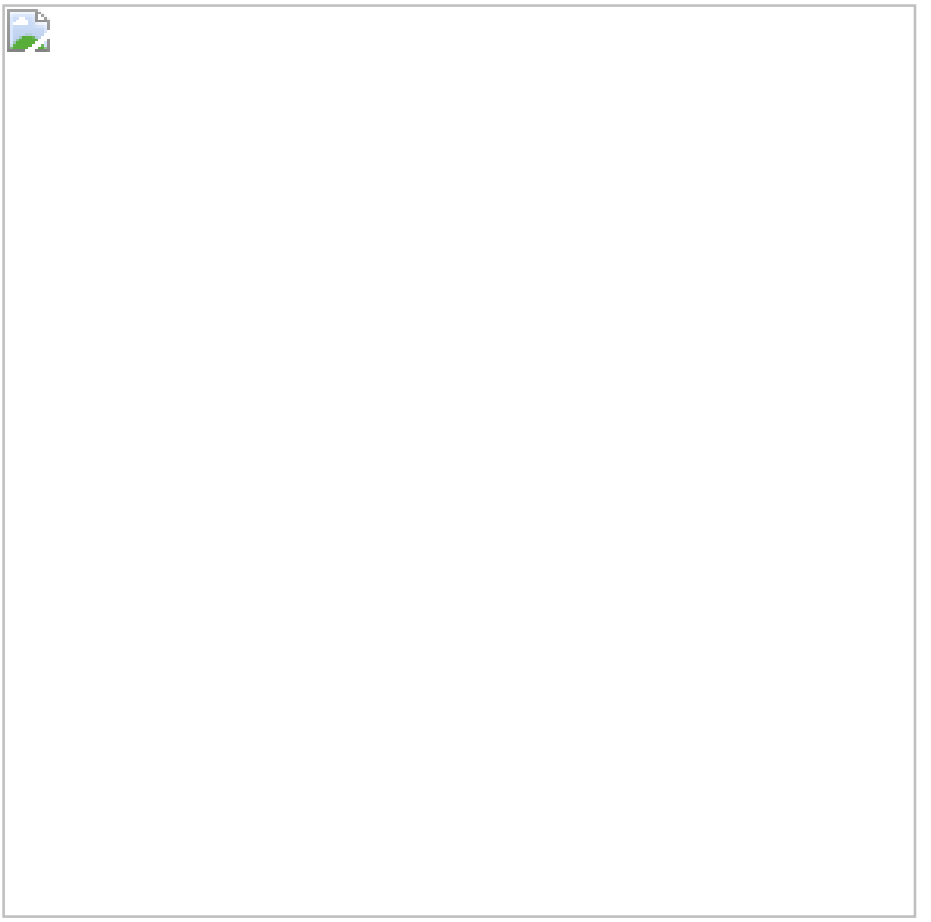

New Data on Chilean Urophonius Pocock, 1893 (Scorpiones, Bothriuridae), with Description of a New Species

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Source: American Museum Novitates, 2011(3725) : 1-44

Published By: American Museum of Natural History

URL: https://doi.org/10.1206/3725.2

AMERICAN MUSEUM NOVITATES

Number 3725, 44 pp. October 28, 2011

New data on Chilean *Urophonius* Pocock, 1893 (Scorpiones, Bothriuridae), with description of a new species

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ABSTRACT

New data are provided on Chilean species of the bothriurid genus *Urophonius* Pocock, 1893. *Urophonius mondacai*, n. sp., from central Chile is described. *Urophonius tumbensis* Cekalovic, 1981, is redescribed according to modern standards, and information about its distribution and ecology provided. *Urophonius transandinus* Acosta, 1998, is redescribed, its known distribution enlarged, and data on the morphological variation among its populations provided. A modification to Maury's (1973) group division of the genus is presented. *Urophonius* is divided into two groups instead of three as proposed by Acosta (1988). A distribution map for the three species covered in this contribution is provided, together with a key to the Chilean species of the genus.

KEY WORDS: Scorpiones, Bothriuridae, *Urophonius*, systematics, Neotropics, Chile.

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 ISSN 0003-0082

INTRODUCTION

The bothriurid scorpion genus *Urophonius* Pocock, 1893, is endemic to southern South America. Species of *Urophonius* have been recorded from Argentina, Brazil, Chile, and Uruguay (Ojanguren-Affilastro et al., 2010). *Urophonius* is currently divided into three species groups: *brachycentrus*, *exochus,* and *granulatus* (Acosta, 1988).

Thus far, five species of *Urophonius* are recorded from Chile: *Urophonius granulatus* Pocock, 1898, *Urophonius tregualemuensis* Cekalovic, 1981, and *Urophonius pizarroi* Ojanguren-Affilastro et al., 2010, all belonging to the *granulatus* group; *Urophonius transandinus* Acosta, 1998, belonging to the *brachycentrus* group; and *Urophonius tumbensis* Cekalovic, 1981, which, until now, had not been placed into a group (Ojanguren-Affilastro et al., 2010).

Urophonius tumbensis was described by Cekalovic (1981) from several male specimens collected on the Tumbes Peninsula, near Concepción, in southern Chile. Unfortunately, the original diagnosis did not permit this species to be clearly separated from other congeners and the type material at the Museo de Zoología de la Universidad de Concepción (MZUC), Chile, appears to be lost (J.N. Artigas, pers. comm.). The identity of *U. tumbensis* therefore remained equivocal until now.

We recently discovered a male specimen of *U. tumbensis*, with the same collection-event data (same locality, collector, and date of collection), but a different accession number (MZUC 345), as the paratypes. We also discovered another conspecific male specimen from the type locality, collected and identified by T. Cekalovic, deposited at the AMNH. These specimens confirmed the validity of *U. tumbensis* as distinct from all others in the genus. During two subsequent winter expeditions to southern Chile, we collected additional specimens near the type locality. The availability of a series of adult male, female, and immature specimens presented an opportunity to redescribe this species.

Urophonius transandinus, described from central Chile (Acosta, 1998), is the only Chilean species assigned to the *brachycentrus* group. Acosta's (1998) diagnosis of this species allows it to be readily distinguished from all others in the genus. The known distribution of *U. transandinus* was, until recently, restricted to a narrow part of central Chile. During two winter expeditions, we collected additional material from central and southern Chile, greatly expanding the known distribution of this species. We observed minor morphological differences among its populations, especially those at extremes of the distributional range. We therefore redescribe *U. transandinus*, taking into account the morphological variation among its populations, and present new records for this species.

In this contribution, we also describe *Urophonius mondacai*, n. sp., from central Chile. Although known from only two individuals, this new species is remarkable for exhibiting characters intermediate between the *brachycentrus* and *granulatus* groups, and shared by *U. pizarroi*, *U. transandinus,* and *U. tumbensis*, requiring these groups to be reassessed. Based on this discovery, we propose a modification to Maury's (1973) group division of the genus.

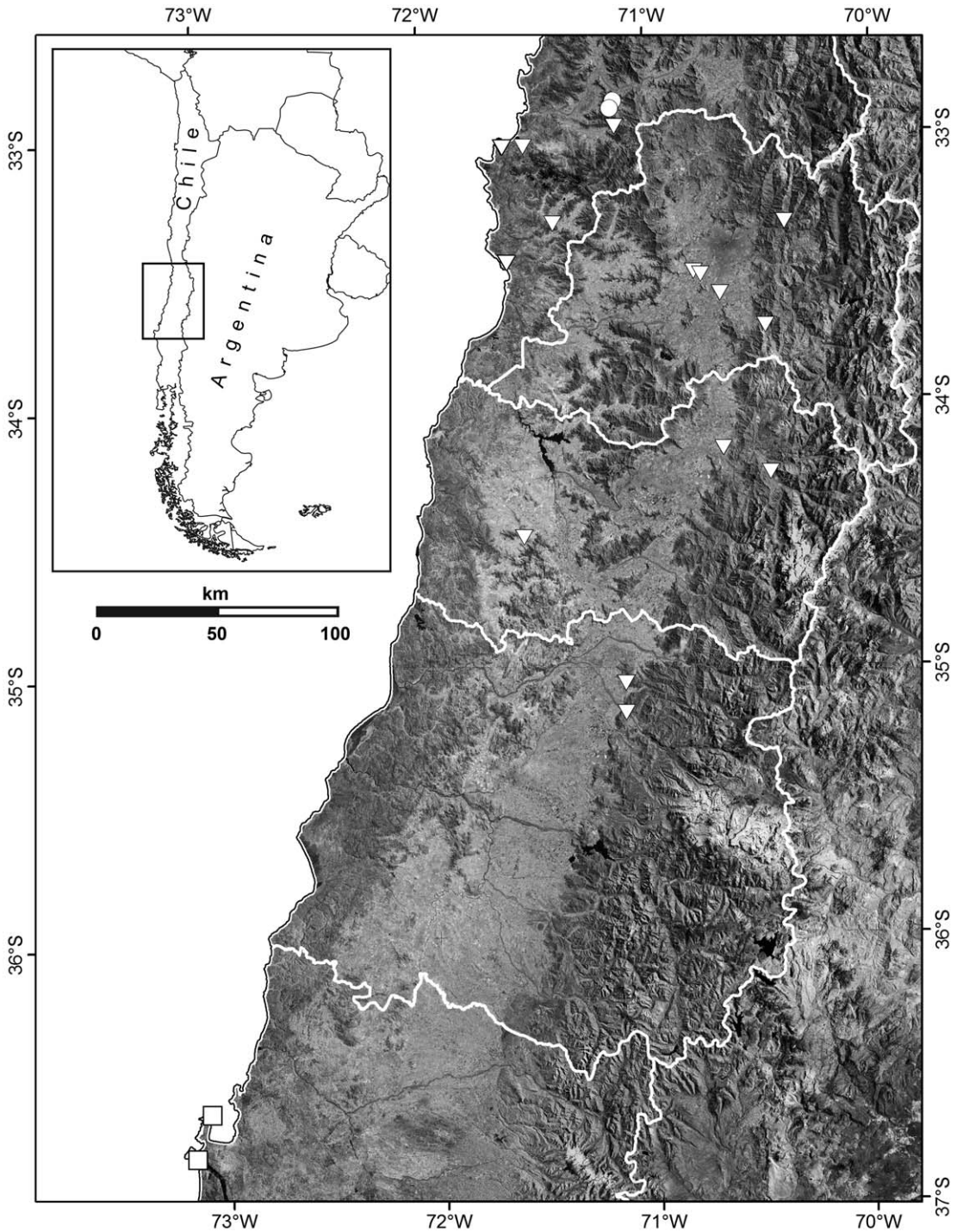

FIGURE 1. Map of central Chile, plotting known locality records for three species of *Urophonius* Pocock, 1893: *U. mondacai*, n. sp. (circles); *U. transandinus* Acosta, 1998 (triangles); *U. tumbensis* Cekalovic, 1981 (squares).

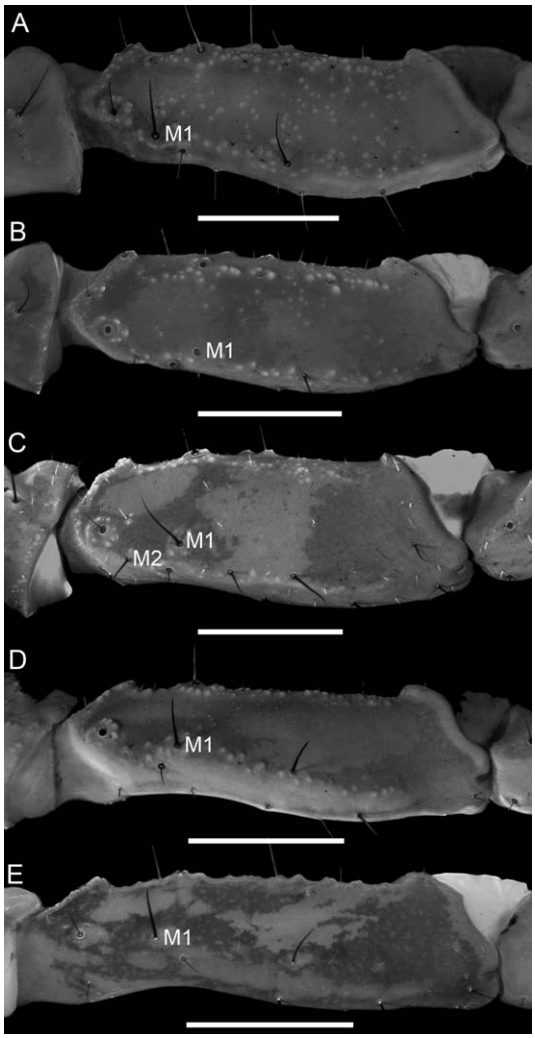

FIGURE 2. Species of *Urophonius* Pocock, 1893, dextral pedipalp femur, dorsoexternal aspect, with diagnostic macrosetae (M1, M2) indicated. **A.** *U. granulatus* Pocock, 1898, ♂ (MACN). **B.** *U. mondacai*, n. sp., holotype ♂ (AMNH). **C.** *U. transandinus* Acosta, 1998, ♂ (MACN). **D.** *U. tregualemuensis* Cekalovic, 1981, ♂ (MACN). **E.** *U. tumbensis* Cekalovic, 1981, ♂ (MACN). Scale bars = 1 mm.

METHODS

Personally collected material was captured with pitfall traps and manually by ultraviolet (UV) light detection at night using UV LEDs inserted into Maglite® 3D flashlights. Abbreviations of collections are as follows: AMNH: American Museum of Natural History, New York; CDA: Cátedra de Diversidad Animal I, Universidad Nacional de Córdoba, Argentina; MACN-Ar: Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina; MNHNS: Museo Nacional de Historia Natural de Santiago, Chile; MZUC: Museo de Zoología de la Universidad de Concepción, Chile; ZMH: Zoologisches Museum Hamburg, Germany.

Measurements, taken using an ocular micrometer, were recorded in mm. Descriptive terminology follows Mattoni and Acosta (2005) for hemispermatophores; Vachon (1974) for trichobothria; Francke (1977) for metasomal carinae, abbreviated as follows: DL: dorsolateral; LIM: lateral inframedian; LSM: lateral supramedian; VSM: ventral submedian; VL: ventrolateral; VM: ventromedian; and Francke (1977) for pedipalp carinae, abbreviated as follows: DI: dorsal internal; DE: dorsal external; VI: ventral internal; VE: ventral external; D: digital; E: external; V: ventral; VM: ventral median; DM: dorsal marginal; DS: dorsal secondary.

Illustrations were produced using a Leica M165C stereomicroscope and camera lucida. Digital images of pigmentation pattern and habitus were taken under visible light, images of external morphology under UV light, using a digital camera (Leica DFC290 or Nikon DS-Fi1) attached to a stereomicroscope (Leica M165C or Nikon SMZ1500), and the focal planes fused using Helicon Focus 3.10.3 (http://helicon.com.usa/heliconfocus/). Scanning electron micrographs (SEM) were taken with a Philips XL30 TMP SEM at the MACN. Samples were previously dehydrated and coated with gold-palladium in a Thermo VG Scientific SC 7620 sputter coater.

