On Puan, a New Genus of Goblin Spiders from Argentina (Araneae, Dysderoidea, Oonopidae)

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On *Puan*, a new genus of goblin spiders from Argentina (Araneae, Dysderoidea, Oonopidae)

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ABSTRACT

A new genus of Oonopidae, *Puan*, is described from Argentina. The genus exhibits several features also found in orsolobids, including a well-sclerotized sperm duct and an H-shaped eye pattern. *Puan* resembles the oonopid genus *Unicorn* Platnick and Brescovit but differs in male palpal morphology. In addition, males lack the clypeal horn characteristic of *Unicorn*. Two new species, *P. chechehet* and *P. nair*, are described from the southwestern mountains of Buenos Aires province. Complex copulatory bulbs are the principal characteristic of these species and could be a synapomorphy for the genus.

INTRODUCTION

Oonopidae (goblin spiders) are members of the Dysderoidea, a superfamily that also includes the families Segestriidae, Dysderidae, and Orsolobidae. The four families have similar internal female genitalia (Forster and Platnick, 1985; see also Izquierdo and Labarque, 2010). The Oonopidae are the sister group of the Orsolobidae (see, e.g., Ramírez, 2000).

Since the start of the PBI project (http://research.amnh.org/oonopidae/), the spider family Oonopidae has experienced substantial growth in the number of described species. In 2006 the

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family contained 459 described species (Platnick, 2006); currently, the family includes 1016 species (Platnick, 2012), an increase of 121%.

Traditionally, the family was divided into two informal subfamilies (see, for example, Roewer, 1942) with the Oonopinae including the soft-bodied spiders and the Gamasomorphinae for those spiders with hard bodies. However, the monophyly of these groups has not been tested (Platnick, 2000). More recently, Platnick et al. (2012) recognize three subfamilies based on tarsal organ morphology and additional characters: Orchestininae Chamberlin and Ivie (containing only *Orchestina* Simon, 1882), Sulsulinae (containing *Sulsula* Simon, 1882, *Xiombarg* Brignoli,1979, *Unicorn* Platnick and Brescovit, 1995, *Cortestina* Knoflach, 2009, and *Dalmasula* Platnick et al., 2012, a new genus from Namibia and South Africa), and Oonopinae Simon (containing all the remaining genera, including those previously placed in the Gamasomorphinae). Here, a new genus, *Puan*, is described from the southwestern mountains of Buenos Aires province. We discuss the relationships of this new genus in light of this new evidence.

MATERIAL AND METHODS

Specimens are deposited in the arachnid collection of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-Ar), Buenos Aires. Female genitalia were observed in temporary preparations in clove oil under an Olympus BH-2 compound microscope and illustrated using a camera lucida. Photographs were taken with a Leica digital camera mounted on a Leica compound microscope and focal planes combined with Helicon Focus 3.10.3 software (http://helicon.com.ua/heliconfocus/). For scanning electron microscope (SEM) preparations male and female specimens were dissected, dehydrated in a graded ethanol series (80%–100%), critical point dried, and coated with a gold-palladium alloy. One female's genitalia (PBI_OON 43388) were dissected and prepared for SEM according to Álvarez-Padilla and Hormiga (2008). Images were taken under high vacuum with a Philips FEI XL30 TMP. High-resolution versions of all images will be available on the PBI website (http://research.amnh.org/oonopidae). SEM images are provided only for males and females of *Puan chechehet*, new species.

In addition to the collection number, vials contain PBI codes as well as preparation codes, formed by initials of the name and surname of the first author plus a five-digit number (for example, MAI 00354). Preparation codes refer to a Microsoft Access database that contains all the information of the specimen (locality, collector, depository, etc.) as well as relevant information on the preparations performed (SEM, temporary mount on alcohol, part mounted, author of preparation, etc.). Holotype and paratypes are separated in microvials with their respective labels.

Descriptions were generated with the aid of the PBI descriptive database and shortened when possible. The species descriptions contain only the differences from the generic description. The description of the females includes only differences from the male. In describing the female genitalia we follow Forster and Platnick (1985), Burger et al. (2010), and Henrard and Jocqué (2011) with some minor modifications. All measurements are in millimeters.

MORPHOLOGY

Chelicerae: Platnick and Brescovit (1995) mentioned that the chelicerae of *Unicorn* are sexually dimorphic; those of males are long, slender, and anteriorly more excavated that those of females, although there are no images in that paper documenting this character feature. Chelicerae can be similarly characterized in *Puan*: In females, the anterior face of the paturon is not excavated (fig. 17). Males, however, have excavated chelicerae with a prominent basal swelling. The swelling carries a group of long setae (figs. 8, 24, 60). These are lacking in some specimens, but their sockets are still detectable (fig. 61). This character is present in a variety of hard-bodied oonopids but with varying degrees of expression.

Sternum: Males and females possess a sternum with a sclerotized border and precoxal triangles (fig. 10). Posterior to the sternum there is a sclerotized band. The band is separated from the sternum by a narrow nonsclerotized region (fig. 12). This character is described here as “pedicel with ventral sclerotization.” It may also be present in *Predatoroonops* Brescovit et al., from Brazil (Brescovit et al., 2012) and in females of *Niarchos* Platnick and Dupérré and *Scaphios* Platnick and Dupérré. However, in *Puan* this sclerotized band is closer to the sternum than the pedicel and with lateral projections longer than in any of these other genera.

Legs: All legs have spines. As in *Unicorn*, *Xiombarg*, *Sulsula,* and *Dalmasula,* the tarsal claws have only one row of teeth (figs. 37, 38, 43–45). As in all Oonopidae, the tarsi are provided with an onychium (figs. 43–45). There are at least four claw tuft setae (fig. 45), with normal bases and the adherent surface facing downward (fig. 45, 46, 48). Also, near the base of each claw is a long seta with a modified socket that has a long projection that touches the base of the claw (fig. 47: arrow). This projection was also observed in some undescribed species of *Orchestina* (Izquierdo, personal obs.).

Male Palp: The male bulb of *Puan* resembles that of Orsolobidae (figs. 25–32, 70–76). The basal part of the bulb is spherical and there are several terminal apophyses (figs. 70–75). The ventral lobe (fig. 72) resembles a similar structure found in *Orsolobus* Simon (see Forster and Platnick, 1985: figs. 24–29, Izquierdo and Labarque, 2010: figs. 6A, “DSL”). The embolus is dark

FIGS. 1–2. Habitat of *Puan*, n. gen., at the Ernesto Tornquist Provincial Park.

and long with a subterminal sperm outlet (fig. 76, scanned only in *P. chechehet*). An excavated apophysis is in close connection with the embolus; the excavation seems to be the groove into which the embolus fits (figs. 74–75). Two additional apophyses are present (fig. 75), the morphology of which is species specific. The sperm duct is a well-sclerotized structure (figs. 25–32), as in Segestriidae, Dysderidae, Orsolobidae, and in the oonopids *Xiombarg*, *Unicorn*, *Orchestina,* and *Cortestina*.

Female Genitalia: The female genitalia resemble that of Orsolobidae (in particular *Orsolobus*), *Unicorn*, *Xiombarg,* and *Orchestina* (figs. 33–36, 77–82). In these genera, the anterior part of the female genitalia is a sclerotized structure (here called *anterior sclerite,* equivalent to the *median rod* of Forster and Platnick, 1985). Izquierdo and Labarque (2010) hypothesized that the anterior sclerite may be homologous to the anterior receptaculum present in other Dysderoidea, judging by its position and the presence of gland ducts (figs. 79, 80) that suggest a sperm-storage function. However, this structure is highly sclerotized and its storage function seems to have been lost in some genera or at least reduced (Izquierdo and Labarque, 2010). The transformation of the anterior receptaculum into a sclerotized structure may be a consequence of another function attributed to the genitalia, possibly related to sexual selection or control of sperm destiny by the female. In *Puan*, a group of muscles (M2, fig. 36) is attached to the tip of the anterior sclerite and are directed to posterior sclerotized plates. For other oonopids it has been suggested that these plates can be moved back and forth by contraction and relaxation of the M2 muscles, suggesting that the uterus externus can be locked, which might prevent sperm from entering during copulation (Burger et al., 2010). The M2 muscles are present in *Orchestina*, *Unicorn,* and *Orsolobus* (Izquierdo, personal obs.). Thus, the sclerotization of the anterior receptaculum may be necessary for the attachment of these muscles. The posterior receptaculum is similar to that of Dysderoidea (figs. 77, 82).

