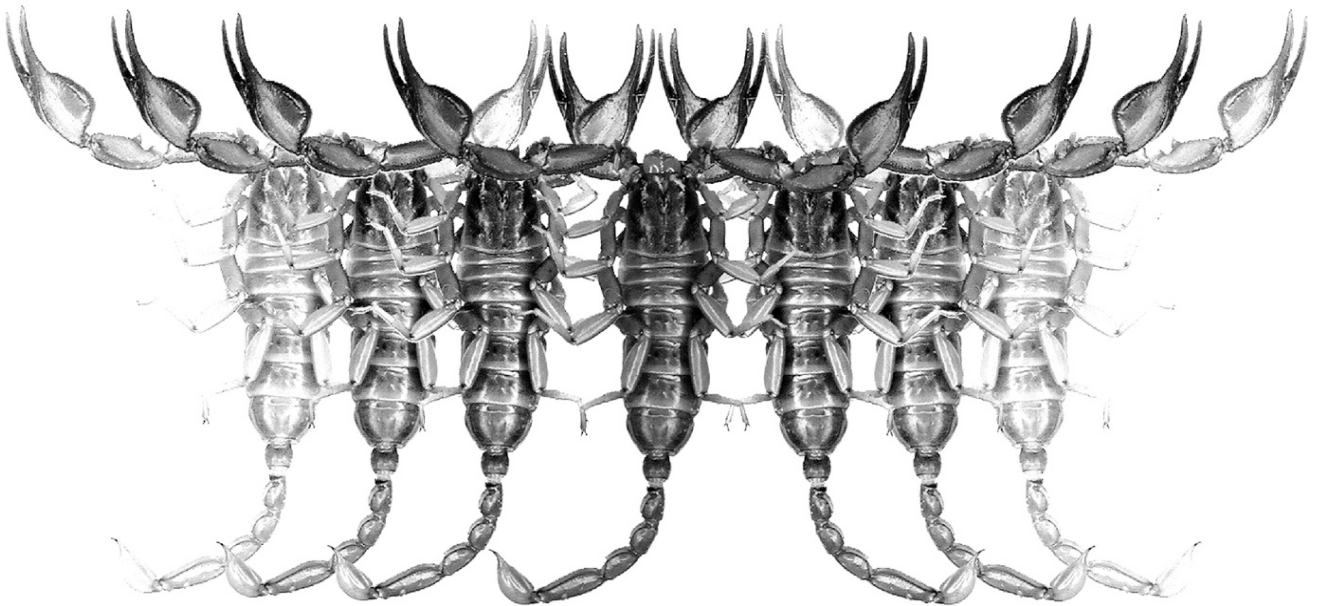


# *Euscorpius*

Occasional Publications in Scorpiology



**A new species of *Ananteris*  
(Scorpiones: Buthidae)  
from Panama**

**Roberto J. Miranda & Luis F. de Armas**

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# *Euscorpius*

## *Occasional Publications in Scorpiology*

EDITOR: Victor Fet, Marshall University, 'fet@marshall.edu'

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## A new species of *Ananteris* (Scorpiones: Buthidae) from Panama

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<http://zoobank.org/urn:lsid:zoobank.org:pub:1B1B4496-18C6-405B-BC77-052C50554851>

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### Summary

A new buthid species belonging to the genus *Ananteris* Thorell, 1891 is herein described from Panama Oeste Province, Panama. This is the second *Ananteris* species known from this Central American country and clearly differs from *Ananteris platnicki* Lourenço, 1993, distributed in Costa Rica and Panama, by its smaller size and male having a different hemispermatophore and telson similar to that of the female.

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### Introduction

The scorpions of Panama have been assigned to three families (Buthidae, Chactidae, and Hormuridae), five genera and 15 species formally named (Teruel & Cozijn, 2011; Miranda, 2011; Quintero Arias & Esposito, 2014). It is one of the most diverse scorpiofauna in Central America, only surpasses by those of Costa Rica and Guatemala; nevertheless, the taxonomic status of several species and populations remain unresolved. Most studies on this fauna have been focused on epidemiological and toxicological aspects (Borges, 2012; Borges et al., 2012), while the taxonomical lists and catalogues (Lourenço & Méndez, 1984; Armas & Maes, 2000, 2001; Teruel & Cozijn, 2011) are needed of update.

The buthid scorpions belonging to the genus *Ananteris* Thorell, 1891 are distributed from Costa Rica (Central America) to Paraguay in South America (Botero-Trujillo & Flórez, 2011). With more than 70 described species, most of them from South America, this genus of small scorpions is represented in Central America by only one species: *Ananteris platnicki* Lourenço, 1993, distributed in Costa Rica (Puntarenas and Limón provinces) and Panamá (provinces of Bocas del Toro, Veraguas, Coclé and Panamá Oeste); additionally, Teruel & Cozijn (2011: 2, fig. 1), on basis to a single damaged female specimen, recorded a possibly new species from Panama.

