

Description and Sexual Behavior of Two New Species of Mygalomorph Spiders (Araneae: Theraphosidae, Pycnothelidae), and First Record of *Xenonemesia platensis* (Pycnothelidae) of Corrientes, Argentina

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Received 10 September 2021 / Accepted 11 August 2022 / Published 30 November 2022
Communicated by I-Min Tso

Paraje Tres Cerros is a low altitude hilly natural area surrounded by cattle fields and characterized by three isolated rocky formations of about 150–180 m a.s.l. located in the Corrientes province of Argentina. Their topographic and environmental conditions are unique across the whole Mesopotamian littoral of Argentina and, therefore, can be considered as a biogeographic island that hosts several endemic species of plants and animals. The lack of knowledge of the mygalomorph spider species of the area led us to conduct a field study at Paraje Tres Cerros with the objective of surveying these spiders. From this survey, we described two new endemic species, *Stenoterommata isa* sp. nov. (Pycnothelidae) and *Catumiri sapucaí* sp. nov. (Theraphosidae); and we recorded *Xenonemesia platensis* for the first time in the Corrientes province. In addition, we described the sexual behavior of *Stenoterommata isa* sp. nov. and *Catumiri sapucaí* sp. nov. for the first time. We presented distribution maps for the Argentinean species of *Stenoterommata*, for the genus *Catumiri* as well as for *Xenonemesia platensis*. *Stenoterommata isa* sp. nov. constitutes the eighth known species of the genus in Argentina and according to its distribution is the only exclusive species recorded in the Corrientes province. Regarding its sexual behavior, we obtained one mating, which consisted in touches the female legs with legs I and II by the male, who starts the courtship by beating the female's cephalothorax and sternum with legs II and palps respectively. Then the male clasps with the first pair of legs between the palp base and chelicerae of the female and elevate her to reach the genital opening for the palpal insertions. *Catumiri sapucaí* sp. nov. is the third species described from Argentina with a new spermathecae shape with two additional elongated digitiform domes external to the inner receptacles. We obtained five matings for this species, two of which involved males contacting females without an evident courtship. For the remaining three, the males initiated courtship by performing a few quick body vibrations. All males achieved the typical copulation position observed in most mygalomorphs and made about 3 to 5 palpal insertions, with the exception of one case in which spiders lost equilibrium and separated from each other. The presence of *Xenonemesia platensis* at this area is based on one adult female, thus further campaigns to collect more specimens will lead us to confirm this record or to better elucidate its taxonomic identity.

Key words: Taxonomy, Biodiversity, Tres Cerros, *Catumiri*, *Stenoterommata*.

BACKGROUND

The infraorder Mygalomorphae is an ancient group of spiders that represents one of three main spider lineages. These spiders differ from their sister group Araneomorphae by the parallel disposition of the chelicerae (Raven 1985). They also possess life-history traits that markedly differ from other spiders, such as long-term life cycles, generalism, breeding once per year, reduced vagility, limited dispersal mechanisms, high habitat specialism, and extreme sedentism (Main 1987; Coyle and Icenogle 1994). These life-history traits promote geographic fragmentation over space and time, resulting in a large number of taxa that have small geographic distributions (Bond et al. 2006) and, therefore, show high values of local endemism. In Argentina, 11 families, 34 genera and 128 species of Mygalomorphae have been recorded (Catálogo de Arañas de Argentina 2022).

Paraje Tres Cerros is a low-altitude (150–180 m a.s.l.), hilly natural area surrounded by cattle fields. It is characterized by the presence of three isolated rocky formations of quartz sandstones from the Upper Jurassic to Lower Cretaceous period (Herbst and Santa Cruz 1999), corresponding to the stratigraphic formation of Botucatu (Aceñolaza 2007), located in the province of Corrientes, Argentina. Their topographic and environmental conditions are unique across the whole Mesopotamian littoral of Argentina and, therefore, can be considered a biogeographic island that hosts several endemic species of plants (Ravenna 2003 2009) and animals (Meregalli 1998; Cajade 2013; Ojanguren-Affilastro et al. 2017).

Historically, arachnological surveys in Corrientes have been conducted almost exclusively for Araneomorph spiders associated with natural and disturbed environments (Ávalos et al. 2007 2009; Escobar et al. 2012). Recently, Nadal et al. (2018) reported on the seasonal diversity of spiders in the Paraje Tres Cerros natural reserve and the presence of three Mygalomorphae families, Dipluridae Simon, 1889, Pycnothelidae Chamberlin, 1917 and Theraphosidae Thorell, 1869, without further specific identifications.

Because of the lack of information surrounding both the spiders and the area, we conducted a field survey of mygalomorph spider species in Paraje Tres Cerros to better understand how the unique features of this biogeographic island correlate with the life-history traits of the spiders.

Pycnothelidae comprises 15 genera and 137 species distributed in Africa, Australia, South America and New Zealand (Opatova et al. 2019; World Spider Catalog 2022). *Stenoterommata* Holmberg, 1881 was established by Holmberg (1881) based on a *S. platensis*

Holmberg 1881, from Argentina. To date, the genus includes 20 nominal species distributed in Argentina, Brazil and Uruguay (Guadanucci 2004; Indicatti et al. 2008; Ghirotto et al. 2021; World Spider Catalog 2022). Spiders of this genus are recognized by having a row of enlarged pumpkini-form spigots along the inner edge of posterior lateral spinnerets spinning field, in conjunction with preening combs on the female metatarsi II, and numerous maxillary cuspules; the male tibia has an apical retrolateral megaspine, and the bulb has several low parallel keels along the embolus (Goloboff 1995). *Stenoterommata palmar* Goloboff, 1995 is the only species known to occur in Corrientes province. The genus *Xenonemesia* Goloboff, 1988 was transferred from Nemesiidae to Pycnothelidae (Montes de Oca et al. 2022). This genus was proposed by Goloboff (1988) based on *X. platensis* Goloboff 1988 and includes 3 species: *X. platensis* distributed in Brazil, Uruguay and Argentina; *X. otti* Indicatti, Lucas & Brescovit, 2007 distributed in Brazil; and *X. araucaria* Indicatti, Lucas & Brescovit, 2007 distributed in Brazil (Indicatti et al. 2007 2008; World Spider Catalog 2022). The genus was diagnosed by the enlarged sternum, cymbium without stout bristles, bulb without keels, male tibiae I without spurs, tarsal scopulae absent on the posterior tarsi, unpaired tarsal claw absent, posterior spinnerets with distal article hemispheric and black markings on legs and abdomen (Goloboff 1988).

Theraphosidae is the most diverse family among mygalomorph spiders, comprising 156 genera and 1,033 species to date with a worldwide distribution, excepting Antarctica (World Spider Catalog 2022). In 1985, Raven defined ‘Ischnocolinae’ as one of the 10 subfamilies contained inside Theraphosidae, based on the divided tarsal scopula. The spiders included in ‘Ischnocolinae’ share the following characteristics: small or medium size, lack of urticating or stridulating setae, male palpal bulb with simple aspect, without keels. Guadanucci (2014) revised the monophyly of the Ischnocolinae genera and proposed splitting Ischnocolinae into less inclusive groups, based on molecular analysis. He established the new subfamily Schismatothelinae, represented for the Neotropical genera *Euthycaelus* Simon, 1889, *Guyruita*, Guadanucci, Lucas, Indicatti & Yamamoto, 2007, *Neoholothele*, Guadanucci & Weinmann, 2015, *Schismatothele* Karsch, 1879 and *Sickius*, Soares & Camargo, 1948; and Ischnocolinae *sensu stricto*, which comprises the Neotropical genera *Acanthopelma*, F. O. Pickard-Cambridge, 1897, *Reichlingia* Rudolff, 2001, *Trichopelma* Simon, 1888, part of *Holothele* Karsch, 1879, and the African genus *Ischnocolus* Ausserer, 1871. Other New World genera (*Catumiri* and *Dolichothele*) remained without clearly defined relationships (Guadanucci 2020) as

did other Ischnocolinae taxa. Some species within the genus *Oligoxystre* were found to be a distinct monophyletic clade. Therefore, he proposed the new genus *Catumiri* Guadanucci, 2004 to hold four species: *Catumiri argentinense* (Mello-Leitão 1941); *C. chicoi* Guadanucci, 2004, from Una, Bahia, Brazil; *C. petropolium* Guadanucci, 2004, from Petrópolis, Rio de Janeiro, Brazil; and *Catumiri parvum* (Keyserling 1878) from Aguas Blancas, Lavalleja, Uruguay, erroneously identified as *Oligoxystre argentinense* by Costa et al. (2000). The species *C. argentinense* and *C. parvum* are cited for Argentina (World Spider Catalog 2022).

In this study, we describe two new endemic species from Paraje Tres Cerros, Corrientes province: *Stenoterommata isa* sp. nov. (Pycnothelidae) and *Catumiri sapucaí* sp. nov. (Theraphosidae). We also recorded *Xenonemesia platensis* for the first time in Corrientes. In addition, we reported on the sexual behavior of *Stenoterommata isa* sp. nov. and *Catumiri sapucaí* sp. nov. Finally, we made distribution maps for all the species treated in this work.