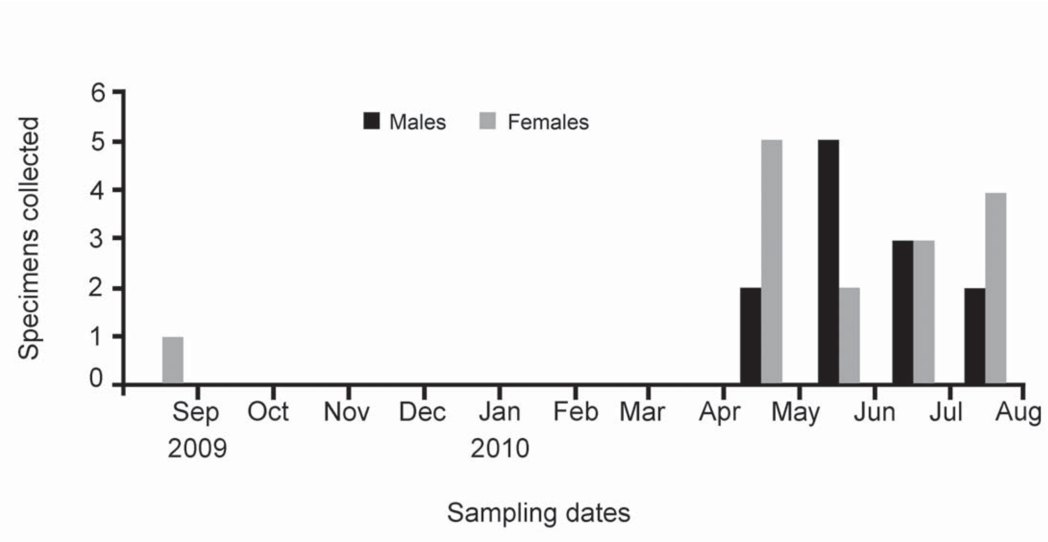
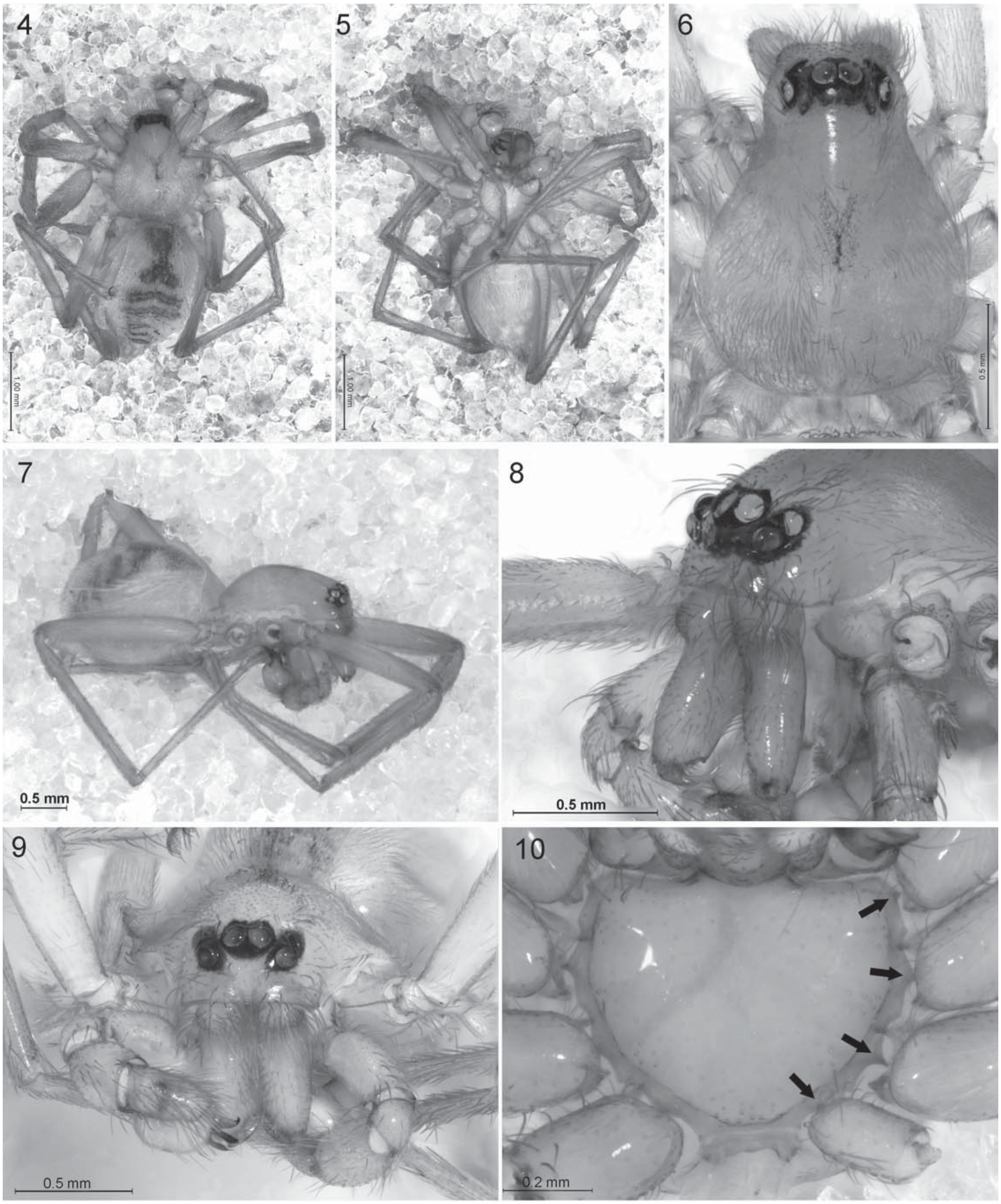
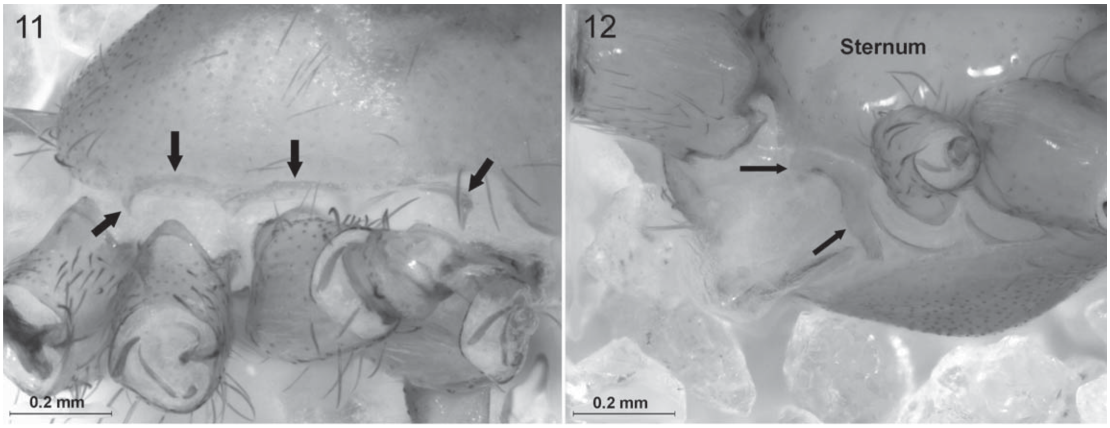


FIG. 3. Phenology of *Puan*, n. gen., based on specimens collected (individuals/month).



FIGS. 4–10. *Puan chechehet*, n. sp., male. **4.** Holotype, habitus, dorsal view (PBI_OON 43344). **5.** Same, ventral view. **6.** Carapace, dorsal view (PBI_OON 00043350). **7.** Habitus, lateral view (PBI_OON 00043350). **8.** Clypeus and chelicerae, lateral view (PBI_OON 00043350). **9.** Same, anterior view. **10.** Sternum, arrows at precoxal triangles.



FIGS. 11–12. *Puan chechehet*, n. sp., male. **11.** Cephalothorax, lateral view, arrows at supracoxal sclerites. **12.** Pedicel, ventral view, arrows at ventral sclerotization.

SYSTEMATICS

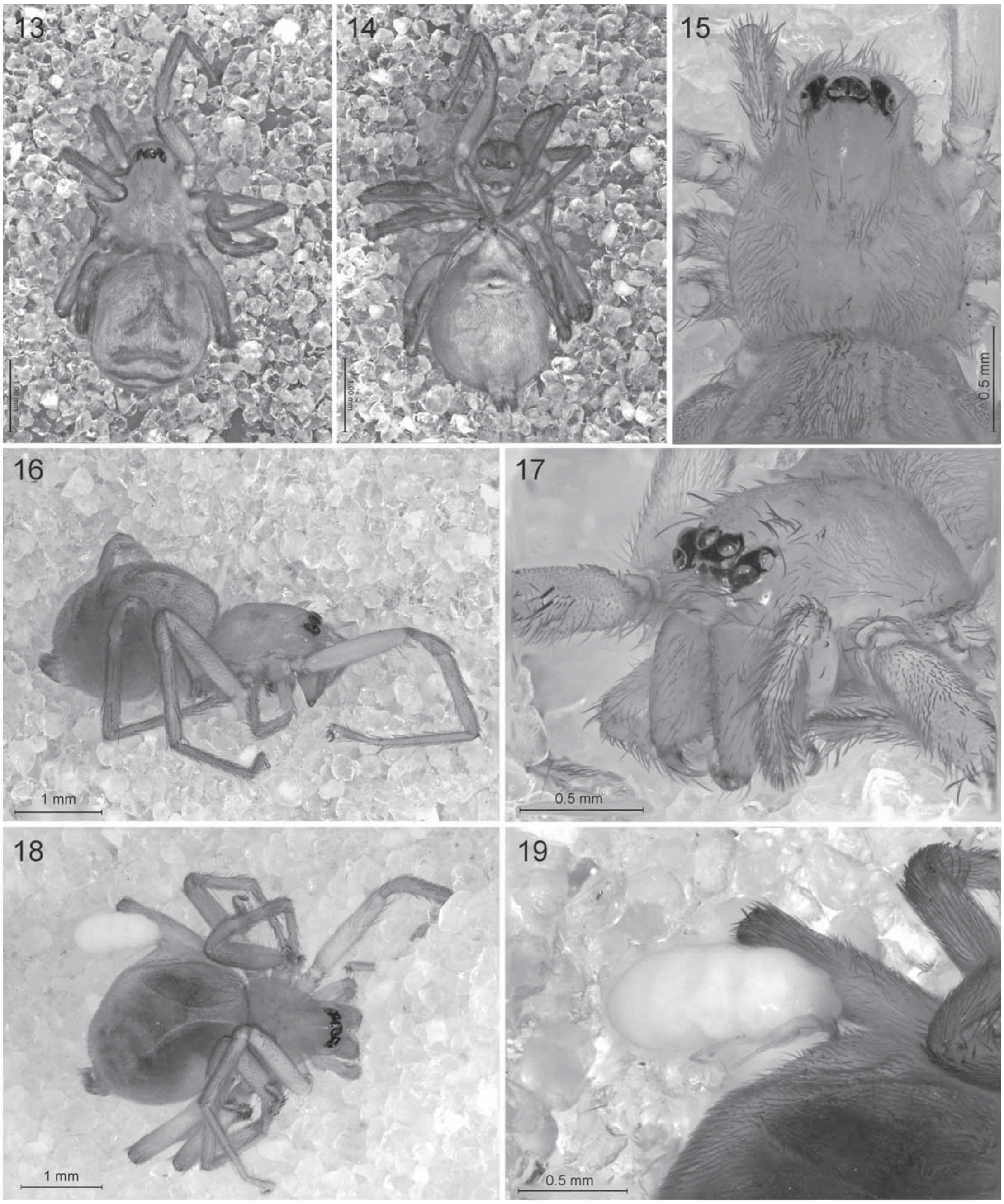
Puan Izquierdo, new genus

Type Species: *Puan chechehet*, new species.

