

## Description of three new species of the jumping spider *Chira* Peckham & Peckham, 1896 (Araneae: Salticidae) from Argentina, Bolivia, and Brazil, with a provisional identification key to the species of the genus

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### Abstract

We present a taxonomic study with the description of three new species of *Chira* Peckham & Peckham, 1896: *C. stolari* sp. nov. (♂♀) from Pernambuco, Brazil; *C. ivyatenea* sp. nov. (♂♀) from Misiones, Argentina and Santa Catarina, Brazil; and *C. hanagarthi* sp. nov. (♀) from La Paz, Bolivia; and a tentative identification key for 12 (of 14 known) species of this Central and South American genus. Some misidentifications of *C. lanei* Soares & Camargo, 1948 and *C. lucina* Simon, 1902 are resolved.

**Keywords:** salticid • South America • species key • taxonomy

### Introduction

Freyinae Edwards, 2015 is a major clade of Neotropical Salticidae including comparably large and robust jumping spiders that are ubiquitous in many Neotropical forest habitats (Edwards 1985). Several forms exhibit striking colour patterns that are suggested to mimic mutillid wasps (Edwards 1984, Nentwig 1984).

The freyine genus *Chira* Peckham & Peckham, 1896 was revised by Galiano (1961), Edwards (1984), and Marta *et al.* (2022) and, to date, includes 11 species. The genus is characterized by the ventral spines of tibia I in a 2-2-2 arrangement (Galiano 1961), the male palp with a conical ventral projection on the bulb and the embolus with an extensive pars pendula (in case of a bifid RTA the prongs are closely appressed and overlap), and the females with usually rounded posterior atria divided by an incipient or full septum, and anterior spherical spermathecae (Edwards 2015).

Edwards (2015) recognized two groups among the males, although, the variability in the included morphological characters, the difficult assignment of the subsequently described females to these groups, and several *incertae sedis* species suggest more complex relationships within the genus (see Marta *et al.* 2022). Taxonomic problems of *Chira* are partly attributed to sexual chromatic differences, making it unusually difficult to match both sexes to species (Edwards 2015, Marta *et al.* 2022).

The currently known distributional pattern of *Chira* species suggests that the diversity centre of the genus is situated in the Chacoan-Brazilian superregion (*sensu* Rivas-Martínez *et al.* 2011), with few records in the Tropical South Andean and Amazonian Guyanan superregions and only two widely distributed species as well occurring north of the equator (see Marta *et al.* 2022). In the present study, we propose three new species from the Tropical South Andean and Chacoan-Brazilian superregions and provide a key to species of the genus *Chira*.

### Material and methods

The species identification key is based on descriptions, diagnoses and illustrations from the literature and on examined male and female specimens of 10 *Chira* species, available from the following two collections: Instituto de Biología Subtropical, Argentina (IBSI-Ar, G. Rubio) and Staatliches Museum für Naturkunde Karlsruhe, Germany (SMNK-ARA, H. Höfer). Descriptions style, terms, abbreviations and measurements follow the most current holistic study on freyines (Edwards 2015). Female genitalia were dissected as described by Levi (1965), examined after digestion in a hot ~15% NaOH solution, or cleared in clove oil to examine their internal structure. Temporary preparations (on a slide) of the specimens from Argentina and Brazil were observed, drawn, and photographed using a Leica DM500 compound microscope and a Leica M60 stereomicroscope. Specimens from Bolivia were examined and drawn under a Zeiss Stemi DRC stereomicroscope; photos were taken with a DMC5400 digital camera adapted to a Z6 APO microscope (both Leica Microsystems, Heerbrugg, Switzerland) and stacked with Helicon Focus stacking software (HeliconSoft, Kharkiv, Ukraine). Measurements were taken directly with an ocular micrometer and are expressed in millimeters. Plates were edited and composed in Corel Draw.

Acronyms used in the text and figures are as follows: ALE = anterior lateral eye(s), AME = anterior median eye(s), AR = atrial rim, CD = copulatory duct(s), CO = copulatory opening(s), E = embolus, EB = embolus base, FD = fertilization duct, pCP = posteriorly opening coupling pocket, PLE = posterior lateral eye(s), PP = pars pendula of E, pRL = proximal retrolateral lobe of TDD, RTA = retrolateral tibial apophysis, Sp = spermathecae, T = tegulum, TDD = tegulum distal division.

The ecoregion and system affinities of the species were analysed using Olson *et al.* (2001) and visualized by using

