

First record of the genus *Semiopyla* Simon, 1901 (Araneae: Salticidae: Sitticini) From Colombia

Primer registro del género *Semiopyla* Simon, 1901 (Araneae: Salticidae: Sitticini) en Colombia

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Abstract

Jumping spiders are the most diverse group within the order Araneae, distributed across nearly all continents, and inhabiting a wide variety of microhabitats, including mangrove forests. In a study of jumping spiders in the mangrove forests of the southern Gulf of Morrosquillo, specimens of the genus *Semiopyla* Simon, 1901 were collected through leaf litter sampling and manual collection. This study aims to report the presence of this genus in Colombia for the first time, specifically the species *S. cataphracta* Simon, 1901. Additionally, the study includes distribution maps based on new and previous records, along with ecological observations on the species in mangrove forests.

Key words: Spiders; Córdoba; gulf of Morrosquillo; taxonomy; zoogeography

Resumen

Las arañas saltarinas son el grupo más diverso dentro del orden Araneae, distribuidas en casi todos los continentes y habitando una amplia variedad de microhábitats, incluyendo los manglares. En un estudio sobre arañas saltarinas en los manglares del sur del Golfo de Morrosquillo, se recolectaron especímenes del género *Semiopyla* Simon, 1901 mediante muestreo de hojarasca y recolección manual. Este estudio pretende reportar por primera vez la presencia de este género en Colombia, específicamente de la especie *S. cataphracta* Simon, 1901. Adicionalmente, el estudio incluye mapas de distribución basados en registros nuevos y anteriores, junto con observaciones ecológicas de la especie en bosques de manglar.

Palabras clave: arañas; Córdoba; golfo de Morrosquillo; taxonomía; zoogeografía

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The family Salticidae Blackwall, 1841 known as jumping spiders, occupies diverse ecological niches in many terrestrial and coastal marine environments, except in Antarctica (Ubick *et al.*, 2009; Foelix, 2011). Currently, the family is represented by 6686 species distributed across 682 genera (World Spider Catalog, 2024). This group of spiders is most diverse in tropical and subtropical regions and is present in a variety of microhabitats, ranging from soil and leaf litter to the canopy (Ubick *et al.*, 2009; Foelix, 2011; Bedoya-Roque and Lopez-Villada, 2020). While the majority of jumping spiders are poor dispersers, some may disperse by rafting, ballooning, or indirectly through human intervention (Richardson *et al.*, 2006; Foelix, 2011).

The genus *Semiopyla* Simon, 1901 is located within the tribe Sitticini Simon, 1901, however, its phylogenetic relationships within the tribe remain uncertain (Maddison *et al.*, 2020). Initially, Simon (1901) created this genus to include the species *S. cataphracta* and *S. biimpressa* from Venezuela. Later, Cutler (1971) declared *S. biimpressa* a synonym of *S. cataphracta*. Subsequently, Galiano (1985) redescribed *S. biimpressa*, providing new diagnostic characters for the species and correcting some of Cutler's (1971) previous description errors of the males' pedipalps. These salticids occur only in the Americas, primarily distributed in South America, with records from Central America in Mexico and Panamá (World Spider Catalog, 2024).

Currently, the genus *Semiopyla* Simon, 1901 is represented by three species: *S. cataphracta* Simon, 1901 from Argentina, Brazil, Mexico, Panama, and Venezuela; *S. triarmata* Galiano, 1985 from Argentina; and *S. viperina* Galiano, 1985 from Argentina and Paraguay (Metzner, 2024; World Spider Catalog, 2024). These spiders are small and primarily inhabit the ground, rocks, tree trunks, and forest litter (Maddison, 2015; Prószyński, 2017). Additionally, these salticids can be easily differentiated by the large anterior epigynous openings in the females, and by the palps with three retrolateral tibial apophyses (RTAs) in various shapes and forms, and the males' embolus with a wide, translucent pars pendula (Cutler, 1971; Galiano, 1963; 1985).

The salticid fauna in Colombia is represented by 156 species and 67 genera (Metzner, 2024; World Spider Catalog, 2024).