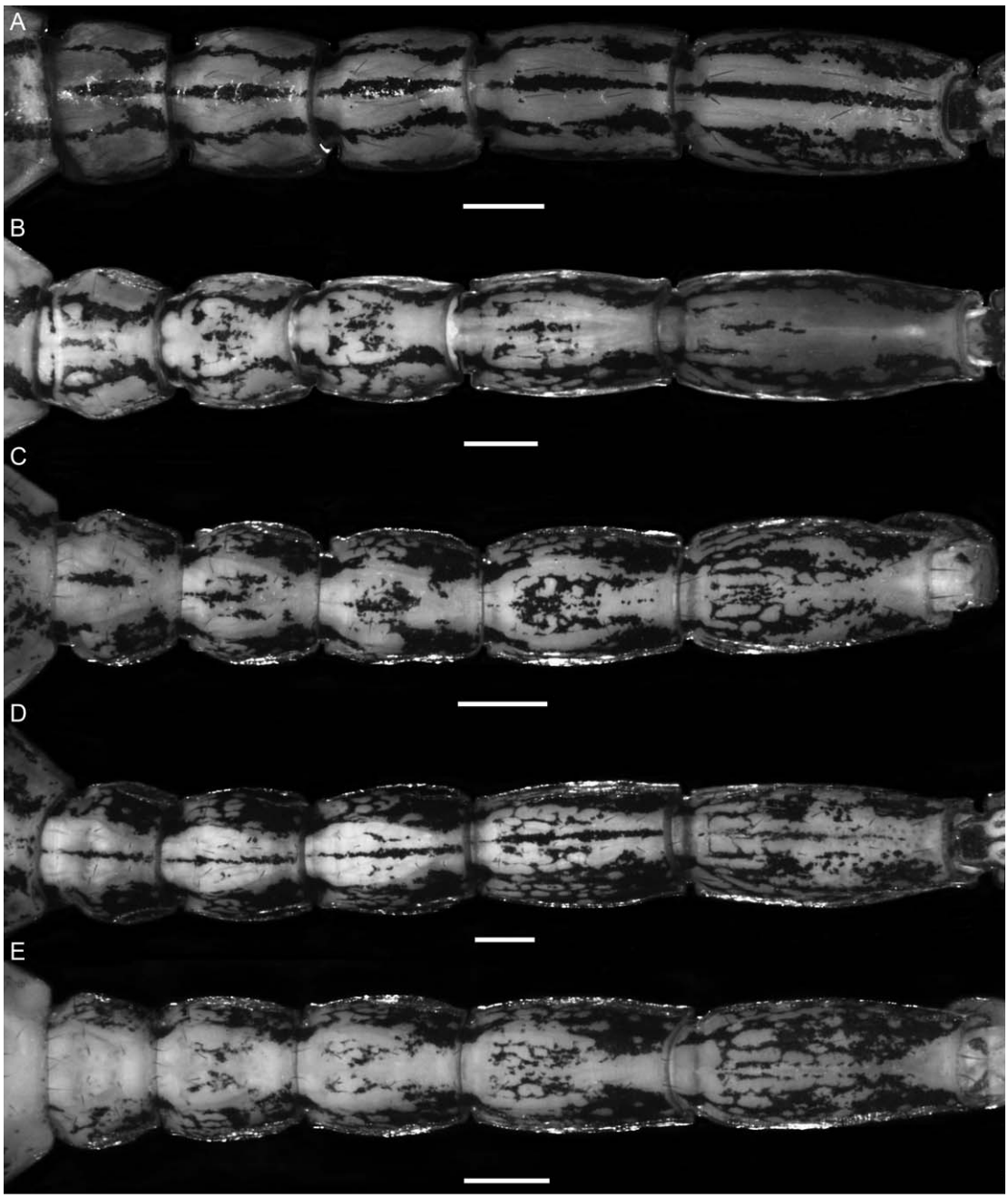

FIGURE 3. Species of *Urophonius* Pocock, 1893, metasoma, ventral surface, showing pigmentation pattern. **A.** *U. granulatus* Pocock, 1898, ♀ (MACN). **B.** *U. mondacai*, n. sp., holotype ♂ (AMNH). **C.** *U. transandinus* Acosta, 1998, ♂ (MACN), "La Campana" National Park, Chile. **D.** *U. transandinus* Acosta, 1998, ♂ (MACN), Curico, Chile. **E.** *U. tumbensis* Cekalovic, 1981, ♂ (MACN). Scale bars = 1 mm.

Point locality records were georeferenced in the field with portable GPS devices (Garmin® GPS II Plus, Etrex, Etrex Vista and Etrex Vista C) or retroactively using the GeoNet Names Server (http://earth-info.nga.mil/gns/html/). Retroactive georeferences are indicated in square brackets in the list of materials examined. A distribution map was generated using ArcMap 9.0 (©Environmental Systems Research Institute, Redlands, California), by superimposing the point locality records on a spatial dataset depicting the political boundaries and topography of Argentina and Chile. The topographic coverage was generated using a digital composition of ASTER Satelital Images (ca. 15 m resolution).

SYSTEMATICS

Family Bothriuridae Simon, 1880
Genus *Urophonius* Pocock, 1893

Urophonius Pocock, 1893: 100, 101; Acosta, 1998: 157–164; 2003: 1–12; Lowe and Fet, 2000: 42, 43 (complete reference list until 1998); Prendini, 2000: 2–5, 12, 19, 21, 22, 29, 41, 66; Ojanguren-Affilastro, 2002: 181–186; 2005: 80, 125–145, 219, 220, 234–236; Prendini, 2003a: 242; 2003b: 154, 156, 169: Ochoa, 2004: 46, 47, 73; Prendini and Wheeler, 2005: 481 (table 10); Volschenk et al., 2008: 654 (table 1), 662 (fig. 3), 666, 673; Kamenz and Prendini, 2009: 11 (table 2), 20 (fig. 11), 27 (fig. 17), 35, 39, plates 117, 118; Ojanguren-Affilastro and Cheli, 2009: 346–356; Ojanguren-Affilastro and Ramírez, 2009: 185–187.

Diagnosis: Small to medium-sized scorpions (21–45 mm). Chelicera, movable finger with two well-developed subdistal teeth. Carapace with three pairs of lateral ocelli. Pedipalp chela, movable finger with two or three median denticle rows and four to six pairs of internal and external accessory denticles. Pedipalp chela manus, internal surface with slight bulge near articulation of movable finger (♀) or pronounced, subtriangular projection and shallow depression, with group of three to seven granules near base of movable finger (♂). Trichobothrial pattern, neobothriotaxic major Type C, with one accessory trichobothrium in *V* series of chela; femur with 3 trichobothria (*d*, *i*, *e*); patella with 19 (3 *v*, 2 *d*, *i*, 3 *et*, *est*, 2 *em*, 2 *esb*, 5 *eb*); chela with 27 (*Est*, 5 *Et*, 5 *V*, *Esb*, 3 *Eb*, *Dt*, *Db*, *et*, *est*, *esb*, *eb*, *dt*, *dst*, *dsb*, *db*, *ib*, *it*); femoral trichobothrium *e* situated close to one or two dorsal macrosetae (M1 and M2) depending on species. Legs I–IV, telotarsi, number of spiniform setae in pro- and retroventral rows, I: 1/1, II: 2/2, III: 4–5/4–6, IV: 4–6/4–7. Hemispermatophore, lobe region small to medium sized; internal lobe with small, bilobed apophysis or pair of denticles. Metasomal segments I–III, each with paired VL and VSM carinae, VSM carinae subparallel along entire length or in basal two-thirds of segment, diverging at anterior margin, and may be reduced to scattered granules or form pair of transverse carinae; segment V, ventral surface with paired VL and single VM carina. Metasomal segments I–IV, each with paired VL and VSM stripes, or paired VL and single VM stripe. Metasomal segment I with two to four pairs of VSM macrosetae.

KEY TO THE CHILEAN SPECIES OF *UROPHONIUS*

1. Pedipalp femur, dorsal surface with two macrosetae (M1, M2) associated with *d* and *e* trichobothria (fig. 2C)….....*U. transandinus*
– Pedipalp femur, dorsal surface with one macroseta (M1) associated with *d* and *e* trichobothria (fig. 2A, B, D, E)…….....……..…….....……2
2. Metasoma, ventral surface with paired VL and single VM stripes on all segments, or at least on segments II–IV (fig. 3A)…….....…….3
– Metasoma, ventral surface with paired VL and VSM stripes on all segments, or at least on segments II–IV (fig. 3B)….…….....……...……..5
3. Pedipalp femur, dorsal surface with trichobothrium *e* situated proximal to macroseta M1 (fig. 2A); hemispermatophore, basal lobe with well-developed internal laminar extension, with internal notch (fig. 5A)….....*U. granulatus*
– Pedipalp femur, dorsal surface with trichobothrium *e* situated in same axis as, or distal to macroseta M1 (fig. 2D); hemispermatophore, basal lobe without internal laminar extension, forming concave surface without internal notch (fig. 5C, E) …….....….....4
4. Color yellowish with dark brown spots; carapace, anterior half weakly pigmented, with small dark spot medially on anterior margin (fig. 4B); metasomal segments IV and V each with VL and VM pigmentation stripes not contiguous at posterior margins of segments; hemispermatophore, lobe region weakly developed, basal lobe forming slightly concave surface (fig. 5C) …….....……...……..… *U. tregualemuensis*
– Color dark brown with black spots; carapace, anterior half densely pigmented, with well-developed dark spot occupying almost entire anterior margin (fig. 4A); metasomal segments IV and V each with VL and VM pigmentation stripes contiguous at posterior margins of segments; hemispermatophore lobe region well developed, basal lobe deeply excavated (fig. 5E) …….....*U. pizarroi*
5. Hemispermatopore with well-developed lobe region (fig. 6C), posterior margin of basal lobe situated distal to posterior margin of capsular concavity; metasomal segments I and II, VSM carinae forming two transverse carinae near anterior margin of segment and in posterior third (fig. 10A, B)…..……..……..……....*U. tumbensis*
– Hemispermatopore with weakly developed lobe region (fig. 6A), posterior margin of basal lobe situated proximal to posterior margin of capsular concavity; metasomal segments I and II, VSM carinae diverging in anterior third of segment (fig. 7A, B)…… ……..…….....…….*U. mondacai*, n. sp.

Urophonius mondacai, n. sp.

Figures 1, 2B, 3B, 6A, B, 7A, B, 11A, D, 12A, D, 13–15; tables 1, 2

Type Material: Holotype ♂ (AMNH), **CHILE: Región Metropolitana de Santiago:** *Chacabuco Province*: La Dormida, Til-Til, Chaca Lavio [32°53′08.13″S 71°7′56.99″W], 4–6.x.1991, L. Peña. Paratype ♀ (MACN), **CHILE: Región V (Valparaíso):** *Valparaíso Province*: Valparaíso, Cerro La Campana [32°54′47.59″S 71°08′53.52″W], 12.x.1968, L. Vásquez.

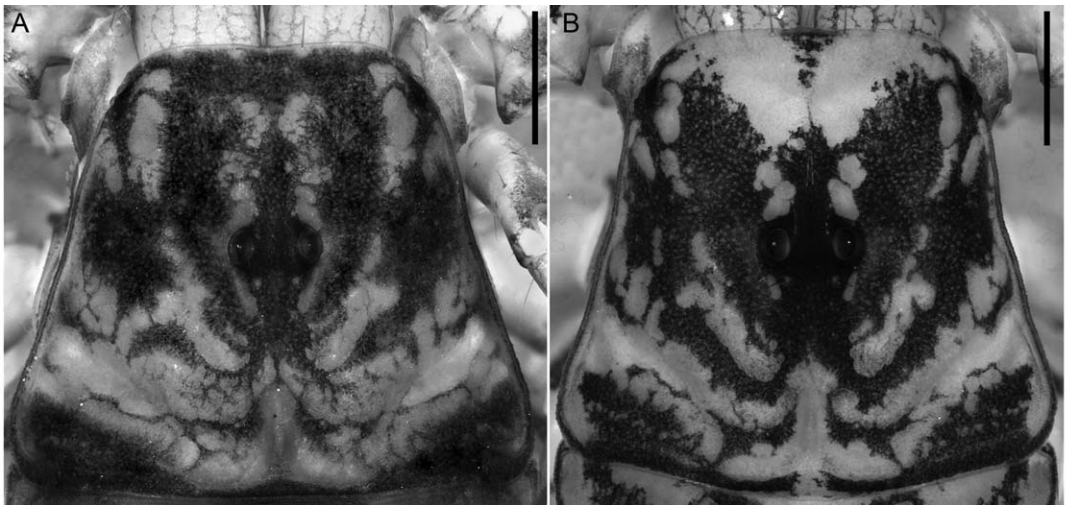

FIGURE 4. Species of *Urophonius* Pocock, 1893, carapace, dorsal aspect, showing pigmentation pattern. **A.** *U. pizarroi* Ojanguren-Affilastro et al., 2010, paratype ♀ (MZUC). **B.** *U. tregualemuensis* Cekalovic, 1981, ♀ (AMNH). Scale bars = 1 mm.

Etymology: This species is dedicated to the Chilean biologist, José Mondaca Escudero (Servicio Agrícola Ganadero de Chile (SAG) and Sociedad Entomológica Chilena), for his assistance during recent expeditions to Chile.

Diagnosis: *Urophonius mondacai*, n. sp., is morphologically most similar to *U. tregualemuensis,* but the two species can be separated based on the orientation of the VSM carinae of metasomal segments I–III. The VSM carinae are subparallel in the posterior two-thirds of the segment, and diverging at the anterior margin in *U. mondacai*, n. sp. (fig. 7A), but subparallel along the entire length of the segment in *U. tregualemuensis*.

Urophonius mondacai, n. sp., is also related to *U. pizarroi*, which occurs in close geographical proximity and shares a similar activity period. *Urophonius mondacai*, n. sp., can be separated from *U. pizarroi* and *U. tregualemuensis* by the pigmentation pattern on metasomal segments I–IV. *Urophonius mondacai*, n. sp., exhibits a single, faint VM stripe, paired, faint VSM stripes and paired VL stripes, whereas *U. pizarroi* and *U. tregualemuensis* exhibit only a single VM and paired VL stripes. In addition, *U. mondacai*, n. sp., is light yellowish in color, whereas *U. pizarroi* is dark brown.

Urophonius transandinus also occurs in the same area as *U. mondacai*, n. sp. The two species can be separated as follows. *Urophonius mondacai*, n. sp., possesses one macroseta (M1) associated with the *d* and *e* trichobothria of the pedipalp femur, whereas *U. transandinus* possesses two (M1, M2). The pedipalp chela manus of *U. mondacai*, n. sp., is less robust, with length/width ratio of 4.36 in ♂ and 5.07 in ♀, than that of *U. transandinus*, with length/width ratio of 2.53–3.08 (n = 20; mean = 2.78) in ♂ and 3.27–3.77 (n = 20; mean = 3.51) in ♀.

Urophonius mondacai, n. sp., can be further separated from *U. pizarroi* and *U. transandinus* by the shape of the hemispermatophore. In *U. mondacai*, n. sp., the proximal part of the basal lobe is weakly developed, situated in line with or distal to the capsular concavity (fig. 6A), and the

proximal part of the basal lobe terminates in a short laminar structure whereas, in *U. pizarroi* and *U. transandinus*, the proximal part of the basal lobe is well developed, situated proximal to the capsular concavity, and the basal lobe terminates in a conspicuous elongated structure (fig. 5E, G).

Description: Based on the holotype ♂ (AMNH) and a paratype ♀ (MACN).

Total length: 29.33 mm in ♂ holotype; 29.01 mm in ♀ paratype.

Color: Base color yellowish, with dark brown spots of pigmentation (fig. 13). Cheliceral manus, external surface with faint reticulate pigmentation; fixed finger densely pigmented basally; movable finger, external surface densely pigmented. Carapace, anterior margin with small unpigmented subtriangular area medially; paired broad, dark stripes extending from lateral sides to anterior part of posteromedian longitudinal sulcus, surrounding median ocular tubercle and unpigmented triangle; distal half of anteromedian longitudinal sulcus densely pigmented; median ocular tubercle and lateral ocelli dark brown; paired stripes extending from lateral margins to posteromedian longitudinal sulcus; paired dark spots covering most of posterior margin laterally, leaving unpigmented area medially. Tergites I–VI each with paired dark spots, laterally and submedially, submedian spots subtriangular, converging medially at posterior margin of segment and reaching anterior margin to form small median spot, lateral spots occupying most of lateral margins; VII with paired dark spots converging laterally at anteromedian margin. Sternum, genital opercula and pectines unpigmented. Sternite III unpigmented; IV and V, lateral margins faintly pigmented; VI, lateral and posterior margins faintly pigmented; VII with pair of broad VSM stripes in posterior half of segment, faintly pigmented on lateral margins. Metasomal segment I, dorsal surface with paired dark spots posterolaterally, not contiguous medially, connected to lateral spots, and with paired narrow stripes along DL carinae; lateral surfaces each with broad dark spots ventral to VSM carinae in posterior half of segment, not connected to VL stripes, and reticulate pigmentation elsewhere, connected to VL stripes; ventral surface, anterior margin with paired reticulate VSM stripes and paired narrow VL stripes, contiguous in posterior half of segment, forming pair of broad VL stripes not contiguous at posterior margin, VM stripe in anterior half of segment also connected to VSM stripes by reticulate pigmentation (fig. 3B). Metasomal segments II and III as for I except lateral spot ventral to LSM carinae only reaching posterior third of segment. Metasomal segment IV as for II and III except lateral spot contiguous with VSM stripes near posterior margin. Metasomal segment V, dorsal surface with faint reticulate pigmentation in posterior three-quarters of segment; lateral surfaces with reticulate pigmentation in anterior three-quarters and dark spot in posterior quarter; ventral surface with paired narrow VSM and VL stripes at anterior margin, contiguous in anterior third of segment, forming two broad VL stripes not contiguous at posterior margin of segment, narrow VM stripe in anterior third not contiguous with VSM stripes. Telson vesicle, dorsal surface densely pigmented (♀) or covered mostly by unpigmented gland (♂); other surfaces densely pigmented, except for paired, narrow VSM and VL unpigmented stripes; aculeus unpigmented basally, apex dark brown. Pedipalps, trochanter with reticulate pigmentation dorsally; femur with well-developed stripes along DI and DE carinae, connected by three dark spots, medially, at articulation with trochanter, and at articulation with patella; patella, internal margin with dark spot medially, dorsal surface densely pigmented, with