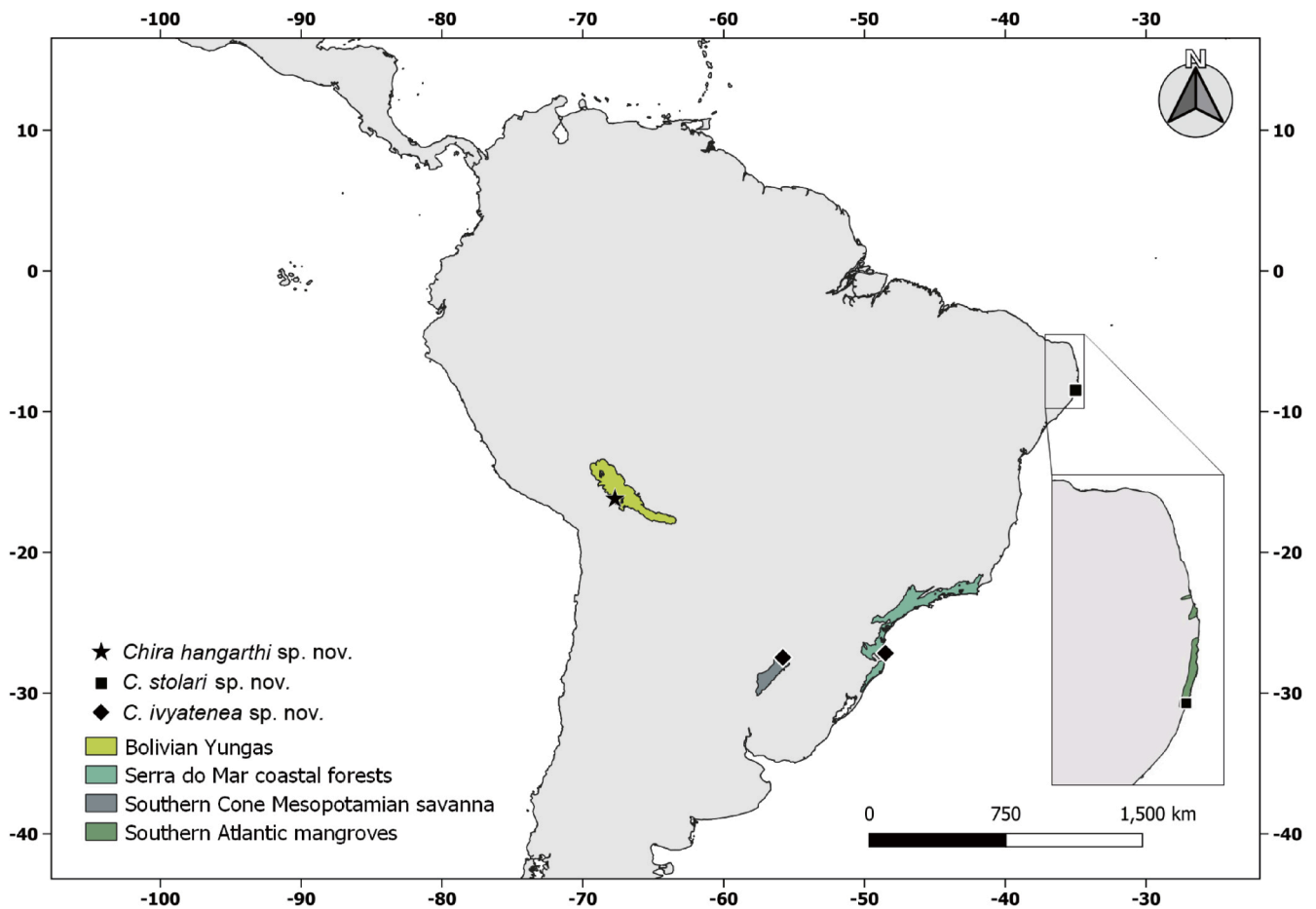


Fig. 1: Records and ecoregion affinities of *C. hanagarhi* sp. nov. (star), *C. stolari* sp. nov. (square), and *C. ivyatenea* sp. nov. (diamond), according to the regionalization by Olson *et al.* (2001). Map produced with QGIS (version 2.14.3, <http://www.qgis.org/en/site>).

the geographic information system QGIS (version 2.14.3, <http://www.qgis.org/en/site>). The information is provided in the type material sections and Fig. 1. Geographic coordinates are shown in decimal degrees of reference datum WGS84, and elevation in metres (m) above sea level.

**Nomenclatural acts.** This published work and the nomenclatural acts involved have been registered in Zoobank: <https://zoobank.org/References/xxxxx> and also reported to the World Spider Catalog (2023). The LSID for this publication is: urn:lsid:zoobank.org:pub:74A81D39-9067-43BC-985D-C279E4F087B4.

## Salticidae Blackwall, 1841

### Salticinae Blackwall, 1841

#### Tribe Aelurillini Simon, 1901

#### Subtribe Freyina Edwards 2015

### *Chira* Peckham & Peckham, 1896

*Type species:* *Attus trivittatus* Taczanowski, 1871 (= *Chira trivittata*)

*Diagnosis:* See Edwards (2015: 26).

*Misidentified specimens:* *Chira lanei* in Prószyński (2016) and figs. F-13805/06/07/08 (Metzner 2023) actually correspond to *C. spinosa* (Mello-Leitão, 1939); *Chira lucina* in figs. 10H,K (Pett, Rubio & Stolar 2021), figs. 10J–L (Marta *et al.* 2022), and figs. F-16989/90 (Metzner 2023) actually correspond to *C. gounellei* (Simon, 1902).

### *Chira stolari* sp. nov. (Figs. 2–3)

<https://zoobank.org/74E999E1-5C13-4D6F-AD08-F2A6B6C58E8F>

*Type material:* Male holotype (IBSI-Ar 1762), BRAZIL: Pernambuco, Porto de Galinhas, -8.4800° -34.9992°, Southern Atlantic mangroves (ecoregion), 01 July 2019, M. Souza leg. Female paratype (IBSI-Ar 1824), same data as holotype.

*Etymology:* The specific name is a patronym in honour of our friend and colleague Cristian Eric Stolar, salticidologist of the GISA.