Specifically, 32 species have been recorded in the Department of Córdoba, mainly in the northern part of the department, which includes mangrove forest, tropical dry forest, humid forest, and swamp areas (Suarez-Martinez and Bedoya-Roque, 2021; Bedoya-Roque *et al.*, 2022; Suarez-Martinez *et al.*, 2022). However, these data are likely underestimated, given the diverse ecosystems in the department, the influence of the Pericaribbean belt and the foothills of the western mountain range, and the biogeographic ecoregions Norandina, Chocó, Magdalena, which hosts a large concentration of native flora and fauna of northern South America (Vásquez-V, 2005; Palencia-Severiche *et al.*, 2006; Bedoya-Roque *et al.*, 2022).

The mangrove forests of the southern Gulf of Morrosquillo are the third largest and one of the best conserved in the Colombian Caribbean region (Prah, 1990; Rojas-Giraldo and Sierra-Correa, 2010). These mangrove forests are characterized by dense vegetation and structure, creating a favorable ecosystem for various species by offering refuges, feeding, and nesting areas (López-Rodríguez and Sierra Correa, 2005; Ramos-Navarro, 2011). Therefore, it is important to initiate studies on the jumping spider fauna in these mangrove forest. This study aims to report the genus *Semiopyla* Simon, 1901 in Colombia for the first time, specifically the species *S. cataphracta* Simon, 1901, thereby expanding its known distribution to include the Department of Córdoba, Colombian Caribbean, and mangrove forests.

The specimens were collected in the leaf litter of *Rhizophora mangle* L. (Rhizophoraceae) in Punta Bonita, San Antero, located in the southern Gulf of Morrosquillo, Colombian Caribbean (9°24'05"N and 75°46'34"W). The mangrove forest fragment of Punta Bonita (Figure 1) is a mature forest composed of *R. mangle* L., 1753, located on the sandbank facing the sea, and *Laguncularia racemosa* (L.) Gaertn (Combretaceae) at the back (Rojas-Giraldo and Sierra-Correa, 2010; Bedoya-Roque *et al.*, 2016). The climate in this area is tropical rainforest, with an average annual temperature of 28°C, an altitude ranging from 0m at the beach to 47m above sea level, and an average annual rainfall of 500 to 1000mm (Cortés and Rangel, 2011). The precipitation regime follows a unimodal-biseasonal pattern, with a dry season from December to March and a rainy season from April to November, with a decrease in rainfall in July (Rojas-Giraldo and Sierra-Correa, 2010).