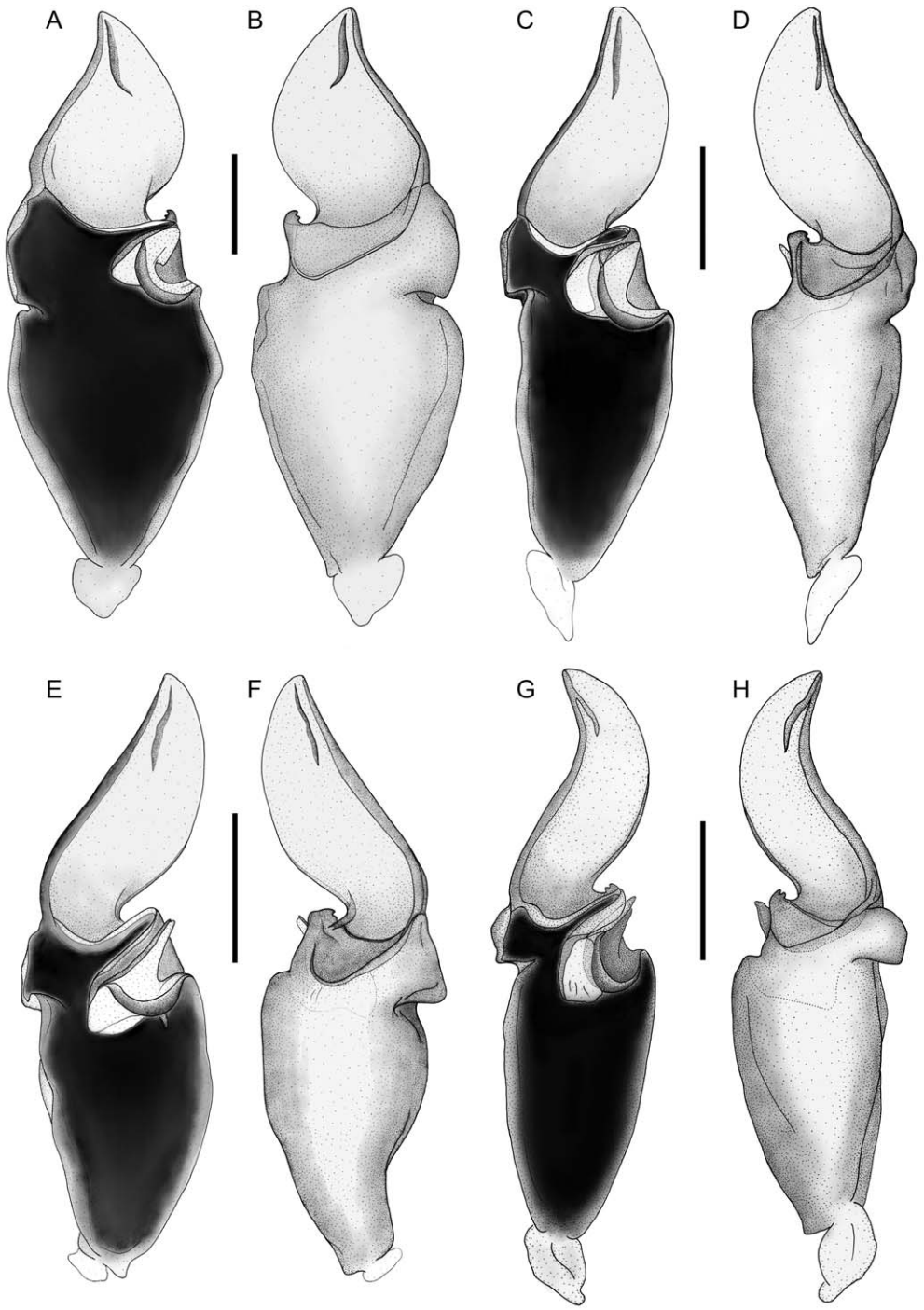

FIGURE 5. Species of *Urophonius* Pocock, 1893, sinistral hemispermatophore, ectal and ental aspects. **A, B.** *U. granulatus* Pocock, 1898, ♂ (MACN). **C, D.** *U. tregualemuensis* Cekalovic, 1981, ♂ (MACN). **E, F.** *U. pizarroi* Ojanguren-Affilastro et al., 2010, paratype ♂ (MZUC). **G, H.** *U. transandinus* Acosta 1998, ♂ (MACN). Scale bars = 1 mm.

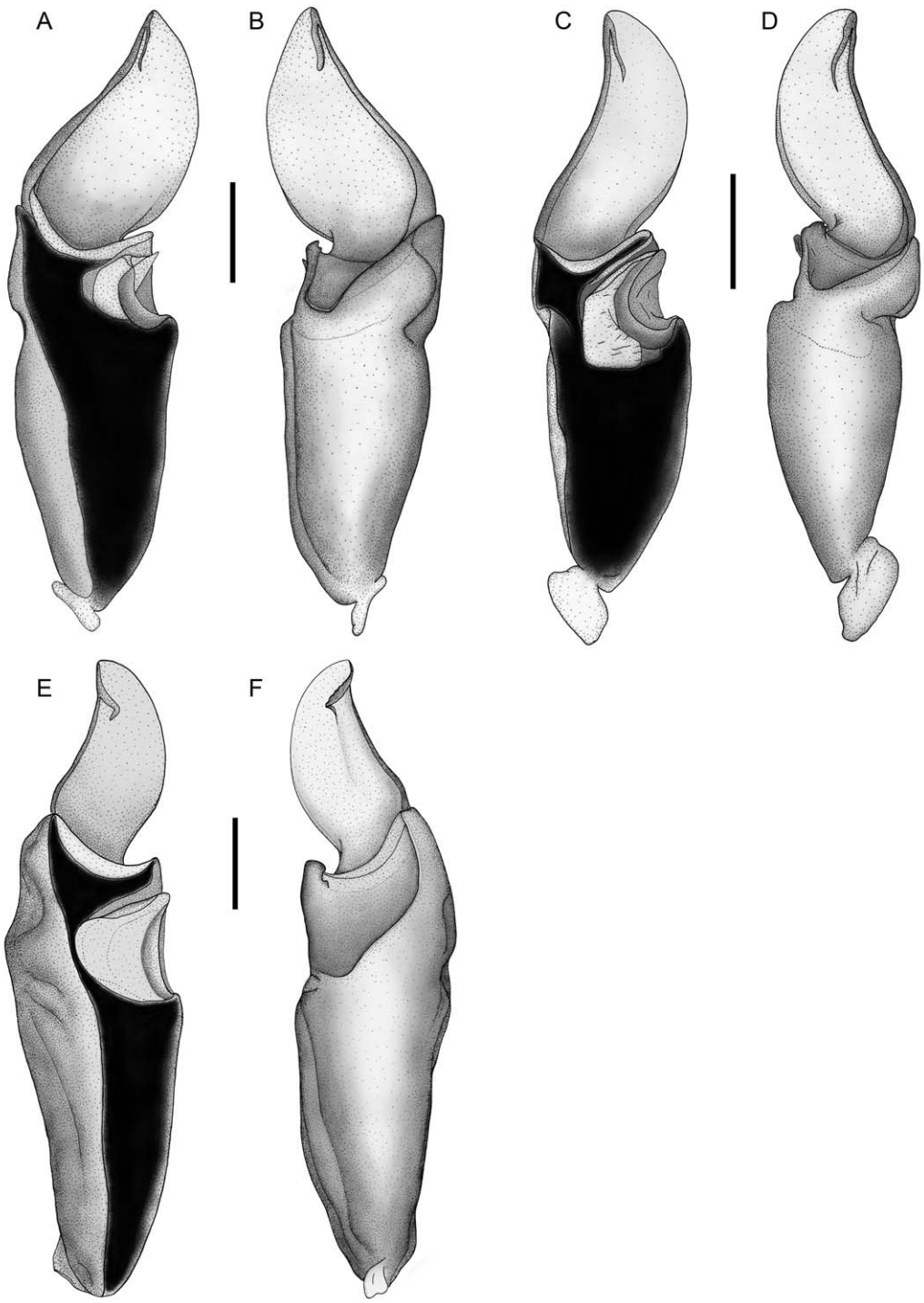

FIGURE 6. Species of *Urophonius* Pocock, 1893, sinistral hemispermatophore, ectal and ental aspects. **A, B.** *U. mondacai*, n. sp., holotype ♂ (AMNH). **C, D.** *U. tumbensis* Cekalovic, 1981, ♂ (MACN). **E, F.** *U. martinezi* Ojanguren-Affilastro and Cheli, 2009, paratype ♂ (MACN). Scale bars = 1 mm.

dark spots at articulation with femur and chela, connected by broad stripe medially, posterior margin with dark stripe medially and narrow, dark stripe ventroexternally; chela with seven dark stripes along DI, DM, DS, D, E, V and VM carinae; base and articulation of fixed and movable fingers with sparse, reticulate pigmentation. Legs, coxa faintly pigmented near base; trochanter spotted prolaterally; femur pigmented at articulation with patella and along ventroexternal margin; patella pigmented at articulations and along ventral margin; tibia pigmented at articulation with patella; basitarsus pigmented at articulation with tibia; telotarsus unpigmented.

Carapace: Surfaces smooth (♀) or slightly granular (♂), more densely so near lateral margins. Anterior margin almost straight. Anteromedian longitudinal sulcus and interocular sulcus weakly developed; posteromedian longitudinal and posterolateral sulci well developed. Median ocular tubercle pronounced; median ocelli large, approximately 1.5 diameters apart; each with two longitudinally aligned microsetae anteriorly and one macroseta posteriorly. Three pairs of small lateral ocelli on each side of carapace; anterior ocellus ca. 30% larger than other ocelli, anterior and median ocelli situated close together, in same horizontal axis, posterior ocellus, 50% smaller, situated slightly dorsal to others.

Tergites: Surfaces I–VI smooth (♀) or finely granular (♂), more coarsely so near posterior and lateral margins; VII with paired submedian carinae, restricted to posterior half of segment, and lateral carinae, restricted to posterior two-thirds, intercarinal surfaces with scattered medium-sized granules, remaining surfaces finely granular.

Sternites: Surfaces III–VI smooth, each with small elliptical spiracles; VII, anterior half smooth, posterior half finely granular, with four well-developed (paired VL and VSM) carinae; posterior margin with moderate carina.

Metasoma: Segment I, dorsal surface finely granular (♂) or smooth (♀); DL and LSM carinae granular, extending entire length of segment, more developed in ♂ (fig. 7A, B); surface between DL and LSM carinae sparsely granular; LIM carinae restricted to posterior half of segment; one pair of LIM macrosetae; lateral margins and ventral surface sparsely granular; VL carinae subparallel, granular; VSM carinae diverging in anterior third of segment, subparallel in posterior two-thirds; three pairs of VL and two pairs of VSM macrosetae. Segment II, DL carinae granular, extending entire length of segment; LSM carinae restricted to anterior and posterior thirds of segment, smooth (♀) or finely granular (♂) medially; LIM carina restricted to posterior half of segment; one pair of DL, LSM, and LIM macrosetae; VL carinae subparallel, extending entire length of segment; VSM carinae diverging in anterior third of segment, subparallel in posterior three-quarters, comprising discontinuous granules; three pairs of VSM and VL macrosetae, intermediate setae ca. 50% smaller. Segment III, DL carinae granular, extending entire length of segment; LSM carinae present in anterior and posterior thirds of segment, smooth medially; LIM carina represented by small granules in posterior quarter of segment; one pair of DL, LSM, and LIM macrosetae; VL carinae obsolete, reduced to slight curvature of surface along entire length of segment; VSM carinae absent (♂) or similar to but less developed than on segment II, represented only by scattered granules (♀); three pairs of VSM and two pairs of VL macrosetae. Segment IV, DL carinae granular, extending almost entire length of segment; LSM carinae restricted

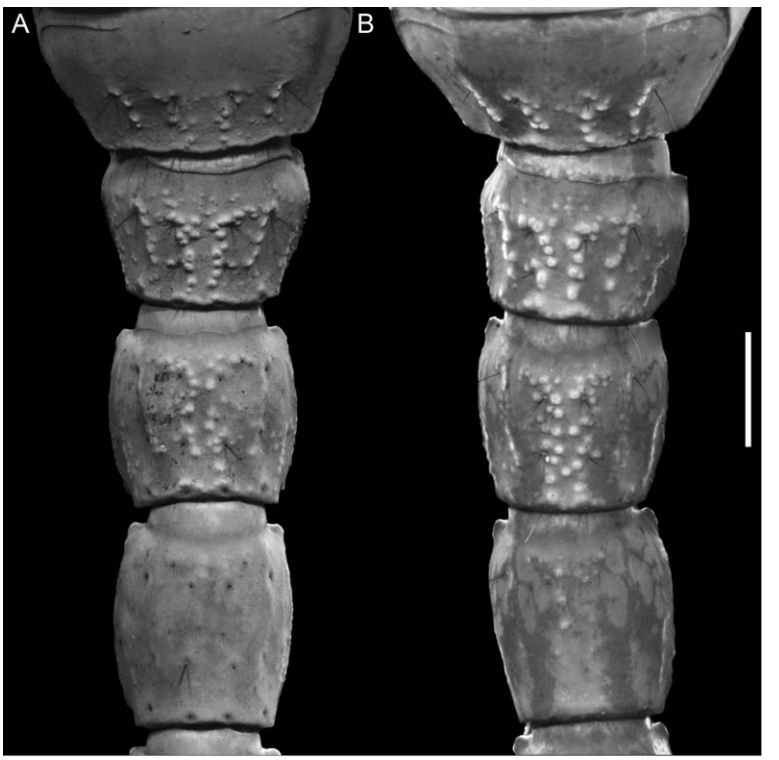

FIGURE 7. *Urophonius mondacai*, n. sp., sternite VII and metasomal segments I–III, ventral aspect. **A.** Holotype ♂ (AMNH). **B.** Paratype ♀ (MACN). Scale bar = 1 mm.

to anterior margin of segment, accessory carina connecting posterior margin of LSM carina to median part of DL carina; LIM carina absent; one pair of DL, LSM, and LIM macrosetae; ventral surface smooth; three pairs of VSM and VL macrosetae. Segment V elongated (fig. 11A, D); length/width ratio: 2.28 (♂), 2.37 (♀); length/height ratio: 2.61 (♂), 2.59 (♀); dorsal and lateral surfaces smooth; DL carina absent, reduced to single granule at anterodorsal margin and pair of macrosetae; LSM carina represented only by two pairs of macrosetae; LIM carina absent; ventral surface granular in posterior half of segment; VL carinae restricted to posterior two-thirds of segment, comprising larger granules near posterior margin; VSM carinae subparallel to VL carinae, restricted to posterior margin of segment and barely discernible from granulation; VM carinae reduced to posterior third of segment (♂) or more developed and occupying posterior half (♀), bifurcating into two divergent carinae at posterior margin; four pairs of VL macrosetae, three pairs of VSM macrosetae, and two pairs of macrosetae at posterior margin of segment.

Telson: Vesicle shallow (♀) or globose (♂) (fig. 12A, D); dorsal surface smooth, with (♂) or without (♀) elliptical median depression, corresponding to telson gland; ventral surface with scattered, blunt granules. Aculeus short, shallowly curved.

Pedipalps: Femur with DI, DE, and VI carinae granular, extending entire length of segment; intercarinal surfaces sparsely covered with medium-sized granules; one dorsal macroseta (M1) associated with *d* and *e* trichobothria; trichobothrium *e* situated proximal to M1 (fig. 2B). Patella with DI and VI carinae distinct, granular, extending entire length of segment (fig. 14); DE carina obsolete, visible only as slight curvature of surface, along entire length of segment (♂) or absent (♀). Chela manus very slender in ♀, slightly more robust in ♂, length/width ratio 4.36 (♂), 5.07 (♀); length/height ratio 4.43 (♂), 4.80 (♀); acarinate (fig. 15); internal surface with slight bulge near articulation of movable finger (♀) or pronounced, subtriangular

FIGURE 8. *Urophonius transandinus* Acosta, 1998, northern population ("La Campana" National Park, Chile), sternite VII and metasomal segments I–III, ventral aspect. **A.** ♂ (MACN). **B.** ♀ (MACN). Scale bar = 1 mm.

projection, shallow depression, and group of six granules near base of movable finger, with additional granule between this group of granules and median denticle row of fixed finger (♂); fingers elongated, median denticle row uneven medially, but not forming distinct double row, with five or six pairs of internal and external accessory denticles.

Legs: Surfaces smooth. Basitarsi each with two well-developed, equal-length pedal spurs. Telotarsi elongated, shallow, each with well-developed ventromedian row of hyaline spinules and paired pro- and retroventral rows of spiniform macrosetae, with following counts on telotarsus I: 1/1, II: 2/2, III: 5–6, IV: 5–6/6; only pair of spiniform macrosetae on I and first pair on II subspiniform, others stout spiniform. Ungues curved, equal in length. Pseudonychium medium sized, apex slightly curved. Median dorsal lobe short, barely protruding.

Pectines: Tooth count: 16–16 (♂); 15–16 (♀).

