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Integration or minimalism: twenty-one new species of ghost spiders (Anyphaenidae: *Anyphaena*) from Mexico

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Abstract. The rhythm of biodiversity loss vastly surpasses the number of new species described per year, with several taxa going extinct without us even knowing about their existence. After more than 250 years of traditional taxonomy, it is clear that the rate of biodiversity description and discovery needs to be improved. Molecular data has greatly increased the speed of species discovery and accuracy of taxonomic delimitation. Phenotypic documentation, although relatively slower, is still crucial to identify species and communicate taxonomic discoveries to a broader audience. Here, we integrate these data sources to describe a relatively large number of new species of the spider genus *Anyphaena* and look into its internal phylogenetic relationships. Our findings support the existence of several species groups within *Anyphaena* (as currently defined), but failed to recover the monophyly of this genus, suggesting a more comprehensive revision of its species groups and closely related anyphaenid genera is necessary. The 21 new species described here are: *Anyphaena adnani* sp. nov., *A. bifurcata* sp. nov., *A. dulceae* sp. nov., *A. epicardia* sp. nov., *A. fernandae* sp. nov., *A. franciscoi* sp. nov., *A. ibarrai* sp. nov., *A. jimenezi* sp. nov., *A. megamedia* sp. nov., *A. miniducta* sp. nov., *A. natachae* sp. nov., *A. noctua* sp. nov., *A. porta* sp. nov., *A. quadrata* sp. nov., *A. rebecae* sp. nov., *A. salgueiroi* sp. nov., *A. sofiae* sp. nov., *A. stigma* sp. nov., *A. tonoi* sp. nov., *A. triangularis* sp. nov. and *A. urieli* sp. nov.

Keywords. Diversity, Neotropic, Araneae, cybertaxonomy, species online documentation.

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Introduction

The debate about the taxonomic impediment and how it should be addressed has generated fruitful discussions about taxonomy's philosophy, methods and relevance in an evermore data-hungry scientific context (Godfray 2002, 2007; Knapp *et al*. 2002; Wilson 2003, 2004; Godfray & Knapp 2004; Wheeler *et al*. 2004; Ebach & Holdrege 2005; Hebert & Gregory 2005; Carvalho *et al*. 2007, 2008; Miller 2007; Godfray *et al*. 2008; Knapp 2008; Wheeler 2008a, 2008b, 2008c; Clark *et al*. 2009; Zauner 2009; Wheeler & Valdecasas 2010; Orr *et al*. 2020; Sharkey *et al*. 2021a; Meier *et al*. 2021). Gathering and reviewing fundamental data about new taxa can take decades in many cases (Fontaine *et al*. 2012).

Taxonomic documentation requires a combination of artistic and scientific skills that allows the generation of hypotheses about species relations and delimitations.

The shadow of the ongoing biodiversity crisis makes it essential to expedite discovery and description of new species, and the revision of old and disorganized taxa. In the last few decades, taxonomic descriptions have been supplemented with digital photography, molecular data, and other types of information. This has transformed taxonomy from a classification system to a data-driven hypothesis-testing science. Recently, an effort to use DNA barcodes to supersede traditional taxonomic descriptions and diagnoses resulted in an outstanding work describing more than 400 species of rare parasitoid wasps (Sharkey *et al*. 2021a). This work minimized the use of morphological characters and abandoned altogether the morphological description of the treated species, substituting it for the processed barcodes used in their analysis. Nevertheless, its approach has sparked a still ongoing discussion (Meier *et al*. 2021; Zamani *et al*. 2021 *et al*.; Sharkey *et al*. 2021a, 2021b), and in a reanalysis of this data, Meier *et al*. (2021) found inconsistencies when parameters of Sharkey *et al*. (2021a) were found to have been modified, suggesting that some of their freshly described species are already in need of revision.

Other attempts to expedite species identifications and descriptions include the publication of online catalogs for morphological documentation applied to spider diversity inventories (Ramirez 2003; Alvarez-Padilla 2012; Miller & Sac 2014; Álvarez-Padilla *et al*. 2020; Garcilazo-Cruz & Álvarez-Padilla 2022). These online catalogs allow the recognition of the existence of taxa, sharing their relevant data even before the taxon in question has been formally described. Furthermore, this model allows the world-wide collaboration between experts for new species discovery without the need of sharing physical specimens (Miller *et al*. 2014; Álvarez-Padilla *et al*. 2020). Lastly, the implementation of prospective data sharing (Agosti & Egloff 2009; Miller *et al*. 2012; Agosti *et al*. 2019; Chester *et al*. 2019) as implemented by this and a number of other taxonomic journals aids in the access and dissemination of biodiversity data within global databases such as Plazi (Plazi 2020) and GBIF (GBIF 2022). This can ultimately aid in the detection of biogeographical patterns, inferring taxa phenologies, among other applications.

Here, we illustrate the integration of spider inventory online catalogs, barcoding and biodiversity data sharing to describe 21 new species of the ghost spider genus *Anyphaena* Sundevall, 1833. Currently, the family Anyphaenidae Bertkau, 1878 is divided into two subfamilies, Amaurobioidinae Hickman, 1949 and Anyphaeninae Bertkau, 1878, and includes 614 species divided in 57 genera. Of these genera, *Anyphaena* is among the three with the largest diversity within this family with 87 described species. This genus has a wide distribution, being found in Asia, Europe, and the Americas, but more than 72% of the currently valid species has been found in North and Central America, and the Caribbean (WSC 2022). A revision of the Nearctic and some Neotropical species recognized four species groups (*accentuata* [palearctic], *celer*, *pectorosa* and *pacifica* [nearctic and neotropical]) based on genital morphology and somatic sexual dimorphic characters (Platnick 1974). The majority of species of *Anyphaena* have good-quality illustrations and descriptions that facilitate the comparison with the new species described here (Keyserling 1879; Pickard-Cambridge O. 1896; Pickard-Cambridge F. 1900; Kraus 1955; Platnick 1974, 1977; Dondale & Redner 1982; Sierwald 1988; Brescovit & Lise 1989; Brescovit 1997; Durán-Barrón *et al.* 2016). However, the utilization of somatic and genital descriptions, standard views in photography, illustrations, and molecular data greatly facilitate taxonomic comparisons. This combination of methods gives multiple lines of evidence for the description of new species, making it easy to test them and subsequently minimizing taxonomic errors.

Material and methods

Specimen localities

All species were collected as part of four diversity inventories using standardized protocols for spiders that specify collecting methods applied, sampling area sizes, and collecting effort units (Coddington *et al*. 1991, 1996; Scharff *et al*. 2003; Malumbres-Olarte *et al*. 2018; and references therein). All specimens were collected in 96% ethanol. The first inventory was conducted in San Luis Potosi Sate, municipality of Xilitla, inside the ecotouristic park Las Pozas. The area is dominated by tropical vegetation fragments as part of the Sierra Madre Oriental. Here, a 1 ha plot was established with the following central coordinates and elevation 21.39722° N, 98.99388° W, alt. 662 m. Four expeditions were carried out from August 2011 to June 2012 (Rivera-Quiroz *et al*. 2016). The second inventory was made in an oak forest located 15 km from the Pico de Orizaba Volcano, Veracruz Sate, Municipality Calcahualco, at 2 km in a SW direction from the town of Atotonilco. Two one-hectare plots were established with the following central coordinates and elevations: Plot I: 19.12569° N, 97.06756° W, alt. 2300 m and Plot II: 19.29483° N, 97.2045° W, alt. 2388; they are separated by 400 meters in a NW direction. Plot I was dominated by oak sprouts from old tree stumps, Plot II was a mixture between the same oak sprouts and pine trees. Three expeditions were made during one year from May 2012 to February 2013. The third inventory was done in the same Municipality of Calcahualco, 1.6 km in a SE direction from the town of Xamaticpac. Two contiguous one-hectare plots were established with the following central coordinates and elevations: Plot I: 19.14172° N, 97.20597° W, alt. 1710 m and Plot II: 19.12614° N, 97.06708° W, alt. 1700 m. Both plots were dominated by a mixture of oak sprouts from old stumps, tropical vegetation and agricultural land with 25 years of vegetation overgrowth. Three expeditions were made from April 2013 to February 2014. The plots at Atotonilco and Xamaticpac are separated by ca 15 km in an E direction. The fourth inventory was done in a primary tropical wet forest at the Biological Station Los Tuxtlas IB-UNAM, in the municipality of San Andres Tuxtlas, Veracruz State. A single one-hectare plot was established with central coordinates 18.58225° N, 95.07558° W, alt. 217–172 m. Four expeditions were made from May 2016 to February 2018 (2017 was sampled only once for logistical reasons) (Álvarez-Padilla *et al*. 2020).

Descriptive methods

Online phenotypic documentation for all species was done following a recent protocol that organizes digital images as standard views across spider diversity inventories. It uses a few high-resolution images of standard views that cover the main genital and somatic diagnostic characters (Álvarez-Padilla *et al*. 2020). Images were taken with the following Nikon equipment: digital cameras, a DS-Fi1 connected to the dissecting microscope SMZ1270 and a DS-Fi2 connected to the glass slide microscope E200, both cameras controlled with a desktop Dell Inspiron 660s; SMZ1000 and E200 microscopes, both sharing a DS-Fi3 connected to a HP Slimline 270-a0xx. Custom-made lamps of two 1.5 watts LEDs of 2 cm in diameter were used for illumination. Individual images were stacked using Helicon Focus ver. 6.8.0 (radius 15, smoothing 4 and rendering method B: depth map). More details of the photography methods are available at www.unamfcaracnolab.com. Drawings were done with the drawing tubes for the E200 (Y-IDT) and dissecting microscopes (P-IDT). Female genitalia were dissected and digested with pig pancreatic digestive enzymes overnight (Alvarez-Padilla & Hormiga 2007). Internal structures were made translucent with methyl salicilate and observed using semi-permanent slide preparations (Coddington 1983) under the E200 microscope. All measurements and scale bars are in millimeters. Species descriptions are based on type material unless specified otherwise. Numbers of specimens measured to establish the species variation are given in each description. Type and examined material are deposited in the Colección Nacional de Arácnidos, Instituto de Biología, Universidad Nacional Autónoma de México. PFX000 codes are for voucher specimens that are illustrated or photographed, ANYM000 codes are for specimens measured, CNAN specimen codes pending. The following species, *A. bromelicola* Platnick, 1977, *A. catalina* Platnick, 1974, *A. alachua* Platnick, 1974 and *A. fraterna* (Banks, 1896), were collected in the diversity inventories mentioned above, were used for comparisons in this study, and are documented with standard views at www.unamfcaracnolab.com.

Molecular methods

Tissues were sampled for most of the new species described here to accurately match the sexes, infer their relationships, and test the monophyly of the species group within *Anyphaena*. One or two legs of every sampled specimen were used. Genomic DNA was extracted using the Qiagen DNeasy Blood & Tissue Kit (Qiagen, Valencia, CA). A fragment of the commonly used barcode COI was amplified using the following combination of primers: 1) LCO1490 (5′-ggtcaacaaatcataaagatattgg-3′) and HCO2198 (5′- taaacttcagggtgaccaaaaaatca-3′) (Folmer *et al*. 1994); and 2) J1718 spider (5′-ggnggatttggaaattgrttrgttcc-3′) (Vink *et al*. 2005) or J1751 (5′-ggatcacctgatatagcattccc-3′) and N2568 (5′-gctacaacataataagtatcatg-3′) (Hedin & Maddison 2001). The reaction mix included 3 µL of template DNA, 0.25 µL of each primer, 0.5 µL of $MgCl_2$, 0.12 µL Taq DNA polymerase and 3.5 µL of buffer 5 × (Mg with ddNTPs). PCR amplification was done as follows: 5 min initial denaturation (95°C); 35 cycles of 45 s denaturation (95°C), 1 min (48°C) annealing, and 1 min (72°C) extension; 7 min final extension (72°C). Sequencing was done at the Laboratorio de Secuenciación Genómica de la Biodiversidad y de la Salud of the IBUNAM. Sequences were edited in Geneious Prime ver. 2020.0.5 and deposited in GenBank; accession numbers are reported in Supp. file 1. The COI data was supplemented with sequences from several anyphaenid and related species: *Clubiona canadensis* Emerton, 1890 (as an outgroup), three species of *Hibana* Brescovit, 1991, two of *Aysha* Brescovit, 1997 and *Oxysoma* Nicolet, 1849, and one of 13 other genera (Supp. file 1). A total of 107 sequences were analyzed, including the type species *Anyphaena accentuata* (Walckenaer, 1802) and representatives of Platnick's species groups (Platnick 1974, 1977; Platnick & Lau 1975): *Anyphaena pacifica* (Banks, 1896), *Anyphaena celer* (Hentz, 1847) and *Anyphaena pectorosa* L. Koch, 1866. All COI sequences were aligned with MAFFT ver. 7.450 online (https://mafft.cbrc.jp/alignment/server/) with default parameters (matrix available in Supp. file 1). The best model fit was obtained via jModelTest2 (Darriba *et al*. 2012); GTR+I+G was selected. SequenceMatrix ver. 1.8 was used to transform the dataset formats. Our barcode dataset was analyzed under Maximum Likelihood (ML) and Bayesian Inference (BI) approaches using respectively: RaXML (Stamatakis 2014) in CIPRES (GTR, bootstrap = 1000), and MrBayes ver. 3.2.6 (Ronquist & Huelsenbeck 2003) (two independent runs with one cold and three heated chains, mcmc = 5 000 000 gen, samplefreq = 1000, burnin = 20 000). The program Tracer ver. 1.7.1 (Rambaut *et al*. 2018) was used to analyze the performance of our BI analyses (Supp. file 2).

Abbreviations used in text and figures

Text

ALE = anterior lateral eyes
AME = anterior median eyes
BEAT = collecting method beating as defined in Scharff *et al*. (2003)
BERL = leaf litter concentrated and specimens extracted with Berlese funnels (Álvarez-Padilla *et al*. 2020)
CNAN = Colección Nacional de Arácnidos, Instituto de Biología, Universidad Nacional Autónoma de México
CRP = cryptic
d = dorsal
LUD = looking down
LUP = looking up (Scharff *et al*. 2003)
p = prolateral
PF = Pitfall trap
PLE = posterior lateral eyes
PME = posterior median eyes
r = retrolateral
RTA = male pedipalp retrolateral tibial apophysis
v = ventral

Figures

a = atrium
aRTA = retrolateral tibial apophysis anterior branch
cd = copulatory ducts
co = copulatory openings
e = embolus
fd = fertilization ducts
h = hood
lb = epigynal atrium lateral borders
ma = median apophysis
mp = epigynum midpiece
pRTA = retrolateral tibial apophysis posterior branch
ptp = prolaetral tegular projection
rtp = retrolateral tegular projection (tegular projection homologies follow Brescovit 1997)
s = spermatheca
sr = seminal receptacle
st = subtegulum
vtp = ventral tegular projection
t = tegulum
vMTA = median tibial apophysis ventral branch

Results

Taxonomy

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Anyphaenidae Bertkau, 1878

Genus ***Anyphaena*** Sundevall, 1833

Type species

Aranea accentuata Walckenaer, 1802; gender feminine.

Celer **group**

Diagnosis

The *celer* group can be separated from other *Anyphaena* species groups by the following characters.

Males

Coxae lacking ventral spurs (spine-like modifications) but might present clusters of setae (Fig. 3F) or tubercles (cuticle blunt protuberances of various shapes) (Fig. 41E–F). The palp of the *celer* group (Fig. 1A–C) (Platnick 1974; Platnick & Lau 1975) presents a tegulum divided in three lamella-shaped projections, described as prolateral tegular projection, retrolateral tegular projection and ventral tegular projection following the homologies in Brescovit (1997) and Oliveira & Brescovit (2021). The embolus is a visible sclerite (in the un-expanded palp), tubular in shape, and curved dorsally. The median apophysis (or conductor in Platnick & Lau 1975) is a thin, transparent and curved sclerite, articulated at the base of the ventral tegular projection by flexible cuticle. In expanded pedipalps, the retrolateral tegular projection and prolateral tegular projection are lamella-shaped and partially articulated. In the unexpanded bulb, these projections lie dorsally like two folded tortillas around the other sclerites (Fig. 1A–C). Their RTA is dominated by the anterior and posterior branches, the former usually larger and shaped as a folded cuticular lamella, the latter is usually smaller and its shape varies considerably between species (Platnick 1974, 1977; Platnick & Lau 1975) (Fig. 5A, C).

Females

Externally the epigynum has a hood close to the anterior margin, a sclerotized median plate below the hood, and a transparent atrium delineated by two sclerotized lateral borders. The copulatory openings are difficult to observe; however, they are located near the lateral border's posterior edge (Figs 2A, 4E, 5E, 7E, 8E, 9E, 18A). Internally, the copulatory and fertilization ducts are usually sclerotized and

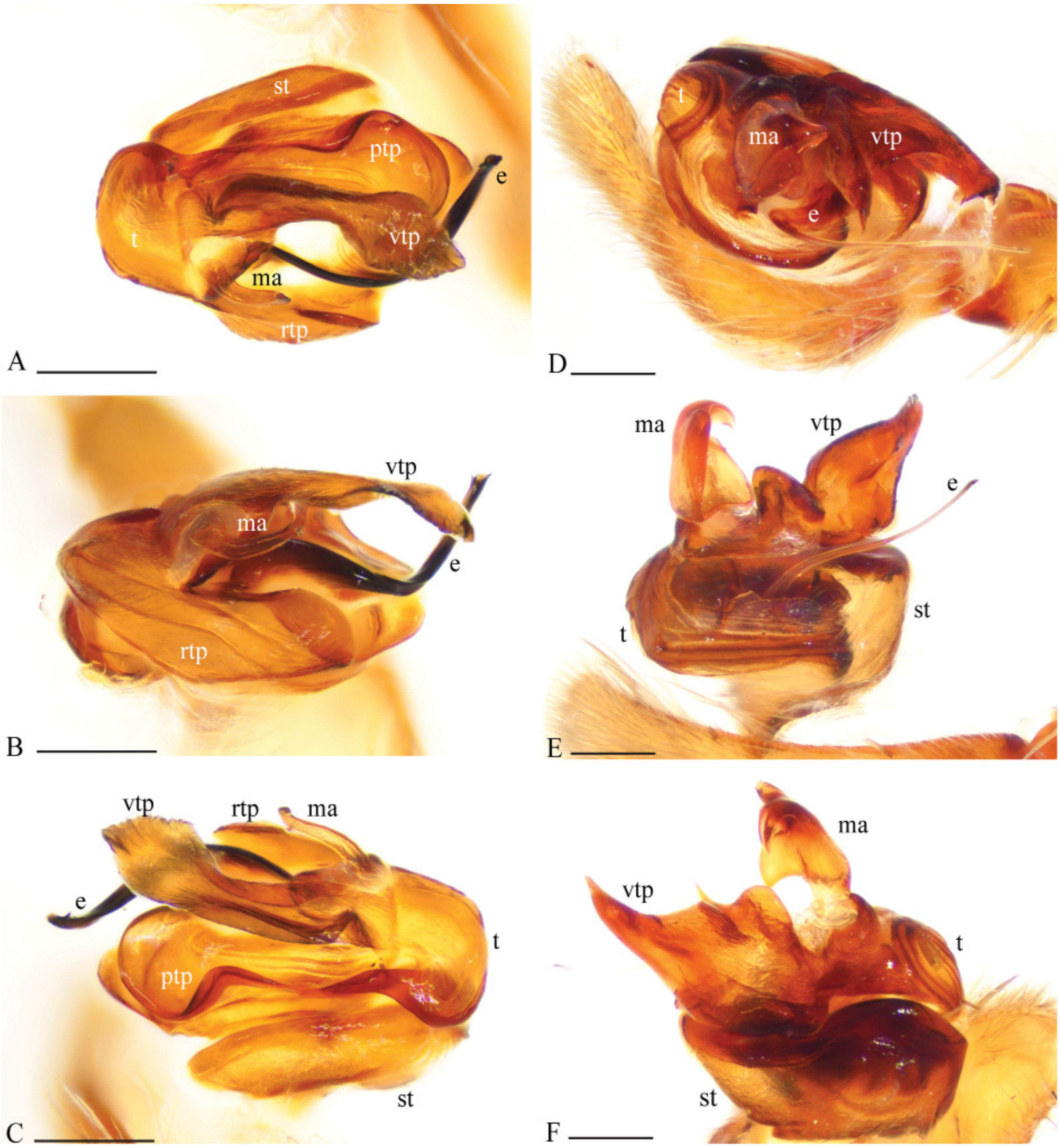

Fig. 1. *Anyphaena* spp., expanded pedipalps. **A**–**C**. *A. natachae* sp. nov., ♂ (PXF302). **A**. Ventral view. **B**. Retrolateral view. **C**. Prolateral view. – **D**–**F**. *A. urieli* sp. nov., allotype, ♂ (CNAN-T01521). **D**. Ventral view. **E**. Retrolateral view. **F**. Prolateral view. Scale bars: 0.2 mm.

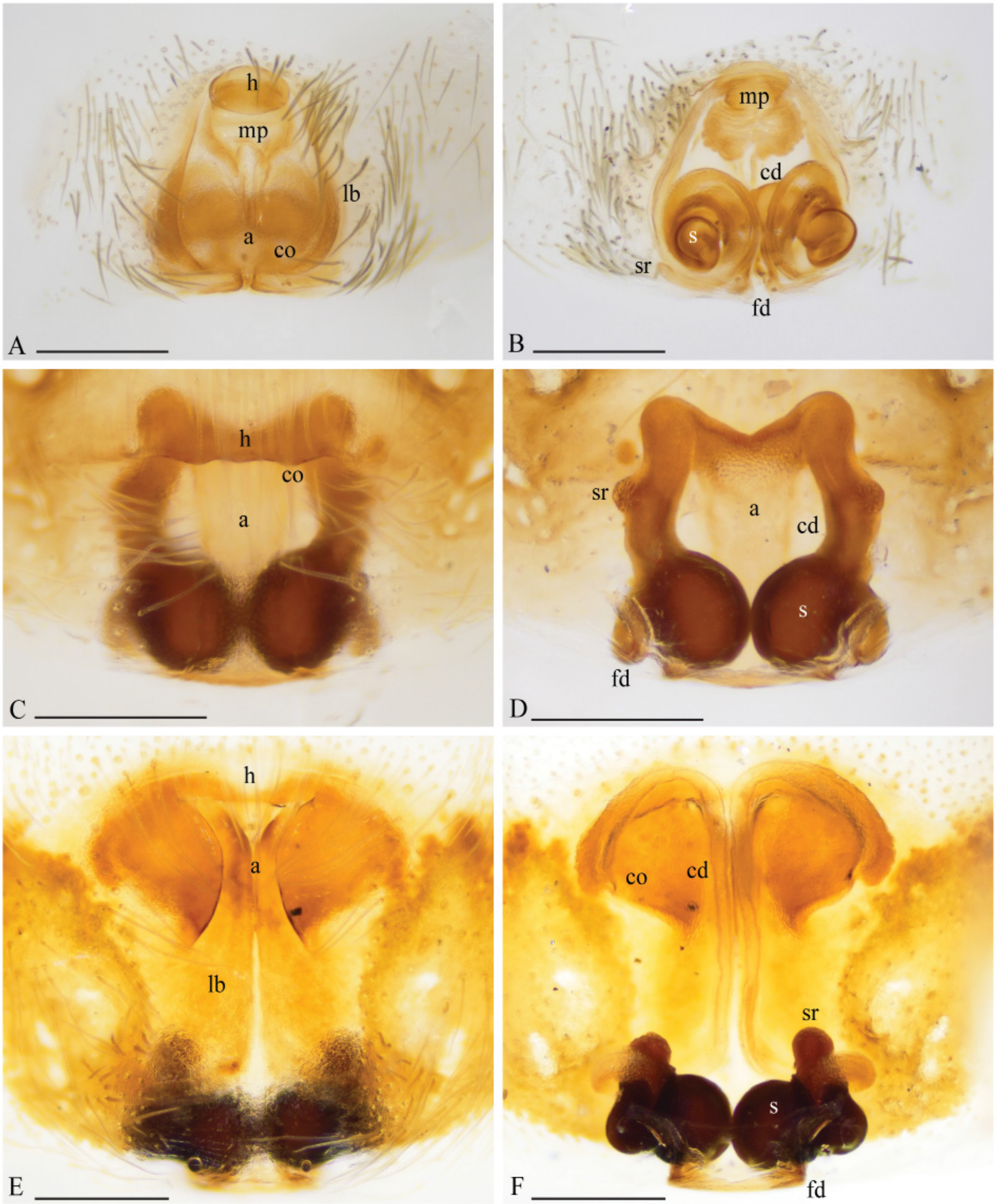

Fig. 2. *Anyphaena* spp., epigynum anatomies. **A–B**. *A. adnani* sp. nov., paratype, ♀ (CNAN-T01546). **A**. Epigynum, ventral view. **B**. Epigynum, dorsal view. – **C–D**. *A. rebecae* sp. nov., holotype, ♀ (CNAN-T01536). **C**. Epigynum, ventral view. **D**. Epigynum, dorsal view. – **E–F**. *A. salgueiroi* sp. nov., holotype, ♀ (CNAN-T01537). **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

variable in length and shape (Platnick 1974, 1977; Platnick & Lau 1975). The seminal receptacles are cylindrical in shape and also located near the posterior edge. The spermathecae are usually spherical to oval and close to the posterior margin (Figs 2B, 4F, 5F, 7F, 8F, 9F, 18B).

Anyphaena natachae sp. nov.

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Figs 1A–C, 3–5, 52

Differential diagnosis

Males of *A. natachae* sp. nov. have the RTA posterior branch single and cone-shaped, the anterior RTA branch rectangular with a curved apical margin (Figs 4C–D, 5C–D). Both RTA branches are similar to those of *A. hespar* Platnick, 1974 (Platnick & Lau 1975: figs 39–40), *A.wanlessi* Platnick & Lau, 1975 (Platnick & Lau 1975: figs 103–104) and *A. inferens* Chamberlin, 1925 (Brescovit 1997: figs 7–8, 11–13), but differ from these species by the ventral tegular projection tip being flat and squared, the slightly curved median apophysis, and the retrolateral tegular projection margin not overlapping the median apophysis (Figs 4A–D, 5A, D). Females of this species are differentiated from those of *A. inferens* (Platnick & Lau 1975: figs 115–116; Brescovit 1992: figs 1–2, 1997: figs 9–10) by the acute posterior edge of the epigynal midpiece and the atrium lateral borders being longer and less curved (Figs 4E–F, 5E–F).

Etymology

The species epithet is dedicated to Natacha Merritt, friend of the authors and a taxonomy supporter.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 4–17 Feb. 2014; Arcanolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01532.

Allotype

MEXICO • ♂; same locality as for holotype; 2–11 Oct. 2013; BEAT; CNAN-T01516.

Paratypes

MEXICO • 2 ♀♀, 1 ♂; same collection data as for allotype; CNAN-T01562.

Additional material

MEXICO • 1 ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; Arcanolab team leg.; oak and tropical wet forest fragment; LUP • 19 ♀♀, 2 ♂♂; same collection data as for preceding; 2–11 Oct. 2013; BEAT • 2 ♂♂; same collection data as for preceding • 2 ♂♂; same collection data as for preceding; ANYM067 • 2 ♂♂; same collection data as for preceding; ANYM068 • 4 ♀♀; same collection data as for preceding; ANYM072 • 3 ♀♀; same collection data as for preceding; CRP • 5 ♀♀, 2 ♂♂; same collection data as for preceding; LUP • 3 ♀♀; same collection data as for preceding; 4–17 Feb. 2014; BEAT • 1 ♀; same collection data as for preceding; CRP • 1 ♀; Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; LUP • 21 ♀♀, 2 ♂♂; same collection data as for preceding; 2–11 Oct. 2013; BEAT • 3 ♀♀; same collection data as for preceding; ANYM071 • 1 ♂, expanded palp; same collection data as for preceding; PXF302 • 3 ♀♀; same collection data as for preceding; LUP • 4 ♀♀; same collection data as for preceding; 4–17 Feb. 2014; LUP

Description

Female

Total length 4.88. Carapace light yellow, pattern with light brown longitudinal marks over the ocular quadrangle, same pattern but darker delineating cephalic area and center, two dark longitudinal bands from ocular quadrangle lateral sides, around thoracic area and carapace margins, clypeus light yellow (Fig. 3A, D). Sternum yellow, darker at margins, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites dark yellow, rectangular, slightly broader at tip (Fig. 3C). Chelicerae darker than cephalothorax, paturon dorsal surface with brown reticulated pattern (Fig. 3D), promargin with four teeth, retromargin with seven to eight denticles. Leg coloration: light yellow with scattered brown patches irregularly distributed from femora to tarsi (Fig. 3A–C). Abdomen light yellow, homogenously covered with brown patches concentrated in transverse chevrons over posterior central line, ventral surface with clear rectangle and dark longitudinal midline cut by tracheal spiracle at center

Fig. 3. *Anyphaena natachae* sp. nov., paratypes (CNAN-T01562). **A**. ♀, dorsal habitus. **B**. ♀, lateral habitus. **C**. ♀, ventral habitus. **D**. ♀, prosoma, anterior view. **E**. ♂, prosoma, anterior view. **F**. ♂, prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

of abdomen (Fig. 3A–C). Epigynum atrium longer than wide, delineated by slightly curved sclerotized borders. Hood elliptical, wider than long. Midpiece same width as hood, rectangular, posterior half tapering. Copulatory openings inside atrium posterior margins. Copulatory ducts hook-shaped, entering posterior margins of spermathecae. Fertilization ducts entering spermathecae dorsal to copulatory ducts. Seminal receptacles curved and near posterior atrium border (Figs 4E–F, 5E–F). Cephalothorax length 2.23, thoracic width 1.61, cephalic width 1.12. Clypeus height 0.09. Eye diameters: AME 0.09, ALE 0.12, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.09, AME–ALE 0.04, ALE–PLE 0.09, PME–PME 0.17, PME–PLE 0.11. Femur lengths: I 1.71, II 1.63, III 1.41, IV 1.83. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v3-2-2, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-0-1, r0-0-1. Tibia II v2-2-1, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v1-1-2, p1-1-0, r1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v1-1-2, p1-1-0, r1-1-0. Metatarsus IV v1-1-2, p1-1-2, r1-1-2.

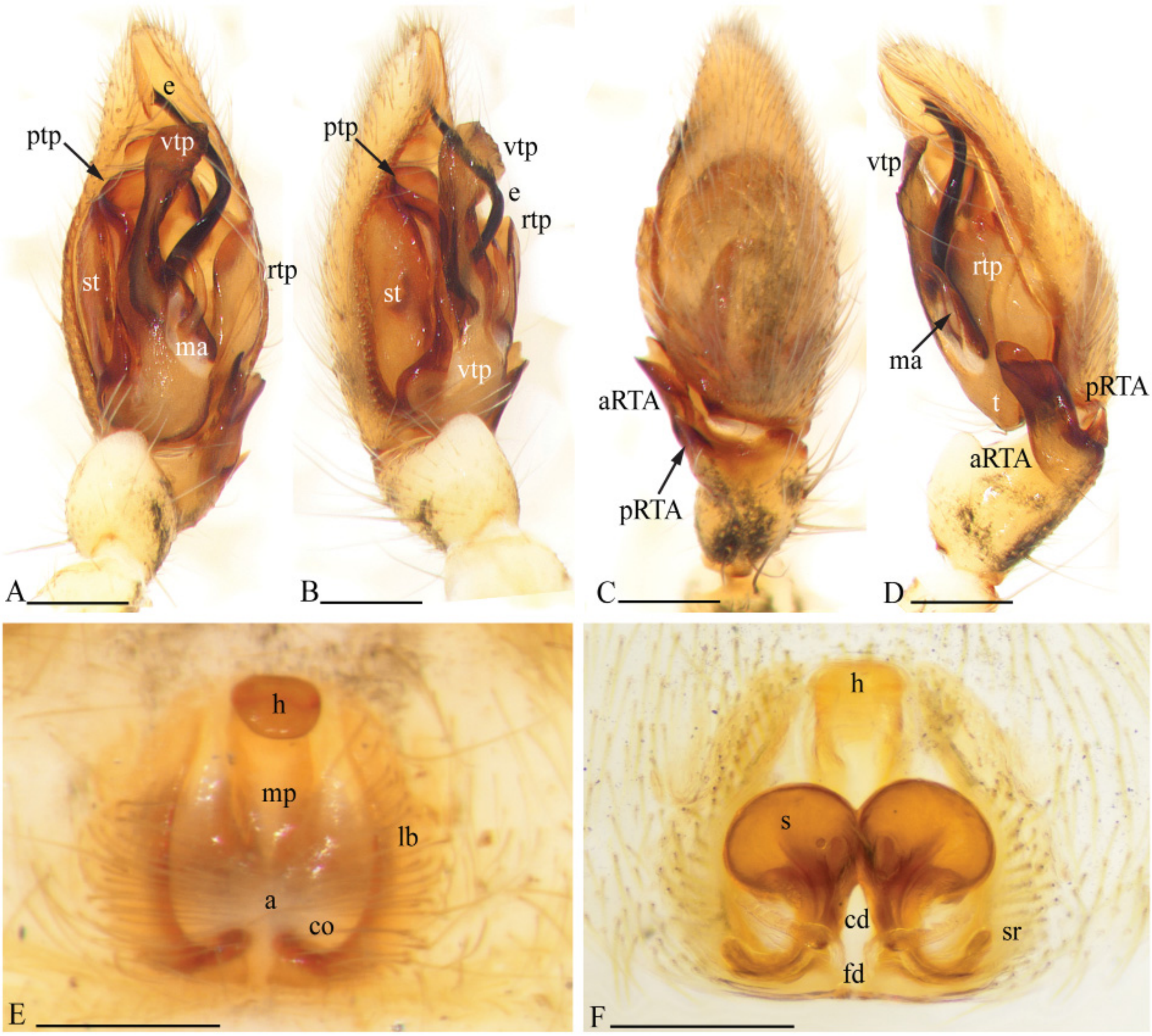

Fig. 4. *Anyphaena natachae* sp. nov., paratypes (CNAN-T01562). **A**. ♂, pedipalp, ventral view. **B**. ♂, pedipalp, prolateral view. **C**. ♂, pedipalp, dorsal view. **D**. ♂, pedipalp, retrolateral view. **E**. ♀, epigynum, ventral view. **F**. ♀, epigynum, dorsal view. Scale bars: 0.2 mm.