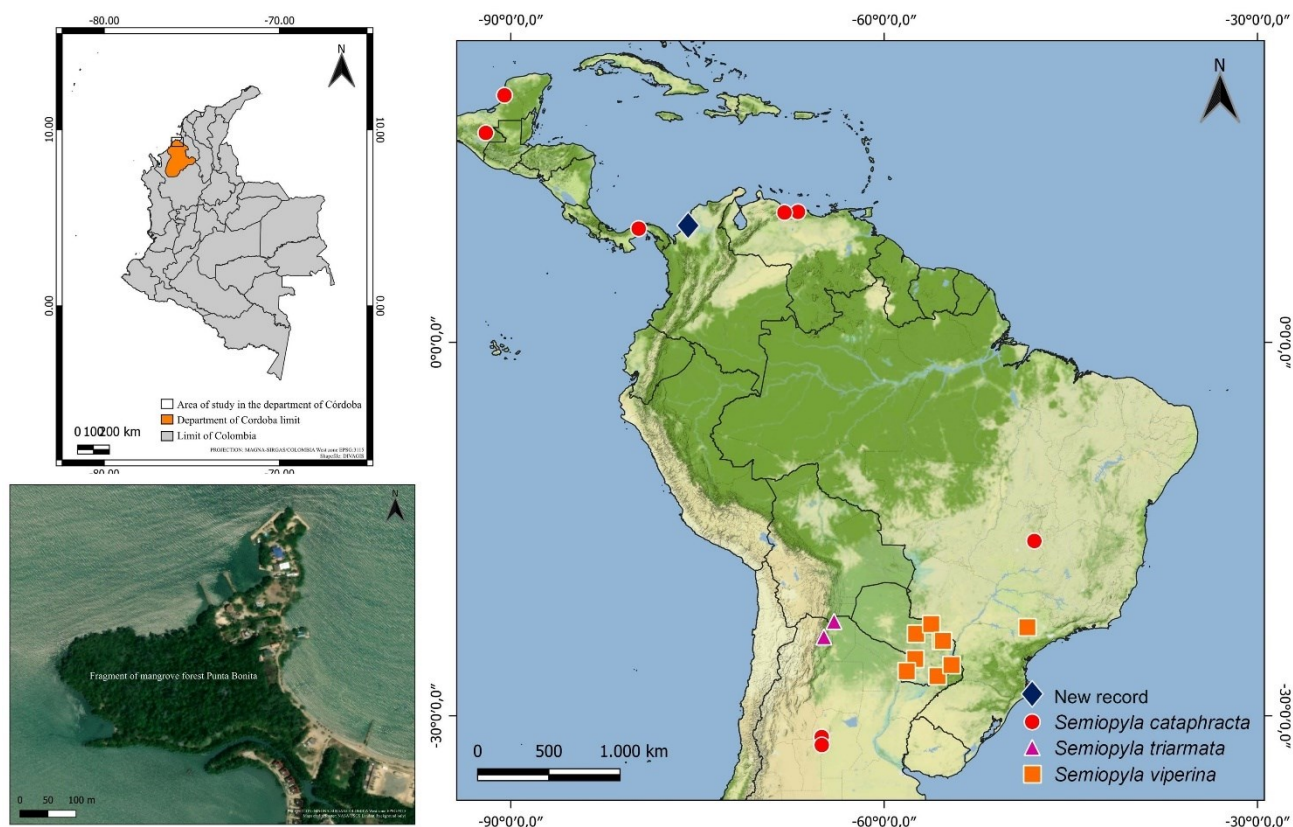


Figure 1. Fragment of mangrove forest at Punta Bonita: Map showing the study area and the mangrove (upper part), the estuarine area in Cispatá Bay (lower part), and the known distribution of the genus *Semiopyla* Simon, 1901, in America (right side). Map credits: © OpenStreetMap contributors, with the base map and data from OpenStreetMap and the OpenStreetMap Foundation (background only).

The sampling in the mangrove forest fragments was conducted on two different dates: the first visit was on November 20, 2022, and the second was on April 23, 2023, using the methods described below. Three researchers independently collected jumping spiders from the leaf litter using quadrats of 1m² as the sampling unit, placed perpendicular to the coastline. This method was replicated three times, resulting in a total of nine quadrats per visit. Additionally, as a complementary method, manual collection was performed through unrestricted free search, for 60 minutes per researcher. The collected specimens were deposited in bottles and preserved in 70% alcohol for subsequent transfer and identification in the laboratory.

The specimens were studied under a Zeiss Axiostar stereomicroscope (Carl Zeiss, Germany) and illustrated with a drawing tube. Female genitalia were dissected following Levi (1965). The epigyne was immersed in 10% lactic acid to digest soft tissue and then placed in clove oil to clear it. Multifocal photographs of the genitalia were taken with an HD digital camera attached to a Carl Zeiss stereomicroscope

and then fused with AxioVision Carl Zeiss SE64 image stacking software (Rel. 4.9.1. SP3).

Measurements in millimeters were taken using a micrometer connected to a Carl Zeiss Axiostar stereomicroscope, along with AxioVision Carl Zeiss SE64 software (Rel. 4.9.1. SP3). Morphological terms follow Galiano (1963). PMEP was determined according to Edwards (2004). Chaetotaxy was described following Bustamante and Ruiz (2017). After microscope analysis, the specimens were rinsed in water, transferred to 70% ethanol, and the dissected parts were stored in a microvial along with the original specimens. The examined material was deposited in the Entomology Laboratory of the University of Córdoba, Colombia (LEUC). Maps were created using QGIS v.3.28.5 (QGIS, 2023).

Taxonomy

Family Salticidae Blackwall, 1841

Tribe Sitticini Simon, 1901

Genus *Semiopyla* Simon, 1901

Type species: *Semiopyla cataphracta* Simon, 1901

Diagnosis. Simon, 1901: 577 with modifications by Galiano (1985).