Hemispermatophore: Basal portion well developed. Distal lamina well developed, ca. 30%

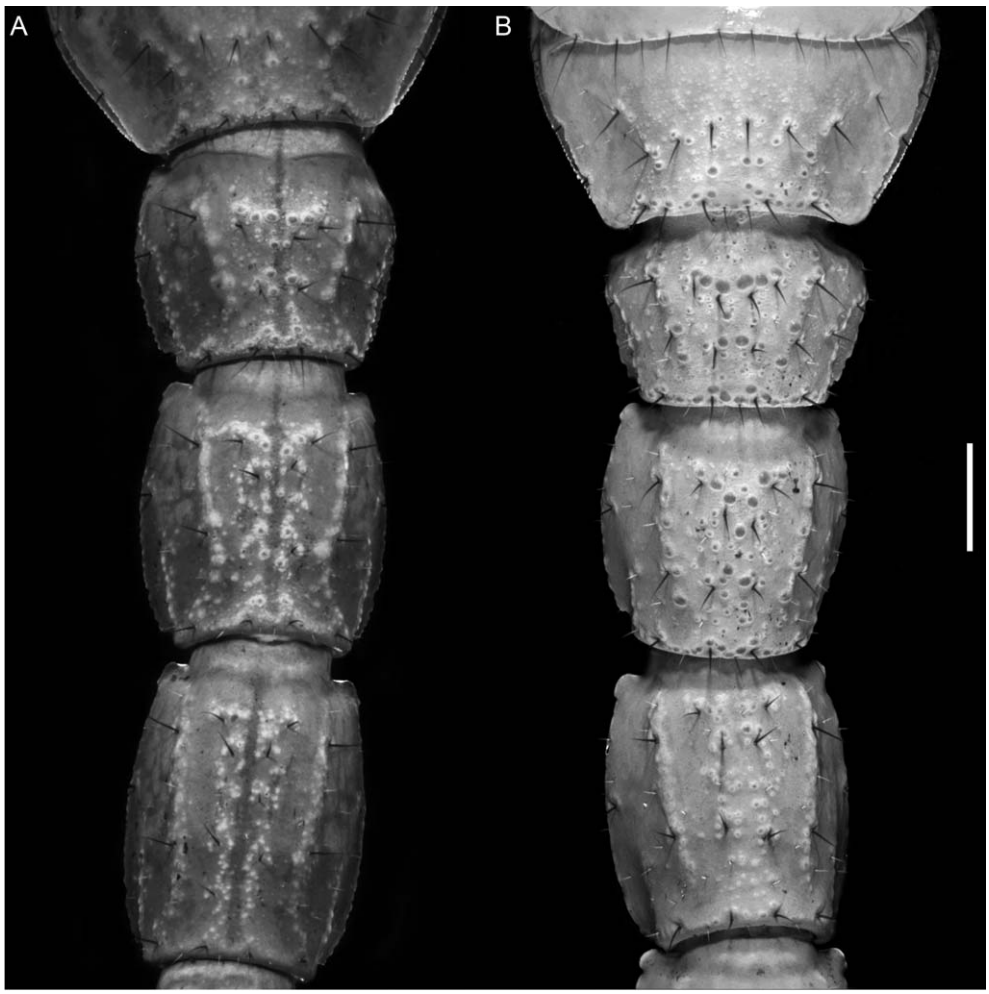

FIGURE 9. *Urophonius transandinus* Acosta, 1998, southern population (Curico, Chile), sternite VII and metasomal segments I–III, ventral aspect. **A.** ♂ (MACN). **B.** ♀ (MACN). Scale bar = 1 mm.

shorter than basal portion; distal crest slightly undulated, oriented in same direction as principal axis of hemispermatophore; frontal crest (distal posterior flexure) present; internal lobe with two well-developed denticles, not connected to distal lamina (fig. 6B), external denticle approximately double the size of internal denticle. Lobe region weakly developed (fig. 6A); basal lobe well developed, barely protruding, without internal laminar extension, anterior surface forming broad, concave excavation; genital plug not recovered during removal of paraxial organ tissues.

Distribution: This species is presently known only from the "La Campana" and "La Dormida" hills, occupying a small area in the Región Metropolitania de Santiago and the Región V (Valparaíso) of central Chile (fig. 1).

Ecology: The known records of *U. mondacai*, n. sp., fall within the "Matorral y Bosque Esclerófilo" botanical region (Gajardo, 1993), a heterogeneous landscape covered by dry woods, palm forests, and shrub steppes. The label data are insufficiently detailed to identify the exact

FIGURE 10. *Urophonius tumbensis* Cekalovic, 1981, sternite VII and metasomal segments I–III, ventral aspect. **A.** ♂ (MACN). **B.** ♀ (MACN). Scale bar = 1 mm.

habitat of the species, however. All known specimens were collected in October, suggesting that this species is active in spring.

Urophonius transandinus Acosta, 1998
11B, E, 12B, E, 16–19; tables 1, 2

Urophonius transandinus Acosta, 1998: 157–164; Ojanguren-Affilastro et al., 2010: 2, 3.

Urophonius brachycentrus: Kraepelin, 1894 (part): 221 [ZMH specimen from Valparaíso; misidentfied]; Cekalovic, 1983 (part): 51 [reference to Kraepelin, 1894].

Urophonius granulatus: Kraepelin, 1899 (part): 194 [presumably same ZMH specimen from Valparaíso, with corrected determination label; misidentified]; Cekalovic, 1983a (part): 52 [reference to Kraepelin, 1899].

Urophonius corderoi Mello-Leitão, 1931: Cekalovic, 1981 (part): 200; 1983b: 189; 1983a: 52 [misidentified].
Urophonius sp. [*brachycentrus* group]: Acosta, 1988: 25 (Fig. 4), 28.

Type Material: Holotype ♂ (ZMH), **CHILE: Región V (Valparaíso):** *Valparaíso Province*: Valparaíso [33°03′S 71°38′W], 15.v.1893, J. Michelsen. Paratypes: **CHILE: Región V (Valparaíso):** *Valparaíso Province*: Road from Casablanca to Algarrobo, 15.vii.1966, J. Solervicens, 1 ♂ (MACN 9602), allotype ♀ (MACN 9601), 1 ♀ (CDA); El Arrayan [33°37′26.5″S 71°36′40.1″W, 19 m], 4.ix.1963, Ecología Animal, 1 ♂ (MZUC 392); El Canelo [33°08′11.2″S 71°39′54.2″W, 212 m], 3.x.1967, G. López, 1 ♀ (MZUC 608).

New Records: **CHILE: Región V (Valparaíso):** *Marga-Marga Province*: "La Campana" National Park, Granizo sector, 32°58′53.1″S 71°07′38.2″W, 446 m, 16.vii.2009, A.A. Ojanguren-Affilastro, J. Pizarro-Araya, M. Izquierdo and F.M. Alfaro, 1 ♂, 3 ♀, 5 juv. (AMNH), 1 ♂, 3 ♀, 5 juv. (MHNS), 1 ♂, 3 ♀ (MACN), 22–23.vii.2010, A.A. Ojanguren-Affilastro, J. Pizarro-Araya, D. Valdivia, L. Piacentini and E. Soto, 5 ♂, 12 ♀ (MACN), 4 ♂, 14 ♀ (MNHNS), 1 ♀ (AMNH [LP 10614]). **Región Metropolitana de Santiago:** *Santiago Province*: Cerro Manquehue [33°20′S 70°35′W], viii.1979, Jacobsohn, 1 ♀, (MACN); Farellones [33°20′38.98″S 70°22′38.44″W], 12.xi.1973, Valencia, 2 ♀, 1 juv. (MZUC); Río Clarillo [33°43′50.47″S 70°27′59″W], vii.1983, Lewin, 1 ♀ (MACN). **Región VI (Libertador Bernardo de O'Higgins):** *Colchagua Province*: La Palmilla de Reto [34°30′37.71″S 71°34′07.92″W], 1.vi.2002, Cornejo, 1 ♀, (MHNS); Rancagua-Machali [34°11′11.64″S 70°41′46.9″W], viii.2007, Castro-Martínez, 1 ♂, 4 ♀ (MHNS); "Río los Cipreses" National Reserve, "Las Arpas" sector, 34°16′52.1″S 70°27′4.2″W, 1066 m, 20.vii.2010, A.A. Ojanguren-Affilastro, J. Mondaca, J. Pizarro-Araya, D. Valdivia, L. Piacentini, and E. Soto, 5 ♂, 12 ♀ (MACN), 5 ♂, 12 ♀ (MNHNS), 1 ♂, 1 ♀, 2 subad., 1 juv. (AMNH [LP 10669]). **Región VII (Maule):** *Curico Province*: Los Niches, Curico, 35°03′47.4″S 71°07′22.3″W, 299 m, 19.vii.2009. A.A. Ojanguren-Affilastro, J.E. Barriga-Tuñón, J. Pizarro-Araya, M. Izquierdo and F.M. Alfaro, 1 ♂, 10 ♀ (AMNH), 1 ♂, 10 ♀ (MACN), 12 ♀ (MNHNS), 18.vii.2010, A.A. Ojanguren-Affilastro, J.E. Barriga-Tuñón, J. Pizarro-Araya, D. Valdivia, L. Piacentini and E. Soto, 5 ♂, 12 ♀ (MACN), 5 ♂, 12 ♀ (MNHNS), 2 ♀ (AMNH [LP 10653]); Yacal, 35°10′23.9″S 71°07′25.1″W, 421 m, 19.vii.2010 A.A. Ojanguren-Affilastro, J. Pizarro-Araya, D. Valdivia, L. Piacentini, and E. Soto, 4 ♂, 11 ♀ (MACN), 4 ♂, 13 ♀ (MNHNS).

Diagnosis: *Urophonius transandinus* is most similar morphologically to *U. tumbensis* and occurs in sympatry with *U. mondacai*, n. sp., *U. pizarroi*, and *U. tregualemuensis*. It may be separated from these species by the presence of two macrosetae (M1, M2) associated with the *d* and *e* trichobothria of the pedipalp femur, only one (M1) of which is present in the other species. Additionally, the pedipalp chela manus of *U. transandinus* is more robust, with length/width ratio of 2.53–3.08 (n = 20; mean = 2.78) in ♂ and 3.27–3.77 (n = 20; mean = 3.51) in ♀, than that of *U. mondacai*, n. sp., with length/width ratio of 4.36 ♂, and 5.07 in ♀.

Urophonius transandinus can be further separated from *U. mondacai*, n. sp., and *U. tregualemuensis* by the shape of the hemispermatophore. In *U. transandinus*, the proximal part of the basal lobe is well developed, situated proximal to the capsular concavity, and the basal lobe terminates in a conspicuous elongated structure, whereas in *U. mondacai*, n. sp.,

FIGURE 11. Species of *Urophonius* Pocock, 1893, metasomal segment V, ventral aspect. **A.** *U. mondacai*, n. sp., holotype ♂ (AMNH). **B.** *U. transandinus* Acosta, 1998, ♂ (MACN). **C.** *U. tumbensis* Cekalovic, 1981, ♂ (MACN). **D.** *U. mondacai*, n. sp., paratype ♀ (MACN). **E.** *U. transandinus*, ♀ (MACN). **F.** *U. tumbensis*, ♀ (MACN). Scale bars = 1 mm.

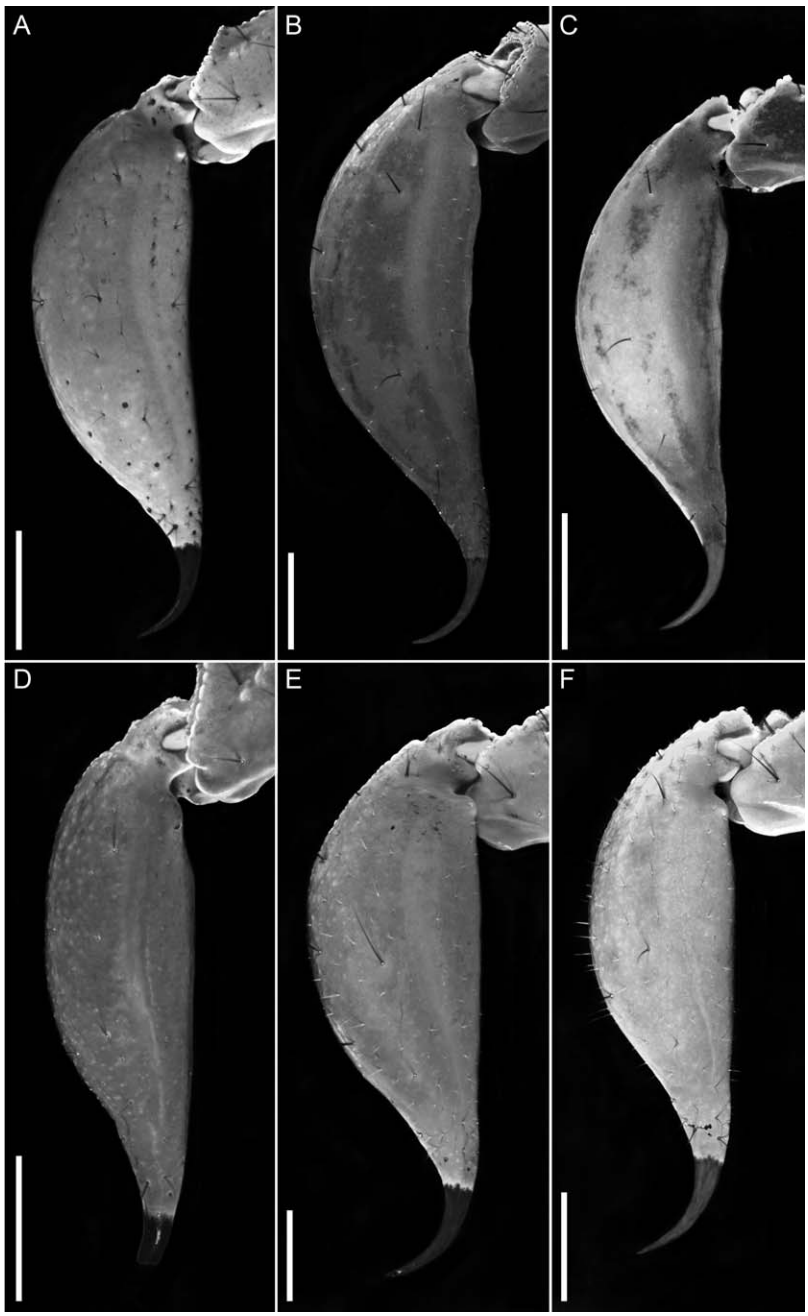

FIGURE 12. Species of *Urophonius* Pocock, 1893, telson, lateral aspect. **A.** *U. mondacai*, n. sp., holotype ♂ (AMNH). **B.** *U. transandinus* Acosta, 1998, ♂ (MACN). **C.** *U. tumbensis* Cekalovic, 1981, ♂ (MACN). **D.** *U. mondacai*, n. sp., paratype ♀ (MACN). **E.** *U. transandinus*, ♀ (MACN). **F.** *U. tumbensis*, ♀ (MACN). Scale bars = 1 mm.

TABLE 1. Measurements (mm) of *Urophonius mondacai,* n. sp., *Urophonius transandinus* Acosta, 1998, and *Urophonius tumbensis* Cekalovic, 1981. Institutional acronyms as follows: AMNH: American Museum of Natural History, New York; MACN: Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires, Argentina; ZMH: Zoologisches Museum, Hamburg, Germany.

Specimen:	*U. mondacai*		*U. transandinus*		*U. tumbensis*	
Type	Holotype	Paratype	Holotype	Paratype		
Sex	♂	♀	♂	♀	♂	♀
Collection	AMNH	MACN	ZMH	MACN	MACN	MACN
Carapace:						
length	3.20	3.24	4.19	3.90	2.96	3.64
anterior width	2.40	2.48	2.91	3.09	2.40	2.80
posterior width	3.76	3.80	4.51	4.58	3.28	4.40
Chela:						
length	5.49	5.38	7.96	6.96	5.77	5.65
width	1.26	1.06	2.84	2.01	1.76	1.60
height	1.24	1.12	2.92	2.04	1.84	1.72
movable finger length	3.60	3.40	4.87	4.30	3.40	1.04
Patella:						
length	3.40	3.20	4.30	3.90	2.96	3.28
width	1.24	1.24	1.62	1.45	1.04	1.28
Femur:						
length	3.00	2.80	3.98	3.65	2.92	3.24
width	0.92	0.88	0.97	1.30	0.92	1.00
Mesosoma:						
length	9.29	11.41	9.89	9.41	8.32	10.43
Metasoma I:						
length	1.60	1.60	2,43	2.13	1.44	1.80
width	2.16	2.16	2.76	2.91	1.76	2.32
Metasoma II:						
length	1.80	1.80	2.92	2.48	1.76	1.92
width	1,92	1.92	2.60	2.66	1.64	2.16
Metasoma III:						
length	2.00	1.89	3.33	2.78	1.92	2.24
width	1.84	1.88	2.52	2.60	1.60	2.08
Metasoma IV:						
length	2.60	2.40	4.14	3.40	2.68	2.68
width	1.80	1.80	2.52	2.60	1.60	2.04
Metasoma V:						
length	4.28	3.88	5.93	4.83	3.60	3.60
width	1.88	1.64	2.51	2.44	1.52	1.92
height	1.64	1.50	1.95	2.04	1.28	1.60
Metasoma:						
total length	12.28	11.56	18.75	15.62	11.40	12.24
Telson:						
total length	4.56	-	7.23	6.19	4.40	4.72
vesicle length	3.52	2.80	6.08	4.58	3.52	3.28
vesicle width	1.68	1.28	2.43	2.29	1.60	1.68
vesicle height	1.40	1.02	2.03	1.79	1.28	1.44
aculeus length	1.04	-	1.22	1.61	0.88	1.04
Total length	29.33	29.01	40.06	35.12	27.08	31.03

TABLE 2. Currently recognized species of *Urophonius* Pocock, 1893, species groups to which assigned, and countries, provinces (Argentina), states (Brazil), regions (Chile), or departments (Uruguay) in which they have been recorded.