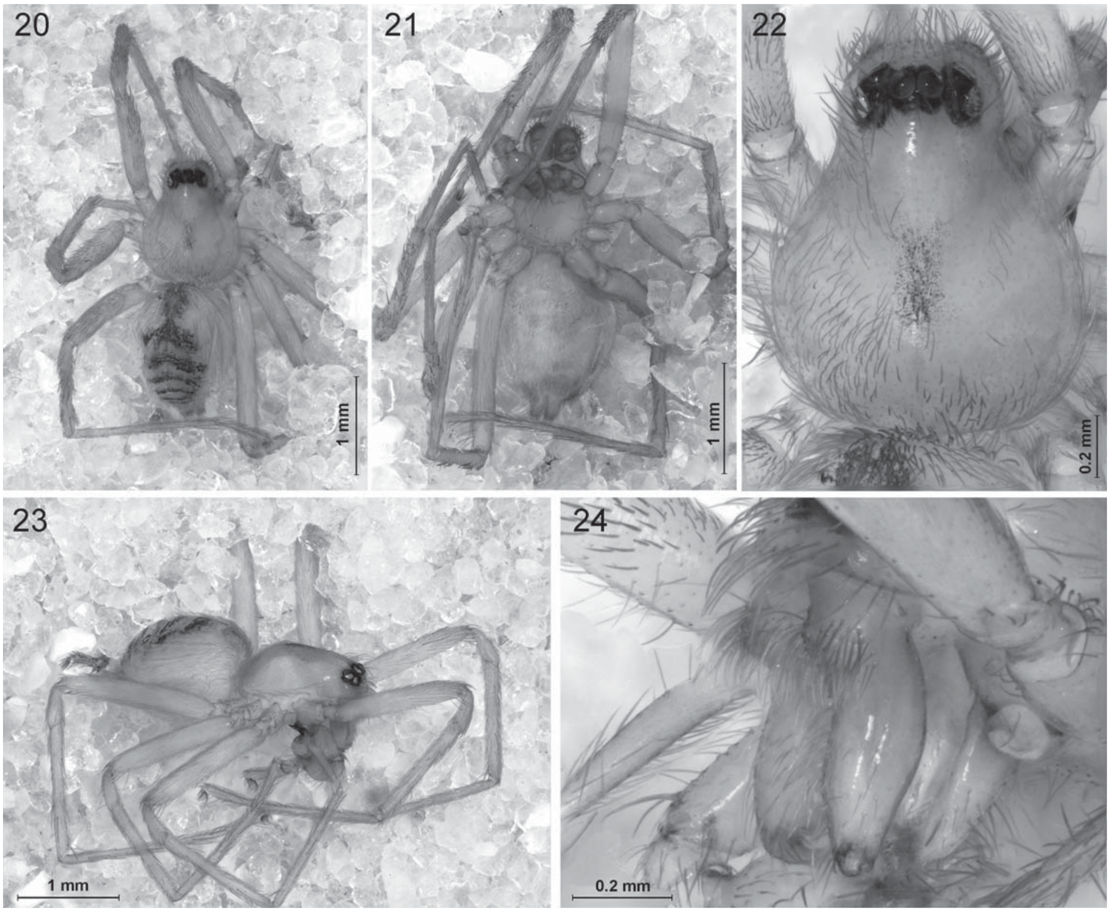
Etymology: The generic name is taken from one of the ranges of the Ventania system, Puan. Gender is feminine.

Diagnosis: The presence of a nonelevated and fully capsulate tarsal organ (figs. 49–52) separates this genus from the Orsolobidae, *Orchestina,* and *Cortestina*. This fully capsulated tarsal organ is also present in *Xiombarg*, *Unicorn*, *Sulsula,* and *Dalmasula*. The presence of leg spines separates *Puan* from *Xiombarg*; it lacks the clypeal horn that typifies the males of *Unicorn*; the presence of cheliceral teeth and wide, and hirsute colulus distinguish it from *Sulsula;* and the absence of copulatory ridges in the female epigastric region separates it from *Dalmasula*.

Description: *Male:* **Cephalothorax**: Carapace with *Xiombarg*-type color pattern, broadly oval in dorsal view (fig. 6), pars cephalica slightly elevated in lateral view (fig. 7), anteriorly narrowed to between 0.5 and 0.75 times its maximum width, with rounded posterolateral corners, posterolateral edge without pits, posterior margin not bulging below posterior rim, anterolateral corners without extension or projections, posterolateral surface without spikes, surface of elevated portion of pars cephalica smooth, sides smooth, thorax without depressions, fovea absent, without radiating rows of pits; lateral margin straight, smooth, without denticles; plumose setae near posterior margin of pars thoracica absent; nonmarginal pars cephalica setae dark, needlelike, scattered; nonmarginal pars thoracica setae dark, needlelike; marginal setae dark, needlelike. Clypeus margin unmodified, curved downward in front view, vertical in lateral view, high, ALE separated from edge of carapace by their radius or more, median projection absent; setae present, dark, needlelike (figs. 8, 9). Chilum absent. Eyes six, well developed, all subequal, all eyes circular; posterior eye row recurved from above, straight from front; ALE separated by more than their diameter, ALE-PLE touching, PME touching for less than half

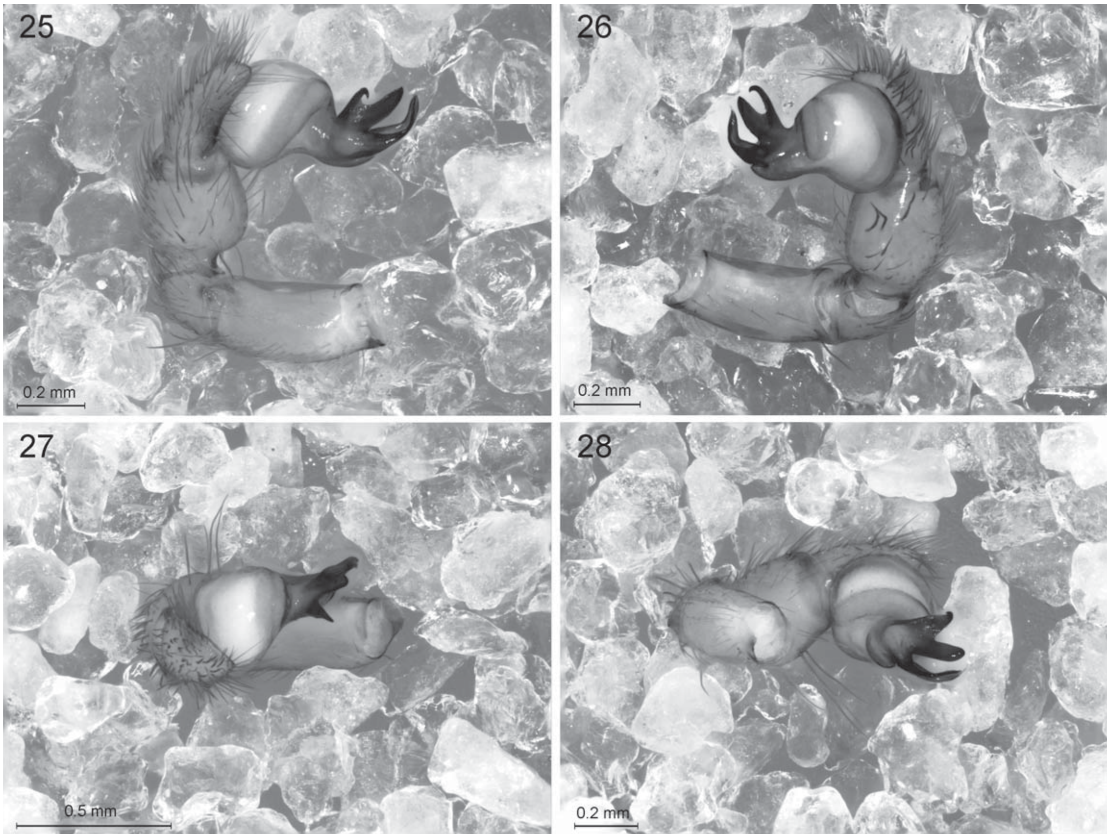


FIGS. 13–19. *Puan chechehet*, n. sp., female. **13.** Paratype, habitus, dorsal view (PBI_OON 43344). **14.** Same, ventral view. **15.** Carapace, dorsal view (PBI_OON 43360). **16.** Same, habitus, lateral view. **17.** Same, clypeus and chelicerae, lateral view. **18.** Female with acari (PBI_OON 43352). **19.** Same, detail.



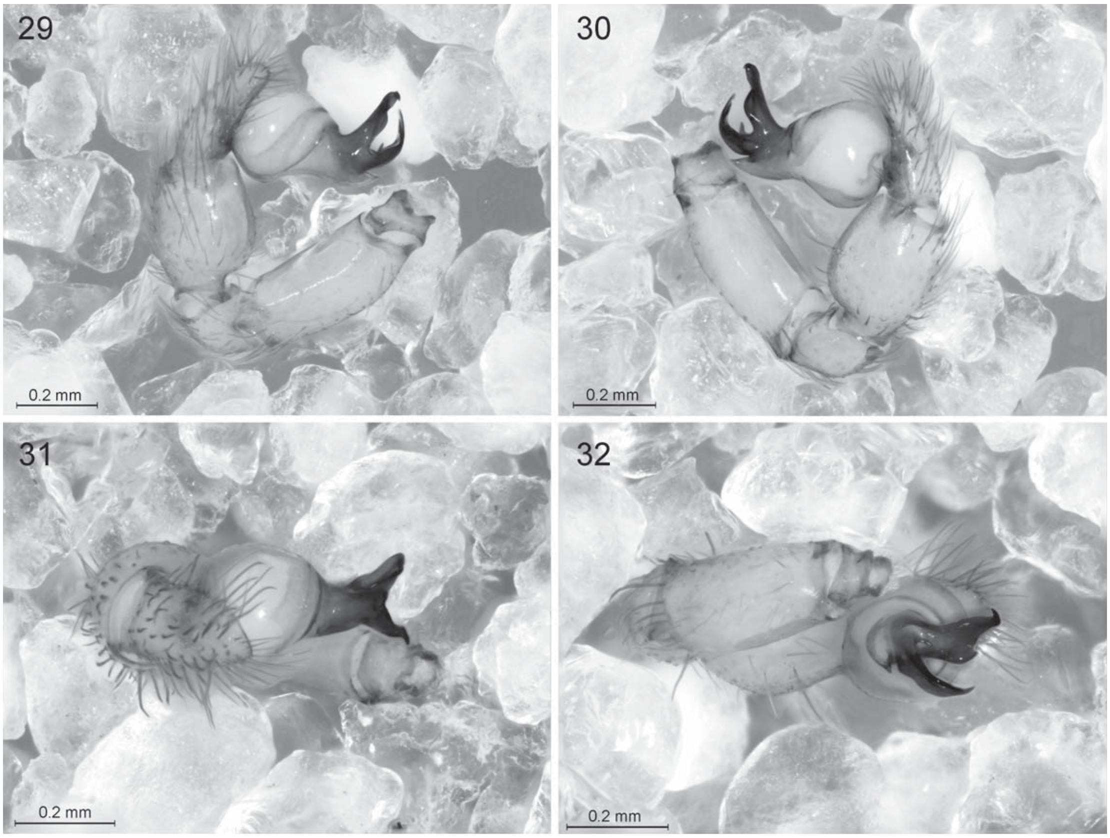
FIGS. 20–24. *Puan nair*, n. sp., holotype male. **20.** Habitus, dorsal view. **21.** Same, ventral view. **22.** Carapace, dorsal view. **23.** Habitus, lateral view. **24.** Clypeus and chelicerae, lateral view.