*Diagnosis:* Male of *C. stolari* sp. nov. can be distinguished easily from those of other *Chira* species by having a well developed TDD, projecting ventro- and retrolaterally when seen in ventral view, even more projected than in *C. lucina* Simon, 1902 (Fig. 2D–H; compare with illustrations in Metzner 2023). Female resembles *C. gounellei* (Simon,

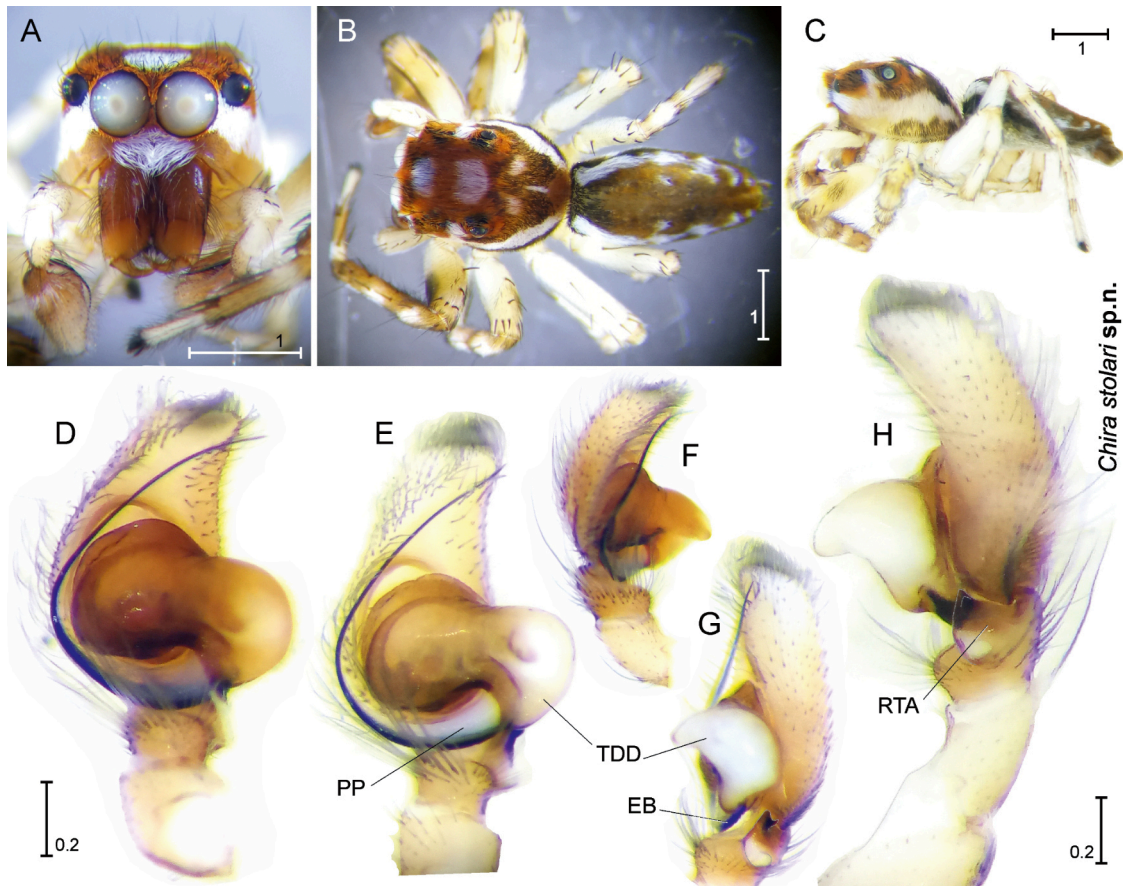


Fig. 2: *C. stolari* sp. nov., male holotype (A–C, E, G–H), specimen IBSI-Ar 1825 (D, F). **A** habitus, front view; **B** same, dorsal view; **C** same, lateral view; **D–E** palp, ventral view; **F** same, prolateral view; **G** same, retroventral view; **H** same, retrolateral view. EB = embolus base, PP = pars pendula of embolus, RTA = retrolateral tibial apophysis, TDD = tegulum distal division.

1902) and *C. lucina* by having epigynes with relatively long, similar stretched copulatory ducts, and the same position of the spermathecae (cf. comparative illustrations in Metzner 2023), but differs from both species by having longer copulatory ducts, with wider, most open loops (Fig. 3D–H; compare with illustrations in Metzner 2023); it also differs from both species and *C. ivyatenea* sp. nov. by having an incipient, less developed pCP (Fig. 3D; compare with Fig. 5D–E).

**Description of holotype male:** Carapace length 2.50, width 1.90; opisthosoma length 2.69. Carapace (Fig. 2A–C) integument pale brown, covered with mahogany and dark brown hairs; cephalic region with square patch of white hairs between ALE and similar patch between PLE; two white spots and third elongated like a longitudinal line posterior to fovea; broad stripes of white hairs (submarginal band) from each AME without joining at thoracic slope. Venter with endites, labium, and sternum pale brown to yellowish. Clypeus with conspicuous tuft of white hairs, directed medially. Chelicerae stout, mahogany, lighter on distal half of paturon; anterior side grooved, both edges keeled. Two promarginal teeth, one retromarginal tooth. Palp pale yellow, cymbium slightly darker; broad RTA, with ventrally and apically directed bifurcated tip, visible in retro-ventral view. Embolus elongate, slender, curved, with thick base and pars pendula; arising retrolaterally and basally from tegulum; TDD ventrolateral projection, cen-

tral, well developed (Fig. 2D–H). Legs light brown, first and second pair slightly stronger, with blackish spots from femora to tarsi. Opisthosoma (Fig. 2B–C) dark brown, with two longitudinal dorsolateral bands of white hairs and some scattered white dots on posterior half; ventral side greyish.

**Description of female paratype:** Carapace length 2.95, width 2.15; opisthosoma length 3.30. Carapace (Fig. 3A–C) integument pale yellow; cephalic region with four longitudinal stripes of red hairs, two outer ones aligned on ALE and posterior eyes; thoracic slope pale, covered with some blackish scattered hairs. Venter with endites, labium, sternum pale yellowish. Clypeus with few white setae. Chelicerae pale, yellowish; teeth as in male. Legs uniformly pale yellow. Opisthosoma (Fig. 3C) integument pale yellow, covered with reddish hairs and four more intense red chevrons on posterior half; ventral side pale yellow. Epigyne with large, rounded atrium without septum, with conspicuous AR, with two anteromedial CO; incipient pCP on epigastric furrow. CD relatively long for the genus, meandering posteriorly and laterally, entering spermathecae from lateral side after a loop (Fig. 3E–H).