Semiopyla cataphracta Simon, 1901 (Figures 2–5); Tables (1–2).

Semiopyla cataphracta Simon, 1901; Galiano, 1963: 443; Cutler, 1971: 144; Galiano, 1985: 282; Prószyński, 2017: 69. Type material deposited in the American Museum of Natural History (AMNH), Museum National d'Histoire Naturelle (MNHN), The

Florida State Collection of Arthropods (FSCA) not examined.

Material examined. 1♂, COLOMBIA: Córdoba, San Antero: Punta Bonita, (9°24'05"N 75°46'34"W), 1 m.a.s.l., 20-XI-2022, collected manually, L.A. Suárez Martínez leg. (LEUC; OARA–211). 1♀ COLOMBIA: Córdoba, San Antero: Punta Bonita (9°24'05"N 75°46'34"W), 1 m.a.s.l., 29-IV-2023, collected on leaf litter, L.A. Suárez Martínez leg. (LEUC; OARA–212).

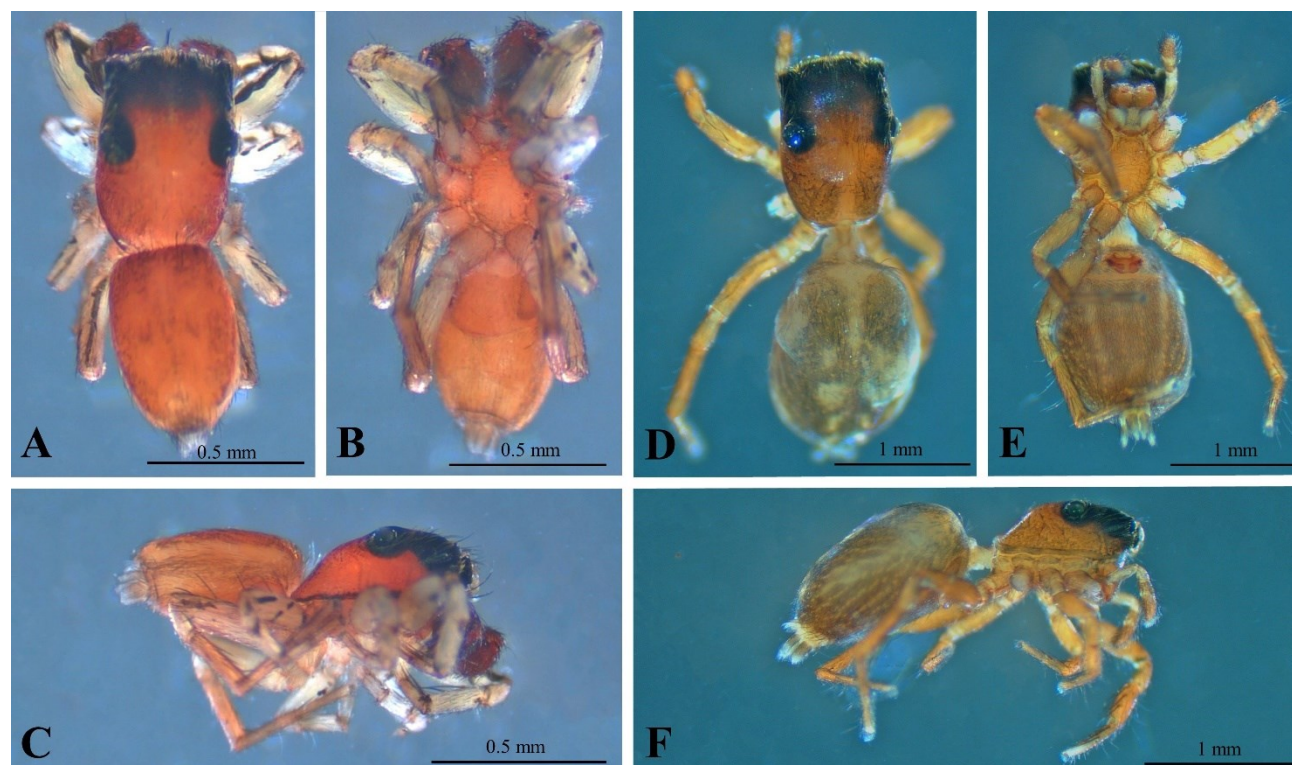


Figure 2. Habitus of *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba: A, male, dorsal view. B, male, ventral view. C, male, lateral view. D, female, dorsal view. E, female, ventral view. F, female, lateral view.

