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and its phylogenetic placement

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COUVERTURE / COVER:

Acanthogonatus messii Signorotto & Ferretti n. sp., habitus female collected and photographed from field.

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A new small *Acanthogonatus* Karsch, 1880 (Mygalomorphae, Pycnothelidae) species from Argentinean Patagonia: description of *A. messii* Signorotto & Ferretti n. sp. and its phylogenetic placement

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ABSTRACT

A new Pycnothelidae Chamberlin, 1917 species from Patagonian steppe, Chubut, Argentina is described and illustrated. *Acanthogonatus messii* Signorotto & Ferretti n. sp. differs from the remaining species of the genus by the male palpal bulb with a narrow basal portion and keel of embolus slightly-developed in conjunction with the presence of strong spines on ventral metatarsus I, females having spermathecae with short oval receptacles, and digitiform internal expansions arising from their base. This comprises a small species that construct burrows on sandy open environments with small shrubs. Results from phylogenetic analysis showed that is close to *A. birabeni* Goloboff, 1995 and *A. chilechico* Goloboff, 1995 inside the “patagonicus” group.

KEY WORDS

Araneae,
patagonic steppe,
cladistic,
new species.

RÉSUMÉ

Une nouvelle petite espèce d'*Acanthogonatus* Karsch, 1880 (Mygalomorphae, Pycnothelidae) de Patagonie argentine : description d'*A. messii* Signorotto & Ferretti n. sp. et son emplacement phylogénétique. Une nouvelle espèce de Pycnothelidae Chamberlin, 1917 de la steppe patagonienne, Chubut, Argentine, est décrite et illustrée. *Acanthogonatus messii* Signorotto & Ferretti n. sp. diffère des autres espèces du genre par le bulbe copulateur du mâle avec une partie basale étroite et la carène de l'embolus légèrement développée en conjonction avec la présence de fortes épines sur le métatarse ventral I, les femelles ayant des spermathèques avec des réceptacles ovales courts, et des expansions internes digitiformes partant de leur base. Il s'agit d'une petite espèce qui construit des terriers dans des environnements ouverts sablonneux avec de petits arbustes. Les résultats de l'analyse phylogénétique montrent qu'elle est proche d'*A. birabeni* Goloboff, 1995 et d'*A. chilechico* Goloboff, 1995 dans le groupe “patagonicus”.

MOTS CLÉS

Araneae,
steppe patagonique,
cladistique,
espèce nouvelle.

INTRODUCTION

Pycnothelidae Chamberlin, 1917 is a recently revalidated family of mygalomorph spiders based on molecular analysis to accommodate taxa formerly belonging to various Nemesiidae Simon, 1889 subfamilies (Opatova *et al.* 2019). This family comprises 15 genera and 138 species described to date (World Spider Catalog 2023). Pycnothelidae spiders are recognized by having a small to large, yellow pallid, soft, developed intercheliceral tumescence covered with few to many setae, cymbium lacking dorsal spines, patella III with 1–1–1 prolateral spines, bipectinate tarsal claws, male tarsi flexible, short spinnerets (except some species of *Acanthogonatus* Karsch, 1880 and *Stanwellia* Rainbow & Pulleine, 1918), tarsal organ located on apical central region, tarsal scopula present and no claw tufts (Goloboff 1995; Montes de Oca *et al.* 2022). The Neotropical pycnothelids are represented by small to medium sized spiders that can be found living in loose tubes, in the leaf litter, under trunks or stones, in burrows close with debris, or simply open, or protected by a trapdoor (Goloboff 1995; Indicatti *et al.* 2015; Ghirrotto *et al.* 2021).

The most diverse Neotropical pycnothelid genus is *Acanthogonatus* Karsch, 1880, which was proposed to include a new species, *Acanthogonatus franckii* Karsch, 1880 based on a female from Chile. Currently, the genus comprises 29 described species, seven of which occur in Argentina (World Spider Catalog 2023). The first species described from Argentina for the genus (although originally described under *Trysothele* Simon, 1902) was *Acanthogonatus fuegianus* (Simon, 1902) from southern Argentina at Santa Cruz province. The most significant contribution to the taxonomy of the genus was the work from Goloboff (1995), not only by describing most of the species known to date but also presenting a phylogenetic analysis based on morphology.

Most of Argentinean species of *Acanthogonatus* described to date occur in semiarid or arid environments from central and southern Argentina, mainly in the Patagonian steppe (Goloboff 1995). An example of this is the “patagonicus” group, a clade recovered by Goloboff (1995) to include five species: *A. patagonicus* (Simon, 1905), *A. fuegianus*, *A. notatus* (Mello-Leitão, 1940), *A. birabeni* Goloboff, 1995 and *A. chilechico* Goloboff, 1995. Species of this group inhabit dry, scrubby habitats in Patagonia and adjacent Chile (Goloboff 1995) and are stricter burrowers that are often rather deep, excavated in firm, clayish soil (Goloboff 1995). They are morphologically recognized by having a triangular apical article of the posterior lateral spinnerets, the less developed serrula and the well-marked chevron pattern on the abdomen (Goloboff 1995).

In this study, a new small species of *Acanthogonatus* is described, found in coastal areas of southern Chubut province. Also, a new updated identification key for all species is presented, as well as a new phylogenetic analysis including *Acanthogonatus messii* Signorotto & Ferretti n. sp. and two newly described species not included in the previous analysis of Goloboff (1995): *Acanthogonatus ericae* Indicatti, Lucas, Ott & Brescovit, 2008 and *A. minimus* Indicatti, Folly-Ramos, Vergara, Lucas & Brescovit, 2015 (Indicatti *et al.* 2008, 2015).

MATERIAL AND METHODS

TERMINOLOGY, MEASUREMENTS AND MATERIALS

The terminology for general structures follows Goloboff (1995) and Indicatti *et al.* (2015). Spine notations follow Petrunkovitch (1925). All measurements are expressed in millimeters. Leg segment length was measured between joints in dorsal view. Total body length does not include chelicerae nor the pedicel and spinnerets. Measurements and images were taken with a MShot digital camera mounted on a Leica S APO stereoscopic microscope, MShot software. Images were taken in different focus planes and then stacked with Helicon Focus software. The palpal bulbs were carefully removed with small tweezers and photographed in ventral, prolateral, retrolateral and dorsal views. Spermathecae were dissected, cleaned with enzyme ©Naclens and photographed in dorsal view.

CLADISTIC ANALYSIS

Cladistic analysis was based on the previous matrix of the South American Nemesiidae genera proposed by Goloboff (1995) with some modifications. The original matrix was modified to include only representatives of the genus *Acanthogonatus* and removing redundant characters not relevant for this genus. The species used as new outgroups were selected on their phylogenetic relationships with *Acanthogonatus*, i.e., *Chaco patagonica* Goloboff, 1995, *Lycinus bonariensis* (Mello-Leitão, 1938) and *L. longipes* Thorell, 1894, as suggested by Goloboff (1995) and Montes de Oca *et al.* (2022). A data matrix composed of 40 morphological characters and 33 taxa has been constructed. This new matrix also included two species not previously scored on a phylogenetic analysis: *A. minimus* and *A. ericae*, both from Brazil. The new species under description was scored for 36 morphological characters. The character matrix was assembled and edited using the computer software Mesquite version 3.61 (Maddison & Maddison 2019). The cladistics analysis was carried out in TNT version 1.5 (Goloboff & Catalano 2016), under maximum parsimony. Multistate characters were treated unordered and follow binary coding, except for characters 1, 2, 5, 6, 7, 11, 14, 17, 18, 19, 20, 21, 29, 30, 32, 35 and 40; characters 5, 6, 7, 11, 14, 17, 30 and 35 were treated additive. Parsimony analysis was made using implied weighting and to decide upon appropriate k-values, we followed the proposal by Mirande (2009). Thus, we selected the commands 3, 10, 70, 95, and 7 for the script iw.run. Nodes without support were collapsed and only best trees were kept. Character optimization and tree editing were performed with the computer software Winclada-ASADO 1.61 (Nixon 2004).