their length, PLE-PME separated by PME radius to PME diameter (figs. 6, 8, 9, 22). Sternum wider than long (fig. 10), pale orange, uniform, not fused to carapace, with a sclerotized border (fig. 10), median concavity absent, without radial furrows between coxae I–II, II–III, III–IV, radial furrow opposite coxae III absent, surface smooth, without pits, sickle-shaped structures absent, anterior margin unmodified, posterior margin not extending posteriorly of coxae IV, anterior corner unmodified, lateral margin without infracoxal grooves, distance between coxae approximately equal, extensions of precoxal triangles present (fig. 10: arrows), without posterior hump; setae sparse, dark, needlelike, evenly scattered, originating from surface, without hair tufts. Mouthparts: Chelicerae (figs. 59–63), endites, and labium pale orange. Chelicerae straight, anterior face with swelling and long setae (figs. 8, 24); without teeth on both promargin and retromargin; fangs without toothlike projections, directed medially, shape normal, without prominent basal process, tip unmodified; setae dark, evenly scattered; paturon inner margin with scattered setae, distal region unmodified, posterior surface unmodified, promargin unmodified, inner margin unmodified, laminate groove absent. Labium elongated hexagon,



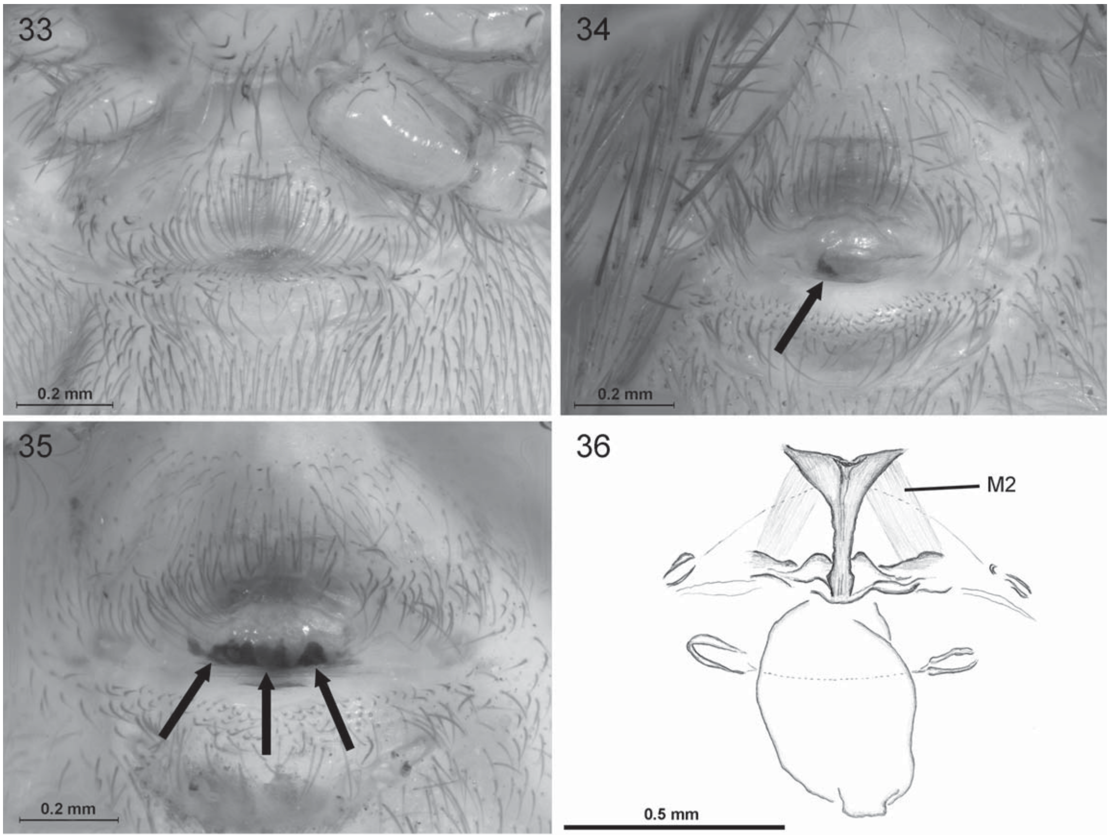
FIGS. 25–28. *Puan chechehet*, n. sp., male left palp (PBI_OON 43343). **25.** Prolateral view. **26.** Retrolateral view. **27.** Dorsal view. **28.** Ventral view.

fused to sternum, anterior margin not indented at middle, same as sternum in sclerotization; with six or more setae on anterior margin, subdistal portion with unmodified setae. Endites distally not excavated, serrula present in single row (fig. 58), anteromedian tip unmodified, posteromedian part unmodified, same as sternum in sclerotization. **Abdomen**: Ovoid, without long posterior extension, rounded posteriorly, interscutal membrane rows of small sclerotized platelets absent posteriorly; dorsum white, with median chevrons. Book lung covers large, round, without setae, anterolateral edge unmodified. Posterior spiracles connected by groove. Pedicel with ventral sclerotization (fig. 12). Pedicel tube medium, scutopedicel region unmodified, abdomen extending anteriad of pedicel, plumose hairs absent, matted setae on anterior ventral abdomen in pedicel area absent, cuticular outgrowths near pedicel absent. Dorsal scutum absent. Epigastric scutum weakly sclerotized, not surrounding pedicel, not protruding, small lateral sclerites absent. Postepigastric scutum absent. Spinneret scutum absent. Supraanal scutum absent. Dorsum setae present, dark, needlelike. Epigastric area setae uniform, dark, needlelike. Postepigastric area setae present, dark, needlelike. Dense patch of setae anterior to spinnerets absent. Spinnerets (figs. 64–69): ALS with one major ampullate gland spigot and four piriform gland spigots; PMS with two minor ampullate gland spigots; PLS with five acini-



FIGS. 29–32. *Puan nair*, n. sp., male left palp (PBI_OON 43373). **29.** Prolateral view. **30.** Retrolateral view. **31.** Dorsal view. **32.** Ventral view.

form gland spigots. Colulus present with at least six setae (fig. 66). **Legs**: Orange, without color pattern; supracoxal sclerites present (fig. 11: arrows), femur IV not thickened, same size as femora I–III, patella plus tibia I longer than carapace, tibia I unmodified, tibia I Emerit's glands absent, tibia IV specialized hairs on ventral apex absent, tibia IV ventral scopula absent, metatarsi I and II mesoapical comb absent, metatarsi III and IV weak ventral scopula absent. Leg spines present. Tarsal proclaws and retroclaws inner face smooth; tarsus I–IV superior claws with nine or more teeth on lateral surface of proclaw, nine or more teeth on lateral surface of retroclaw (figs. 43–45). Tarsi I to IV without inferior claw. Trichobothria metatarsus: each with one; base rounded, aperture internal texture not gratelike, hood smooth (figs. 53–56). Tarsal organ fully capsulate (figs. 49–52). **Genitalia**: Epigastric region with sperm pore not visible; furrow without Ω-shaped insertions, without setae. Palp normal size (figs. 25–32), not strongly sclerotized, right and left palps symmetrical, proximal segments pale orange; embolus dark, prolateral excavation absent; trochanter normal size, unmodified; femur normal size, two or more times as long as trochanter, without posteriorly rounded lateral dilation, attaching to patella basally; patella shorter than femur, not enlarged, without prolateral row of ridges, setae

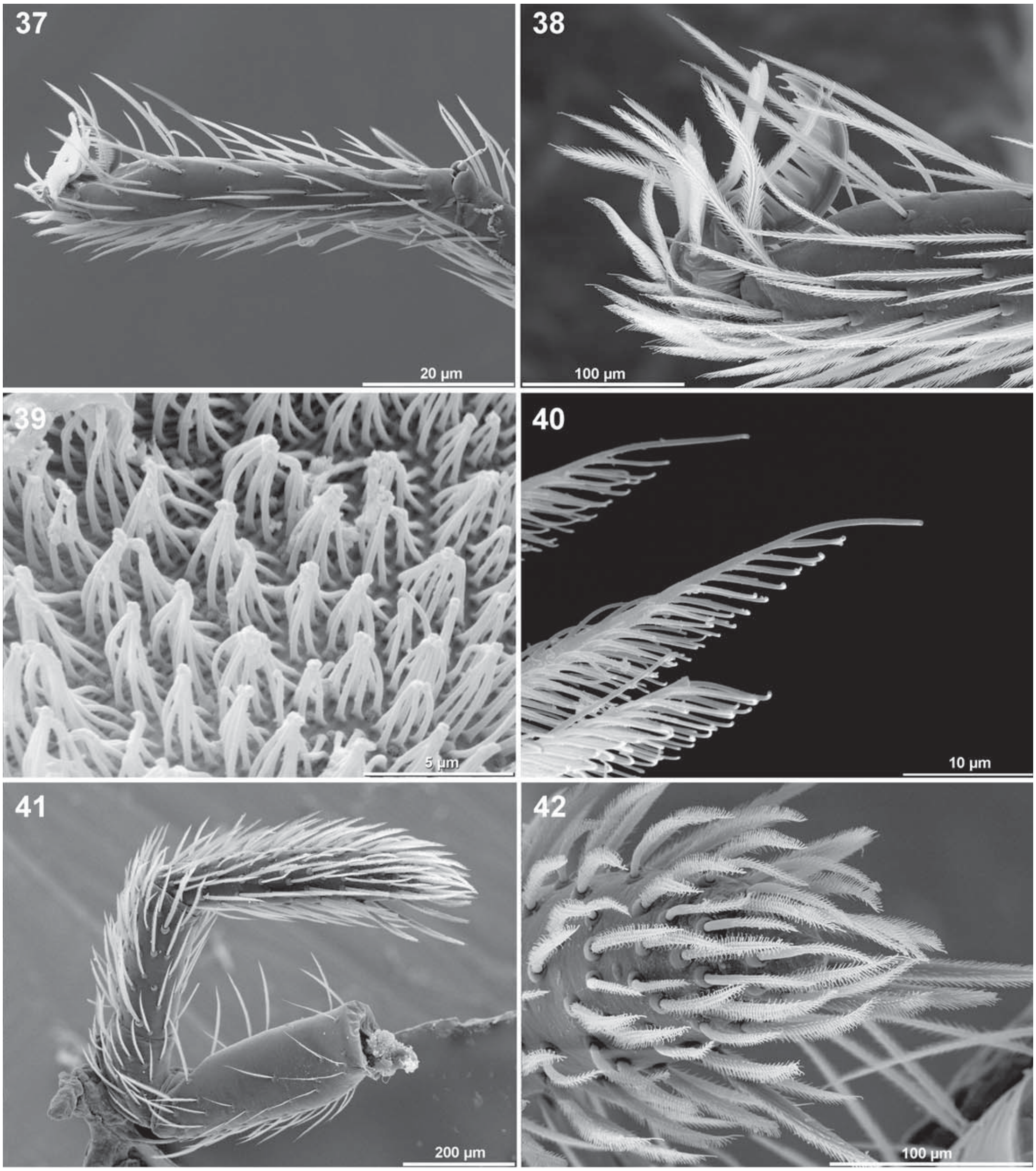


FIGS. 33–36. *Puan chechehet*, n. sp., female genitalia, ventral views. **33.** Paratype. **34, 35.** Dark marks in the epigastric region (arrows) (PBI_OON 43360, PBI_OON 43346 respectively). **36.** Drawing, in clove oil temporary mount (PBI_OON 43342).