Male

Total length 4.68. Cephalothorax and abdomen reticulated patterns as in female, coloration dark brown (Fig. 3E). All coxae covered with scattered setae (Fig. 3F). Chelicerae promargin with six teeth, retromargin with eight to nine denticles. Pedipalp ventral tegular projection straight, tip roughly rectangular (Figs 1A, 4A–B, 5A–B). Prolateral tegular projection curved and surrounding ventral tegular projection (Figs 1A–B, 4A–B, 5A–B). Retrolateral tegular projection enclosing other two tegular apophyses, ventral margin straight (Figs 1A–B, 4A, D, 5A, D). Median apophysis slightly curved and projected apically (Figs 4A, 5A). Embolus black, thicker than median apophysis, and coiling towards

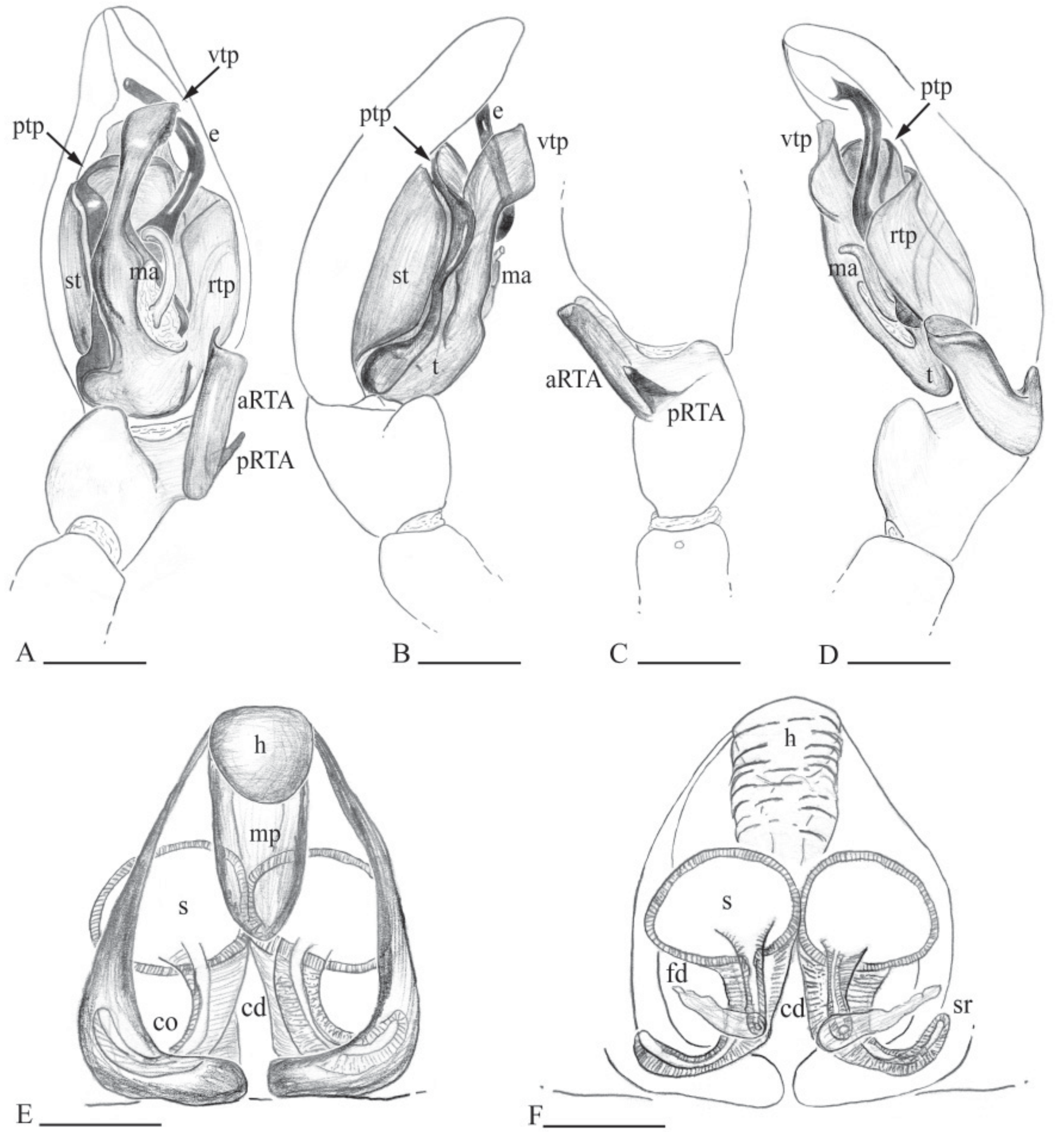

Fig. 5. *Anyphaena natachae* sp. nov., paratypes (CNAN-T01562). **A**. ♂, pedipalp, ventral view. **B**. ♂, pedipalp, prolateral view. **C**. ♂, pedipalp, dorsal view. **D**. ♂, pedipalp, retrolateral view. **E**. ♀, epigynum, ventral view. **F**. ♀, epigynum, dorsal view. Scale bars: A–D = 0.2 mm; E–F = 0.1 mm.

apex (Figs 1A–B, 4A, 5A). RTA anterior branch flat, curved and longer than wide, RTA posterior branch single, spine-shaped and located at base (Figs 4C–D, 5A, C–D). Prolateral apophysis absent (Figs 4B–C, 5BC). Pedipalp tibia slightly longer than wide, ventral surface with large white tubercle at base (Figs 4A–D, 5A–D). Cephalothorax length 2.26, thoracic width 1.71, cephalic width 0.93. Clypeus height 0.07. Eye diameters: AME 0.09, ALE 0.12, PME 0.11, PLE 0.12. Eye interdistances: AME–AME 0.05, AME–ALE 0.01, ALE–PLE 0.06, PME–PME 0.13, PME–PLE 0.8. Femur lengths: I 2.37, II 2.15, III 1.78, IV 2.29. Leg spination as in female.

Variation

Females (N = 10): total length 4.69 (± 0.5), cephalothorax length 2.15 (± 0.07), thoracic width 1.57 (± 0.05), cephalic width 1.07 (± 0.05), femur I 1.69 (± 0.04). Males (N = 10): total length 4.44 (± 0.19), cephalothorax length 2.15 (± 0.09), thoracic width 1.67 (± 0.05), cephalic width 0.91 (± 0.03), femur I 2.23 (± 0.09).

Distribution

This species is found in oak mixed with tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present year-round.

Anyphaena adnani sp. nov.

urn:lsid:zoobank.org:act:44F20A0E-E32D-43DC-B7B2-1AE4AA62AC21

Figs 2A–B, 6–8, 52

Differential diagnosis

Males of *A. adnani* sp. nov. have the RTA anterior and posterior branches similar to those of *A. bromelicola* Platnick, 1977 (Platnick 1977: figs 5–6), but differ from this species by the sharper point of the RTA anterior branch and the ventral tegular projection tip acute and being less curved (Figs 7A, D, 8A, D). Females of this species are differentiated from those of *A. bromelicola* (Platnick 1977: figs 7–8) by the flattened hood, shorter midpiece, and wider atrium (Figs 7E, 8E).

Etymology

The species epithet is dedicated to Dr Adnan Selimovic, friend of the authors and taxonomy supporter.

Material examined

Holotype

MEXICO • ♂; Veracruz, Calcahualco, Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 4–17 Feb. 2014; Arcanolab team leg.; oak and tropical wet forest fragment; BEAT; CNAN-T01522.

Allotype

MEXICO • ♀; same locality as for holotype, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; BEAT; AR_084; GenBank: ON619641; CNAN-T01499.

Paratypes

MEXICO • 2 ♀♀; same collection data as for allotype; CNAN-T01543 • 2 ♂♂; same collection data as for allotype; CNAN-T01544 • 1 ♂; same collection data as for allotype; LUP; CNAN-T01545 • 2 ♀♀; same collection data as for holotype; 19–27 Apr. 2013; CNAN-T01546.

Additional material
MEXICO • 3 ♀♀; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT • 2 ♀♀; same collection data as for preceding; ANYM057 • 2 ♀♀, 1 ♂; same collection data as for preceding; CRP • 1 ♂; same collection data as for preceding; LUP; ANYM064 • 2 ♀♀; same collection data as for preceding; 4–17 Feb. 2014; BEAT • 3 ♀♀; same collection data as for preceding; Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT • 3 ♀♀, 1 ♂; same collection data as for preceding; ANYM060 • 1 ♂; same collection data as for preceding; ANYM063 • 1 ♀; same collection data as for preceding; CRP • 3 ♀♀; same collection data as for preceding; LUP • 1 ♂; same collection data as for preceding; AR_0811; GenBank: ON619640 • 1 ♀; same collection data as for preceding; ANYM059 • 1 ♀; same collection

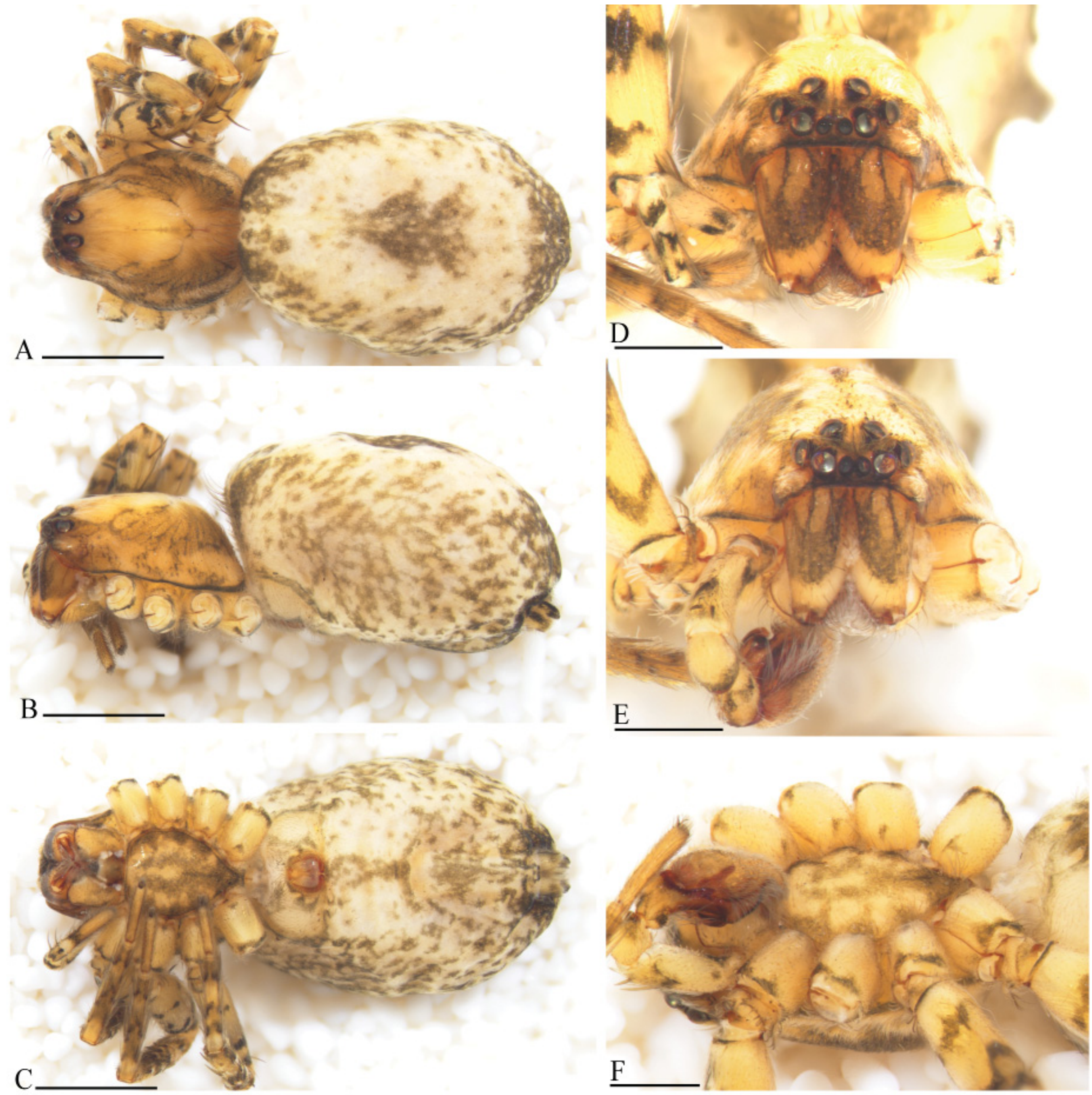

Fig. 6. *Anyphaena adnani* sp. nov. **A**–**D**. Paratype, ♀ (CNAN-T01546). **E**–**F**. Paratype, ♂ (CNAN-T01545). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

data as for preceding; 4–17 Feb. 2014; BEAT • 1 ♂; same collection data as for preceding; AR_081; GenBank: ON619640 • 2 ♀♀; same collection data as for preceding; ANYM058 • 1 ♂; same collection data as for preceding; ANYM065 • 1 ♀; same collection data as for preceding; CRP.

Description

Female

Total length 4.15. Carapace yellow, pattern with brown longitudinal bands around cephalic area extending over most of thoracic area and clypeus (Fig. 6A, D). Sternum surface yellow, covered with brown patches, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, slightly broader at tip (Fig. 6C). Chelicerae dark yellow, paturon covered with brown patches (Fig. 6B, D), promargin with four teeth, retromargin with six to seven denticles. Leg coloration: light yellow with scattered brown patches irregularly distributed from femora to tarsi (Fig. 6A–C). Abdomen white, hirsute, dorsal surface with two central brown chevrons, lateral and ventral surfaces white, covered with isolated dark patches, ventral surface with clear rectangle and dark longitudinal

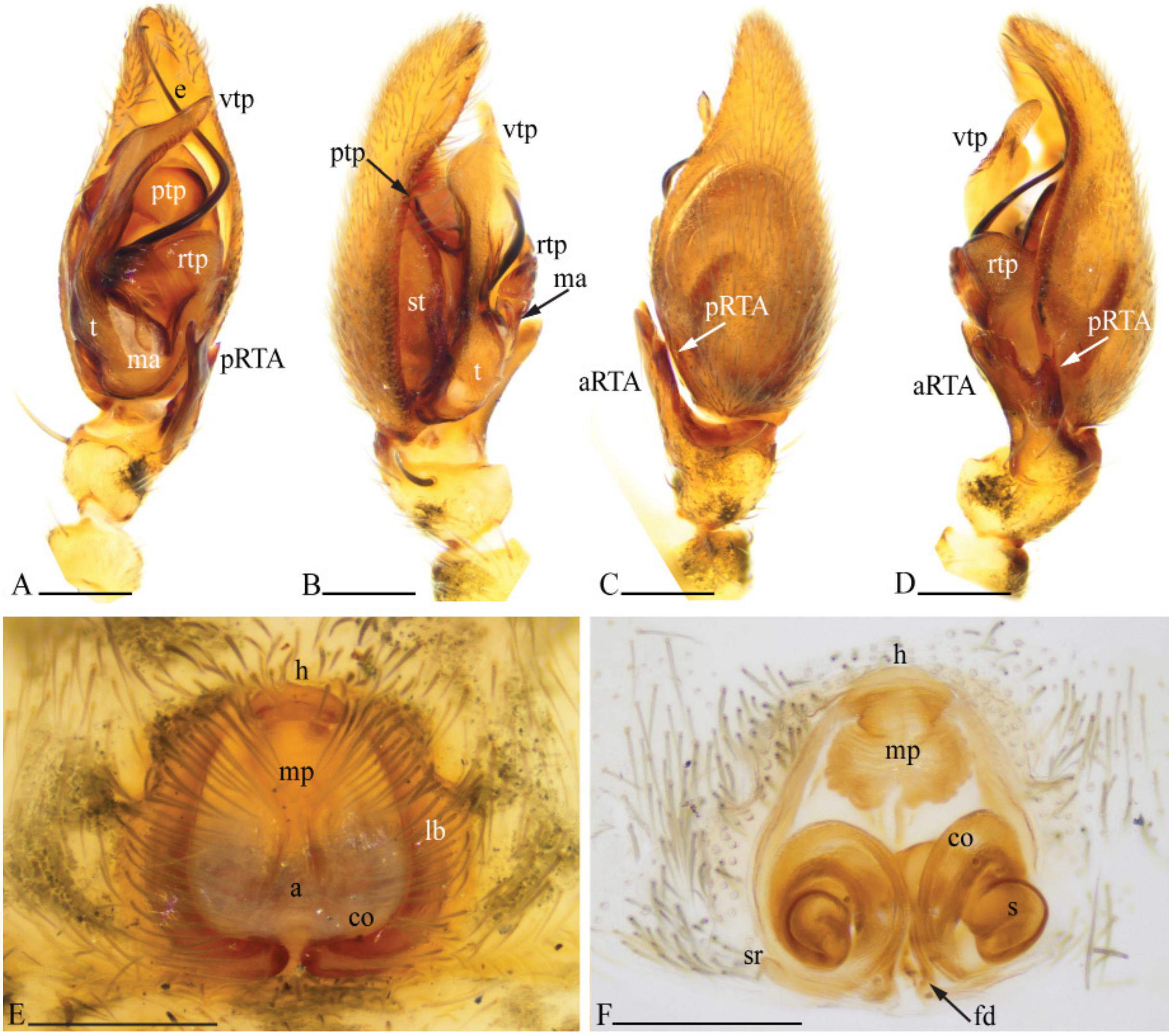

Fig. 7. *Anyphaena adnani* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01545).**E–F**. Paratype, ♀ (CNAN-T01546). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

midline cut by tracheal spiracle at center of abdomen (Fig. 6A–C). Epigynum atrium rectangular, slightly longer than wide, delineated by almost straight sclerotized borders. Hood flattened, midpiece semicircular. Copulatory openings inside atrium posterior border (Figs 7F, 8F). Copulatory ducts coiled 360° around spermathecae, entering dorsal surface of spermathecae. Spermathecae dorsally projected. Fertilization ducts entering central margins of spermathecae and partially covered by copulatory ducts.

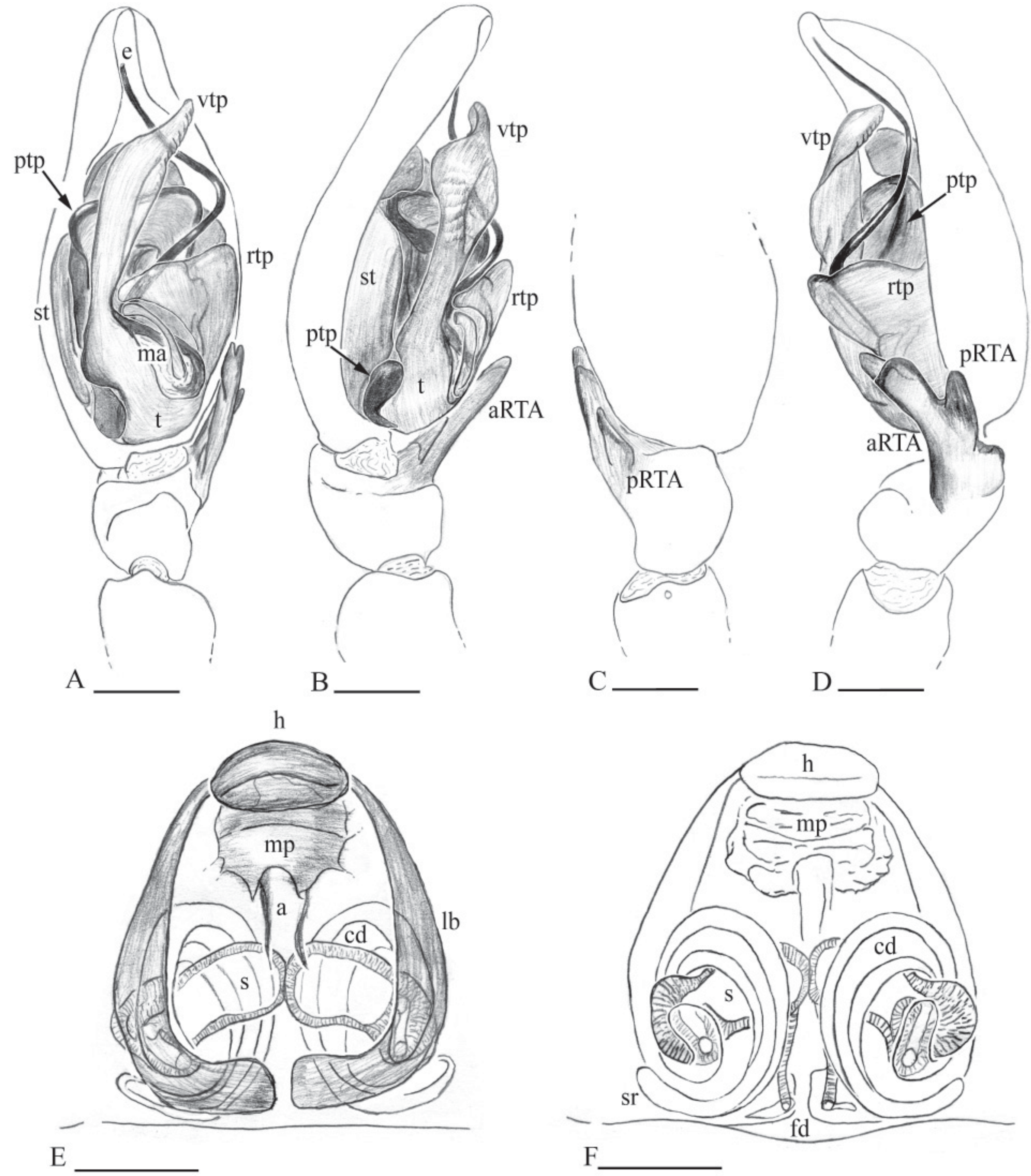

Fig. 8. *Anyphaena adnani* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01545). **E–F**. Paratype, ♀ (CNAN-T01546). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–D = 0.2 mm; E–F = 0.1 mm.

Seminal receptacles curved and near posterior atrium border (Fig. 8E–F). Cephalothorax length 1.81, thoracic width 1.32, cephalic width 0.85. Clypeus height 0.07. Eye diameters: AME 0.06, ALE 0.1, PME 0.09, PLE 0.1. Eye interdistances: AME–AME 0.04, AME–ALE 0.04, ALE–PLE 0.06, PME–PME 0.2, PME–PLE 0.07. Femur lengths: I 1.29, II 1.22, III 1.15, IV 1.46. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v2-2-2, p1-1-1, r1-1-1. Metatarsus I v2-2-2, p1-1-1, r1-1-1. Femur II d1-1-1, p0-0-1, r0-0-1. Tibia II v2-2-2, p1-1-1, r1-1-1. Metatarsus II v2-2-2, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v1-1-2, p1-1-0, r1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v1-1-2, p1-1-1, r1-1-1. Metatarsus IV v2-1-2, p1-1-2, r1-1-2.

Male

Total length 4.2. Cephalothorax (Fig. 6E) and abdomen coloration as in female. Ventral surface of coxa smooth (Fig. 6F). Pedipalp ventral tegular projection straight, tip narrow and slightly curved (Figs 7A, 8A). Prolateral tegular projection curved and dorsally surrounding ventral tegular projection (Figs 7A–B, 8A–B). Retrolateral tegular projection enclosing other two tegular apophyses, ventral margin projected over median apophysis. Medial apophysis slightly curved, projected towards prolateral tegulum edge (Figs 7A, 8A). Embolus very sclerotized, same width as median apophysis, and coiling towards apex (Figs 7A–B, 8A, D). RTA anterior branch flat, curved and longer than wide, RTA posterior branch length almost half that of anterior branch, basal spine with small sharp point (Figs 7D, 8D). Prolateral apophysis absent (Figs 7B–C, 8B–C). Pedipalp tibia slightly longer than wide, with small white tubercle on basal ventral surface (Figs 7A, D, 8A, D). Cephalothorax length 2.1, thoracic width 1.58, cephalic width 0.9. Clypeus height 0.09. Eye diameters: AME 0.09, ALE 0.12, PME 0.09, PLE 0.07. Eye interdistances: AME–AME 0.03, AME–ALE 0.01, ALE–PLE 0.05, PME–PME 0.18, PME–PLE 0.09. Femur lengths: I 1.95, II 1.66, III 1.46, IV 1.95. Leg spination as in female except: femur I p0-1-2. Tibia I v2-2-1. Femur II p0-1-2. Tibia II v2-2-1. Tibia III p1-1-1, r1-1-1. Metatarsus IV v2-2-2.

Variation

Females (N = 10): total length 4.17 (± 0.39), cephalothorax length 1.79 (± 0.08), thoracic width 1.34 (± 0.07), cephalic width 0.86 (± 0.03), femur I 1.32 (± 0.06). Males (N = 10): total length 4.13 (± 0.11), cephalothorax length 1.94 (± 0.1), thoracic width 1.53 (± 0.06), cephalic width 0.86 (± 0.03), femur I 1.57 (± 0.13).

Distribution

This species is found in oak mixed with tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present all year-round.

Anyphaena fernandae sp. nov.

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Figs 9, 18A–B, 52

Differential diagnosis

Females of *A. fernandae* sp. nov. are differentiated from those of *A. autumna* Platnick, 1974 (Platnick 1974: figs 39, 45) and the other species of the *celer* group by the following features: ellipsoid hood, wider than long, midpiece rhomboidal and tapering posteriorly, spermathecae wider than long, and short copulatory ducts (Figs 9E–F, 18A–B).

Etymology

The species epithet is dedicated to Fernanda Lia Rivera, sister of the first author.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 4–14 Oct. 2012; Arcanolab team leg.; oak forest fragment; BEAT; CNAN-T01526.

Description

Female

Total length 5.5. Carapace yellow, more sclerotized over ocular area, pattern with brown longitudinal bands around cephalic area extending to thoracic area and clypeus (Fig. 9A, D). Sternum surface yellow, margins darker, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide.

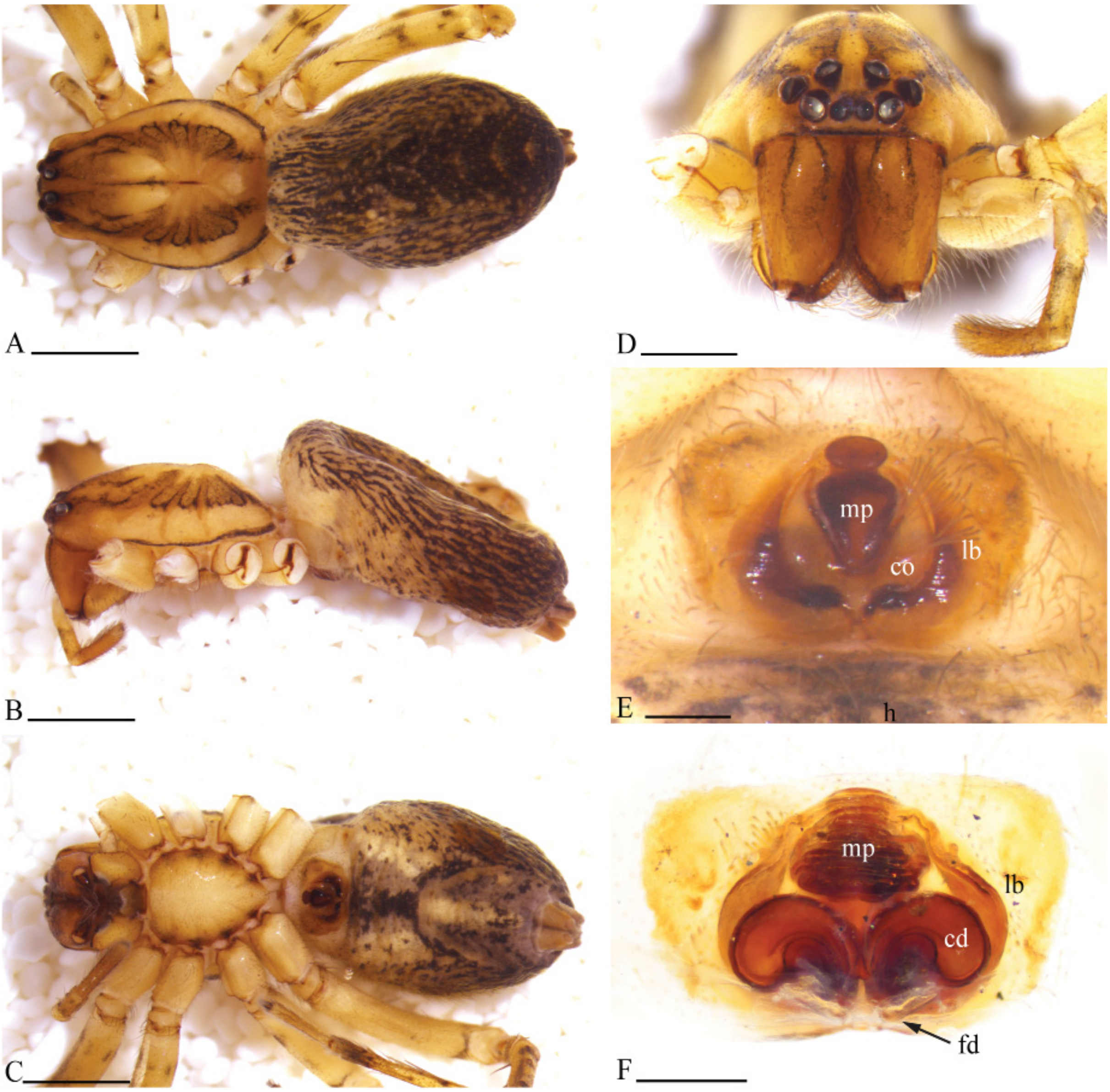

Fig. 9. *Anyphaena fernandae* sp. nov., holotype, ♀ (CNAN-T01526). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Endites yellow, rectangular, slightly broader at tip (Fig. 9C). Chelicerae slightly dark yellow, paturon dorsal surface covered with two darker lines (Fig. 9B, D), promargin with four teeth, retromargin with eight to nine denticles. Leg coloration: yellow with scattered brown patches irregularly distributed from femora to tarsi (Fig. 9A–C). Abdomen dark brown, dorsal surface with four central darker chevrons, lateral and ventral surfaces yellow, covered with reticulated dark lines, ventral surface with clear rectangle and dark longitudinal midline cut by tracheal spiracle at center of abdomen (Fig. 9A–C). Epigynum atrium wider than long, delineated by curved sclerotized lateral borders. Copulatory openings inside posterior margins of atrium (Fig. 9E–F). Copulatory ducts short and comma-shaped, entering spermathecae ventrally. Fertilization ducts entering spermathecae dorsally. Seminal receptacles not visible (Fig. 18A–B). Cephalothorax length 2.26, thoracic width 1.61, cephalic width 1.05. Clypeus height 0.09. Eye diameters: AME 0.07, ALE 0.13, PME 0.11, PLE 0.13. Eye interdistances: AME–AME 0.05, AME–ALE 0.02, ALE–PLE 0.06, PME–PME 0.15, PME–PLE 0.11. Femur lengths: I 1.95, II 1.76, III 1.46, IV 2.05. Leg spination: femur I d1-1-1, p0-0-2, r0-0-0. Tibia I v2-1-1, p1-1-1, r0-0-1. Metatarsus I v2-2-0, p1-1-0, r1-1-0. Femur II d1-1-1, p0-0-2, r0-0-0. Tibia II v2-1-1, p1-1-1, r0-0-1. Metatarsus II v2-2-0, p1-1-0, r1-1-0. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v2-2-2, p1-1-0, r1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-0, r1-1-0. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Unknown.

Variation

Only type specimen known.

Distribution

Only known from the type locality (Fig. 52).

Natural history

Collected by beating vegetation.

Pacifica **group**

Diagnosis

The *pacifica* group can be separated from other species groups of *Anyphaena* by the following characters.

Males

Both of the species described here show modifications in the venter of coxae II, III and IV (Figs 12E–F, 15E–F). Coxae II show a small and relatively inconspicuous bump. Coxae III and IV have fully developed ventral spurs. The palp of the *pacifica* group shows a morphology similar to that of the *pectorosa* and *porta* groups. It can be separated from both by the large dorsal cymbium bulge, and the larger RTA posterior branch that projects dorso-laterally (Figs 11A, C–D, 14A, C–D).

Females

Both new species differ from other *Anyphaena* by having an enlarged epigynal plate bulging anteriorly (Figs 10F, 13F). This enlarged plate shows two sclerotized spots that might serve as an anchor point for male palp structures; the spermathecae are usually oval to spherical (Figs 11E–F, 12G–H, 14E–F, 15G–H).

Anyphaena triangularis sp. nov.
urn:lsid:zoobank.org:act:99F21C7F-3CC1-413F-9269-57931511CE81
Figs 10–12, 52

Differential diagnosis

The epigynal plate in *A. triangularis* sp. nov. is broad, more than two thirds of the epigastric furrow length, anteriorly projected and ventrally distended, epigynum anterior projection with two deep comma-shaped pits (Figs 10C, F, 11E–F, 12G (arrow), H). Similar epigyna are found in *A. urieli* sp. nov., but they differ by the flatter anterior projection and copulatory duct paths. Males of *A. triangularis* sp. nov. are differentiated from those of *A. urieli* sp. nov. by their larger cymbium basal projection (Figs 11C, 12C (arrow)), ventral tegular projection retrolateral margin without a translucent section, median apophysis distal hook smaller, the RTA posterior branch wider, and the coxa II tubercle larger (Figs 11A–D, 12A–F).

Etymology

The species epithet refers to the triangular shape of the epigynal plate in ventral view.

Material examined

Holotype

MEXICO • ♀; San Luis Potosi, Xilitla City, Las Pozas; 21.39722° N, 98.99388° W; alt. 662 m; 10–15 Jun. 2012; Aracnolab team leg.; tropical wet forest fragment; BEAT; CNAN-T01541.

Allotype

MEXICO • ♂; same collection data as for holotype; CNAN-T01520.

Paratypes

MEXICO • 1 ♀; same collection data as for holotype; LUP; CNAN-T01579 • 1 ♀; same collection data as for holotype; CNAN-T01580 • 1 ♂; same collection data as for holotype; CNAN-T01577 • 1 ♂; same collection data as for holotype; CNAN-T01578.

Additional material

MEXICO • 3 ♂♂; San Luis Potosi, Xilitla City, Las Pozas; 21.39722° N, 98.99388° W; alt. 662 m; 10–15 Jun. 2012; Aracnolab team leg.; tropical wet forest fragment; BEAT • 1 ♀; same collection data as for preceding; ANYM085 • 1 ♂; same collection data as for preceding; CRP • 1 ♀; same collection data as for preceding; ANYM086 • 1 ♀; same collection data as for preceding; ANYM087 • 3 ♂♂; same collection data as for preceding; LUD • 2 ♀♀; same collection data as for preceding; ANYM090 • 2 ♂♂; same collection data as for preceding; ANYM091 • 4 ♂♂; same collection data as for preceding; ANYM092 • 5 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM088 • 1 ♀; same collection data as for preceding; ANYM089 • 1 ♀; same collection data as for preceding; 27–31 Jul. 2011; CRP; AR_002; GenBank: ON619642.