In the present contribution, the first of a series on the Panamanian scorpions, a new species of *Ananteris* is described from this country.

### Methods & Material

Examined specimens are deposited in the following institutions: IESC: Instituto de Ecología y Sistemática, La Habana, Cuba; ICGES: Instituto Conmemorativo Gorgas de Estudios de Salud, Panama City, Panama Province, Panama.

They were examined and measured with a Leica MZ 12.5 stereomicroscope fitted with an ocular micrometer. Photos were obtained with a Canon Powershot SX 60 HS camera; stacked images were taken with Leica MC 170 HD fitted to a Leica M 205 A stereomicroscope and processed with Leica application suite, version 4.12.0. Others digital images obtained were slightly processed with Adobe Photoshop CS8, only for optimizing brightness and contrast for print. The distribution map was elaborated using the cartographic base of the Instituto de Estadísticas y Censos de la Contraloría General de la Nación (INEC) using ArcGIS10.6.

Measurements and terminology follow Stahnke (1971), except for metasomal segments (Francke, 1977), sternum terminology (Soleglad & Fet, 2003) and trichobothrial terminology (Vachon, 1974, 1975).

The following specimens were examined for comparative purposes:

*Ananteris leilae* Lourenço, 1999

COLOMBIA: CHOCÓ DEPARTMENT: ♀ holotype, Riosucio, La Gira, July 1992, L. Mendoza & C. Torres (ICN-AS-10).

*Ananteris platnicki* Lourenço, 1993

PANAMÁ: COCLÉ PROVINCE: 2♂, Parque Nacional General de División Omar Torrijos Herrera, 5 May 2010, R. J. Miranda (ICGES). PANAMÁ PROVINCE: 1♀, Carretera El Llano-Cartí, 9 November, 2012, R. Miranda, I. Murgas & S. Arizala; 1♂3♀, Carretera El Llano-Cartí, sendero Río Paja, 20 July, 2017, R. Miranda, I. Murgas, J. Lezcano & G. García (ICGES). PANAMÁ OESTE PROVINCE: 1♂, Parque Nacional Altos de Campana, 18 September, 2017, R. Miranda, I. Murgas, G. García & J. Lezcano (ICGES). COSTA RICA: LIMON PROVINCE: 1♂1♀, Hitoy Cerere, 74340 (ICGES). PUNTARENAS PROVINCE: 1♀, Parque Nacional Corcovado, Cerro Mueller, 744 m., 24 June-31 July, 2002, Malaise trap, J. Azofeifa (ICGES).

| Dimensions (MM)   |           | <i>A. canalera</i> sp. n. | <i>A. canalera</i> sp. n. | <i>A. canalera</i> sp. n. | <i>A. canalera</i> sp. n. |
|-------------------|-----------|---------------------------|---------------------------|---------------------------|---------------------------|
|                   |           | ♀ holotype                | ♀ paratype                | ♂ paratype                | ♂ paratype                |
| Carapace          | L / W     | 3.00 / 3.00               | 3.25 / 3.25               | 2.35 / 2.20               | 2.40 / 2.25               |
| Mesosoma          | L         | 6.70                      | 8.00                      | 6.00                      | 5.50                      |
| Tergite VII       | L / W     | 1.80 / 2.90               | 2.50 / 3.25               | 1.25 / 2.00               | 1.15 / 2.05               |
| Metasoma + telson | L         | 15.65                     | 15.90                     | 12.00                     | 11.80                     |
| Segment I         | L / W / D | 1.50 / 1.65 / 1.50        | 1.75 / 1.85 / 1.60        | 1.30 / 1.40 / 1.20        | 1.25 / 1.45 / 1.25        |
| Segment II        | L / W / D | 1.75 / 1.75 / 1.60        | 2.00 / 1.70 / 1.55        | 1.45 / 1.30 / 1.20        | 1.40 / 1.35 / 1.25        |
| Segment III       | L / W / D | 2.00 / 1.75 / 1.65        | 2.10 / 1.70 / 1.60        | 1.60 / 1.30 / 1.20        | 1.60 / 1.30 / 1.25        |
| Segment IV        | L / W / D | 2.90 / 1.75 / 1.65        | 2.80 / 1.70 / 1.65        | 2.15 / 1.30 / 1.25        | 2.00 / 1.25 / 1.30        |
| Segment V         | L / W / D | 4.00 / 1.65 / 1.60        | 3.90 / 1.70 / 1.60        | 3.00 / 1.25 / 1.25        | 3.00 / 1.30 / 1.25        |
| Telson            | L / W / D | 3.50 / 1.30 / 1.10        | 3.35 / 1.15 / 1.00        | 2.50 / 0.80 / 0.75        | 2.50 / 0.85 / 0.75        |
| Pedipalp          | L         | 10.10                     | 9.90                      | 7.35                      | 7.25                      |
| Femur             | L / W     | 2.60 / 0.90               | 2.60 / 0.80               | 2.00 / 0.55               | 1.90 / 0.60               |
| Patella           | L / W     | 3.25 / 1.15               | 3.30 / 1.10               | 2.35 / 0.70               | 2.35 / 0.70               |
| Chela             | L         | 4.25                      | 4.00                      | 3.00                      | 3.00                      |
| Manus             | W / D     | 0.90 / 0.95               | 0.80 / 0.80               | 0.55 / 0.50               | 0.50 / 0.50               |
| Movable finger    | L         | 3.15                      | 3.00                      | 2.10                      | 2.20                      |
| <b>Total</b>      | <b>L</b>  | <b>25.35</b>              | <b>27.15</b>              | <b>20.35</b>              | <b>19.70</b>              |