The data matrix is given in Table 1. Characters used in the cladistics analysis are: (1) pubescence: 0, absent; 1, light; 2, dense; (2) sternum: 0, wide; 1, normal; 2, long; (3) female tarsi: 0, normal; 1, stout; (4) leg color: 0, uniform; 1, patterned; (5) maxillary cuspules: 0, few (about 0–10); 1, medium (about 10–30); 2, many (over 30); (6) serrula: 0, present in male and female; 1, present in male only; 2, absent in male and female; (7) rastellum: 0, absent; 1, weak; 2, strong; (8) male cheliceral tumescence: 0, absent; 1, present; (9) male tarsi: 0, rigid; 1, flexible; (10) female tarsi: 0, rigid; 1, flexible;

TABLE 1. — Character matrix used in the cladistics analysis of the genus *Acanthogonatus* Karsch, 1880. Symbol: –, inapplicable, unknown or doubtful.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40					
<i>L. longipes</i>	2	0	0	0	0	1	2	1	1	0	2	0	0	2	0	0	2	0	1	1	0	1	1	1	0	0	1	1	4	1	0	1	1	0	0	0	0	0	–	3					
<i>L. bonariensis</i>	2	0	0	0	0	1	2	1	1	1	2	0	0	2	0	0	2	0	1	1	0	0	1	1	0	0	1	1	4	1	0	0	0	0	1	0	0	0	–	3					
<i>C. patagonica</i>	0	1	0	0	1	1	1	–	–	0	2	0	0	0	–	0	2	0	1	1	0	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	0	0	–	3				
<i>A. subcalpeianus</i>	0	1	0	1	1	0	1	1	1	0	0	1	0	0	–	–	0	1	1	1	0	0	0	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0	2					
<i>A. confusus</i>	1	1	0	0	1	0	0	1	1	1	1	0	0	2	–	–	0	1	0	0	0	0	0	0	0	0	0	–	0	4	2	0	2	0	0	1	0	0	0	1					
<i>A. campanae</i>	1	1	0	0	1	0	0	1	1	1	0	0	0	1	–	–	0	1	0	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	1					
<i>A. alegre</i>	1	1	0	0	2	0	0	–	–	1	1	0	0	2	–	–	0	–	0	0	0	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	0	0	0	1					
<i>A. pissi</i>	1	1	0	0	1	0	0	1	1	1	2	0	0	2	–	–	0	0	0	0	0	0	0	0	0	0	0	0	2	0	–	2	0	0	1	0	0	0	1	1					
<i>A. huaquen</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	0	1	1	0	2	0	0	0	0	0	0	1	0	2	1	0	2	0	0	1	0	0	0	1	2				
<i>A. quilocura</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	0	1	1	0	0	0	0	0	0	0	0	1	0	2	1	0	2	0	0	1	0	0	0	1	2				
<i>A. juncal</i>	1	1	0	0	1	0	1	–	–	1	2	0	0	2	–	–	0	1	0	0	2	–	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	0	0	0	1	2			
<i>A. incurus</i>	1	1	0	0	2	0	0	–	–	1	1	0	1	2	–	–	0	1	1	0	0	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	0	0	0	–	–			
<i>A. centralis</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	0	1	1	0	0	0	0	0	0	0	0	–	2	1	0	0	0	–	1	0	0	0	0	1	–	–			
<i>A. parana</i>	1	1	0	0	1	0	1	–	–	1	2	0	0	2	–	–	0	1	1	0	0	–	–	–	–	–	0	–	–	–	–	–	–	–	–	–	–	0	0	0	1	–			
<i>A. tacuariensis</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	0	1	1	0	0	0	0	0	0	0	0	2	–	0	2	0	0	1	0	0	0	0	0	1	1	–			
<i>A. franckii</i>	1	1	0	0	1	0	–	–	1	1	2	0	0	0	–	–	0	1	1	0	2	1	1	0	0	0	0	1	4	1	0	2	1	0	1	0	0	0	0	1	2	–			
<i>A. peniasco</i>	1	1	0	0	1	0	1	–	–	1	2	0	0	2	–	–	1	1	1	0	2	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	0	0	0	–	2		
<i>A. recinto</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	0	1	1	0	2	0	0	0	0	0	1	1	4	1	0	2	1	0	0	–	0	0	1	–	–				
<i>A. patagonicus</i>	1	1	0	0	1	1	1	1	1	1	2	0	0	2	–	–	1	1	0	0	0	1	1	0	0	1	1	0	2	1	1	2	0	1	1	0	0	0	0	1	2	–			
<i>A. fuegianus</i>	1	1	0	0	1	0	1	1	1	1	2	0	0	2	–	–	1	1	1	0	1	1	1	0	0	1	0	4	1	–	2	0	1	2	0	0	0	0	0	0	2	–			
<i>A. notatus</i>	1	1	0	0	1	1	1	1	1	1	2	0	0	1	–	–	1	1	1	1	–	1	0	1	0	0	1	0	2	0	1	2	0	1	1	0	0	0	1	2	–				
<i>A. birabeni</i>	1	1	–	0	1	1	1	1	–	–	2	–	0	1	–	–	1	–	1	0	–	0	0	0	0	0	0	0	2	0	1	2	0	1	1	–	–	–	0	–	–				
<i>A. chilchico</i>	1	1	–	0	1	1	1	1	–	–	2	–	0	2	–	–	1	1	0	–	0	0	0	0	0	1	–	2	0	1	2	0	1	1	–	–	–	–	–	–	–				
<i>A. nahuelbuta</i>	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	0	2	1	0	2	0	–	0	0	1	1	–	–	1				
<i>A. hualpen</i>	0	0	0	0	1	0	0	1	0	0	0	0	0	0	–	–	0	1	0	0	0	1	0	0	1	1	1	1	0	2	1	0	2	0	–	0	0	1	1	–	–	1			
<i>A. patagallina</i>	0	1	0	0	1	0	0	1	0	0	0	0	0	0	–	–	0	1	0	0	0	1	0	0	1	1	1	0	0	2	1	0	2	0	0	1	–	1	1	–	–				
<i>A. vilches</i>	0	1	0	0	1	0	0	–	–	0	0	0	0	0	–	–	0	1	0	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	0	–	1		
<i>A. tolhuaca</i>	0	1	0	0	1	0	0	–	–	1	0	0	0	2	–	–	0	1	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0	0	–	1	
<i>A. mulchen</i>	0	2	0	0	1	0	0	–	–	1	0	0	0	2	–	–	0	1	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0	0	–	1
<i>A. brunneus</i>	0	1	0	0	1	0	0	–	–	1	0	0	0	2	–	–	0	1	–	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0	0	–	–
<i>A. minimus</i>	1	0	–	0	1	0	1	1	0	0	0	0	–	–	–	–	2	–	0	–	1	–	1	0	–	–	0	0	–	0	–	0	0	–	1	1	0	0	–	–	–	–	–		
<i>A. ericae</i>	1	2	–	0	1	1	2	1	1	2	0	–	–	–	–	–	0	–	–	0	–	0	0	–	–	–	–	0	–	–	–	–	–	–	–	–	0	0	2	0	1	–	–	–	
<i>A. messii</i> n. sp.	1	1	0	0	1	–	1	1	1	1	2	0	0	0	–	–	1	–	1	0	1	0	0	0	0	0	0	1	0	2	0	1	0	0	1	1	0	0	0	0	0	1	–	–	

(11) third claw: 0, present I-IV; 1, absent I-III; 2, absent from all legs; (12) teeth female STC IV: 0, numerous; 1, few; (13) claw tufts: 0, absent; 1, present; (14) scopula IV: 0, absent/very light; 1, light; 2, dense; (15) basal bothrial plate: 0, convex; 1, flattened and with deeper ridges; (16) tarsal organ: 0, normal; 1, elevated but with a flattened surface, and finely ridged; (17) PLS apical article: 0, digitiform; 1, triangular; 2, domed; (18) inner row of pumpkiniform spigots: 0, absent; 1, narrow; 2, very wide, with huge spigots; (19) spines on patella III: 0, 1–1P (or less); 1, 1–1–1 P; 2, many P; (20) metatarsus IV: 0, 1–1–1 p superior; 1, 0–0–1 p superior; 2, 0 p superior; 3, 16 p/p superior; (21) preening combs: 0, absent; 1, present; 2, pseudocombs; (22) dorsal spines on male palpal tibia: 0, absent; 1, present; (23) dorsal spines on male tibia I: 0, absent; 1, present; (24) spines on male patella I: 0, 0 r; 1, 1 r; (25) shield of setae on male tibia I: 0, absent; 1, present; (26) p superior spines on male metatarsus II: 0, normal; 1, strong; (27) spines on male patellae I-II: 0, 0/1 p; 1, 1–1–1 p; (28) female patella IV: 0, 0/1 p; 1, 1 1–1 p; (29) male tibial spur: 0, proventral, bipartite; 1, retrolateral apical or subapical single spur bearing single megaspine; 2, proventral single low spur, bearing two closely set spines; 3, proventral single spur, bearing numerous spines; 4, absent; 5, proventral apical; (30) male palpal tibia: 0, short; 1, long; 2, very long; (31) joint between the male palpal patella and tibia: 0, normal; 1, wide; (32) male bulb keels: 0, absent; 1, parallel keels or ridges along embolus

base; 2, lateral keels or flanges; (33) male bulb shape: 0, piriform (with the basal portion of the bulb rounded, tapering abruptly to form distinct embolus; 1, conical (bulb tapering evenly to form embolus, with a gradual transition between embolus and main bulb portion); (34) male bulb duct: 0, basal portion evenly curved; 1, basal portion strongly sinuous; (35) male embolus: 0, short; 1, long; 2, very long; (36) female spermathecae: 0, separate; 1, fused; (37) female spermathecae: 0, normal; 1, thick and heavily sclerotized, fingerlike, with wide opening; (38) female spermathecae thickened further: 0, no; 1, yes; (39) female spermathecae: 0, cactuslike (with a main branch, and a lateral receptaculum; 1, with the receptaculum arising from a low basal dome; (40) habits: 0, web; 1, tube; 2, open burrow; 3, flap-door; 4, trap-door.

