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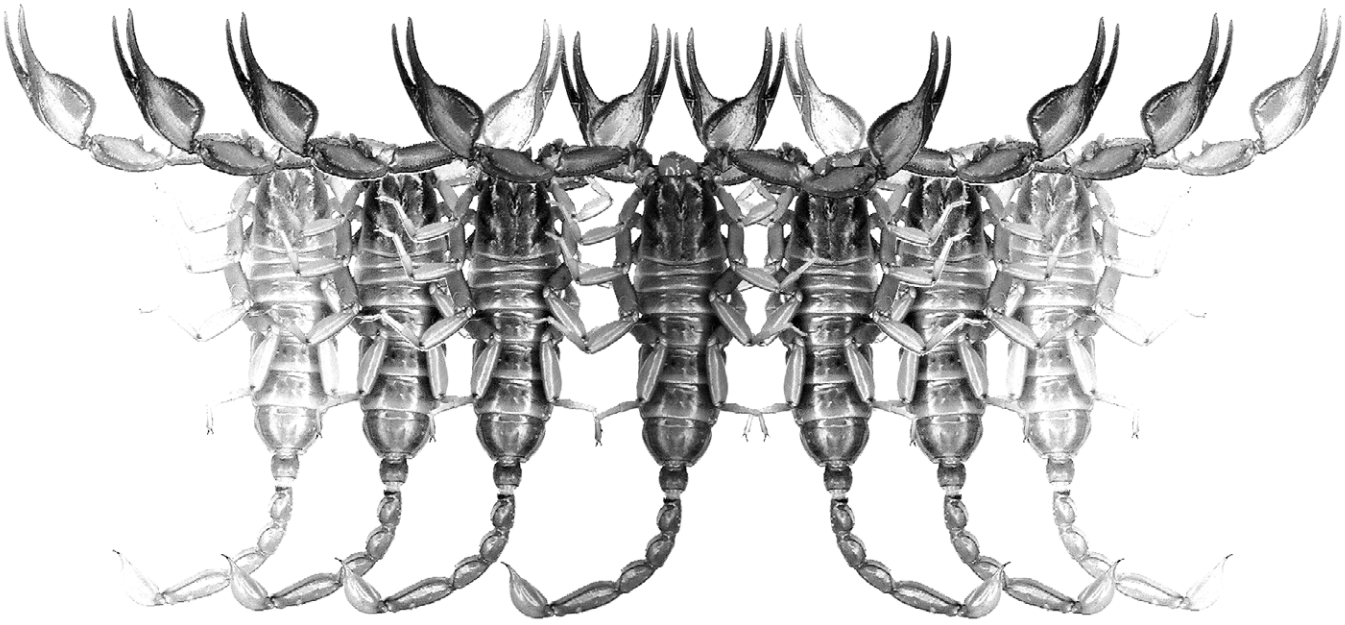

A Checklist of the Scorpions (Arachnida: Scorpiones) of Panama, with Two New Records

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- **WAM**, Western Australian Museum, Perth, Australia
- **NTNU**, Norwegian University of Science and Technology, Trondheim, Norway
- **OUMNH**, Oxford University Museum of Natural History, Oxford, UK
- **NEV**, Library Netherlands Entomological Society, Amsterdam, Netherlands

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A checklist of the scorpions (Arachnida: Scorpiones) of Panama, with two new records

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Summary

In the present note, we compile a checklist of all scorpion species recorded from Panama. A total of three families, five genera and 14 species are confirmed to occur in the country, and previous records of two other families, four genera, and nine species are discarded as misidentifications, mislabelings, or accidental introductions. Two Buthidae species are herein recorded for the first time from Panama: *Tityus tayrona* Lourenço, 1991 (so far known only from northern Colombia) and one apparently undescribed species of *Ananteris* Thorell, 1891.