**Other material examined:** 3♂♂ (IBSI-Ar 1825), BRAZIL: Pernambuco, Porto de Galinhas, -8.4800° -34.9992°, Southern Atlantic mangroves (ecoregion), 01 July 2019, M. Souza leg.

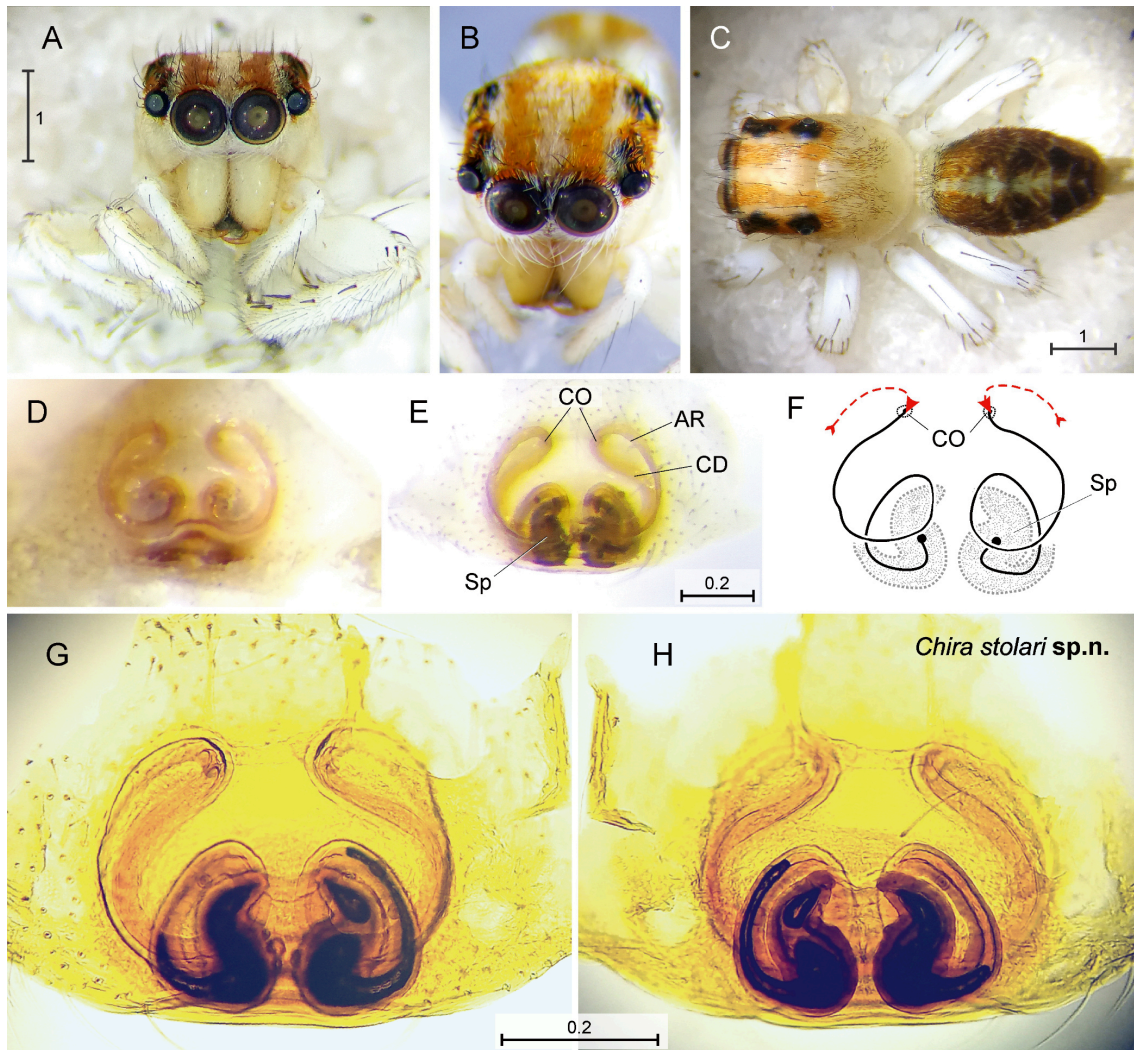


Fig. 3: *C. stolari* sp. nov., female paratype. **A** habitus, front view; **B** same, dorsofrontal view; **C** same, dorsal view; **D** epigyne, ventral view; **E** same, cleared; **F** same, scheme of course of ducts; **G** epigyne, ventral view; **H** same, dorsal view. AR = atrial rim, CD = copulatory duct, CO = copulatory opening, Sp = spermathecae.

**Variability:** The forelegs of some males are more pigmented; carapace length 2.50–3.10, width 1.90–2.20; opisthosoma length 2.69–3.40.

**Natural history:** Not known.

**Distribution:** Only known from the type locality in north-eastern Brazil, from the ecoregion of Southern Atlantic mangroves (Fig. 1).

#### *Chira ivyatenea* sp. nov. (Figs. 4–5)

<https://zoobank.org/BAFCB922-44FC-4399-ABF7-98CDEF0D7A7E>

**Type material:** Male holotype (IBSI-Ar 1593), ARGENTINA: Misiones, Candelaria, Urutaú Natural Reserve, -27.4802° -55.7925°, Southern Cone Mesopotamian savanna (ecoregion), 05 February 2021, G. Rubio, J. Baigorria & C. Stolar leg. Paratypes: 1 male, 1 female (IBSI-Ar 1596), same data as holotype.