Group A	
Urophonius eugenicus (Mello-Leitão, 1931)	ARGENTINA: Santa Cruz
Urophonius exochus (Penther, 1913)	ARGENTINA: Mendoza, Neuquén, Río Negro
Urophonius mahuidensis Maury, 1973	ARGENTINA: Buenos Aires
Urophonius martinezi Ojanguren-Affilastro and Cheli, 2009	ARGENTINA: Chubut
Group B	
Urophonius achalensis Abalos and Hominal, 1974	ARGENTINA: Córdoba
Urophonius brachycentrus (Thorell, 1876)	ARGENTINA: Buenos Aires, Córdoba, La Pampa, La Rioja, Río Negro, San Juan, San Luís, Santiago del Estero, Tucumán
Urophonius granulatus Pocock, 1898	ARGENTINA: Chubut, Santa Cruz; CHILE: Magallanes
Urophonius iheringii Pocock, 1893	ARGENTINA: Buenos Aires; BRAZIL: Río Grande do Sul; URUGUAY: Lavalleja, Maldonado, Montevideo, Tacuarembó
Urophonius mondacai, n. sp.	CHILE: Metropolitana de Santiago, Valparaíso
Urophonius pizarroi Ojanguren-Affilastro et al., 2010	CHILE: Metropolitana de Santiago
Urophonius somuncura Acosta, 2003	ARGENTINA: Río Negro
Urophonius transandinus Acosta, 1999	CHILE: Metropolitana de Santiago, Valparaíso, Libertador Bernardo de O'Higgins, Maule
Urophonius tregualemuensis Cekalovic, 1981	CHILE: Araucanía, Bío-Bío, Maule, Libertador Bernardo de O'Higgins
Urophonius tumbensis Cekalovic, 1981	CHILE: Bío-Bío

and *U. tregualemuensis*, the proximal part of the basal lobe is less developed, situated in line with or distal to the capsular concavity, and the proximal part of the basal lobe terminates in a short laminar structure.

Urophonius transandinus can be further separated from *U. pizarroi*, *U. tregualemuensis,* and *U. tumbensis* by the orientation of the VSM carinae on metasomal segments I and II or I–III. The VSM carinae are subparallel in the posterior two-thirds of the segment, diverging in the anterior third, in *U. transandinus* but subparallel along its entire length in *U. pizarroi* and *U. tregualemuensis*, and they form a transverse carina in *U. tumbensis*.

Urophonius transandinus can be further separated from *U. pizarroi* and *U. tregualemuensis* by the pigmentation pattern on the ventral surface of metasomal segments I–IV. *Urophonius transandinus* exhibits paired VL and VSM stripes, and occasionally a single VM stripe, whereas *U. pizarroi* and *U. tregualemuensis* exhibit a single VM and paired VL stripes.

DESCRIPTION: Based on ♂ and ♀ specimens (AMNH, MACN, MZUC).

Total length: 33–43 mm (n = 20; mean = 37.77 mm) in ♂; 36.5–47 mm (n = 34; mean = 41.21 mm) in ♀.

FIGURE 13. *Urophonius mondacai*, n. sp., habitus. **A, B.** Holotype ♂ (AMNH). **C, D.** paratype ♀ (MACN). **A, C.** Dorsal aspect. **B, D.** Ventral aspect. Scale bars = 10 mm.

Color: Base color yellowish, with dark brown spots of pigmentation (fig. 16). Cheliceral fingers densely pigmented; manus densely pigmented at base of fixed finger and articulation of movable finger, with reticulate pigmentation elsewhere. Carapace, anterior two-thirds densely pigmented; anterior margin pigmented medially; lateral ocelli, anteromedian longitudinal sulcus, median ocular tubercle, and anterior margin of postocular sulcus densely pigmented; posterior two-thirds of postocular sulcus unpigmented; paired broad, dark stripes extending laterally from anterior margin to posteromedian longitudinal sulcus, complete or nearly so in densely pigmented specimens but disappearing near anterior margin in faintly pigmented specimens; paired dark spots laterally and posterolaterally. Tergites I–VII, each with

paired dark spots laterally, leaving unpigmented stripe medially, but not reaching lateral margins, spots restricted to posterior two-thirds or posterior half of segment in faintly pigmented specimens, but occupying most of lateral surface, reaching anterior part of segment in densely pigmented specimens; median unpigmented stripe complete on I–III, lateral spots usually contiguous at anterior margins of IV–VII. Sternum, genital opercula, and pectines unpigmented. Sternite III with faint sparse spots; IV–VI each with small spot at anterolateral margin and additional faint sparse spots; VII, lateral margins densely pigmented in anterior half, with three dark stripes ventrally, usually connected by reticulate pigmentation in median part of segment, two broad stripes laterally, usually restricted to posterior half of segment, and narrow stripe medially, usually extending entire length of segment. Metasomal segment I, dorsal surface with paired dark spots at articulation points, paired triangular spots (very faint in less pigmented specimens) submedially, not contiguous medially, and paired spots at posterior margin, not contiguous medially, leaving unpigmented stripe medially; lateral margins densely pigmented, each with dark spot in posterior two-thirds of segment, ventral to LSM carinae, reaching VL carinae and dorsal spots posteriorly; VL stripes restricted to posterior half of segment, contiguous with ventral part of lateral spot; VSM stripes absent or reduced to faint pigmentation in median part of segment; VM stripe very narrow, faint, and restricted to median part of segment in specimens from northern populations (fig. 3C), well developed, extending entire length of segment in specimens from southern populations (fig. 3D). Metasomal segments II and III as for I, except dorsal surface with median spots contiguous, forming single triangular spot that may be faint in less pigmented specimens; lateral surfaces each with dark lateral spot restricted to posterior third of segment, remainder of lateral margin reticulate; VL stripes extending entire length of segment, posterior margins contiguous with dark lateral spot; VSM stripes well developed, occupying most of segment in specimens from northern populations. Metasomal segment IV as for II and III, except dorsal margin with median spot reduced to narrow stripe; lateral margins with lateral spot restricted to posterior third of segment; VL stripes extending entire length of segment, VSM stripes well developed, contiguous with VL stripes in posterior third of segment, and connected to VM stripe in anterior half by reticulate pigmentation. Metasomal segment V, dorsal surface with dorsolateral margins densely pigmented, especially in posterior half of segment, leaving unpigmented area medially; lateral margins densely pigmented at posterior margin, with reticulate pigmentation elsewhere; VL and VSM stripes extending entire length of segment, VL stripes becoming wider and more diffuse in posterior two-thirds, VSM stripes contiguous with VL stripes in posterior two-thirds; VM stripe extending entire length of segment, connected to VSM stripes in posterior half by reticulate pigmentation. Telson vesicle, dorsal surface unpigmented; ventral and lateral surfaces densely pigmented, except for VM stripe and paired VSM and lateral unpigmented stripes; aculeus reddish brown, apex dark brown. Pedipalps, trochanter with dark reticulate pigmentation dorsally; femur densely pigmented dorsally, especially near articulation points, external surface densely pigmented near articulation with patella, unpigmented elsewhere; patella densely pigmented dorsally, externally and dorsointernally, unpigmented ventrally; chela with reticulate pigmentation and seven dark longitudinal stripes, internal surface less pigmented and with two faint stripes,

area near articulation of fixed and movable fingers, and base of fingers densely pigmented. Legs, coxa unpigmented; trochanter with dark spot; femur, external surface with two dark spots medially and near articulation with patella; patella, dorsoexternal surface with two dark spots near articulation with femur and tibia; tibia with two dark spots, medially and near articulation with basitarsus; basitarsus with spot medially; telotarsus unpigmented.

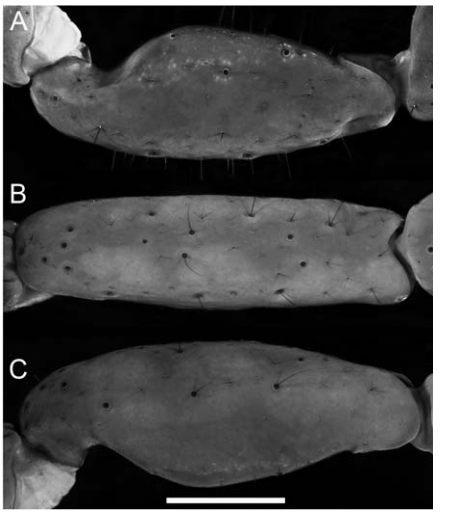

FIGURE 14. *Urophonius mondacai*, n. sp., holotype ♂ (AMNH), dextral pedipalp patella. **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. Scale bar = 1 mm.

Carapace: Surfaces finely granular in ♀, more coarsely granular in ♂. Anterior margin with very shallow median notch. Anteromedian longitudinal, interocular, posteromedian longitudinal, and posterolateral sulci well developed. Median ocular tubercle well developed, superciliary carinae more pronounced and median ocelli larger in ♂; ocelli approximately two diameters apart, each with one microseta situated anteriorly and one macroseta situated posteriorly, anterior microsetae replaced by macrosetae in some specimens. Three pairs of small lateral ocelli on each side of carapace, anterior and median ocelli situated very close together, in same horizontal axis, posterior ocellus situated slightly dorsal to others, one diameter apart.

Tergites: Surfaces I–VI smooth; VII with paired submedian and lateral carinae, comprising medium-sized granules, lateral carinae restricted to posterior two-thirds of segment, submedian carinae to posterior half. Tergite I with four posterior macrosetae, II–VI each with six posterior macrosetae; III–VII each with paired submedian macrosetae in anterior half of segment.

Sternites: Surfaces III–VI smooth, each with small elliptical spiracles; VII, anterior half smooth, posterior half granular, with four carinae, paired VSM and VL, well developed in ♀, obsolete in ♂; posterior margin with well developed carina.

Metasoma: Metasomal segment I, dorsal surface smooth to sparsely granular; DL carinae granular, more coarsely so near posterior margin, extending entire length of segment, with one pair of DL macrosetae; LSM carinae granular, extending entire length of segment, with one pair of LSM macrosetae; surface between DL and LSM carinae sparsely granular; LIM carinae restricted to posterior two-thirds of segment, with one pair of LIM macrosetae; VL carinae subparallel, VSM carinae diverging obliquely at anterior margin, subparallel at posterior margin, anterior part almost always oblique, VSM carinae creating V-shape in northern populations (fig. 8A, B), but forming transverse anterior carina in southern populations (fig. 9A, B); three pairs of VL macrosetae; four pairs of VSM macrosetae, anterior pair situated on anterolateral margin of VSM carina, not in same axis as other pairs. Segment II as for I, except with slightly less granular carinae; LIM carinae restricted to posterior third of

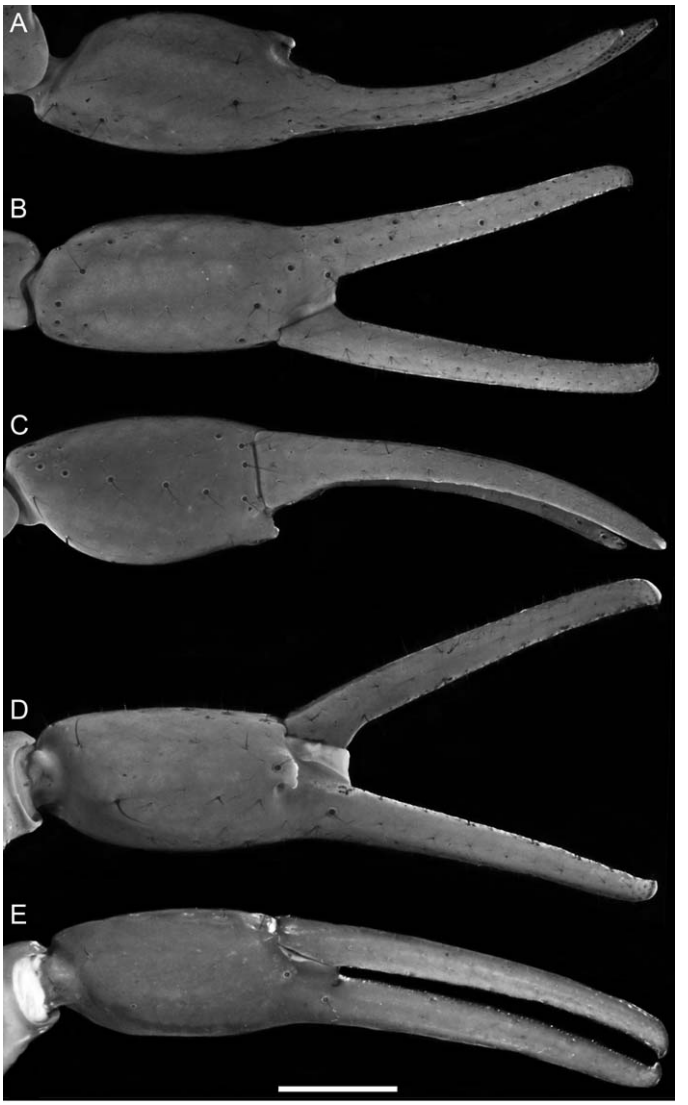

FIGURE 15. *Urophonius mondacai*, n. sp., dextral pedipalp chela. **A–D.** Holotype ♂ (AMNH). **E.** ♀ (MACN). **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. **D, E.** Internal aspect. Scale bar = 1 mm.

segment; VSM carinae slightly oblique in anterior third, not forming transverse carina. Segment III as for II, except with slightly less granular carinae; VSM carinae subparallel. Segment IV, DL, and LSM carinae distinct, granular (♀), or obsolete, reduced to slight elevation of surface (♂), extending entire length of segment; one pair of DL macrosetae; three or four pairs of LSM macrosetae; VL carinae obsolete, extending entire length of segment; VSM carinae obsolete, extending entire length of segment (♀), or absent (♂); five or six pairs of VSM macrosetae; four pairs of VL macrosetae. Segment V elongated (fig. 11B, E); length/width ratio 2.16–2.56 (n = 10; mean = 2.34) in ♂, 1.77–2.00 (n = 10; mean = 1.90) in ♀; length/height ratio 2.52–3.05 (n = 10; mean = 2.83) in ♂, 2.14–2.39 (n = 10; mean = 2.26) in ♀; DL carinae reduced to few granules in anterior third of segment and three or four pairs of DL macrosetae; LSM carinae represented only by four or five pairs of macrosetae; LIM carinae absent; VL carinae granular, extending entire length of segment; five pairs of VL macrosetae, posterior pair situated posterior to posterior transverse carina; VSM carinae barely distinguishable from, and reduced to additional granules parallel to VL carinae, and in most specimens to few granules surrounding VL macrosetae; VM carina extending entire length of segment, bifurcating in posterior third; six pairs of VM macrosetae, posterior pair situated posterior to posterior transverse carina.

Telson: Vesicle shallow, more elongated in ♂ than ♀ (fig. 12B, E), length/height ratio 3.25–3.74 (n = 10; mean = 3.51) in ♂, 2.74–3.25 mm (n = 10; mean = 3.03) in ♀; dorsal surface

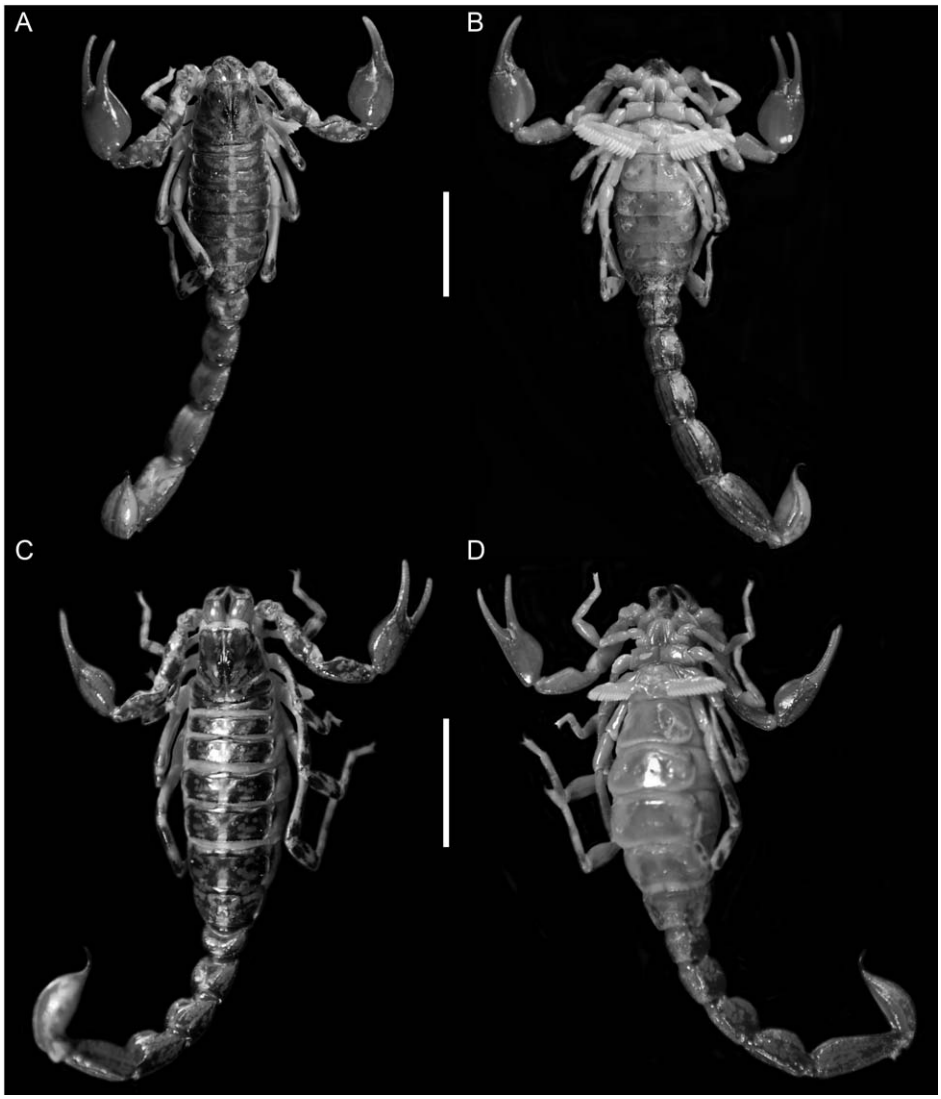

FIGURE 16. *Urophonius transandinus* Acosta, 1998, habitus. **A, B.** ♂ (MACN). **C, D.** ♀ (MACN). **A, C.** Dorsal aspect. **B, D.** Ventral aspect. Scale bars = 10 mm.

smooth, with (♂) or without (♀) elliptical median depression, corresponding to telson gland; ventral surface slightly granular. Aculeus short, shallowly curved.