Description

Female

Total length 6.9. Carapace yellow, ocular area slightly darker, pattern with two darker longitudinal brown parallel bands around cephalic area and fovea, clypeus dark yellow (Fig. 10A, D). Sternum surface white, intercoxal triangles present on all legs. Labium yellow, white at tip, longer than wide. Endites yellow, rectangular, slightly broader at tip (Fig. 10C). Chelicerae dark yellow, paturon dorsum without pattern (Fig. 10B, D), promargin with five teeth, retromargin with eleven to twelve denticles. Leg coloration: yellow covered with darker patches from femora to tarsi. Abdomen yellow, hirsute, dorsal surface delineated with light brown pattern and several chevrons over posterior half, anterior central half with darker median band, lateral surfaces light brown pattern only at top, lateral sides and ventral surface white, tracheal spiracle at middle (Fig. 10A–C). Copulatory openings under semicircular and sclerotized hood. Hood with straight edge slightly projected at center. Atrium short, lateral borders sinuous, extended in posterior region (Figs 11E–F, 12G–H). Copulatory ducts sclerotized, short, entering spermathecae on anterior surfaces. Seminal receptacles rounded and located in anterior third of copulatory ducts. Fertilization ducts short, straight, and emerging from lateral surfaces of spermathecae (Figs 11E–F, 12G–F). Cephalothorax length 2.93, thoracic width 2.1, cephalic width 0.97. Clypeus height 0.09. Eye diameters: AME 0.07, ALE 0.13, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.07, AME–ALE 0.04, ALE–PLE 0.06, PME–PME 0.12, PME–PLE 0.09. Femur lengths: I 3.38, II 3.05, III 2.29, IV 3.43. Leg spination: femur I d1-1-1, p0-2-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1.

Fig. 10. *Anyphaena triangularis* sp. nov. **A–D, F**. Paratype, ♀ (CNAN-T01579). **E**. Paratype, ♂ (CNAN-T01577). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Epigynum, lateral view. Scale bars: A–C = 1.0 mm; D–E = 0.5 mm; F = 0.2 mm.

Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 6.9. Cephalothorax and abdomen coloration as in female (Fig. 10E). Retromargin of chelicerae with seven to eight denticles. Coxa III tubercle roughly rectangular with posterior apical spine. Coxa IV with a long, curved spur, located at retrolateral basal corner (Fig. 12E–F). Ventral tegular apophysis bifurcated (Fig. 12A (arrow)). Median apophysis hook-shaped in ventral view. Embolus long, translucent and filiform (Figs 11A, D, 12A, D). RTA anterior branch curved with sclerotized margin, posterior branch of RTA large, distal edge with translucent keel (Figs 11A, C–D, 12A, C–D). Prolateral apophysis of palpal tibia small, conical (Figs 11B–C, 12B–C). Pedipalp tibia proportions longer than wide, stridulatory ridges extending from ventral branch of median tegular apophysis to tibial distal margin (Figs 11A–B, D, 12A–B, D). Cephalothorax length 2.78, thoracic width 2.15, cephalic width

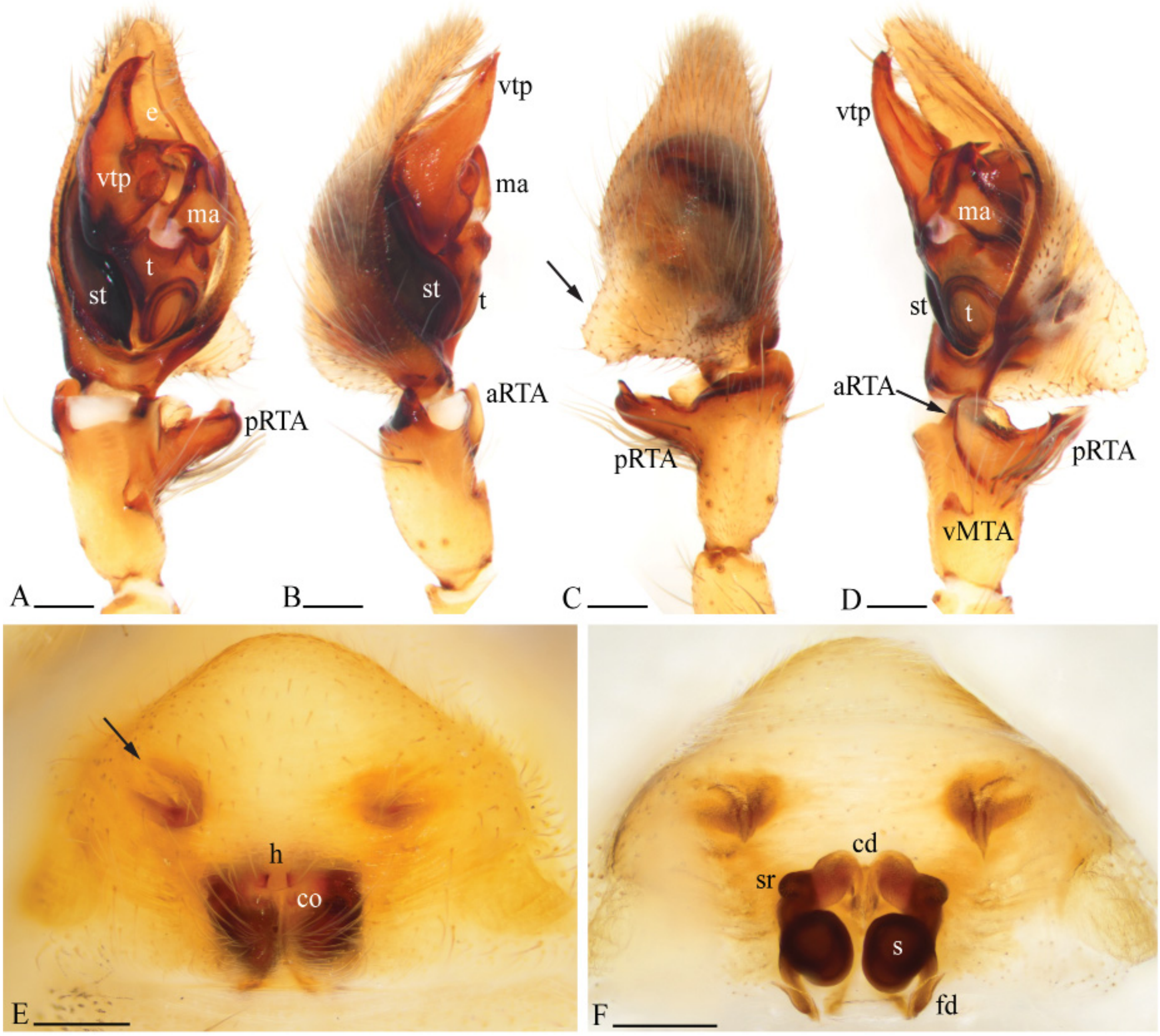

Fig. 11. *Anyphaena triangularis* sp. nov. **A**–**D**. Paratype, ♂ (CNAN-T01577). **E**–**F**. Paratype, ♀ (CNAN-T01579). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

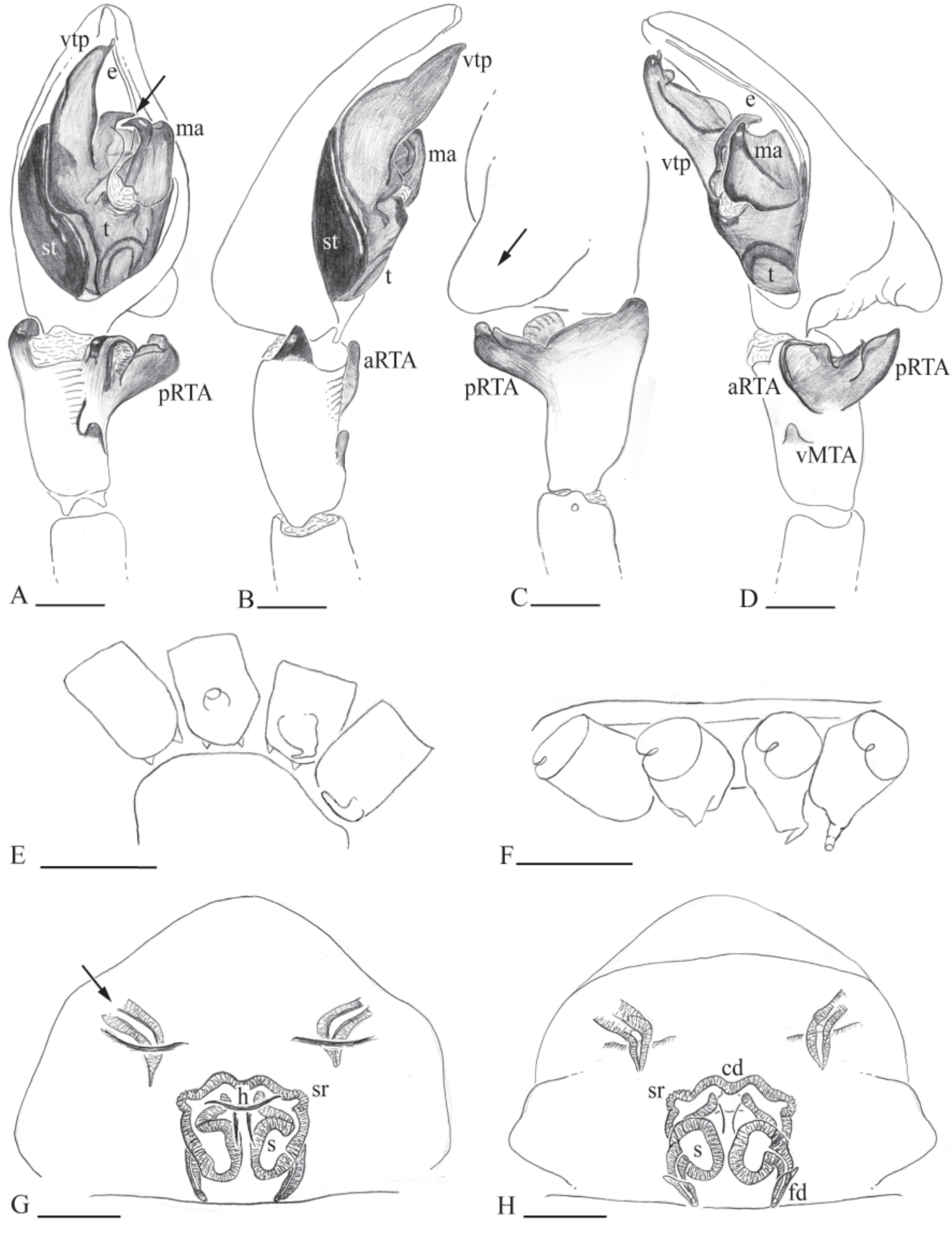

Fig. 12. *Anyphaena triangularis* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01577). **G–H**. Paratype, ♀ (CNAN-T01579). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

0.97. Clypeus height 0.11. Eye diameters: AME 0.09, ALE 0.16, PME 0.16, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.05, PME–PME 0.1, PME–PLE 0.09. Femur lengths: I 3.52, II 3.19, III 2.38, IV 3.57. Leg spination as in female except: femur IV r0-1-1.

Variation

Females (N = 10): total length 6.94 (± 0.36), cephalothorax length 2.73 (± 0.11), thoracic width 2.06 (± 0.07), cephalic width 1.12 (± 0.06), femur I 3.32 (± 0.12). Males (N = 10): total length 6.66 (± 0.26), cephalothorax length 2.74 (± 0.1), thoracic width 2.19 (± 0.1), cephalic width 1.06 (± 0.06), femur I 3.6 (± 0.06).

Distribution

This species is found in primary tropical wet forest fragments (Fig. 52).

Natural history

Most specimens were collected over vegetation by beating, direct searching and cryptic search on the ground.

Anyphaena urieli sp. nov.

urn:lsid:zoobank.org:act:82E29AF5-6DE2-4561-B7F1-4B88170DBDF6

Figs 1D–F, 13–15, 52

Differential diagnosis

The epigynal plate in *A. urieli* sp. nov. is broad, more than two thirds of epigastric furrow length, globular, anteriorly projected and ventrally compressed (Figs 13C, F, 14E–F), epigynum anterior half with two deep pits (Figs 14E (arrow), F, 15G (arrow), H). Similar epigyna are found in *A. triangularis* sp. nov., but differ from those in *A.urieli* sp. nov. by their anterior projection being ventrally distended, the shape of the anterior pits, and the path of the copulatory ducts extremely short (Figs 14A–B, 15G–H). Males of *A. urieli* sp. nov. are differentiated from those of related species by their ventral tegular projection base being bifurcated with a process shaped like a bird head (Figs 14A, 15A (arrows)), and from *A. triangularis* sp. nov. by the smaller basal projection of the cymbium (Figs 14C–D, 15D (arrows)), the ventral tegular projection of the retrolateral margin with a transparent cuticular edge, the narrower RTA posterior branch (Figs 14A, C–F, 15A, C–F), and the smaller coxa II tubercle (Fig. 15E–F).

Etymology

The species epithet is dedicated to Uriel Garcilazo-Cruz, Mexican arachnologist, and former member of the second author's lab.

Material examined

Holotype

MEXICO • ♀; Veracruz, San Andres Tuxtla, Estación de Biología Tropical Los Tuxtlas IB-UNAM; 18.58225° N, 95.07558° W; alt. 217–172 m; 16–22 May 2016; Aracnolab team leg.; primary tropical wet forest; LUP; CNAN-T01542.

Allotype

MEXICO • ♂; same collection data as for holotype; 20–27 Nov. 2017; CNAN-T01521.

Paratypes

MEXICO • 1 ♂, 1 ♀; same collection data as for allotype; BEAT; CNAN-T01582 • 1 ♀; same collection data as for holotype; BEAT; CNAN-T01581.

Additional material

MEXICO • 3 ♀♀, 2 ♂♂; Veracruz, San Andres Tuxtla, Estación de Biología Tropical Los Tuxtlas IB-UNAM; 18.58225° N, 95.07558° W; alt. 217–172 m; 16–22 May 2016; Aracnolab team leg.; primary tropical wet forest; BEAT • 1 ♀; same collection data as for preceding; ANYM073 • 1 ♀; same collection data as for preceding; ANYM074 • 2 ♂♂; same collection data as for preceding; ANYM083 • 1 ♀, 1 ♂; same collection data as for preceding; LUD • 1 ♀; same collection data as for preceding; LUP; ANYM077 • 1 ♂; same collection data as for preceding; ANYM080 • 1 ♂; same collection data as for preceding; ANYM081 • 3 ♂♂; same collection data as for preceding; ANYM084 • 3 ♀♀, 1 ♂; same collection data as for preceding • 1 ♀; same collection data as for preceding; ANYM075 • 1 ♀, 1 ♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM078 • 1 ♀, 2 ♂♂; same collection data as for preceding; 20–27 Nov. 2017; BEAT • 2 ♀♀; same collection data as for preceding; ANYM076 • 1 ♂; same collection data as for preceding; ANYM082 • 2 ♀♀, 1 ♂;

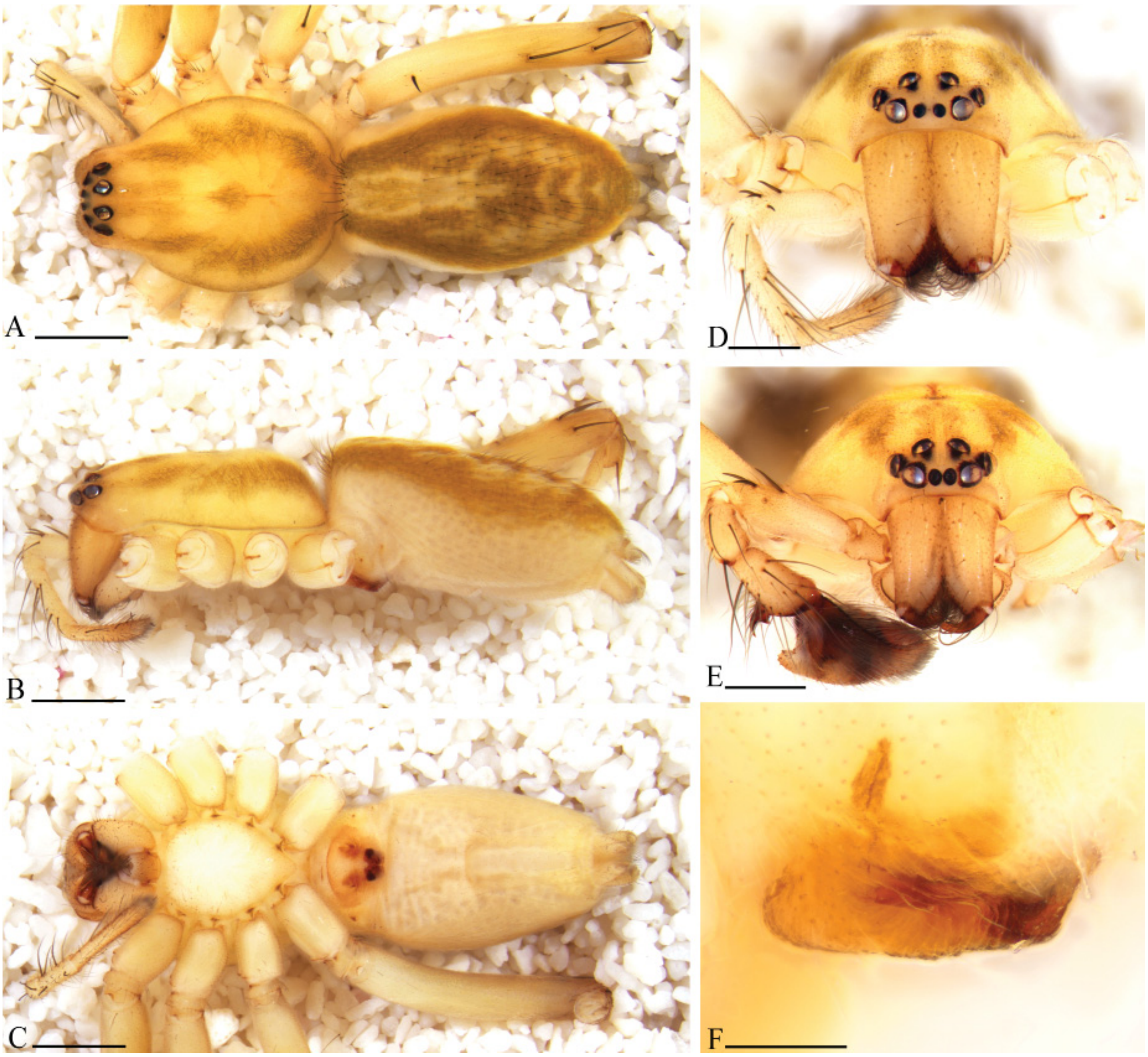

Fig. 13. *Anyphaena urieli* sp. nov. **A–D**. Holotype, ♀ (CNAN-T01542). **E**. Paratype, ♂ (CNAN-T01582). **F**. Paratype, ♀ (CNAN-T01581). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Epigynum, lateral view. Scale bars: A–C = 1.0 mm; D–E = 0.5 mm; F = 0.2 mm.

same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM079 • 1 ♀, 2 ♂♂; same collection data as for preceding; 9–16 Feb. 2018; BEAT • 4 ♂♂; same collection data as for preceding; LUP.

Description

Female

Total length 5.0. Carapace yellow, ocular area slightly darker, pattern with two darker longitudinal brown parallel bands around cephalic area and fovea, clypeus yellow (Fig. 13A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, slightly broader at tip (Fig. 13C). Chelicerae yellow, paturon dorsum without pattern (Fig. 13B, D), promargin with five teeth, retromargin with eight to nine denticles. Leg coloration: yellow, darker from distal section of femora to tarsi. Abdomen yellow, hirsute, dorsal pattern brown,

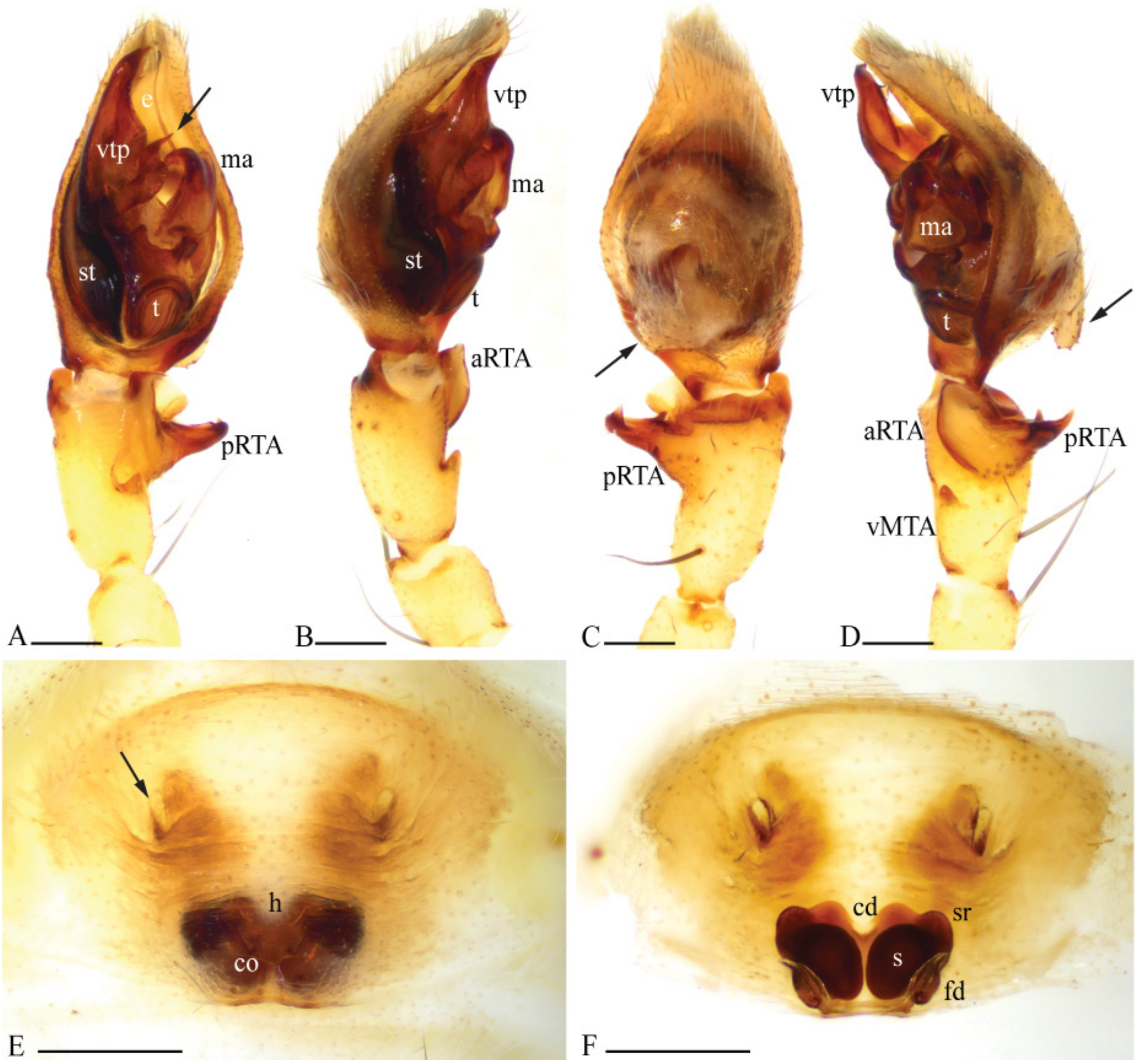

Fig. 14. *Anyphaena urieli* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01582). **E–F**. Paratype, ♀ (CNAN-T01581). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

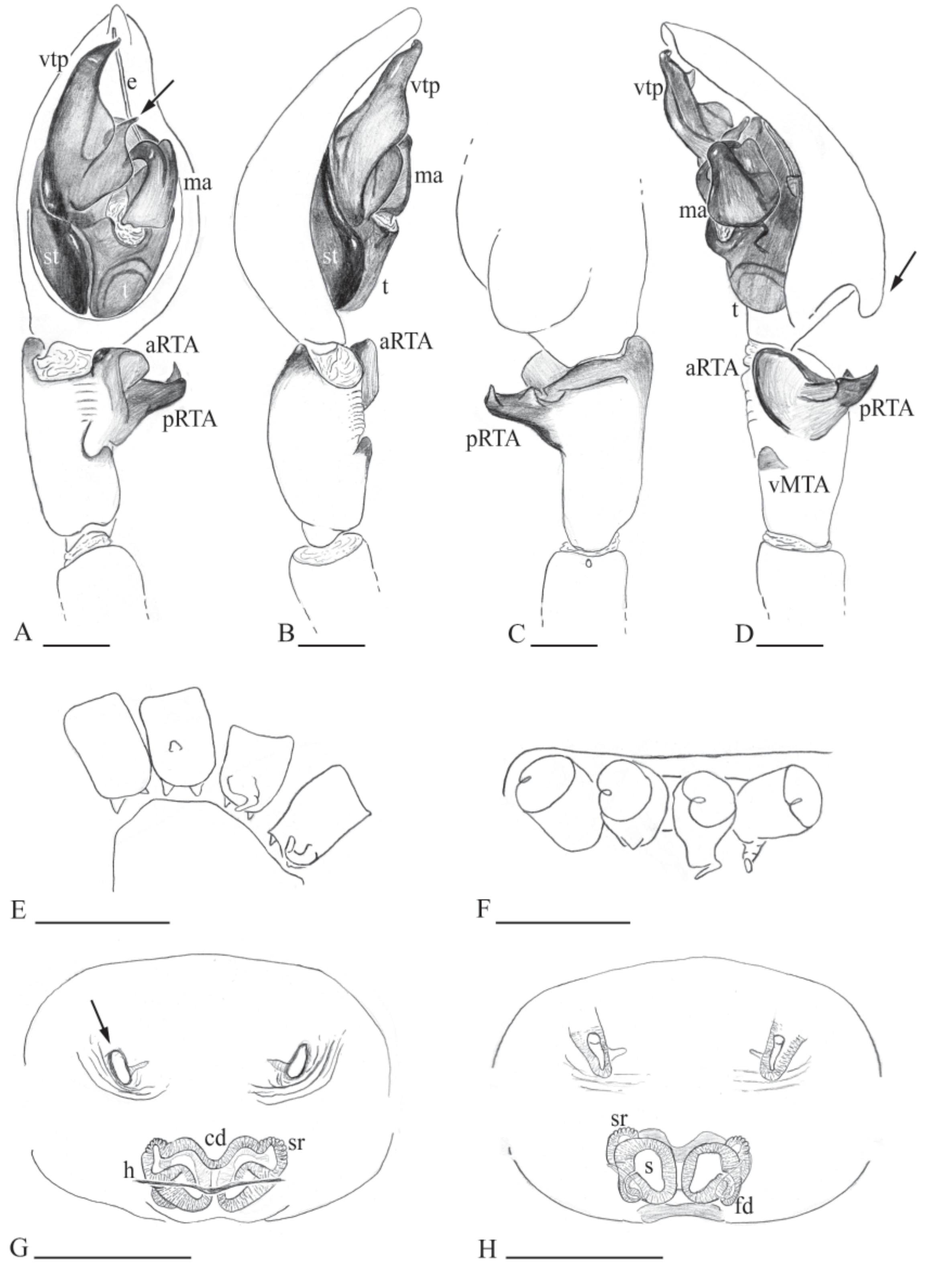

Fig. 15. *Anyphaena urieli* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01582). **G–H**. Paratype, ♀ (CNAN-T01581). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

surface delineated with wide band and several chevrons over posterior central half, anterior central half without this pattern, brown pattern of lateral surfaces only at top, lateral sides and ventral surface white covered with faint darker spots, tracheal spiracle at middle (Fig. 13A–C). Copulatory openings under straight hood slightly projected at center. Copulatory ducts sclerotized, short, slightly curved, entering spermathecae on lateral surfaces. Seminal receptacles in anterior third in copulatory ducts inconspicuous. Fertilization ducts short, straight, and emerging from lateral surfaces of spermathecae (Figs 14E–F, 15G–H). Cephalothorax length 2.24, thoracic width 1.8, cephalic width 0.97. Clypeus height 0.07. Eye diameters: AME 0.09, ALE 0.12, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.05, AME–ALE 0.02, ALE–PLE 0.04, PME–PME 0.12, PME–PLE 0.09. Femur lengths: I 2.58, II 2.42, III 1.81, IV 2.65. Leg spination: femur I d1-1-1, p0-2-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v1-1-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 5.8. Cephalothorax and abdomen coloration as in female (Fig. 13E). Chelicerae retromargin with eleven to twelve denticles. Coxa III tubercle roughly rectangular with posterior apical spur. Coxa IV with a long, curled spur curved at tip (Fig. 15E–F). Median apophysis hook-shaped in ventral view. Embolus long, translucent and filiform (Figs 14A, 15A). RTA anterior branch curved with sclerotized margin, apical edge of posterior branch of RTA with two triangular tips (Figs 14A, C–D, 15A, C–D). Palpal tibia prolateral apophysis small, conical (Figs 14B–C, 15B–C). Pedipalp tibia proportion slightly longer than wide, stridulatory ridges extending from ventral branch of median tegular apophysis to tibial distal margin (Figs 14A–B, D, 15A–B, D). Cephalothorax length 2.54, thoracic width 2.05, cephalic width 0.9. Clypeus height 0.06. Eye diameters: AME 0.07, ALE 0.17, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.02, ALE–PLE 0.05, PME–PME 0.11, PME–PLE 0.09. Femur lengths: I 3.24, II 2.9, III 2.19, IV 3.1. Leg spination as in female except: femur I p0-1-2. Femur II p0-1-2. Metatarsus II r1-1-0. Femur III r0-0-1. Tibia III v1-2-2, p1-1-0, r1-1-0. Femur IV r0-1-1. Tibia IV p1-1-1, r1-1-1.

Variation

Females (N = 10): total length 5.83 (±0.44), cephalothorax length 2.43 (±0.14), thoracic width 1.86 (±0.11), cephalic width 0.99 (±0.05), femur I 2.89 (±0.33). Males (N = 10): total length 5.48 (±0.3), cephalothorax length 2.44 (±0.1), thoracic width 1.99 (±0.07), cephalic width 0.88 (±0.03), femur I 3.15 (±0.16).

Distribution

This species is found in primary tropical wet forest (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching and beating vegetation.

Pectorosa group

Diagnosis

The *pectorosa* group can be separated from other *Anyphaena* species groups by the following characters.

Males

Coxae II, III and IV ventral surface armed with spurs and/or tubercles. Coxae II tubercle sometimes reduced. Coxae III and IV commonly with spurs, the spurs on coxa III may be bifurcated (Fig. 35E–F).

The general shape of the male palp is similar to that in the *porta* and *pacifica* groups. It can be separated from the former by the relative length of the palpal tibia and the general shape of the RTA. It differs from the latter by the relative length and direction of the RTA posterior branch.

Female

Epigynum with an atrium anterior to the spermathecae**.** Copulatory openings anterior to the atrium usually under the hood. Copulatory ducts very sclerotized and usually longer than 1.5 times the spermathecae diameter and always projecting posteriorly, 'encircling' the atrium in dorsal view (*A. epicardia* sp. nov., *A. dulceae* sp. nov., *A. sofiae* sp. nov., *A. rebecae* sp. nov. and *A. franciscoi* sp. nov.). Exceptions to the standard length and shape of the copulatoy ducts, and sometimes the overall shape of the atrium, can be found in *A. noctua* sp. nov., *A. jimenezi* sp. nov, and *A. bifurcata* sp. nov. Spermatheca well sclerotized, oval to spherical except in *A. sofiae* sp. nov. (Figs 18C, 21C, 38C).

Anyphaena jimenezi sp. nov.
urn:lsid:zoobank.org:act:44A36DC8-80BF-4197-95E8-B4D86F42D9F4
Figs 16, 18C–D, 52

Differential diagnosis

Females of *A. jimenezi* sp. nov. are differentiated from those of all species of the *pectorosa* and *pacifica* groups (Keyserling 1879; Pickard-Cambridge O. 1896; Pickard-Cambridge F. 1900; Kraus 1955; Platnick 1974; Dondale & Redner 1982; Sierwald 1988; Brescovit & Lise 1989; Brescovit 1997; Durán-Barrón *et al.* 2016) by the curved mustache-shaped lateral borders, and the genital openings being adjacent at the center of the epigynal plate (Figs 16E, 18C). Central and adjacent genital openings are also present in females of *A. tonoi* sp. nov. (Fig. 46E–F), but both species differ by the path and length of the copulatory ducts (Fig. 18B–C).

Etymology

The species epithet is dedicated to the Mexican arachnologist Dr María Luisa Jiménez.

Material examined

Holotype

MEXICO • ♀; Veracruz, San Andres Tuxtla, Estación de Biología Los Tuxtlas IB-UNAM; 18.58225° N, 95.07558° W; alt. 217–172 m; 9–16 Feb. 2018; Arcanolab team leg.; primary tropical wet forest; LUP; CNAN-T01529.

Description

Female

Total length 6.07. Carapace yellow, with few dark patches of sclerotized cuticle and setae, delineating cephalic area and around fovea (Fig. 16A, D). Sternum surface white, intercoxal triangles present on all legs. Labium light brown, white at tip, longer than wide. Endites light yellow, rectangular, broader at tip (Fig. 16C). Chelicerae slightly darker than cephalothorax (Fig. 16B, D), promargin with five teeth, retromargin with eleven to twelve denticles. Leg coloration darker than cephalothorax and scattered brown patches irregularly distributed from femora to tarsi (Fig. 16A–C). Abdomen yellow-gray, dorsal and lateral surfaces with scattered darker patches, ventral surface without patterns, tracheal spiracle closer to epigastric furrow (Fig. 16A–C). Epigyum hood short, slightly curved, and over both genital openings. Anterior plate area delineated by two sclerotized curved notches at corners (Figs 16E–F, 18C–D). Seminal receptacles in anterior third of copulatory ducts. Copulatory duct path U-shaped, bending dorsally, and curving again to enter external lateral surface of spermathecae. Fertilization ducts short, cylindrical, entering spermathecae dorsally. Spermathecae longer than wide and between copulatory ducts coils (Fig. 18C–D). Cephalothorax length 2.7, thoracic width 2.2, cephalic width 1.2. Clypeus height 0.1. Eye diameters: AME 0.1, ALE 0.13, PME 0.13, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.06, PME–PME 0.16, PME–PLE 0.13. Femur lengths: I 3.32, II 3.27, III 2.39, IV 3.37. Leg spination: femur I d1-1-1, p0-1-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v2-2-2, p1-1-0, p1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Unknown.