MATERIALS AND METHODS

The material examined in the present study was deposited into the collection of the Universidad Nacional del Nordeste (CARTROUNNE), Corrientes, Argentina. Terminology for general morphological features follows Goloboff (1995) and Indicatti et al. (2017) for the genus *Stenoterommata* and Guadanucci (2004) for *Catumiri*. All measurements are in millimeters (mm). The palpal bulbs were removed with tweezers and photographed in ventral, prolateral, retrolateral and dorsal views. Spermathecae were dissected and immersed in an enzyme (Naclens[®]) for 24 h to digest the soft tissue and photographed or drawn in dorsal view. Total body length was taken from the dorsal view and does not include the chelicerae and spinnerets. Carapace length was measured from the clypeus margin to the posterior margin. Palp and leg segments were measured between the joints in dorsal view: femur, patella, tibia, metatarsus, and tarsus. Leg measurements were taken with a digital caliper to the nearest 0.001 mm. Other measurements and pictures were taken with a MShot digital camera mounted on a Leica S APO stereomicroscope. Images were integrated by the image stacking software Helicon Focus 7. The distribution maps were made using the public domain online tool SimpleMappr (Shorthouse 2010).

For the description of the sexual behavior we performed three male-female pairings for *Stenoterommata isa* sp. nov. and eight pairings for *Catumiri sapucaí* sp. nov. We obtained one mating

for *Stenoterommata isa* sp. nov. and five for *Catumiri sapucaí* sp. nov. from which we based the descriptions of the courtship and mating behavioral units and frequencies. Durations of behaviors are expressed in seconds and mean values \pm standard deviation. The duration of copulation was measured from the first clasping until the male escaped from the female. All encounters were recorded using a Handycam Panasonic SDR-S7.

RESULTS

TAXONOMY

Infraorder MYGALOMORPHAE Pocock, 1892
Family Pycnothelidae Chamberlin, 1917
Subfamily Pycnothelinae Chamberlin, 1917
Genus *Stenoterommata* Holmberg, 1881

Stenoterommata isa sp. nov.

(Figs. 1–5)

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Material examined: Holotype male. ARGENTINA. *Corrientes*: San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti leg. 7.iii.2020 (CARTROUNNE 9379). Paratype female. ARGENTINA. *Corrientes*: San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti leg. 7.iii.2020 (CARTROUNNE 9380).

Additional material examined: 3 females. ARGENTINA. *Corrientes*: San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti leg. 7.iii.2020 (CARTROUNNE 9381).

Etymology: The species is named in recognition of the continued support from the International Society of Arachnology (ISA) to arachnological studies around the world.

Diagnosis: Males of *Stenoterommata isa* sp. nov. resemble those of *S. chavarii* Ghirrotto & Indicatti, 2021, *S. crassimana* (Mello-Leitão, 1923), *S. palmar* Goloboff, 1995, *S. sevegnaniae* Indicatti, Chavari, Zucatelli-Júnior, Lucas & Brescovit, 2017 and *S. tenuistyla* Goloboff, 1995 by the palpal bulb with thin and filiform embolus (Fig. 3A–D). It can be distinguished from the *S. sevegnaniae* and *S. tenuistyla* by the strongly curved embolus at the tip (Fig. 3A–D). Also, males resemble those of *S. tenuistyla* in the presence of numerous short spines on ventral metatarsus I (Fig. 3H), but differ in having fewer spines and the presence of labial cuspules and a fewer number of maxillary cuspules (fewer than 45). Additionally, males

can be distinguished from those of *S. crassimana* by the palpal duct being much less curved in medial region and absence of stains on ventral abdomen (Fig. 2D); from *S. chavarii* and *S. palmar* by the presence of numerous short spines on ventral metatarsus I (Fig. 3H), and also from *S. palmar* by the presence of ITC on legs III and IV. Females are distinguished by the single receptacle arising from the basal portion of medial area of a very short triangular basal dome (Fig. 4F) [in *S. palmar*, the basal dome is very long and triangular (Figs. 43–47, Indicatti et al. 2008); and in *S. tenuistyla*, the basal dome is short and rounded with the receptacle arising from the tip (Fig. 72C, Goloboff 1995)].

Description: Male holotype. Color pattern (in life): chelicerae, carapace light brown covered with dark brown setae, coxa and trochanter light brown, patellae, tibiae and tarsi light grey, femora and metatarsi black (Fig. 1B). Abdomen dorsally brownish with black stains mainly on central region (Fig. 1B). Color in ethanol: carapace (Fig. 2A), coxa and trochanter brown reddish, carapace covered by black setae. Abdomen dorsally light brown yellowish with black mottling forming discrete chevron (Fig. 2B), laterally and ventrally light brown yellowish without mottles (Fig. 2D). Total

length 7.37. Chelicerae 0.83 long, 0.43 wide (only left side). Carapace 3.4 long, 2.32 wide, with very narrow, procurved fovea, 0.15 wide (Fig. 2A). Abdomen 3.97 long, 2.24 wide (Fig. 2B, D). Thoracic region flat, not elevated. Clypeus 0.09 long. Eye tubercle 0.32 long, 0.61 wide, slightly elevated. Anterior eye row slightly procurved, posterior slightly recurved (Fig. 2A). Eye sizes and interdistances: AME 0.11, ALE 0.06, PME 0.07, PLE 0.15, AME–AME 0.10, AME–ALE 0.04, PME–PME 0.25, PME–PLE 0.03, ALE–PLE 0.04. Chelicerae with 7 teeth on promargin, with 18 basal smaller teeth on retromargin, rastellum weak formed by long thin setae (Fig. 2C). Intercheliceral tumescence large and circular, pale yellow, covered with few long setae on basal region. Labium 0.16 long, 0.41 wide, with 1 cuspule, although holes indicate 3 original cuspules. Maxillae with 41/36 blunt cuspules on internal basal angle. Sternum oval, 1.62 long, 1.25 wide. Sternal sigilla: all circular, anterior slightly smaller than medium, posterior the largest; anterior, medium and posterior distant from margin by ca. 0.5x length (Fig. 2C). Legs and palp measurements are shown in table 1. Spination: tarsi of all legs, 0; femur: palp and legs I–IV, 0; patellae: palp and legs I–II, 0; III: 1-1-1P, 1R; IV:

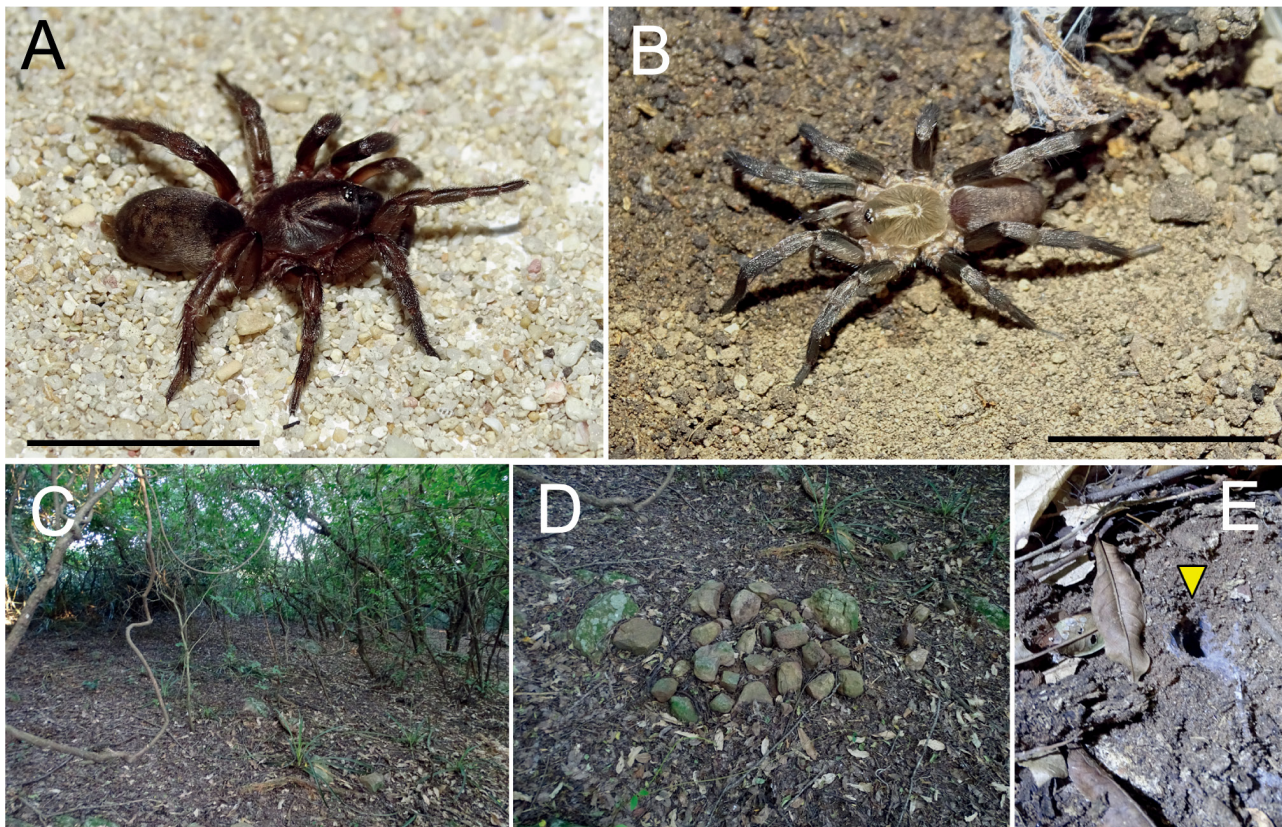


Fig. 1. *Stenoterommata isa* sp. nov. A, Habitus female paratype. B, Habitus of male holotype. C, Habitat at Nazareno hill, Paraje Tres Cerros. D, Collecting site. E, General aspect of burrow (yellow arrow indicates a burrow of female). Scale bars = 1 cm.