Pedipalps: Femur with DI, DE, and VI carinae granular (♂) or obsolete, reduced to slight curvature of surface (♀), extending entire length of segment; two dorsal macrosetae (M1, M2) associated with *d* and *e* trichobothria (fig. 2C); trichobothrium *e* situated proximal to macroseta M1 in some specimens and distal to M1 in others. Patella with DI and VI carinae granular, extending entire length of segment; DE and VE carinae obsolete, reduced to slight elevation of surface along entire length of segment (fig. 17). Chela manus robust (♂) or slender (♀), length/

width ratio 2.53–3.08 (n = 20; mean = 2.78) in ♂, 3.27–3.77 (n = 20; mean = 3.51) in ♀; length/height ratio 2.33–2.79 (n = 20; mean = 2.56) in ♂, 2.88–3.31 (n = 20; mean = 3.12) in ♀; E, VM, DS, DM, DI, D, and IM carinae obsolete, more developed in ♂ than in ♀ (fig. 18); internal surface with slight bulge near articulation of movable finger (♀) or with pronounced, subtriangular projection, shallow depression, and group of 4 or 5 granules near base of fixed finger, with one or two additional granules between this group of granules and median denticle row of fixed finger (♂); fingers elongated, median denticle row uneven medially, forming double row, with five or six pairs of internal and external accessory denticles; fixed finger, median denticle row with basal denticles usually fused.

Legs: Surfaces smooth. Basitarsi each with two well-developed, equal-length pedal spurs. Telotarsi elongated, shallow, each with well-developed ventromedian row of hyaline spinules and paired pro- and retroventral rows of spiniform macrosetae; spinules similar in length to spiniform macrosetae near base of telotarsus, twice their length at distal margin; spiniform macrosetae with following counts in pro- and retroventral rows on telotarsus I: 1/1, II: 2/2, III: 5–6/6–7, IV: 6–7/7–8; only pair of spiniform macrosetae on I and first pair on II–IV subspiniform, others stout spiniform (fig. 19). Ungues curved, equal in length (fig. 19C, E, G). Pseudonychium well developed, apex curved. Median dorsal lobe protruding approximately 20%–30% length of unguis.

Pectines: Tooth count: 14–17 (n = 29; mode = 16) in ♂; 12–16 (n = 74; mode = 13) in ♀.

Hemispermatophore: Basal portion very well developed. Distal lamina well developed, elongated, similar in length to basal portion; distal crest almost straight, oriented in same direction as frontal margin on distal lamina; frontal crest (distal posterior flexure) barely distinguishable from frontal margin; internal lobe with two well-developed denticles forming bicusp, not connected to distal lamina (fig. 5H), external denticle slightly larger than internal denticle. Lobe region well developed (fig. 5G), basal lobe very well developed, protruding, internal surface forming deep, concave excavation. Genital plug well developed, with internal longitudinal flexure and median longitudinal excavation.

Distribution: According to Acosta (1998), *U. transandinus* is restricted to a narrow area extending from the Región Metropolitana de Santiago to Región V (Valparaíso), central Chile. Based on additional material examined in Chilean collections and collected during several winter expeditions to central and southern Chile, this species is more widely distributed, however. In the present contribution, *U. transandinus* is recorded from four regions of Chile (table 2). The specimens described by Acosta (1998) appear to represent the northernmost populations of this species.

Ecology: The habitat in central Chile, where the type material was collected, is a mixture of forests and shrub steppes (Gajardo, 1993). In this area, we collected *U. transandinus* in dry woods at "La Campana" National Park. We also collected this species further south, in shrub steppe at approximately 1100 m in the foothills of the Andes, at "Río los Cipreses" National Reserve. The ground surface on this occasion was covered by a layer of snow, approximately 5 cm deep, accumulated several hours earlier. Based on observations with UV light detection, we found that scorpions were active on the surface, in spite of the weather conditions, but avoided snow-covered areas by climbing over small rocks instead. We also

collected *U. transandinus* near Curicó, in Region VII (Maule), the southernmost record of the species, more than 200 km south of the type locality and other records listed by Acosta (1998). These specimens were collected on plains and small hills, in a mixed grass/shrub steppe.

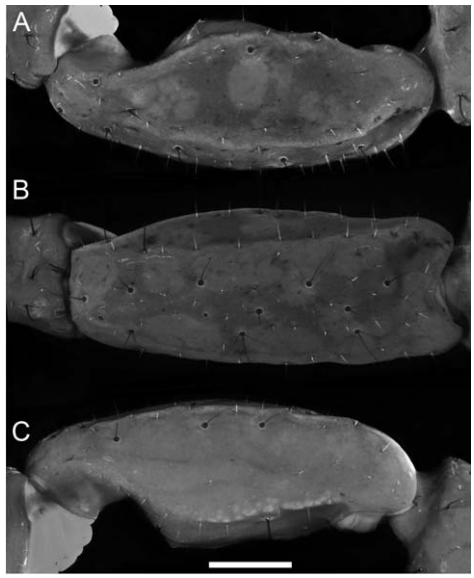

FIGURE 17. *Urophonius transandinus* Acosta, 1998, ♂ (MACN), dextral pedipalp patella. **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. Scale bar = 1 mm.

Variation: Based on the additional material available, several morphological differences are evident among northern and southern populations of *U. transandinus*. Specimens from northern populations exhibit two dark VSM stripes and, in some specimens, traces of a VM stripe on the ventral surface of metasomal segments I–III (fig. 3C) whereas those from southern populations exhibit a well-defined VM stripe and traces of VSM stripes (fig. 3D). The VSM carinae on metasomal segments I and II are oblique and diverging in the anterior third of the segment in northern populations (fig. 8A), but form a transverse carina in the anterior third in most specimens from southern populations (fig. 9A). Finally, the denticles of the internal lobe of the hemispermatophore are slightly less developed in some males from southern populations. None of these differences appear to be fixed within the respective populations, however. We therefore consider these populations to be conspecific.

Urophonius tumbensis Cekalovic, 1981
Figures 1, 2E, 3E, 6C, D, 10A, B, 11C, F, 12C, F, 20, 21C, 22–24, 25A, B; tables 1, 2

Urophonius tumbensis Cekalovic, 1981: 197–199; Lowe and Fet, 2000: 46 (complete reference list until 1998); Ojanguren-Affilastro et al., 2010: 2; Pizarro-Araya et al., 2011: 166–169.

Type Material: Holotype ♂ (MZUC 259), **CHILE: Región VII (Bío-Bío):** *Concepción Province*: Tumbes Peninsula, Caleta Leandro [36°38′S 73°05′W], 15.VI.1965, G. Sanhueza. Paratypes: same data except "15.V.1966," 2 ♂ (MZUC 614, 663). According to the MZUC curator (J.N. Artigas, personal commun.), these specimens cannot be found although they were not formally loaned, and must therefore be lost.

New Records: Same data as paratypes, 1 ♂ (MZUC 345). **CHILE: Región VII (Bío-Bío):** *Concepción Province*: Tumbes Peninsula [36°38′S 73°05′W], 4.xii.1972, T. Cekalovic, 1 ♂ (AMNH); Hualpén Botanical Reserve, 36°47′51.2″S 73°09′29.3″W, 150 m, 24.vii.2009, A.A. Ojanguren-Affilastro, J. Pizarro-Araya, F.M. Alfaro, O. Vergara, D. Valdivia, and C. Grismado, 2 ♀ (MACN), 1 ♀ (AMNH), 15.vii.2010, A.A. Ojanguren-Affilastro, J. Pizarro-Araya, L. Piacentini, E. Soto, and D. Valdivia, 2 ♂, 3 ♀ (MACN), 2 ♂, 3 ♀ (MHNS), 2 subad., 1 juv. (AMNH [LP 10649]).

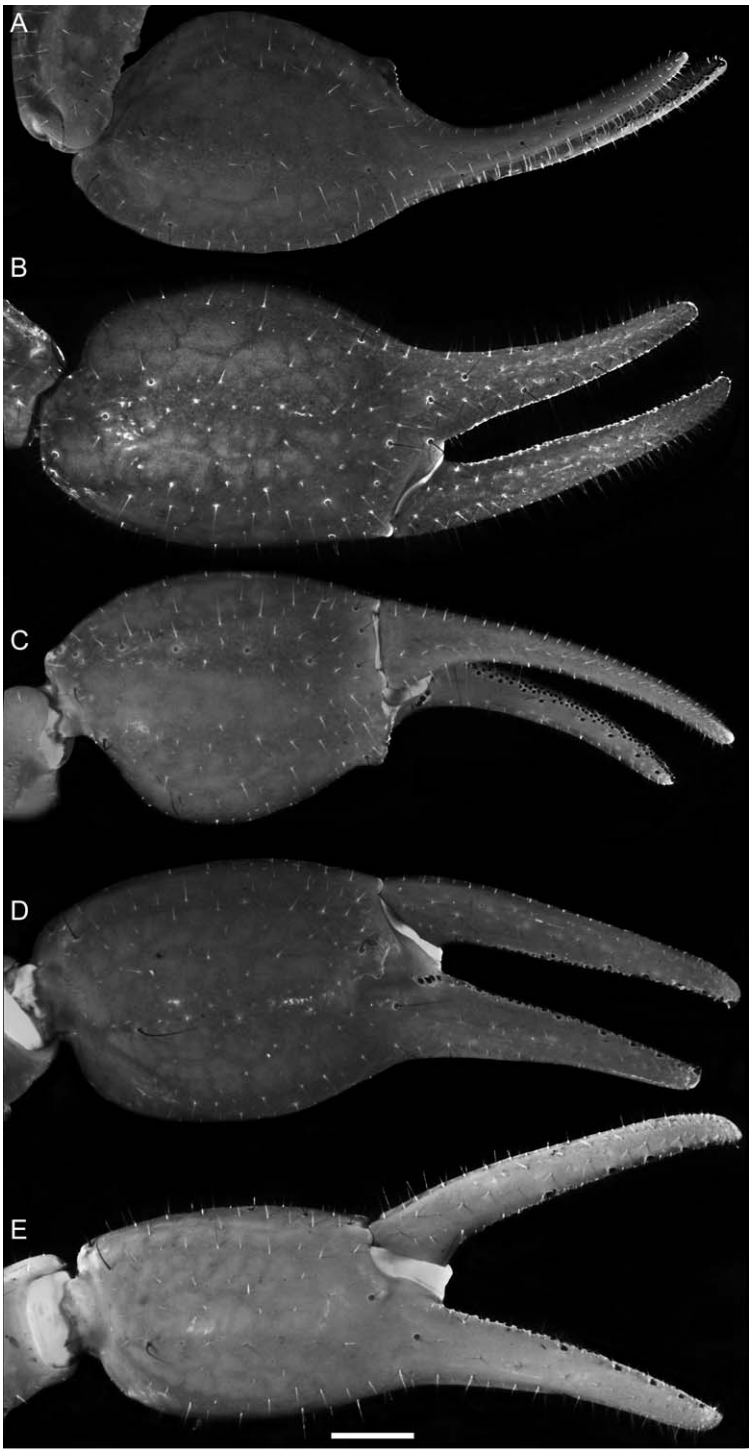

FIGURE 18. *Urophonius transandinus* Acosta, 1998, dextral pedipalp chela. **A–D.** ♂ (MACN). **E.** ♀ (MACN). **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. **D, E.** Internal aspect. Scale bar = 1 mm.

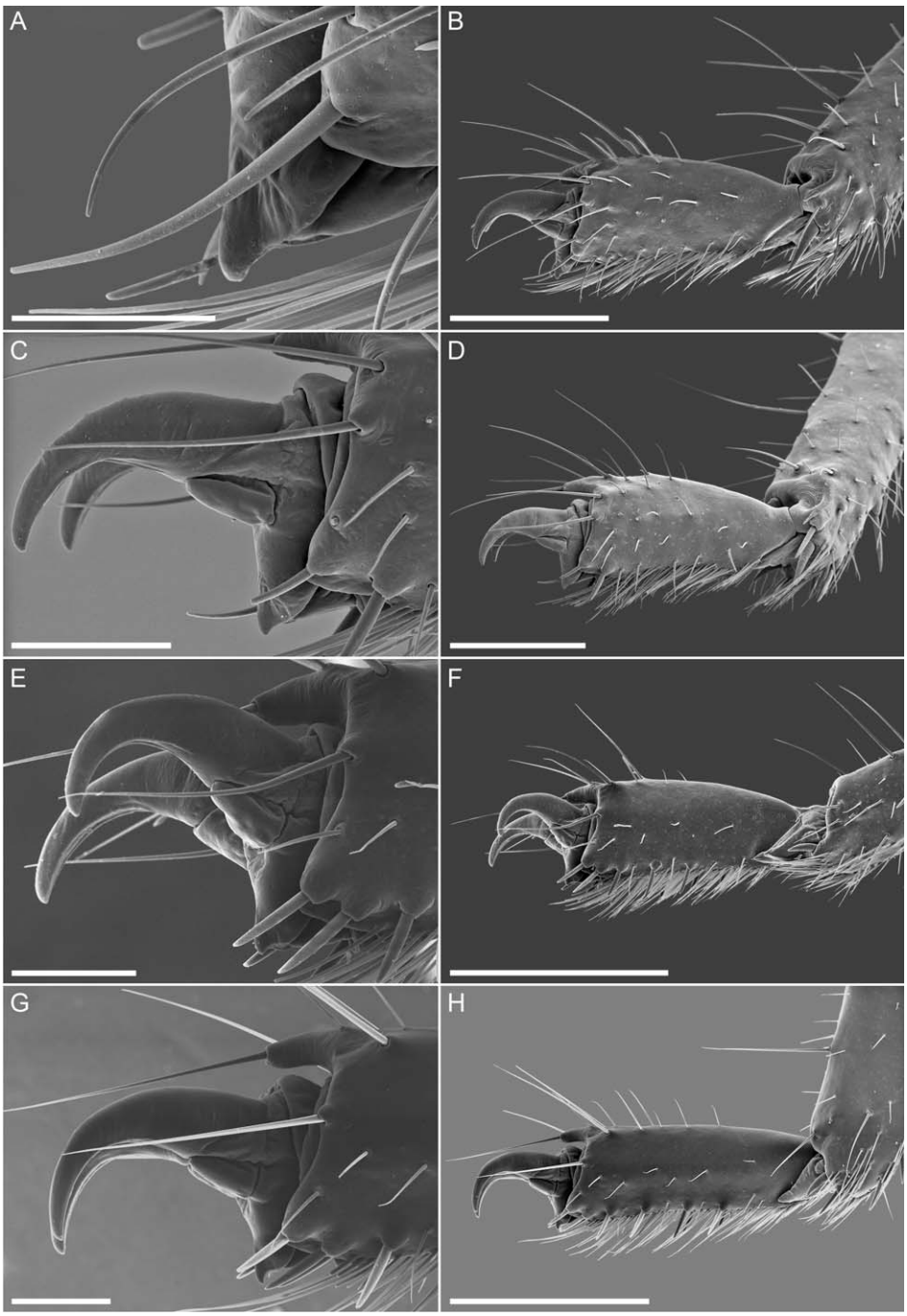

FIGURE 19. *Urophonius transandinus* Acosta, 1998, ♀ (MACN), telotarsi I–IV. **A, B.** Dextral telotarsus I, prolateral aspect, with detail of anterior pair of spiniform macrosetae (**A**). **C, D.** Dextral telotarsus II, prolateral aspect, with detail of ungues (**C**). **E, F.** Sinistral telotarsus III, retrolateral aspect, with detail of ungues (**E**). **G, H.** Sinistral telotarsus IV, retrolateral aspect, with detail of ungues (**G**). Scale bars = 0.1 mm (**A**), 0.5 mm (**B, D**), 0.2 mm (**C, E, G**) and 1 mm (**F, H**).

FIGURE 20. *Urophonius tumbensis* Cekalovic, 1981, habitus. **A, B.** ♂ (MACN). **C, D.** ♀ (MACN). **A, C.** Dorsal aspect. **B, D.** Ventral aspect. Scale bars = 10 mm.