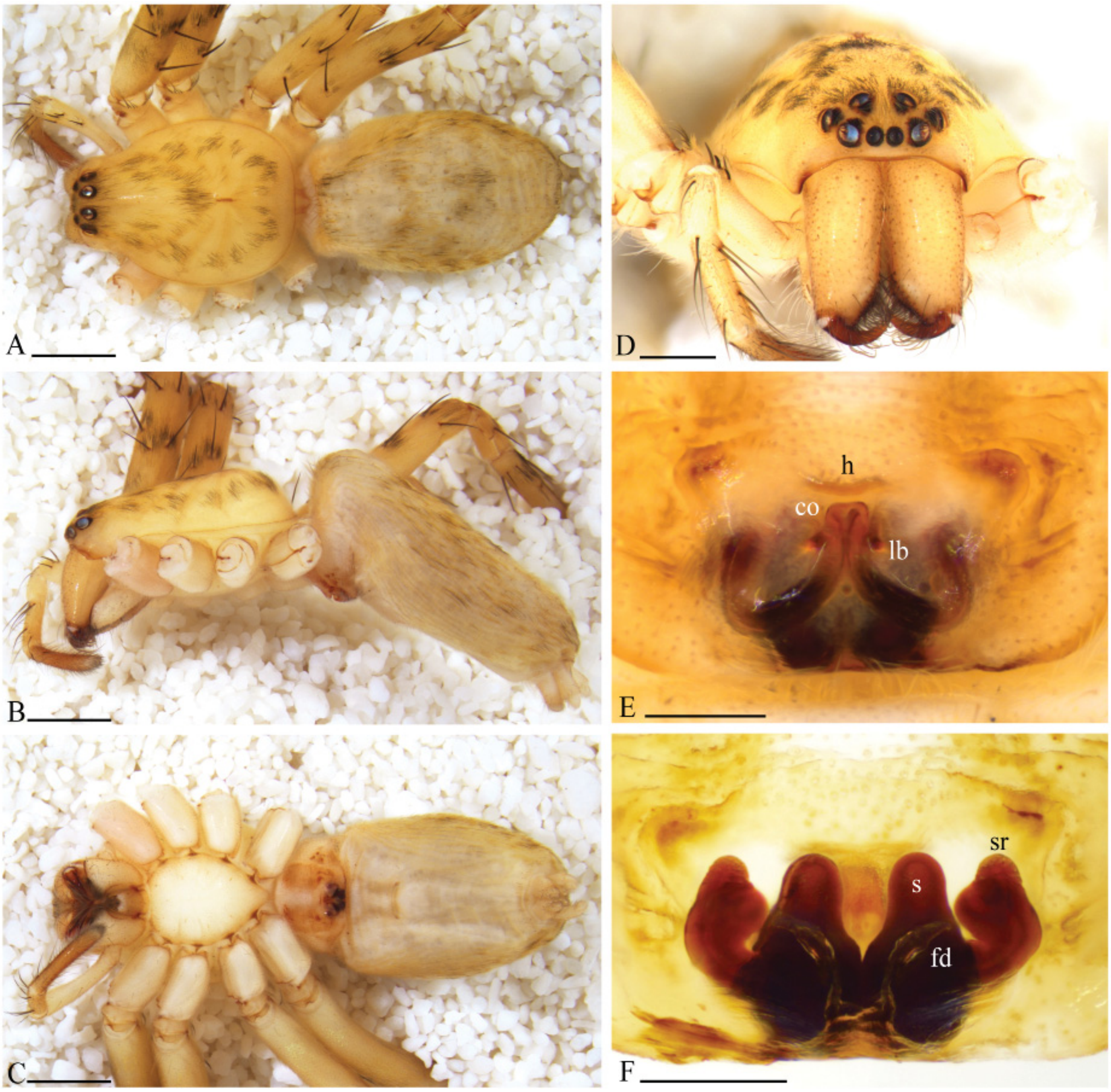

Fig. 16. *Anyphaena jimenezi* sp. nov., holotype, ♀ (CNAN-T01529). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Variation

Only type specimen known.

Distribution

Only known from the type locality (Fig. 52).

Natural history

Collected at night by direct searching over vegetation.

Anyphaena franciscoi sp. nov.

urn:lsid:zoobank.org:act:D00F2524-98DA-4755-82FE-FC064FCD1CCD

Figs 17, 18E–F, 52

Differential diagnosis

The female of *A. franciscoi* sp. nov. is differentiated from all those of species of the *pectorosa* and *pacifica* groups by the following features: atrium trapezoidal, hood broad and posteriorly curved at the center (Figs 17E–F, 18E–F). The female of *A. rebecae* sp. nov. also has a similar trapezoidal atrium, and copulatory duct paths (Fig. 28E–F), but it differs from that of *A. franciscoi* sp. nov. by the notched hood and smaller size (7.23 ±1.1). *Anyphaena sofiae* sp. nov. shares similar copulatory duct paths and spermathecal proportions with both species, but differs by the oval atrium and copulatory ducts extending beyond the hood (Fig. 36E–F).

Etymology

The species epithet is dedicated to Francisco Rivera, father of the first author.

Material examined

Holotype

MEXICO • ♀; San Luis Potosi, Xilitla City, Las Pozas; 21.39722° N, 98.99388° W; alt. 662 m; 26–30 Mar. 2012; Arcanolab team leg.; tropical wet forest fragment; LUP; CNAN-T01527.

Description

Female

Total length 9.6. Carapace light yellow, with two faint darker bands delineating cephalic area and around fovea (Fig. 17A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, broader at tip (Fig. 17C). Chelicerae brown without dorsal pattern (Fig. 17B, D), promargin with five teeth, retromargin with nine to ten denticles. Legs femora base yellow, orange-brown distally and from patella to tarsi (Fig. 17A–C). Abdomen dorsal surface white and delineated by two light brown parallel longitudinal lines, lateral surfaces white and dorsally delineated by light brown longitudinal lines, ventral surface center with faint light brown longitudinal band from epigastric furrow to spinneret bases, tracheal spiracle closer to epigastric furrow (Fig. 17A–C). Anterior area of epigynal plate delineated laterally by two faint triangular pits. Genital openings at both sides of anterior edge of atrium under hood. Copulatory duct slightly curved and entering surface of anterior spermathecae. Seminal receptacles oval in anterior third of copulatory ducts. Fertilization ducts short, cylindrical, and entering lateral surface of spermathecae (Figs 17E–F, 18E–F). Cephalothorax length 4.37, thoracic width 2.73, cephalic width 1.55. Clypeus height 0.13. Eye diameters: AME 0.11, ALE 0.15, PME 0.16, PLE 0.16. Eye interdistances: AME–AME 0.07, AME–ALE 0.04, ALE–PLE 0.07, PME–PME 0.15, PME–PLE 0.13. Femur lengths: I 4.24, II 3.71, III 2.98, IV 4.29. Leg spination: femur I d1-1-1, p0-1-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p1-1-0, p1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male
Unknown.

Variation
Only type specimen known.

Distribution
Only known from the type locality (Fig. 52).

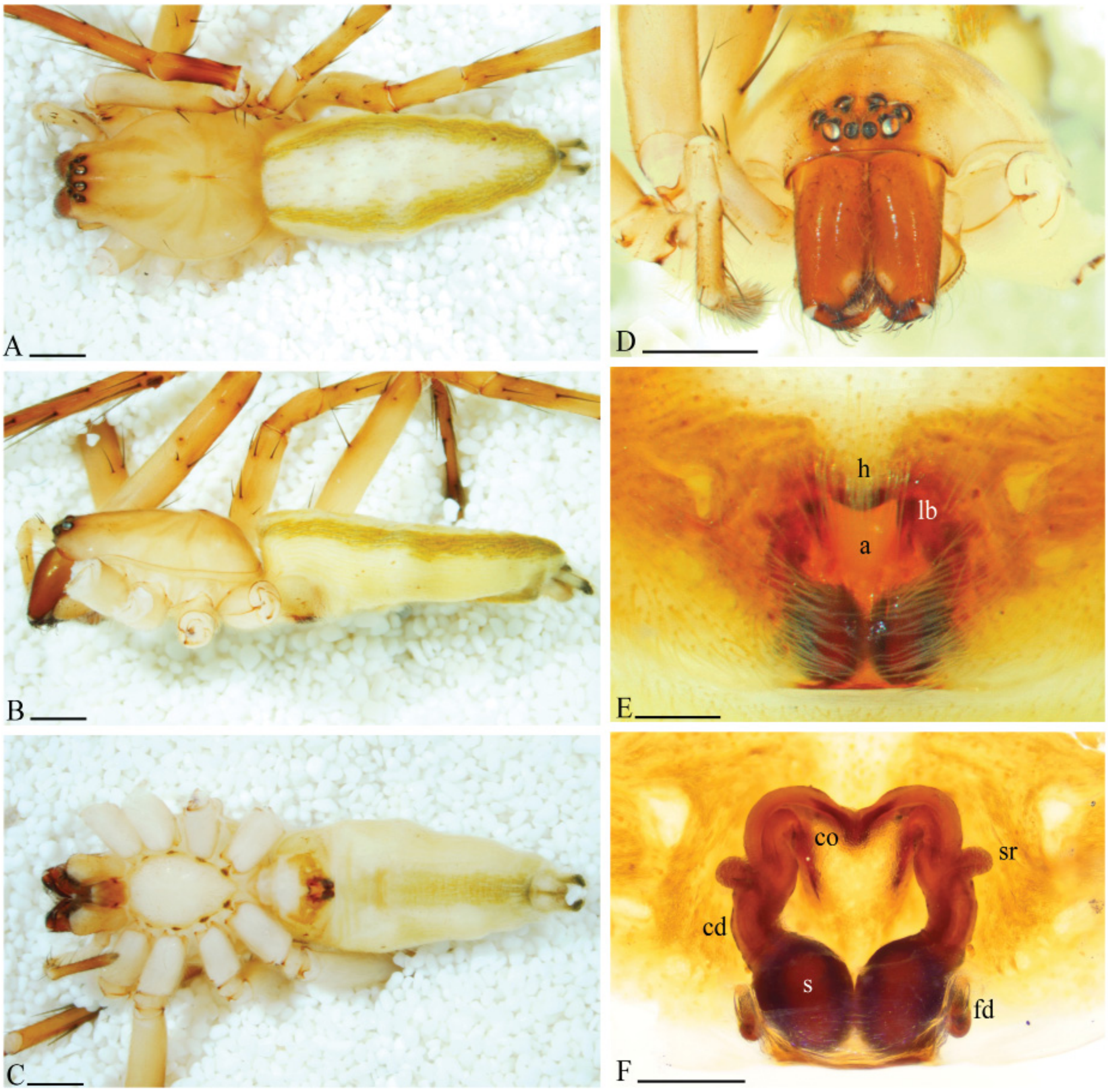

Fig. 17. *Anyphaena franciscoi* sp. nov., holotype, ♀ (CNAN-T01527). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Natural history

Collected at night by direct searching over vegetation.

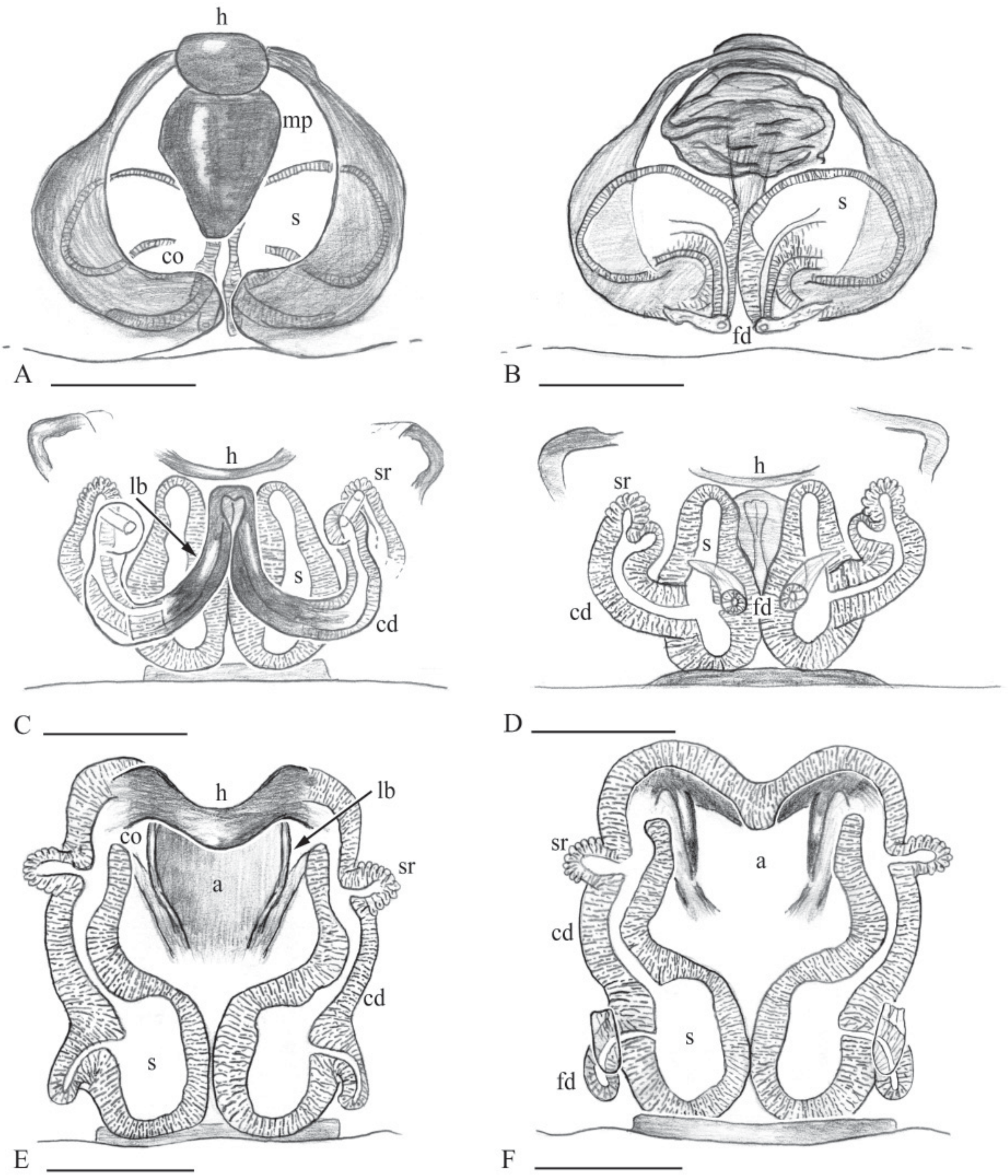

Fig. 18. *Anyphaena* spp. **A–B**. *A. fernandae* sp. nov., holotype, ♀ (CNAN-T01526). **A**. Epigynum, ventral view. **B**. Epigynum, dorsal view. – **C–D**. *A. jimenezi* sp. nov., holotype, ♀ (CNAN-T01529). **C**. Epigynum, ventral view. **D**. Epigynum, dorsal view. – **E–F**. *A. franciscoi* sp. nov., holotype, ♀ (CNAN-T01527). **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

Anyphaena bifurcata sp. nov.
urn:lsid:zoobank.org:act:35864EEB-BF52-411A-82FC-C5BC0AD40F7E
Figs 19–21, 52

Differential diagnosis

The epigynum in *A. bifurcata* sp. nov. is broad, the anterior edge is more than two thirds of the abdomen width, the shape triangular and projected below the epigastric furrow (Fig. 19C), posterior third of the epigynal plate narrower, the tip excavated with a small central atrium where the copulatory openings are located (Figs 20E–F, 21G–H). Similar epigyna plates and atria are found in females of *A. pectorosa*, but differ from those of *A.bifurcata* sp. nov. by the trapezoidal shape and convex posterior margin (Dondale & Render 1982: figs 328–329). Broad epigynal plates are also present in *A. triangularis* sp. nov. and *A. urieli* sp. nov., but they are anteriorly projected in both species (Figs 10C, F, 13C, F). Males of *A. bifurcata* sp. nov. are differentiated from those of related species by their ventral tegular

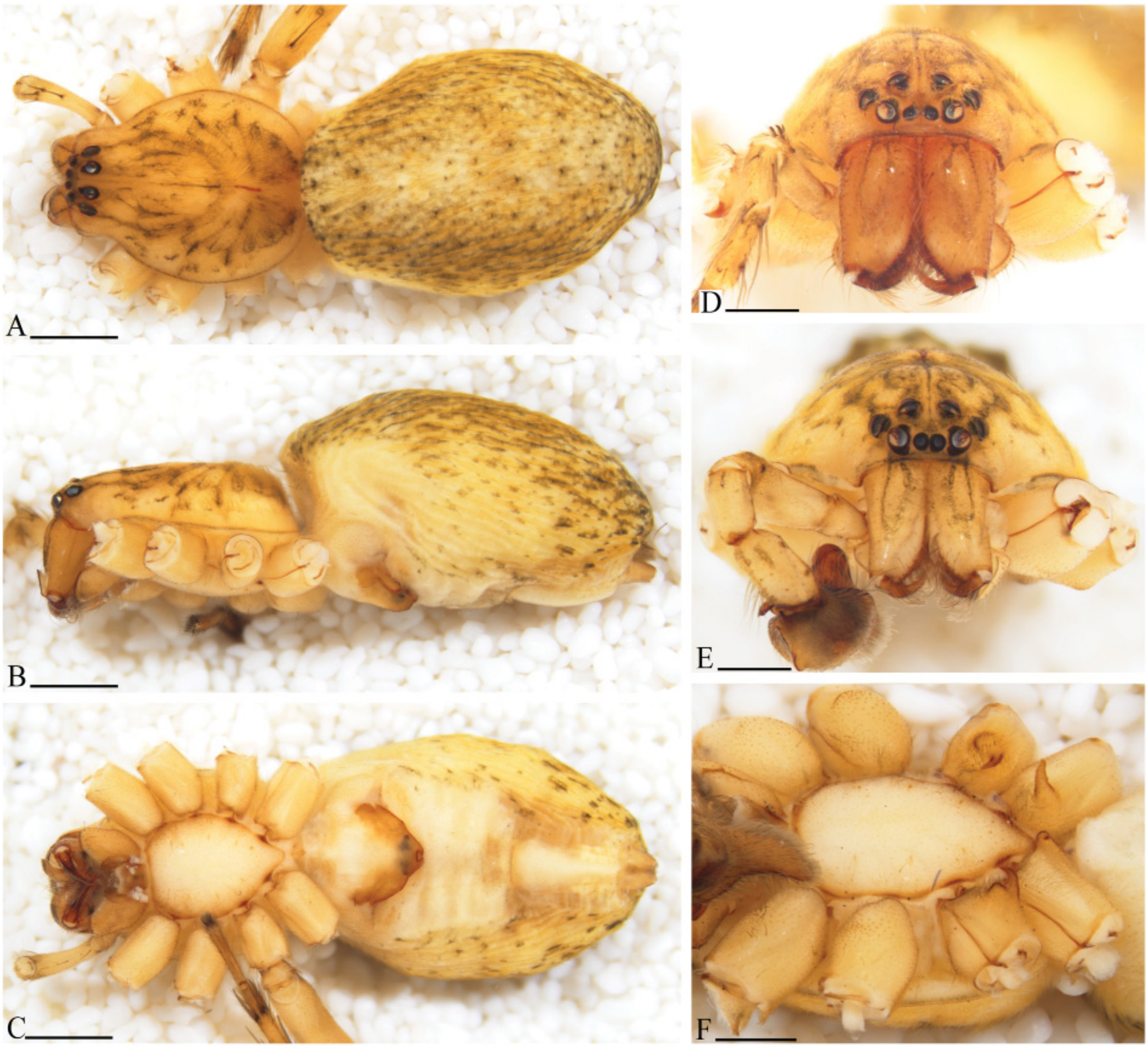

Fig. 19. *Anyphaena bifurcata* sp. nov. **A–D**. Holotype, ♀ (CNAN-T01523). **E–F**. Paratype, ♂ (CNAN-T01549). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

projection base being excavated and bifurcated with a thin rectangular process (Figs 20A–B, 21A–B, arrows), median apophysis with a small hook in ventral and retrolateral view, and cymbium base dorsally projected (Figs 20A–D, 21A–D). A similar cymbium and bifurcated ventral tegular projections are found in males of *A. triangularis* sp. nov. (Fig. 12A (arrow)) and *A. urieli* sp. nov. (Fig. 15A (arrow)), but they differ from those of *A. bifurcata* sp. nov. by not being excavated.

Etymology

The species epithet is taken from the Spanish word *bifurcado* and refers to the bifurcated ventral tegular projection diagnostic of this species.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 15–24 Feb. 2013; Aracnolab team leg.; oak forest fragment; LUP; CNAN-T01523.

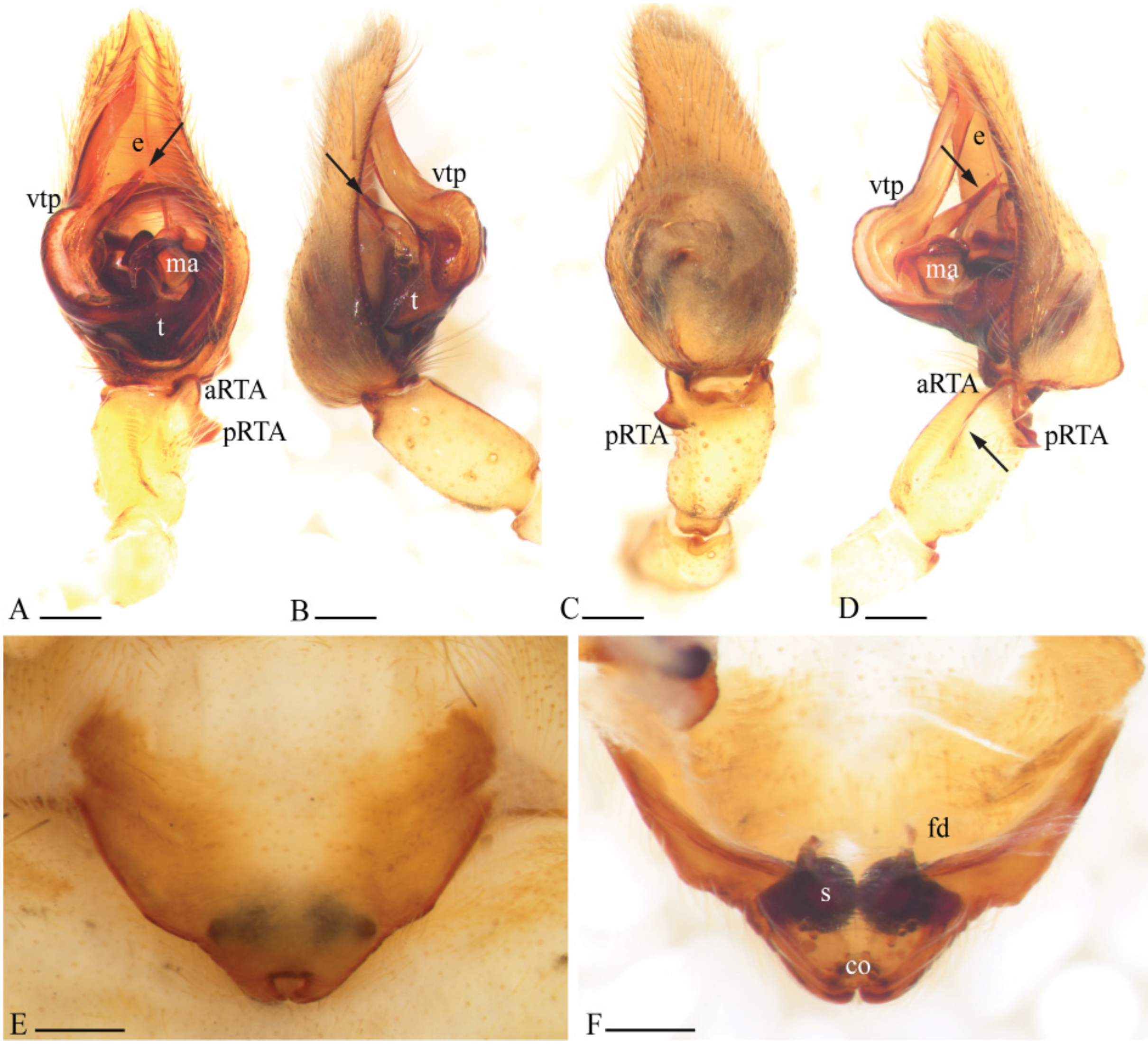

Fig. 20. *Anyphaena bifurcata* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01549). **E–F**. Paratype, ♀ (CNAN-T01550). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

Allotype

MEXICO • ♂; same collection data as for holotype; AR_035; GenBank: ON619650; CNAN-T01512.

Paratypes

MEXICO • 3 ♂♂; same collection data as for holotype; CNAN-T01547 • 2 ♀♀; same collection data as for holotype; CNAN-T01548 • 1 ♂; same collection data as for holotype; CNAN-T01549 • 1 ♀; same collection data as for holotype; 21–30 Mar. 2012; CNAN-T01550.

Additional material

MEXICO • 2 ♂♂; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 15–24 Feb. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BERL • 4 ♂♂, 1 ♀; same collection data as for preceding; CRP • 1 ♀; same collection data as for preceding; AR_063; GenBank: ON619629 • 1 ♀; same collection data as for preceding; ANYM023 • 3 ♀♀, 4 ♂♂; same collection data as for preceding; LUP • 1 ♂; same collection data as for preceding; AR_036; GenBank: ON619651 • 2 ♂♂; same collection data as for preceding; ANYM019 • 1 ♂; same collection data as for preceding; PF; AR_037; GenBank: ON619652 • 1 ♀; same collection data as for preceding; 21–30 May 2012; LUP; AR_062; GenBank: ON619628 • 1 ♂; same collection data as for preceding; 4–14 Oct. 2012; BEAT; AR_034; GenBank: ON619649 • 1 ♀; same collection data as for preceding; ANYM021 • 1 ♀; same collection data as for preceding; BERL; ANYM022.

Description

Female

Total length 7.1. Carapace yellow, pattern with darker longitudinal bands over cephalic and thoracic areas, carapace margins and clypeus yellow (Fig. 19A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites dark yellow, rectangular, slightly broader at tip (Fig. 19C). Chelicerae orange, paturon dorsum with darker and diffuse line pattern (Fig. 19B, D), promargin with four teeth, retromargin with eight to nine denticles. Leg coloration: light yellow with scattered dark patches, pattern slightly darker at metatarsi and tarsi. Abdomen yellow, hirsute, dorsal surface covered with scattered small brown patches, pattern lighter at center, forming longitudinal band, lateral surfaces with same pattern faded ventrally, ventral surface white, tracheal spiracle at middle (Fig. 19A–C). Copulatory openings inside small internal edges of atrium. Copulatory ducts sclerotized, short, slightly curved, entering spermathecae via lateral surfaces below seminal receptacles. Fertilization ducts short, straight, and emerging from anterior surface of spermathecae (Figs 20E–F, 21G–H). Cephalothorax length 2.68, thoracic width 2.2, cephalic width 1.19. Clypeus height 0.11. Eye diameters: AME 0.07, ALE 0.15, PME 0.12, PLE 0.13. Eye interdistances: AME–AME 0.07, AME–ALE 0.06, ALE–PLE 0.1, PME–PME 0.17, PME–PLE 0.1. Femur lengths: I 2.94, II 2.68, III 2.1, IV 2.77. Leg spination: femur I d1-1-1, p0-1-2, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 5.8. Cephalothorax and abdomen coloration as in female except yellow chelicerae (Fig. 19E). Coxa II ventral surface with broad and shallow tubercle. Coxa III tubercle roughly rectangular with spine at middle. Coxa IV spur located at retrolateral basal corner (Figs 19F, 21E–F). Embolus long, translucent and filiform. RTA branches short, anterior branch curved with sclerotized margin, posterior branch small, triangular in dorsal and ventral views (Figs 20A, C–D, F 21A, C–D). Prolateral apophysis of palpal tibia small, conical (Figs 20B–C, 21B–C). Pedipalp tibia longer than wide, ventral surface with median stridulatory ridges. Median tibial apophysis absent (Figs 20C, 21A, D). Cephalothorax length

2.68, thoracic width 2.2, cephalic width 0.9. Clypeus height 0.11. Eye diameters: AME 0.07, ALE 0.11, PME 0.13, PLE 0.13. Eye interdistances: AME–AME 0.06, AME–ALE 0.05, ALE–PLE 0.09, PME–PME 0.15, PME–PLE 0.12. Femur lengths: I 3.1, II 2.94, III 2.26, IV 2.9. Leg spination as in female except: femur II r0-2-1. Femur IV p0-1-1, r0-1-1.

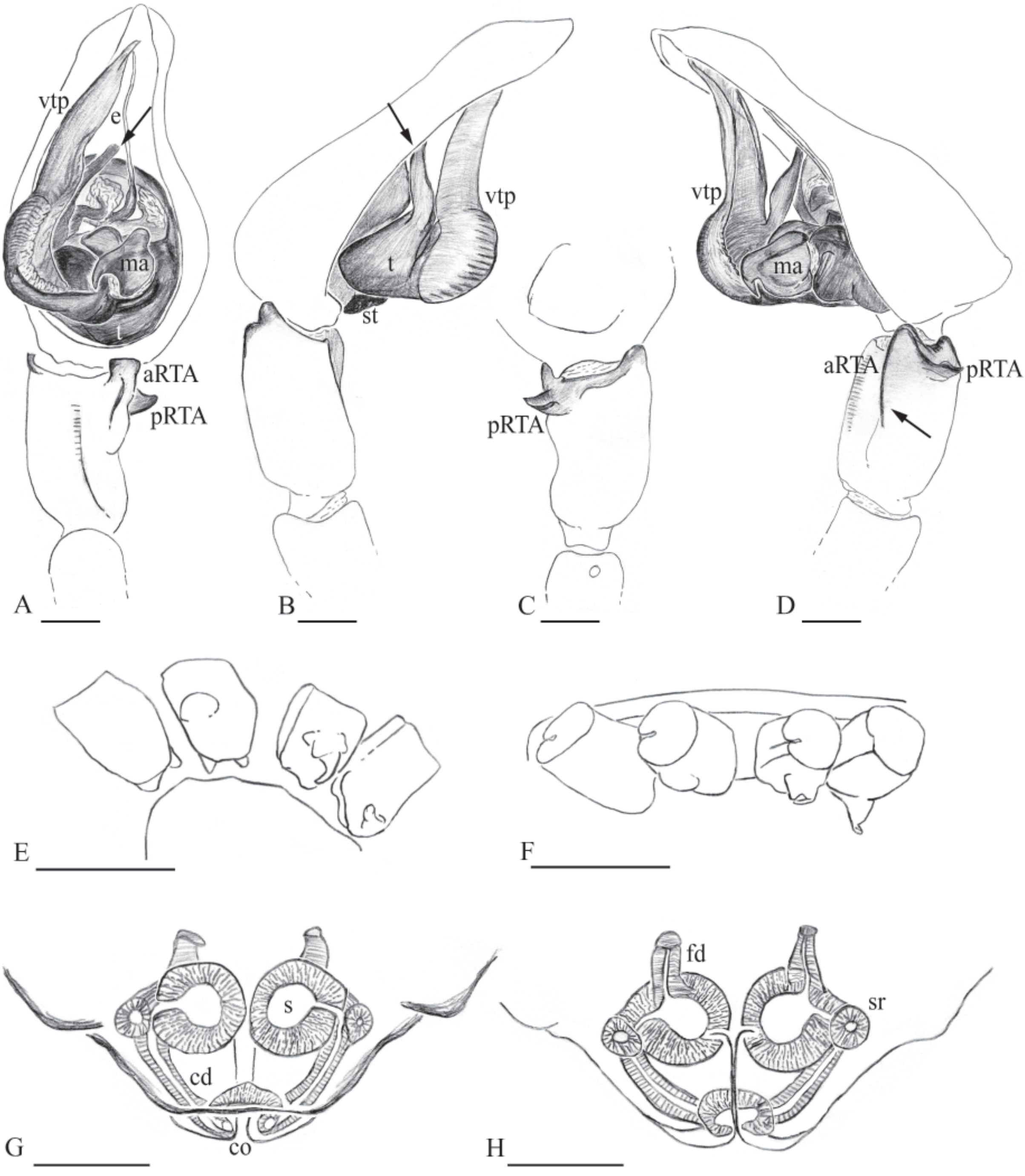

Fig. 21. *Anyphaena bifurcata* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01549). **G–H**. Paratype, ♀ (CNAN-T01550). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

Variation

Females (N=10): total length 7.2 (±0.67), cephalothorax length 2.84 (±0.12), thoracic width 2.19 (±0.07), cephalic width 1.2 (±0.04), femur I 2.88 (±0.08). Males (N=10): total length 5.79 (±0.17), cephalothorax length 2.79 (±0.09), thoracic width 2.21 (±0.06), cephalic width 1.0 (±0.05), femur I 3.13 (±0.19).

Distribution

This species is found in oak forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching, Berlese funnels and cryptic searching on the ground vegetation.

Anyphaena epicardia sp. nov.

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Figs 22–24, 52

Differential diagnosis

Females from *Anyphaena epicardia* sp. nov. can be differentiated from those of all other American species of the *pectorosa* and *pacifica* groups by the heart-shaped atrium of the epigynum (Fig. 23E–F), and from those of *A. dulceae* sp. nov. by the straight copulatory ducts (Fig. 24G–H). Males of this species resemble those of *A. fraterna* (Platnick 1974: figs 52, 56, 60) and *A. simoni* Becker, 1878 (Brescovit & Lise 1989: figs 1–9) by their elongated ventral tegular projection, but differ from both species by the presence of an apical translucent curved lamella (Figs 23A–D, 24A–D (arrows)), a broader median apophysis in ventral view (Figs 23A, 24A), an acute spine on the ventral corner of the trapezoidal RTA posterior branch (Figs 23D, 24D) and the coxa III tubercle bifurcated (Figs 22F, 24E–F), this last feature more similar to *A. simoni* than *A. fraterna*.

Etymology

The species epithet is a combination from the Spanish words *epigino* and *cardia*, referring to the heart-shaped epigynum atrium, a diagnostic feature of this species.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 21–30 May 2012; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01525.

Allotype

MEXICO • ♂; same collection data as for holotype; 15–24 Feb. 2013; CNAN-T01514.

Paratypes

MEXICO • 1 ♀; same collection data as for holotype; AR_073; GenBank ON619623; CNAN-T01557 • 1 ♂; same collection data as for preceding; Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 21–30 May 2012; Arcanolab team leg.; oak and pine forest fragment; BEAT; AR_069; GenBank: ON619619; CNAN-T01556.

