



On current status of the scorpion fauna (Chelicerata: Scorpiones) from Cordoba, Colombian Caribbean: A Checklist

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General Note



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ABSTRACT

The first records on scorpions for the department of Córdoba date from three decades ago. To update the knowledge about scorpions in this department, information was obtained both from bibliographic sources and from material deposited in biological collections. In total, five species of three families are reported: *Ananteris columbiana* Lourenço, 1991, *Opisthacanthus elatus* (Gervais,

1844), *Tarsoporosus* sp., *Tityus (Archaeotityus) tayrona* Lourenço, 1991 and *Tityus (Atreus) choco* Lourenço & Flórez, 2018, which corresponds to 6.1% of the species and 75% of the families reported for Colombia. This contribution represents the first approach to the scorpion fauna of the department of Córdoba, covering its six subregions. *Ananteris columbiana* Lourenço, 1991, for the first time is reported in fragments of mangrove from Colombia and the known distribution of *Tityus (Atreus) choco* Lourenço & Flórez, 2018 is increasing towards to the department of Córdoba. Additionally, ecological data and distribution maps were included.

Keywords: Taxonomy, Microhabitat, Diversity, Distribution, Colombia.

1. INTRODUCTION

The Scorpions are a group of arachnids widely distributed in all continents and bioregions of the planet, except Antarctica, although most species are found in tropical and subtropical regions (1-3). They are predators of nocturnal and solitary habits, they use the strong chelae of the pedipalps and the powerful toxins of their poison to immobilize their prey; all produce poison, which they use in the capture of prey and as a defense (1,3).

They are arthropods, whose body size varies between 8.5 mm and 23 cm, their coloration is usually yellow, brown or black; some cave and humic species are de-pigmented and adapted to the microhabitats they occupy (4,1,5,3), distinguished by the metasoma, which is one of the most important appendices of scorpions, because in the terminal end they present the telson, which contains the poison gland and the inoculating stinger (1,3).

Their evolutionary relationships with other groups of arachnids are still under study, scorpions have confounded our understanding of animal terrestrialization for several decades (1, 3). These arachnids are one of the most successful terrestrial animal groups, but at present, the details of their journey out of the water are unclear⁶. The oldest fossils date from the Silurian approximately 440 million years ago, their appearance is basically the same and their morphology extraordinarily stable, however, some fossil species reached up to one meter in length (1,3).

The scorpion fauna of Colombia has been one of the best known in South America (7-27). Currently, the scorpion fauna of Colombia is represented by four families (Buthidae, Chactidae, Diplocentridae, and Hormuridae), 14 genera and approximately 81 species (8,24,28,29). In the Caribbean region of Colombia, different studies have been conducted focused on knowing the composition, richness, distribution and taxonomy of scorpion species in different departments (11, 20, 28 27). However, the department of Córdoba does not present systematic studies; Only some reports scattered in the literature are known (10,15,8,24,29, 30).

The first records on scorpions for the department of Córdoba date from three decades ago, made by 10, which recorded the species *Tityus (Atreus) asthenes* Pocock, 1893 in the scorpion review for Colombia, likewise, 15 published a synopsis of the scorpions of Colombia, which registered the species *Opisthacanthus elatus* Peters, 1861, however, the location mentioned for the municipality of Lorica is imprecise.

Subsequently, 8 conducted a review of scorpions of the family Buthidae where it refers to two species for the department of Córdoba, *Tityus (Archaeotityus) tayrona* Lourenço, 1991 and *T. (A.) asthenes* (24,29), mention the species *T. tayrona* from several locations of the department. Recently, a study on the richness and diversity of scorpions done by 30 is known, this is the most complete contribution, since it covers several locations in the department, however, the data was never published. In order to contribute to the knowledge of the biodiversity of the Scorpiones order in Colombia, it was considered essential to update the state of knowledge of the species present in the department of Córdoba.

2. MATERIALS AND METHODS

The department of Córdoba It's characterized by presenting the 70% of the surface corresponding to areas of flat relief, which serve as flood valleys of the rivers Sinú and San Jorge, and the remaining 30% corresponds to mountainous areas of the Abibe, San Jerónimo, and Ayapel, which allows the department to be divided into six sub-regions taking into account administrative and environmental aspects (Alto Sinú, Medio Sinú, Bajo Sinú, San Jorge, Savannas and Costanera), (31).

In order to establish a clear panorama about the current status of scorpions in the department of Córdoba, a literature review of works developed in scorpions of the department of Córdoba was carried out. Additionally, the arthropod collection of the Laboratory of Zoology (LUZC) and Entomology of the University of Córdoba (LEUC) was reviewed. Likewise, between July 2014 and December 2017, collections were made in different areas that correspond to areas of tropical dry forest, humid forest, savannah areas, and mangrove forests. During the collections, both the free search without restriction, using ultraviolet light, and the sifting of

leaves in a Winkler sieve with a diameter of 16 mm were used, reviewing the material in white plastic trays and entomological clamps.