ADDITIONAL SPECIMENS EXAMINED

Lycinus longipes. — **Argentina** • 1 ♀; Mendoza, Reserva de Biósfera Nacuñán; 2.X.2013; N. Ferretti leg.; UNS-M0297.

Lycinus bonariensis. — **Argentina** • 1 ♂; Buenos Aires, Bahía Blanca; II.2006; N. Ferretti leg.; UNS-M0125.

Chaco patagonica. — **Argentina** • 1 ♀ holotype; Chubut, Comodoro Rivadavia; 20.III.1984; Goloboff leg.; MACN; images examined.

Acanthogonatus confusus Goloboff, 1995. — **Argentina** • 1 ♀; Neuquén, San Martín de los Andes, Hua-Hum; 29.X.2011; Ferretti leg.; UNS-M0278.

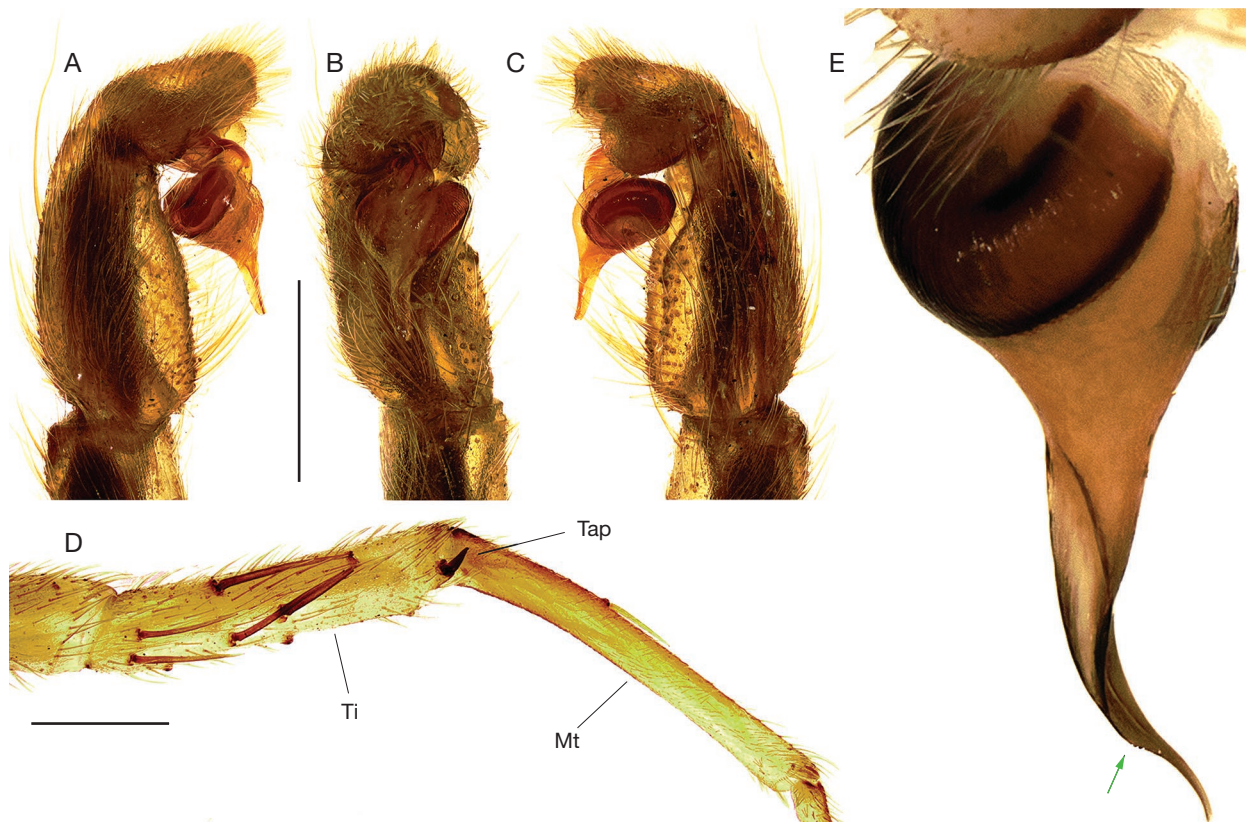


FIG. 1. — *Acanthogonatus notatus* (Mello-Leitão, 1940), male: **A-D**, male holotype; **E**, male (CAI); **A**, palp, prolateral view; **B**, palp, ventral view; **C**, palp, retrolateral; **E**, palpal bulb, dorsal view (green arrow indicates the denticles on embolus). Abbreviations: **Mt**, metatarsus, **Tap**, tibial apophysis, **Ti**, tibia. Scale bars: A-D, 1 mm; E, 0.5 mm.

Acanthogonatus centralis Goloboff, 1995. — **Argentina** • 1 ♂; Buenos Aires, Sierra de la Ventana; 31.X.2009; Ferretti leg.; UNS-M0180 • 1 ♀; Argentina, Buenos Aires, Sierra de la Ventana; 31.X.2009; Ferretti leg.; UNS-M0205.

Acanthogonatus patagonicus. — **Argentina** • 1 ♀; Chubut, Caleta Cordova; 25.XI.2018; Panchuk leg.; UNS-M0570.

ABBREVIATIONS

Institutions

CAI Arachnological collection of the Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza;
MLP Museo de La Plata, Buenos Aires;
UNS Universidad Nacional del Sur, Bahía Blanca, Buenos Aires.

General structures and spines

ALE anterior lateral eyes;
AME anterior median eyes;
ap apical;
d dorsal;
ITC inferior tarsal claw;
p prolateral;
PLE posterior lateral eyes;
PME posterior median eyes;
PMS posterior median spinnerets;
r retrolateral;
STC superior tarsal claws;
v ventral.

SYSTEMATICS

Infraorder MYGALOMORPHAE Pocock, 1892
Family PYCNOTHELIDAE Chamberlin, 1917
Subfamily DIPLOTHELOPSINAE Schiapelli & Gerschman, 1967

Genus *Acanthogonatus* Karsch, 1880

Acanthogonatus Karsch, 1880: 391. — Raven 1985: 83 (transferred from the Barychelidae Simon, 1889 to the Nemesiidae). — Opatova *et al.* 2020: 701 (transferred to the Pycnothelidae).

Tryssothele Simon, 1902: 7.

TYPE SPECIES. — By original designation, *Acanthogonatus francki* Karsch, 1880.

DIAGNOSIS. — See Goloboff (1995): 73.

Acanthogonatus notatus (Mello-Leitão, 1940)
(Fig. 1)

Chubutia notata Mello-Leitão, 1940b: 4, f. 1-5 (Dm).

Acanthogonatus notatus – Goloboff 1995: 113, f. 100A-E (removed male from synonym of *A. patagonicus*, contra Gerschman & Schiapelli, 1970: 152, sub *Tryssothele*).