**Note:** This species is placed in the recently defined *gounellei* group by having the so-called ventral projection

on the bulb in a proximo-retrolateral position and undeveloped in the ventral position (see Marta *et al.* 2022).

**Etymology:** The specific matronymic name is dedicated to Ivy and Atenea Baigorria Oklander, the daughters of JEB.

**Diagnosis:** *Chira ivyatenea* sp. nov. resembles *C. gounellei* and *C. lucina* by having a similar structure of the bulb: lacking the conical ventral-central projection on the tegulum, being this quite flat and with a very thick embolic base; by having epigynes with relatively long, similar stretches copulatory ducts, and the same position of the spermathecae (cf. comparative illustrations in Metzner 2023). Males can be distinguished from both species by having a longer embolus, arising retrolateral apically from the tegulum, going one and a quarter turn (*v.* shorter, arising retrolateral-basally in *C. gounellei* and *C. lucina*) (Fig. 4C–E; compare with illustrations in Metzner 2023); female differs from both species by having longer copulatory ducts (Fig. 5E–F; compare with illustrations in Metzner 2023).

**Description of holotype male:** Carapace length 3.15, width 2.60; opisthosoma length 3.45. Carapace (Fig. 4A–B) integument light brown to pale orange; cephalic region covered with brown to blackish hairs, square patch of white

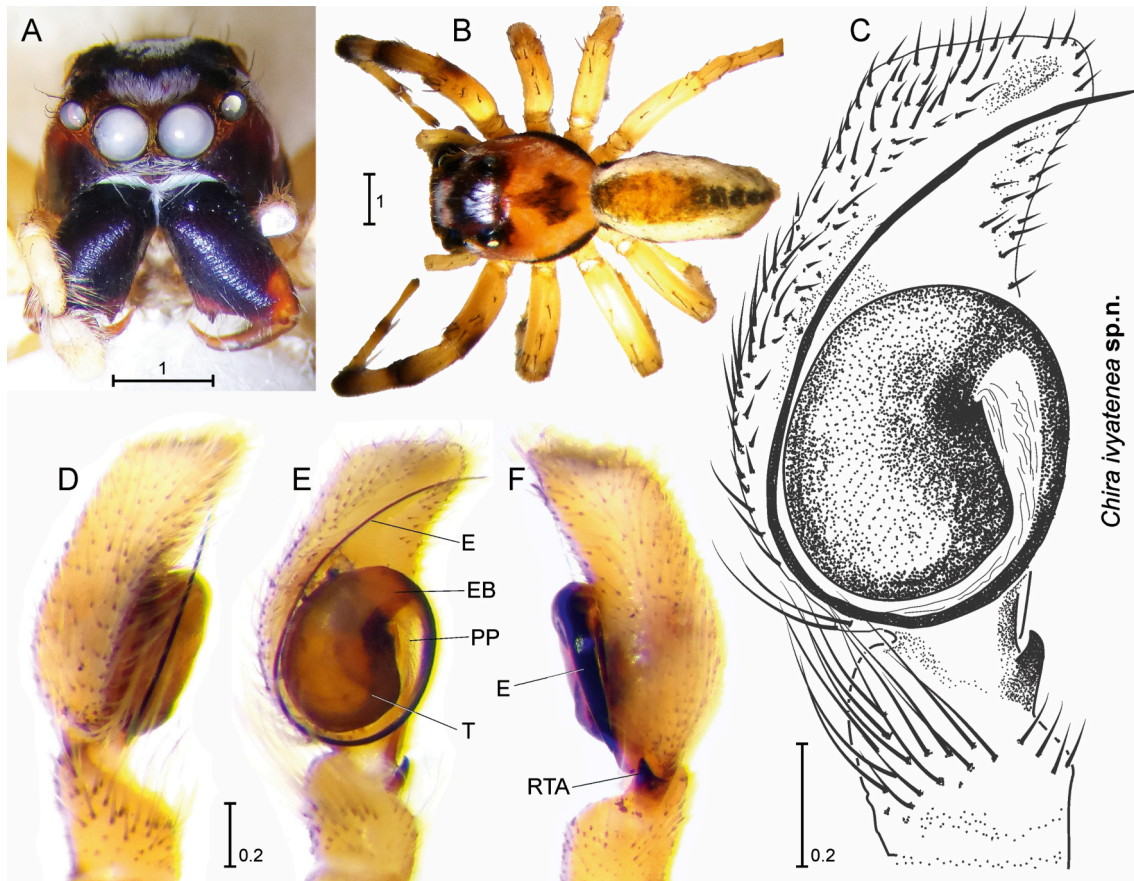


Fig. 4: *C. ivyatenea* sp. nov., male holotype. **A** habitus, front view; **B** same, dorsal view; **C**, **E** palp, ventral view; **D** same, prolateral view; **F** same, retro-lateral view. E = embolus, EB = embolus base, PP = pars pendula of E, RTA = retrolateral tibial apophysis, T = tegulum.

hairs between ALE and similar patch between PLE; dark brown, somewhat triangular, mark posterior to fovea, surrounded by white hairs; broad stripes of brown to blackish hairs (submarginal band) from each AME without joining at thoracic slope. Venter with endites brown, labium blackish, sternum yellowish. Clypeus blackish, with few white setae. Chelicerae blackish, very stout paturon; two promarginal teeth, one retromarginal tooth. Palp pale yellow, with small nail-shaped RTA. Embolus base thick; embolus elongate, slender and curved, arising retrolaterally and apically from somewhat discoidal tegulum, going  $1\frac{1}{4}$  quarter turn; extensive pars pendula on embolus (Fig. 4C,E). Legs brownish, first and second pair slightly stronger, first pair darker distally on each segment. Opisthosoma (Fig. 4B) dark brown, with two broad longitudinal dorsolateral bands of white hairs; ventral side blackish.