**Table 1.** Comparative measurements of adults of *Ananteris canalera* sp. n. Abbreviations: length (L), width (W, in carapace it corresponds to posterior width), depth (D).

## Systematics

### Family Buthidae C. L. Koch, 1837

Genus *Ananteris* Thorell, 1891

#### *Ananteris canalera* sp. n.

(Figures 1–9, Table 1).

<http://zoobank.org/urn:lsid:zoobank.org:act:FE6CB237-3D82-4BBD-828D-043DD85C02AA>

*Ananteris* sp. Teruel & Cozijn, 2011: 2, fig. 1.

TYPE LOCALITY AND TYPE REPOSITORY. Panama, Panama Oeste Province, Capira, Trinidad de las Minas; ICGES.

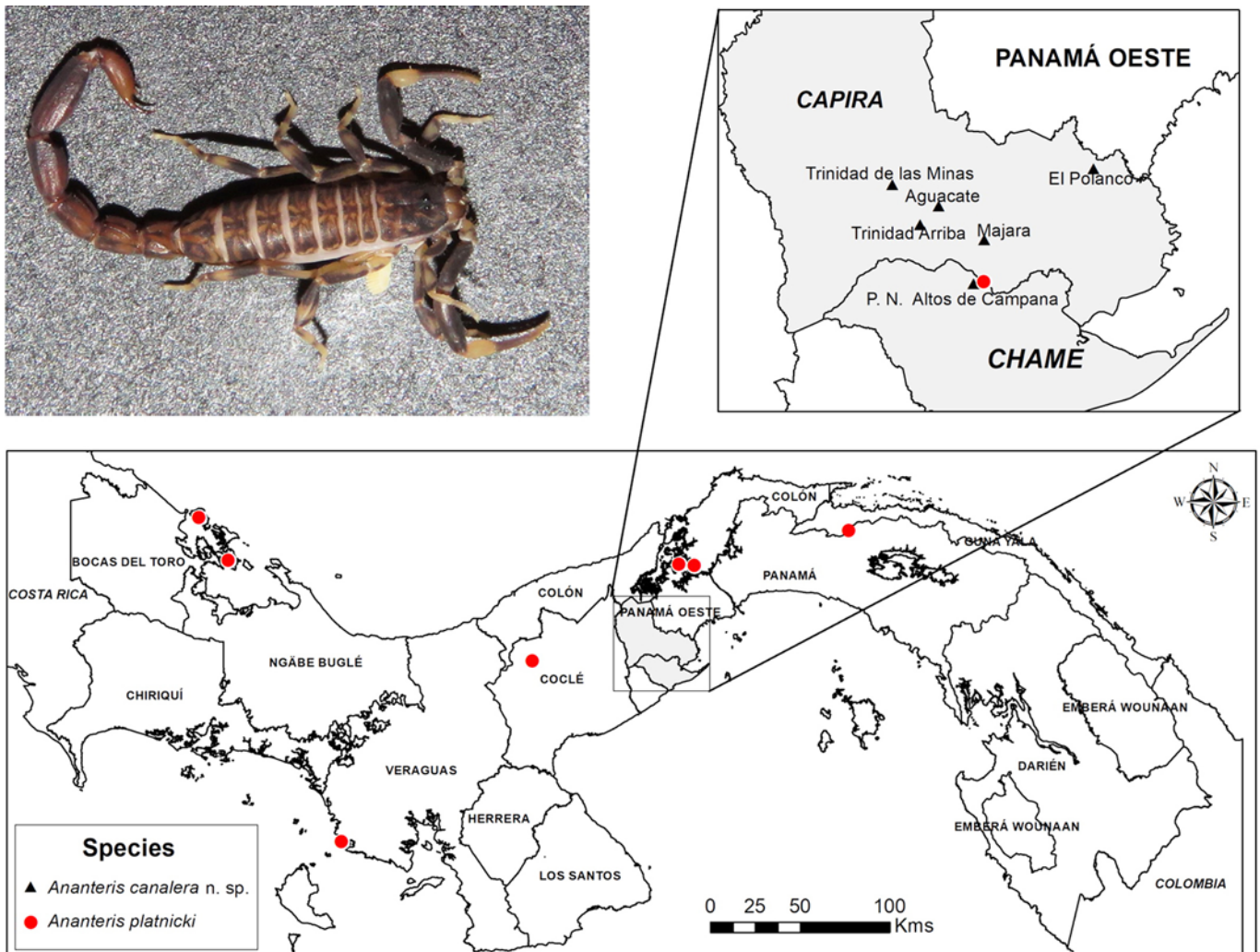
TYPE MATERIAL. **Panama, Panama Oeste Province**, Capira, Trinidad de las Minas, 1♀ (holotype) (CoZEM-ICGES), 4 April 2019, R. Miranda & J. Lezcano. Capira, 2♂3♀ (paratypes) (IESC), 21 November 2017, R. Miranda, I. Murgas, G. García & G. González; 1♂2♀ (paratypes) (ICGES), 20 November 2017, R. Miranda, I. Murgas, G. García & G. González; 1♀ (paratype) (ICGES), 14 August 2019, R. Miranda & I. Murgas. Trinidad de las Minas, 1♂ (paratype) (ICGES), 24 August 2019, R. Miranda & J. Lezcano. Trinidad Arriba, 1♂ (paratype) (ICGES), 9 March 2018, R. Miranda, I. Murgas, J. Lezcano & G. García; 1♀ (paratype) (ICGES), 14 August 2018, R. Miranda, J. Lezcano, L. Domínguez, Gino Fatacioli. Aguacate, 1♂ (paratype) (ICGES), 15 August 2018, R. Miranda, J. Lezcano, L. Domínguez. Majara, 1♂ (paratype) (ICGES), 22 November 2017, R. Miranda, I. Murgas, G. García & G. González. Chame, Chicá, Parque Nacional Altos