The samples were preserved in 70% alcohol, the individuals were identified following the keys proposed by 16, 8. Finally, the collected specimens were deposited in the collection of the Entomology Laboratory of the University of Córdoba (LEUC). The maps were made with the QGIS program "Girona" version 3.4.12, with raster layers of Natural Earth. Additionally, distribution records were supplemented from previous bibliographic sources (10,15,8,24,30,29).

3. RESULTS

FAMILY BUTHIDAE

Ananteris columbiana Lourenço, 1991

Figures 1a, 2, 7a

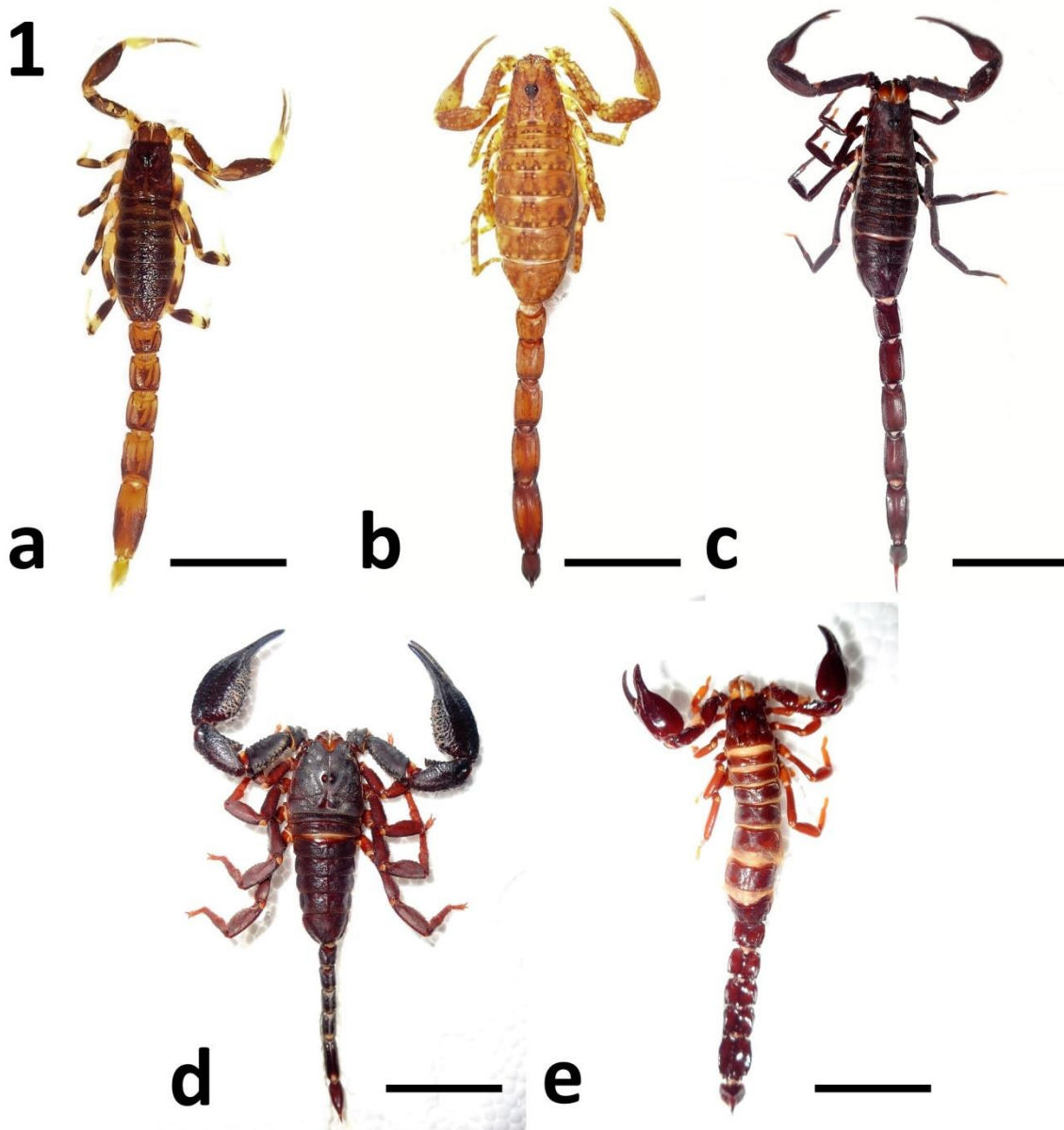


Figure 1. Habitus: a, *Ananteris columbiana* Lourenço, 1991; b, *Tityus (Archaeotityus) tayrona* Lourenço, 1991; c, *Tityus (Atreus) choco* Lourenço & Flórez, 2018; d, *Opisthacanthus elatus* Peters, 1861; e, *Tarsoporosus* sp.