Additional material

MEXICO • 2 ♂♂; same collection data as for holotype; 15–24 Feb. 2013; BEAT • 7 ♂♂; same collection data as for preceding; LUP • 1 ♂; same collection data as for preceding; PF • 1 ♂; same collection data as for preceding; 21–30 May 2012; BEAT; AR_72; GenBank: ON619622 • 1 ♂; same collection data as for preceding; CRP; AR_071; GenBank: ON619621 • 1 ♀; same collection data as for preceding; ANYM002 • 1 ♀, 8 ♂♂; same collection data as for preceding; LUP • 3 ♂♂; same collection data as for preceding; ANYM006 • 1 ♂; same collection data as for preceding; PF • 1 ♂; same collection data as for preceding; 4–14 Oct. 2012; BEAT • 4 ♂♂; same collection data as for preceding; Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 15–24 Feb. 2013; Aracnolab team leg.; oak forest fragment; BEAT • 1 ♂; same collection data as for preceding; BERL; ANYM005 • 1 ♂; same collection data as for preceding; CRP • 1 ♂; same collection data as for preceding; LUP • 7 ♂♂; same collection data as for preceding; 21–30 May 2012; BEAT • 1 ♀; same collection data as for preceding; ANYM003 • 1 ♀, 2 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; AR_076; GenBank: ON619624 • 1 ♂; same collection data as for preceding; AR_70; GenBank: ON619620 • 1 ♀;

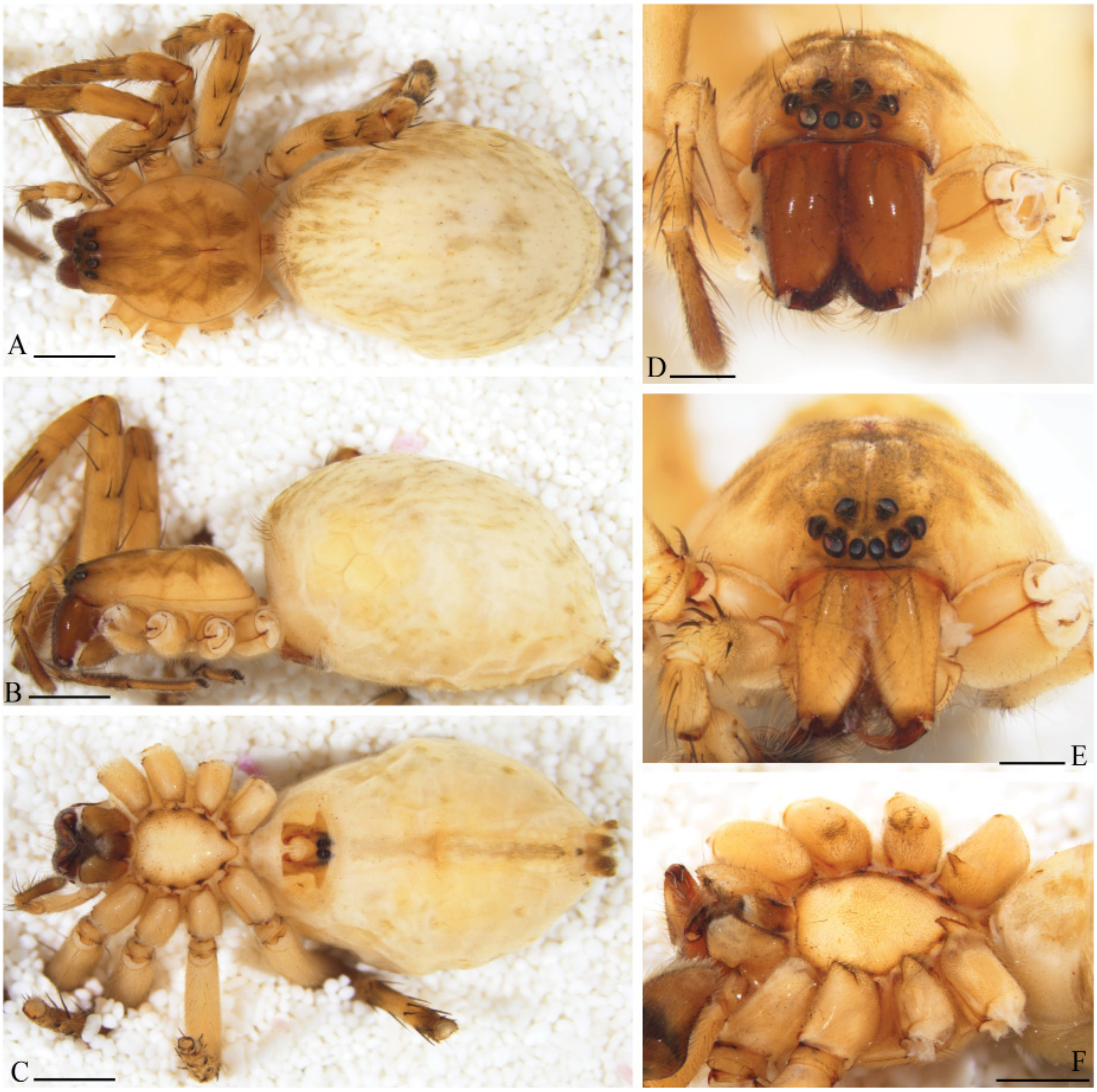

Fig. 22. *Anyphaena epicardia* sp. nov. (♀: CNAN-T01525; ♂: CNAN-T01514). **A**. ♀, dorsal habitus. **B**. ♀, lateral habitus. **C**. ♀, ventral habitus. **D**. ♀, prosoma, anterior view. **E**. ♂, prosoma, anterior view. **F**. ♂, prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

same collection data as for preceding; ANYM001 • 1 ♀; same collection data as for preceding; 4–14 Oct. 2012; BEAT; ANYM004.

Description

Female

Total length 9.6. Carapace dark yellow, hirsute, with darker bands over cephalic, thoracic area and clypeus (Fig. 22A, D). Sternum yellow, slightly darker at margins, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites brown, rectangular, slightly broader at tip. Chelicerae dark brown (Fig. 22C–D), promargin with four teeth, retromargin with eight to nine denticles. Abdomen dorsum white, hirsute, with few scattered light brown patches around edges, lateral sides and center, ventral surface with diffuse longitudinal line between tracheal spiracle and spinnerets, tracheal spiracle in center of abdomen (Fig. 22A–C). Leg coloration: dark yellow with brown patches at distal end of femora, patella and tibia. Metatarsus and tarsus brown. Epigynum hood absent, lateral border sinuous. Copulatory openings on anterior internal margin of heart-shaped atrium. Copulatory

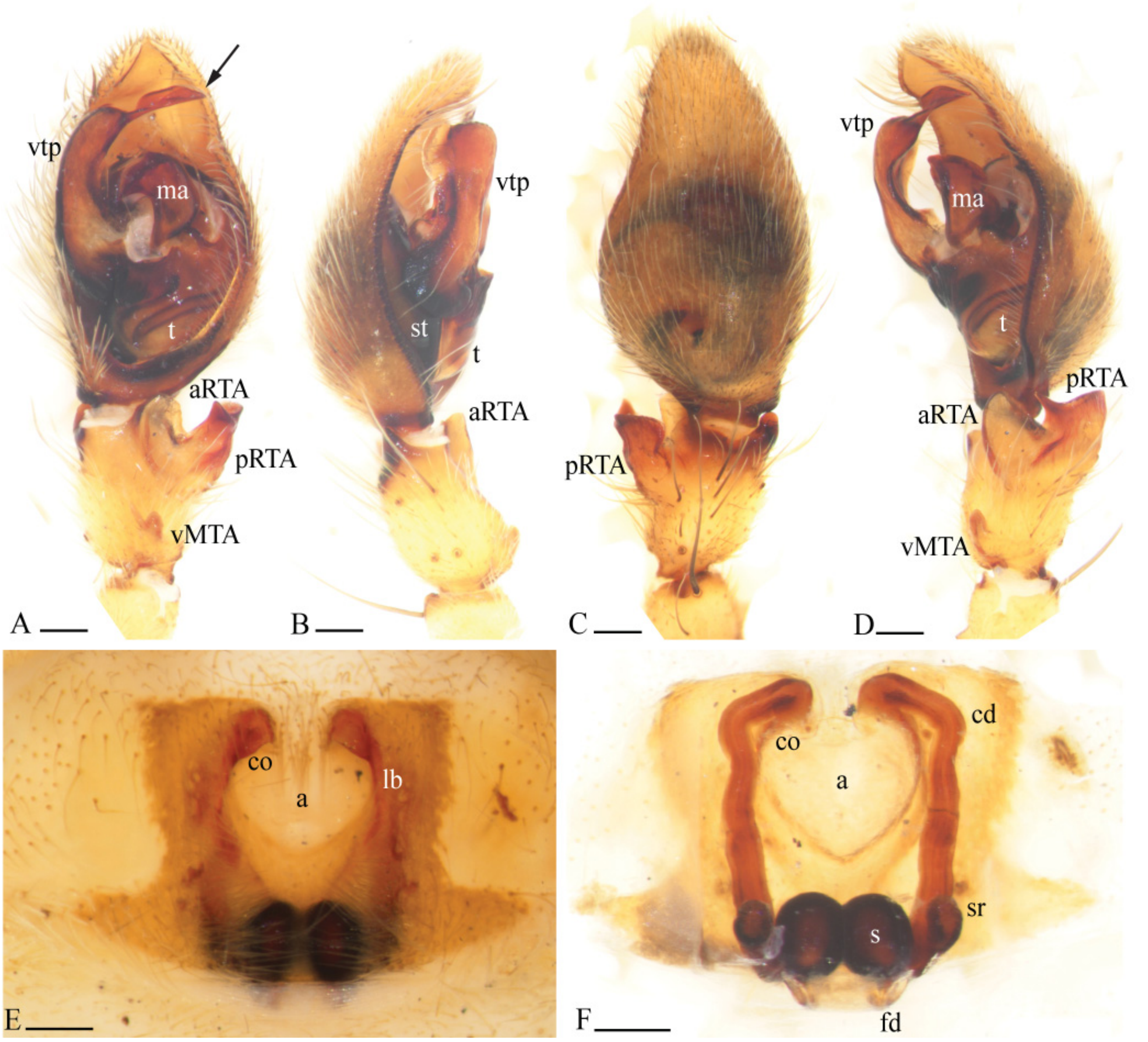

Fig. 23. *Anyphaena epicardia* sp. nov. **A**–**D**. Paratype, ♂ (CNAN-T01556). **E**–**F**. Holotype, ♀ (CNAN-T01557). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

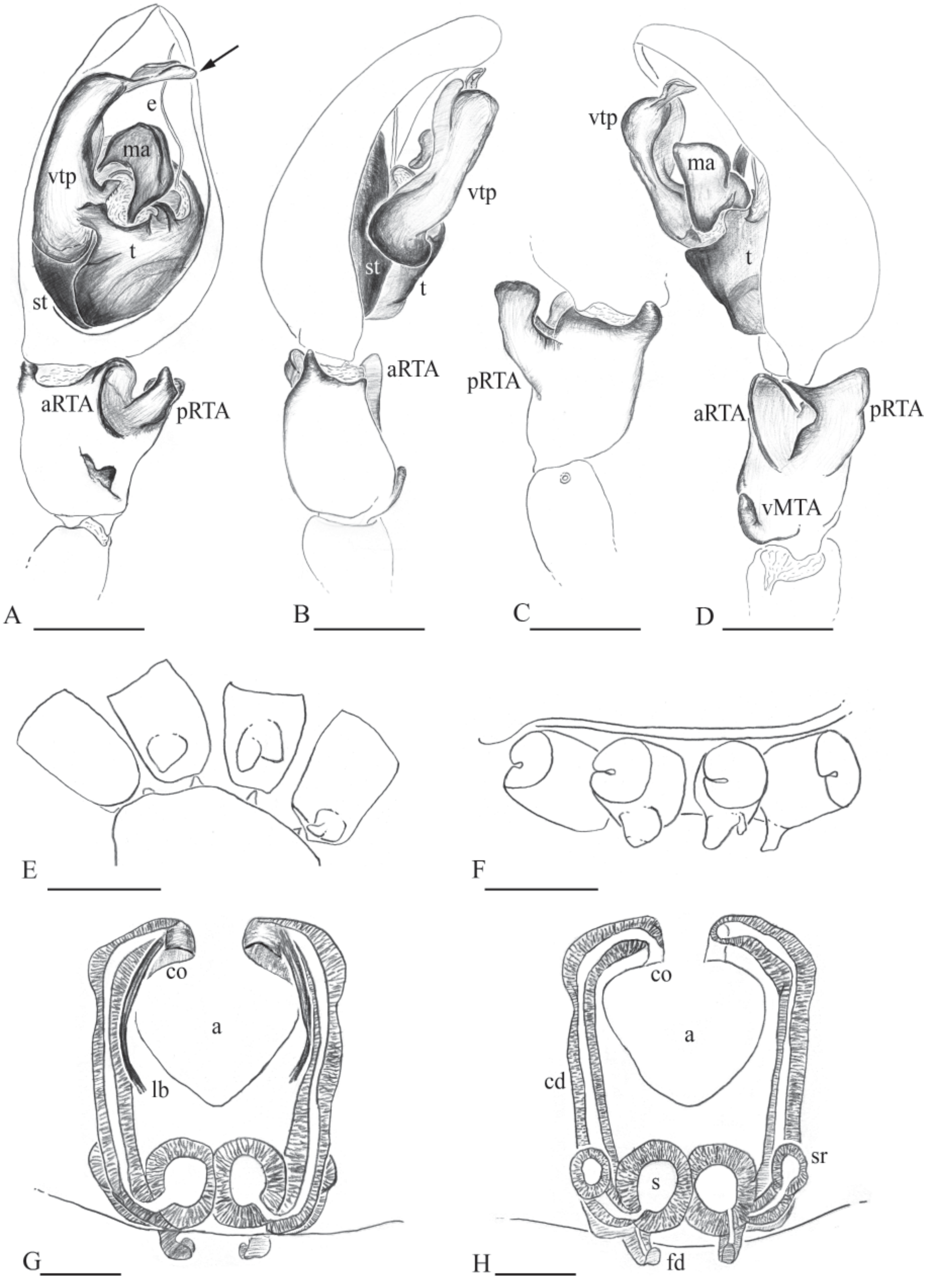

Fig. 24. *Anyphaena epicardia* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01556). **G–H**. Holotype, ♀ (CNAN-T01557). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

ducts parallel. Seminal receptacles cylindrical, projected dorsally and located at junction between spermathecae and copulatory duct entrance (Figs 23E–F, 24G–H). Copulatory and fertilization ducts attached to posterior margin of spermathecae. Fertilization ducts short and slightly curved (Fig. 24G–H). Cephalothorax length 3.27, thoracic width 2.44, cephalic width 1.35. Clypeus height 0.11. Eye diameters: AME 0.11, ALE 0.15, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.06, AME–ALE 0.05, ALE–PLE 0.07, PME–PME 0.16, PME–PLE 0.11. Femur lengths: I 3.56, II 3.27, III 2.49, IV 3.41. Leg spination: femur I d1-1-1, p0-1-2, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0. p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r1-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 7.8. Cephalothorax coloration as in female except dark yellow chelicerae and endites (Fig. 22E). Coxa II tubercle roughly triangular, coxa IV spur base broad (Figs 22F, 24E–F). Abdomen yellow with darker patches covering dorsal surface and lateral sides, ventral surface with longitudinal line between tracheal spiracle and spinnerets. Pedipalp ventral tegular projection in prolateral view with distal translucent keel (Figs 23B, 24B), Embolus filiform and translucent (Fig. 24A). RTA anterior branch semicircular with sclerotized edge and translucent center, RTA posterior branch cuticle as in tibia, more sclerotized and roughly rectangular (Figs 23A, C–D, 24A, C–D). Prolateral apophysis small and cone-shaped (Figs 23B, 24B). Pedipalp tibia slightly longer than wide. Median tibial apophysis ventral branch displaced towards proximal border of tibia (Figs 23A, D, 24A, D). Cephalothorax length 3.37, thoracic width 2.73, cephalic width 1.10. Clypeus height 0.15. Eye diameters: AME 0.11, ALE 0.13, PME 0.09, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.06, PME–PME 0.15, PME–PLE 0.11. Femur lengths: I 4.20, II 3.76, III 2.98, IV 3.95. Leg spination as in female except: femur II p0-1-2, r0-2-2. Femur IV p0-1-1.

Variation

Females (N=9): total length 9.1 (±0.82), cephalothorax length 3.26 (±0.15), thoracic width 2.6 (±0.15), cephalic width 1.37 (±0.07), femur I 3.63 (±0.14). Males (N=10): total length 7.66 (±0.43), cephalothorax length 3.38 (±0.23), width 2.79 (±0.19), cephalic width 1.21 (±0.09), femur I 4.20 (±0.28).

Distribution

This species is found in oak and oak-pine forests around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray; some male specimens were caught in PF traps and Berlsese funnels. This species is present year-round.

Anyphaena dulceae sp. nov.

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Figs 25–27, 52

Differential diagnosis

Females of *Anyphaena dulceae* sp. nov. can be differentiated from those of all other species of the *pectorosa* and *pacifica* groups by the heart-shaped epigynal atria (Fig. 26E–F), and from *A. epicardia* sp. nov. by the middle coil of the copulatory ducts (Fig. 27G–H). Males of this species resemble those of *A. fraterna* (Platnick 1974: figs 52, 56, 60) and *A. simoni* (Brescovit & Lise 1989: figs 1–9) by their elongated ventral tegular projection with a rounded tip and the hook-shaped median apophysis, but differ from these species by the presence of a rectangular process at the ventral tegular projection base (Figs 26A, 27A (arrows)), the more elongated and curved median apophysis hook (Figs 26A, 27A), the RTA posterior branch being hook-shaped (Figs 26D, 27D) and the large spurs of coxa II–IV (Figs 25F, 27E–F).

Etymology

The species epithet is dedicated to Dulce Flor Piedra-Jiménez, Mexican arachnologist, and former member of the second author's lab.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 21–30 May 2012; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01524.

Allotype

MEXICO • ♂; same collection data as for holotype; BEAT; CNAN-T01513.

Paratypes

MEXICO • 1 ♀; same collection data as for holotype; CRP; AR_033; GenBank: ON619655; CNAN-T01555 • 1 ♀; same collection data as for preceding; 15–24 Feb. 2013; CNAN-T01553 • 1 ♀; same collection data as for preceding; Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 21–30 May 2012; Arcanolab team leg.; oak and pine forest fragment; LUP; CNAN-T01552 • 1 ♂; same collection data as for preceding; CNAN-T01551 • 1 ♀; same collection data as for preceding; 15–24 Feb. 2013; BEAT; AR_031; GenBank: ON619653; CNAN-T01554.

Additional material

MEXICO • 1 ♀, 2 ♂♂; same collection data as for holotype; 15–24 Feb. 2013; BEAT • 1 ♀; same collection data as for preceding; CRP, ANYM010 • 5 ♀♀, 2 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM011 • 2 ♂♂; same collection data as for preceding; 21–30 May 2012; BEAT • 2 ♀♀, 2 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; AR_032; GenBank: ON619654 • 1 ♀, 1 ♂; same collection data as for preceding; 4–14 Oct. 2012; LUP • 4 ♂♂; same collection data as for preceding; Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 15–24 Feb. 2013; Aracnolab team leg.; oak forest fragment; BEAT • 4 ♀♀, 12 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM012 • 1 ♀, 4 ♂♂; same collection data as for preceding; ANYM013 • 2 ♂♂; same collection data as for preceding; ANYM014 • 2 ♂♂; same collection data as for preceding; ANYM015 • 4 ♂♂; same collection data as for preceding; ANYM014; 21–30 May 2012; BEAT • 7 ♀♀, 1 ♂; same collection data as for preceding; LUP • 1 ♂; same collection data as for preceding; 4–14 Oct. 2012; LUP.

Description

Female

Total length 8.8. Carapace dark yellow, hirsute, with darker areas delineating cephalic area, around thoracic groove, ocular quadrangle, and clypeus (Fig. 25A, D). Sternum yellow, darker at margins, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, slightly broader at tip (Fig. 25C). Abdomen dorsum white, hirsute, covered with brown patches, lateral sides with same brown patches diffusing ventrally, ventral surface with dark longitudinal line at center, tracheal spiracle in center of abdomen (Fig. 25A–C). Chelicerae dark brown (Fig. 25D), promargin with four teeth, retromargin with eight to nine denticles. Leg coloration: dark yellow with brown patches irregularly distributed from distal end of femora to tarsi, tibia IV with two dark bands at opposite ends (Fig. 25A). Epigynum hood absent, lateral borders sinuous. Copulatory openings on anterior internal margin of heart-shaped atrium (Fig. 26E–F). Copulatory ducts entering lateral margins of spermathecae. Seminal receptacles cylindrical, projected dorsally and located at junction between spermathecae and copulatory duct entrance. Fertilization ducts attached to posterior margin of spermathecae (Fig. 27G–H). Cephalothorax length 3.8, thoracic width 3.07, cephalic width 2.39. Clypeus height 0.13. Eye diameters: AME 0.13, ALE 0.18, PME 0.17, PLE 0.2. Eye interdistances: AME–AME 0.04, AME–ALE 0.11, ALE–PLE 0.09, PME–PME 0.2, PME–PLE 0.12. Femur lengths: I 4.1, II 4.0, III 3.17, IV 4.0. Leg spination: femur I d1-1-1, p0-0-2, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-2, r0-1-1. Tibia II v2-2-0. p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p2-1-0, r1-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-1-1, r0-1-1. Tibia IV v2-2-2, p2-1-0, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

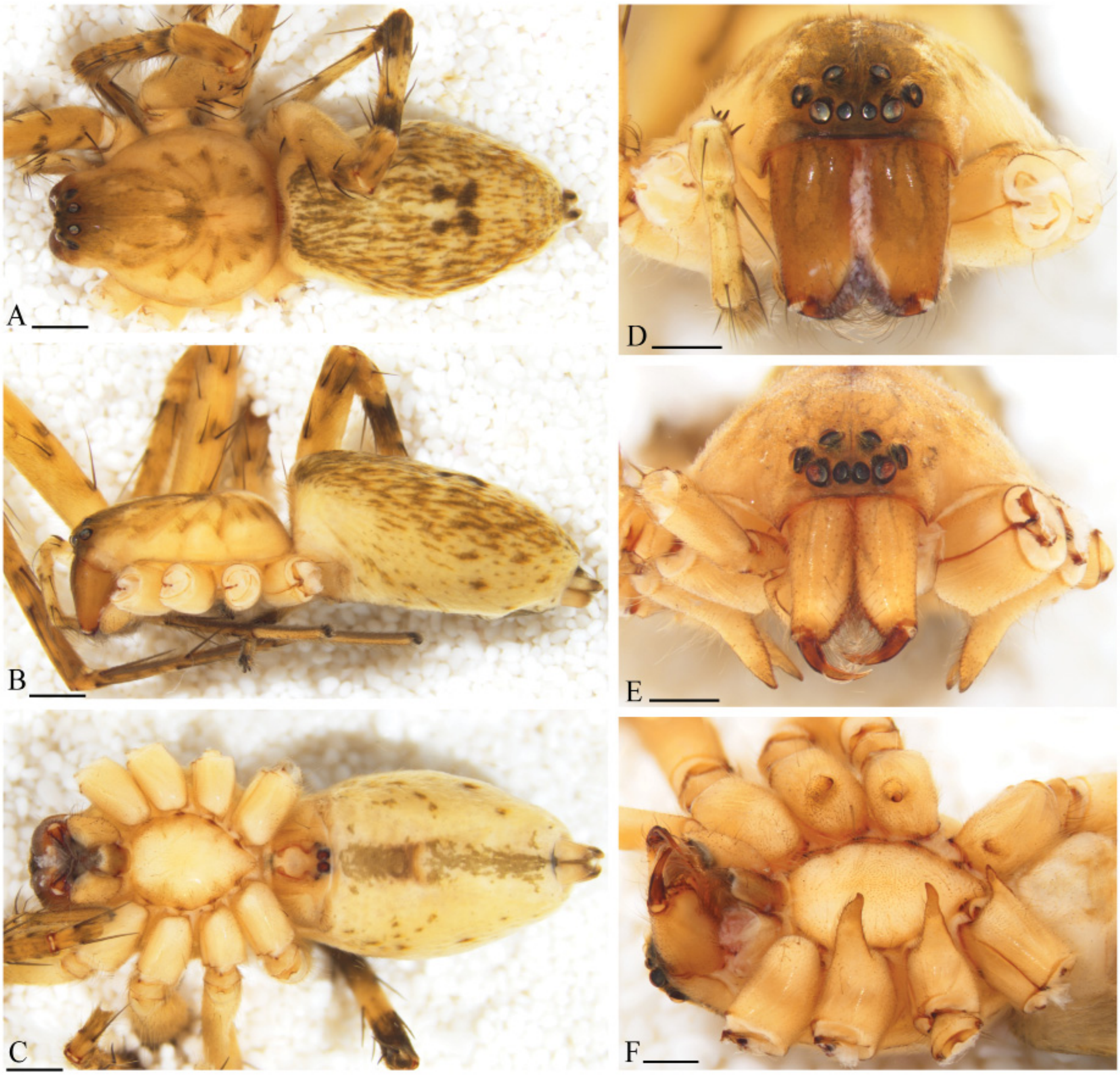

Fig. 25. *Anyphaena dulceae* sp. nov. **A–D**. Paratype, ♀ (CNAN-T01553). **E–F**. Paratype, ♂ (CNAN-T01551). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

Male

Total length 8.2. Cephalothorax coloration as in female except yellow chelicerae (Fig. 25E). Spurs of coxa II to IV large, covered with scattered setae (Figs 25F, 27E–F). Abdomen pattern as in female but paler, dark longitudinal line absent. Pedipalp ventral tegular projection in prolateral view without dorsal keel (Figs 26B, 27B). Embolus filiform and translucent (Fig. 27A). RTA anterior branch semicircular with sclerotized edge and translucent center, RTA posterior branch sclerotized and hook-shaped with translucent tip (Figs 26 A, C–D, F, 27A, C–D). Prolateral apophysis small and cone-shaped (Fig. 27B). Pedipalp tibia slightly longer than wide. Ventral branch of median tibial apophysis displaced towards proximal border of tibia (Figs 26 A, D, 27A, D). Cephalothorax length 3.32, thoracic width 2.68, cephalic width 1.80. Clypeus height 0.1. Eye diameters: AME 0.11, ALE 0.18, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.06, AME–ALE 0.04, ALE–PLE 0.07, PME–PME 0.15, PME–PLE 0.11. Femur lengths: I 3.9, II 3.61, III 2.88, IV 3.8. Leg spination: as in female except: femur I p0-1-2.

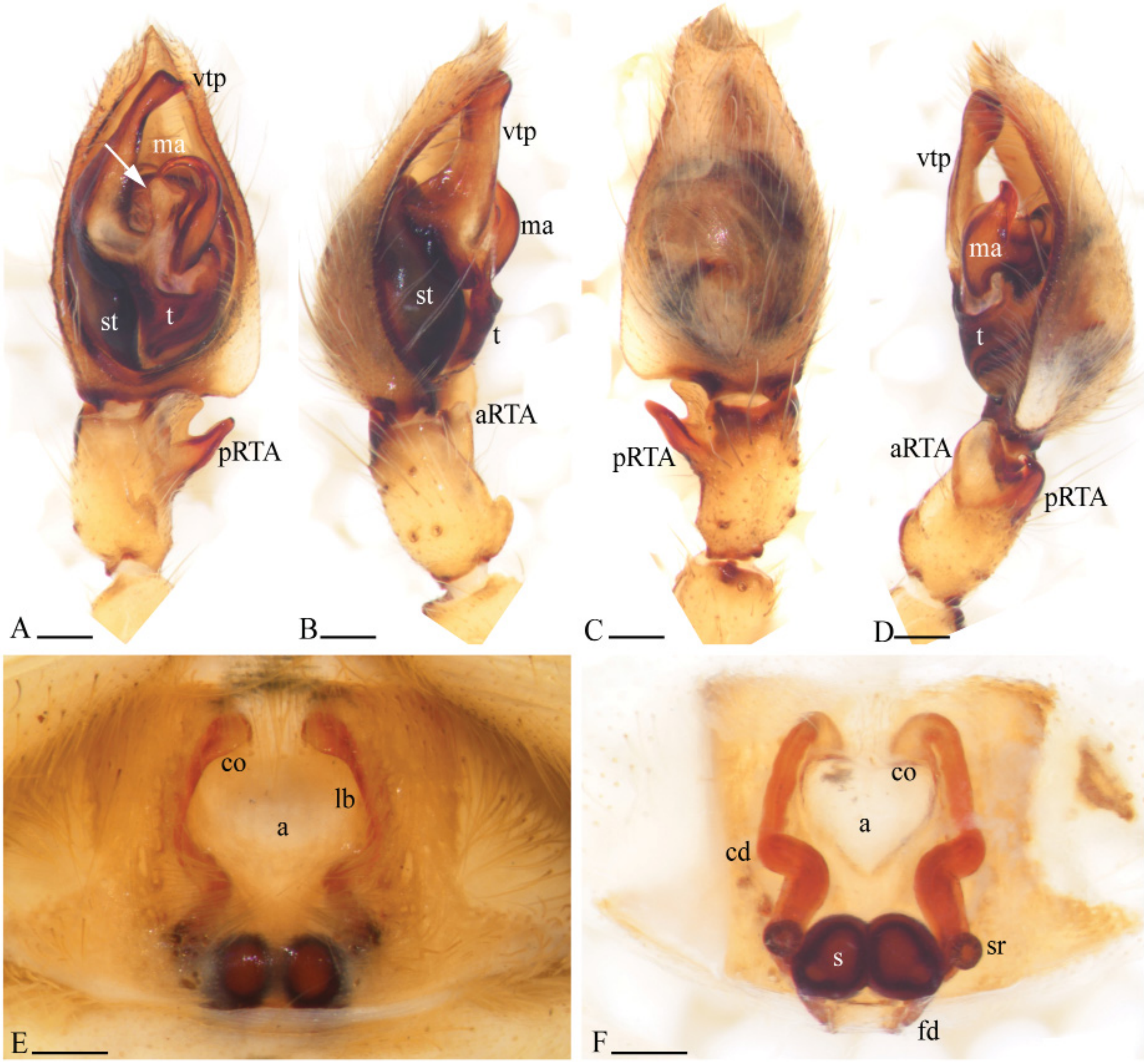

Fig. 26. *Anyphaena dulceae* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01551). **E–F**. Paratype, ♀ (CNAN-T01552). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

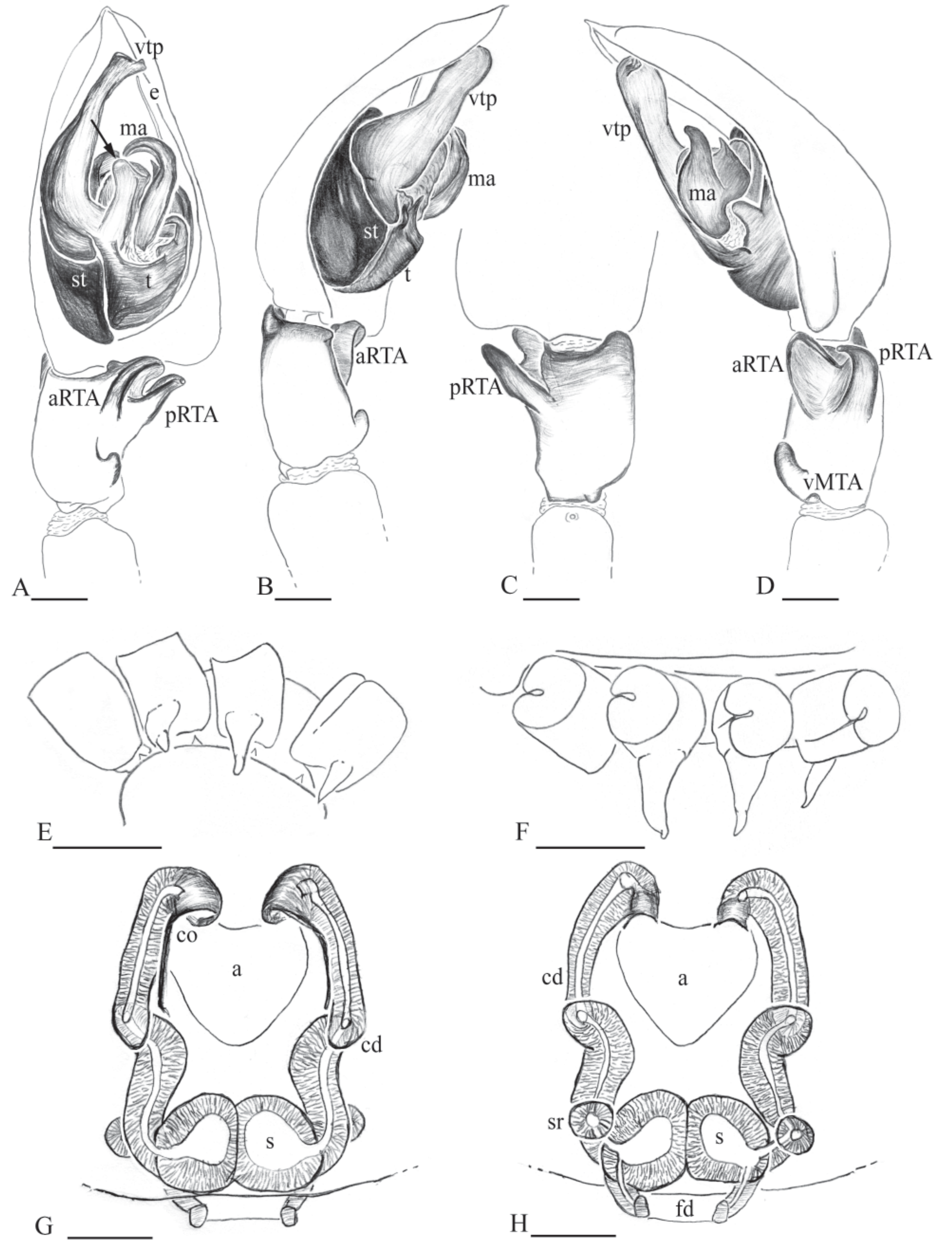

Fig. 27. *Anyphaena dulceae* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01551). **G–H**. Paratype, ♀ (CNAN-T01552). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

Variation

Females (N = 10): total length 8.16 (±0.97), cephalothorax length 3.49 (±0.27), thoracic width 2.69 (±0.32), cephalic width 2.17 (±0.27), femur I 3.8 (±0.28). Males (N = 10): total length 7.47 (±0.39), cephalothorax length 3.3 (±0.13), thoracic width 2.64 (±0.12), cephalic width 1.79 (±0.08), femur I 3.97 (±0.18).

Distribution

This species is found in oak and oak-pine forests around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present year-round.

Anyphaena rebecae sp. nov.