Table 1. Measurements of *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba, Colombia. AERW: anterior eye row width; AL: abdomen length; CH: caparace height maximum; CL: caparace length; CW: caparace width; LOQ: length of ocular quadrangle (ALE–PLE inclusive); PERW: posterior eye row width; PMEP: posterior median eye position (as ratio of ALE–PME distance to ALE–PLE distance); TL: total length.

Code	Sex	TL	CL	AL	CH	CW	AERW	PERW	LOQ	PMEP
LEUC; OARA–211	♂	1.905	0.955	0.892	0.389	0.616	0.631	0.560	0.465	0.577
LEUC; OARA–212	♀	2.684	1.056	1.418	0.438	0.743	0.716	0.774	0.505	0.600

Diagnosis. According to Galiano (1963; 1985).

Description of male. Carapace reddish brown, sparsely covered

with black hairs; cephalic region blackish; ocular area surrounded by black spots, covered with short yellow hairs, and inclined forward. Eyes surrounded by white hairs (Figure 2a).

Labium, endites, and sternum light brown (Figure 2b). Chelicera yellowish, small, and straight; with five promarginal teeth, of which two small teeth in the middle of two large ones, and a fifth small distal tooth (Figure 5a). Abdomen orange, irregular black spots and scattered black hairs on the dorsum (Figure 2a, 2b, 2c). Measurements (Table 1). Legs yellow; leg IV larger than leg III (Table 2); slightly thicker than legs I and II, III on the prolateral margins of the femur, patella, tibia, and metatarsus with a dark band; leg IV light brown (Figure 2a, 2b, 2c). Palpus

dark brown, with three RTAs: RTAa sinuous and loosely sclerotized, RTAb quadrangular, and RTAc has a broad laminar base bearing at the posterior angle a distally and curved dilated in a small head (Figures 3a, 3c, 5b, 5c, 5d); embolus arises prolaterally and has a broad, translucent pars pendula (Figures 3a, 3c, 5c, 5d). Spines: Leg I: F=d:0-1-1; P=0; T= p2-2-2; M= v2-2. Leg II: F= d1-1-1; P=0; T= 1r-2v-1p; M= v2-2. Leg III: F=d1-1-1; P=0; T= 1r-2v-1p; M= v2-2. Leg IV: F=d0-1-1; P=0; T= 2r-2v-2p; M= v2-2. Leg IV is a little more spinose than leg III.

Table 2. Measurements of legs, *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba, Colombia.

Code	Sex	Legs	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
LEUC; OARA-211	♂	I	0.571	0.243	0.438	0.302	0.208	1.762
		II	0.464	0.251	0.303	0.242	0.284	1.544
		III	0.502	0.294	0.359	0.344	0.238	1.737
		IV	0.798	0.265	0.500	0.564	0.310	2.437
LEUC; OARA-212	♀	I	0.357	0.149	0.310	0.159	0.197	1.172
		II	0.495	0.291	0.376	0.274	0.275	1.711
		III	0.464	0.182	0.325	0.236	0.228	1.435
		IV	0.557	0.177	0.572	0.419	0.286	2.011