de Campana, 2♀ (paratypes), 21 September 2017, R. Miranda, I. Murgas, J. Lezcano, G. García.

OTHER MATERIAL EXAMINED (not paratypes). Panama, Panamá Oeste Province, Polanco, 8♂7♀, 20–21 November, 2017, R. Miranda, I. Murgas, G. García & G. González (ICGES); 1♀, 22 March, 2018, I. Murgas, G. García, J. Lezcano (ICGES). Trinidad de las Minas, 1♀, 8 March 2018, R. Miranda, I. Murgas, G. García and J. Lezcano (ICGES); 2♂3♀, 21–28 August, 2018, R. Miranda, L. Domínguez & J. Lezcano (ICGES). Trinidad Arriba, 1♂1♀, 9–15 March 2018, R. Miranda, I. Murgas, J. Lezcano & G. García (ICGES). Majara, 4♂, 22 November, 2017, R. Miranda, I. Murgas, G. García & G. González (ICGES). Parque Nacional Altos de Campana, 3♂1♀, 18–21 September, 2017, R. Miranda, I. Murgas, J. Lezcano, G. García.

ETYMOLOGY. The specific name is an adjective that commonly refers to the inhabitants of Panama.

DIAGNOSIS. A medium-sized species among its congeneric, from which it differs by the following unique combination of features: Carapace weakly, evenly biconcave and lacking anteromedian projection; metasomal carinal formula 10:10:10:8:5, with all carinae complete; pectines have 17–20 teeth (female 17–18, male 18–20); sternites III–V are smooth, VI bears few weak granules laterally, VII is densely and finely granulose, III and V without whitish smooth areas in the male; fixed finger trichobothria in the order *eb: esb: db: est: et: dt*, with *est* slightly distal to *db* (Fig. 9); male telson similar to that of the female, but smoother; hemispermatophore with *pars*