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Figs 2C–D, 28–30, 52

Differential diagnosis

Females of *A. rebecae* sp. nov. are differentiated from those of all species of the *pectorosa* and *pacifica* groups by the following features: atrium trapezoidal, hood notched at the center (Figs 29E–F, 30G–H). The female of *A. franciscoi* sp. nov. also has a similar trapezoidal atrium and copulatory duct paths (Fig. 17E–F), but differs from that of *A. rebecae* sp. nov. by the central part of the atrium being convex and its larger size (9.6 ± 1.1). The females of *A. sofiae* sp. nov. share with both species similar copulatory duct paths and spermathecae proportions, but differ by the oval atrium and copulatory ducts extending beyond the hood (Fig. 36E–F). Males can be differentiated by the presence of the following features: median apophysis hook-shaped and with a ventral transparent lamella, ventral tegular projection distal section widest, middle section constricted, retrolateral border with a transparent cuticular edge, prolateral border with a basal protuberance (Figs 29A–B, D, 30 A–B, D), RTA posterior branch roughly squared with a spine-shaped process on its anterior border (Figs 29D, F, 30D). Ventral tegular projections with broad middle sections and translucent retrolateral edges are also present in *A. zorynae* and *A. zuyelenae* Durán-Barrón, Pérez & Brescovit, 2016 (Durán-Barrón *et al.* 2016: figs 5, 9, 12, 16), *A. pectorosa* and *A. pacifica* (Platnick 1974: figs 51, 55, 59, 63), *A. porta* sp. nov. (Fig. 41A), and *A. quadrata* sp. nov. (Fig. 35A). Median apophysis with transparent lamella is present in *A. pectorosa*, *A. fraterna*, *A. lacka* and *A. alachua* (Platnick 1974: figs 51–58). Similar RTA are present in *A. epicardia* sp. nov. (Fig. 24D).

Etymology

The species epithet is dedicated to Maria Rebeca Quiroz, mother of the first author.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01536.

Allotype

MEXICO • ♂; same collection data as for holotype; CNAN-T01518.

Paratypes

MEXICO • 3 ♂♂; same collection data as for holotype; CNAN-T01567 • 1 ♀; same collection data as for holotype; CNAN-T01569 • 1 ♂ same collection data as for holotype; Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; BEAT; CNAN-T01568.

Additional material

MEXICO • 2 ♂♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT • 1 ♀; same collection data as for preceding; ANYM035 • 1 ♀; same collection data as for preceding; ANYM036 • 3 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM032 • 1 ♀; same collection data as for preceding; ANYM033 • 1 ♀; same collection data as for preceding; ANYM034 • 1 ♂; same collection data as for preceding; 4–17 Feb. 2014; BEAT • 1 ♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for holotype; BEAT • 1 ♀; same collection

Fig. 28. *Anyphaena rebecae* sp. nov. **A**–**D**. Holotype, ♀ (CNAN-T01536). **E**–**F**. Paratype, ♂ (CNAN-T01568). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

data as for preceding; ANYM031 • 2 ♂♂; same collection data as for preceding; ANYM040 • 1 ♂; same collection data as for preceding; ANYM043 • 4 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM037 • 1 ♀; same collection data as for preceding; ANYM038 • 2 ♂♂; same collection data as for preceding; ANYM041 • 1 ♂; same collection data as for preceding; 4–17 Feb. 2014; BEAT.

Description

Female

Total length 7.8. Carapace light yellow, with two darker bands over cephalic area, around fovea and clypeus, lateral sides without pattern (Fig. 28A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites white, rectangular, broader at tip (Fig. 28C). Chelicerae brown without dorsal pattern (Fig. 28B, D), promargin with four teeth,

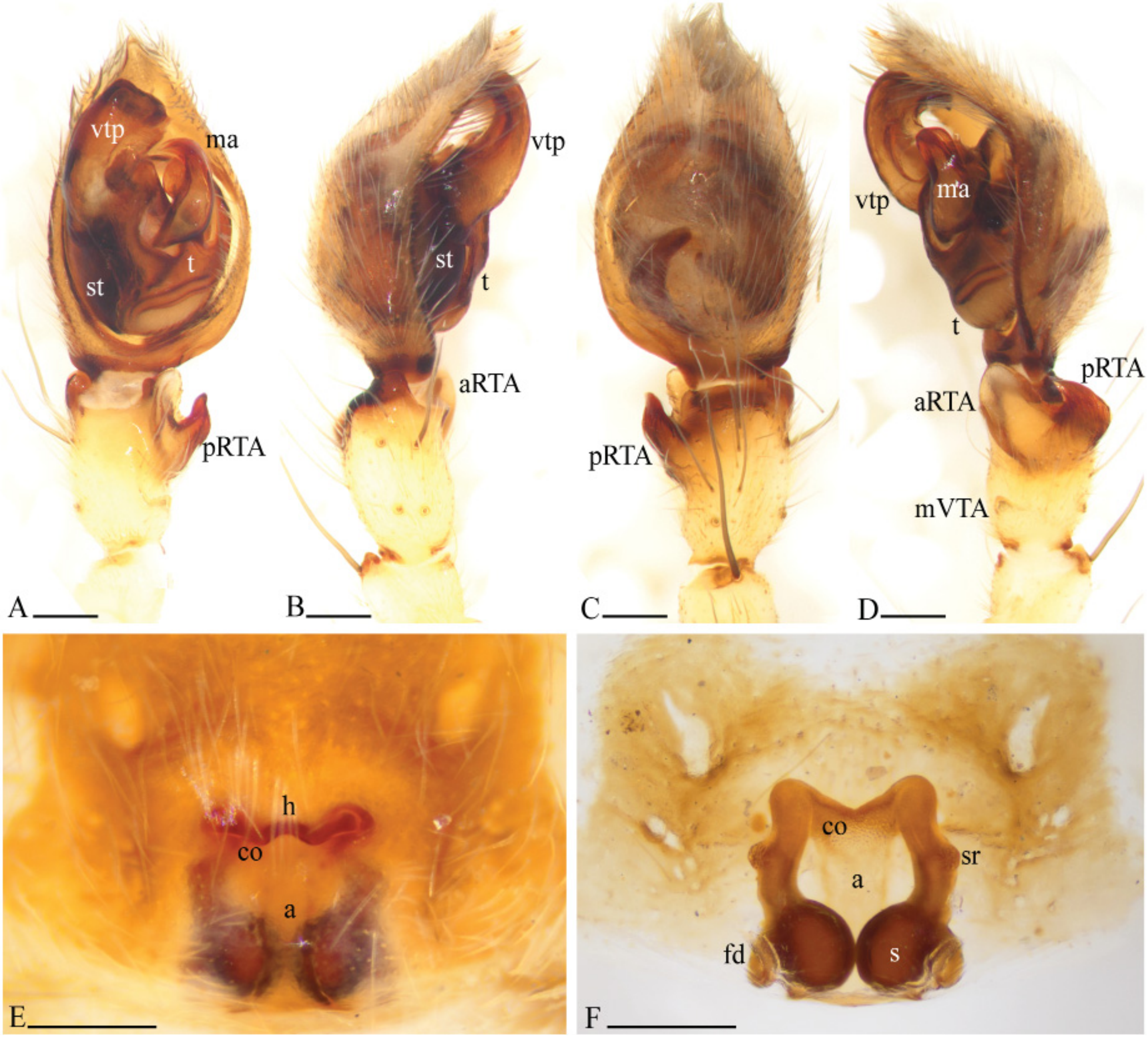

Fig. 29. *Anyphaena rebecae* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01568). **E**. Holotype, ♀ (CNAN-T01536). **F**. Paratype, ♀ (CNAN-T01569). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

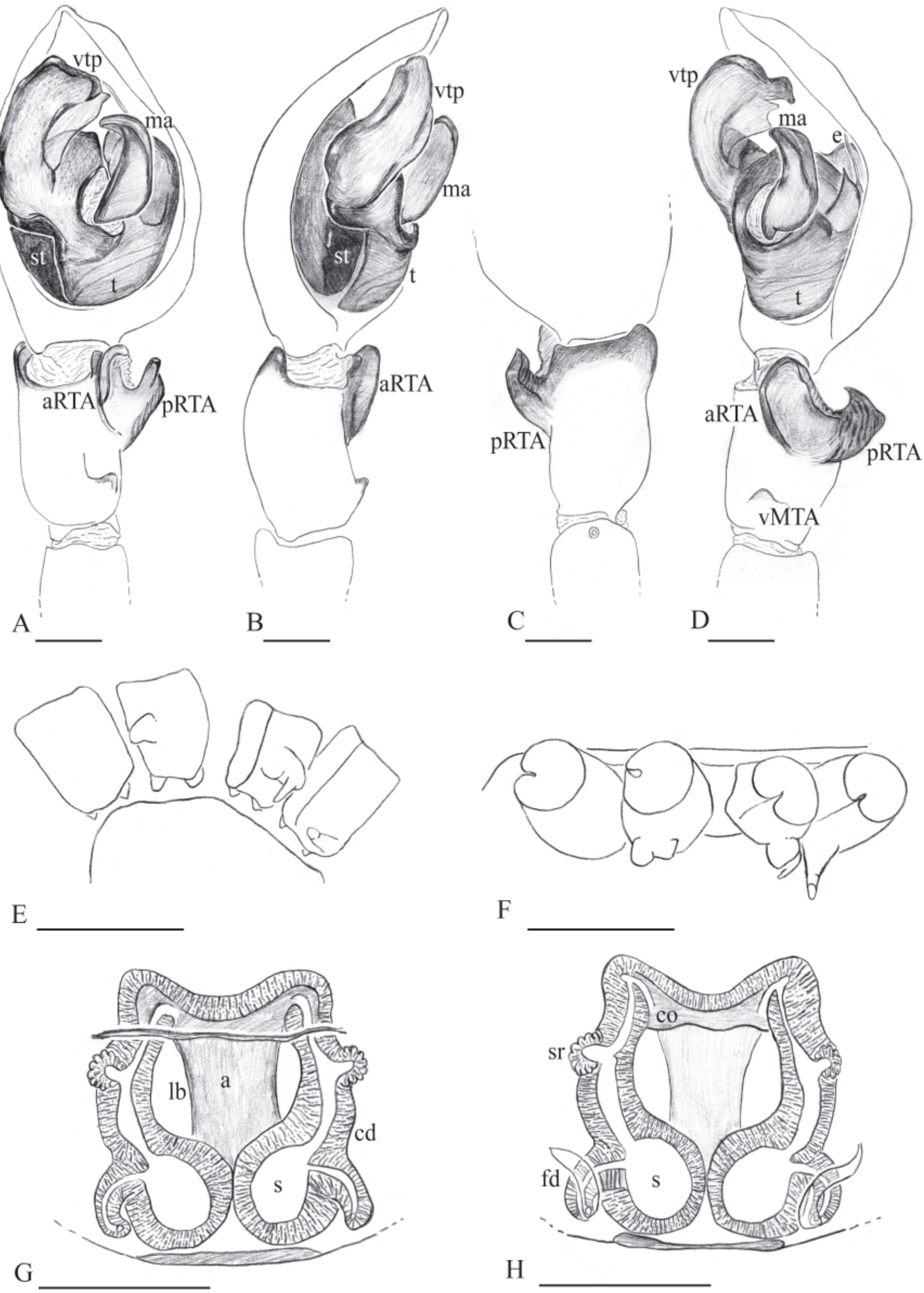

Fig. 30. *Anyphaena rebecae* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01568). **G–H**. Paratype, ♀ (CNAN-T01569). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

retromargin with eight to nine. Legs femora base yellow and covered with darker patches from patella to tarsi. Abdomen dorsum white, hirsute, covered with brown patches, lateral sides with same brown patches diffusing ventrally, ventral surface white, tracheal spiracle in center of abdomen (Fig. 28A, C). Epigynal plate anterior area delineated laterally by two faint pits. Atrium trapezoidal. Genital openings at both lateral sides under hood. Copulatory duct slightly curved, with seminal receptacles at half their length, and entering surface of anterior spermathecae. Fertilization ducts short, comma-shaped, and entering lateral surface of spermathecae (Figs 29E–F, 30G–H). Cephalothorax length 3.7, thoracic width 3.24, cephalic width 2.34. Clypeus height 0.13. Eye diameters: AME 0.1, ALE 0.15, PME 0.13, PLE 0.13. Eye interdistances: AME–AME 0.06, AME–ALE 0.05, ALE–PLE 0.09, PME–PME 0.16, PME–PLE 0.13. Femur lengths: I 3.51, II 3.27, III 2.54, IV 3.32. Leg spination: femur I d1-1-1, p0-1-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-1-1, r0-1-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 6.3. Cephalothorax and abdomen coloration as in female, except yellow chelicerae (Fig. 28E). Coxa II tubercle bifurcated. Coxa III tubercle roughly rectangular with median spine. Coxa IV spur bent and located at retrolateral basal corner (Figs 28F, 30E–F). Embolus filiform and translucent. Palpal tibia prolateral apophysis present (Figs 29E–F, 30B–C). Pedipalp tibia slightly longer than wide. Ventral branch of median tibial apophysis displaced towards proximal border of tibia (Figs 29A, D, 30A, D). Cephalothorax length 2.83, thoracic width 2.2, cephalic width 1.0. Clypeus height 0.07. Eye diameters: AME 0.11, ALE 0.15, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.04, AME–ALE 0.04, ALE–PLE 0.04, PME–PME 0.17, PME–PLE 0.09. Femur lengths: I 3.41, II 3.12, III 2.39, IV 3.17. Leg spination as in female except: femur I r0-2-1.

Variation

Females (N = 10): total length 7.23 (± 1.01), cephalothorax length 2.97 (± 0.2), thoracic width 2.35 (± 0.3), cephalic width 1.19 (± 0.08), femur I 3.28 (± 0.15). Males (N = 10): total length 6.49 (± 0.23), cephalothorax length 2.85 (± 0.12), thoracic width 2.27 (± 0.11), cephalic width 0.99 (± 0.03), femur I 3.44 (± 0.18).

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present year-round.

Anyphaena miniducta sp. nov.

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Figs 31–33, 52

Differential diagnosis

Females of *A. miniducta* sp. nov. are differentiated from most of those of the *pectorosa* and *pacifica* groups by the following features: atrium T-shaped, lateral borders short and parallel, copulatory ducts short, slightly curved (Figs 32E–F, 33G–H). Similar atria are present in females of *A. simplex* (Pickard-Cambridge O. 1894: pl. 18 fig. 3a) and *A. porta* sp. nov. (Fig. 39E), but they differ by the atrium proportions and the length of the lateral sides, respectively. Males can be differentiated by the presence of the following features: median apophysis hook-shaped, transparent lamellae absent, middle section of ventral tegular projection broad, retrolateral border with a narrow cuticular transparent edge, distal section pointed, RTA anterior branch ear-shaped, larger than the lamella-shaped posterior branch in retrolateral view (Figs 32A–D, 33A–D).

Etymology

The species epithet refers to the short copulatory ducts of this species in relation to other members of the *pectorosa* group.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01531.

Allotype

MEXICO • ♂; same collection data as for holotype; BEAT; CNAN-T01515.

Paratypes

MEXICO • 1 ♂, 1 ♀; same collection data as for holotype; CNAN-T01561 • 1 ♀; same collection data as for holotype; CNAN-T01560.

Additional material

MEXICO • 1 ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; ANYM047 • 1 ♂; same collection data as for holotype; BEAT; ANYM048 • 1 ♀; same collection data as for preceding; ANYM049 • 1 ♀; same collection data as for preceding; CRP; ANYM050 • 1 ♀; same collection data as for preceding; LUP; ANYM051.

Description

Female

Total length 9.0. Carapace light yellow, with two darker and faint bands over cephalic area, around fovea and clypeus (Fig. 31A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites white, rectangular, broader at tip (Fig. 31C). Chelicerae brown without dorsal pattern (Fig. 31B, D), promargin with five, retromargin with eight to nine denticles. Abdomen dorsum light yellow, hirsute, delineated by dark yellow longitudinal bands, central anterior half white, lateral sides light yellow, darker band only at top, ventral surface white, tracheal spiracle closer to epigastric furrow (Fig. 31A, C). Copulatory duct slightly curved and entering lateral surface of spermathecae. Seminal receptacles above genital openings. Fertilization ducts short, comma-shaped, and entering lateral surface of spermathecae (Figs 32E–F, 33G–H). Cephalothorax length 3.76, thoracic width 2.83, cephalic width 1.52. Clypeus height 0.15. Eye diameters: AME 0.11, ALE 0.15, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.06, AME–ALE 0.05, ALE–PLE 0.11, PME–PME 0.2, PME–PLE 0.1. Femur lengths: I 4.39, II 4.05, III 3.17, IV 4.59. Leg spination: femur I d1-1-1, p0-2-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-2. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV 1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 8.0. Cephalothorax and abdomen pattern as in female, except darker and yellow chelicerae (Fig. 31E). Coxa II ventral surface smooth. Coxa III tubercle bifurcated, with posterior bent spine and anterior tubercle. Coxa IV spur bent and with broad base (Figs 31F, 33E–F). Embolus filiform and translucent. Pedipalp tibia longer than wide. RTA posterior branch short and shaped as bent lamella. Prolateral apophysis of palpal tibia present. Ventral branch of median tibial apophysis present (Figs 32A–D, 33A–D). Cephalothorax length 3.41, thoracic width 2.59, cephalic width 1.19. Clypeus height 0.12. Eye diameters: AME 0.09, ALE 0.12, PME 0.12, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.11, PME–PME 0.15, PME–PLE 0.12. Femur lengths: I 4.63, II 4.1, III 3.17, IV 4.63. Leg spination as in female except: femur I r0-2-1. Femur II p0-1-2.

Variation

Females (N=6): total length 8.9 (±0.39), cephalothorax length 3.8 (±0.11), thoracic width 2.89 (±0.06), cephalic width 1.52 (±0.06), femur I 4.41 (±0.04). Males (N=4): total length 8.03 (±0.37), cephalothorax length 3.44 (±0.21), thoracic width 2.63 (±0.12), cephalic width 1.21 (±0.07), femur I 4.61 (±0.13).

Fig. 31. *Anyphaena miniducta* sp. nov. **A–D**. Paratype, ♀ (CNAN-T01560). **E–F**. Allotype, ♂ (CNAN-T01515). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C=1.0 mm; D–F=0.5 mm.

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present year-round.

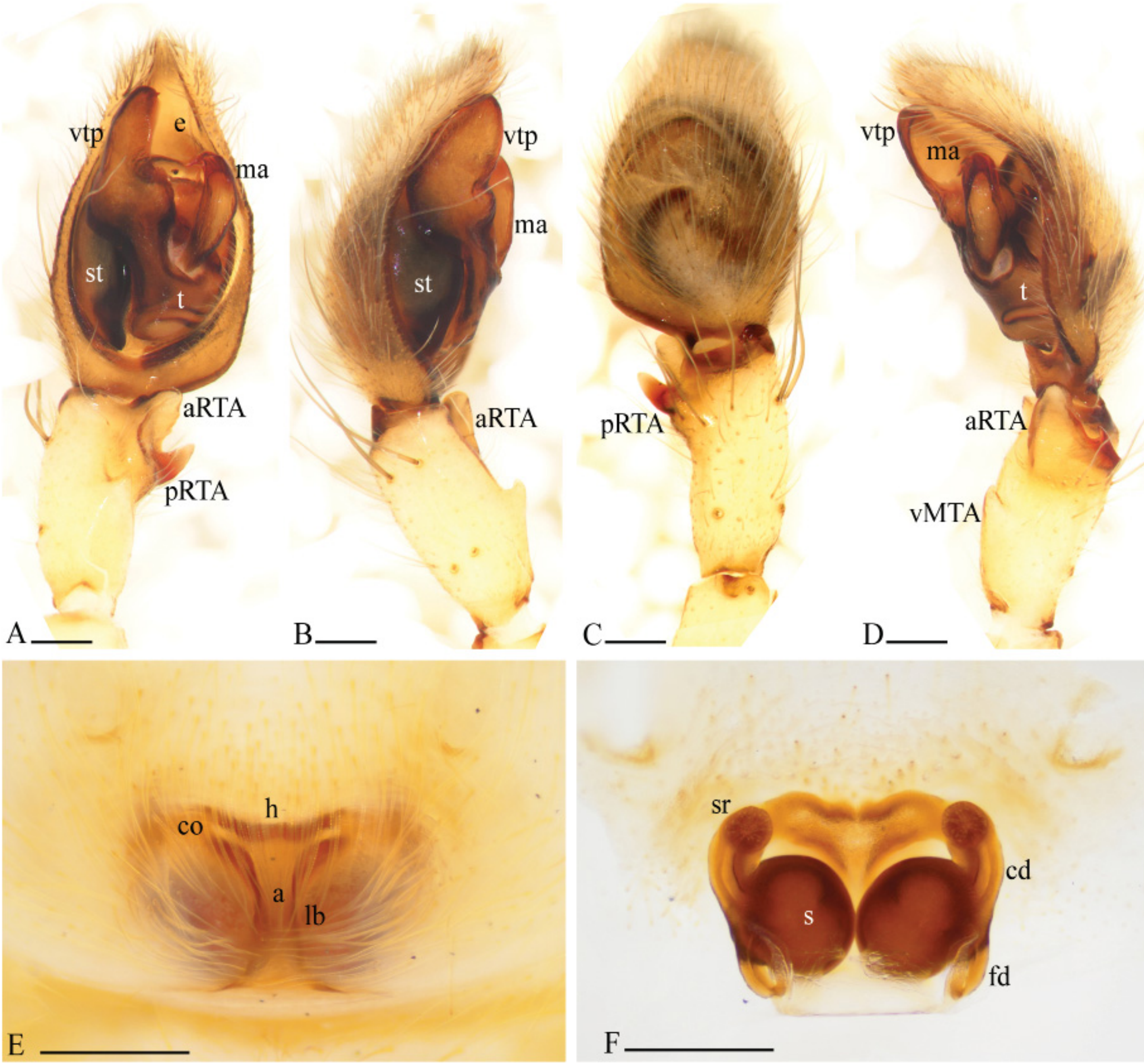

Fig. 32. *Anyphaena miniducta* sp. nov. **A**–**D**. Allotype, ♂ (CNAN-T01515). **E**–**F**. Paratypes, ♀♀ (CNAN-T01560, CNAN-T01561). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

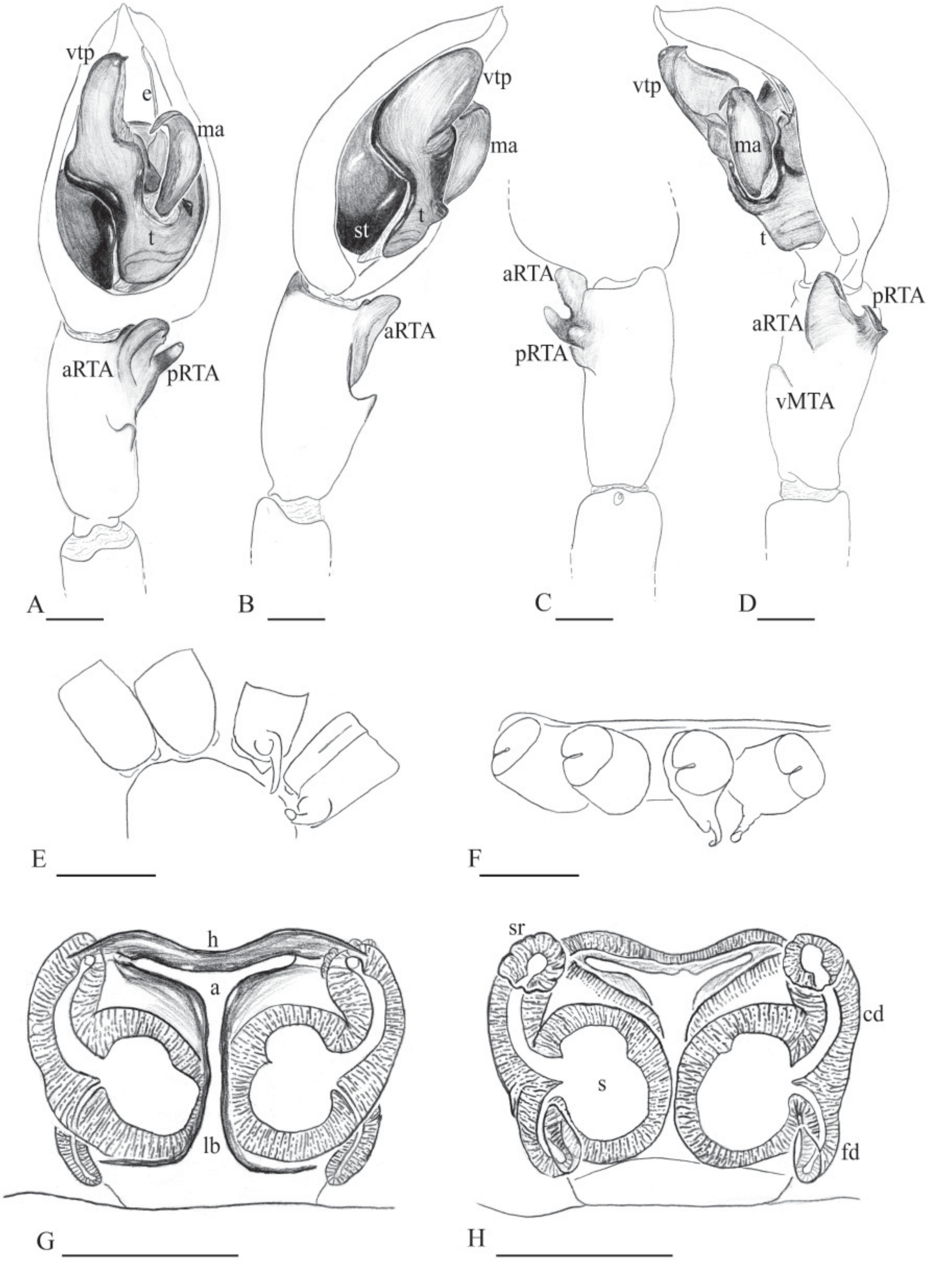

Fig. 33. *Anyphaena miniducta* sp. nov. **A–F**. Allotype, ♂ (CNAN-T01515).**G–H**. Paratype, ♀ (CNAN-T01561). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

Anyphaena quadrata sp. nov.
urn:lsid:zoobank.org:act:DE0EFD57-6E7A-4854-9B6D-2C919B2AF7D7
Figs 34–35, 52

Differential diagnosis

Males of *A. quadrata* sp. nov. are differentiated from all those of the *pectorosa* and *pacifica* groups by the ventral tegular projection distal section being broad and rectangular, the median apophysis also rectangular, longer than wide (Figs 34E–F, 35A–D). Coxa III tubercle bifurcated, anterior ramification blunt, posterior ramification spine-shaped (Fig. 35E–F). Similar tegular apophyses are found in males of *A. zuyelenae* (Durán-Barrón *et al.* 2016: figs 12–14, 16) and *A. accentuata* (Platnick 1974: figs 63, 70; Dondale & Redner 1982: fig. 336; Brescovit 1997: figs 1–6), but they differ by the hook-shaped median apophysis, the RTA shape and coxal ventral surfaces.

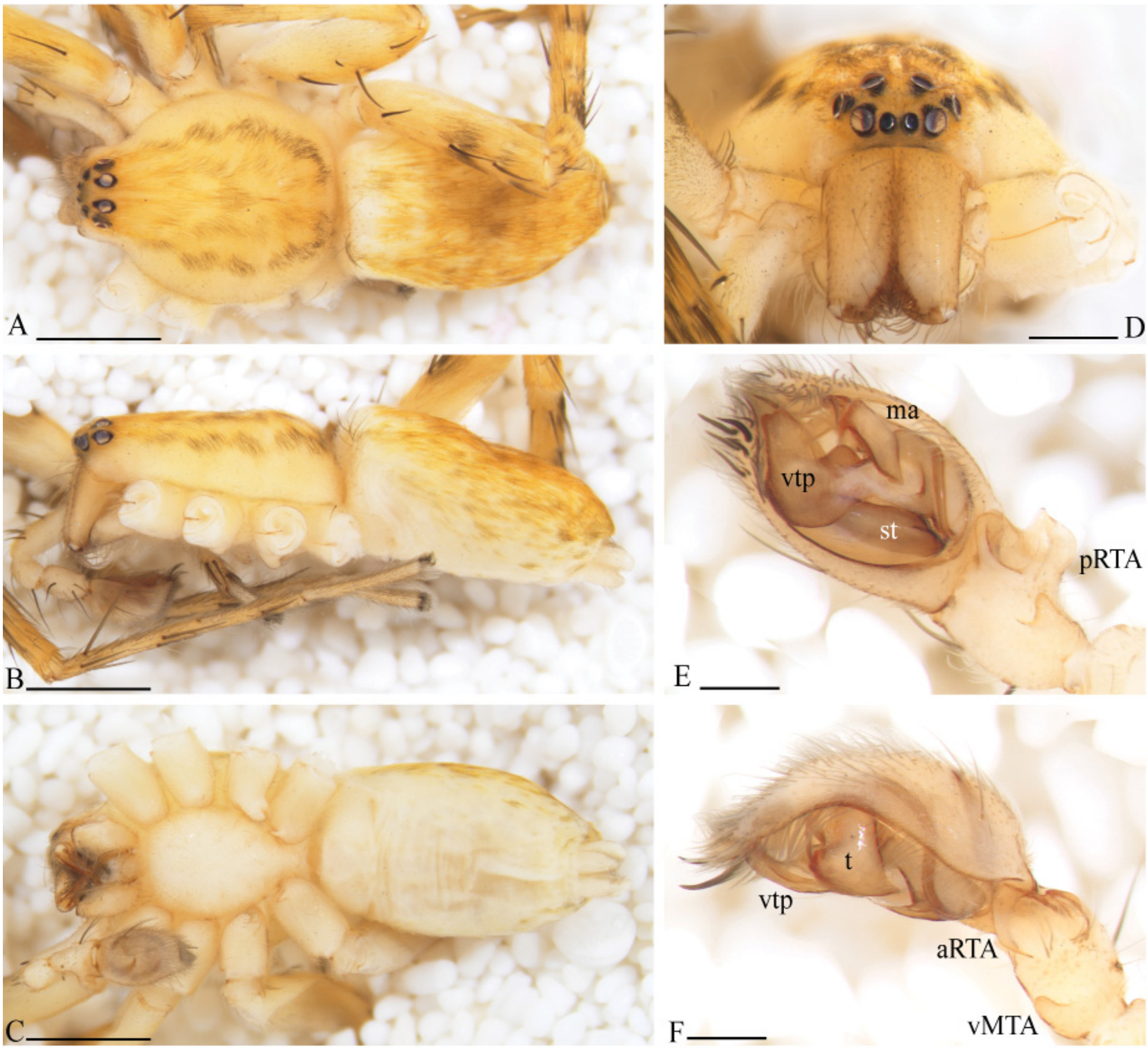

Fig. 34. *Anyphaena quadrata* sp. nov., paratype, ♂ (CNAN-T01566). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Pedipalp, ventral view. **F**. Pedipalp, retrolateral view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Etymology

The species epithet is derived from the Latin '*quadrata*' ('square'), referring to the distinctive broad semi-squared shape of the ventral tegular projection.

Material examined

Holotype

MEXICO • ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 2–11 Oct. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; CNAN-T01535.

Paratype

MEXICO • 1 ♂; Veracruz, Calcahualco, Xamaticpac, Plot II 19.12614° N, 97.06708° W; alt. 1700 m; 2–11 Oct. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; CNAN-T01566.

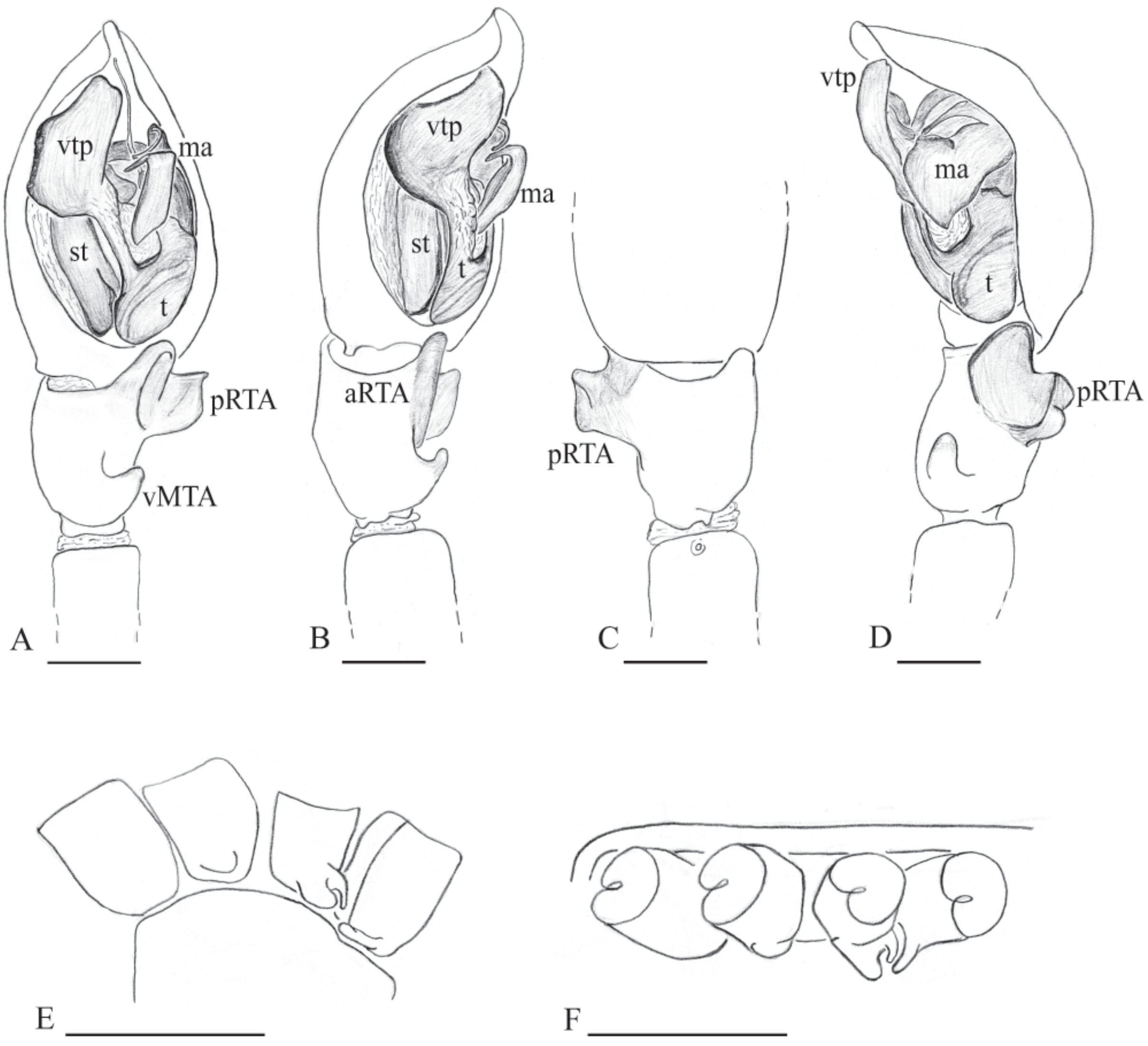

Fig. 35. *Anyphaena quadrata* sp. nov., paratype, ♂ (CNAN-T01566). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. Scale bars: A–D = 0.2 mm; E–F = 1.0 mm.

Additional material

MEXICO • 1 ♂; same collection data as for paratype; BEAT; ANYM054 • 1 ♂; same collection data as for preceding; ANYM055.