**Description of paratype female:** Carapace length 3.00, width 2.30; opisthosoma length 2.91. Carapace (Fig. 5A–C) integument pale yellow; cephalic region slightly darker, with two united brown spots in centre; thoracic slope also pale, all covered with some blackish scattered hairs. Venter with endites, labium, sternum pale yellowish. Clypeus low, with few white setae. Chelicerae pale, yellowish; teeth as in male. Legs uniformly pale yellow. Opisthosoma (Fig. 5A–B) pale yellow, with numerous small, red chevrons forming somewhat transverse striped pattern; ventral side pale, yellowish. Epigyne with large rounded atrium without septum, with sharp edges (conspicuous atrial rims), with two antero-

medial CO; triangular pCP on epigastric furrow. CD relatively long for the genus, meandering posteriorly and laterally, entering spermathecae from lateral side after a loop (Fig. 5F).

**Other material examined:** 1♂ (IBSI-Ar 0287), BRAZIL: Santa Catarina, Mariscal,  $-27.1781^{\circ}$   $-48.5083^{\circ}$ , Serra do Mar coastal forest (ecoregion), 16 January 2014, G. Rubio leg.

**Variability:** The paratype male is smaller, less stout and pigmented, with smaller and paler chelicerae; carapace length 2.1, width 1.83; opisthosoma length 2.60.

**Natural history:** In Argentina, *C. ivyatenea* sp. nov. mostly inhabits the ecoregion known as Southern Cone Mesopotamian savanna. We found these spiders in islets of subtropical forest in a grassland matrix, on leaves of bushes.

**Distribution:** This species is known from northwestern Argentina (Misiones) and southern Brazil (Santa Catarina) from the ecoregions of Southern Cone Mesopotamian savanna and Serra do Mar coastal forest (Fig. 1).

#### *Chira hanagarthi* sp. nov. (Fig. 6)

<https://zoobank.org/D6DD6E3B-E280-4AB7-B913-D15F3D6F3CDC>

**Type material:** Female holotype (SMNK-ARA 01277), BOLIVIA: La Paz, Nor-Yungas, Coroico, Rio Huarinilla, 1200–1500 m,  $-16.1940^{\circ}$   $-67.7289^{\circ}$ , Bolivian Yungas forest

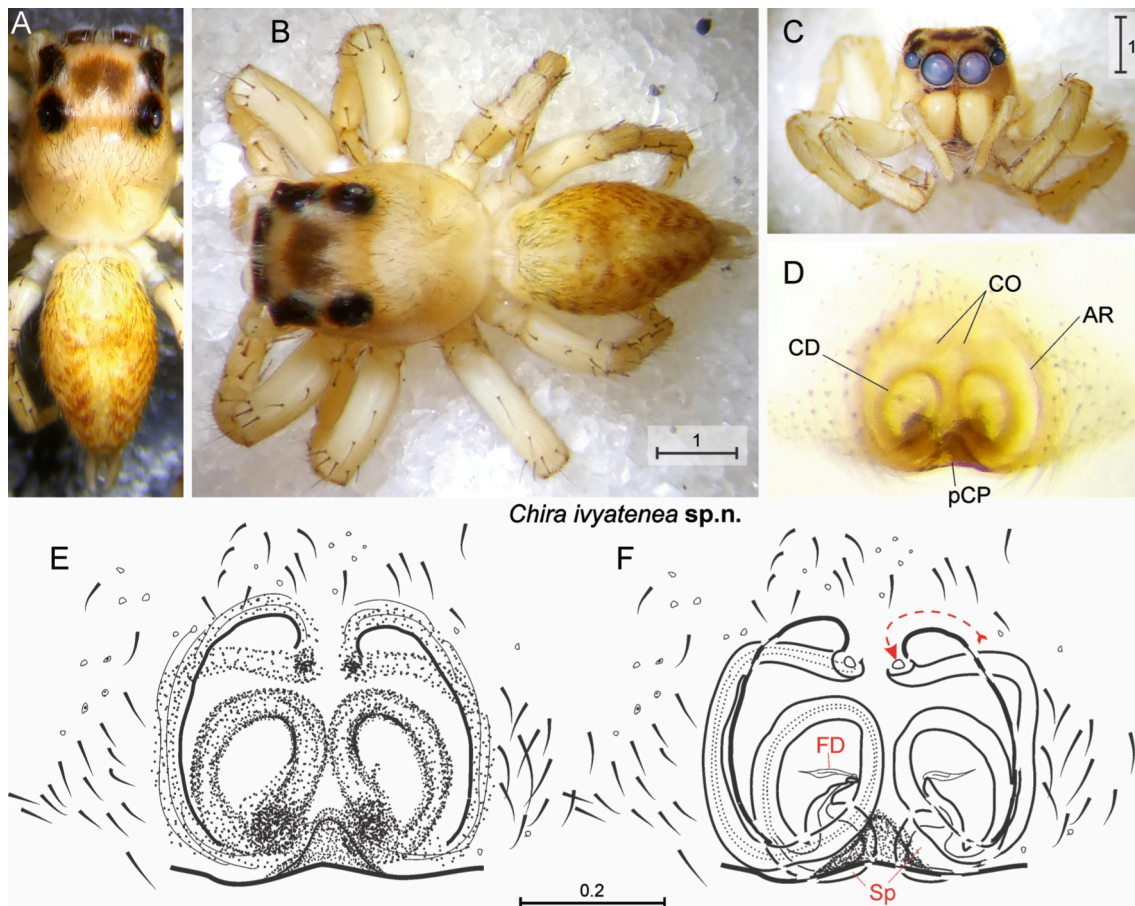


Fig. 5: *C. ivyatenea* sp. nov., female paratype. **A–B** habitus, dorsal view; **C** same, frontal view; **D** epigyne, ventral view; **E** same, drawing; **F** same, cleared. AR = atrial rim, CD = copulatory duct, CO = copulatory opening, FD = fertilization duct, pCP = posteriorly opening coupling pocket, Sp = spermathecae.