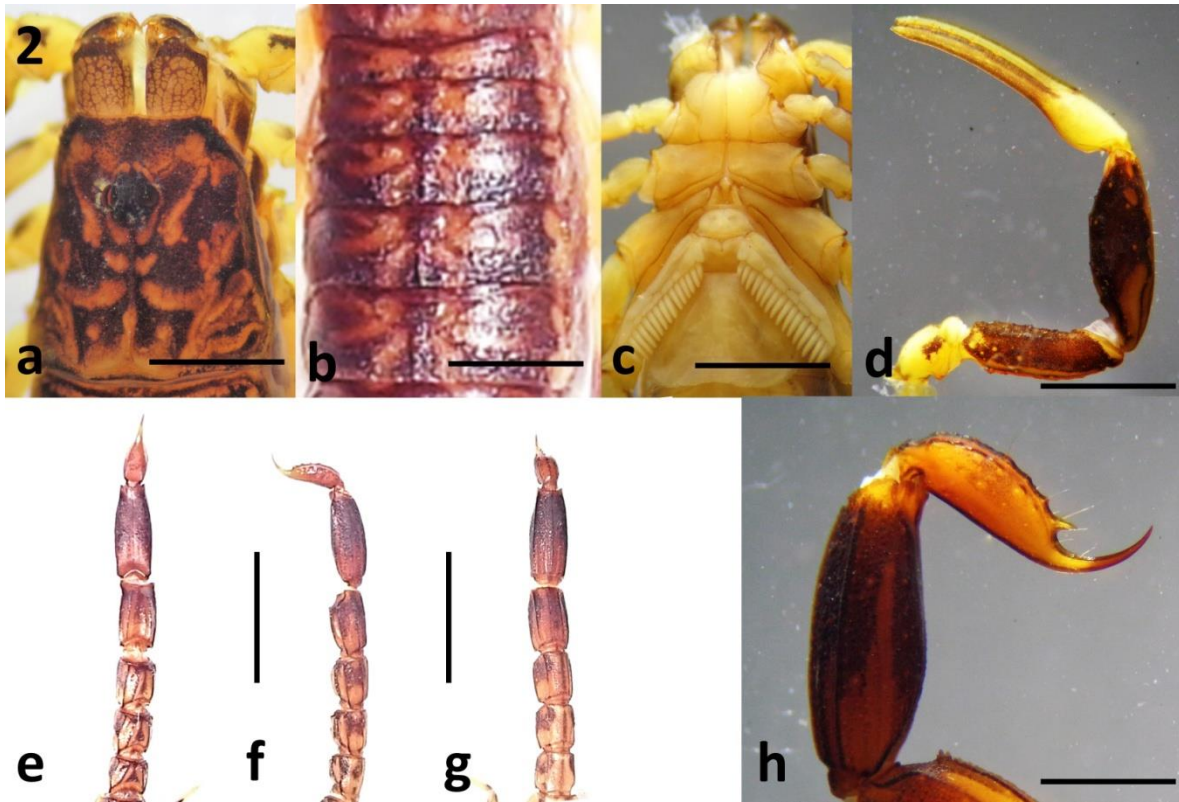


Figure 2. Adult, *Ananteris columbiana* Lourenço, 1991: a) prosoma, dorsal view; b) tergites I-V, dorsal view; c) sternopectinal region, ventral view; d) pedipalp, dorsal view; e) metasoma, dorsal view; f) metasoma, lateral view; g) metasoma, ventral view; h) metasomal segment V and telson, lateral view. Scale line=3 mm (Figs. a, b, c, d, e); 1mm (Figs. f, g, h).