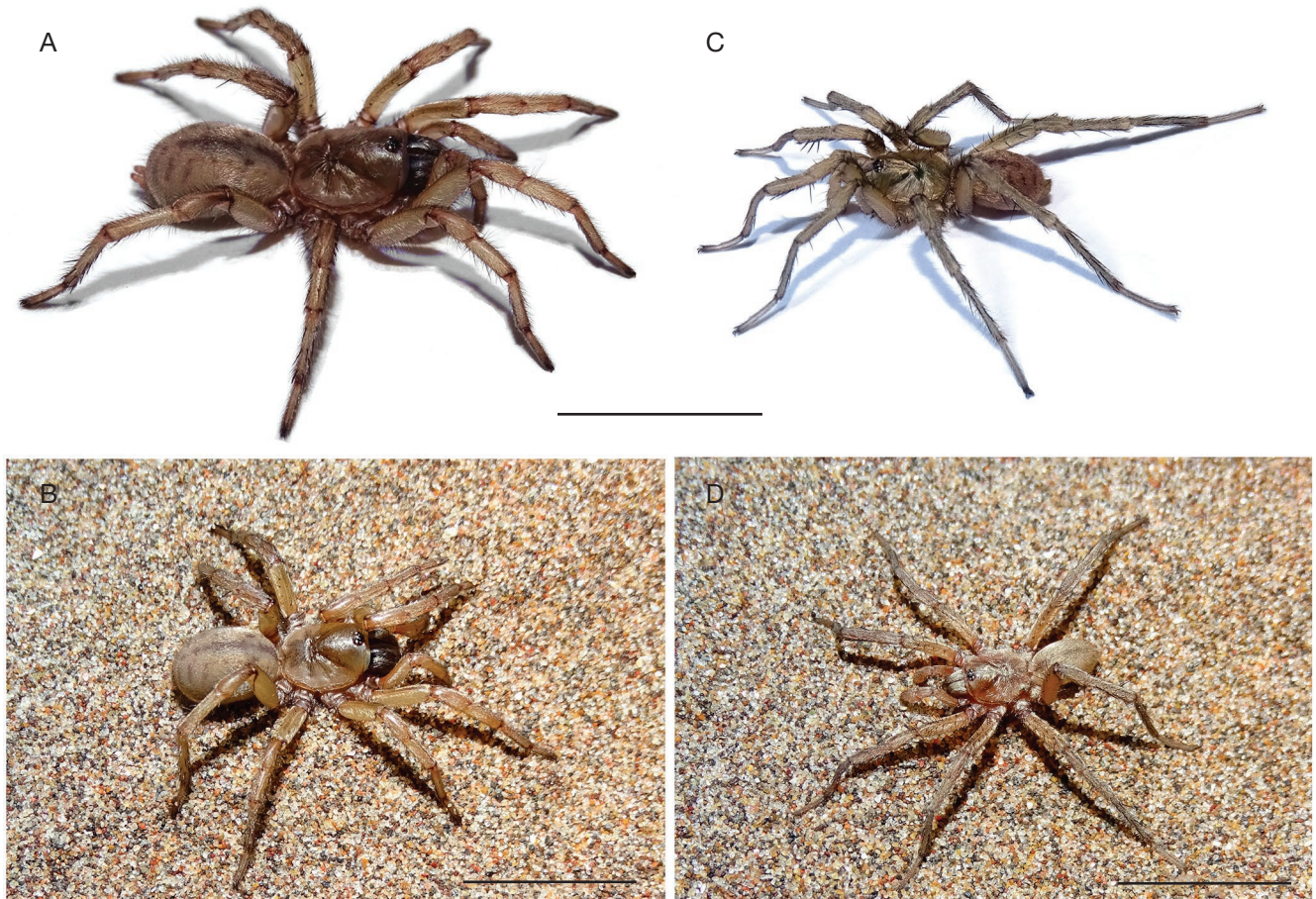


FIG. 2. — *Acanthogonatus messii* Signorotto & Ferretti n. sp., habitus: **A**, female molted in laboratory; **B**, female collected and photographed from field; **C**, male molted in laboratory; **D**, male collected walking in the field. Scale bars: 1 cm.

TYPE MATERIAL. — **Holotype. Argentina** • 1 ♂; Chubut, Gobernador Costa; 8.III.39; M. Birabén leg.; MLP 14260; examined.

ADDITIONAL MATERIAL EXAMINED. — **Argentina** • 1 ♂; Argentina, Chubut, Lago Muster; XI.2017; CAI.

DIAGNOSIS. — See Goloboff (1995: 113).

Acanthogonatus messii Signorotto & Ferretti n. sp.
(Figs 2-6)

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TYPE MATERIAL. — **Holotype. Argentina** • 1 ♂; Chubut, Escalante (near Rada Tilly); 45°50'54"S, 67°47'40"W; 24.XI.2018; N. Ferretti leg.; found walking during night; UNS-M0658.

Paratypes. Argentina • 3 ♀; same data as the holotype; 24.XI.2018; excavated from burrows; UNS-M0657 • 1 ♂; same data as the holotype; 24.XI.2018; kept alive, became adult in 7.XII.2019, died in XII.2019; UNS-M0656.

ETYMOLOGY. — The specific name is a patronym in honor of Lionel Andrés Messi, an Argentine professional footballer and one of the greatest players of all times, unique winner of seven Ballons d'or.

DIAGNOSIS. — Males can be distinguished from the known species, excepting *A. chilechico*, by the palpal bulb, with basal portion narrower and keel of embolus slightly-developed (Fig. 4A-D), and by the

presence of strong spines on ventral metatarsus I (Fig. 3H, I). Males differ from those of *A. chilechico* by the presence of labial cuspules (Fig. 3E) and from *A. birabeni* by the presence of strong spines on ventral metatarsus I (Fig. 3H, I). Males resemble those of *A. notatus* by the coloration with dark chevron on dorsal abdomen (Fig. 3C), but can be distinguished by the curved embolus without small teeth on apical region (Fig. 4C) and presence of strong spines on ventral metatarsus I (Fig. 3I). Females differ from the known species of the genus by the shape of the spermathecae, with short oval receptacles, and digitiform internal expansions from their base (Fig. 5H).

DESCRIPTION

Male holotype

Color pattern. In life, carapace light brown with dark striae and margins, legs light brown with lighter coxae and trochanter, abdomen light brown with dorsal black chevron; in ethanol, carapace brown with dark striae and margins, abdomen with dorsal black chevron and ventrally light brown (Fig. 2C, D), in ethanol, carapace brown with dark striae and margins, abdomen with dorsal black chevron and ventrally light brown (Fig. 3C, D).

Cephalothorax. Total length 9.19. Carapace 4.31 long, 3.47 wide, thoracic region raised. Abdomen 4.66 long, 2.63 wide. Clypeus very narrow, 0.08. Fovea slightly procurved (Fig. 3A), 0.3 long. Eye tubercle 0.59 long, 0.94 wide,