(ecoregion), 01 August 1993, A. D. Brescovit & H. Höfer leg.

**Etymology:** The specific name is a patronym in honour of the German zoologist and ecologist Dr Werner Hanagarth, who worked long and hard in Bolivia and significantly contributed not only to the ecology of the Beni region, but also to the development of the ecology institute and the Colección Boliviana de Fauna in La Paz. He had initiated and organized the sampling expedition of SMNK to Beni in 1993 (Höfer & Brescovit 1994); noun (name) in genitive case.

**Diagnosis:** The female of *C. hanagarthi* sp. nov. resembles *C. spinosa* in having Sp positioned in the posterior region of the epigyne and resembles it in the length and scheme of the CD, both species have the longest ducts within the genus; however, the female of the new species is distinguished by having the CO closer together (53% of the epigynal plate width to AR v. 88% in *C. spinosa*), and the Sp also closer and with more CD coils before connecting to the Sp (Fig. 6D–H; compare with illustrations in Metzner 2023).

**Description of holotype female:** Carapace length 2.50, width 1.90; opisthosoma length 3.75. Carapace (Fig. 6A–B) integument uniformly pale orange, covered with some blackish scattered hairs; cephalic region without patterns, probably due to preservation; thoracic slope pale orange.

Venter with endites, labium, sternum pale. Clypeus with few setae. Chelicerae pale, yellowish; two promarginal teeth, one retromarginal tooth (Fig. 6C). Legs uniformly pale orange. Opisthosoma (Fig. 6A) integument pale yellow, covered with blackish scattered hairs; ventral side pale yellow. Specimen overall faded by preservation. Epigyne with atrium and conspicuous medial septum, with AR, two posteriorly located CO; very small pCP on epigastric furrow. CD relatively very long for the genus, meandering almost entire epigynal plate; spherical spermathecae posteriorly located (Fig. 6E–F,H).

Male unknown.

**Natural history:** Not known, the only specimen was collected during a walk along the river, probably by beating from lower vegetation.

**Distribution:** Only known from the type locality at about 1200 m in Nor Yungas, a region of the eastern flank of the Bolivian Cordillera Real, from the ecoregion of Bolivian Yungas forest (Fig. 1).

#### Key to *Chira* species

For easier comparison use figures at [www.jumping-spiders.com](http://www.jumping-spiders.com) (Metzner 2023).