1R; tibiae: palp: 1(ap)R, 1-2(ap)P; I: 1-1-2(ap)V (1ap + megaspine) (Fig. 3E–F); II: 1-1P, 1-1-2(ap)V; III: 1D, 1R, 2-2-3(ap)V, 2-1P; IV: 2-2-2V, 1-1P, 1-1R; metatarsi: I: 2-2-1-2-3(ap)V, 1-2(ap)P; II: 1-2-3(ap)V, 1-1P; III: 1-2-2R, 2-2-2D, 1-1-2(ap)V, 1-1-2(ap)P; IV: 1-1-1-1-2(ap)D, 1-2-2(ap)R, 2-2-1-2V, 1-1-1-1-1-1P. Metatarsal preening combs: III: 3VR, 3VP; IV: 3VP. Combs of leg IV are formed by equal size setae. Tarsi I–II integral, III–IV flexible. Scopulae on tarsi I and II complete and divided by a central row of 3 thin setae; III and IV absent. Scopulae on $\frac{1}{2}$ length of metatarsi I and on $\frac{1}{3}$ of metatarsi II; III and IV absent. STC large with double row of teeth: I: 6/7–8/7; II: 6/8–6/7; III: 7/8–7/9; IV: 7/7–8/6. ITC on tarsi I–IV (Fig. 3G–H). Presence of 16 epiandric spigots. Four spinnerets: PMS 0.34 long, with pumpkiniform spigots on apical half. PLS: basal segment 0.59, median 0.55, apical triangular, 0.33 long, with pumpkiniform spigots on all segments. Palp (Fig. 3A–F): cymbium with elongate dense setae, denser at tip (Fig. 3E–F); bulb piriform, basal region of tegulum

with grooves, thin embolus curved at the tip, with ca. 18 retrodorsal parallel well-developed keels (Fig. 3A–D).

Female paratype: Color pattern (in life): chelicerae, carapace dark brown covered with bronze setae, legs dark brown, with darker femora (Fig. 1A). Abdomen dorsally brown with black stains mainly on central region (Fig. 1A). Color in ethanol: carapace (Fig. 4A), coxa and trochanter brown reddish, carapace covered by black setae. Abdomen dorsally light brown yellowish with black mottling forming discrete chevron (Fig. 4B). Total length 10.59. Chelicerae 1.46 long, 0.90 wide (only left side). Carapace 4.92 long, 3.58 wide, with procurved fovea, 0.36 wide (Fig. 4A). Abdomen 5.67 long, 3.92 wide (Fig. 4B). Thoracic region raised. Clypeus 0.08 long. Eye tubercle 0.54 long, 0.79 wide, slightly elevated. Anterior eye row slightly procurved, posterior slightly recurved (Fig. 4A). Eye sizes and interdistances: AME 0.16, ALE 0.23, PME 0.19, PLE 0.25, AME–AME 0.12, AME–ALE 0.08, PME–PME 0.34, PME–PLE 0.04, ALE–PLE 0.05. Chelicerae



Fig. 2. *Stenoterommata isa* sp. nov., male holotype. A, Carapace, dorsal view. B, Abdomen, dorsal view. C, cephalothorax, ventral view. D, Abdomen, ventral view. Scale bars = 1 mm.

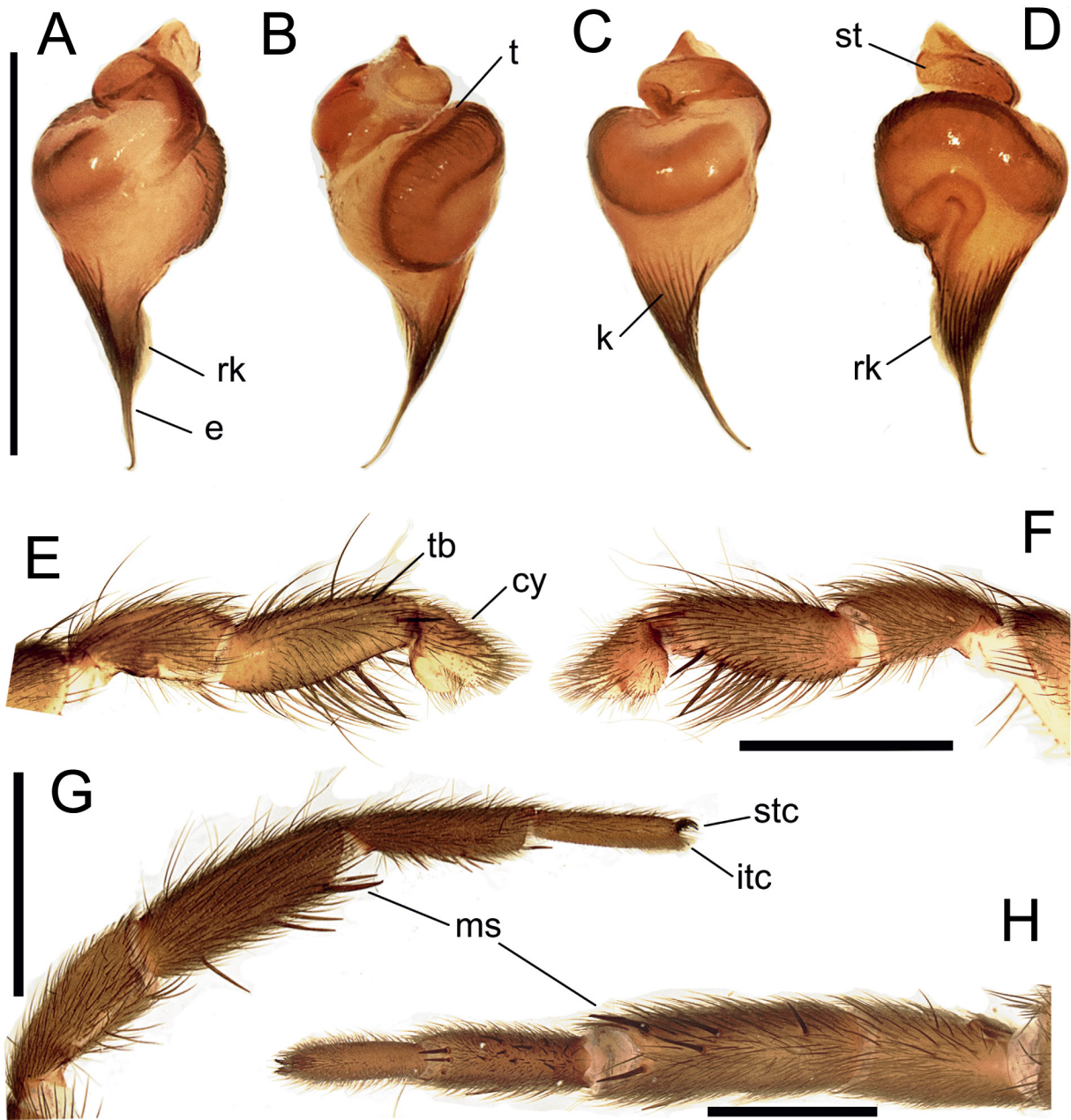


Fig. 3. *Stenoterommata isa* sp. nov., male. A–D, Right palpal bulba, Ventral view. B, Prolateral view. C, Retrolateral view. D, Dorsal view. E–F, Right palp. E, Retrolateral view. F, Prolateral view. G–H, Right leg I. G, Retrolateral view. H, Ventral view. Scale bars = 1 mm.

Table 1. *Stenoterommata isa* sp. nov. Holotype male, length of palp and leg segments

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	2.07	1.68	1.27	1.16	1.38
Patella	1.72	1.45	1.1	1.49	0.81
Tibiae	1.84	1.4	1.3	1.91	0.82
Metatarsus	0.87	1.05	0.81	2.42	-
Tarsus	0.54	0.48	0.52	1.03	0.2
Total	7.04	6.06	5	8.01	3.21

with 8 teeth on promargin, with 19 basal smaller teeth on retromargin, rastellum weak formed by long thin setae (Fig. 4C). Labium 0.37 long, 0.74 wide, with 2 cuspules, although holes indicate 4 original cuspules. Maxillae with 72/80 blunt cuspules on internal basal angle (Fig. 4D). Sternum oval, 2.11 long, 1.80 wide. Sternal sigillae: all circular, anterior slightly smaller than medium, posterior the largest; anterior, medium and posterior distant from margin by ca. 0.5x length (Fig. 4C). Legs and palp measurements are shown in table 2. Spinination: tarsi of all legs, 0; femur: palp and legs

I–IV: 0; patellae: palp and legs I–II: 0; III: 1-1-1P; IV: 1R; tibiae: palp: 1-2(ap)V, 1-1P; I–II: 0; III: 1-1-3(ap)V, 1D, 1-1P, 1R; IV: 2(ap)V, 1-1R, 1-1P; metatarsi: I: 1-1-1V; II: 2-2-2(ap)V; III: 2-2-2(ap)V, 1-1R, 2-1-2P, 1-2-2D; IV: 1-1-2(ap)D, 2-1-1-1-3(ap)V, 1-2-1R, 1-1-1P. Metatarsal preening combs: II: 3VP; III: 4VR, 4VP; IV: 4V. Combs of leg IV are formed by equal size setae. Tarsi I–III integral, IV flexible. Scopulae on tarsi I and II complete and divided by a central row of 4 thin setae; III and IV absent. Scopulae on $\frac{2}{3}$ length of metatarsi I and on $\frac{1}{2}$ of metatarsi II; III and IV absent. STC large