Diagnosis: *Urophonius tumbensis* is most similar morphologically to *U. transandinus*: the hemispermatophore is similar; the VM and VSM carinae of metasomal segment V are well developed, occupying the entire length of the segment; and the chela manus is robust, with distinct carinae in the male. The two species can be separated as follows. One macroseta (M1), associated with the *d* and *e* trichobothria of the pedipalp femur, is present in *U. tumbensis*, compared with two macrosetae (M1, M2) in *U. transandinus*. The VSM carinae of metasomal segments I and II form two transverse carinae, one at the anterior margin of the segment, the other in its posterior third, in *U. tumbensis*, whereas the VSM carinae are diverging at the anterior margin of the segment and subparallel posteriorly, in *U. transandinus*.

FIGURE 21. *Urophonius tumbensis* Cekalovic, 1981, habitat in the Hualpén Botanical Reserve, Concepción Province, Región VIII (Bío-Bío), southern Chile. **A, B.** "Peumo" tree, *Cryptocarya alba* (Molina) Looser, with close-up of epiphytes on trunk epiphytes (**B**). **C.** *U. tumbensis* sitting on tree bark at night, under ultraviolet light.

Description: Based on ♂ (MZUC, AMNH) and ♀ (MACN) specimens.

Total length: 26–31 mm (*n* = 6; mean = 29.17 mm) in ♂; 29–36.5 mm (*n* = 9; mean = 32.11 mm) in ♀.

Color: Base color yellowish, with dark brown spots of pigmentation (fig. 20). Cheliceral manus with dense reticulate pigmentation; fingers densely pigmented in distal half and near point of articulation. Carapace, anterior two-thirds densely pigmented; anterior margin densely pigmented medially and around lateral ocelli; anteromedian longitudinal sulcus, ocular tubercle, and anterior margin of postocular sulcus densely pigmented; two broad, dark stripes extending from lateral ocelli to anterior margin of posteromedian longitudinal sulcus; paired dark spots laterally and posterolaterally, posterolateral spots connected medially by dark narrow stripe at posterior margin. Tergites I–VI, each with paired dark spots laterally in posterior two-thirds of segment, not reaching lateral margins, and paired dark spots submedially in posterior half, contiguous at anterior margin, lateral and submedian spots contiguous at posterior margin in most specimens; VII with dense reticulate pigmentation in posterolateral two-thirds of segment, contiguous medially at anterior margin. Sternum, genital opercula and pectines unpigmented. Sternite III unpigmented; IV–VII each with small spot at anterolateral margins, VII additionally with faint reticulate pigmentation in posterior third of segment. Metasomal segment I, dorsal surface with paired triangular spots submedially and at posterior margin, not contiguous, leaving unpigmented stripe medially; lateral margins densely pigmented in posterior half of segment ventral to LSM carinae, with reticulate pigment elsewhere; VL stripes restricted to anterior third of segment and posterior margin; VL stripes absent or reduced to faint pigmentation medially (fig. 3E). Metasomal segments II and III, dorsal and lateral surfaces as for segment I; VL stripes restricted to anterior margin and posterior half of segment, contiguous with lateral spots in posterior quarter; VSM stripes restricted to posterior half of segment, contiguous medially, and connecting to VL stripes in posterior third of segment. Metasomal segment IV, dorsal margin with paired dark spots posterolaterally, leaving unpigmented area medially, and reticulate pigmentation elsewhere; lateral margins with dark spot in posterior quarter of segment, contiguous with dorsal and ventral pigmentation at posterior margin, and reticulate pigmentation elsewhere; ventral surface as for segment III. Metasomal segment V, dorsolateral margins densely pigmented, especially in posterior third, leaving unpigmented area medially; lateral margins densely pigmented in posterior third, with reticulate pigmentation elsewhere; paired VL and VSM stripes extending entire length of segment, VL stripes connected to VSM stripes and to lateral pigmentation by dense reticulate pigmentation, VSM stripes separated, additional VM stripe evident between them in densely pigmented specimens. Telson vesicle faintly pigmented, except for narrow VM and paired narrow VSM stripes; aculeus unpigmented basally, apex dark brown. Pedipalps, trochanter with dark spot dorsally; femur pigmented dorsally and externally, especially near articulation with patella, unpigmented ventrally; patella densely pigmented dorsally, dorsoexternally and dorsointernally, unpigmented ventrally; chela manus, external surface with reticulate pigmentation and five dark longitudinal stripes, internal surface unpigmented, except at base of fixed finger and near

articulation of movable finger, which are densely pigmented. Legs, coxa unpigmented, trochanter faintly pigmented, femur external surface with two dark spots medially and near articulation with patella; patella dorsoexternal surface with two dark spots medially and near articulation with tibia; tibia with dark spot medially; basitarsi with dark spot at articulation with tibia; telotarsi unpigmented.

Carapace: Surfaces smooth or finely granular, usually more so in ♂. Anterior margin with shallow median notch. Anteromedian longitudinal, interocular, posteromedian longitudinal, and posterolateral sulci well developed. Median ocular tubercle shallow, ocelli larger in ♂ than in ♀, approximately two diameters apart, each with two longitudinally aligned microsetae anteriorly and one macroseta posteriorly. Three pairs of small lateral ocelli on each side of carapace, anterior and median ocelli situated very close together, in same horizontal axis, posterior ocellus situated slightly dorsal to others, one diameter apart.

FIGURE 22. *Urophonius tumbensis* Cekalovic, 1981, ♂ (MACN), dextral pedipalp patella. **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. Scale bar = 1 mm.

Tergites: Surfaces I–VI smooth; VII with paired submedian and lateral carinae, comprising medium-sized granules, lateral carinae restricted to posterior two-thirds of segment, submedian carinae to posterior half. Segments I–VI each with anteromedian pair of microsetae, and one to three pairs of macrosetae, some or all of which may be reduced to microsetae, at posterior margin.

Sternites: Surfaces III–VI smooth, with small, elliptical spiracles; VII, anterior half smooth, posterior half granular, with well developed VSM and VL carinae, posterior margin with well-developed carina.

Metasoma: Metasomal segment I, dorsal surface sparsely granular; DL carinae granular, extending entire length of segment, with larger granules near posterior margin; LSM carinae weakly granular, extending entire length of segment; surface between DL and LSM carinae densely granular; LIM carinae restricted to posterior two-thirds of segment; one pair of LIM macrosetae; lateral margins sparsely granular; paired VL and VSM carinae, VL carinae subparallel, VSM carinae forming two transverse carinae, one well developed near anterior margin, other less developed in median part of segment (fig. 10A, B), some granules forming two subparallel VSM carinae between them; four pairs of VSM macrosetae, anterior pair situated on external margin of anterior transverse carina, not in same axis as other pairs; three pairs of VL macrosetae. Segment II as for I, except with carinae slightly less developed; one pair of LSM macrosetae and three pairs of VSM macrosetae, anterior pair absent. Segment III as for II, except carinae much less developed; DL and LSM carinae extending entire length of segment but comprising small scattered granules; one pair of DL and LSM macro-

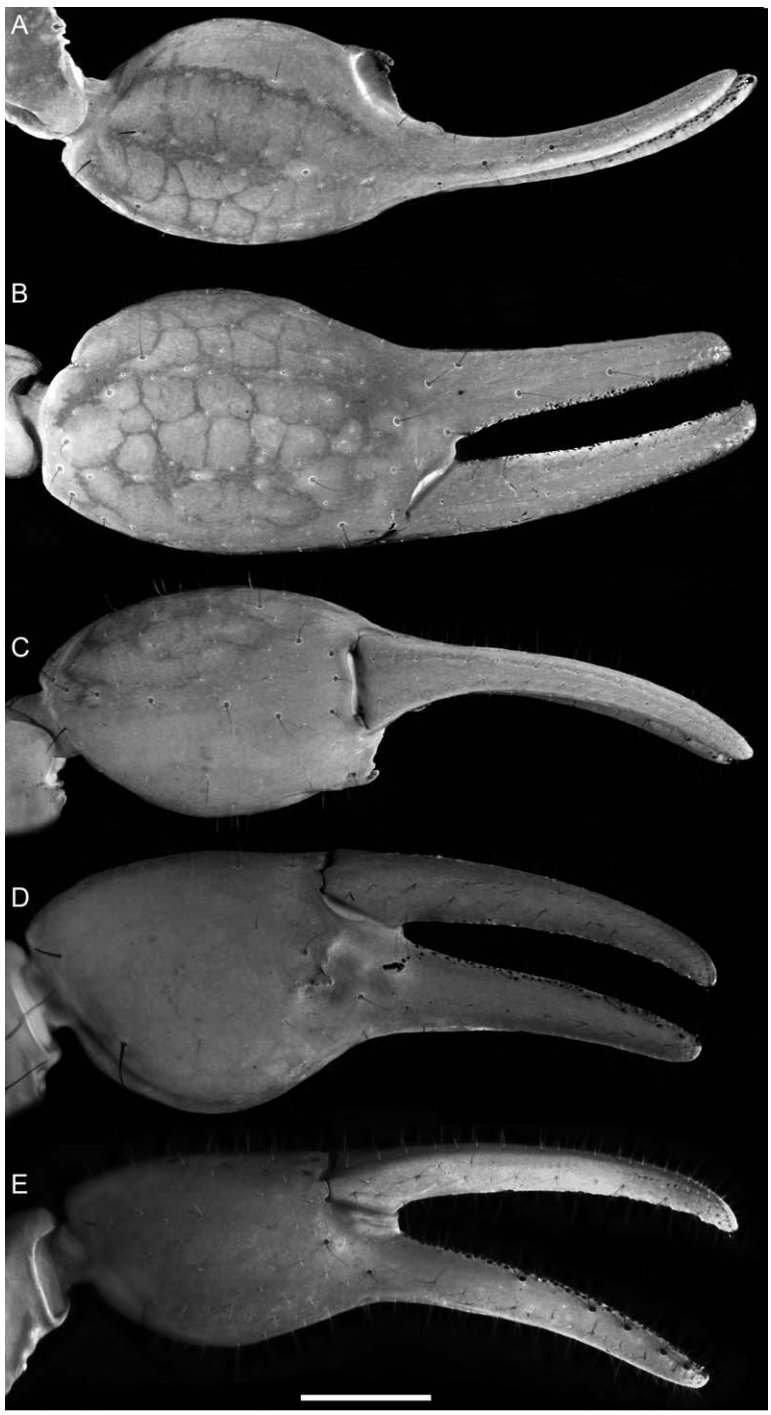

FIGURE 23. *Urophonius tumbensis* Cekalovic, 1981, ♂ (MACN), dextral pedipalp chela. **A–D.** ♂ (MACN). **D.** ♀ (MACN). **A.** Dorsal aspect. **B.** External aspect. **C.** Ventral aspect. **D, E.** Internal aspect. Scale bar = 1 mm.

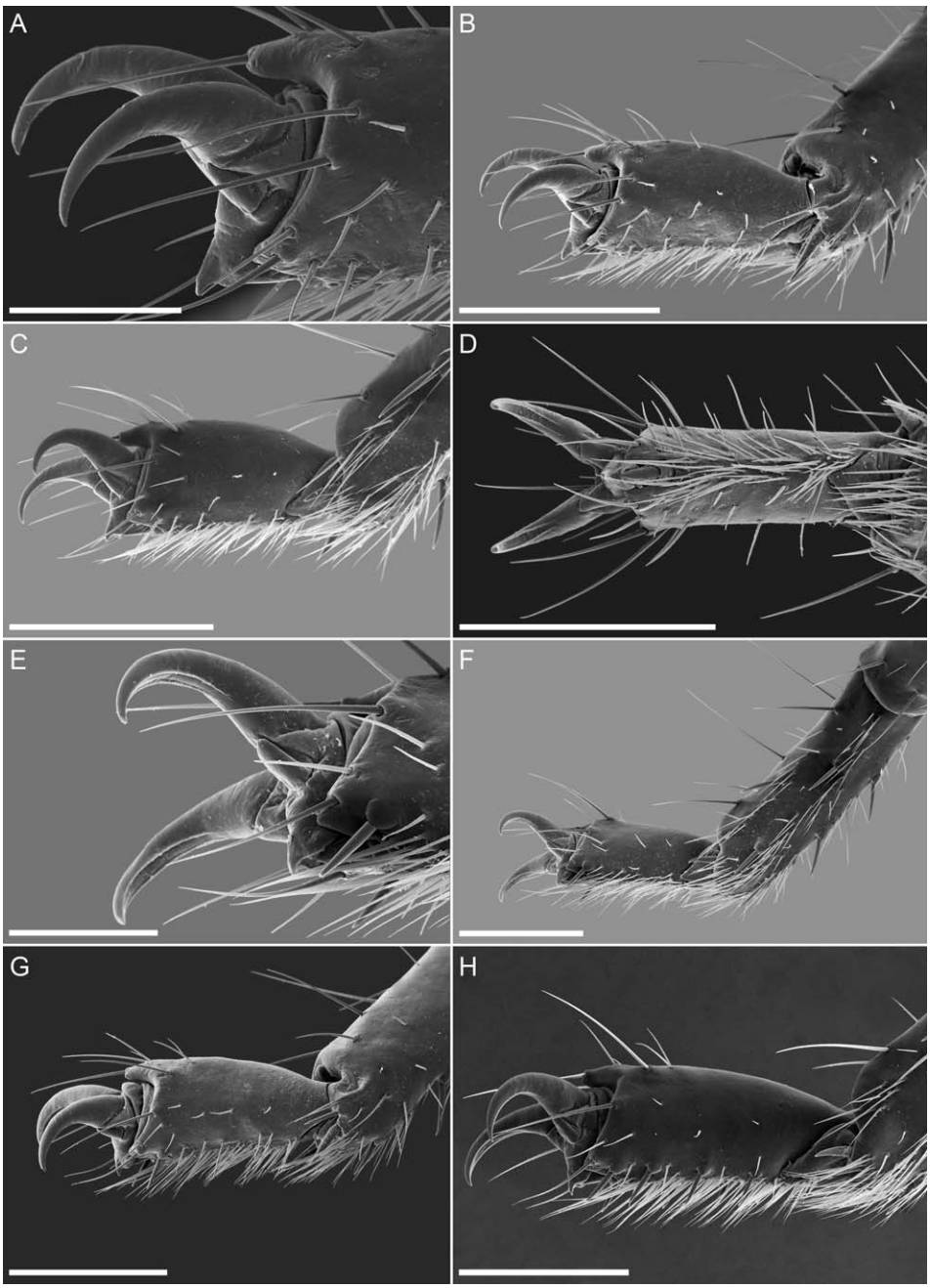

FIGURE 24. *Urophonius tumbensis* Cekalovic, 1981, ♀ (MACN), telotarsi I–IV. **A, B.** Dextral telotarsus I, prolateral aspect, with detail of ungues (**A**). **C.** Sinistral telotarsus I, retrolateral aspect. **D.** Dextral telotarsus I, ventral aspect. **E, F.** Sinistral telotarsus II, retrolateral aspect, with detail of anterior pair of spiniform macrosetae (**E**). **G.** Dextral telotarsus II, prolateral aspect. **H.** Sinistral telotarsus III, retrolateral aspect. Scale bars = 0.2 mm (**A, E**), 0.5 mm (**B–D, F–H**).

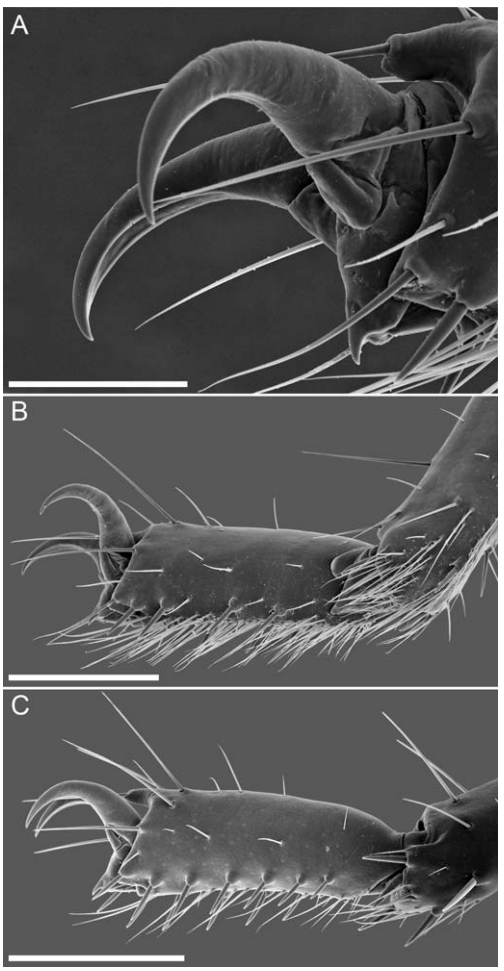

FIGURE 25. *Urophonius* Pocock, 1893, telotarsi. **A, B.** *U. tumbensis* Cekalovic, 1981, ♀ (MACN). **A.** Sinistral telotarsus III, retrolateral aspect, with detail of ungues. **B.** Sinistral telotarsus IV, retrolateral aspect. **C.** *U. brachycentrus* (Thorell, 1876), ♂ (MACN), dextral telotarsus IV, prolateral aspect. Scale bars = 0.2 mm (**A**) and 0.5 mm (**B, C**).

setae; LIM carinae restricted to posterior third of segment, with one pair of LIM macrosetae; VL carinae granular, extending entire length of segment, with three pairs of VL macrosetae; VSM carinae comprising few scattered granules, anterior transverse carina well developed, posterior transverse carina reduced to few more pronounced granules (♀) or absent (♂), with three pairs of VSM macrosetae. Segment IV, DL, LSM, and VL carinae obsolete, reduced to slight curvature of surface along entire length of segment, LSM carinae barely visible medially; LIM carinae absent; VSM carinae reduced to few scattered low granules, barely visible (♀) or absent (♂); one pair of DL macrosetae; one or two pairs of LSM macrosetae; three pairs of VL and VSM macrosetae. Segment V elongated (fig. 11C, F); length/width ratio 2.22–2.57 (n = 6; mean = 2.47) in ♂, 1.85–2.08 (n = 9; mean = 1.95) in ♀; length/height ratio 2.8–3.23 (n = 9; mean = 3.01) in ♂, 2.07–2.47 (n = 9; mean = 2.26) in ♀; DL carinae reduced to small bulge at anterior margin of segment (♀) or absent (♂); two pairs of DL macrosetae; LSM carinae represented only by three or four pairs of macrosetae; LIM carinae absent; VL carinae granular, extending entire length of segment (♀) or restricted to posterior half (♂); five pairs of VL macrosetae, posterior pair situated posterior to posterior transverse carina; VSM and VL carinae obsolete; VM carina extending entire length of segment, bifurcating in posterior third; four pairs of VM macrosetae, posterior pair situated posterior to posterior transverse carina.