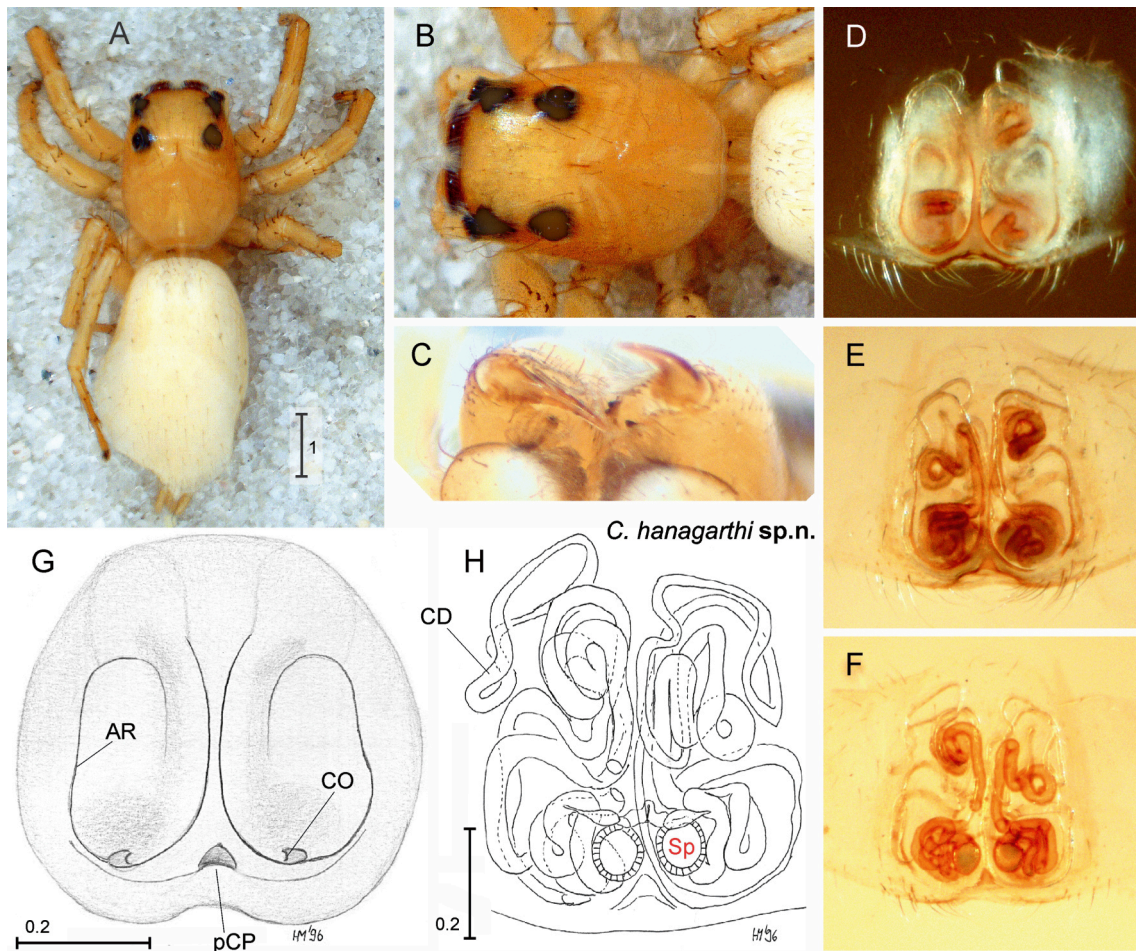


Fig. 6: *C. hanagarthi* sp. nov., female holotype. A–B habitus, dorsal view; C cheliceral teeth, ventral view; D epigyne, ventral view; E same, cleared; F same, dorsal view; G epigyne, ventral view (drawing); H same, cleared, dorsal view. AR = atrial rim, CD = copulatory duct, CO = copulatory opening, pCP = posteriorly opening coupling pocket, Sp = spermathecae.

1 Male specimens.....	2	- RTA complex, with several prongs (Fig. D-12296).....	
- Female specimens .....	12	..... <i>C. guianensis</i> (Taczanowski, 1871)	
2 Bulb with a conspicuous projection on the TDD (figs. D-12305, D-12320).....	3	8 RTA with bifurcated tip (Fig. 2G, this paper) .....	
- Bulb without such projection on the TDD, flattened in lateral view (fig. D-728).....	11	..... <i>C. stolari</i> sp. nov.	
3 Bulb with conical pRL in ventral and central position, long spiral embolus (fig. F-4285).....	4	- RTA simple with one prong (figs. D-12321, D-11282)...	9
- Bulb with pRL in proximo-retrolateral projection, shorter non-spiral embolus (fig. D-12320).....	5	9 Conspicuous pRL, also ventrally (figs. D-12320, D-12321) .....	<i>C. trivittata</i> (Taczanowski, 1871)
4 Spiral embolus with two full loops (fig. F-4285).....		- pRL directed more proximo-retrolaterally than ventrally (figs. D-12299, D-16989).....	10
- Spiral embolus with one full loop (fig. D-12314).....		10 Embolus overlapping the cymbium apex (fig. D-12299) .....	<i>C. lucina</i> Simon, 1902
..... <i>C. lanei</i> Soares & Camargo, 1948		- Embolus not overlapping the cymbium apex (fig. D-11283) .....	<i>C. gounellei</i> (Simon, 1902)
5 Palpal femur with a large ventral spine and/or a projected tubercle (figs. D-2520, D-12317) .....	6	11 Embolus long, arising retrolaterally and apically (Fig. 4C,E, this paper) .....	<i>C. ivyatenea</i> sp. nov.
- Palpal femur without such ventral spine or tubercle (Fig. 2H, this paper).....	8	- Embolus shorter, arising prolaterally and basally (fig. D-727) .....	<i>C. thysbe</i> Simon, 1902
6 Palpal femur with a large ventral spine (fig. D-12317) ..		12 Epigyne with spherical (or circular in ventral view) spermathecae (fig. D-10378) .....	13
..... <i>C. simoni</i> Galiano, 1961		- Epigyne with kidney-shaped spermathecae (fig. D-10388) .....	17
- Palpal femur with a projected tubercle (figs. D-2520, D-40657).....	7	13 Spermathecae positioned in the anterior region of the epigyne (fig. D-10378).....	14
7 RTA simple and short, with one prong, almost triangular (fig. D-40657) .....	<i>C. fagei</i> Caporiacco, 1947		

- Spermathecae positioned in the medial region of the epigyne (Marta *et al.* 2022, fig. 5a)..... 15
- Spermathecae positioned in the posterior region of the epigyne (fig. F-4282) ..... 16
- 14 Spermathecae overlapping the COs (fig. F-4288).....  
..... *C. trivittata*
- Spermathecae not overlapping the COs (fig. D-10378)..  
..... *C. thysbe*
- 15 Anterior stretch of CD robust, Sp close together, pCP short (Marta *et al.* 2022, fig. 5a) ..... *C. simoni*
- No such anterior stretch of CD, Sp more separated, pCP deeper (fig. D-10376)..... *C. guianensis*
- 16 CO contiguous (53 % epigynal plate width), Sp contiguous (figs. D-50881/82) ..... *C. hanagarthi* sp. nov.
- CO separated (88 % epigynal plate width), Sp separated (fig. F-4281) ..... *C. spinosa*
- Hypothetically the undescribed female of *C. lanei* could be here (based on male resemblance)
- 17 CD long, with wide / open loops (Figs. 3G–H, 5E–F, this paper) ..... 18
- CD shorter, with tighter loops (figs. D-10388, D-10389) ..... 19
- 18 Epigyne with pCP narrow and deep, triangular (Fig. 5D–E, this paper) ..... *C. ivyatenea* sp. nov.
- Epigyne with pCP wide and shallow, less conspicuous (Fig. 3D, this paper)..... *C. stolari* sp. nov.
- 19 Medial posterior border of Sp overlapping the pCP (fig. D-10388) ..... *C. lucina*
- Medial posterior border of Sp not overlapping the pCP (fig. D-10389) ..... *C. gounellei*

*Note:* *Chira flavescens* Caporiacco, 1947 and *C. typica* (Mello-Leitão, 1930) have only the females described, and they were left out of this key due to lack of sufficient information, the available illustrations are deficient and access to examination of material from these species was not achieved.

### Acknowledgements

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