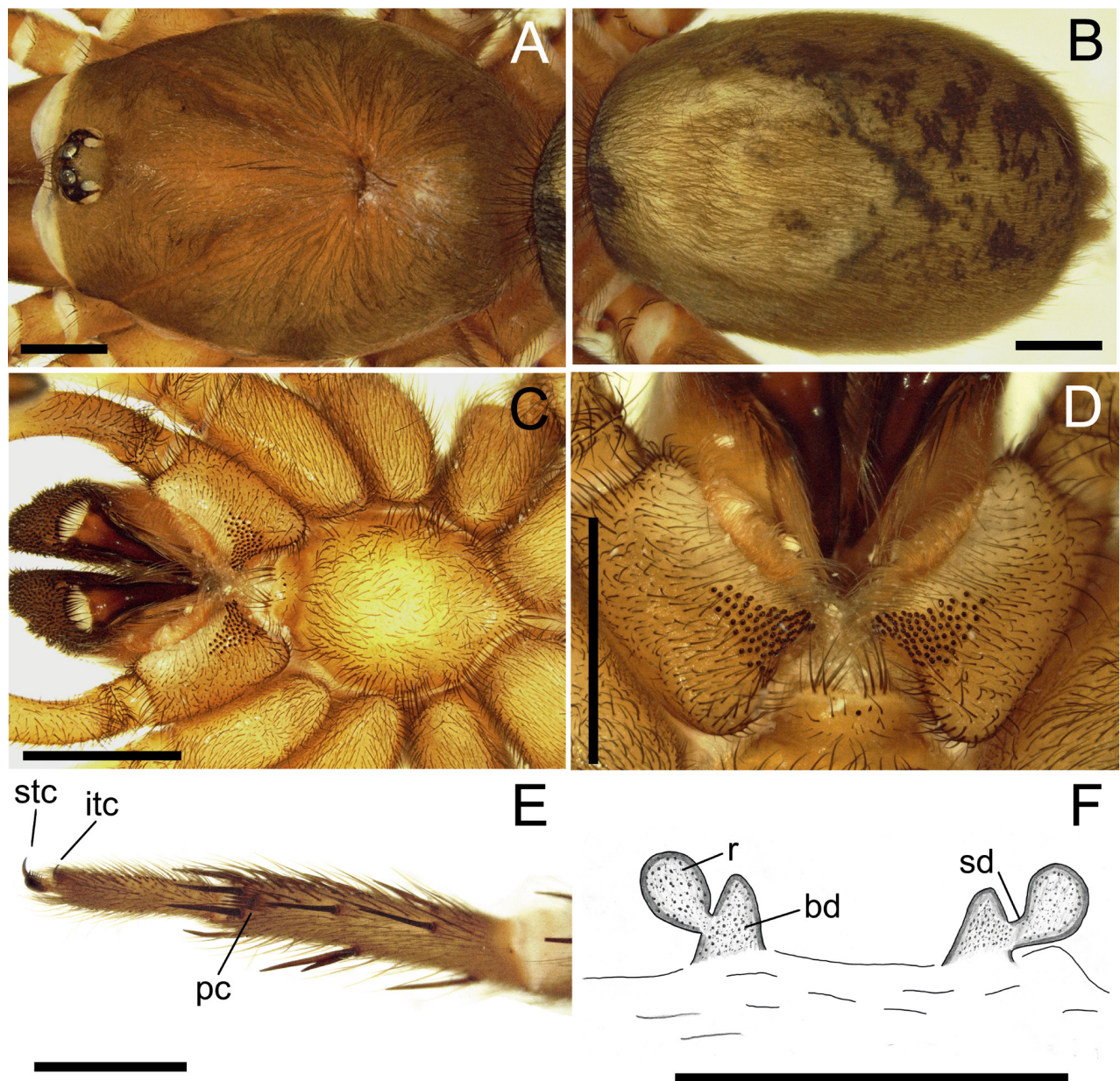


Fig. 4. *Stenoterommata isa* sp. nov., female paratype. A, Carapace, dorsal view. B, Abdomen, dorsal view. C, Cephalothorax, ventral view. D, Labium and maxilla, ventral view. E, Right leg IV, ventral view. F, Spermatheca. Scale bars = 1 mm.

with double row of teeth: I: 5 on all claws; II: 6/6–5/6; III: 6/7–7/7; IV: 9/8–7/9. ITC on tarsi I–IV (Fig. 4E). Four spinnerets: PMS 0.45 long, with pumpkiniform spigots on apical half. PLS: basal segment 0.65, median 0.61, apical triangular, 0.46 long, with pumpkiniform spigots on all segments.

Distribution: *Stenoterommata isa* sp. nov. has only been collected in its type locality in the low hill range of Paraje Tres Cerros, in north eastern Corrientes province, in northern Argentina (Fig. 5).

Natural History: All specimens were found in the Nazareno hill formation only in the forest slopes and not in the surrounding grasslands (Fig. 1C–D). Spiders were found occupying dense silk tubes with one apparent entrance under small stones (Fig. 1E).

Sexual behavior: We obtained one mating of *S. isa* sp. nov. The male contacts the female through a sheet

of silk without previous courtship, as result, the female starts chasing the male and after a couple of seconds of persecution, the male remains still and the female returns to the shelter. Then, the male turns around and touches the female legs with legs 1 and 2 and starts the courtship by beating the female’s cephalothorax and sternum with legs 2 and palps respectively for 11 seconds. After that, the male clasped with the first pair of legs between the palp base and chelicerae of the female and elevated her to reach the genital opening. Then, the male proceeds to make at least 5 palpal insertion attempts, alternating his palps, while the female remains still. In the last 30 seconds, the female starts to make slow movements with her legs, then, the male escapes quickly. The duration of copulation was 420 seconds.

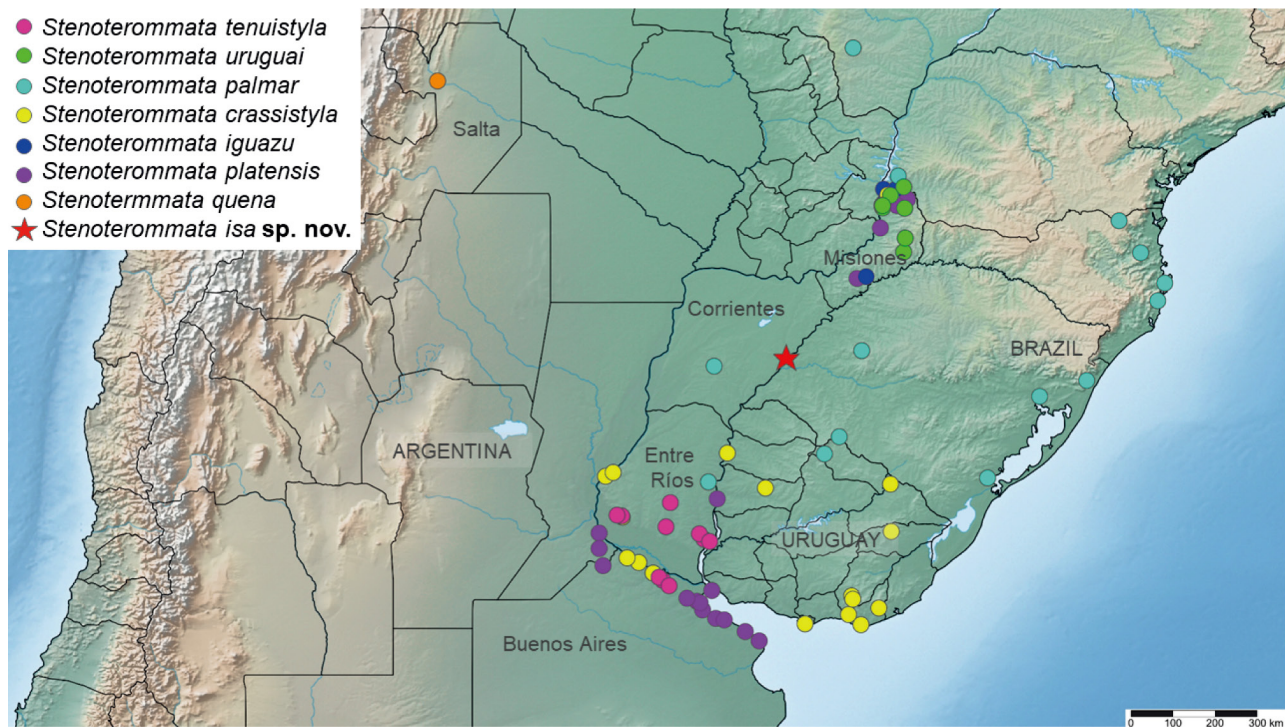


Fig. 5. Distribution map of the known species of *Stenoterommata* in Argentina.

Table 2. *Stenoterommata isa* sp. nov. Paratype female, length of palp and leg segments

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	2.81	2.59	2.31	3.35	2.08
Patella	1.99	1.59	1.57	1.92	1.19
Tibiae	1.93	1.47	1.25	2.18	0.93
Metatarsus	1.06	1.42	1.45	2.73	-
Tarsus	0.61	0.98	1.28	1.4	0.47
Total	8.4	8.05	7.86	11.58	4.67

Family Theraphosidae Thorell, 1869
Subfamily Ischnocolinae Simon, 1892
Genus *Catumiri* Guadanucci, 2004

***Catumiri sapucaí* sp. nov.**

(Figs. 6–10)

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Material examined: Holotype male. ARGENTINA. *Corrientes:* San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), M. Nicoletta, J. Panchuk legs. 9.iii.2020 (CARTROUNNE 9382). Paratype female. ARGENTINA. *Corrientes:* San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti, N. Peralta-Seen legs. 9.iii.2020 (CARTROUNNE 9383).