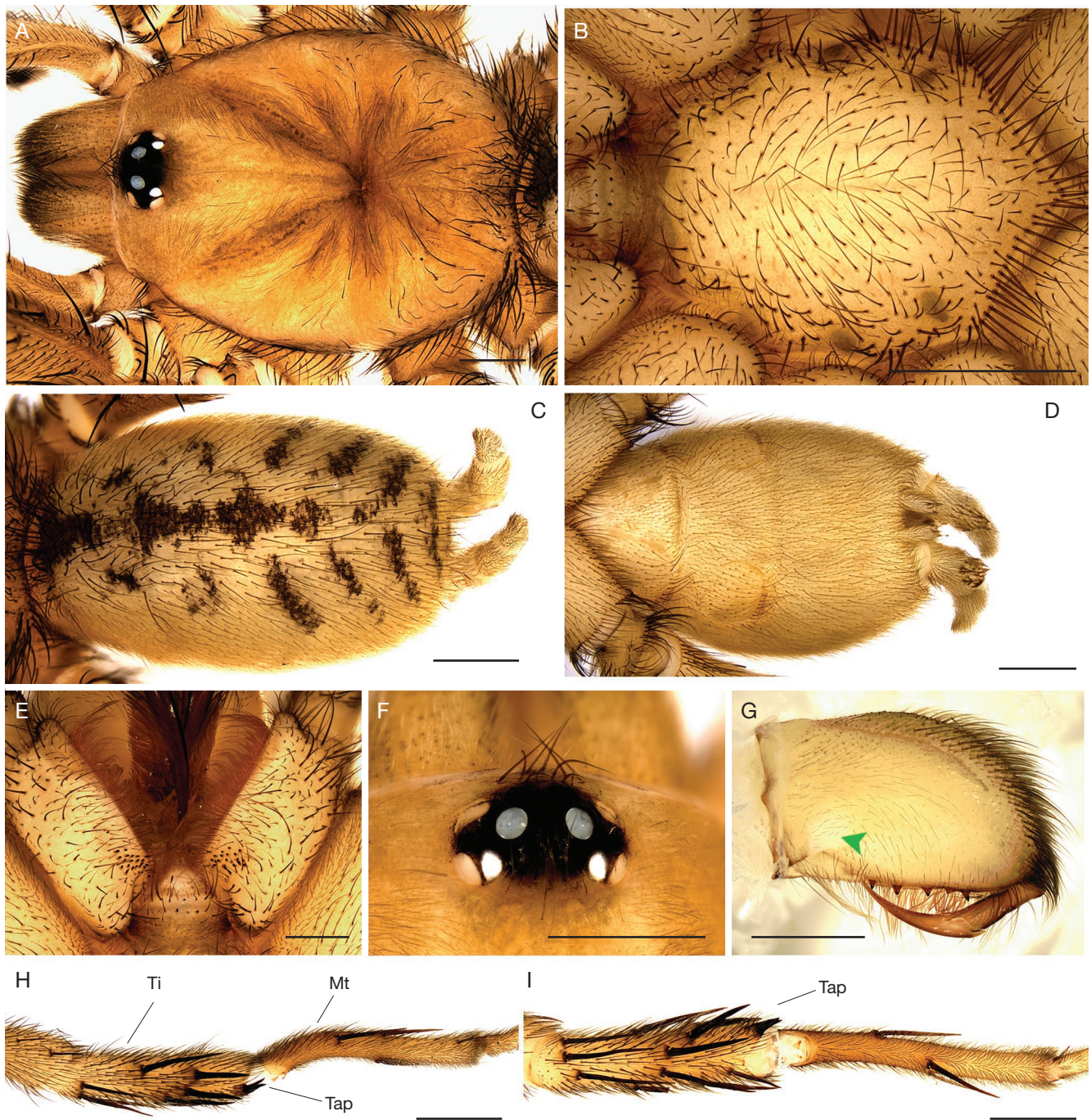


Fig. 3. — *Acanthogonatus messii* Signorotto & Ferretti n. sp., holotype male: **A**, carapace, dorsal view; **B**, sternum, ventral view; **C**, abdomen, dorsal view; **D**, abdomen, ventral view; **E**, labium and maxillae, ventral view; **F**, eyes, dorsal view; **G**, chelicerae, prolateral view (green arrow indicates intercheliceral tumescence); **H**, leg I, prolateral view; **I**, leg I, ventral view. Abbreviations: **Mt**, metatarsus, **Tap**, tibial apophysis, **Ti**, tibia. Scale bars: A-D, F-I, 1 mm, E, 0.5 mm.

slightly elevated. Anterior eye row procurved, posterior row recurved (Fig. 3F). Eyes sizes and interdistances: AME 0.17, ALE 0.2, PME 0.13, PLE 0.18, AME-AME 0.2, AME-ALE 0.06, PME-PME 0.45, PME-PLE 0.03, ALE-PLE 0.13. Chelicerae 2.19 long, 1.43 wide, with 5 small teeth in prolateral row. Rastellum weak formed by long attenuate setae. Intercheliceral tumescence small with 14 thin setae (Fig. 3G). Labium 0.67 long, 0.72 wide, with 7 cuspules (Fig. 3E). Maxillae with 21/18 blunt cuspules on internal

basal angle (Fig. 3E). Sternum oval (Fig. 3B), 2.15 long, 1.61 wide. Sternal sigilla: anterior and medium of same size and close to margin, posterior the largest and distant from margin by $c. 1 \times$ length.

Measurements. Palp: femur 1.95/ patella 0.93/ tibia 1.36/ cymbium 0.88/ total 4.49; legs: I: femur 3.49/ patella 2.06/ tibia 2.26/ metatarsus 3.32/ tarsus 2.19/ total 13.32; II: 3.62/ 1.75/ 2.58/ 3.23/ 2.14/ 13.32; III: 3.65/ 1.86/ 2.6/ 4.23/ 2.45/ 14.79; IV: 3.87/ 1.98/ 3.57/ 4.84/ 3.12/ 17.38.

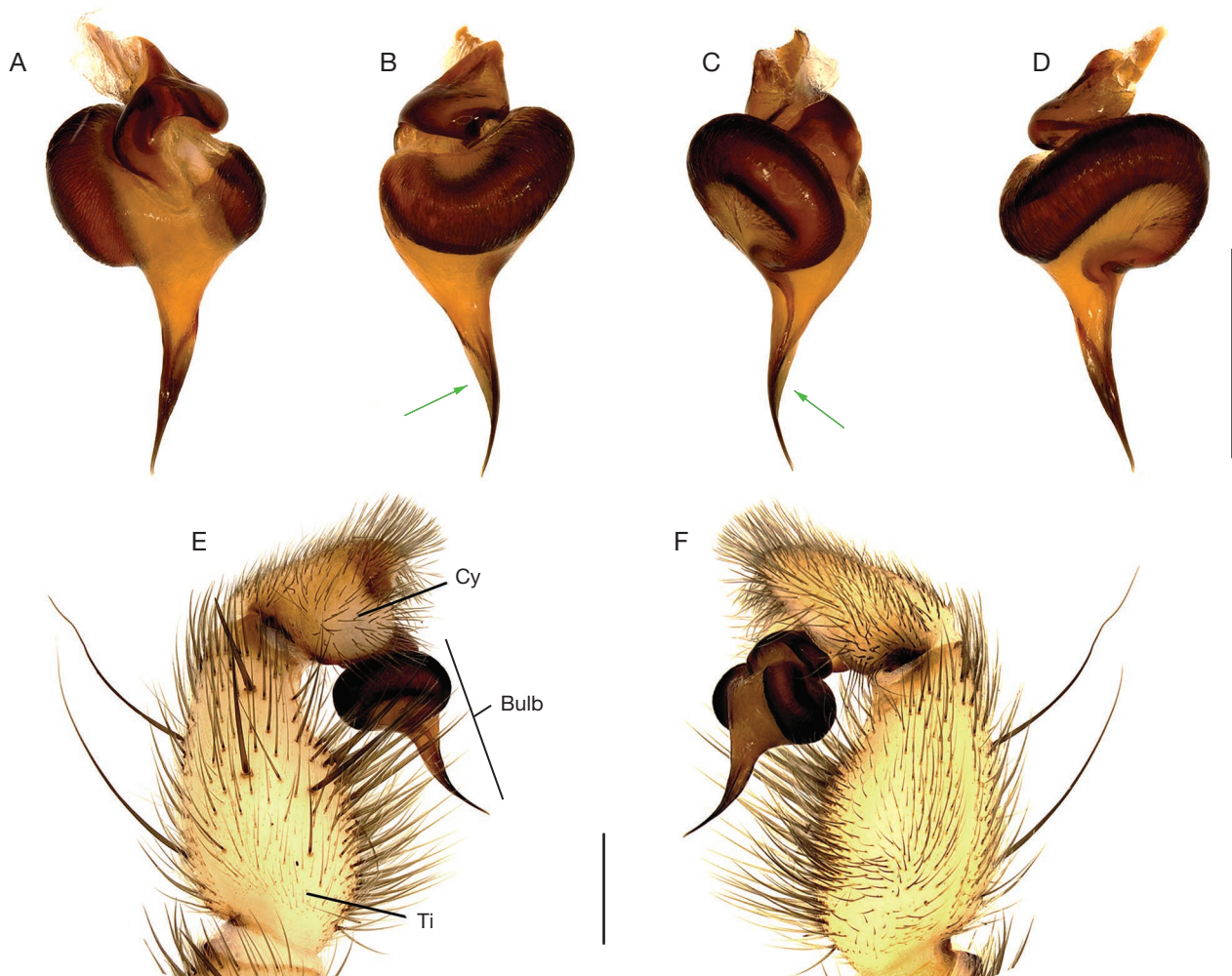


FIG. 4. — *Acanthogonatus messii* Signorotto & Ferretti n. sp., holotype male: **A-D**, palpal bulb. **A**, prolateral view; **B**, dorsal view (green arrow indicates the keel); **C**, retrolateral view (green arrow indicates the keel); **D**, dorsal view; **E**, palp, prolateral view; **F**, palp, retrolateral view. Abbreviations: **Cy**, cymbium; **Ti**, tibia. Scale bars: 1 mm.