Introduction

The scorpion fauna of Panama has attracted the attention of scorpiologists for more than a century: it achieves a plethora of punctual records and/or descriptions (e.g., Masi, 1912; Lourenço, 1984, 1993a–b, 1996; Francke & Stockwell, 1987; Víquez, 1999; Montoya & Armas, 2002; Quintero, 2005; a quasi-complete compilation can be found in Fet et al., 2000), as well as some revisions (Pocock, 1902; Lourenço & Méndez, 1984; Armas & Maes, 2000, 2001). Further, some species which had been wrongly synonymized have recently been revisited and revalidated (Armas & Trujillo, 2010; Armas et al., 2011a; Teruel, 2011).

Pooling from all of these sources, the complete number of scorpion taxa that have been either described or recorded from Panama is increased to five families, nine genera and 21 species. Nevertheless, it must be noted that these numbers are different in all available revisions (Pocock, 1902; Lourenço & Méndez, 1984; Armas & Maes, 2000, 2001), mostly because some "old" taxa have been overlooked and other obviously erroneous or questionable records have been uncritically reproduced.

We attempted to clear up these ambiguities by examining as many scorpion samples and literature as possible and we present the results below. During this process, we also received recently collected samples which include two new additions for the Panamanian scorpion fauna. The results of this study are herein presented in the form of an annotated checklist, which also updates the distribution of all taxa in the country.

Methods & Materials

The specimens were studied and measured under a Zeiss Stemi 2000-C stereomicroscope equipped with line scale and grid ocular micrometers. Photographs were taken with a Canon PowerShot A620 digital camera. Digital images were slightly processed with Adobe Photoshop® 8.0, only to optimize bright and contrast features. Nomenclature and measurements follow Stahnke (1970). All measurements are given in millimeters. Abbreviations for the repositories of the specimens mentioned herein are IES (Instituto de Ecología y Sistemática, Havana, Cuba), MM (personal collection of Michel Montoya, San José, Costa Rica), and RTO (first author's personal collection).

Results and Discussion

Taxa confirmed to occur in Panama, including their distributions by provinces:

Family Buthidae C.L. Koch 1837

1. *Ananteris platnicki* Lourenço, 1993. Distribution: Bocas del Toro, Veraguas, Coclé, Panamá. Also in Costa Rica (Limón, Puntarenas). See Lourenço (1993b), Víquez (1999), Montoya & Armas (2002), and Quintero (2005). We examined all specimens recorded by Montoya & Armas (2002) from Bocas del Toro (IES, MM), and confirmed their identity after comparison with adult topotypes of both sexes from Costa Rica (RTO: Sco-0187–0191 and Sco-0446).

Figure 1: Adult female *Ananteris* sp. from Panama, dorsal view.

2. *Ananteris* sp. (Fig. 1). Distribution: Panamá. We examined an adult female collected in the environs of Panama City (RTO: Sco-0495), which is clearly not conspecific with *A. platnicki*, nor matches any of the species described or recorded from neighboring Colombia. Unfortunately, this specimen lacks both pectines and is not well preserved, thus, it is preferable to wait for additional samples to make an adequate description.

3. *Centruroides bicolor* (Pocock, 1898). Distribution: Chiriquí, Veraguas. Also in Costa Rica (Puntarenas). See Lourenço & Méndez (1984), Francke & Stockwell (1987), Víquez (1999), and Quintero (2005). We examined high-resolution color pictures of adults of both sexes from Chiriquí (kindly sent by František Kovařík) and confirmed their identity.

4. *Centruroides granosus* (Thorell, 1876). Distribution: Bocas del Toro, Veraguas, Herrera, Panamá, Darién. So far recorded only from Panama, but it probably occurs also in neighboring Costa Rica and Colombia. See Armas & Trujillo (2010) and Armas et al. (2011a–b).

