuatrociénegas Valley, Site E3. Saline/gypsum clay soils and scattered mesquite and saltbush.





**Figure 13.** Cuatrociénegas Valley, Site F5. Freshwater ponds and surrounding wetlands, mesquite and acacia.