Spination. Palp: tibia: d1-1, p1-1, v2-3. Tarsi of legs I-IV, 0. I: femur: d1-1-1-1-1-1-1-1-1-1; patella: p1-1-1; tibia: p1-1-2-2ap (on common base), r1-1, v2-1-1-1-1; metatarsus: v1-2-1. II: femur: d1-1-1-1-1-1-1, p1; patella: p1-1-1; tibia: p1-1-1, r1-1, v1-1-1-1-1-2ap, metatarsus: d1, p1-1-1, r1-1, v1-1-1-1-1. III: femur: d1-1-1-1-1-1-1, p1-1-1; patella: p1-1-1, r1; tibia: d1, p1-1, r1-1, v2-1-1-3ap; metatarsus: d1-1-1-1-1, p1-1-1-1, r1-1-1ap, v1-1-2ap. IV: femur: d1-1-1-1-1, p1-1-1, r1-1; patella: p1-1, r1; tibia: d1-1-1, p1-1, r1, v1-1-1-1-3ap; metatarsus: d2-1-1-1-1, p1-1-1, r1-1, v2-1-1-3ap. Tarsi I-IV flexible. Scopulae on tarsi I-IV light; I, II entire, III divided by two rows of thin setae, IV divided by three rows of thin setae. Scopulae of metatarsus I entire on $\frac{1}{2}$ of length; II entire on $\frac{1}{3}$ of length; III, IV absent. Metatarsal preening combs absent from legs I-IV. STC with double row of teeth: I: 12 13 12 12; II: 14 14 12 13; III: 14 13 13 13; IV: 14 14 14 12. Four spinnerets: PMS 0.5 long; PLS: basal segment 1.08 long, median 0.38 long, apical 0.43 long.

Palp. Cymbium with elongate dense setae, denser at tip; tibia dorsally with two elongated setae (Fig. 4E, F), ventrally with a deep excavation on apical third; bulb with tegulum globose, embolus thin, slightly curved to retrolateral face on apical half, one well-developed keel, *c.* $\frac{1}{3}$ of embolus length, sperm duct very sinuous (Fig. 4A-D).

Female (paratype UNS-M0657)

Color pattern. In life, carapace brown with dark striae and margins, abdomen light brown with dorsal black chevron (Fig. 2A, B); in ethanol, carapace brown with dark striae and margins (Fig. 5A), abdomen with dorsal black chevron and ventrally light brown (Fig. 5C, D).

Cephalothorax. Total length 11.93. Carapace 6.43 long, 5.03 wide, thoracic region raised. Abdomen 5.51 long, 3.28 wide. Clypeus very narrow, 0.13. Fovea slightly procurved, 0.7 long. Eye tubercle 0.71 long, 1.3 wide, slightly elevated. Anterior eye row procurved, posterior row recurved (Fig. 5F). Eyes sizes and interdistances: AME 0.2, ALE 0.34, PME 0.18, PLE

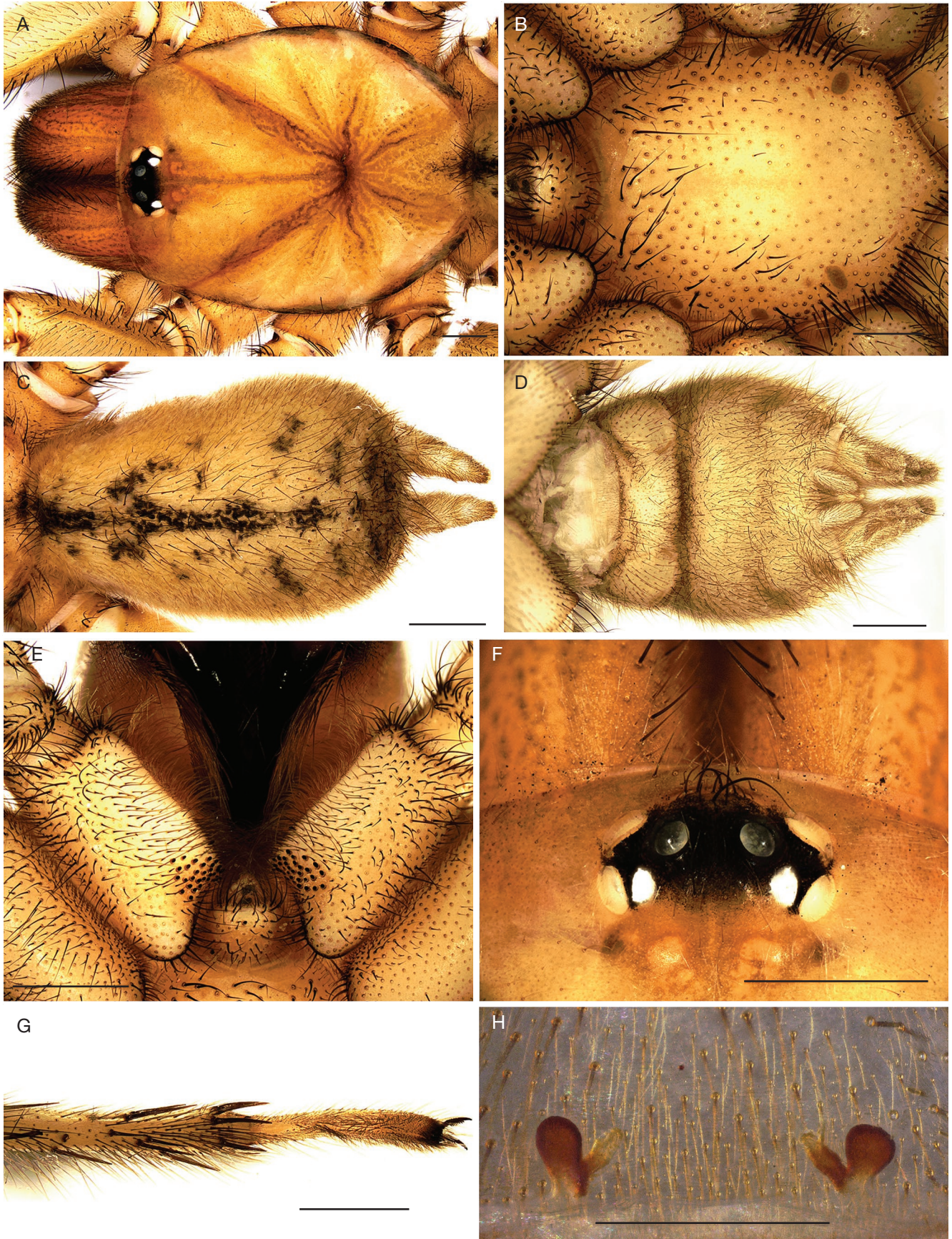


FIG. 5. — *Acanthogonatus messii* Signorotto & Ferretti n. sp., paratype female: **A**, carapace, dorsal view; **B**, sternum, ventral view; **C**, abdomen, dorsal view; **D**, abdomen, ventral view; **E**, labium and maxillae, ventral view; **F**, eyes, dorsal view; **G**, leg IV, ventral view; **H**, spermathecae. Scale bars: A-G, 1 mm, H, 0.5 mm.



Fig. 6. — **A**, habitat at type locality of *Acanthogonatus messii* Signorotto & Ferretti n. sp.; **B, C**, female burrows opened at night at type locality.

0.25, AME-AME 0.26, AME-ALE 0.11, PME-PME 0.58, PME-PLE 0.05, ALE-PLE 0.12. Chelicerae 2.85 long, 2.14 wide, with 5 small teeth in prolateral row. Rastellum weak formed by long attenuate setae. Labium 0.85 long, 0.9 wide, with 1 cuspule (Fig. 5E). Maxillae with 36/34 blunt cuspules on internal basal angle. Sternum oval (Fig. 5B), 3.08 long, 2.5 wide. Sternal sigilla: anterior slightly smaller than medium and close to margin, posterior the largest and distant from margin by $c. 1 \times$ length.

Measurements. Palp: femur 3.22/ patella 1.82/ tibia 2.04/ cymbium 1.92/ total 9; legs: measurements: I: femur 4.58/ patella 3.04/ tibia 2.87/ metatarsus 3.07/ tarsus 1.64/ total 15.2; II: 4.29/ 2.75/ 2.29/ 2.82/ 1.96/ 14.11; III: 3.81/ 2.29/ 2.08/ 3.64/ 2.29/ 14.11; IV: 4.67/ 2.93/ 3.46/ 4.31/ 2.5/ 17.87.

Spination. Palp: tibia: p1ap, v4ap. Tarsi of legs I-IV, 0. I: femur:d1-1-1-1-1-1, p1; patella: 0; tibia: p1, v1ap; metatarsus: 0. II: femur: d1-1-1-1; patella: 0; tibia: v1-1; metatarsus: v1-1. III: femur: d1; patella: p1-1; tibia: r1, v1-1ap; metatarsus: d1, p1-1, r1-1, v1-1ap. IV: femur: 0; patella: 0; tibia: r1, v1ap; metatarsus: p1, r1. Scopulae on tarsi I-IV light; I, II entire, III divided by three rows of thin setae, IV divided by four rows of thin setae. Scopulae of metatarsus I, II entire and on full length; III on $\frac{1}{5}$ of length; IV absent. Metatarsal preening combs absent from legs I-IV (Fig. 5G). STC with double row of teeth: I: 8 8 8 7; II: 7 8 8 7; III: 9 8 8 8; IV: 8

8 8 6. Four spinnerets: PMS 0.83 long; PLS: basal segment 1.31 long, median 0.40 long, apical 0.55 long.