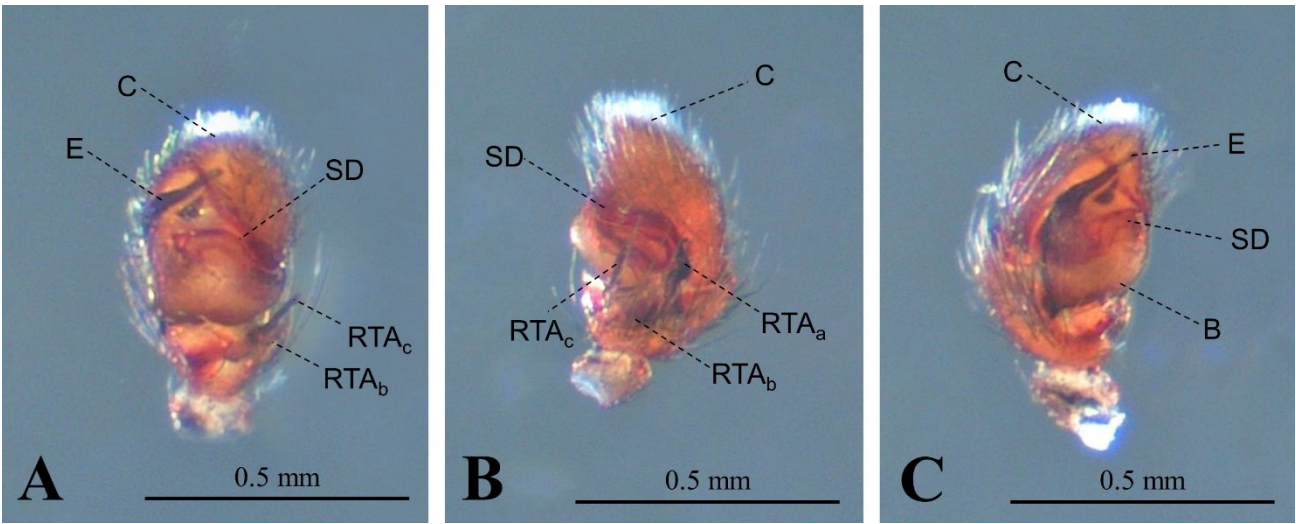


Figure 3. Male left pedipalp of *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba: A, ventral view. B, retrolateral view; C, prolateral view. Abbreviations: B= bulb, C= cymbium, E= embolus, RTA (a, b, c)= retrolateral tibial apophysis, SD= sperm ducts.

Description of female. Carapace reddish yellow, sparsely covered with black hairs; cephalic region blackish; ocular area surrounded by black spots; eyes surrounded by white hairs (Figure 2d). Labium, endites, and sternum yellow (Figure 2e). Chelicera yellowish, small, and straight, the same as in males (Figure 5b). Abdomen yellow, brindled with irregular brown spots, a longitudinal yellow spot, and four pairs of spots on the dorsum (Figure 2d). Measurements (Table 1). Legs yellow (Figure 2d, 2e, 2f), leg IV larger than leg III (Table 2). Epigyne slightly

lobed, with a notch on the middle part; anterior region on the plate with a large elliptical, transverse depression (Figures 4a, 5f); on the inferior region, projecting from the spermathecae, two deep grooves, forming a right angle, and two small oval spermathecae (Figures 4b, 5g). Spines: Leg I: F= d1-1-1; P=0; T= p2-2-2; M= v2-2. Leg II: F= d1-1-1; P=0; T= 1r-2v-1p; M= v2-2. Leg III: F= d1-1-1; P=0; T= 1r-2v-1p; M= v2-2. Leg IV: F= d1-1-1; P=0; T= 2r-2v-2p; M= v2-2. Leg IV is a little more spinose than leg III.