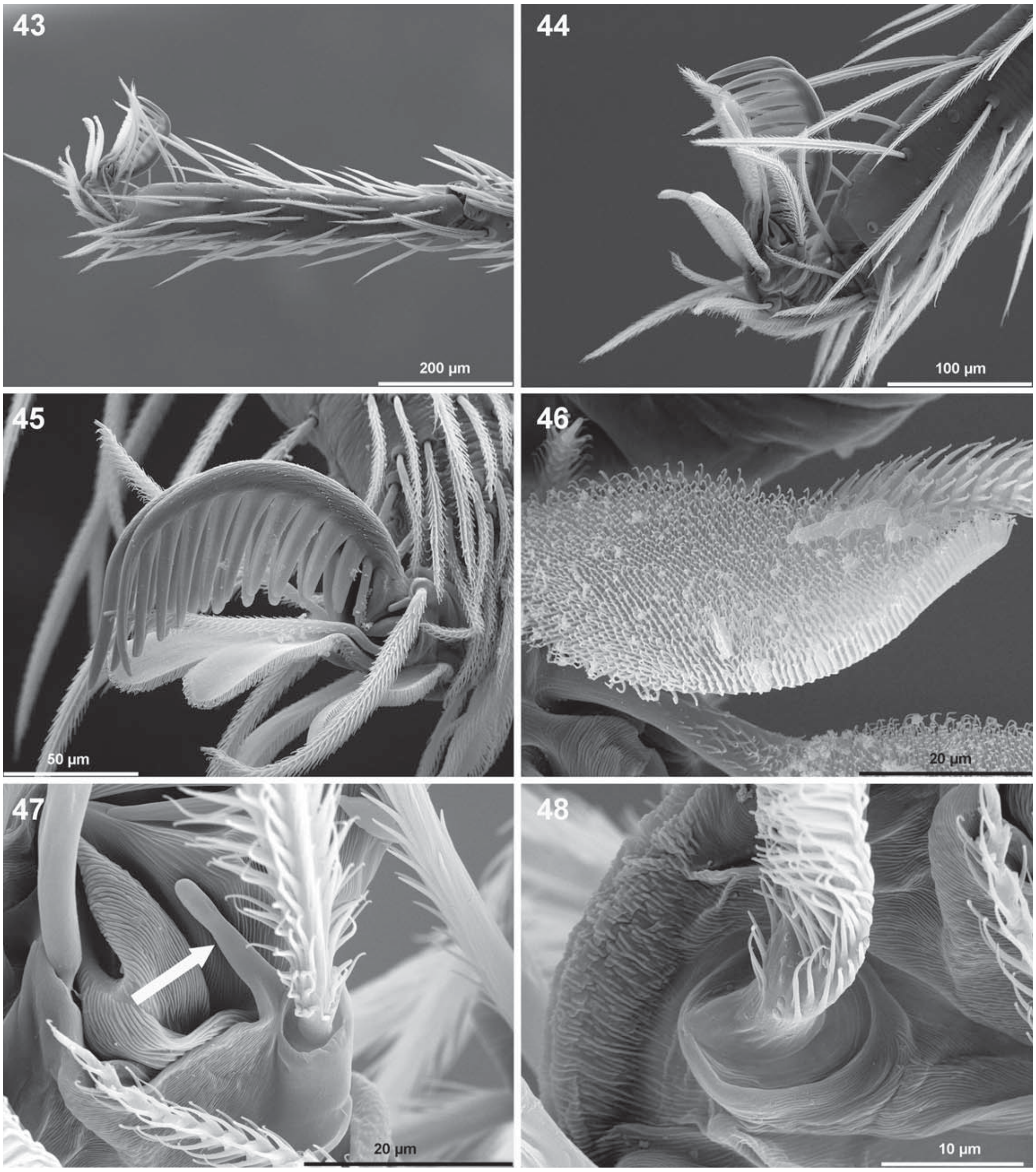
unmodified; tibia enlarged, trichobothria not examined; cymbium pale orange, ovoid in dorsal view, not fused with bulb, not extending beyond distal tip of bulb, plumose setae absent, without stout setae, without distal patch of setae; bulb 1 to 1.5 times as long as cymbium, stout, tapering apically.

Female: As in male except as noted. **Cephalothorax**: Carapace orange. Mouthparts: Chelicerae anterior face unmodified. Female palp claws absent (figs. 41, 42); spines absent; tarsus unmodified, patella without prolateral row of ridges. **Abdomen**: Epigastric scutum slightly protuding, without lateral joints. Epigastric area frontal setae thickened.

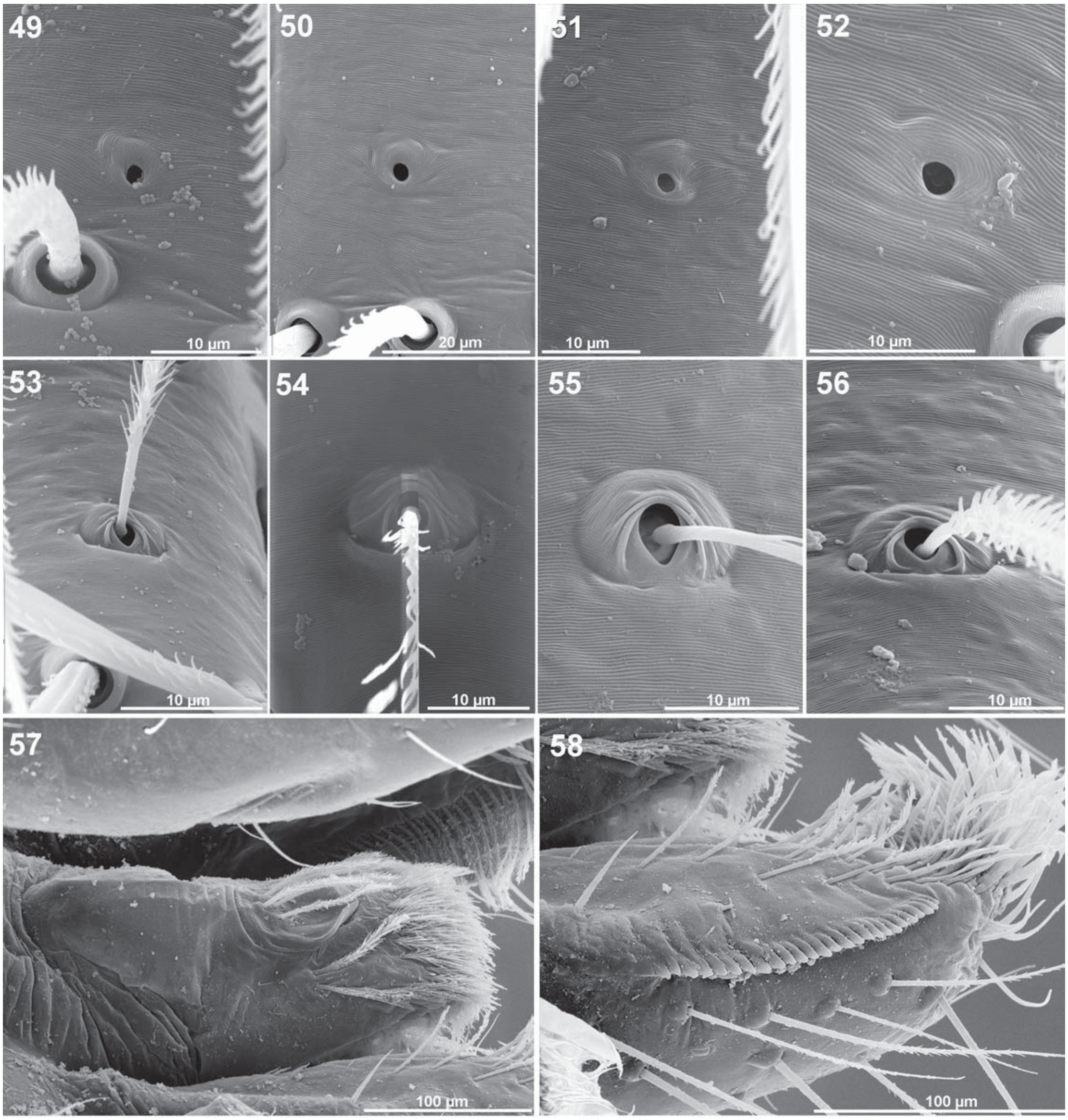
Natural History: The specimens were collected during ecological studies in the Ernesto Tornquist Provincial Park (figs. 1, 2) (Ferretti et al., 2012). This park has a surface area of 6718 ha and is located in the Ventania system, a group of mountain ranges (Lizzi et al., 2007). The protected area is one of the few places where the pampean grasslands are conserved (Lizzi et al., 2007). The climate is humid and temperate, with an annual mean temperature of 14.5° C; average annual rainfall is 850 mm (Pérez and Frangi, 2000). Additional information on the