5. *Centruroides limbatus* (Pocock, 1898). Distribution: Bocas del Toro. Also in Nicaragua (Atlántico Norte, Managua, Río San Juan) and Costa Rica (Heredia,

Limón, Puntarenas). See Francke & Stockwell (1987), Víquez (1999), and Montoya & Armas (2002). We examined all specimens recorded by Montoya & Armas (2002) from Bocas del Toro (IES, MM) and confirmed their identity.

6. *Tityus cerroazul* Lourenço, 1986. Distribution: Panamá. Also in Costa Rica (Limón). See Lourenço (1986) and Víquez et al. (2005). We examined two Costa Rican specimens recorded by Víquez et al. (2005) as adult male and female, and both appear to be actually small juveniles of *T. pachyurus*. Nevertheless, we accept its current status here because the holotype from Panama has not been studied by us.

7. *Tityus championi* Pocock, 1898. Distribution: Chiriquí. Also in Costa Rica (Puntarenas). See Francke & Stockwell (1987) and Teruel (2011).

8. *Tityus festae* Borelli, 1899. Distribution: Panamá, Darién. Also in Colombia (Magdalena). See Lourenço (1984, 1997) and Lourenço & Méndez (1984). We examined an adult female collected in the environs of Panama City (RTO: Sco-0496).

9. *Tityus mongei* Lourenço, 1996. Distribution: Colón. So far recorded only from Panama. See Lourenço (1996).

10. *Tityus ocelote* Francke et Stockwell, 1987. Distribution: Bocas del Toro. Also in Costa Rica (Heredia, Limón, Puntarenas). See Francke & Stockwell (1987), Víquez (1999), Montoya & Armas (2002), and Quintero (2005). We examined all specimens recorded by Montoya & Armas (2002) from Bocas del Toro (IES, MM) and confirmed their identity.

11. *Tityus pachyurus* Pocock, 1897. Distribution: Bocas del Toro, Colón, Panamá, Darién. Also in Costa Rica (Limón) and Colombia (Chocó, Tolima, Cundinamarca). See Lourenço & Méndez (1984), Francke & Stockwell (1987), Lourenço (1997), Víquez (1999), and Montoya & Armas (2002). We examined all specimens recorded by Montoya & Armas (2002) from Bocas del Toro (IES, MM) and confirmed their identity.

12. *Tityus tayrona* Lourenço, 1991 (Fig. 2). Distribution: Panama, probably also Darién and San Blas. Also in Colombia (Córdoba, Bolívar, Atlántico, Magdalena, Cesar). See Lourenço (1997), Botero-Trujillo & Fagua (2007), and Teruel & Roncallo (2010). We examined two adult males, four adult females, and one juvenile female collected in the environs of Panama City (RTO: Sco-0497), plus several males, females, and juveniles kept alive by the second author (MAC). Panamanian specimens are slightly smaller (males 30–34 mm, females 32–37 mm) than Colombian ones (males 33–41 mm, females 35–38 mm), but both samples are otherwise identical in all other diagnostic characters (morphometric proportions, pectinal tooth counts, number of principal rows of granules in pedipalp fingers, shape of basal middle lamella of pectines, as well as shape, sculpture, and carination of pedipalps, metasoma, and telson). This represents the first record of this species both from Panama and for outside Colombia.

Family Chactidae Pocock, 1893

13. *Chactas exsul* (Werner, 1939). Distribution: Coclé, Colón, Panamá, Darién. Also in Costa Rica (Limón). See Lourenço & Méndez (1984), Francke & Stockwell (1987), and Sissom (2000a). See below under *Neochactas delicatus* (Karsch, 1879).

Family Hemiscorpiidae Pocock, 1893

14. *Opisthacanthus elatus* (Gervais, 1844). Distribution: Panamá, Darién. Also in Colombia (Chocó, Córdoba, Antioquia, Bolívar, Atlántico, Magdalena, Caldas, Norte de Santander, Santander, Boyacá, Meta, Huila, Amazonas). See Lourenço & Méndez (1984) and Lourenço (1993a, 1997). We examined adults of both sexes from the type locality (IES).