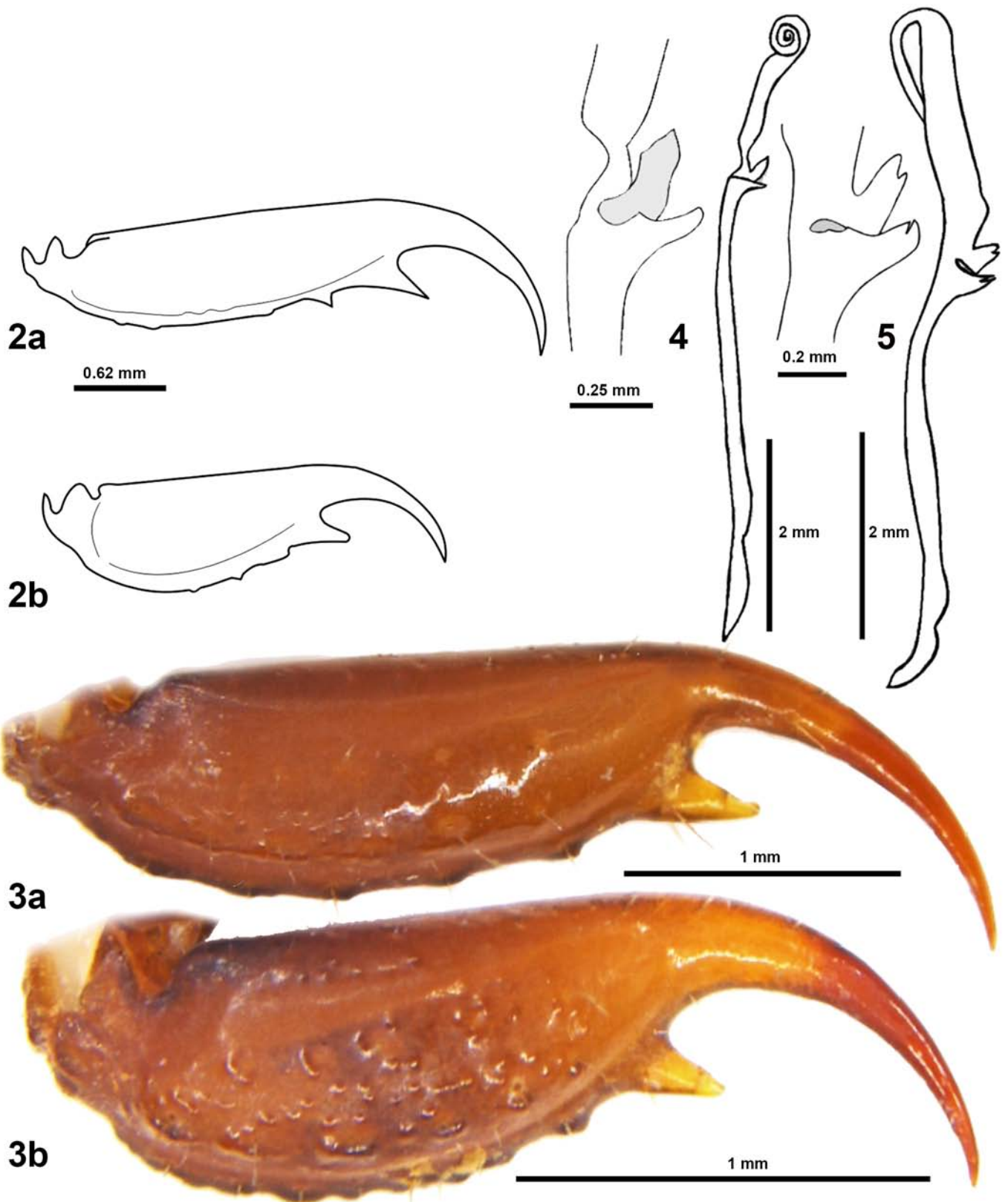
**Figure 1.** Geographical distribution of *Ananteris canalera* sp. n. and *A. platnicki* in Panama. Inside is the dorsal habitus of the female holotype of *A. canalera*.

*recta* clearly wider than *pars reflexa* (Fig. 5). Its closest relative seems to be *A. platnicki*, from which it differs by the structure of male hemispermatophore (Fig. 4), and having only minor sexual dimorphism, whereas in *A. platnicki* the male has the telson (Fig. 2) and pedipalps elongate. It also differs from the Colombian *Ananteris leilae* Lourenco, 1999 by its larger size, higher pectinal tooth count (15–16 teeth in *A. leilae*), telson slightly globose, and chelicerae with a different color pattern. Hemispermatophore of *A. canalera* sp. n. resembles that of *Ananteris columbiana* (see Botero & Flórez, 2011: fig. 61), but the Colombian species has most attenuate pedipalps and telson.

#### DESCRIPTION OF THE FEMALE

**Coloration.** Yellowish with variegated pigmentation over almost the entire body and appendages (Figs. 1, 6–8). Carapace predominantly brown with some yellow spots (Figs. 1, 5); median ocular tubercle black, surrounded by brown spot. Chelicerae hand with dense and complete brown reticular pattern on dorsal view (Fig. 6); fingers almost completely brownish. Coxosternal region yellow with vestigial variegated

pigmentation; genital operculum, pectinal basal piece and pectines, immaculate yellow; sternites III–VI mostly yellow, vestigially spotted in lateral and posterior submargins; sternite VII most darkened. Tergites primarily brown (Fig. 1); each side of tergites I–VI with two marginal slender yellow stripes; two longitudinal submedian yellow stripes crossing tergites I–VI are limited to the posterior one-third of each segment; each side of tergites I–VI with two transverse yellow lines converging near the axial line, arrow-like; tergite VII mostly brown dorsally, with small yellow regions dorsally and laterally. Metasoma predominantly yellowish to reddish (Fig. 7); dorsal intercarinal spaces of segments I–III with a median brown design wider anteriorly, arrow-like (Fig. 8); all segments with variegated pigmentation on all surfaces and carinae; segment V darker (Fig. 7). Telson vesicle pale yellow orange, laterally spotted with brown. Pedipalp trochanter predominantly yellow, with a dorsal quadrate mark; femur and patella mainly brownish (Fig. 6), dorsally darker; trichobothrial pits surrounded by yellow areas; chela with hand uniformly yellow; fingers light brown. Legs with variegated pigmentation, brown spots on all segments except for the tarsomere II, which is completely yellow.