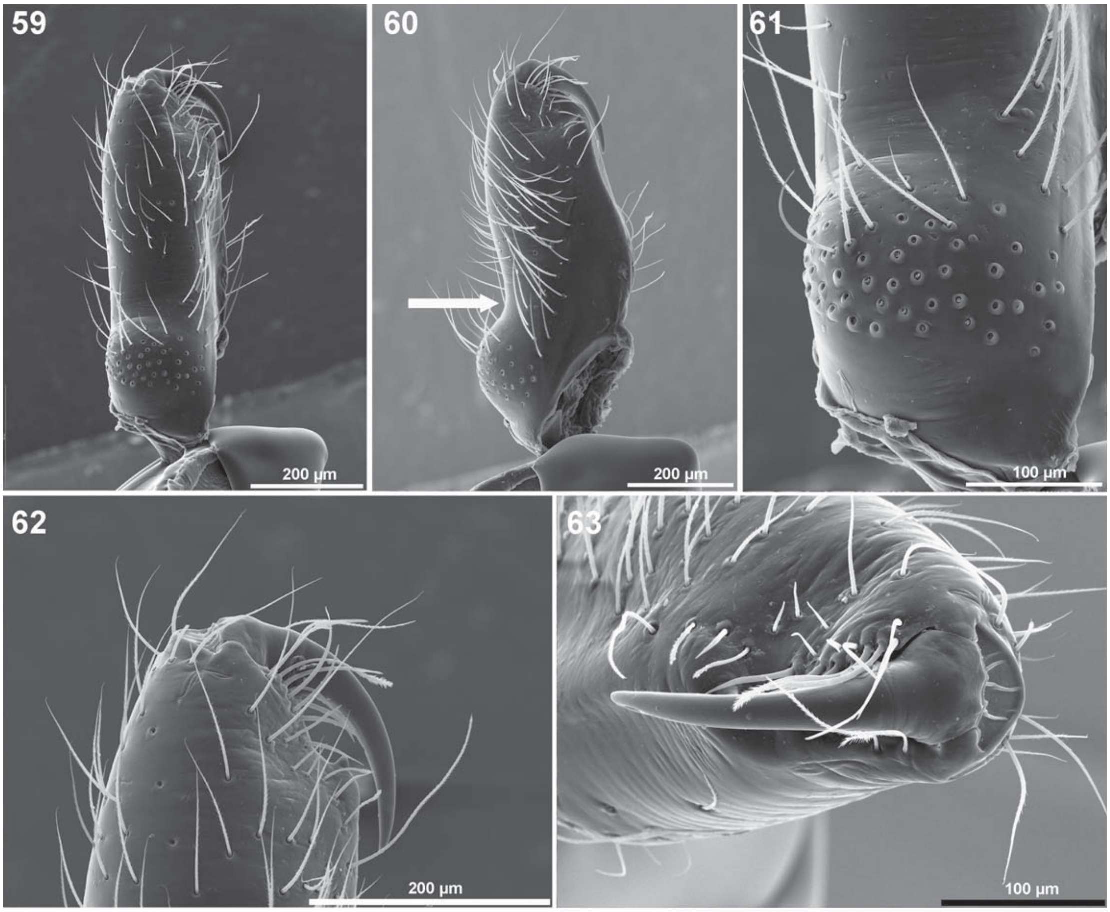
FIGS. 37–42. *Puan chechehet*, n. sp., female leg structures and palp. **37.** Left tarsus II, retrolateral view (PBI_OON 43388). **38.** Claws IV, prolateral view (PBI_OON 43342). **39.** Leg II, claw tuft setae, tenent surface (PBI_OON 43388). **40.** Left leg IV, detail of chemosensory setae (PBI_OON 43342). **41–42.** Left palp (PBI_OON 43342). **41.** Prolateral view. **42.** Prolateral-apical view.



FIGS. 43–48. *Puan chechehet*, n. sp., male leg structures (PBI_OON 43343). **43–44**, **47–48**. Right leg IV. **45–46**. Left leg II. **43.** Tarsus, prolateral view. **44.** Claws, prolateral view. **45.** Claws, prolateral view (image flipped). **46.** Claw tuft, tenent surface. **47.** Onychium, detail of a seta base. **48.** Same, detail of a claw tuft seta base.



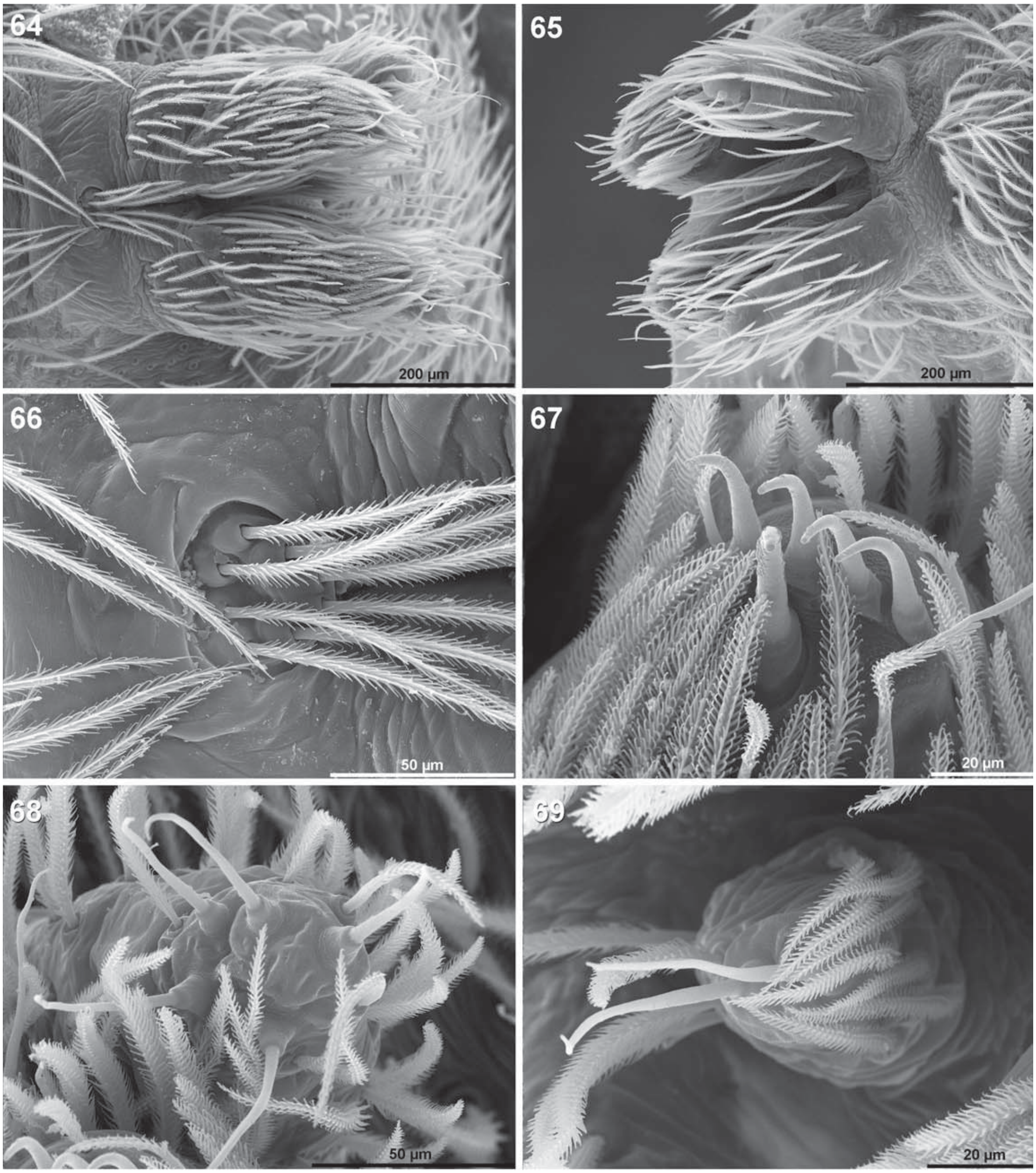
FIGS. 49–58. *Puan chechehet*, n. sp., female and male leg structures and endites. **49–52.** Tarsal organs. **53–56.** Metatarsal trichobothria sockets. **57–58.** Male mouthparts. **49.** Female left leg IV (PBI_OON 43342). **50.** Same, leg II (PBI_OON 43388). **51.** Male, right leg IV (PBI_OON 43343). **52.** Same, left leg I. **53.** Female, left leg IV (PBI_OON 43342). **54.** Same, leg II (PBI_OON 43388). **55.** Male, right leg IV (PBI_OON 43343). **56.** Same, left leg I. **57.** Labrum, lateral view (PBI_OON 43350). **58.** Serrula, lateral view.



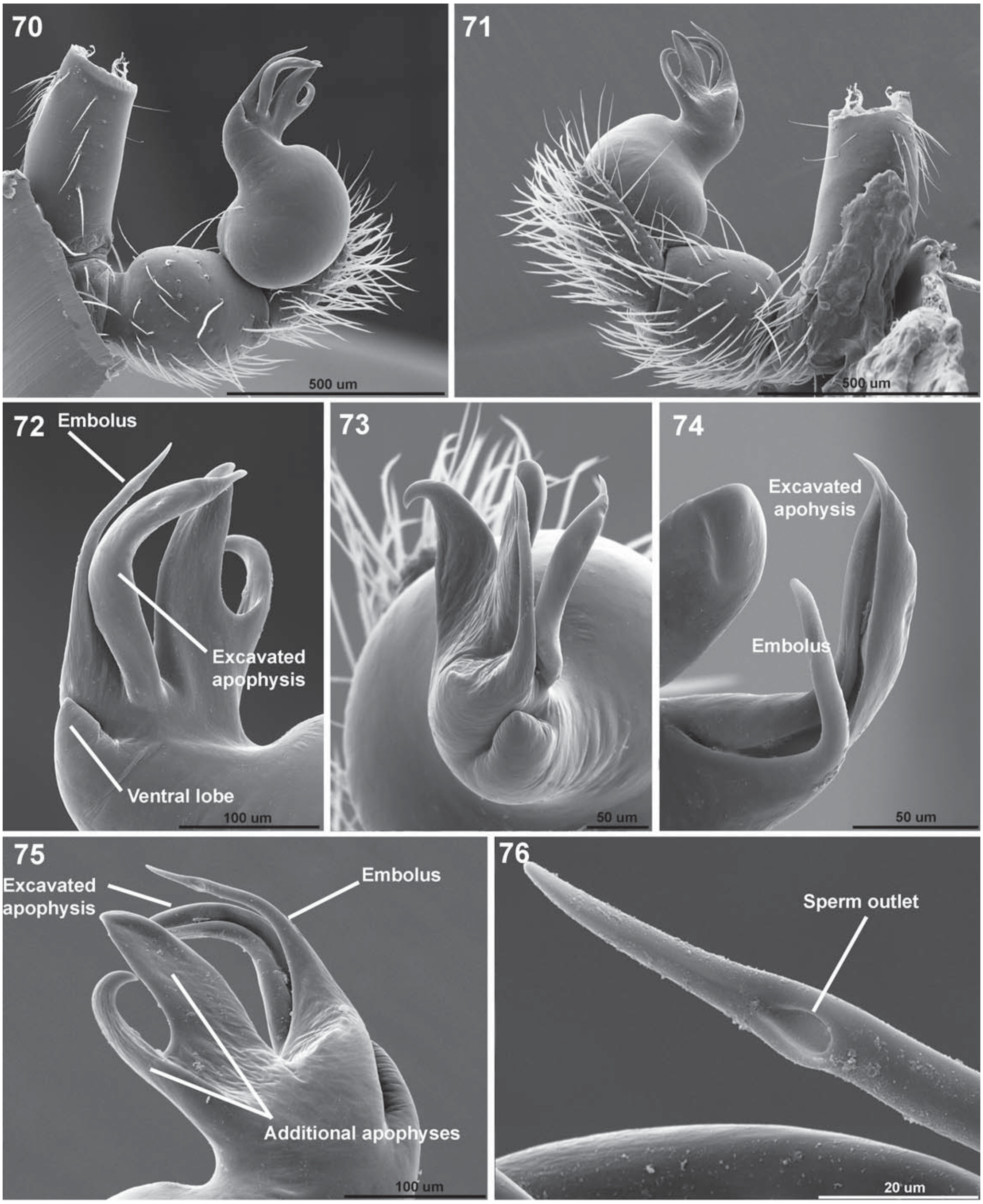
FIGS. 59–63. *Puan chechehet*, n. sp., male left chelicerae (PBI_OON 43343). **59.** Anterior view. **60.** Anterior-mesal view, arrow to the excavation. **61.** Detail of cheliceral boss region. **62.** Fang, promarginal view. **63.** Apical view.