Records which are either erroneous or in need of confirmation:

1. *Centruroides exsul* (Meise, 1934). Recorded by Lourenço & Méndez (1984) from Chiriquí. This species is endemic from the Galapagos Islands of Ecuador (Baert et al., 1995; Fet & Lowe, 2000), thus, this record clearly implies a misidentification, mislabeling, or an accidental introduction.

2. *Centruroides gracilis* (Latreille, 1804). Recorded by Lourenço & Méndez (1984) from several localities in Bocas del Toro, Panamá, and Darién. Montoya & Armas (2002) demonstrated that the species occurring at Bocas del Toro is actually *C. limbatus*, thus, the remaining records need to be confirmed.

3. *Centruroides margaritatus* (Gervais, 1841). Repeatedly recorded from Panama (e.g., Masi, 1912; Lourenço & Méndez, 1984; Fet & Lowe, 2000), but Armas et al. (2011a–b) demonstrated that the species occurring at all localities examined by them is actually *C. granosus*.

4. *Tityus androcottoides* (Karsch, 1879). Recorded by Pocock (1902) from Panama. This species occurs only in Venezuela, Guyana, and French Guiana (Fet & Lowe, 2000), thus, this record clearly implies a misidentification, mislabeling, or an accidental introduction.

Figure 2: Live specimens of *Tityus tayrona* from Panama, in captivity: **(a–b)** small adult males; **(c)** large adult female; **(d)** juvenile.

5. *Tityus asthenes* Pocock, 1893. Repeatedly recorded from Panama (e.g., Lourenço, 1988; Fet & Lowe, 2000), but Teruel (2011) questioned all of these records and demonstrated that at least those from Chiriquí actually refer to *T. championi*.

6. *Tityus parvulus* Kraepelin, 1914. Recorded by Lourenço & Méndez (1984) from Arraiján (there is an Arraiján in Herrera Province, but the locality plotted in the map by Lourenço & Méndez (1984: fig. 14) actually corresponds to Nuevo Arraiján, in Panamá Province). Teruel & García (2008) discarded this record as erroneous and suggested that it could refer instead to *T. ocelote*, which was so far the single member of the "*clathratus*" group recorded from this country. Nevertheless, it seems now that the species actually implied was more likely *T. tayrona*, because its Panamanian record herein given is less than 20 km away from Nuevo Arraiján.

7. *Neochactas delicatus* (Karsch, 1879). Recorded by Pocock (1902) from Panama City and by Sissom (1990) from El Llano (also in Panamá Province), as *Broteochactas delicatus*. Both genera *Broteochactas* Pocock, 1893 and *Neochactas* Soleglad et Fet, 2003 are strictly South American taxa that reach their northwestern natural range in southern Colombia (Sissom, 2000a; Soleglad & Fet, 2003), thus, this record clearly implies a misidentification, mislabeling, or an accidental introduction. At least the black & white photo that supports the most recent record (Sissom, 1990: fig. 3.18) actually shows an adult female of *Chactas exsul*.

8. *Brachistosternus ehrenbergii* (Gervais, 1841). Recorded by Masi (1912) from Taboga Island (Panamá Province). The genus *Brachistosternus* Pocock, 1893 is strictly a South American taxon that reaches its northernmost natural occurrence in southern Ecuador (Cekalovic, 1969; Lowe & Fet, 2000), thus, this record clearly implies a misidentification, mislabeling, or an accidental introduction.

9. *Vaejovis* sp. Recorded by Lourenço & Méndez (1984) from Panama City. The family Vaejovidae Thorell, 1876 is strictly a North American taxon that reaches its

southernmost natural occurrence in extreme western Guatemala (Sissom, 1989; Sissom, 2000b), thus, this record clearly implies a misidentification, mislabeling, or an accidental introduction.

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