**Figures 2–5:** **Figure 2.** Male telson, lateral aspect, *A. platnicki* from Hitoy Cerere, Costa Rica (2a) and *A. canalera* sp. n. (2b). **Figure 3.** Female telson, lateral aspect, *A. platnicki* from Carretera El Llano-Cartí (3a) and *A. canalera* sp. n. (3b). **Figures 4–5:** Hemispermatophore in ectal aspect and detail of the capsular region in ventral aspect, *A. platnicki* from Parque Nacional Altos de Campana, Panamá Oeste Province (4) and *A. canalera* sp. n., paratype from Polanco (5).

**Carapace.** Densely covered with fine rounded granules, mostly on the brown areas; anterior margin very slightly bi-concave, without a definite median projection (Fig. 6); superciliary carinae moderately strong and subgranulose, others inconspicuous. Median ocular tubercle on the posterior half of the anterior third of the carapace; median eyes separated by almost an ocular diameter. Furrows: anterior median, central median, posterior median, posterior marginal and posterior lateral evident, moderately deep; median ocular furrow wide and deep, mostly smooth, with rudimentary granules posteriorly to the eyes.

**Chelicerae.** Dentition characteristic of the family Buthidae (Vachon, 1963). Movable finger dorsally with two small basal teeth, one median (the largest), one subdistal and one distal tooth; ventrally with three moderately strong teeth: one basal, one median (slightly smaller than the basal), and one distal tooth. Fixed finger dorsally with one basal and one median tooth forming a bicuspid, one subdistal, and one distal tooth. Ventrally with one subdistal tooth.

**Coxosternal region.** Smooth, scarcely setose; sternum type 1, subtriangular, with deep and wide posterior depression that reaches the “apical button”, with two pairs of small lateral setae; coxapophyses I–II with numerous anterior setae.

**Pectines.** Long, almost reaching the posterior end of coxae IV, with vestigial fulcra; pectinal basal piece slightly wider than long, deeply notched anteriorly and strongly convex posteriorly.

**Sternites:** with abundant short and translucent setae; III–VI smooth; VII finely and densely granulose, with short and finely granulose paramedian carinae, lateral carinae absent; spiracles elongated, approximately 1.5 longer than wide in III–V and 2.0 times longer than wide in VI.

**Tergites.** Granulation similar to that of carapace; tergites III–VI with median carina that only occupies the posterior half of each plate; tergite VII tetracarinate, and granulose anteromedian elevation on the position of the median carina.

**Metasoma.** Scarcely setose. Segments I–III with 10 carinae, IV with eight, and V with five; lateral inframedian carinae on III rudimentary, only evident on the basal one-half of the segment; dorsal lateral carinae converge distally on segments I–III, and also ending in a larger distal granule on II–IV; all carinae minutely serrulate; intercarinal spaces with granulations. Telson (Fig. 3): vesicle lightly elongated; lateral surfaces mostly smooth, except for some vestigial granules towards the ventral surface; ventrally with three poorly developed longitudinal carinae composed by low and large granules; subaculear tubercle strong and spine-like; aculeus long and curve.

**Pedipalps.** femur with five longitudinal carinae; dorsal surface coriaceous, with some disperse small granules. Patella without well-defined carinae, with some moderate granules on the internal surface. Chela acarinate; fingers with six almost linear rows of denticles, being the basal the longest; also, on the movable finger there is a short apical row of four denticles (it is considered by some authors as a seventh row). Trichobothriotaxy type A, femur with  $\beta$  configuration

(Vachon 1974, 1975); fixed finger trichobothria in the order *eb:esb:db:est:et:dt*, with *est* slightly distal to *db* (Fig. 9). Measurements (Table 1).

**Legs:** tarsomeres I and II with numerous ventral setae; tibial spur on legs III–IV; prolateral pedal spur single on legs I–II, bifid on III–IV; retrolateral pedal spur present on all legs.

**DESCRIPTION OF THE MALE.** Similar to female, from which it differs in the following characters: smaller in size; pectines longer, slightly reaching beyond the posterior end of coxae IV, with higher tooth counts (18 – 20); and telson not elongated (Fig. 2), but slightly most attenuate (vesicle twice as long as wide). Measurements (Table 1).