geography, geology, flora, and fauna of the park can be found in Gregori et al. (2005), Sellés-Martínez (2001), and Frangi and Bottino (1995).

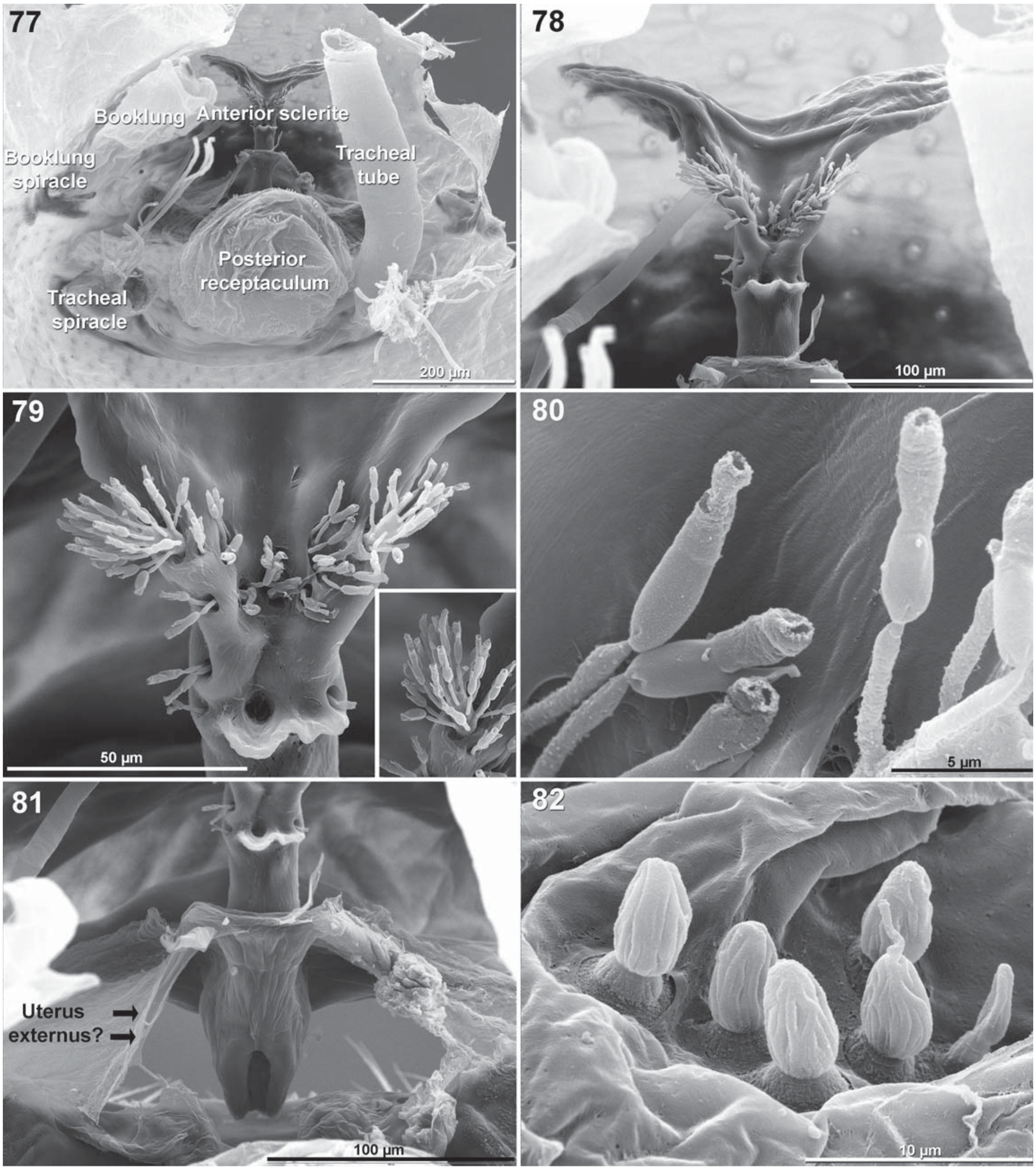
The spiders were found on the eastern slope of a hill near the Cerro de la Ventana at altitudes ~520 m. The specimens were collected during a pitfall campaign that ran from September 2009 to August 2010. Males were observed from May to August (winter season) with a maximum number of captured specimens in June (fig. 3). The temperatures during these months are low, ranging from 5° C to 10° C. Females were more abundant and were captured during the same period with the exception of one recorded in September (spring). The abundance in the winter compared with other months suggests that the spiders' biological cycle may be displaced to this season in order to avoid predation or competition. It is interesting to note that juveniles were not found in any month of sampling.



FIGS. 64–69. *Puan chechehet*, n. sp., female spinnerets and colulus (PBI_OON 43342). **64.** ALS, ventral view. **65.** PLS, dorsal view. **66.** Colulus. **67.** ALS spigots. **68.** PLS spigots. **69.** PMS spigots.



FIGS. 70–76. *Puan chechehet*, n. sp., male left palp (PBI_OON 43343). **70.** Retrolateral view. **71.** Prolateral view. **72.** Bulb, terminal elements, retrolateral view. **73.** Same, apical view. **74.** Embolus and excavated apophysis, prolateral view. **75.** Terminal elements, prolateral view. **76.** Embolus, sperm outlet.



FIGS. 77–82. *Puan chechehet*, n. sp., female digested vulva (PBI_OON 43388). **77.** Dorsal view. **78.** Anterior sclerite, detail of tip. **79.** Glands of the anterior sclerite (detail in the right square). **80.** Detail of glands. **81.** Anterior sclerite, detail of base. **82.** Glands of posterior receptaculum.

One female of *P. chechehet* had a mite attached to its abdomen, probably a larva of Parasitengona (Trombidiformes: Prostigmata) (Andrés Porta, personal commun.; figs. 18, 19). Some females have dark marks on the epigastric region (figs. 34, 35). These marks may be the result of copulatory maneuvers by the male; the bulbal structures could injure the female tissues. Similar scars have been observed in females of *Physocyclus globosus* (Taczanowski) after a second copulation event (Alfredo Peretti, personal commun.). Recently, Izquierdo and Rubio (2011) found embolus fragments inside the posterior receptaculum of females of *Unicorn catleyi* Platnick and Brescovit. We did not find bulbal structures in the female genital tract of *P. chechehet*.

DISTRIBUTION: Known only from the Ernesto Tornquist Provincial Park at Buenos Aires province.

Puan chechehet Izquierdo, new species

Figures 4–19, 25–28, 33–82

TYPES: Male holotype and female paratype from Buenos Aires, Tornquist, Ernesto Tornquist Provincial Park: 300 m from the seismograph of the forest, grasses, 525 m, -38.05611°, -61.96666°, Argentina, May 2010, N. Ferretti (MACN 27623 PBI_OON 43344).

ETYMOLOGY: The *chechehet* were one of the three principal divisions of the *het,* or native pampas, according to the classification of the English Jesuit Thomas Falkner in 1774.

DIAGNOSIS: Males can be distinguished by the shape of the additional apophyses, which are clearly separated (figs. 26, 75). *Male* (PBI_OON 43344): Total length 3.03. **Cephalothorax**: Carapace orange. Eyes surrounded with dark pigment (figs. 6, 8, 9). Labrum as in figure 57. **Legs**: Leg spination (only surfaces bearing spines listed; all spines longer than segment width): tibiae: I p1-1-0; v0-0-2; r0-1-0; II p1-1-1; r1-1-0; III p1-1-0; v0-p1-2; r1-1-0; IV d0-1-0; p1-1-1; vp1-p1-2; r1-1-1; metatarsi: I v0-0-2; II p0-1-0; v0-0-2; r0-1-0; III d1-1-1; vp1-p1-2; r1-1-1. Teeth of tarsi I–IV superior claws examined in detail. Trichobothria examined with SEM (figs. 55, 56). **Genitalia**: Palpal bulb pale orange. Additional apophyses clearly separated.

VARIATION: Spination, tibia II: p1-1, metatarsus IV: d1-1-1-1; p1-1-1-1; r1-1-1-1; v p1-p1-p1-2.

Female (PBI_OON 43344): Total length 3.49. As in male except as noted. **Cephalothorax**: Female palp spines absent (fig. 41). **Abdomen**: Colulus with at least six setae. Spinnerets: ALS with one major ampullate gland spigot and four piriform gland spigots (fig. 67); PMS with two spigots (fig. 69); PLS with five aciniform gland spigots (fig. 68). **Legs**: Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II p0-1-1; vp1-p1-2; r0-1-1; III, IV d0-1-0; p0-1-1; vp1-p1-2; r1-1-1; metatarsi: I p0-1-1; vp1-p1-2; r0-1-1; II p0-1-1; vp1-p1-2; r0-1-0; III d1-1-1; vp1-p1-2; r1-1-1; IV d1-1-1; p1-1-1; vp1-p1-2; r1-1-1. Teeth of tarsi I–IV superior claws examined in detail. Trichobothria examined with SEM (figs. 53, 54).