Spermathecae. Each with one globose oval dome with very short duct from which arises an elongated digitiform receptaculum (Fig. 5H).

DISTRIBUTION AND NATURAL HISTORY

Known only from the type locality (Fig. 6A). The open burrows from females (Fig. 6B, C) were found at night at about 21:00 h in a sandy area with small shrubs. Burrow entrances had a diameter of approximately 15 mm and spiders were actively feeding. One adult male was found walking in the area at 21:50 h in a sandy area close to the female burrows, which is indicative of the reproductive period of the species in November.

CLADISTIC ANALYSIS

Search with implied weighting (IW) (k-values = 3.122, 3.665, 4.124, 4.877, 5.972 and 7.237) resulted in 3 equally parsimonious trees with 111 steps. The remaining k-values (8.253, 12.832, 16.117 and 25.376) resulted in 8 equally parsimonious trees with 113 steps. The strict consensus of IW resulted in a tree with 113 steps, CI = 42 and RI = 66. The tree in Figure 7 is the most consistent topology from the sensitivity analysis (script iw.run) and correspond to the results of the IW analyses using K-value (concavity) of 16.117.

IDENTIFICATION KEY FOR *ACANTHOGONATUS* KARSCH, 1880 UPDATED FROM INDICATTI *ET AL.* (2015)

Males

Males of *A. alegre* Goloboff, 1995, *A. brunneus* (Nicolet, 1849), *A. incurus* (Chamberlin, 1916), *A. juncal* Goloboff, 1995, *A. mulchen* Goloboff, 1995, *A. parana* Goloboff, 1995, *A. peniasco* Goloboff, 1995, *A. tolhuaca* Goloboff, 1995 and *A. vilches* Goloboff, 1995 are unknown.

1. ITC IV absent 2
— ITC IV present 16
2. Apophysis with two apical laminar spines on the same base; palpal tibia with two dorsal sinuous long setae; bulb with no keels, or with lateral keels 3
— No tibial apophysis of any kind; ITC I absent; forests in southern Chile and Argentina *A. confusus* Goloboff, 1995
3. Bulb with a lateral keel forming a concavity; central Chile (regions IV, V) *A. huaquen* Goloboff, 1995
— Bulb different 4
4. Dorsal abdomen yellowish with a chevron; apical article of PLS short, triangular; Argentina (dry regions of Patagonia) and southern Chile 5
— Dorsal abdomen with pattern formed by numerous mottles; apical article of PLS longer, digitiform; Argentina (north of Patagonia) 9
5. Large spiders (about 20 mm total length, carapace over 9 mm; bulb with two lateral flanges delimiting concave triangular area; palpal tibia rather elongate) *A. patagonicus* (Simon, 1905)
— Medium to small spiders (total length 15 mm or smaller, carapace below 6 mm); bulb variable; palpal tibia shorter 6
6. Bulb with low lateral keels (or with single keel); metatarsi I with at least 1 or 2 ventral spines 7
— Bulb with more developed lateral keels; metatarsi I with no ventral spines *A. notatus* (Mello-Leitão, 1940)
7. Bulb with a single keel; patella III with 1-1-1 P 8
— Bulb with a double keel; patella III with only 0-0-1; slightly larger (carapace length about 5 mm) *A. chilechico* Goloboff, 1995
8. Bulb with slightly developed keel, maxillae without cuspules *A. birabeni* Goloboff, 1995
— Bulb with well-developed keel, maxillae with more than 15 cuspules *A. messii* Signorotto & Ferretti n. sp.
9. Dorsal abdomen blackish with yellowish whitish oblique lines; bulb with widened, flanged tip; extremely common in central-southern Chile (regions IV-VIII) *A. pissii* (Simon, 1889)
— Dorsal abdomen with only white dots not forming continuous lines, or mottled; bulb with narrower tip, flanged in the base or without flanges 10
10. Bulb with no keels; total length *c.* 13 mm; central Argentina (Córdoba, San Luis, San Juan, and Buenos Aires) *A. centralis* Goloboff, 1995
— Bulb with serrated, curved and long embolus; central Chile Uruguay and southern Brazil 11
11. Metatarsus I slightly curved downward; central Chile *A. quilocura* Goloboff, 1995
— Metatarsus I straight 12
12. Presence of flanges along the embolus 13
— Absence of flanges on embolus 14
13. One flange on palpal embolus apex; southern Brazil *A. ericae* Indicatti, Lucas, Ott & Brescovit, 2008
— Bulb with three perpendicular flanges along embolus *A. franki* Karsch, 1880
14. Bulb with a winglike projection; PLS apical segment digitiform *A. recinto* Goloboff, 1995
— Bulb different; PLS apical segment triangular 15
15. Presence of tibial spur on tibia I; Uruguay and southern Brazil *A. tacuariensis* (Pérez-Miles & Capocasale, 1982)
— Absence of tibial spur on tibia I; Argentina (Patagonia) *A. fuegianus* (Simon, 1902)
16. Anterior tibia with dense prolateral shield of setae 17
— Anterior tibia without such shield 19

17. Palpal tibia widest in basal third, and then uniformly tapering; retrolateral thicker setae present along apical $\frac{2}{3}$ of article 18
 — Palpal tibia of uniform width along medial half, more abruptly narrowed in the apical third; retrolateral thicker setae present only on apical third *A. hualpen* Goloboff, 1995
18. Bulb with its basal portion rounded, abruptly tapered to form embolus base; basal portion of the bulb duct strongly sinuous *A. patagallina* Goloboff, 1995
 — Bulb with its basal portion not rounded, tapering more gradually to form embolus base basal portion of the bulb duct little sinuous *A. nahuelbuta* Goloboff, 1995
19. Tibia I with a strong apical retrolateral megaspine; palpal bulb with twisted embolus; total length less than 5 mm; Brazil (Rio de Janeiro) *A. minimus* Indicatti, Folly-Ramos, Vargas, Lucas & Brescovit, 2015
 — Tibia I with no retrolateral megaspine; palpal bulb with slightly curved embolus; total length more than 13 mm 20
20. No apophysis on anterior tibia *A. confusus* Goloboff, 1995
 — Low prolateral tibial apophysis, bearing two spines on common base 21
21. Palpi long, about three times of the cymbium length; embolus *c.* half-length of palpal bulb
 *A. subcalpeianus* (Nicolet, 1849)
 — Palpi normal, about two times of the cymbium length; embolus *c.* $\frac{2}{3}$ length of palpal bulb
 *A. campanae* (Legendre & Calderón, 1984)

Females

Females of *A. birabeni*, *A. chilechico* and *A. patagallina* are unknown.

1. Claw tufts present; Peru *A. incursum*
 — Claw tufts absent 2
2. ITC IV absent 3
 — ITC IV present 17
3. Patella IV with 1-1-1 4
 — Patella IV with 0-0-1 or (more often) no spines at all 7
4. Spermathecae thick, sclerotized *A. peniasco*
 — Spermathecae slightly sclerotized 5
5. Spermathecae cactus like; Argentina *A. centralis*
 — Spermathecae different; Chile 6
6. Spermathecae with short duct, slightly curved from the internal side *A. francki*
 — Spermathecae without basal dome, long twisted receptaculum duct *A. recinto*
7. Apical article of PLS triangular 8
 — Apical article of PLS longer, digitiform 11
8. Spermathecae branched (bi- or trifurcated) *A. fuegianus*
 — Spermathecae with a basal mound or protuberance 9
9. Small spiders (total length about 12, carapace length 5-6 mm); carapace slightly patterned, with margins and medial line lighter; lateral stripes of dorsal abdominal chevron conspicuous; general coloration yellowish ... 10
 — Larger spiders (total length well over 20 mm, carapace length 10 mm or more); carapace not appreciably patterned; dorsal abdominal pattern limited mostly to cardiac area; general coloration brown with golden hairs *A. patagonicus*
10. Scopula IV absent *A. messii* Signorotto & Ferretti n. sp.
 — Scopula IV light *A. notatus*
11. Spermathecae with a main branch and a lateral secondary internal branch arising from middle of main branch 12
 — Spermathecal duct arising from the inner side of basal mound or protuberance 13
12. Main spermathecal branch widened distally; central Argentina *A. centralis*
 — Main spermathecal branch not widened distally; eastern Argentina (Entre Rios) *A. parana*