Description

Male

Total length 4.5. Carapace yellow, with two darker bands over ocular quadrangle, around fovea and clypeus. Sternum surface white, intercoxal triangles present on all legs. Labium yellow, white at tip, longer than wide. Endites white, rectangular, broader at tip (Fig. 34A–C). Chelicerae yellow, paturon without pattern (Fig. 34D), promargin with four teeth, retromargin with eight to nine denticles. Abdomen hirsute, dorsal surface dark yellow, anterior border white, lateral sides with same dark pattern on top and diffusing ventrally, ventral surface white. Tracheal spiracle at center of abdomen (Fig. 34A, C). Distal surface of median apophysis with spine. Prolateral apophysis present. Tibia slightly longer than wide. Ventral branch of median tibial apophysis displaced towards proximal border of tibia (Figs 34E–F, 35A–B, D). Coxa II with short basal tubercle, coxa IV with bent spur (Fig. 35F-F). Cephalothorax length 2.24, thoracic width 1.76, cephalic width 0.77. Clypeus height 0.07. Eye diameters: AME 0.06, ALE 0.1, PME 0.1, PLE 0.11. Eye interdistances: AME–AME 0.04, AME–ALE 0.02, ALE–PLE 0.09, PME–PME 0.15, PME–PLE 0.07. Femur lengths: I 2.29, II 2.05, III 1.71, IV 2.2. Leg spination: femur I d1-1-1, p0-2-1, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Female

Unknown.

Variation

Males (N = 4): total length 4.63 (± 0.15), cephalothorax length 2.24 (± 0.04), thoracic width 1.76 (± 0.04), cephalic width 0.81 (± 0.04), femur I 2.37 (± 0.05).

Distribution

Only known from the type locality (Fig. 52).

Natural history

Most specimens collected by beating and direct searching over vegetation.

Anyphaena sofiae sp. nov.

urn:lsid:zoobank.org:act:8A24E970-6D83-475F-BD2C-9CD4C599C653

Figs 36, 38A–B, 52

Differential diagnosis

Females of *A. sofiae* sp. nov. are differentiated from those of all species of the *pectorosa* and *pacifica* groups by the following features: copulatory ducts extending beyond the hood, atrium oval, hood faint, thin and straight (Figs 36E–F, 38A–B).

Etymology

The species epithet is dedicated to Sofia Rivera, niece of the first author.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 15–24 Feb. 2013; Arcanolab team leg.; oak and pine forest fragment; BEAT; AR_060; GenBank: ON619648; CNAN-T01538.

Paratypes

MEXICO • 1 ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 21–30 May 2012; Aracnolab team leg.; oak forest fragment; LUP; AR_057; GenBank: ON619646; CNAN-T01572 • 1 ♀; same collection data as for preceding; AR_059; GenBank: ON619647; CNAN-T01573.

Fig. 36. *Anyphaena sofiae* sp. nov., paratypes, ♀♀ (CNAN-T01572, CNAN-T01573). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Additional material

MEXICO • 1 ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 15–24 Feb. 2013; Aracnolab team leg.; oak forest fragment; BEAT • 1 ♀; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; 21–30 May 2012; LUP • 1 ♀; same collection data as for preceding; ANYM025 • 1 ♀; same collection data as for preceding; Atotonilco. Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 15–24 Feb. 2013; oak and pine forest fragment; BEAT • 1 ♀; same collection data as for preceding; CRP • 3 ♀♀; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM029 • 1 ♀; same collection data as for preceding; 21–30 May 2012; BEAT; ANYM026 • 1 ♀; same collection data as for preceding; ANYM027 • 1 ♀; same collection data as for preceding; ANYM028 • 1 ♀; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; ANYM030 • 1 ♀; same collection data as for preceding; 4–14 Oct. 2012; LUP.

Description

Female

Total length 7.8. Carapace yellow, pattern with darker bands delineating cephalic area, around fovea and clypeus (Fig. 36A, D). Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, broader at tip (Fig. 36C). Chelicerae brown, without dorsal pattern (Fig. 36B, D), promargin with four teeth, retromargin with eight to nine denticles. Abdomen dorsal surface white, covered with darker patches and some diffuse chevrons at center, lateral and ventral surfaces white, pattern diffusing ventrally, tracheal spiracle slightly closer to epigastric furrow (Fig. 36A–C). Anterior area of epigynal plate delineated laterally by two faint pits near copulatory ducts bent. Genital openings at both sides of hood. Copulatory duct paths bent posteriorly beyond hood and entering spermathecae antero-laterally. Seminal receptacles closer to spermathecae at one third of copulatory ducts' length. Fertilization ducts short, straight, and entering spermathecae via postero-lateral surface (Figs 36E–F, 38A–B). Cephalothorax length 2.93, thoracic width 2.29, cephalic width 1.23. Clypeus height 0.1. Eye diameters: AME 0.09, ALE 0.12, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.06, AME–ALE 0.04, ALE–PLE 0.17, PME–PME 0.17, PME–PLE 0.13. Femur lengths: I 3.13, II 2.9, III 2.26, IV 3.0. Leg spination: femur I d1-1-1, p0-1-2, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-1-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2

Male

Unknown.

Variation

Females (N = 10): total length 8.03 (± 0.62), cephalothorax length 3.41 (± 0.3), thoracic width 2.48 (± 0.19), cephalic width 1.27 (± 0.08), femur I 3.46 (± 0.27).

Distribution

Only known from the type locality (Fig. 52).

Natural history

Most specimens collected by beating and direct searching over vegetation.

Anyphaena noctua sp. nov.

urn:lsid:zoobank.org:act:1C0E8CF3-254F-4193-B505-8272507357B1

Figs 37, 38C–D, 52

Differential diagnosis

Females of *A. noctua* sp. nov. are differentiated from those of all species of the *pectorosa* and *pacifica* groups by the following features: atrium small, lateral borders sinuous, hood triangular, posteriorly curved at the center, genital openings at the posterior margin of the atrium, copulatory ducts short, comma-shaped (Figs 37E–F, 38C–D).

Etymology

The species epithet is derived from the Latin '*noctua*' ('owl'), in reference to the characteristic shape of the epigynum and atrium that are reminiscent of a horned owl with the spermathecae as its eyes.

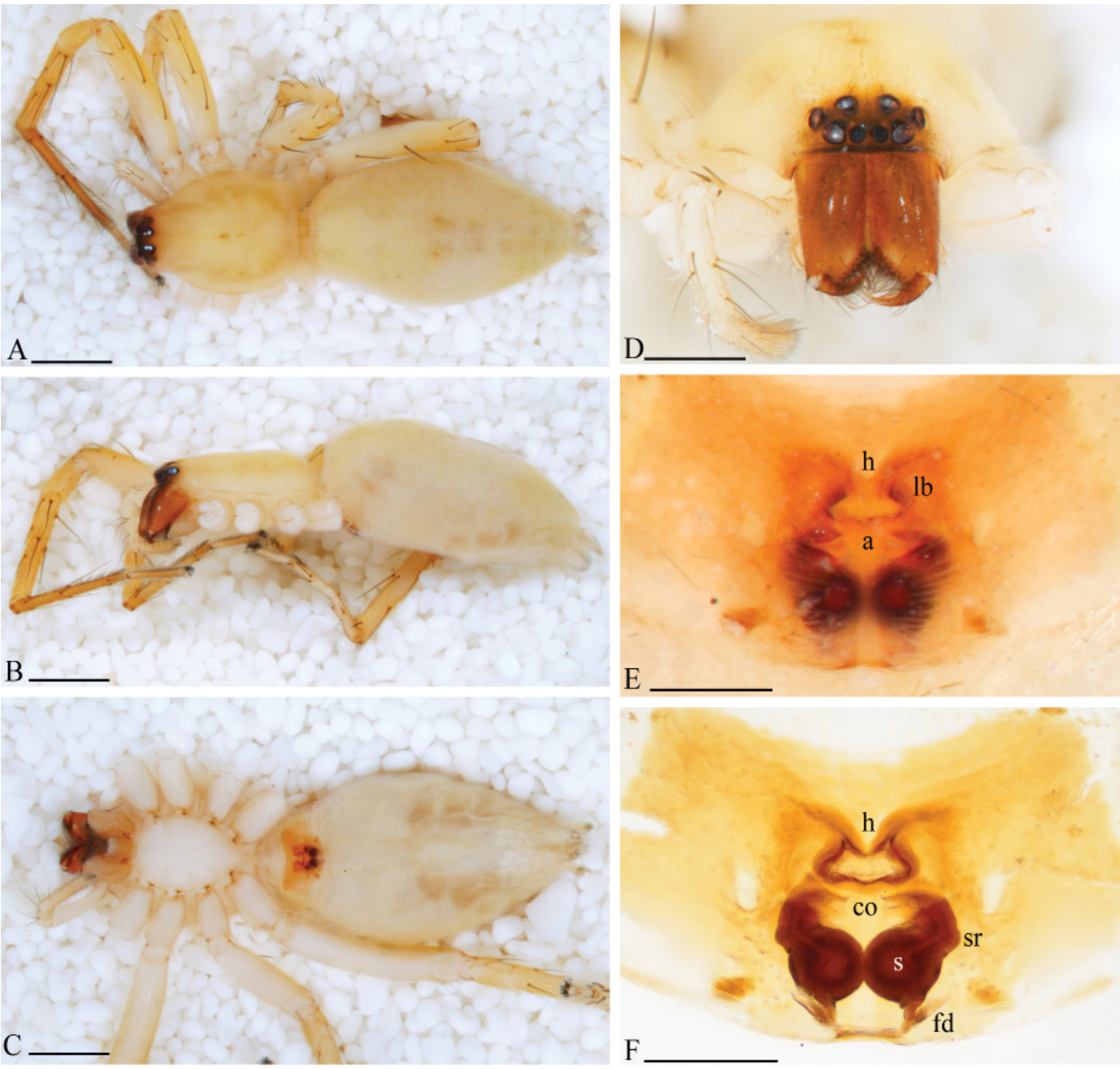

Fig. 37. *Anyphaena noctua* sp. nov., holotype, ♀ (CNAN-T01533). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Material examined

Holotype

MEXICO • ♀; San Luis Potosi, Xilitla City, Las Pozas; 21.39722° N, 98.99388° W; alt. 662 m; 10–15 Jun. 2012; Arcanolab team leg.; tropical wet forest fragment; LUP; CNAN-T01533.

Description

Female

Total length 6.1. Carapace light yellow, with two faint darker bands delineating cephalic area and around fovea, ocular quadrangle and clypeus dark brown (Fig. 37A, D). Sternum surface white, intercoxal triangles present on all legs. Labium yellow, white at tip, longer than wide. Endites yellow, rectangular, broader at tip (Fig. 37C). Chelicerae brown without dorsal pattern (Fig. 37B, D), promargin with four

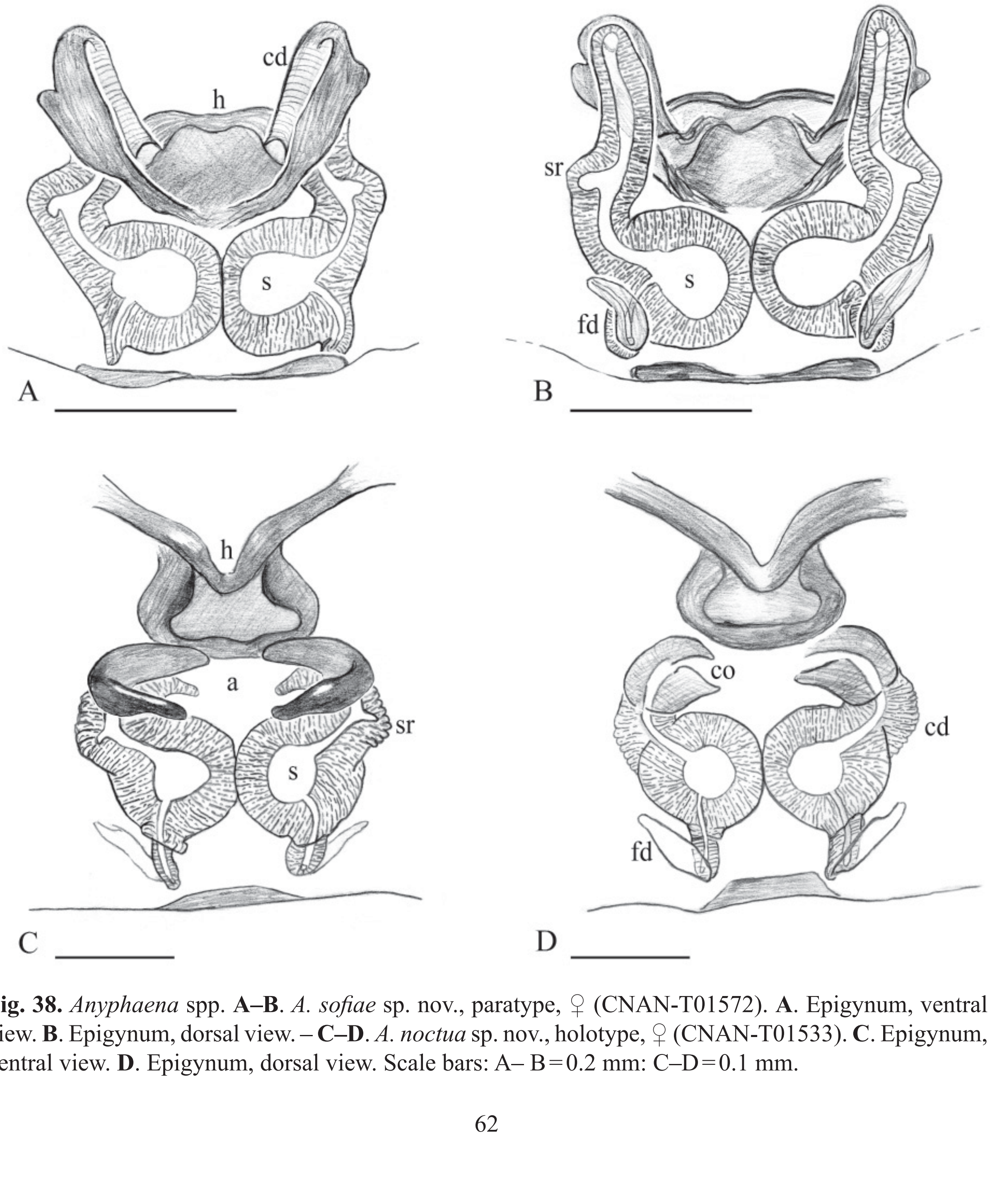

Fig. 38. *Anyphaena* spp. **A–B**. *A. sofiae* sp. nov., paratype, ♀ (CNAN-T01572). **A**. Epigynum, ventral view. **B**. Epigynum, dorsal view. – **C–D**. *A. noctua* sp. nov., holotype, ♀ (CNAN-T01533). **C**. Epigynum, ventral view. **D**. Epigynum, dorsal view. Scale bars: A– B = 0.2 mm: C–D = 0.1 mm.

teeth, retromargin with seven to eight denticles. Femora base of legs white, orange-yellow distally, darker from patella to tarsi. Abdomen dorsal surface white and covered by diffuse darker pattern, pattern of lateral and ventral surfaces even fainter, tracheal spiracle closer to epigastric furrow (Fig. 37A–C). Lateral side of espigynal plate flanked by two faint pits. Seminal receptacles close to genital openings. Fertilization ducts short, cylindrical, and entering posterior surface of spermathecae (Figs 37E–F, 38C–D). Cephalothorax length 2.71, thoracic width 2.1, cephalic width 1.1. Clypeus height 0.05. Eye diameters: AME 0.07, ALE 0.11, PME 0.1, PLE 0.11. Eye interdistances: AME–AME 0.04, AME–ALE 0.02, ALE–PLE 0.05, PME–PME 0.17, PME–PLE 0.07. Femur lengths: I 2.86, II 2.62, III 2.19, IV 2.95. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-0-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v1-1-0, p1-1-1, r1-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Unknown.

Variation

Only type specimen known.

Distribution

Only known from the type locality (Fig. 52).

Natural history

Collected by beating direct searching over ground vegetation.

Porta **group**

Diagnosis

The *porta* group can be separated from other *Anyphaena* species groups by the following characters.

Males

Coxae III and IV smooth or sometimes with ventral tubercles (Figs 41E–F, 51E–F). The general shape of the male palp is similar to that of the *pectorosa* and *pacifica* groups. Differs from both of them by having relatively longer palpal tibiae and in the general shape of the RTA. The RTA base is usually restricted to the distal portion of the tibia instead of the medial portion (compare Figs 48E, 49A with Figs 23A, 24A).

Female

Atrium considerably longer than wide. Copulatory openings sometimes covered by the lateral borders of the atrium. Copulatory ducts long and parallel to each other, projecting posteriorly beyond the hood margin (*A. porta* sp. nov., *A.ibarrai* sp. nov., *A. salgueiroi* sp. nov.), although two species (*A. tonoi* sp. nov. and *A. alachua*) have shorter copulatory ducts (Fig. 46F, see *A. alachua* in Supp. file 3). Spermatheca well sclerotized, oval to spherical.

Anyphaena porta sp. nov.

urn:lsid:zoobank.org:act:F69F982D-2304-4E29-B8F0-F9E66CF24314

Figs 39–41, 52

Differential diagnosis

Females of *A. porta* sp. nov. can be differentiated from females of all described species of *Anyphaena* of the *pacifica* and *pectorosa* groups by the lateral borders of the epigynum being long and parallel, simulating a pair of lengthy doors slightly open with the hood as the door upper frame. Copulatory ducts weakly sclerotized, path bent 180° at the hood, making two loops (Figs 39E–F, 40E–F, 41G–H). Similar epigynum shapes are shared with *A. salgueiroi* sp. nov. and *A. ibarrai* sp. nov., but differ, respectively, from *A. porta* sp. nov. by the almost closed atrium borders (Fig. 42E) and the copulatory ducts being heavily sclerotized (Fig. 43F). Males have a broad ventral tegular projection with the prolateral edge enlarged, a retrolateral rectangular transparent edge, and two small apical apophyses (Figs 40A, 41A). Distal edge of median apophysis bifurcated, ventral extension the largest and hook-shaped in ventral view (Figs 40A, 41A), dorsal extension translucent and hook-shaped in retrolateral view (Figs 40D, 41D). RTA anterior branch acute, RTA posterior branch tip C-shaped (Figs 40B–D, 41B–D). Coxae II to IV with broad and flat ventral tubercles (Fig. 41E–F). Similar broad ventral tegular projections are found in *A. pectorosa* (Platnick 1974: figs 51, 55, 59; Dondale & Redner 1982: fig. 327), *A. bermudensis* Sierwald, 1988 (Sierwald 1988: fig. 1) and *A. zorynae* Durán-Barrón, Pérez & Brescovit, 2016 (Durán-

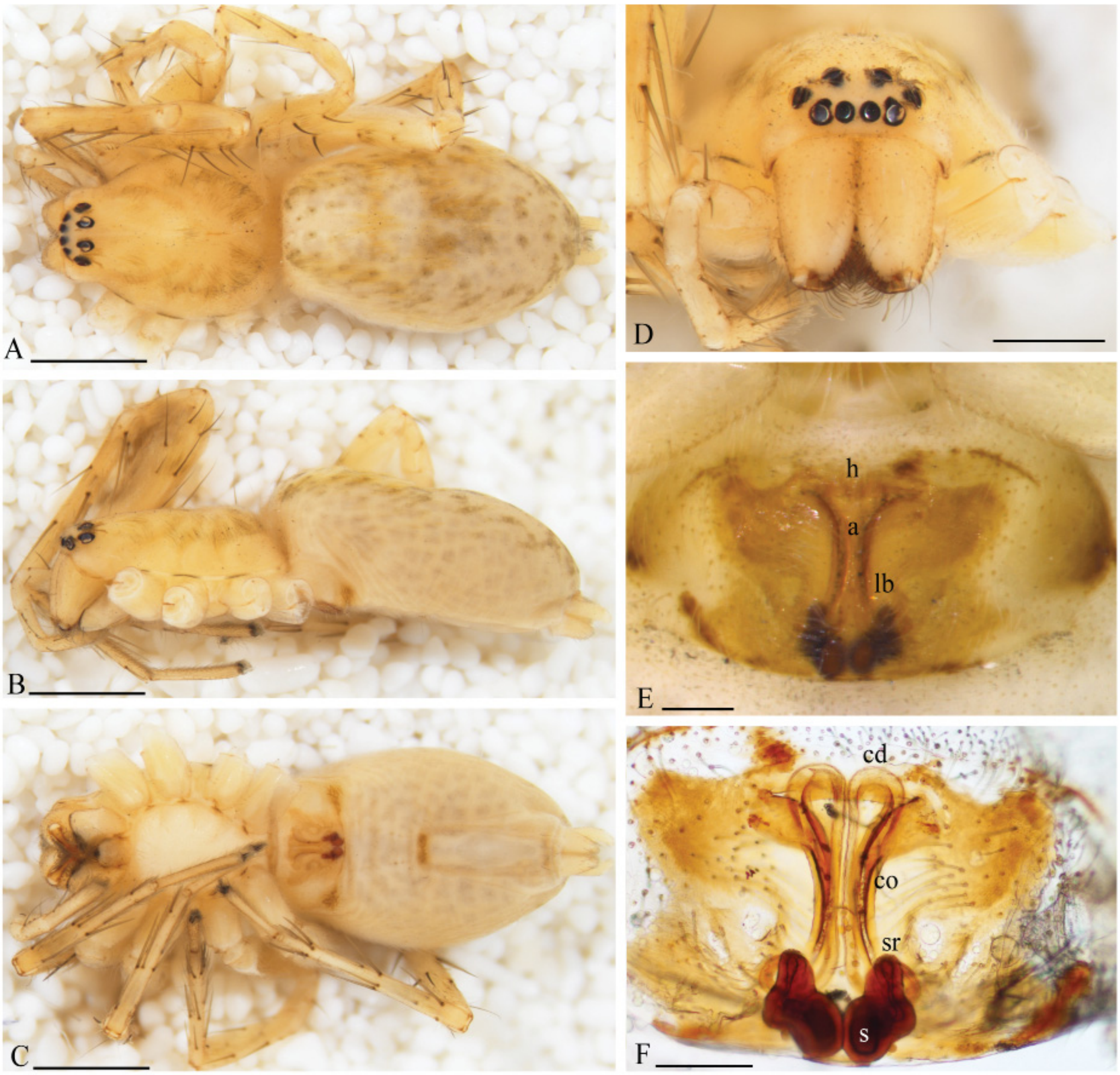

Fig. 39. *Anyphaena porta* sp. nov. **A**–**C**. Holotype, ♀ (CNAN-T01534). **E**–**F**. Paratype, ♀ (CNAN-T01564). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum ventral. **F**. Epigynum ventral cleared. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Barrón *et al.* 2016: figs 5–6, 9), these last two species with coxae unarmed and with small tubercles, respectively.

Etymology

The species epithet refers to the Spanish words '*portón*' or '*puerta*', referring to the door-shaped epigynum atrium, a feature diagnostic of this species.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 15–24 Feb. 2013; Arcanolab team leg.; oak and pine forest fragment; CRP; CNAN-T01534.

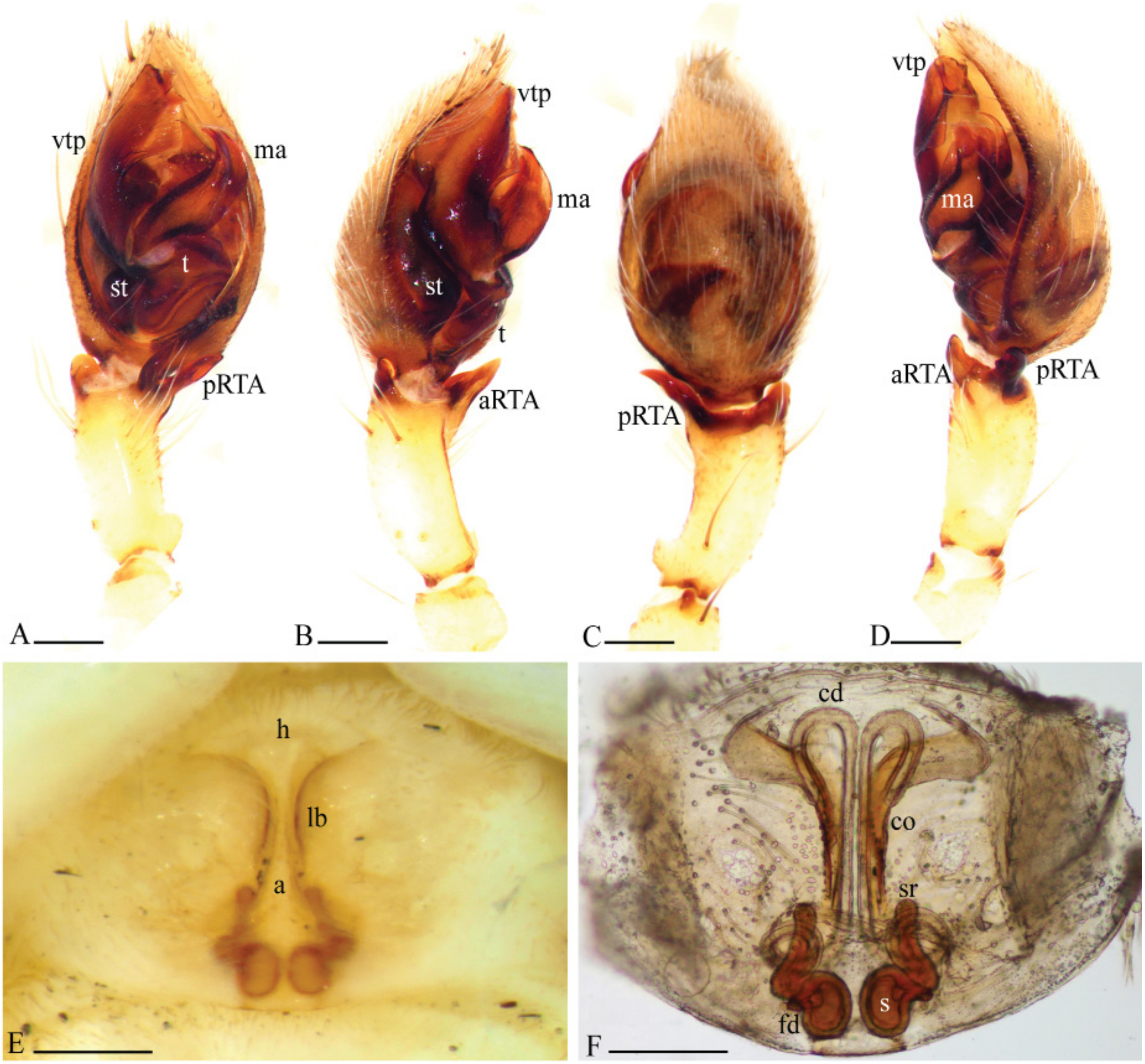

Fig. 40. *Anyphaena porta* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01563). **E–F**. Paratype, ♀ (CNAN-T01565). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

Allotype
MEXICO • ♂; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 21–30 May 2012; oak forest fragment; LUP; AR_066; GenBank: ON619626; CNAN-T01517.

Paratypes
MEXICO • 1 ♀; same collection data as for holotype; BEAT; AR_077; GenBank: ON619656; CNAN-T01565 • 1 ♂; same collection data as for holotype; 21–30 May 2012; AR_065; GenBank: ON619625; CNAN-T01563 • 1 ♀; same collection data as for preceding; BEAT; AR_027; GenBank: ON619643; CNAN-T01564.

Additional material
MEXICO • 8 ♀♀; 6 ♂♂; same collection data as for allotype; 15–24 Feb. 2013; BEAT • 1 ♀; same collection data as for preceding; AR_029; GenBank: ON619644 • 1 ♀; same collection data as for preceding; CRP • 8 ♀♀, 7 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; AR_030; GenBank: ON619645 • 1 ♀, 1 ♂; same collection data as for preceding; 21–30 May 2012; BEAT • 2 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; 4–14 Oct. 2012; BEAT • 17 ♀♀, 9 ♂♂; same collection data as for holotype; BEAT • 1 ♂; same collection data as for preceding; AR_067; GenBank: ON619627 • 1 ♀; same collection data as for preceding; AR_078; GenBank: ON619657 • 1 ♀; same collection data as for preceding; BERL • 5 ♂♂; same collection data as for preceding; CRP • 42 ♀♀, 37 ♂♂; same collection data as for preceding • 2 ♂♂; same collection data as for preceding; ANYM016 • 2 ♂♂; same collection data as for preceding; ANYM017 • 3 ♂♂; same collection data as for preceding; ANYM018 • 1 ♂; same collection data as for preceding; PF • 8 ♀♀, 3 ♂♂; same collection data as for preceding; 21–30 May 2012; BEAT • 1 ♂; same collection data as for preceding; BERL • 1 ♀; same collection data as for preceding; CRP • 7 ♀♀, 3 ♂♂; same collection data as for preceding; LUP • 1 ♀; same collection data as for preceding; 4–14 Oct. 2012; BEAT • 1 ♀; same collection data as for preceding; LUP • 1 ♀; Calcahualco, Atotonilco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; LUP; AR_014; GenBank: ON619664.

Description

Female
Total length 5.6. Carapace yellow, pattern with darker longitudinal bands around cephalic area and fovea (Fig. 39A, D). Sternum surface white, intercoxal triangles present on all legs. Labium yellow, white at tip, longer than wide. Endites white, rectangular, slightly broader at tip (Fig. 39C). Chelicerae yellow (Fig. 39B, D), promargin with four teeth, retromargin with seven or eight denticles. Leg coloration: light yellow, slightly darker on metatarsi and tarsi (Fig. 39A–C). Abdomen white, hirsute, dorsal surface with scattered brown patches, lateral and ventral surfaces with same pattern but faded ventrally, tracheal spiracle close to epigastric furrow (Fig. 39A–C). Epigynum atrium rectangular, longer than wide, door-shaped. Copulatory openings inside middle section of lateral borders of atrium. Copulatory ducts coiled around seminal receptacles, entering spermathecae on ventral surface at junction between long seminal receptacles and fertilization duct origin. Fertilization ducts short, cylindrical (Figs 39E–F, 40E–F, 41G–H). Cephalothorax length 2.15, thoracic width 1.56, cephalic width 0.81. Clypeus height 0.09. Eye diameters: AME 0.07, ALE 0.1, PME 0.09, PLE 0.09. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.1, PME–PME 0.12, PME–PLE 0.09. Femur lengths: I 1.84, II 1.68, III 1.29, IV 1.87. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-0-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-0. Femur III d1-1-1, p0-1-1, r0-0-1. Tibia III v2-2-2, p1-1-0, r1-1-0. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-0, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

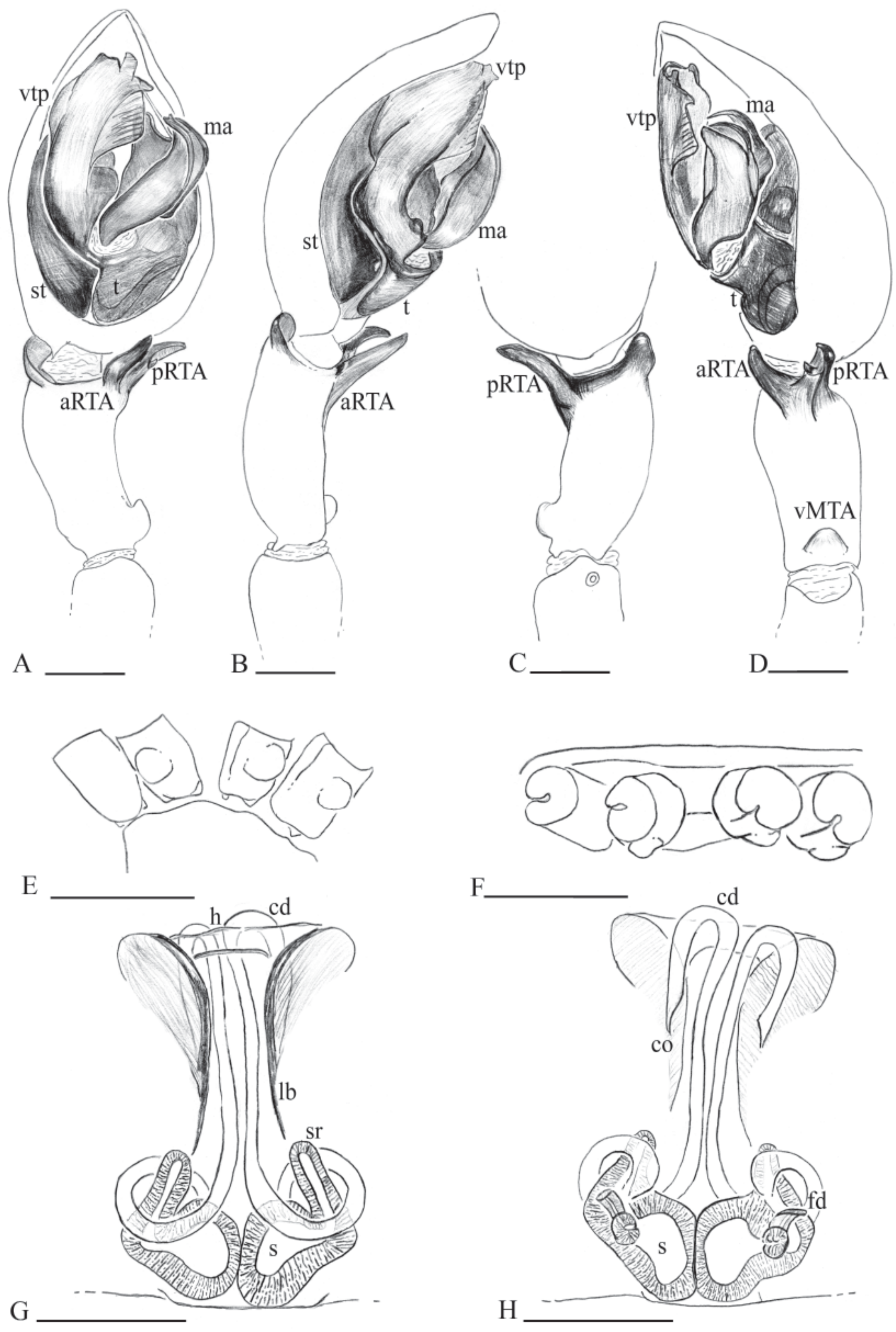

Fig. 41. *Anyphaena porta* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01563). **G–H**. Paratype, ♀ (CNAN-T01565). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

Male

Total length 5.3. Cephalothorax and abdomen coloration as in female. Embolus filiform and translucent. Prolateral apophysis of palpal tibia present (Figs 40B–C, 41B–C). Pedipalp tibia longer than wide. Ventral branch of median tibial apophysis displaced towards proximal border of tibia (Figs 40A, C–D, 41A, C–D). Cephalothorax length 2.39, thoracic width 1.61, cephalic width 0.84. Clypeus height 0.07. Eye diameters: AME 0.09, ALE 0.1, PME 0.1, PLE 0.1. Eye interdistances: AME–AME 0.05, AME–ALE 0.09, ALE–PLE 0.06, PME–PME 0.09, PME–PLE 0.07. Femur lengths: I 2.54, II 2.44, III 2.1, IV 2.49. Legs as in female except: femur II p0-0-2. Metatarsus II r1-1-1. Femur III p0-0-1. Tibia III v1-1-0, p0-1-1, r0-1-1. Tibia IV v0-1-0.