Additional material examined: 1 male (molted in captivity). ARGENTINA. *Corrientes:* San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti, M. Nicoletta, J. Panchuk, N. Peralta-Seen legs. 9.iii.2020 (CARTROUNNE 9384). 2 females. ARGENTINA. *Corrientes:* San Martín, Paraje Tres Cerros (29°6'31.54"S–56°56'2.17"W), N. Ferretti, M.

Nicoletta, J. Panchuk, N. Peralta-Seen legs. 8.iii.2020 (CARTROUNNE 9385).

Etymology: The species name refers to “sapukái” from the Guaraní language, which means clamor. The “sapucaí” is a long, high-pitched shout used as a call. It is typical of the Guaraní culture and is widespread along the Argentinean littoral region and particularly in the Corrientes province. In addition, it is particularly used in the Chamamé culture.

Diagnosis: Males differ from those of *C. petropolium* by the presence of a tibial spur on tibia of leg I, and from *C. argentinense* by the retrolateral branch having two spines (Fig. 8A) [one large in *C. argentinense*, figs. 16–17 in Guadanucci (2004)]. Additionally, males differ from those of *C. chicaoi* by the absence of a partially bifurcate spine on the retrolateral branch of the tibial spur. Finally, males resemble those of *C. parvum*, from which differ by the curved spines on the retrolateral branch of the tibial spur [straight in *C. parvum*, fig. 10 in Guadanucci (2004)], and by the shape of the palpal bulb, with a more globose tegulum and thicker curved embolus (Fig. 8B–C)

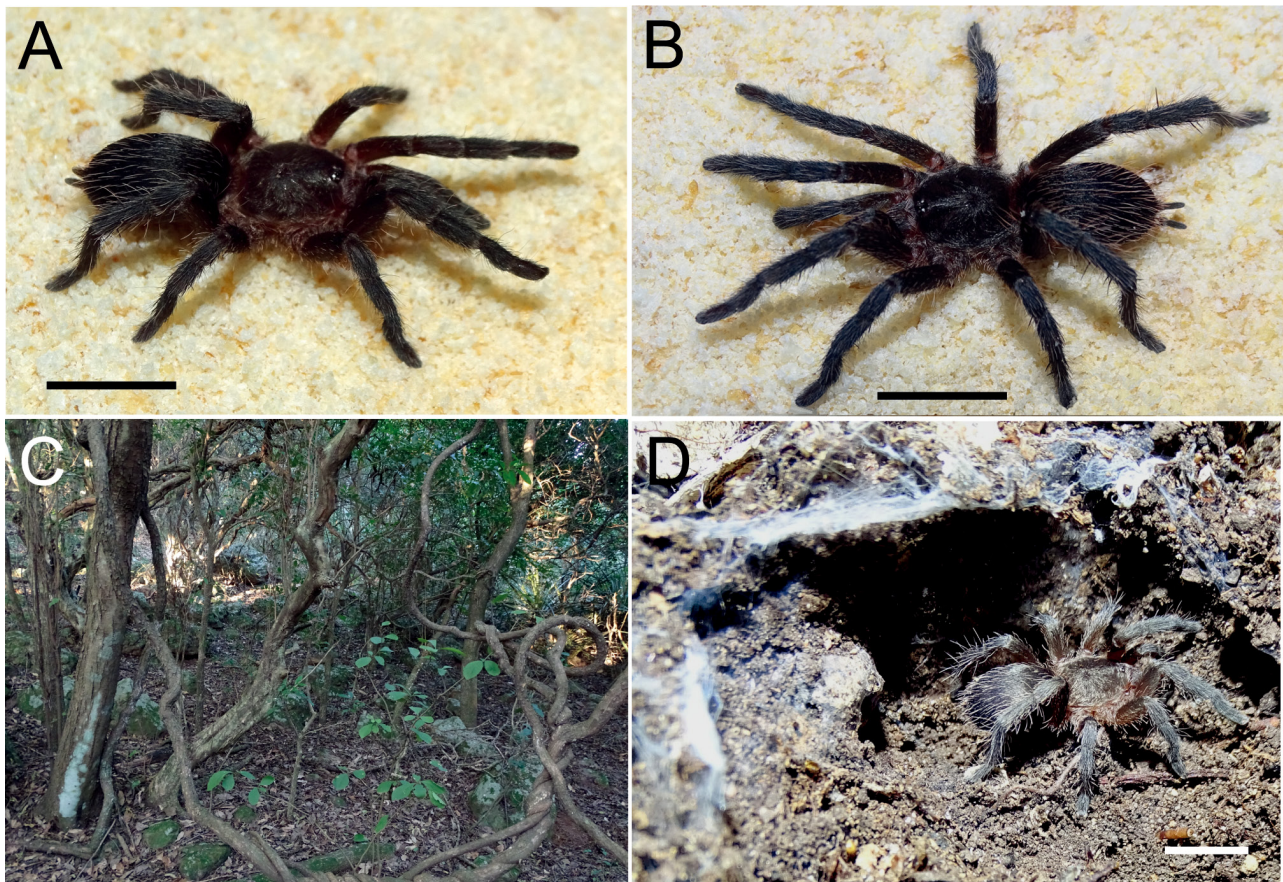


Fig. 6. *Catumiri sapucaí* sp. nov. A–B, Habitus. A, Male holotype. B, Female paratype. C, Habitat at Nazareno hill, Paraje Tres Cerros. D, Female at shelter in collecting site. Scale bars = 1 cm.

[thinner and straight *C. parvum*, fig. 5 in Galleti-Lima et al. (2021)]. Females can be easily distinguished from the known species by the shape of the spermathecae, having two elongated digitiform domes external to the inner receptacles (Fig. 9F).

Description: Male holotype. Color in life: carapace black with margins covered with pinkish setae, legs black with coxa and trochanter covered dorsally with pinkish setae; abdomen black with long reddish setae, mainly on anterior part, spinnerets black (Fig.

6B). Color in ethanol: carapace (Fig. 7A) and chelicerae (Fig. 7C) light brown with black setae, carapace margin black; abdomen dorsally black with long reddish setae, mainly on anterior part (Fig. 7B); legs light brown with femora, metatarsi and tarsi dark brown; sternum, labium and maxillae light brown (Fig. 7C), tarsi ventrally dark brown; abdomen and spinnerets ventrally brown (Fig. 7D). Total length: 10.24. Carapace: 5.03 long, 4.26 wide. Fovea: slightly recurved, 0.32 wide (Fig. 7A). Eye tubercle: 0.49 long, 0.79 wide (Fig. 7E). Anterior eye

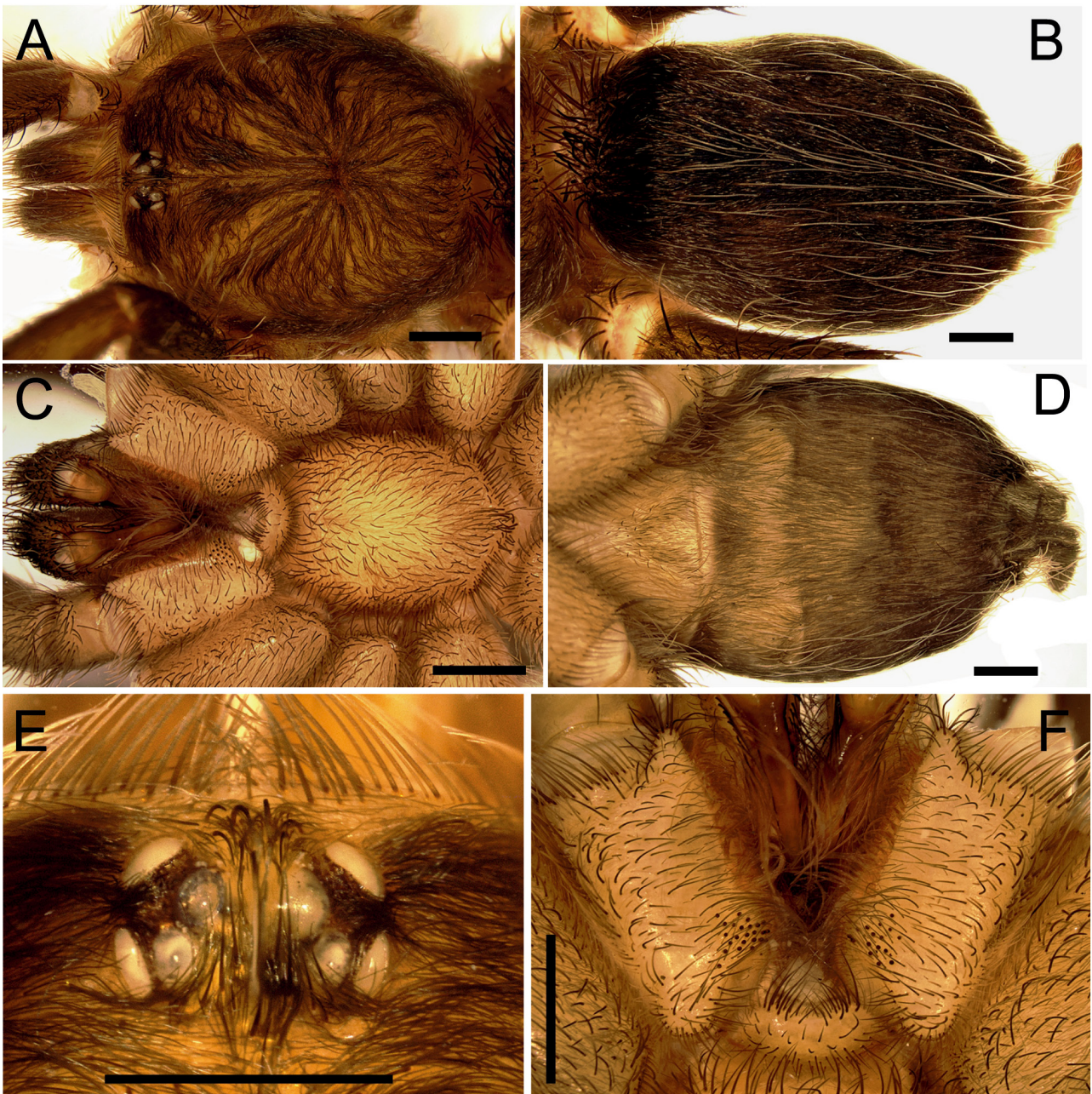


Fig. 7. *Catumiri sapucaei* sp. nov., male holotype. A, carapace, dorsal view. B, Abdomen, dorsal view. C, Cephalothorax, ventral view. D, Abdomen, ventral view. E, Eyes, dorsal view. F, Labium and maxilla, ventral view. Scale bars = 1 mm.