13. Dorsal abdomen blackish with yellow-white oblique lines; spermathecae with low basal dome; central and southern Chile (regions IV-VIII) *A. pissii*
 — Dorsal abdomen with white dots or spots not forming continuous lines, or yellowish with darker mottles 14
14. Small spiders (total length about 10 mm, carapace 4 mm or smaller); spermathecae weakly sclerotized, very short duct; patella III with p0-1-1 spines *A. juncal*
 — Larger (total length 20 mm or more, carapace 8 mm or more); patella III with p1-1-1 spines 15
15. Spermathecae with blunt basal mound, and duct strongly curved at the base *A. quilicura*
 — Spermathecae with basal mound tapering more gradually 16
16. Carapace brownish, dorsal abdomen irregularly mottled; with (weak) rastellum; spermathecae with basal dome narrow, duct strong curvate to inner side; central Chile *A. huaquen*
 — Carapace reddish, dorsal abdomen with oblique lines of dots; rastellum absent 17
17. Spermathecae with short copulatory ducts, arising from basal dome side; Uruguay and southern Brazil
 *A. tacuariensis*
 — Spermathecae with short copulatory ducts, arising from the basal dome apex; southern Brazil *A. ericae*
18. ITC I present 19
 — ITC I absent 26
19. Spermathecae very long, twisted; fovea T-shaped; Brazil (Rio de Janeiro) *A. minimus*
 — Spermathecae short, not twisted; fovea normal, procurved 20
20. Spermathecae two wide (but flat) plates 21
 — Spermathecae different 22
21. Sternum long; spermathecae fused, without copulatory duct, with shallow medial notch *A. mulchen*
 — Sternum normal 23
22. Color uniform blackish; patella III with p0-1-1 spines *A. tolhuaca*
 — Color brownish, with mottled abdomen; patella III with p0-1-1 or p1-1-1 spines *A. brunneus*
23. Spermathecae strongly sclerotized, with a wide cavity, opening through wide passage 24
 — Spermathecae weakly sclerotized, flat and with no appreciable cavity; duct opening not conspicuous 25
24. Spermathecae finger like, strongly curved *A. nahuelbuta* and *A. hualpen*
 — Spermathecae wider, shaped like two pockets *A. vilches*
25. Carapace patterned, legs ringed; spermathecae with short copulatory ducts, arising from the external side of basal dome *A. subcalpeianus*
 — Carapace and legs uniform brown; spermathecae single, undivided; central Chile (regions IV, V)
 *A. campanae*
26. Epigastrium posteriorly produced; spermathecae long; northern Chile (Region II) *A. alegre*
 — Epigastrium normal; spermathecae shorter; southern Chile (Regions VIII-X) and Argentina (Neuquén)
 *A. confusus*

DISCUSSION

From this work, the diversity of the genus *Acanthogonatus* in Argentina is increased to include eight species, with the patagonic steppe of southern Argentina as the most diverse region. *Acanthogonatus messii* Signorotto & Ferretti n. sp. resembles *A. notatus* in the coloration pattern and lifestyle and they are about 300 km geographically distant, but the genitalic features from male and female are clearly different. Males of *A. messii* Signorotto & Ferretti n. sp. also resembles *A. birabeni* in the small size, but differs by the different coloration pattern of the dorsal abdomen, the more nu-

merous strong spines on ventral metatarsus I and the more developed keel on the embolus, and they are about 300 km geographically distant.

Results from the cladistic analysis showed that the main species groups “nahuelbuta”, “mulchen”, “patagonicus” and “francki” obtained by Goloboff (1995) was also recovered in the present study, with an exception. Indeed, in the “nahuelbuta” group, we recovered *A. vilches* outside of this group, and *A. patagallina*, *A. nahuelbuta* and *A. hualpen* as a clade supported by the following synapomorphies: presence of shield of setae on male tibia I and strong spines on male metatarsus II. *A. minimus* was found to be the sister species

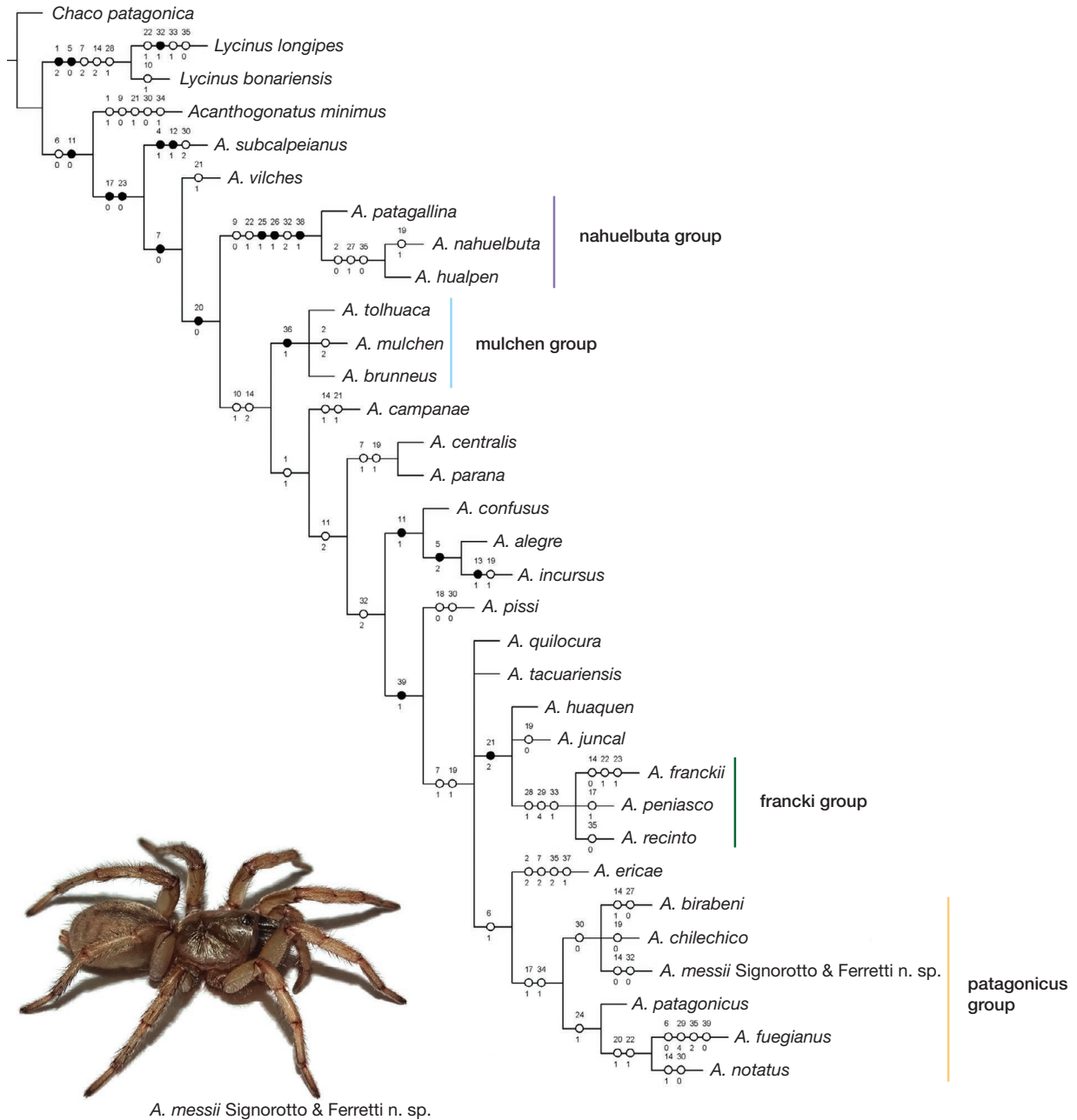


FIG. 7. — Most parsimonious cladogram using IW. Symbols: **black squares**: exclusive synapomorphies; **white squares**: homoplasies. **Numbers above the circles**: characters; **below**: states. Species group notations follows Goloboff (1995).

of the remaining *Acanthogonatus* representatives supported by the presence of an inferior tarsal claw, and *A. ericae* as the sister species of the “patagonicus” group supported by the homoplastic character of presence of serrula on male only. The phylogenetic analysis showed *A. messii* Signorotto & Ferretti n. sp. as a close species to *A. chilechico* and *A. birabeni* supported by a short palpal tibia (homoplastic character). The inclusion of this new species into the “patagonicus” group from the phylogenetic analysis also corroborates some features that characterize this group such as the well-marked chevron abdominal pattern and their presence in dry and scrubby habitats.

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