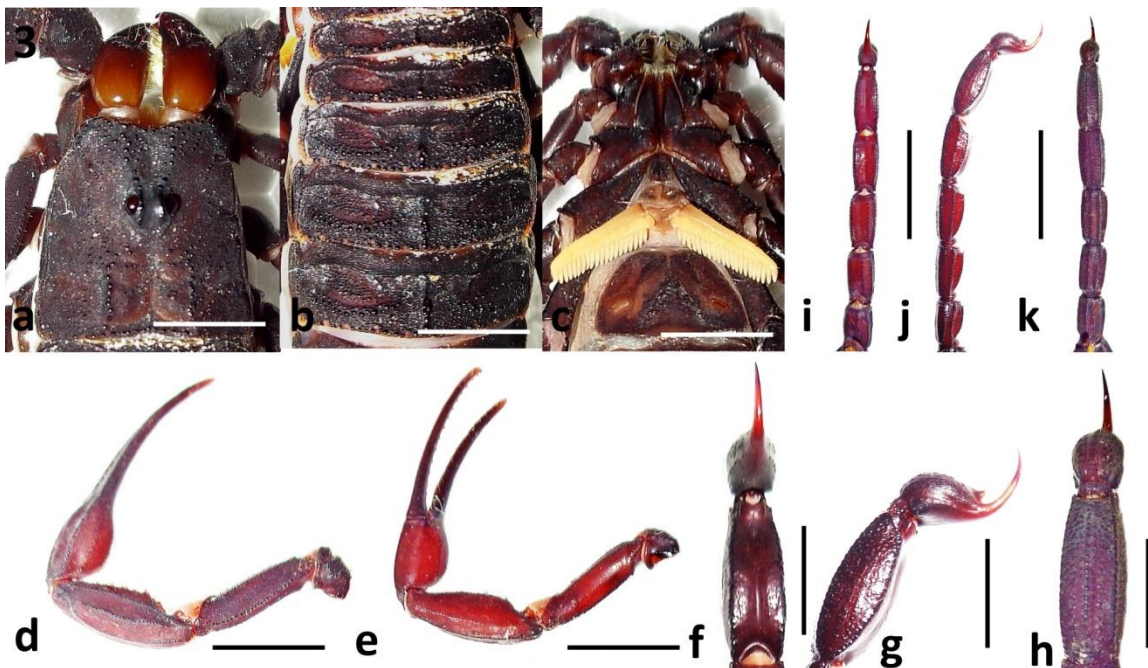


Figure 3. Adult, *Tityus (Atreus) choco* Lourenço & Flórez, 2018: a) prosoma, dorsal view; b) tergites I-V, dorsal view; c) pedipalp, dorsal view; d) pedipalp, ventral view; e) sternopectinal region, ventral view; f) metasomal segment V and telson, dorsal view; g) metasomal segment V and telson, lateral view; h) metasomal segment V and telson, ventral view; i) metasoma, dorsal view; j) metasoma, lateral view; k) metasoma, ventral view. Scale line= 0.5 mm. Scale line=3 mm (Figs. a, b, c, d, e); 1mm (Figs. f, g, h); 10 mm (Figs. i, j, k).

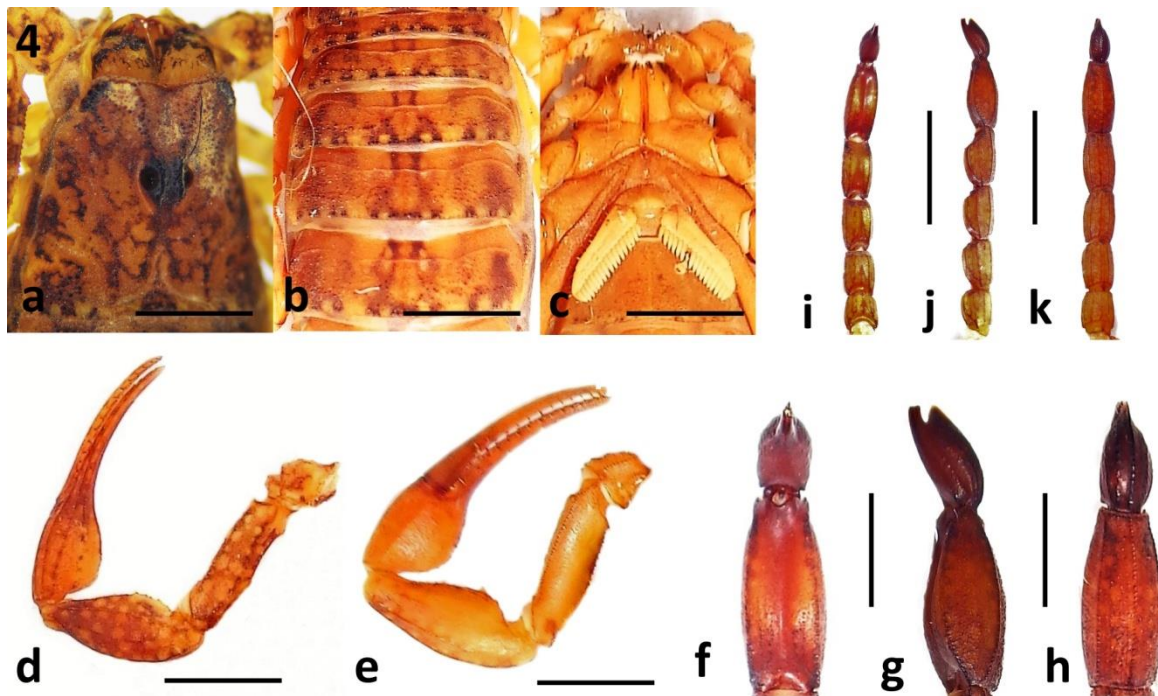


Figure 4. Adult, *Tityus (Archaeotityus) tayrona* Lourenço, 1991: a) prosoma, dorsal view; b) tergites I-V, dorsal view; c) pedipalp, dorsal view; d) pedipalp, ventral view; e) sternopectinal region, ventral view; f) metasomal segment V and telson, dorsal view; g) metasomal segment V and telson, lateral view; h) metasomal segment V and telson, ventral view; i) metasoma, dorsal view; j) metasoma, lateral view; k) metasoma, ventral view. Scale line= 0.5 mm. Scale line=3 mm (Figs. a, b, c, d, e); 1mm (Figs. f, g, h); 10 mm (Figs. i, j, k).