**Hemispermatothore** (description based on two specimens from Capira, Majara). Flagelliform, thin and poorly sclerotized. Foot narrow and flat. Pedal flexure inconspicuous but movable. Body very long. Capsular region located near the middle of the body, with two lobes, the basal and the internal subequal and strong. Flagellum with long *pars recta*, wider than the curved but not coiled *pars reflexa* (Fig. 5). Carapace length to hemispermatothore body length ratio = 1:2. There was no variation between the two hemispermatothores examined.

**VARIABILITY.** Pectinal teeth count: 17 to 20 on males ( $n = 23$ ; mode = 18); 16 to 19 on females ( $n = 17$ ; mode = 17 and 18). Total body length (including telson): male 21–24 mm, female 25–30 mm. No variation was observed in the trichobothrial pattern on the pedipalp fixed finger.

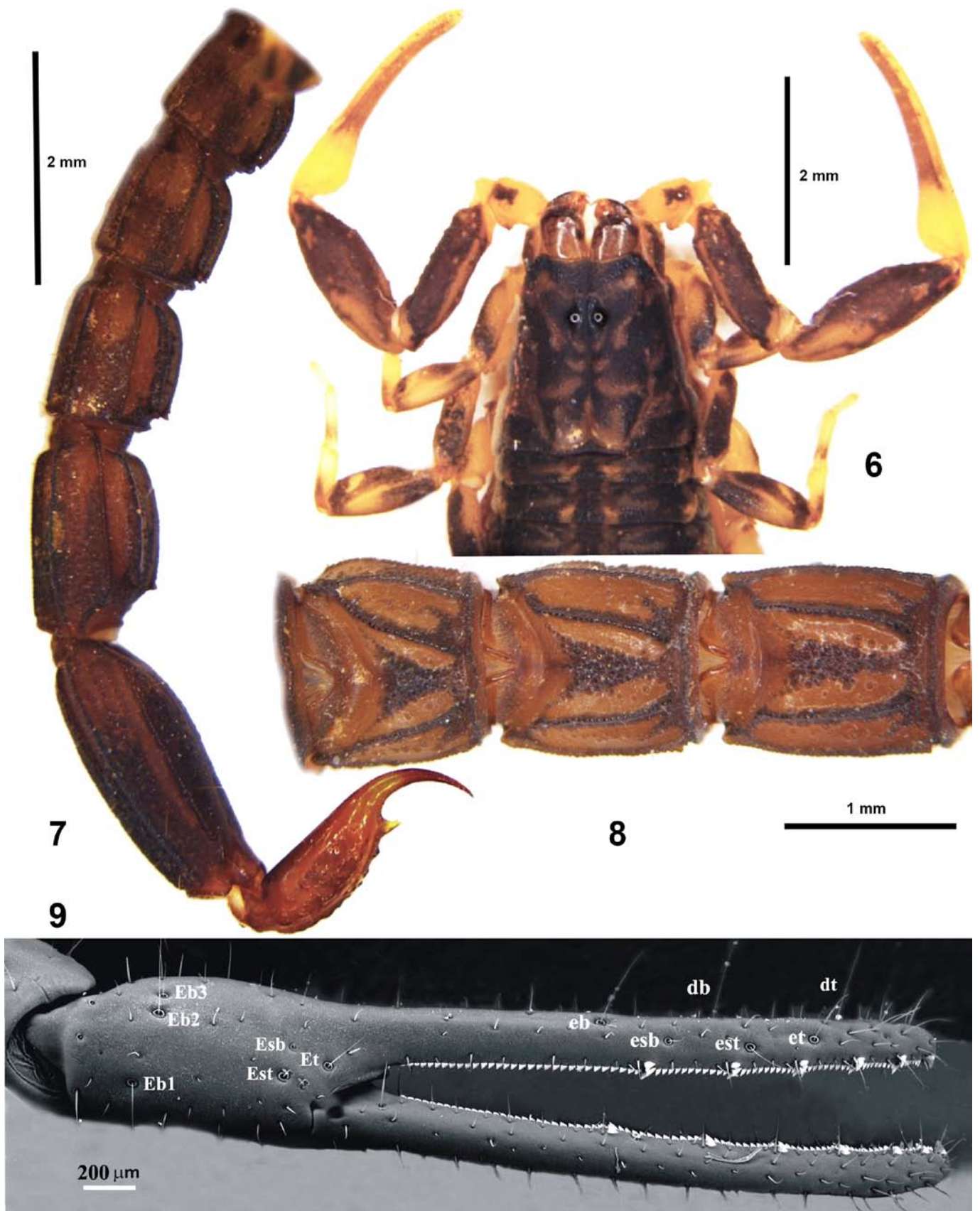
**ANOMALIES.** One female paratype (IES) has only 11 teeth on the left comb, but it lacks the distal piece of the marginal lamella (a similar case was recorded for a male of *Ananteris solimariae* by Botero-Trujillo & Flórez, 2011: 32); such anomalies may be congenic or due to postembryonic accident. One male has four rows of granules in the movable finger of left pedipalp (lacks the apical part).