VARIATION: Spination, tibia III: p1-1-1.

OTHER MATERIAL EXAMINED: **ARGENTINA: Buenos Aires:** Tornquist: Parque Provincial Ernesto Tornquist: 300 m del bosque del sismógrafo, grasses, 525 m, -38.05611°, -61.96666°, May 2010, N. Ferretti, 2 males, 1 female (MACN 27620 PBI_OON 43342); same, 1 female, 1 male (MACN 27628 PBI_OON 43343);; same, 520 m, -38.05583°, -61.96666°, Aug. 2010, N.

Ferretti, 2 females (MACN 27615 PBI_OON 43346); same, 1 male (MACN 27624 PBI_OON 43347); same, 530 m, -38.05638°, -61.96666°, Aug. 2010, N. Ferretti, 2 males (MACN 27622 PBI_OON 43348); same, 528 m, -38.05638°, -61.96666°, May 2010, N. Ferretti, 1 male, 1 female (MACN 27616 PBI_OON 43349); same, July 2010, N. Ferretti, 1 male (MACN 27626 PBI_OON 43350); same, 525 m, -38.05611°, -61.96666°, Jul. 2010, N. Ferretti, 1 female (MACN 27617 PBI_OON 43351); same, 527 m, -38.05638°, -61.96666°, Jul. 2010, N. Ferretti, 2 females (MACN 27618 PBI_OON 43352); same, 520 m, -38.05583°, -61.96666°, Sep. 2009, N. Ferretti, 1 female (MACN 27614 PBI_OON 43356); same, 527 m, -38.05638°, -61.96666°, Aug. 2010, N. Ferretti, 2 females (MACN 27629 PBI_OON 43360); same, 530 m, -38.05638°, -61.96666°, Aug. 2010, N. Ferretti, 1 female (MACN 27625 PBI_OON 43361); same, 525 m, -38.05611°, -61.96666°, May 2010, N. Ferretti, 1 female (MACN 27619 PBI_OON 43374); same, 1 female (MACN 27621 PBI_OON 43387); same, 2 females, 1 male (MACN 27627 PBI_OON 43388).

Distribution: Known only from the type locality.

Puan nair Izquierdo, new species

Figures 20–24, 29–32

Type: Male holotype from Buenos Aires, Tornquist, Parque Provincial Ernesto Tornquist: 300 m from the seismograph of the forest, grasses, 530 m, -38.05638°, -61.96666°, Argentina, Jul. 2010, N. Ferretti (MACN 27630 PBI_OON 43373).

Etymology: The species name is an arbitrary combination of letters.

Diagnosis: The different male palpal morphology, with a small apophysis near the base of the embolus and the additional apophyses almost united, separates this species from *P. chechehet* (figs. 29–32). *Male:* **Cephalothorax**: Carapace pale orange. **Legs**: Leg spination (only surfaces bearing spines listed; all spines longer than segment width): femora: I, II d0-0-1; p0-0-1; tibiae: I, II p1-1-0; vp1-p1-2; r1-1-0; III d0-1-0; p1-1-0; vp1-p1-2; r1-1-0; IV d0-1-0; p1-1-0; vp1-p1-2; r1-1-1; metatarsi: I p0-1-1; vp1-p1-2; r1-1-0; II p0-1-0; vp1-p1-2; r0-1-0; III d1-1-1; vp1-p1-2; r1-1-0; IV d1-1-1; p1-1-1; vp1-p1-2; r1-1-1. Tarsi I to IV superior claws teeth not examined in detail. Trichobothria examined with stereo microscope. **Genitalia**: Palpal bulb yellow. A small, dark, pointed apophysis near the base of the embolus (figs. 29, 30). Additional apophyses almost completely fused.

Variation: Spination, right femora I: p0-0-2, leg II: femora d0-0-0; p0-0-0; metatarsus r1-1-0.

Female: Unknown.

Other Material Examined: None.

Distribution: Known only from the type locality.

DISCUSSION

The studies of the family Oonopidae in the past few years has led to the elucidation of morphological patterns and phylogenetic relationships at various levels. One example of this improvement is in the analysis of the tarsal organ, eye arrangement, and genitalia that recently allowed the delimitation of three subfamilies (Platnick et al., 2012): The Orchestininae are distinguished by the presence of an exposed tarsal organ with a longitudinal ridge originating from the proximal end of the organ and a serially dimorphic 4-4-3-3 pattern of raised receptors on legs I–IV. The Sulsulinae are united by having tarsal organs that are partially (in the case of *Cortestina*) or fully capsulated (in the case of *Sulsula*, *Xiombarg*, *Unicorn,* and *Dalmasula;* Platnick et al., 2012). The members of this subfamily resembles to Orchestininae in retaining two plesiomorphic features, an H-shaped, transverse eye arrangement and a heavily sclerotized, thick-walled sperm duct within the male palp. The Oonopinae (the remaining higher oonopids) are united by the loss of the heavily sclerotized palpal sperm duct, the reduction in the tarsal organ pattern to 3-3-2-2 raised receptors on legs I–IV and by the acquisition of a clumped eye arrangement. A 4-4-3-3 tarsal organ receptor pattern and an H-shaped eye arrangement seem to be retained only in the New Zealand genus *Kapitia* Forster.

In this context, *Puan* belong to the Sulsulinae because of the presence of fully capsulated tarsal organs (figs. 49–52). The H-shaped eye arrangement and the heavily sclerotized sperm duct are additional characters shared with this subfamily and the Orchestininae.

The complex male copulatory bulb is perhaps one of the main characteristics of *Puan* and a probable synapomorphy for the genus; its general shape resembles the palps of Orsolobidae. As far as we know this complexity is unique for this genus. Complex copulatory bulbs are also found in *Dalmasula,* although they are simpler than in *Puan* (see Platnick et al., 2012). As in *Puan,* large size, color pattern, the tarsal claws with one row of teeth and the enlarged tibia of the male palp are also present in *Xiombarg* and *Unicorn*. Additional support for grouping *Puan* with these genera is their shared geographic distribution (they are all present only in the southern part of South America). However, the presence in *Puan* of a hirsute colulus could indicate the genus should be grouped with *Dalmasula*. The evidence provides a good opportunity for further explor biogeographic aspects and speciation processes of these spiders.

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REFERENCES

Álvarez-Padilla, F., and G. Hormiga. 2008. A protocol for digesting internal soft tissues and mounting spiders for scanning electron microscopy. Journal of Arachnology 35: 538–542.

Brescovit, A.D, C.A. Rheims, A.B. Bonaldo, A.J. Santos, and R. Ott. 2012. The Brazilian goblin spiders of the new genus *Predatoroonops* (Araneae: Oonopidae). Bulletin of the American Museum of Natural History 370: 1–68.

Burger, M., M. Izquierdo, and P. Carrera. 2010. Female genital morphology and mating behavior of *Orchestina* (Arachnida: Araneae: Oonopidae). Zoology 113: 100–109.

Ferretti, N., G. Pompozzi, S. Copperi, F. Pérez-Miles, and A. González. 2012. Mygalomorph spider (Araneae) community of a natural reserve in a hilly system from central Argentina. Journal of Insect Science 12 (31): 1–16.

Forster, R.R., and N.I. Platnick. 1985. A review of the austral spider family Orsolobidae (Arachnida, Araneae), with notes on the superfamily Dysderoidea. Bulletin of the American Museum of Natural History 181: 1–230.

Frangi, J.L., and O.J. Bottino. 1995. Comunidades vegetales de la Sierra de la Ventana, Provincia de Buenos Aires. Revista de la Facultad de Agronomía (La Plata) 71: 93–133.

Gregori, D.A., V.L. López, and L.E. Grecco. 2005. A late Proterozoic–Early Paleozoic magmatic cycle in Sierra de la Ventana, Argentina. Journal of South American Earth Sciences 19: 155–171.

Henrard, A., and R. Jocqué. 2012. An overview of Afrotropical canopy-dwelling *Orchestina* (Araneae, Oonopidae), with a wealth of remarkable sexual dimorphic characters. Zootaxa 3284: 1–104.

Izquierdo, M.A., and F.M. Labarque. 2010. Description of the female of *Orsolobus pucara* Forster and Platnick 1985, with comments on the functional morphology of the female genitalia in Dysderoidea (Araneae: Dysderoidea: Orsolobidae). Journal of Arachnology 38: 511–520.

Izquierdo, M.A., and G.D. Rubio. 2011. Male genital mutilation in the high-mountain goblin spider, *Unicorn catleyi*. Journal of Insect Science 11: 118.

Knoflach, B., K. Pfaller, and F. Stauder. 2009. *Cortestina thaleri* – a new dwarf six-eyed spider from Austria and Italy (Araneae: Oonopidae: Oonopinae). Contributions to Natural History 12: 743–771.

Lizzi, J., M.F. Garbulsky, R.A. Golluscio, and A.V. Deregibus. 2007. Mapeo indirecto de la vegetación de la Ventana, provincia de Buenos Aires. Ecología Austral 17: 217–230.

Pérez, C.A., and J.L. Frangi. 2000. Grassland biomass dynamics along an altitudinal gradient in the Pampa. Journal of Range Management 53: 518–528.

Platnick, N.I., and A.D. Brescovit. 1995. On *Unicorn*, a new genus of the spider family Oonopidae (Araneae, Dysderoidea). American Museum Novitates 3152: 1–12.

Platnick, N.I. 2000. On *Coxapopha*, a new genus of the spider family Oonopidae from Panama (Araneae, Haplogynae). Memorie della Società Entomologica Italiana 78: 403–410.

Platnick, N.I. 2006. The Oonopid spider PBI. Available online (http://research.amnh.org/oonopidae/projectdescription/projectdescription.php).

Platnick, N.I. 2012. The world spider catalog, version 12.5. New York: American Museum of Natural History. Available online (http://research.amnh.org/iz/spiders/catalog). [DOI: 10.5531/db.iz.0001]

Platnick, N.I., et al. 2012. Tarsal organ morphology and the phylogeny of goblin spiders (Araneae, Oonopidae) with notes on basal genera. American Museum Novitates 3736: 1–52.

Ramírez, M.J. 2000. Respiratory system morphology and the phylogeny of haplogyne spiders (Araneae, Araneomorphae). Journal of Arachnology 28: 149–157.

Roewer, C.F. 1942. Katalog der Araneae von 1758 bis 1940: 1: 1–1040. Bremen: Natura.

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