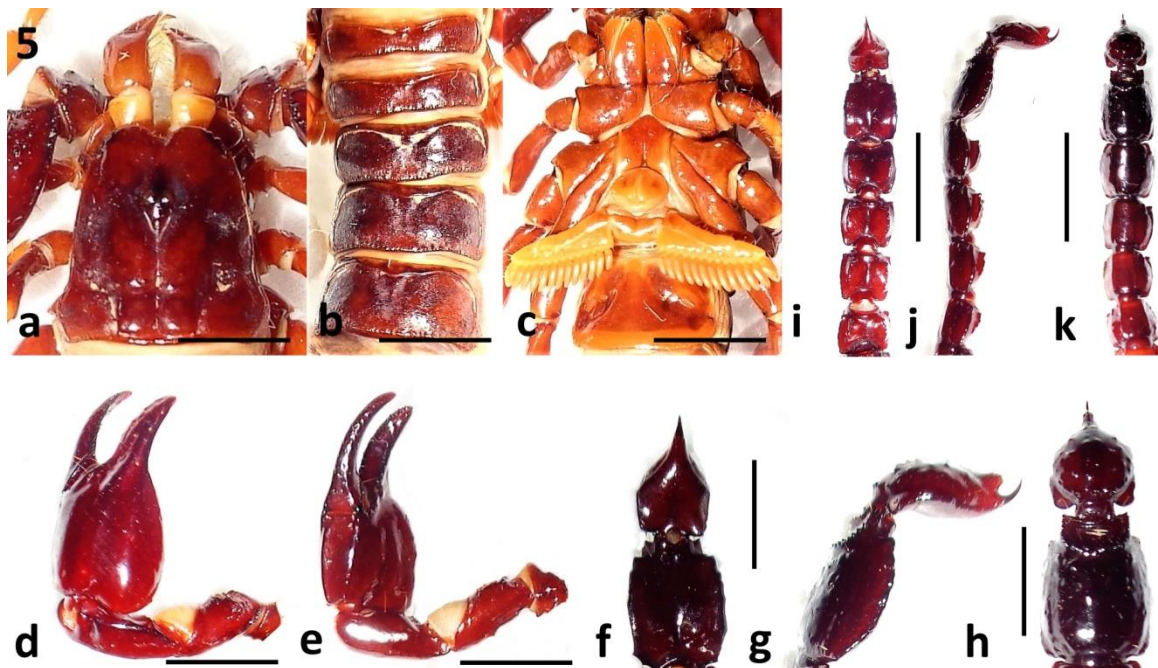


Figure 5. Adult, *Tarsoporosus* sp.: a) prosoma, dorsal view; b) tergites I-V, dorsal view; c) pedipalp, dorsal view; d) pedipalp, ventral view; e) sternopectinal region, ventral view; f) metasomal segment V and telson, dorsal view; g) metasomal segment V and telson, lateral view; h) metasomal segment V and telson, ventral view; i) metasoma, dorsal view; j) metasoma, lateral view; k) metasoma, ventral view. Scale line= 0.5 mm. Scale line=3 mm (Figs. a, b, c, d, e); 1mm (Figs. f, g, h); 10 mm (Figs. i, j, k).

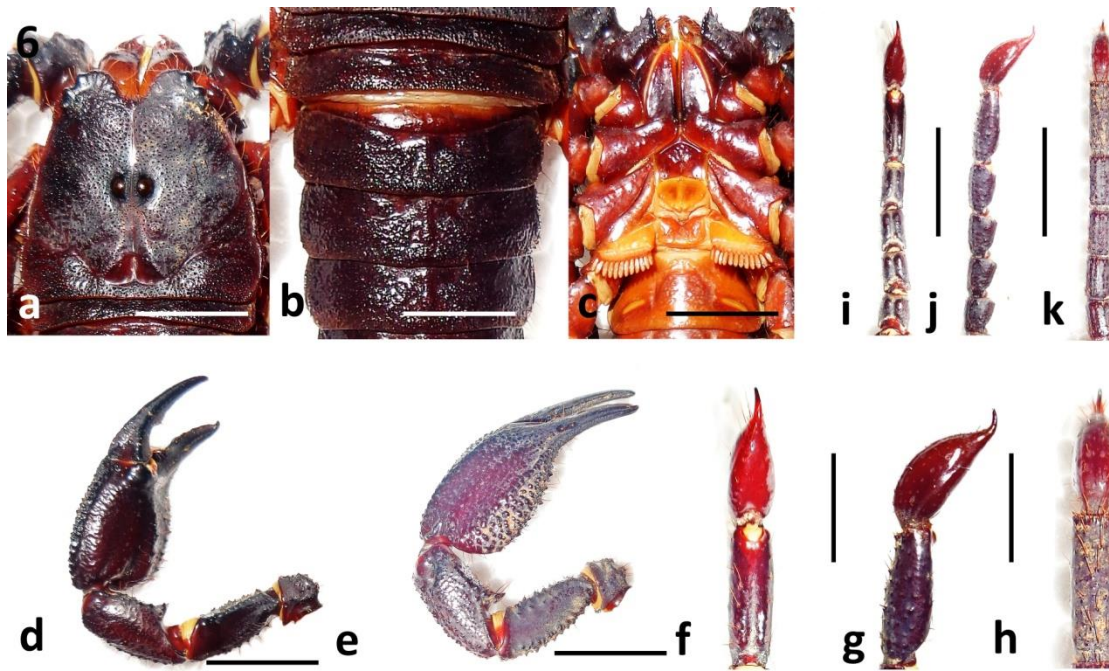


Figure 6. Adult, *Opisthacanthus elatus* Peters, 1861: a) prosoma, dorsal view; b) tergites I-V, dorsal view; c) pedipalp, dorsal view; d) pedipalp, ventral view; e) sternopectinal region, ventral view; f) metasomal segment V and telson, dorsal view; g) metasomal segment V and telson, lateral view; h) metasomal segment V and telson, ventral view; i) metasoma, dorsal view; j) metasoma, lateral view; k) metasoma, ventral view. Scale line= 0.5 mm. Scale line=3 mm (Figs. a, b, c, d, e); 1mm (Figs. f, g, h); 10 mm (Figs. i, j, k).