row procurved, posterior slightly recurved. Eye sizes and interdistances: AME 0.22, ALE 0.24, PME 0.16, PLE 0.23, AME–AME 0.09, AME–ALE 0.10, PME–PME 0.34, PME–PLE 0.07, ALE–PLE 0.13. Cheliceral furrow with 8 big teeth on the promargin and 10 smaller on retromargin. Labium: 0.31 long, 0.92 wide, without cuspules. Maxillae with 24/19 cuspules (Fig. 7F). Sternum oval: 2.73 long, 2.26 wide (Fig. 7C). Legs and palp measurements are shown in table 3. Spination: tarsi of all legs, 0; femur: palp: 0; I: 1P; II: 0; III: 1-1D, 1-1R; IV: 1-1P; patellae: palp, legs I–II and IV: 0; III: 1R; tibiae: palp: 2-1P; I: 1-1-1V, 1-1P; II: 1-1-2(ap)V, 1-1P; III: 1-1-1-1P, 1-1-2(ap)V, 1-2-1-1R; IV: 2-2-3(ap)V, 1-1P, 1-1-2R; metatarsi: I: 2-1-1V; II: 1-1V, 1P; III: 1-2-2-1P, 1-1-2(ap)V, 2-2R; IV: 2-2-3(ap)V, 1-1-2P, 1-1-1R, 1-1D. Tibial spur formed by two branches, prolateral

strongly reduced bearing a strong curved spine, retrolateral well developed with two curved spines on its apical end (Fig. 8A). Metatarsus I bends retrolaterally to the branch of tibial spur. Paired tarsal claws I and II with 6 teeth on the prolateral side; paired tarsal claws III and IV smooth. Scopulae on tarsi: I complete and divided by a longitudinal band of 3 setae, II and III complete and divided by a longitudinal band of 4 setae, IV complete and divided by a longitudinal band of 6/7 setae. Scopulae on metatarsi: I totally occupied by scopula, II $\frac{2}{3}$ occupied by scopula, III $\frac{3}{4}$ occupied by scopula, IV $\frac{1}{2}$ occupied by scopula. Lobes of cymbium of equal size, Male palpal bulb long, embolus ventrally slightly curved, tegulum globose and tapering abruptly (Fig. 8B–C).

Female paratype: Color in life and in ethanol as

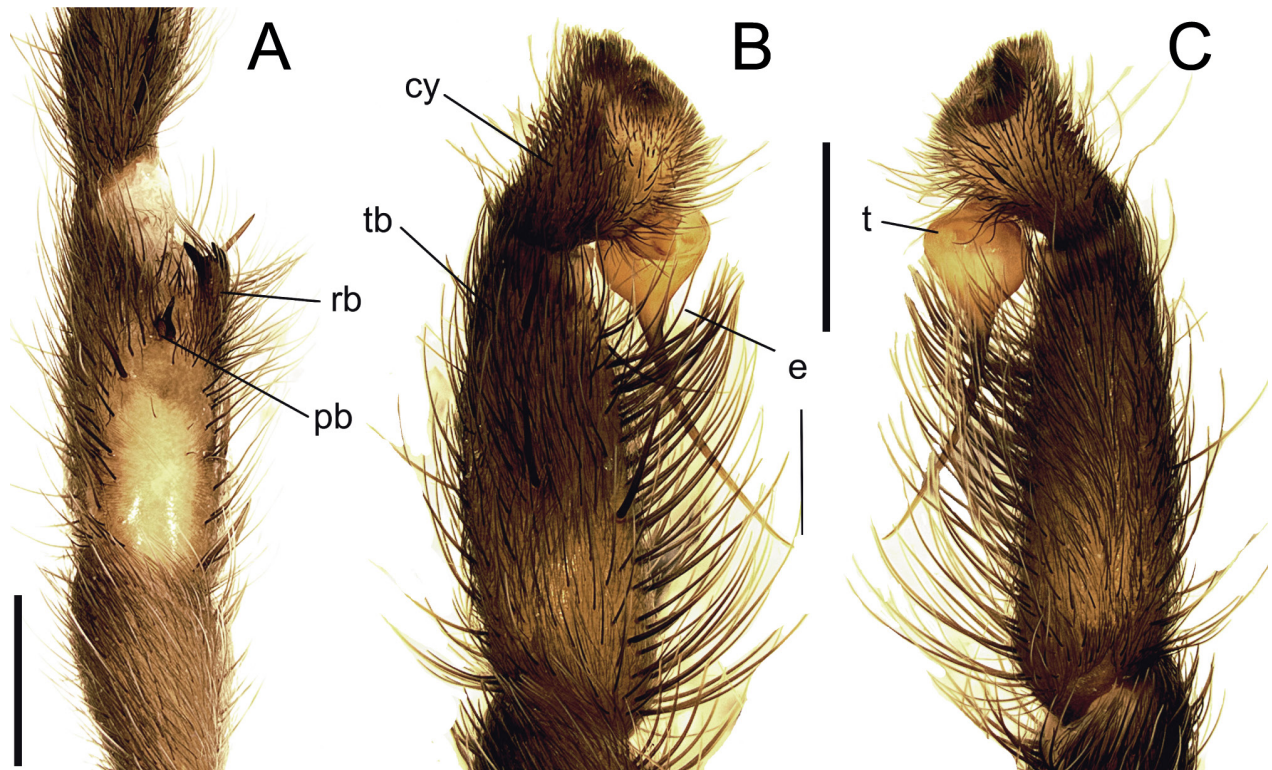


Fig. 8. *Catumiri sapucaei* sp. nov., male. A, Left leg I, prolateral view. B–C, Palp. B, Prolateral view. C, Retrolateral view. Scale bars = 1 mm.

Table 3. *Catumiri sapucaei* sp. nov. Holotype male, length of palp and leg segments

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	3.62	3.19	2.96	4.12	2.58
Patella	2.37	1.51	1.68	2.04	1.53
Tibiae	2.63	2.07	1.99	3.47	2.48
Metatarsus	2.45	2.26	3.02	4.13	-
Tarsus	1.36	1.52	1.39	2.15	0.94
Total	12.43	10.55	11.04	15.91	7.53

in male (Figs. 6A, 9A–D). Total length: 9.68. Carapace: 4.68 long, 3.92 wide (Fig. 9A). Fovea: recurved, 0.44 wide. Eye tubercle: 0.47 long, 0.82 wide (Fig. 9E). Anterior eye row procurved, posterior slightly recurved. Eye sizes and interdistances: AME 0.13, ALE 0.24, PME 0.15, PLE 0.24, AME–AME 0.16, AME–ALE 0.06, PME–PME 0.36, PME–PLE 0.05, ALE–PLE 0.08. Cheliceral furrow with 9 big teeth on the promargin and 12 smaller on retromargin. Labium: 0.31 long, 0.8 wide, without cuspules. Maxillae with 20/21 cuspules. Sternum oval: 2.15 long, 1.72 wide (Fig. 9C). Legs and palp measurements are shown in table 4. Spination: tarsi of all legs, 0; femur: palp, legs I–II: 0; III: 1-2D;

IV: 1D; patellae: palp, legs I–II and IV: 0; III: 1P; tibiae: palp: 3(ap)V, 1P; I: 1-1V; II: 1-2V; III: 2-2-3(ap)V, 1-1-1P, 1-1-1R; IV: 1-2-2V, 1-2-1P, 1-1R; metatarsi: I: 1-1V; II: 1-1V; III: 1-1-3(ap)V, 2-1P, 1-1-1R, 2(ap)D; IV: 2(ap)D, 2-2-3(ap)V, 1-1P, 2-1-1R. Paired tarsal claws smooth. Paired tarsal claws I with 6 and II with 7 teeth on the prolateral side; paired tarsal claws III and IV smooth. Scopulae on tarsi: I complete and divided by a longitudinal band of 4 setae, II complete and divided by a longitudinal band of 5 setae, III complete and divided by a longitudinal band of 7 setae, IV complete and divided by a longitudinal band of ca. 10 setae. Scopulae on metatarsi: I and II $\frac{2}{3}$ occupied by scopula, III and



Fig. 9. *Catumiri sapucaei* sp. nov., female paratype. A, Carapace, dorsal view. B, Abdomen, dorsal view. C, Cephalothorax, ventral view. D, Abdomen, ventral view. E, Eyes, dorsal view. F, Spermathecae, dorsal view. Scale bars = 1 mm.