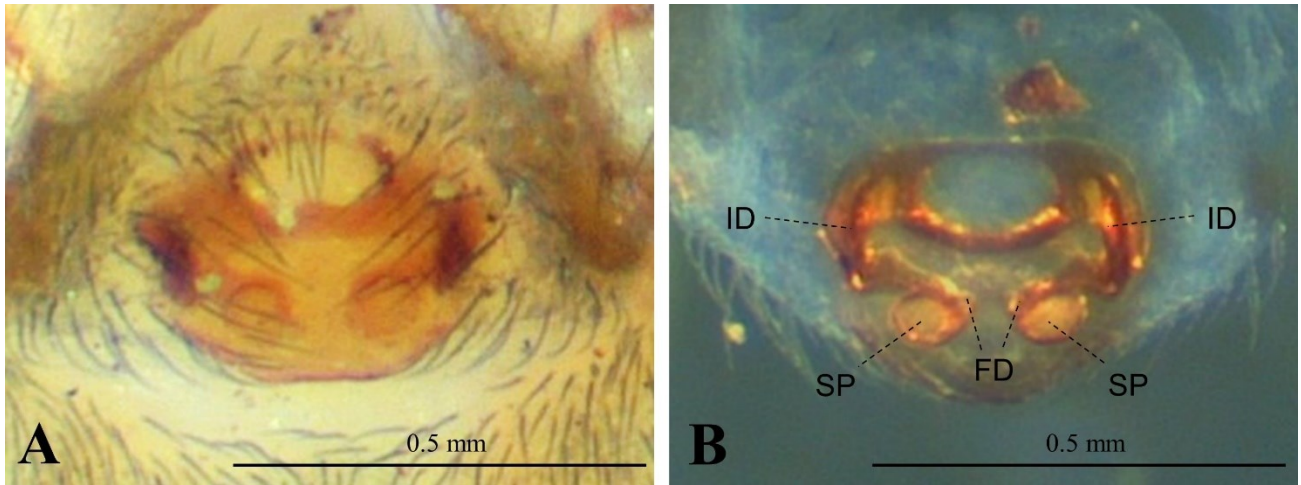


Figure 4. Epigyne, female of *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba: A, dorsal view. B, ventral view. Abbreviations: ID= Insemination ducts, FD= fertilization ducts, SP= spermatheca.