**NATURAL HISTORY.** This species is associated with soil and leaf litter in areas of secondary forest or scrubland. It is sympatric with *Centruroides granosus* (Thorell, 1876) and *Tityus tayrona* Lourenco, 1991. Births have been registered in May–June ( $n = 5$ ) and October to December ( $n = 6$ ). Average litter size 18 ( $n = 14$ , range = 4–31).

**DISTRIBUTION.** Panama, Panama Oeste province, at several locations from Capira and Chame districts (Fig. 1).

## Acknowledgements

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**Figures 6–9:** *A. canalera* sp. n., paratypes (ICGES). **Figures 6–8.** Female, pedipalps, carapace and tergites I–III (6), metasoma and telson lateral view (7), and metasoma I–III, dorsal view (8). **Figure 9.** Male, pedipalp chela, external view, showing trichobothria.



of *A. platnicki* for comparison. We thank Jorge Ceballos, Smithsonian Tropical Research Institute for the pedipalp chela micrograph. Ingrid Murgas and Juan Lezcano (ICGES) assisted during field and laboratory work. Alberto Cumbreña (Geographic System Unity, ICGES) helped with the precise data on several localities.

## References

- ARMAS, L.F. DE & J.M. MAES. 2000. Lista anotada de los alacranes (Arachnida: Scorpiones) de América Central, con algunas consideraciones biogeográficas. *Cocuyo*, 10: 16–17.
- ARMAS, L.F. DE & J.M. MAES. 2001. Enmiendas a la “Lista anotada de los alacranes de América Central (Arachnida: Scorpiones)”. *Revista Nicaragüense de Entomología*, 46: 23–38.
- BORGES, A. (ed.). 2012. *Los escorpiones y el escorpionismo en Panamá*. Novo Art, Panamá. Vol. I, 48 pp.
- BORGES, A., R. J. MIRANDA & J. M. PASCALE. 2012. Scorpionism in Central America, with special reference to the case of Panama. *The Journal of Venomous Animals and Toxins including Tropical Diseases*, 18(2): 130–143.
- BOTERO-TRUJILLO, R. & E. FLÓREZ D. 2011. A revisionary approach of Colombian *Ananteris* (Scorpiones, Buthidae): two new species, a new synonymy, and notes on the value of trichobothria and hemispermatophore for the taxonomy of the group. *Zootaxa*, 2904: 1–44.
- LOURENÇO, W. R. & E. MÉNDEZ. 1984. Inventario preliminar sobre la fauna de escorpiones de Panamá, con algunas consideraciones taxonómicas y bio-geográficas. *Revista de Biología Tropical*, 32(1): 85–93.
- MIRANDA, R. J. 2011. Aspectos biológicos. Pp. 13–20 in: Borges, A., ed., *Los escorpiones y el escorpionismo en Panamá*. Editora NovoArt, Panamá, vol. 1, 48 pp.
- QUINTERO ARIAS, D. & L. A. ESPOSITO. 2014. A new species of *Centruroides* Marx (Scorpiones: Buthidae) from Panama and new distribution records for *Centruroides bicolor* (Pocock, 1898) and *Centruroides granosus* (Thorell, 1876). *Zootaxa*, 3795 (3): 373–382.
- SOLEGLAD, M. E. & V. FET. 2003. The scorpion sternum: structure and phylogeny (Scorpiones: Orthosterni). *Euscorpius*, 5: 1–34.
- STAHNKE, H. L. 1971. Scorpion nomenclature and mensuration. *Entomological News*, 81(11): 297–316.
- TERUEL, R. & COZIEN, M. A. C. 2011. A checklist of the scorpions (Arachnida: Scorpiones) of Panama, with two new records. *Euscorpius*, 133: 1–6.
- VACHON, M. 1963. De l'utilité, en systématique, d'une nomenclature des dents des chélicères chez les scorpions. *Bulletin du Muséum national de Histoire naturelle*, Paris (2e séries.), 35(2): 161–166.
- VACHON, M. 1974. Etude des caractères utilisés pour classer les familles et les genres de Scorpions (Arachnides). 1. La trichobothriotaxie en arachnologie. Sigles trichobothriaux et types de trichobothriotaxie chez les Scorpions. *Bulletin du Muséum National d'Histoire Naturelle*, Paris, 3è sér., n° 140, Zoologie, 104: 857–958.
- VACHON, M. 1975. Sur l'utilisation de la trichobothriotaxie du bras des pédipalpes des scorpions (Arachnides) dans le classement des genres de la famille des Buthidae Simon. *Comptes Rendus des séances de l'Académie des Sciences, Paris (series D)*, 281: 1597–1599.