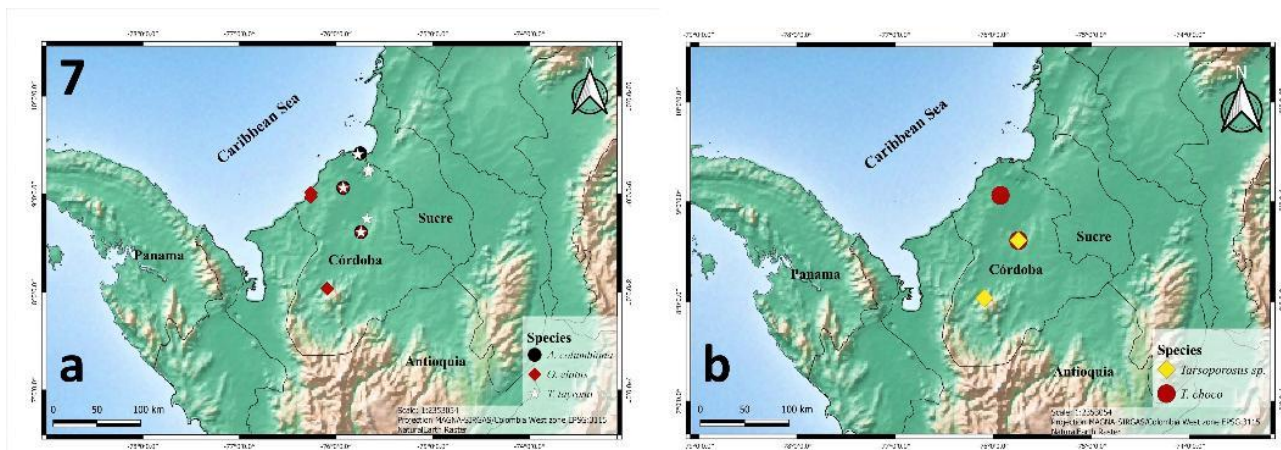


Figure 7. Geographic distribution of scorpion species in the department of Córdoba, Colombian Caribbean: a) *Ananteris columbiana* Lourenço, 1991; *Tityus (Archaeotityus) tayrona* Lourenço, 1991; *Opisthacanthus elatus* Peters, 1861; b) *Tarsoporosus* sp.; *Tityus (Atreus) choco* Lourenço & Flórez, 2018.

Material examined. COLOMBIA, Department of Córdoba, 2 ♂, San Antero, Córdoba: Punta Calao. 9°24'58.7"N; 75°44'58.0"W, [7m asl], April 23, 2017, mangrove forest, E. Bedoya-Roque leg. (Deposited in LEUC; Esc-001).

Geographic distribution in Colombia: Departments of Atlántico, Córdoba, Bolívar, Magdalena, Sucre 28; 20.

Comments: According to 1, scorpions are not distributed randomly within a habitat, but mainly in specific microhabitat, in which they find favorable environmental conditions for their development and where they can get shelter, food and/or partner, *Ananteris columbiana* Lourenço, 1991 (Figures 1a, 2), was collected in the shrub land and leaf litter from the mangrove forests in the area known as Punta Calao in the municipality of San Antero, apparently the plant structure of the area and mangrove conditions provide

favorable conditions for shelter and food. This report becomes the first record of the species in mangrove forests of Colombia (Figure 7a).

***Tityus (Atreus)choco* Lourenço & Flórez, 2018**

Figures 1c, 3, 7b

Material examined. COLOMBIA, Department de Córdoba, 1 ♀, Montería, Santa Isabel-Patio Bonito, 8°36'42"N;75°44'32" W,[40m asl] December 2, 2014, tropical dry forest. E. Bedoya-Roqueleg. (Deposited in LEUC; Esc-002).

Geographic distribution in Colombia: Departments of Chocó and Córdoba* (31).

Comments: *Tityus (Atreus) choco* Lourenço & Flórez, 2018 (Figures 1c, 3), is a species that is distributed in the northwest of Colombia, in the humid forest from Colombian Darien in the department of Chocó32. However, in the department of Córdoba, the specimen was collected at 40 m in tropical dry forest, associated with decomposing trunk on leaf litter, increasing the known distribution of the species towards to the department of Córdoba in the Caribbean region of Colombia (Figure 7b).