Telson: Vesicle shallow, ventral surface broader anteriorly in ♂ than ♀ (fig. 12C, F), length/height ratio 3.23–3.63 (n = 6; mean = 3.39) in ♂, 3.27–3.58 mm (n = 9; mean = 3.50) in ♀; dorsal surface smooth, with (♂) or without (♀) elliptical median depression, corresponding to telson gland; ventral surface slightly granular. Aculeus short, shallowly curved.

Pedipalps: Femur with DI, DE, and VI carinae comprising discontinuous row of small granules along entire length of segment (♂) or reduced to few scattered granules (♀) (fig. 2E); one macroseta (M1) associated with *d* and *e* trichobothria; trichobothrium *e* situated

proximal to macroseta M1 in some specimens and distal to M1 in others. Patella with DI, DE, and VI carinae obsolete, reduced to slight curvature of surface, along entire length of segment (fig. 22). Chela manus slender, more robust in ♂ (fig. 23), length/width ratio 2.80–3.52 (n = 6; mean = 3.14) in ♂; 3.84–4.5 (n = 9; mean = 4.03) in ♀; length/height ratio 2.82–3.18 (n = 6; mean = 3.03) in ♂, 3.48–4 (n = 9; mean = 3.67) in ♀; acarinate; internal surface with slight bulge near articulation of movable finger (♀) or with pronounced, subtriangular projection, shallow depression, and group of 4 or 5 granules near base of fixed finger (♂) (fig. 23D); fingers elongated, median denticle row uneven medially, forming double row in parts, with five pairs of internal and external accessory denticles.

Legs: Surfaces smooth. Basitarsi each with two well-developed, equal-length pedal spurs. Telotarsi elongated, shallow, each with well-developed ventromedian row of hyaline spinules, and paired pro- and retroventral rows of spiniform macrosetae, with following counts on telotarsus I: 1/1, II: 2/2, III: 4–5/5, IV: 5/5–6; only pair of spiniform macrosetae on I and first pair on II–IV subspiniform, others stout spiniform (figs. 24, 25A, B). Ungues strongly curved, equal in length, with acute tip (fig. 25A). Pseudonychium well developed, apex curved and very acute. Median dorsal lobe protruding ca. 20%–30% length of unguis.

Pectines: Tooth count: 13–15 (n = 6; mode = 14) in ♂; 12–14 (n = 9; mode = 12) in ♀. Cekalovic (1981) mentions 14–15 for a male of the type series.

Hemispermatophore: Basal portion very well developed. Distal lamina well developed, elongated, similar in length to basal portion; distal crest almost straight, oriented in same direction as frontal margin on distal lamina; frontal crest (distal posterior flexure) barely distinguishable from frontal margin; internal lobe with two well-developed denticles not connected to distal lamina (fig. 6D), external denticle ca. 50% larger than internal denticle. Lobe region well developed (fig. 6C), basal lobe very well developed, protruding; internal surface forming deep, concave excavation. Genital plug very well developed, covering most of posterior part of basal lobe; area near concave excavation with grooves.

Distribution: All known records of *Urophonius tumbensis* occur on the Tumbes Peninsula in the Concepción Province of Región VIII (Bío-Bío), southern Chile (fig. 1). We examined a female *Urophonius* specimen from "Cueva de Pincheiras" in Ñuble Province, also in Región VIII, which appears to be closely related. This specimen exhibits minor differences from the Tumbes specimens, however, and we prefer not to speculate on its identity until additional specimens, including adult males, become available.

Ecology: All records of this species occur in dense, temperate to cold deciduous humid forests, near the Pacific coast, an area that belongs to the "Bosque Caducifolio de Concepción" of the "Bosque Caducifolio" botanical region (Gajardo, 1993).

We collected this species in the Hualpén Botanical Reserve, one of few areas in southern Chile where scorpions have been previously recorded (Cekalovic, 1976). Personally collected specimens were discovered with UV light detection at night, during the winter months of July and August. All other known specimens were collected during May and September. These records suggest a winter activity period for *U. tumbensis*. This species was collected in sympatry with two other bothriurid species in primary forest: a species of *Phoniocercus* Pocock,

1893, probably *Phoniocercus sanmartini* Cekalovic, 1968, and a species of *Centromachetes* Lönnberg, 1897, probably *Centromachetes pocockii* (Kraepelin, 1894). Only the *Centromachetes* species was present in adjacent patches of grassland within the reserve, and no specimens of *U. tumbensis* were found in nearby coastal areas, or plantations of *Pinus* sp., close to the reserve boundaries.

Urophonius tumbensis is the only arboreal (corticolous) species of the family Bothriuridae, and the only arboreal scorpion species recorded from the temperate forests of southern Chile (Pizarro-Araya et al., 2011). Most specimens were collected from 2 to 6 m above ground in "Peumo" trees, *Cryptocara alba* (Molina) Looser (fig. 21), where they were observed walking on the main trunk and, in some cases, feeding on spiders. Few specimens were collected on the ground surface.

The telotarsal ungues and pseudonychium of *U. tumbensis* are more strongly curved, with a more acute tip, than those of other ground-dwelling species of *Urophonius* (figs. 19, 24, 25). This character, observed in arboreal (corticolous) scorpion species of several other families (Prendini, 2001), may be associated with the arboreal habitat of *U. tumbensis*. Other bothriurid species, e.g., *U. tregualemuensis*, have been observed foraging on shrubs, bamboo, and other plants at night (Ojanguren-Affilastro et al., 2010), and may occasionally use the base of trees as a daytime shelter (Maury, 1973). However, no other bothriurid species was previously observed to be active on trees at such heights.

ON THE SPECIES GROUPS OF *UROPHONIUS*

Maury (1973) separated the genus *Urophonius* into two species groups, A and B. *Urophonius eugenicus* (Mello-Leitão, 1931) and *Urophonius exochus* (Penther, 1913), formerly placed in a separate genus, *Iophorus* Penther, 1913, were included with a newly described species, *Urophonius mahuidensis* Maury, 1973, in group A. *Urophonius brachycentrus* (Thorell, 1876), *Urophonius iheringii* Pocock, 1893, and *U. granulatus* were placed in group B. The diagnostic characters for the two groups defined by Maury (1973) are as follows:

Group A: Telotarsus III with 4/4–5 pairs of spiniform macrosetae in pro- and retroventral rows. Hemispermatophore without distal posterior flexure; internal lobe with bifid spatulate bulge, lateral lobe greatly enlarged.

Group B: Telotarsus III with 5–6/5–7 pairs of spiniform macrosetae in pro- and retroventral rows. Hemispermatophore with distal posterior flexure; internal lobe with two spiniform bulges, lateral lobe moderate in size.

Acosta (1988) presented a new division of species groups in the genus, renaming group A as the *exochus* group and dividing group B into the *granulatus* and *brachycentrus* groups. The diagnostic characters for the three groups defined by Acosta (1988) are as follows:

brachycentrus group: Pedipalp femur with two macrosetae (M1, M2) situated adjacent to *d* trichobothrium. Telotarsus III with 5–6/6 pairs of spiniform macrosetae in pro- and retroventral rows; IV with 6/6–7 pairs. Metasoma, ventral pigmentation pattern comprising two irregular VSM stripes, often accompanied by VM stripe, or fused medially; segment I, VSM carinae strongly diverging anteriorly, usually forming transverse carina, subparallel posteriorly, comprising conspicuous, pearliform granules, ventral surface with four pairs of macrosetae, proximal pair situated near lateral margins of segment, aligned with carinae; segments II and III, ventral surfaces each with more than three pairs of macrosetae, proximal pair situated near lateral margins of segment. Hemispermatophore lobe region well developed and complex; concavity between basal and external lobes greatly extended, obscuring most of flexure formed by internal and basal lobes; basal lobe ending in conspicuous laminar structure, slightly concave and with curved margins.

exochus group: Pedipalp femur with single macroseta (M1) situated equidistant between *d* and *e* trichobothria. Telotarsi III and IV respectively with 4/4 and 4/5 pairs of spiniform macrosetae in pro- and retroventral rows. Metasoma, ventral pigmentation pattern comprising two irregular VSM stripes; segment I, VSM carinae mostly subparallel, diverging slightly anteriorly; ventral surface with three pairs of macrosetae situated along VSM carinae; segments II and III, ventral surfaces each with three pairs of macrosetae, often with additional pair of microsetae proximally, close to lateral margins. Hemispermatophore lobe region well developed, particularly flexure formed by internal and basal lobes, compared with region between external and basal lobes, restricted to narrow fringe; conspicuous laminar elongation of basal lobe absent, but rudimentary laminar structure, probably homologous to elongation in other groups, evident behind lobe.

granulatus group: Pedipalp femur with *e* trichobothrium situated in close proximity to single macroseta (M1), its position variable among species. Telotarsus III with 5/5–6 pairs of spiniform macrosetae in pro- and retroventral rows; IV with 5–6/6–7 pairs. Metasoma, ventral pigmentation pattern with single VM and paired VL stripes, but without VSM stripes; segment I, VSM carinae entirely subparallel, well defined, comprising sparse granules, ventral surface with two pairs of macrosetae, rarely three pairs, in which case one macroseta missing from median pair; segments II and III, ventral surfaces each with three pairs of macrosetae. Hemispermatophore lobes weakly extended; basal lobe terminating in plain laminar structure, with characteristic margin; basal lobe and internal lobe region concave.

Until recently, most taxonomic work was conducted on *Urophonius* species occurring to the east of the Andes (in Argentina, Brazil, and Uruguay), little work having been conducted on the Chilean species to the west. Consequently, species occurring to the east of the Andes are fairly well accommodated in the groups proposed by Maury (1973) and Acosta (1988), whereas the Chilean species (*U. mondacai*, n. sp., *U. pizarroi*, *U. transandinus*, *U. tregualemuensis*, and *U. tumbensis*) are not. Ojanguren-Affilastro et al. (2010) modified Acosta's (1988) diagnosis of the *granulatus* group to accommodate the endemic Chilean species of this group.

Based on new data, however, the species groups can no longer be supported as currently defined. We justify this assertion with the following examples.

In *U. pizarroi*, included in the *granulatus* group by Ojanguren-Affilastro et al. (2010), the VSM carinae of metasomal segment I diverge anteriorly, as in *U. transandinus*, instead of being subparallel as in other species of the group. Additionally, the proximal part of the hemispermatophore basal lobe is well developed and situated more proximally than the capsular concavity, while the basal lobe ends in a conspicuous laminar structure, with an internal flexure, as in species of the *brachycentrus* group (Ojanguren-Affilastro et al., 2010). These characters relate *U. pizarroi* to the *brachycentrus* group, whereas others relate it to the *granulatus* group.

In *U. transandinus*, until now the only Chilean species assigned to the *brachycentrus* group (Acosta, 1998), the VSM carinae of metasomal segment I diverge anteriorly in most specimens, sometimes forming a transverse carina, as in other members of the group. A VM stripe is evident on metasomal segments I–III, in addition to the paired VSM stripes observed in other members of the group. The distal part of the capsular concavity of the hemispermatophore is situated slightly more proximal in *U. transandinus* than in other species of the group. These characters relate *U. transandinus* to the *granulatus* group. Its apparently intermediate position was first noted by Acosta (1998), who nevertheless included it in the *brachycentrus* group, based on other characters.

Urophonius mondacai, n. sp., exhibits several characters that prevent its satisfactory placement within the groups defined by Acosta (1988). Only one macroseta (M1) is associated with the *d* and *e* trichobothria of the pedipalp femur, as in the *exochus* and *granulatus* groups. The counts of ventrosubmedian spiniform macrosetae on the telotarsi are similar to those of the *brachycentrus* and *granulatus* groups. The ventral surface of the metasoma exibits paired VSM stripes contiguous medially on each segment, as in the *brachycentrus* group, whereas the VSM carinae of metasomal segment I diverge anteriorly, as in *U. pizarroi* and *U. transandinus*, and three pairs of ventral macrosetae are present on segment I, as in the *exochus* group. The hemispermatophore is similar to that of *U. tregualemuensis* from the *granulatus* group.

Urophonius tumbensis, until now not included within a group (Lowe and Fet, 2000; Ojanguren-Affilastro et al., 2010), shares most of the diagnostic characters of the *brachycentrus* group, but possesses a single macroseta (M1) associated with the *d* and *e* trichobothria of the pedipalp femur, as in the *exochus* and *granulatus* groups.

Finally, particular characters of several species from outside Chile do not reflect the current group division either. For example, some populations of *U. iheringii* from southern Brazil exhibit a single macroseta (M1) associated with the *d* and *e* trichobothria of the pedipalp femur, instead of two (M1, M2) as in other species of the *brachycentrus* group. Some specimens of *Urophonius somuncura* Acosta, 2003, placed until now in the *granulatus* group, exhibit faint paired VSM stripes, in addition to a VM and paired VL stripes, on the ventral surface of metasomal segment I. An undescribed species from central Argentina, closely related to *U. somuncura*, also exhibits faint VSM stripes, but in this case on all metasomal segments.

Based on these data, we conclude that the species currently accommodated in the *brachycentrus* and *granulatus* groups probably form a monophyletic group that also includes

those Chilean species possessing characters that appear to be intermediate between the two groups. On the other hand, species currently included in the *exochus* group appear to form a separate, probably monophyletic group. We therefore propose a modified version of Maury's (1973) group division, which we believe to be a better reflection of the phylogenetic relationships among the species of *Urophonius*: group A, including all species of the *exochus* group; group B, including all species currently placed within the *brachycentrus* and *granulatus* groups, as well as *U. mondacai*, n. sp., and *U. tumbensis* (table 2). The group division and composition presented here will be tested in a forthcoming phylogenetic analysis, based on morphological and molecular data. Revised diagnoses of the two groups are as follows:

Group A: Telotarsi III and IV each with 4/4–5 spiniform macrosetae in pro- and retroventral rows. Hemispermatophore with very simple lobe region (fig. 6E, F); distal part of basal lobe without distal process; capsular concavity reduced to narrow, almost flat surface, situated in anterior part of basal lobe.

Group B: Telotarsi III and IV respectively with 5/5–6 and 6/6–7 spiniform macrosetae in pro- and retroventral rows. Hemispermatophore with complex lobe region (figs. 5, 6A–D); distal part of basal lobe with distal process; capsular concavity well developed, situated medially on basal lobe.

ACKNOWLEDGMENTS

We are indebted to Ivan Benoit (Corporación Nacional Forestal del Gobierno de Chile, CONAF) for assistance with obtaining permits to collect scorpions in Chilean National Parks, and to the CONAF authorities for issuing the permits. We are grateful to Matías Izquierdo, Fermín Alfaro-Kong, Juan Enrique Barriga-Tuñón, Cristian Grismado, Daniel E. Valdivia, and Olivia E. Vergara for participating in the 2009 expedition to Chile; Eduardo Soto, Luis Piacentini, Daniel Valdivia, and José Mondaca for participating in the 2010 expedition to Chile; Mario Elgueta (MNHNS), Jorge Artigas (MZUC), and Jose Mondaca (SAG) for the loan of materials; Jorge Artigas for information about the type material of *U. tumbensis*; Steve Thurston for assistance with preparing the plates; and Camilo Mattoni and José Ochoa for comments on the manuscript. Fieldwork was financially supported by the following sources: PICT 20071393 to A. Ojanguren, DIULS-PF07101 from the Universidad de La Serena to J. Pizarro-Araya, U.S. National Science Foundation (NSF) DEB 0228699 to L. Prendini, and NSF DEB 0613754 to N.I. Platnick.

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