IV ½ occupied by scopula. Spermathecae paired with internal long and slightly curved ducts bearing terminal circular receptacula, and presence of an elongated digitiform domes not sclerotized on the external side, not differentiated in a receptaculum (Fig. 9F).

Distribution: *Catumiri sapucaí* sp. nov. has only been collected in its type locality in the low hill range of Paraje Tres Cerros, in north eastern Corrientes province, in northern Argentina (Fig. 10).

Natural History: Specimens were found inhabiting in sympatry with those of *Stenoterommata isa* sp. nov. by occupying small rocks (Fig. 6C). However, *Catumiri sapucaí* sp. nov. constructs short burrows or crevices with abundant silk and some sleeves (Fig. 6D).

Sexual behavior: From the five matings registered for *Catumiri sapucaí* sp. nov., in two cases, males

contacted the females without an evident courtship, they walked straight to the female position. In the remaining three encounters, males initiated courtship by performing a few quick body vibrations, while they moved toward the female. Then, they contacted the female with legs I and II until they faced each other and grabbed legs I and II of the female and began to pull on them ($16.41 \text{ s} \pm 9.65 \text{ SD}$). Also, in contact, males performed quick body vibrations ($2.09 \text{ s} \pm 0.89 \text{ SD}$) and touches the legs I and II of the females ($11.92 \text{ s} \pm 14.16 \text{ SD}$). In one case, we observed that the male performed high-frequency body vibrations ($29.33 \text{ s} \pm 17.78 \text{ SD}$) alternately touching the first pairs of legs of the female. In all encounters, the females moved towards the male position and raised the first pair of legs and body. Then, the males beat on the sternum and

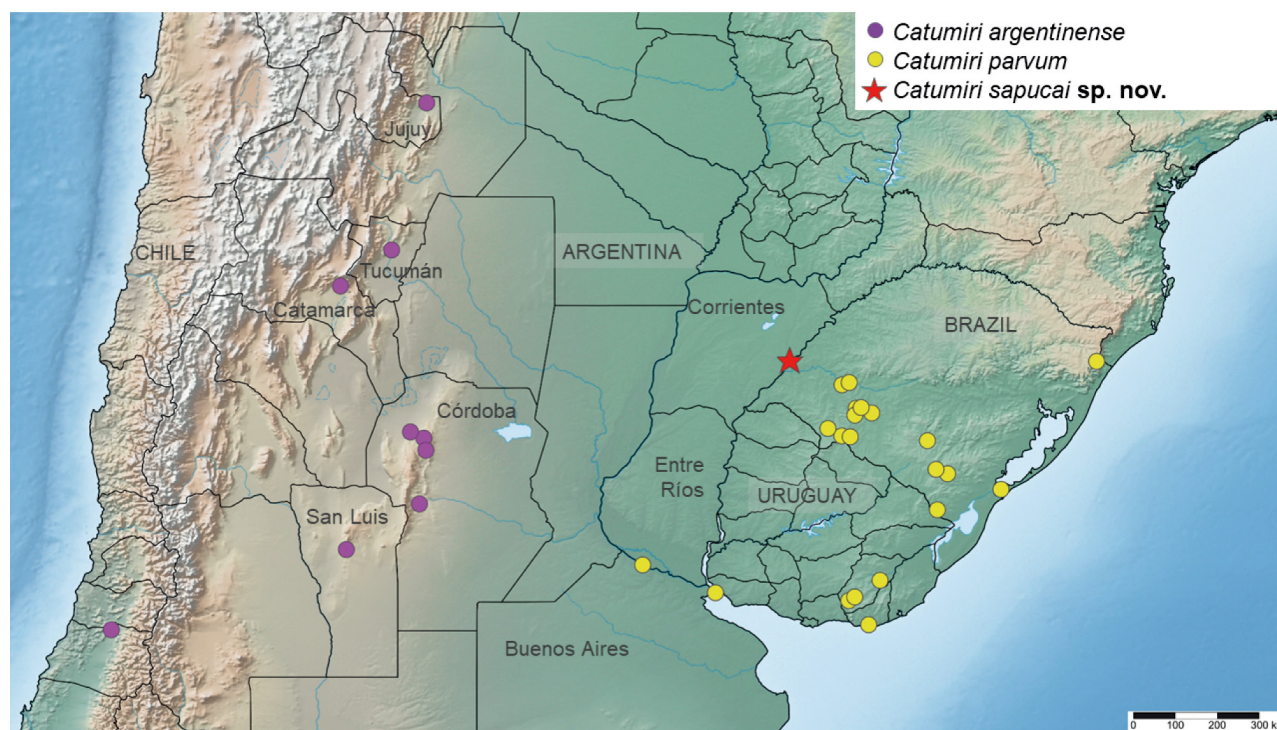


Fig. 10. Distribution map of the known species of *Catumiri* in Argentina.

Table 4. *Catumiri sapucaí* sp. nov. Paratype female, length of palp and leg segments

	Leg I	Leg II	Leg III	Leg IV	Palp
Femur	2.66	2.53	2.15	3.05	1.97
Patella	1.85	1.49	1.54	1.74	1.43
Tibiae	2.23	1.58	1.94	2.71	1.13
Metatarsus	1.52	1.67	2.07	3.1	-
Tarsus	0.9	1.03	1.29	1.95	1.5
Total	9.16	8.3	8.99	12.55	6.03

coxa of the females with their palps ($4.78 \text{ s} \pm 4.85 \text{ SD}$) and subsequently clasped using their tibial apophysis between the palpal coxa and chelicerae of the female, elevating her to reach the genital opening. Males made about 3 to 5 alternated palpal insertions, with the exception of one insertion in a case in which spiders lost equilibrium and separated from each other. The duration of copulation was $30.05 \text{ s} \pm 23.6 \text{ SD}$ and in most cases, males unclasped and ran away, but in two encounters females ended the copulation by moving their back legs to push away the male. No cases of aggression or cannibalism were observed.

Family Pycnothelidae Chamberlin, 1917
Subfamily Pycnothelinae Chamberlin, 1917
Genus *Xenonemesia* Goloboff, 1988

***Xenonemesia platensis* Goloboff, 1988**
 (Figs. 11–12)

Material examined: Female holotype and male paratype from General Pacheco, Buenos Aires, Argentina, deposited in Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, 8603 and 8608, not examined).

Additional material examined: 1 female. ARGENTINA. *Corrientes*: San Martín, Paraje Tres Cerros ($29^{\circ}6'31.54''\text{S}$ – $56^{\circ}56'2.17''\text{W}$), N. Peralta-Seen leg. 7.iii.2020 (CARTROUNNE 9386).

Diagnosis: *Xenonemesia platensis* can be distinguished from congeners by a short and apical straight embolus of male palpal bulb, and females differ by the genitalia having short, straight seminal receptacles (Fig. 11F).

Description: See Goloboff (1988: 358–362, figs. 1–14).

Distribution: Argentina, Uruguay and southern Brazil (Fig. 12).

New record: ARGENTINA. *Corrientes*: San Martín, Paraje Tres Cerros ($29^{\circ}6'31.54''\text{S}$ – $56^{\circ}56'2.17''\text{W}$).

Natural history: The female was found in a small crevice under a stone with little silk covering the shelter. A larva attached to the anterior part of the abdomen was observed (Fig. 11A–B) and the spider was found to move freely when captured. The larvae possibly belong to a Pompilidae wasp.

DISCUSSION

Catumiri sapucaí sp. nov., *Stenoterommata isa* sp. nov. and *Xenonemesia platensis* were found living in sympatry in low forest areas of the rocky relief of the Nazareno hill. In higher areas of the forest

and the surrounding rocky grassland, individuals of *Grammostola* sp. were located in crevices under rocks. The sympatric scorpion *Tityus curupi* Ojanguren-Affilastro, Adilardi, Cajade, Ramírez, Ceccarelli & Mola, 2017 was also found inhabiting the same environment of these new species (Ojanguren-Affilastro et al. 2017).

Although the Corrientes province of Argentina is known for its high biodiversity, some areas, such as the isolated group of three small hills at Paraje Tres Cerros, had remained unexplored for a long time (Cajade et al. 2013a). However, during the last several years, many herpetological and arachnological field surveys in this area led to the description of new species of lizards, scorpions and spiders endemic to Argentina (Cajade et al. 2013a; Ojanguren-Affilastro et al. 2017; Nadal et al. 2018). The Paraje Tres Cerros, with its three rocky, isolated, low-altitude hills and unique environmental features, has long been a “biogeographic island” hosting many endemic species of plants and small vertebrates (Ravenna 2003 2009; Cajade et al. 2013a b). Thus, the combination of this isolation and environmental singularity makes this an ideal place for the evolution of endemic species. Indeed, the discovery of these two new species of *Stenoterommata* and *Catumiri* could be evidence of taxa evolving in isolation and adapting to their local environment resulting in further endemic species. The presence of *Xenonemesia platensis* in this area is based on only one adult female, and thus further campaigns to collect more specimens, mainly adult males which have the more diagnostic features in mygalomorph spiders, will lead us to confirm this record or to better elucidate its taxonomic identity.

Stenoterommata isa sp. nov. constitutes the eighth known species of the genus in Argentina and, according to its distribution, is the only exclusive species recorded in the Corrientes province. The other registered species in Corrientes is *Stenoterommata palmar*, which is also distributed in Entre Ríos and Misiones provinces in Argentina, northern Uruguay and southern Brazil (Indicatti et al. 2008). These two species are about 100 km apart from each other. Indeed, the male of this new species resembles that of *S. palmar* in regards to the genitalic features, but can be distinguished by the presence of numerous short spines on ventral metatarsus I, a morphological character that is shared with *S. tenuistyla*. Moreover, the spermathecae of females are similar to that presented by Goloboff (1995) for *S. palmar*. However, Indicatti et al. (2008) noted that the illustration of the female paratype of *S. palmar* was incomplete and consequently the basal dome is very long and triangular, which clearly differs from that of *Stenoterommata isa* sp. nov., whose females have a very short triangular basal dome.