***Tityus (Archaeotityus) tayrona* Lourenço, 1991**

Figures 1b, 4, 7a

Material examined. COLOMBIA, Department of Córdoba, Department of Córdoba, 1 ♀, Montería, Santa Isabel-Patio Bonito. 8°36'42" N; 75°44'32" W, [40m asl], December 13, 2014, tropical dry forest, E. Bedoya-Roqueleg., (deposited in LEUC; Esc-003). 2♂, Montería, Santa Isabel-Patio Bonito. 8°36'42" N; 75°44'32" W, [40m asl], December 13, 2014, tropical dry forest, E. Bedoya-Roqueleg., (deposited in LEUC; Esc-004); 1♀, Pueblo Nuevo, Córdoba: 8°32'16.3"N; 75°26'03.3"W, [88m asl], December 13, 2014, tropical dry forest, E. Bedoya-Roqueleg., (deposited in LEUC; Esc-005); 1♀, San Antero, Córdoba: Punta Bonita. 9°24'10.1"N; 75°46'40.3"W, [5 m asl], April 21, 2016, mangrove forest, E. Bedoya-Roqueleg. (Deposited in LEUC; Esc-006). 1♂, Momil: Cerro Mohan. 9°13'25.1"N; 75° 39'51.3"W, [72m asl], November 6, 2019, tropical dry forest, J.A. Quirós-Rodríguez leg (deposited in LZUC; Esc-011). 1♀, Momil: Vereda Florizan, 9°15'6.22"N; 75°39'53.66"W,[12 m asl], November 6, 2019, tropical dry forest,. A.Quirós-Rodríguez leg (deposited in LZUC; Esc-012).

Geographic distribution in Colombia: Atlantic departments, Bolívar, Cesar, Córdoba, Magdalena, Sucre (8,24,28,29).

Comments: *Tityus (Archaeotityus) tayrona* Lourenço, 1991 (Figures 1b, 4), is a species that is only distributed in the Caribbean region of Colombia, which is located in the north of the country, for the department of Córdoba only knew the reports previously made by (15, 8, 29) for dry forest areas and the report of 24 for the coastal zone, the present investigation confirms the presence of the species in the department of Córdoba (Figure 7a), widely distributed in its territory from sea level to the 80 m, commonly associated with shrub vegetation and litter, in the mangrove forest fragment of Punta Bonita, was found associated with leaf litter in areas near residences.

FAMILY DIPLOCENTRIDAE

***Tarsoporosus* sp.**

Figures 1e, 5, 7b

Material examined. COLOMBIA, Department of Córdoba, 2 ♂, Tierralta: TuisTuis, finca Tuti Fruti, 8°2'2.881" N; 76°5'29.993" W,[175m asl], December 3, 2014, humid forest, A. Santos Morales; E. Bedoya-Roqueleg. (Deposited in LEUC; Esc-007).

Comments: In Colombia only two species of the genus *Tarsoporosus* Francke, 1978, *T. anchicaya* Lourenço & Flórez, 1990 of the tropical jungles of Chocó on the Colombian coast of the Pacific region and *T. macuire* Teruel & Roncallo, 2007 of the Peninsula de la Guajira, northeastern Colombia, restricted to coastal and sub-coastal area (33). The males of Córdoba (Figures 1e, 5), were collected in areas close to houses in a wet area of 180 m. This contribution confirms the presence of the genus in the department and its known distribution is extended to the department of Córdoba (Figure 7b).

FAMILY HORMURIDAE

***Opisthacanthus elatus* Peters, 1861**

Figures 1d, 6, 7a

Material examined. COLOMBIA, Department of Córdoba, 1♂. Tierralta: TuisTuis, finca Tuti Fruti, 8°2'2.881"N, 76°5'29.993"W, [175m asl], December 2, 2014, humid forest, E. Bedoya-Roqueme leg. (deposited in LEUC; Esc-008); 1♀, Puerto Escondido: Puerto Escondido, 9° 0'48.24"N, 76°15'39.76"W, [75M asl], March 19, 2019, coastal forest area, J.A.Quirós-Rodríguez leg (deposited in LZUC; Esc-009), 1♀, Canalete: San José de Canalete, 8°58'14.87"N, 76°15'39.90"W, [21m asl], March 19, 2019, coastal forest area, J.A.Quirós-Rodríguez leg (deposited in LZUC; Esc-010).

Comments: *Opisthacanthus elatus* Peters, 1861 (Figures 1d, 6), is a species of scorpion that commonly lives under fallen logs, cracks of standing trees and under stones, under rocks and trunks of fallen trees; above and below the bark of living trees, in cracks in rocks and in holes or galleries in the ground (34,35). In the same way, it has been registered to present a high spatial niche overlap with the species *T. asthenes* in tropical dry forest and competition for resources 34. In the department of Córdoba, this species was present in a humid forest at 175 m in areas close to houses, walking freely on the ground. Initially *O. elatus* was mentioned by 15, for the municipality of Lorica, however, there were no subsequent records, in this sense, with this record the presence of the species in the department of Córdoba is confirmed, increasing its known distribution in Colombia to the department (Figure 7a).

4. DISCUSSION

Taking into account the above and the data obtained in the field, a total of five scorpion species were recognized, distributed in three families (Table 1), corresponding to 6.1% of the species and 75% of the families registered for Colombia, being Buthidae the most diverse family (60%), Hormuridae and Diplocentridae (40%). According to 34, the Buthidae family is the most diversified, with the greatest geographical distribution on the planet, and the only one that contains species considered as potentially dangerous. Although the largest number of the genus of buthids is found in the Old World, the most diverse genus is found in America (34).