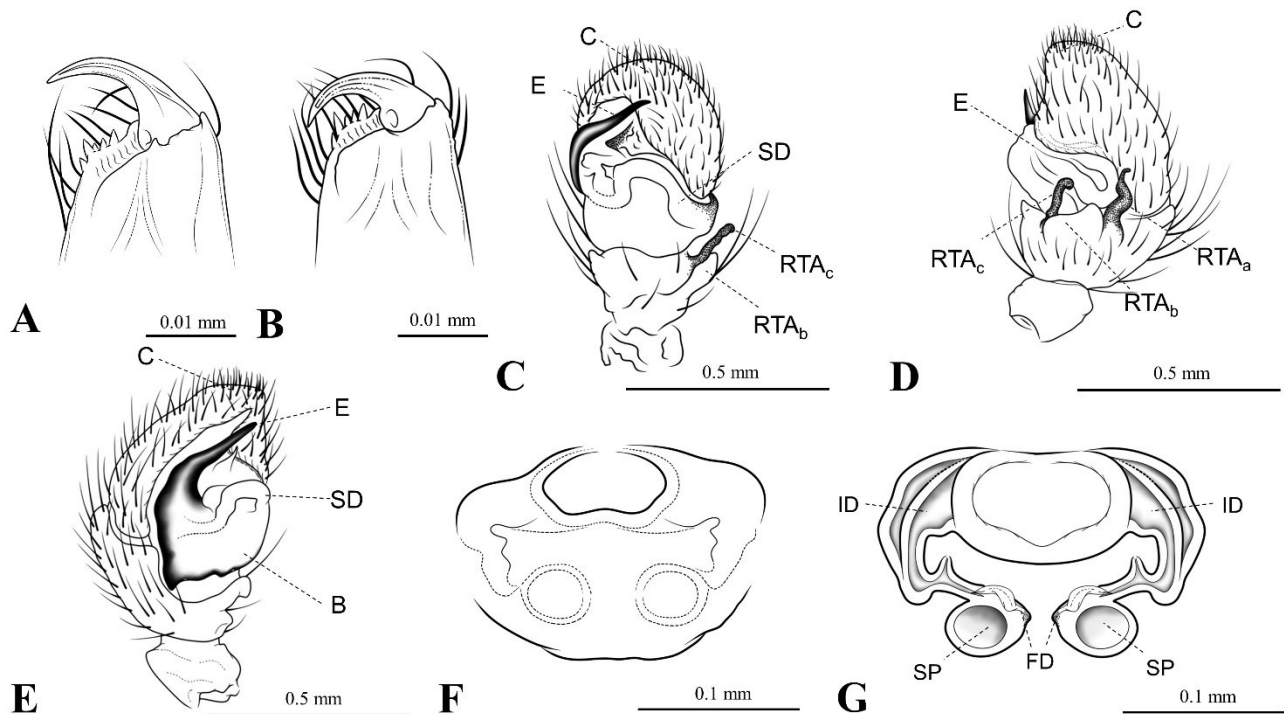


Figure 5. *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba: A, male, right chelicera. B, female, right chelicerae. Male left pedipalp: C, ventral view. D, retrolateral view. E, prolateral view. Epigyne, female: F, dorsal view. G, ventral view. Abbreviations: B= bulb, C= cymbium, E= embolus, FD= fertilization ducts, ID= Insemination ducts, RTA (a, b, c)= retrolateral tibial apophysis, SD= sperm ducts, SP= spermatheca.

Distribution: Argentina, Brazil, Colombia (new record), México, Panamá, Venezuela (Figure 1).

The family Salticidae occurs in diverse ecosystems, with the highest levels of diversity in areas of increasing plant structural complexity (Jocqué, 1984; Rubio *et al.*, 2018). The great diversity of these spiders is attributed to their ability to migrate easily between vegetation strata (Foelix, 2011). Similarly, this group of

arachnids is considered dominant in mangrove areas due to their predatory habits, wide prey range, and ease of hunting in the canopy, as well as their ability to move to the ground at low tide (Jiménez-Valverde, 2003).

The genus *Semiopyla* was initially described from a male of the species *S. cataphracta* collected from leaf litter and dung in a wooded area of Caracas, Venezuela, and rocks in the central

mountains of Argentina (Simon, 1901; Galiano, 1963; 1985; Cutler, 1971). In contrast, in the Department of Córdoba, the species was collected from the leaf litter of mangrove forests (Figure 6a, 6b, 6c, 6d). This ecosystem is considered highly productive with great faunal richness despite the instability of its soils (Ramos-Navarro, 2011). It appears that *S. cataphracta* generally prefers microhabitats with high-quality leaf litter and organic matter (Cutler, 1971).

The reports recorded in this study were made in the Litoral subregion of the Department of Córdoba, which has contributed the most species to the list of salticids in the Department, with a total of 12 records (Suarez-Martinez and Bedoya-Roque, 2021; Bedoya-Roque *et al.*, 2022). This subregion occupies 8% of Córdoba's territory and is characterized by the typical vegetation of heavily disturbed tropical dry forest and tropical humid forest. It includes important ecosystems such as coastal lagoons, with approximately 25000 ha of mangrove forests and 5500 ha of estuarine lagoons (Ballesteros-Correa *et al.*, 2019). Most

ecosystems in the department have not been sufficiently explored, making it essential to conduct studies that contribute to the understanding of spider diversity and richness (Bedoya-Roque *et al.*, 2022).

In this study, the genus *Semiopyla* Simon, 1901 is reported for the first time in Colombia, extending the known distribution of *S. cataphracta* to include Colombia and the Department of Córdoba. This record increases the number of known species of the family Salticidae in the Department of Córdoba to 33, and to 157 species and 68 genera in Colombia. Spiders are characterized by high taxonomic diversity within each habitat and exhibit responses related by specific guilds in response to environmental variations, making them suitable subjects for biological studies (Turnbull, 1973; Toti *et al.*, 2000). Therefore, it is necessary to continue generating interest in this type of research to enhance the knowledge of the arachnofauna. More studies should focus on various methodologies to obtain comprehensive data on the jumping spider fauna in mangrove forests of the Department of Córdoba.



Figure 6. Microhabitats recorded in this study, *Semiopyla cataphracta* Simon, 1901, from San Antero, Córdoba: A, Fragment of mangrove forest in the locality of Punta Bonita. B, estuarine area in the locality of Punta Bonita. C, mangrove roots and leaf litter. D, Arrows indicating the sampling microhabitat.

Conflicts of interest

The authors declare no conflict of interest.

Authors' contribution

Leiner A. Suárez-Martínez, Kenia S. Gallego-Lengua, Luisa F. Hoyos-Figueroa, Jorge A. Quirós-Rodríguez, Edwin Bedoya-Roque: Conceptualization, Research, Writing-Preparation of the original draft, Drafting-revision, and editing.

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