Regarding the sexual behavior of *Stenoterommata isa* sp. nov., the absence of behavioral units of courtship involving the early recognition of tactochemical signals associated with the silk of the female could be due to the low number of observations and the quick response from the female to the approximation of the

male to her shelter. The beating of the male over the female carapace with legs II was also observed in *Stenoterommata platensis* (Schwerdt and Copperi 2014), but *Stenoterommata isa* sp. nov. also incorporated the palps to this beating behavior. The number of palpal insertions observed in *S. isa* sp. nov. was similar to

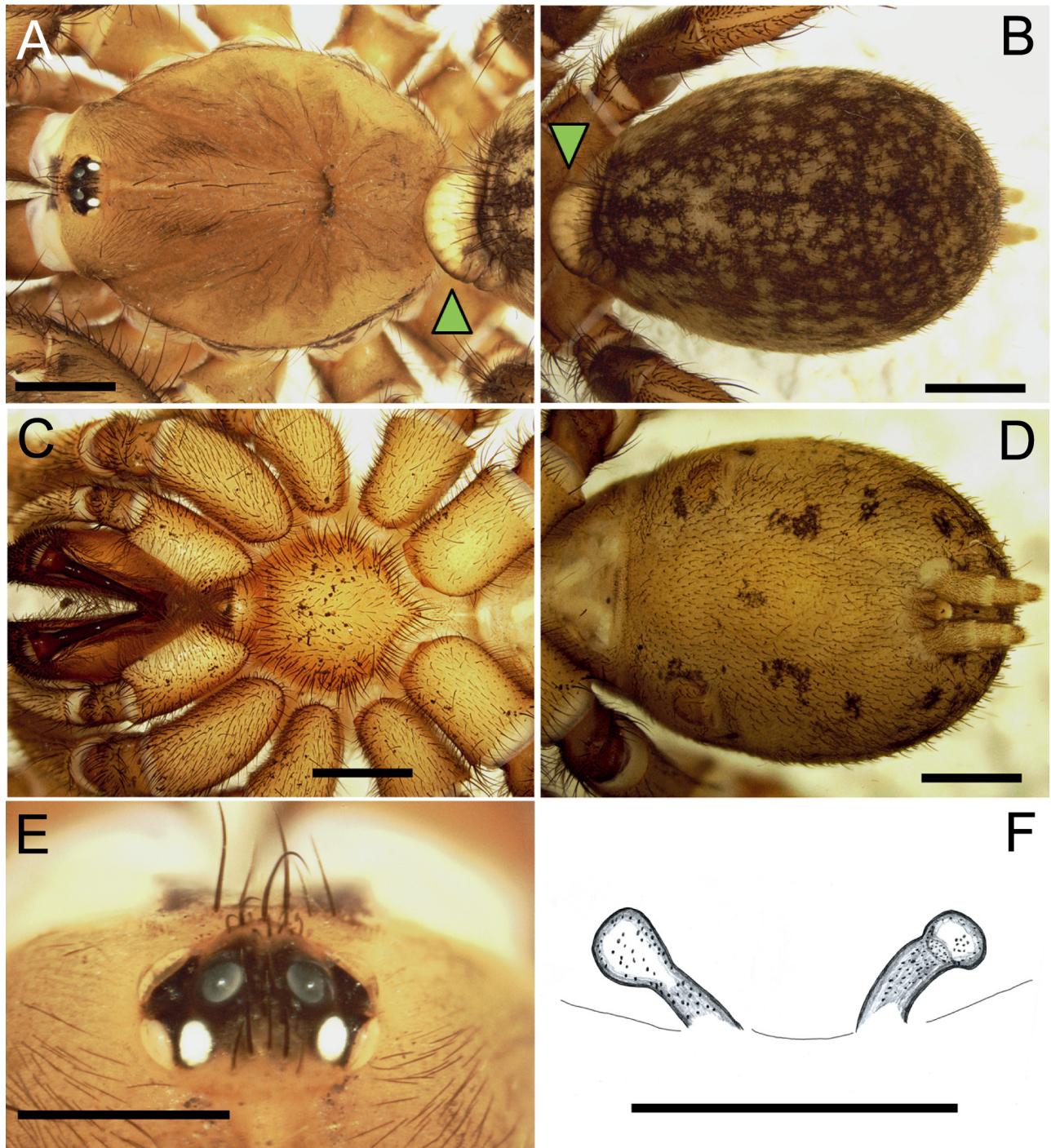


Fig. 11. *Xenonemesia platensis*. A, Carapace, dorsal view (green arrow indicates the larvae attached). B, Abdomen, dorsal view (green arrow indicates the larvae attached). C, Cephalothorax, ventral view. D, Abdomen, ventral view. E, Eyes, dorsal view. F, Spermatheca. Scale bars = 1 mm.

that reported for other Pycnothelidae. However, the copulation duration was slightly longer than reported for other species of *Stenoterommata* and *Acanthogonatus* (Pérez-Miles and Capocasale 1982; Ferretti et al. 2011; Schwerdt and Copperi 2014).

Catumiri sapucaí sp. nov. is the third species described from Argentina. Guadanucci (2004) did not find morphological characters known to distinguish female *C. parvum* from *C. argentinense*, stating that these two species can only be distinguished by their zoogeographical distribution (*C. parvum* occurs in the southern Rio Grande do Sul State in Brazil, Uruguay and in Argentina is restricted to Martín García Island). In the present study, we showed a new spermathecae shape with two additional elongated digitiform domes external to the inner receptacles for *Catumiri sapucaí* sp. nov. that clearly distinguished this species from the known congeners and could be considered as an autapomorphy of this species (Guadanucci 2004; Galleti-Lima et al. 2021).

The sexual behavior observed in *C. sapucaí* sp. nov. was similar to that reported for most Theraphosidae species (Costa and Pérez-Miles 2002; Ferretti et al. 2013). However, the courtship behavior showed some differences in relation to that observed for *Catumiri parvum* (Costa and Pérez-Miles 2002; Schwerdt et al. 2013, unpublished data). In the case of *C. sapucaí* sp. nov., the males performed only body vibrations of

different frequencies and durations instead of the quick tapping with legs I and II observed in *C. parvum*. The number of palpal insertions and the copulation duration were similar to those observed in *C. parvum* (Costa and Pérez-Miles 2002; Schwerdt et al. 2013; unpublished data).

This contribution increases the diversity of mygalomorph spiders from Argentina through the discovery of two new species of Pycnothelidae and Theraphosidae. Most importantly, this study provides additional information on new possible endemic taxa restricted to the isolated mountain systems of Paraje Tres Cerros, and thus would comprise the third record of an endemic animal taxa in this area (Cajade et al. 2013a; Ojanguren-Affilastro et al. 2017).

CONCLUSIONS

Two new mygalomorph species of the families Pycnothelidae and Theraphosidae were described and illustrated from Corrientes, Argentina. These new species *Stenoterommata isa* sp. nov. and *Catumiri sapucaí* sp. nov. are restricted to the Paraje Tres Cerros area. The species *Xenonemesia platensis* was reported for the first time from the Corrientes province. In addition, the description of courtship and mating of these new species was provided. The behavioral units



Fig. 12. Distribution map of *Xenonemesia platensis*.

exhibited by *S. isa* sp. nov. are similar to those reported for other *Stenoterommata* species; and the sexual behavior observed in *C. sapucaí* sp. nov. showed some differences mainly in the courtship behavior in relation to that of *C. parvum*.

Acknowledgment: This work and the two new species names were registered with ZooBank under urn:lsid:zoobank.org:pub:66E97BDE-3CA4-4EF4-9C17-1001637D5A8C. This work was supported by grants from the National Agency for Scientific and Technological Promotion, Argentina (ANPCyT, PICT 2018-1751) to N. Ferretti and International Society of Arachnology (ISA) to M. Nicoletta. Authors wish to thank Rodrigo Cajade and Cecilia Achitte for their kind help in the logistics of the field work and the Reserva Natural Privada Paraje Tres Cerros.

List of abbreviations

ALE, anterior lateral eyes.
 AME, anterior median eyes.
 ap, apical.
 cy, cymbium.
 D, dorsal.
 e, embolus.
 ITC, inferior tarsal claw.
 k, keels.
 ms, megaspine.
 P, prolateral.
 pb, prolateral branch.
 PLE, posterior lateral eyes.
 PLS, posterior lateral spinnerets.
 PME, posterior median eyes.
 PMS, posterior median spinnerets.
 R, retrolateral.
 rb, retrolateral branch.
 rk, retrolateral keel.
 s, seconds.
 SD, standard deviation.
 st, subtegulum.
 STC, superior tarsal claw.
 t, tegulum.
 tb, tibia.
 V, ventral.

Authors' contributions: MN, JP, NP-S and NF organized fieldwork and collected the material. NF identified the specimens. MN and JP prepared the figures and maps. JP, MN and NP-S analyzed the behavior. All authors contributed equally to write the paper.

Competing interests: All of the authors declare they

have no conflict of interest.

Availability of data and materials: Specimens in this study are deposited in the collection of the Universidad Nacional del Nordeste (CARTROUNNE), Corrientes, Argentina.

Consent for publication: All of the authors agreed to publish the paper.

Ethics approval consent to participate: Not applicable.

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