The species *T. tayrona* Lourenço, 1991 and *A. colombiana* Lourenço, 1991, besides being present in the different biomes of the department of Córdoba, were collected in mangrove forests of the coastline of the municipality of San Antero, although little is known about the ecology of these species in coastal environments, such is the case of the species *T. tayrona*, which prefers dry habitats and has adapted to a way of life with certain degree of tolerance to highly disturbed and deteriorated areas (36, 27).

Table 1. Taxonomic list of scorpion species from Córdoba and distribution patterns in Colombia. Department abbreviations: Ant= Antioquia; Atl= Atlántico; Bol= Bolívar; Cau= Cauca; Cho= Chocó; Cor = Córdoba; Gor= Isla Gorgona; Mag = Magdalena; Nar= Nariño; Su = Sucre; VCa = Valle del Cauca. Regiones: And = Andina; Car = Caribe; Pac = Pacífica.

Family/Specie	Departments	Region	Microhabitat	References
Family Buthidae				
<i>Ananteris colombiana</i> Lourenço, 1991.	Cor, Bol, Atl, Mag, Suc	Car	Leaf litter decomposing trunks.	Botero-Trujillo, 2009; Gómez <i>et al.</i> , 2013; This study.
<i>Tityus (Atreus) choco*</i> Lourenço & Flórez, 2018.	Cor, Cho	Car, Pac,	Leaf litter, Cracks in the trees.	Lourenço & Flórez (2018); This study.
<i>Tityus (Archaeotityus)</i> <i>tayrona</i> Lourenço, 1991	Atl, Bol, Ces, Cor, Mag, Suc	Car	Leaf litter.	Lourenço, 1997; Flórez, 2001; Botero- Trujillo & Fragua, 2007; Teruel & Roncallo, 2010; Moreno-González <i>et</i> <i>al.</i> (2019).
Familia Diplocentridae				
<i>Tarsoporosus</i> sp.	Cor	Car	Cracks or Galleries.	This study.
Familia Hormuridae				
<i>Opisthacanthus elatus</i> Peters, 1861	Cor, Suc, Atl,	And, Car	Burrows or cracks.	Lourenço, 1997; Gómez & Otero, 2007.

However, *A. colombiana* was collected in a fragment of mangrove forest, with a complex plant structure, which seems to be associated with less disturbed areas or with a low degree of intervention. Also, the two species were collected associated with leaf litter on the sand bar; similar habit has been evidenced in other types of environments, such as tropical dry forest, moving mainly in

litter, decomposing trunks and in the soil (1,30,27), in this sense, some authors such as 39, suggest that scorpions may exhibit a higher degree of specialization in the microhabitat they occupy.

The species *O. elatus* and *Tarsoporosus* sp., are characterized by their specificity to certain habitat types, while *O. elatus* is more common in disturbed or disturbed environments, the species *Tarsoporosus* sp., appears to be more associated with less disturbed environments and under stable conditions, with a more conserved plant structure (1,36,33,37,27). Similarly, *O. elatus* is considered a species of ecological interest and classified as very low toxicity for mammals, whose populations are generally inhabiting cracks and burrows in humid forests (38).

T. (Atreus) choco was registered in the locality of Acandí, in humid forests of the Colombian Darien (Caribbean region), (32), described and discussed the taxonomic status of this specie, separating it from the species *T. (Atreus) festae* Borelli, 1899 reported from Panama and the Colombian Caribbean (8, 32), the specimen reported here corresponds to the description of *T. (Atreus) choco* by 32, therefore, and in the absence of resolving the taxonomic status among these species, it is decided to assign this specimen collected in Córdoba to the species *T. (Atreus) choco*, which, being in nearby areas of farms, offers a potential of medical importance (32).

The present contribution represents the first approach to the scorpion fauna in the different biomes and covering the six subregions of the department of Córdoba, composed of five species *Ananteris columbiana*, *Tityus (Archaotityus) tayrona*, *T. (Atreus) choco*, *Opisthacanthus elatus* and *Tarsoporosus* sp., likewise, species that offer the potential to be epidemiological important such as *T. (Atreus) choco*, which constitutes a fundamental base on the diversity and distribution of scorpions for the department of Córdoba and the Colombian Caribbean, since it provides data of distribution and ecological information that will allow formulating policies of education and accident prevention with scorpions. For this, it is necessary to explore certain areas and it is necessary to conduct new focused studies applying and combining different methodologies to obtain greater values of richness and to know how anthropic activities affect the diversity and distribution of these arachnids in the region.

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Edwin Bedoya-Roqueme, I declare that I contributed substantially to the conception and design of the work; taxonomic identification, taking of photography, design of the maps, also for the acquisition, analysis and interpretation of data for the work; I participated in writing the work and revising it critically to provide important intellectual content; I approved the version that will be published and I agreed to be responsible for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are properly investigated and resolved.

Jorge A. Quirós-Rodríguez, I declare that I contributed substantially to the conception and design of the work, and for the acquisition, analysis and interpretation of data, the taxonomic identification; I participated writing the work and revising it critically, I contributed important intellectual content; I approved the version that will be published and I agreed to be responsible for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are properly investigated and resolved.

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Conflict of Interest: The authors declare that there are no conflicts of interests.

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