Variations

The anterior curvature of the female copulatory ducts and the seminal receptacle length vary among specimens (Figs 39E–F, 40E–F). Females (N = 10): total length 5.66 (± 0.98), cephalothorax length 2.18 (± 0.11), thoracic width 1.66 (± 0.12), cephalic width 0.9 (± 0.07), femur I 1.96 (± 0.13). Males (N = 10): total length 5.2 (± 0.29), cephalothorax length 2.4 (± 0.13), thoracic width 1.88 (± 0.14), cephalic width 0.82 (± 0.05), femur I 2.55 (± 0.11). The anterior projections of the spermathecae and proportions of the atrium vary in shape (Figs 39E–F, 40A-B).

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray. This species is present year-round.

Anyphaena salgueiroi sp. nov.

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Figs 2E–F, 42, 44A–B, 52

Differential diagnosis

Females of *A. salgueiroi* sp. nov. can be differentiated from those of *A. porta* sp. nov. and *A. ibarrai* sp. nov. by their larger size, reddish color in alcohol (Fig. 42A–D), epigynal lateral borders almost touching, atrium greatly reduced, and genital openings inside two large semicircular sclerotized plates (Fig. 42E–F).

Etymology

The species epithet is dedicated to Dr Francisco Javier Salgueiro-Sepúlveda, former member of the second author’s lab.

Material examined

Holotype

MEXICO • ♀; Veracruz, Calcahualco, Atotonilco, Plot I; 19.12569° N, 97.06756° W; alt. 2300 m; 15–24 Feb. 2013; Aracnolab team leg.; oak forest fragment, CRP; AR_039; GenBank: ON619631; CNAN-T01537.

Paratypes

MEXICO • 1 ♀; same collection data as for holotype; 21–30 May 2012; LUP; AR_040; GenBank: ON619632; CNAN-T01571 • 1 ♀; Atotonilco, Plot II; 19.29483° N, 97.2045° W; alt. 2388 m; 21–30

May 2012; Arcanolab team leg.; oak and pine forest fragment; BEAT; AR_038; GenBank: ON619630; CNAN-T01570.

Description

Female

Total length 8.2. Carapace orange over cephalic area with two red longitudinal bands over most of thoracic area, lateral margins yellow, clypeus red. Sternum pale orange, darker at margins, intercoxal triangles present on all legs. Labium red, white at tip, longer than wide. Endites pale orange, rectangular, slightly broader at tip. Chelicerae orange, promargin with five teeth, retromargin with six to seven denticles. Leg coloration: yellow at base, turning red after femora to tarsi (Fig. 42A–D). Lateral sides

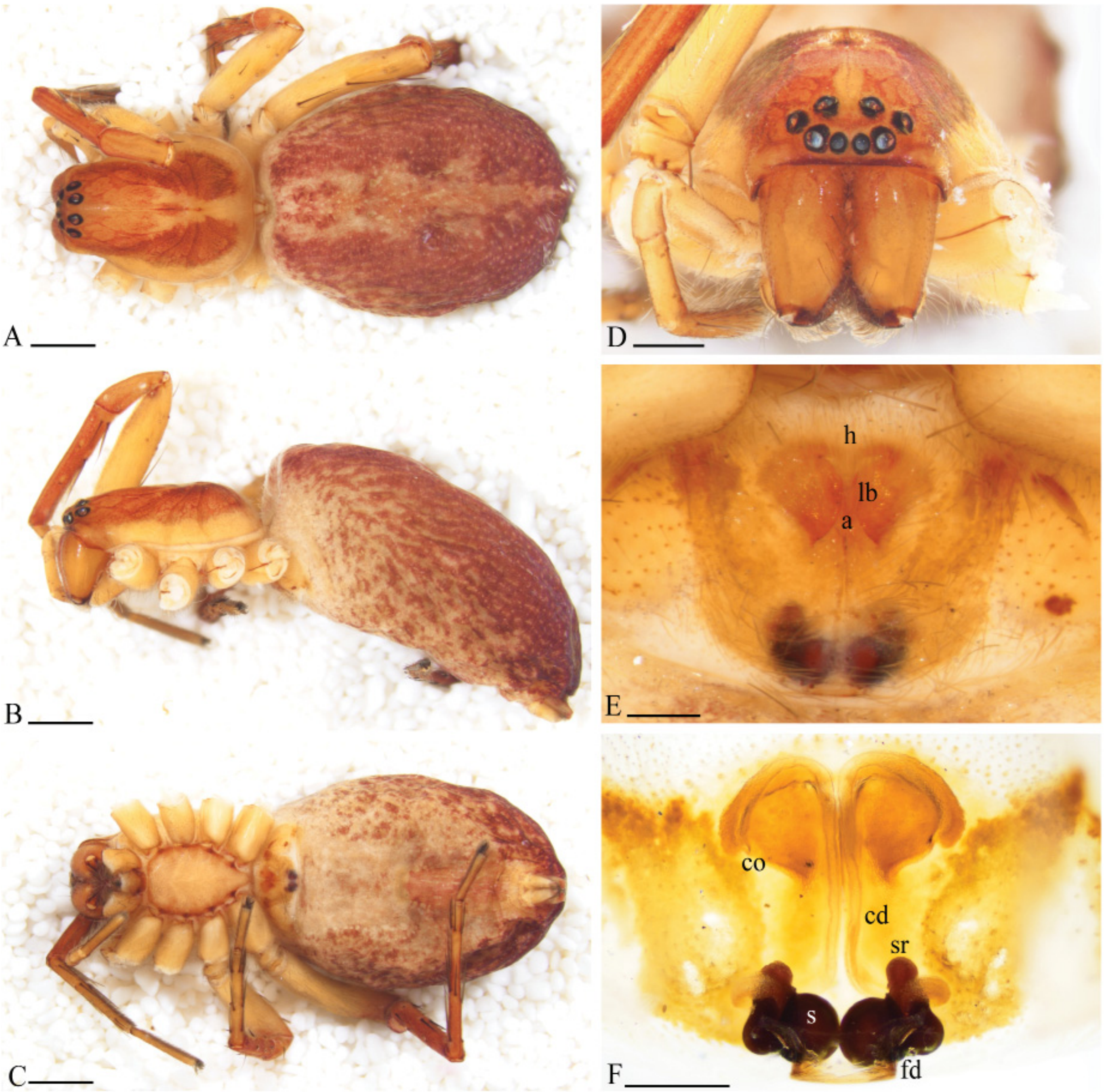

Fig. 42. *Anyphaena salgueiroi* sp. nov., holotype, ♀ (CNAN-T01537). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

of abdomen dorsum covered with red reticulated pattern leaving clearer central longitudinal band, lateral sides with same pattern, less dense ventrally. Tracheal spiracle at center, anterior half of abdomen surface almost without red pattern, posterior half dominated by reddish longitudinal lines (Fig. 42A–C). Epigynum atrium rectangular, longer than wide, door-shaped. Hood narrow and straight. Copulatory openings inside two semicircular sclerotized plates (Fig. 42E–F). Copulatory ducts weakly sclerotized following external edge of semicircular plates, turning 180° beyond hood, and entering spermathecae ventrally at junction between long seminal receptacles and fertilization duct origin. Fertilization ducts short and curved (Figs 42E–F, 44A-B). Cephalothorax length 2.98, thoracic width 2.24, cephalic width 1.35. Clypeus height 0.11. Eye diameters: AME 0.1, ALE 0.13, PME 0.13, PLE 0.12. Eye interdistances: AME–AME 0.06, AME–ALE 0.04, ALE–PLE 0.18, PME–PME 0.17, PME–PLE 0.11. Femur lengths: I 2.52, II 2.42, III 1.97, IV 2.58. Leg spination: femur I d1-1-1, p0-1-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p1-1-1, r1-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v1-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Unknown.

Variation

Females (N = 3): total length 7.8 (± 0.36), cephalothorax length 2.67 (± 0.27), thoracic width 2.05 (± 0.18), cephalic width 1.25 (± 0.1), femur I 2.3 (± 0.21).

Distribution

This species is found in oak and oak with pine forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Unknown.

Anyphaena ibarrai sp. nov.

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Figs 43, 44C–D, 52

Differential diagnosis

Females of *A. ibarrai* sp. nov. can be differentiated from those of *A. porta* sp. nov. and *A. salgueiroi* sp. nov. by the genital openings being shaped as two large sclerotized chambers, copulatory ducts also well sclerotized, and the atrium lateral borders diverging posteriorly (Figs 43E–F, 44C–D).

Etymology

The species epithet is dedicated to the Mexican arachnologist Dr Guillermo Ibarra.

Material examined

Holotype

MEXICO • ♀; San Luis Potosi, Xilitla City, Las Pozas; 21.39722° N, 98.99388° W; alt. 662 m; 26–30 Mar. 2012; Arcanolab team leg.; tropical wet forest fragment; LUP; AR_001; GenBank: ON619633; CNAN-T01528.

Description

Female

Total length 6.6. Carapace yellow with brown bands delineating cephalic area and around fovea, ocular area and clypeus cuticle brown. Sternum brown at borders with longitudinal white irregular band, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites dark yellow, rectangular, slightly broader at tip. Chelicerae brown, paturon dorsum covered by darker reticulated pattern (Fig. 43A–D), promargin with four teeth, retromargin with seven to eight denticles. Leg coloration: yellow with irregular dark band and patches throughout length. Abdomen dorsum white, covered by gray pattern of chevrons and irregular patches, lateral and ventral surfaces covered with same dark pattern of irregular patches, except anterior ventral half, where restricted to central band anterior to racheal spiracle (Fig. 43A–C). Epigynum atrium rectangular, longer than wide, door-shaped. Hood

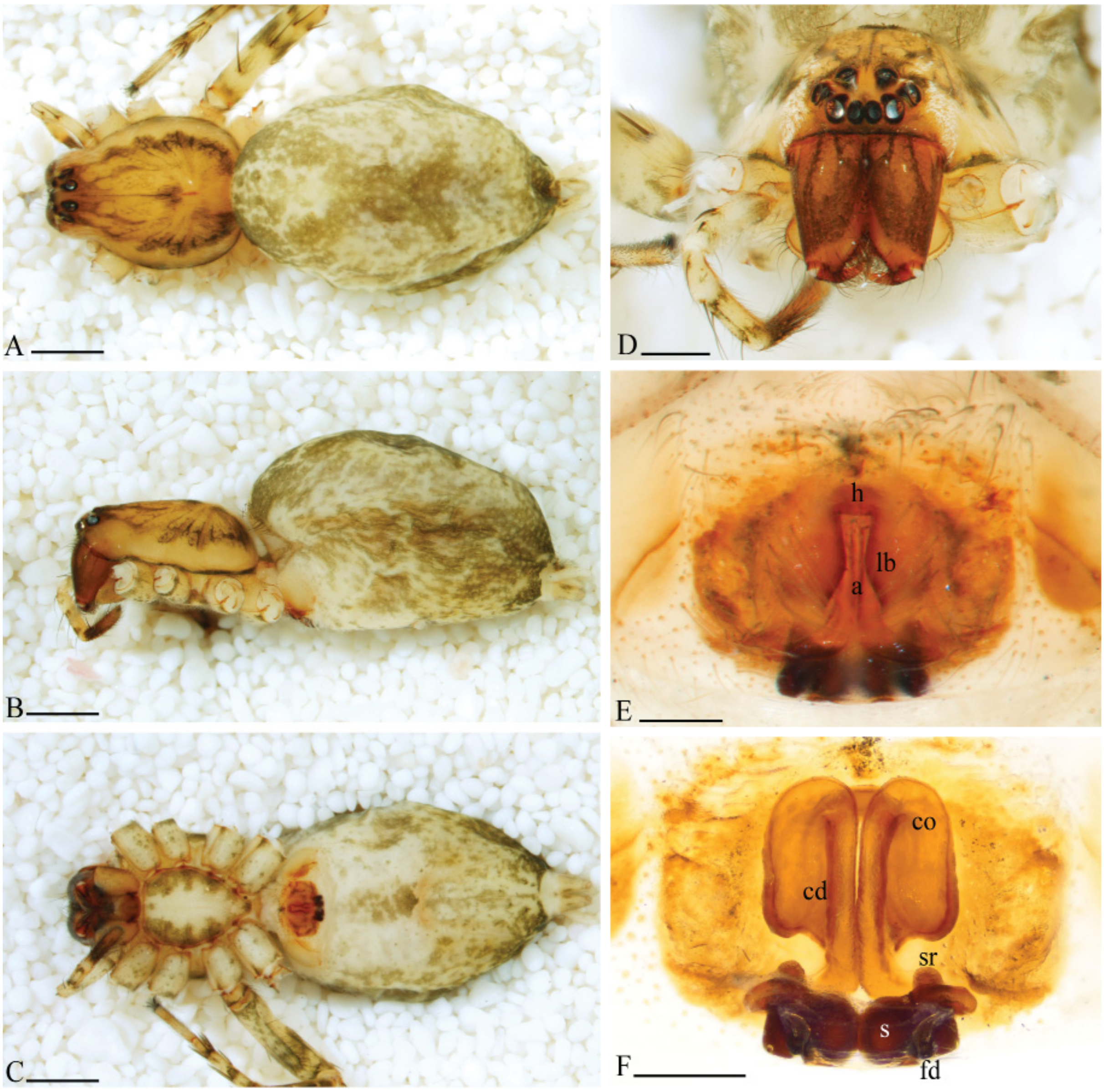

Fig. 43. *Anyphaena ibarrai* sp. nov., holotype, ♀ (CNAN-T01528). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

narrow and curved. Copulatory duct openings at anterior edge of two sclerotized chambers. Copulatory ducts well sclerotized, tube-shaped, parallel and ventrally entering spermathecae at junction between long seminal receptacles and fertilization duct origin. Fertilization ducts short and curved (Figs 43E–F, 44C–D). Cephalothorax length 2.32, thoracic width 1.87, cephalic width 1.1. Clypeus height 0.11. Eye diameters: AME 0.1, ALE 0.15, PME 0.11, PLE 0.12. Eye interdistances: AME–AME 0.04, AME–ALE 0.04, ALE–PLE 0.07, PME–PME 0.16, PME–PLE 0.09. Femur lengths: I 2.29, II 2.1, III 1.45, IV 2.32. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-0-1, r0-0-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v1-1-0, p1-1-1, r1-1-1. Metatarsus III v2-2-2, p1-1-2,

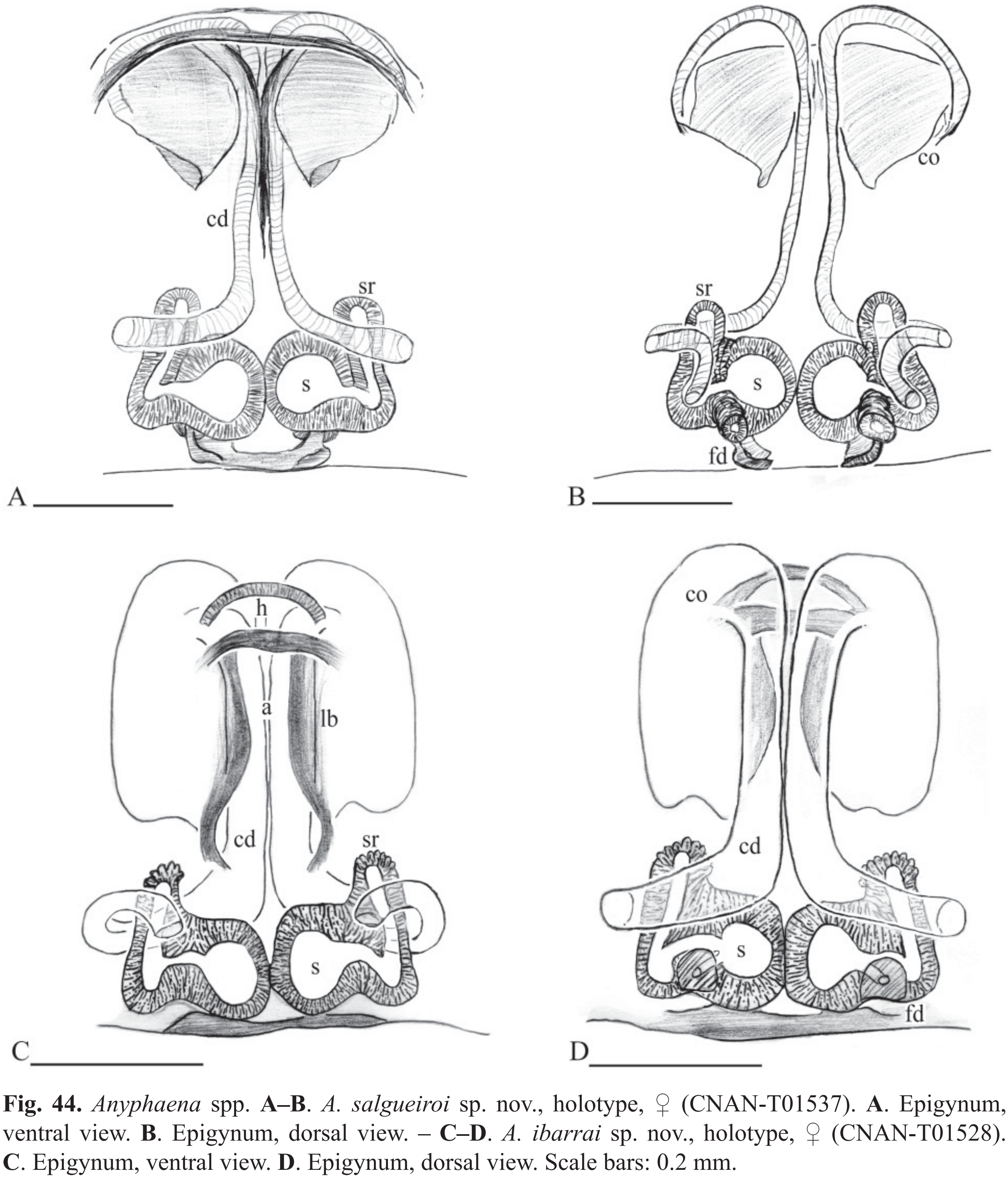

Fig. 44. *Anyphaena* spp. **A–B**. *A. salgueiroi* sp. nov., holotype, ♀ (CNAN-T01537). **A**. Epigynum, ventral view. **B**. Epigynum, dorsal view. – **C–D**. *A. ibarrai* sp. nov., holotype, ♀ (CNAN-T01528). **C**. Epigynum, ventral view. **D**. Epigynum, dorsal view. Scale bars: 0.2 mm.

r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p1-1-1, r1-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male
Unknown.

Variation

Only type specimen known.

Distribution

Only known from the type locality (Fig. 52).

Natural history

Collected at night by direct searching over vegetation.

Anyphaena tonoi sp. nov.
urn:lsid:zoobank.org:act:C6FF6A9C-010D-41A0-8283-2538027BCBD5
Figs 45–47, 52

Differential diagnosis

Females of *A. tonoi* sp. nov. can be differentiated from those of all described species of *Anyphaena* of the *pacifica* and *pectorosa* groups by the opposing L-shaped copulatory ducts, and the adjacent genital openings being inside a small longitudinal rectangular atrium (Figs 46E–F, 47G–C). Central genital openings are also present in females of *A. jimenezi* sp. nov., but the latter species differs by the moustache-shaped copulatory ducts. Males can be differentiated by the presence of the following features: distal edge of median apophysis with two transparent lamellae and a sclerotized central hook (Figs 46D, 47D), middle section of ventral tegular projection broad, retrolateral border with a transparent cuticular edge, distal section shaped as a folded lamella. RTA anterior branch rectangular, long and straight, posterior branch lamella-shaped with a middle notch (Fig. 47C–D), and coxal ventral surfaces smooth (Figs 45E–F, 46A–D, 47A–F). Ventral tegular projection with broad middle sections and translucent retrolateral edges are also found in males of *A. zorynae* (Durán-Barrón *et al.* 2016: figs 5–6), *A. quadricornuta* Kraus, 1955 (Kraus 1955: figs 108–109), *A. stigma* sp. nov. (Fig. 50E), *A. miniducta* sp. nov. (Fig. 32A) and *A. bermudensis* (Sierwald 1988: fig. 1), these latter two species without the lateral edge. A median apophysis with transparent lamella are present in *A. pectorosa*, *A. fraterna*, *A. lacka* Platnick, 1974 and *A. alachua* (Platnick 1974: figs 51–58). Similar RTA are present in *A. scopulata* F. Pickard-Cambridge, 1900 (Pickard-Cambridge F. 1900: pl. 7 fig. 17), *A. simplex* O. Pickard-Cambridge, 1894 (Pickard-Cambridge O. 1896: pl. 23 figs 1–2) and *A. stigma* sp. nov. (Fig. 50F).

Etymology

The species epithet is dedicated to Marcial Antonio Galán-Sánchez, Mexican arachnologist, and current member of the second author's lab.

Material examined

Holotype
MEXICO • ♀; Veracruz, Calcahualco, Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 2–11 Oct. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; CNAN-T01540.

Allotype
MEXICO • ♂; same collection data as for holotype; CRP; AR_020; GenBank: ON619669; CNAN-T01519.

Paratypes

MEXICO • 1 ♂; same collection data as for holotype; 4–17 Feb. 2014; LUP; AR_019; GenBank: ON619668 CNAN-T01575 • 1 ♀; same collection data as for preceding; AR_013; GenBank: ON619660; CNAN-T01576.

Additional material

MEXICO • 1 ♀; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 2–11 Oct. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; AR_012; GenBank: ON619659 • 1 ♀; same collection data as for preceding; ANYM045 • 1 ♀; same collection data as for preceding; 4–17 Feb. 2014; BEAT; AR_016; GenBank: ON619670 • 1 ♀; same collection data as for preceding; Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 19–27 Apr. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT • 1 ♀; same collection data as for preceding; ANYM044 • 1 ♀; same collection data as for preceding; 4–17 Feb. 2014; BEAT.

Fig. 45. *Anyphaena tonoi* sp. nov. **A–D**. Paratype, ♀ (CNAN-T01576). **E–F**. Paratype, ♂ (CNAN-T01575). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Prosoma, anterior view. **F**. Prosoma, oblique view. Scale bars: A–C = 1.0 mm; D–F = 0.5 mm.

Description

Female

Total length 5.1. Carapace yellow, pattern with darker longitudinal bands over cephalic, thoracic areas and clypeus, lateral edges yellow (Fig. 45A, D). Sternum surface light yellow, intercoxal triangles present on all legs. Labium light brown, white at tip, longer than wide. Endites white, rectangular, slightly broader at tip (Fig. 45C). Chelicerae yellow, slightly darker than carapace, paturon dorsum with a diffuse dark pattern (Fig. 45B, D), promargin with four teeth, retromargin with eight or nine denticles. Abdomen white, hirsute, dorsal surface with scattered brown patches, center with white chevrons and marks, lateral and ventral surfaces with same pattern but faded ventrally, tracheal spiracle closer to epigastric furrow (Fig. 45A–C). Epigynum atrium small, rectangular, longer than wide. Anterior lateral sides delineated by two anterior shallow pits (Fig. 46E–F). Copulatory openings contiguous, inside anterior edges of atrium. Copulatory ducts coiled over and around spermathecae, entering spermathecae on lateral surface. Seminal receptacles not visible or inconspicuous. Fertilization ducts short, emerging

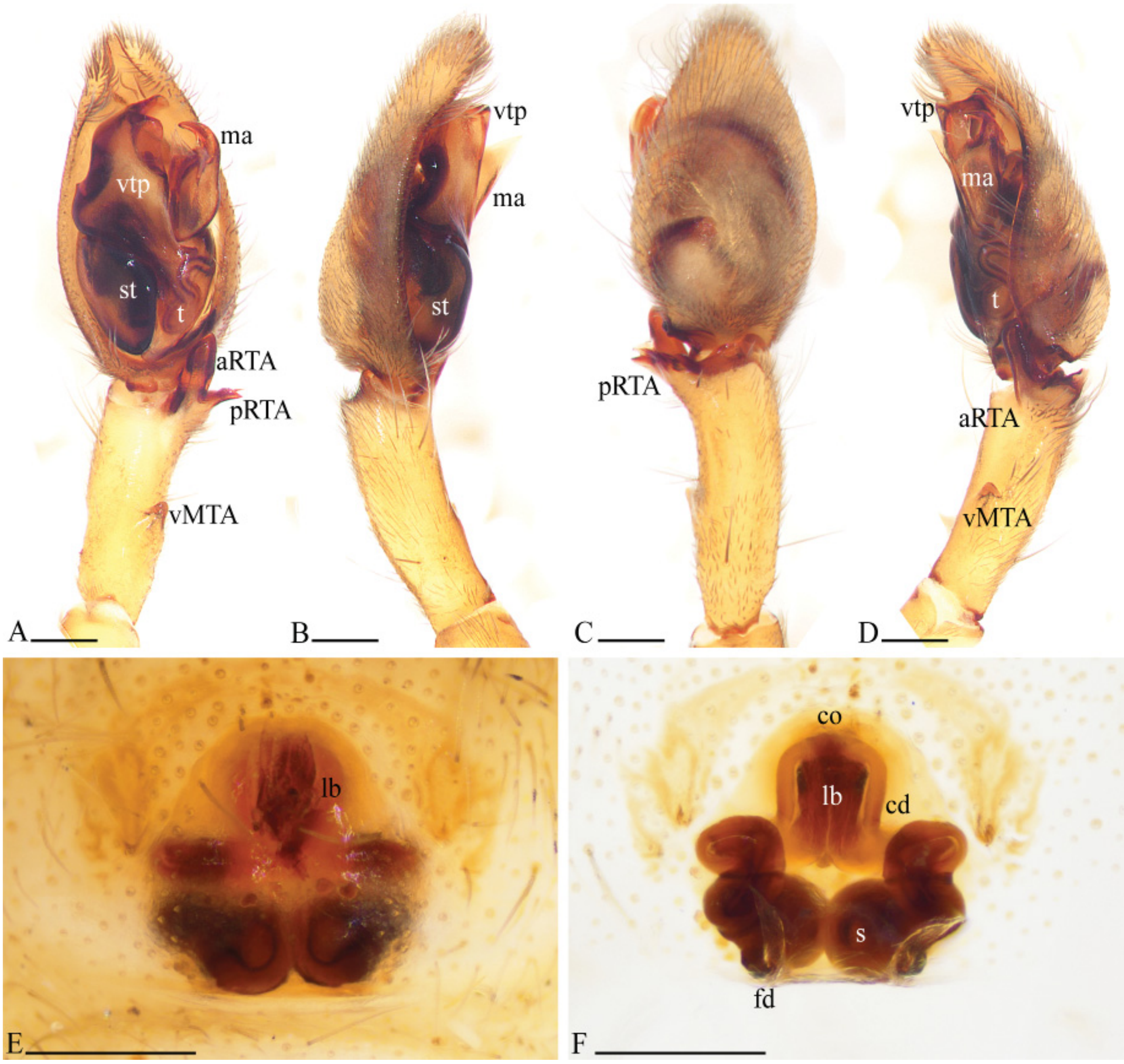

Fig. 46. *Anyphaena tonoi* sp. nov. **A–D**. Paratype, ♂ (CNAN-T01575). **E–F**. Paratype, ♀ (CNAN-T01576). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Epigynum, ventral view. **F**. Epigynum, dorsal view. Scale bars: 0.2 mm.

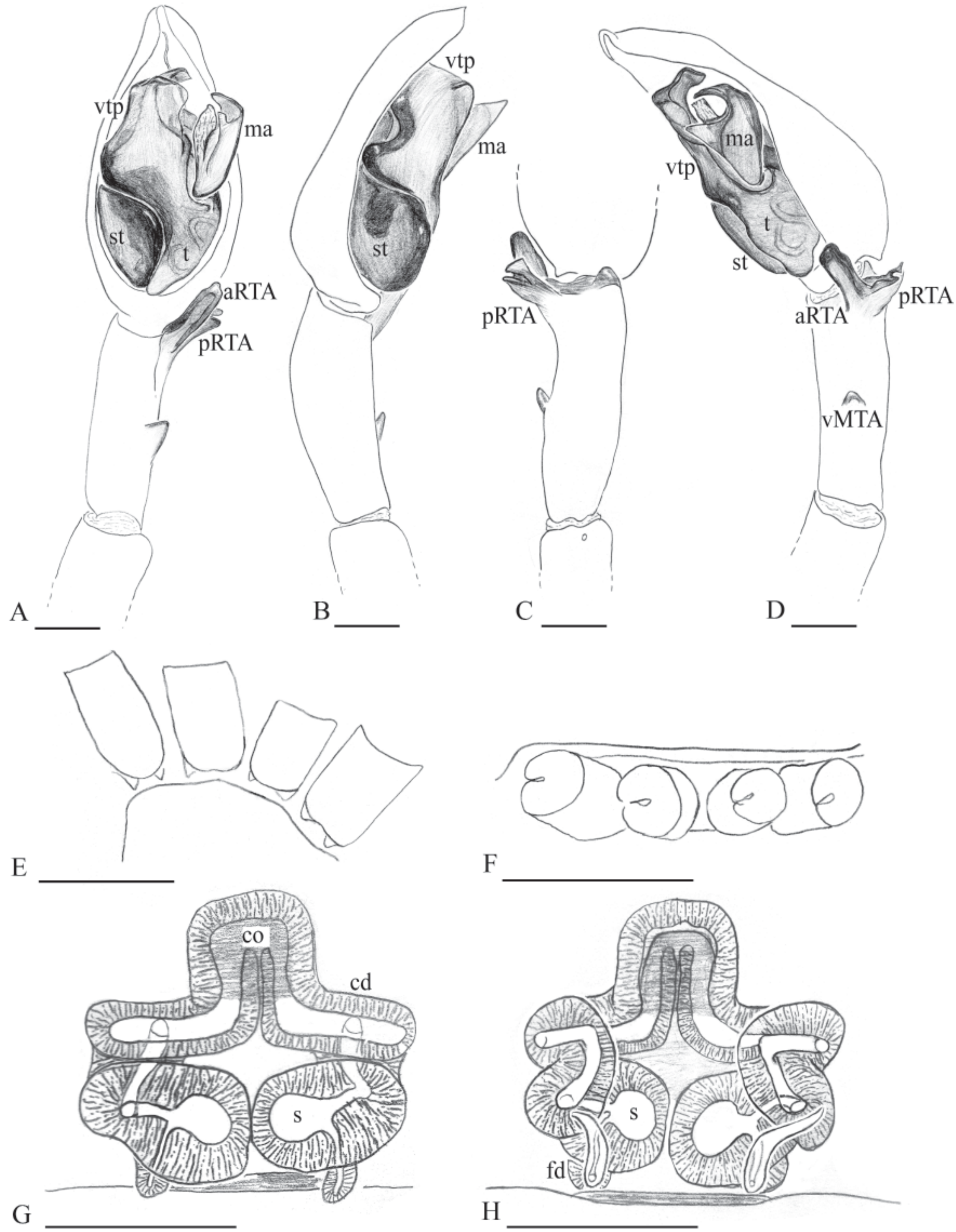

Fig. 47. *Anyphaena tonoi* sp. nov. **A–F**. Paratype, ♂ (CNAN-T01575). **G–H**. Paratype, ♀ (CNAN-T01576). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. **G**. Epigynum, ventral view. **H**. Epigynum, dorsal view. Scale bars: A–D, G–H = 0.2 mm; E–F = 1.0 mm.

from lateral surfaces below copulatory duct entrance (Figs 46E–F, 47G–H). Cephalothorax length 2.29, thoracic width 1.8, cephalic width 0.97. Clypeus height 0.07. Eye diameters: AME 0.09, ALE 0.12, PME 0.11, PLE 0.12. Eye interdistances: AME–AME 0.05, AME–ALE 0.02, ALE–PLE 0.09, PME–PME 0.15, PME–PLE 0.1. Femur lengths: I 2.2, II 1.95, III 1.61, IV 2.2. Leg spination: femur I d1-1-1, p0-0-2, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-0-1, r0-0-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-0-1. Tibia III v2-2-2, p1-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-1-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Male

Total length 5.6. Cephalothorax and abdomen coloration as in female. Chelicerae paturon pattern darker (Fig. 45E). Embolus filiform and translucent. Prolateral apophysis of palpal tibia present (Figs 46B–C, 47C). Pedipalp tibia longer than wide. Ventral branch of median tibial apophysis present (Figs 46A–D, 47A–D). Cephalothorax length 2.78, thoracic width 2.15, cephalic width 1.03. Clypeus height 0.11. Eye diameters: AME 0.09, ALE 0.11, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.04, AME–ALE 0.04, ALE–PLE 0.07, PME–PME 0.09, PME–PLE 0.1. Femur lengths: I 3.61, II 2.68, III 1.95, IV 2.93. Leg spination as in female except: femur II p0-0-2. Tibia III p0-1-1.

Variation

Females (N=8): total length 5.29 (±0.46), cephalothorax length 2.29 (±0.25), thoracic width 1.73 (±0.12), cephalic width 0.94 (±0.07), femur I 2.09 (±0.21). Males (N=2): total length 5.55 (±0.07), cephalothorax length 2.71 (±0.1), thoracic width 2.12 (±0.03), cephalic width 1.0 (±0.05), femur I 3.46 (±0.21).

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by beating tray and direct searching. This species is present year-round.

Anyphaena megamedia sp. nov.

urn:lsid:zoobank.org:act:F1F5319C-F100-4D69-9370-E1A5BF56E6C0

Figs 48–49, 52

Differential diagnosis

Males of *A. megamedia* sp. nov. are differentiated from all those of the *pectorosa* and *pacifica* groups by the enormous size of the median apophysis, larger than the ventral tegular projection, and trapezoidal in shape (Figs 48E–F, 49A, D).

Etymology

The species epithet refers to the large size of the median apophysis characteristic of these species.

Material examined

Holotype

MEXICO • ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 4–17 Feb. 2014; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; AR_024; GenBank: ON619661; CNAN-T01530.

Paratypes

MEXICO • 1 ♂; same collection data as for holotype; LUP; CNAN-T01558 • 1 ♂; Xamaticpac, Plot II; 19.12614° N, 97.06708° W; alt. 1700 m; 2–11 Oct. 2013; AR_018; GenBank: ON619672; CNAN-T01559.

Additional material

MEXICO • 1 ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 2–11 Oct. 2013; Aracnolab team leg.; oak and tropical wet forest fragment; BEAT; AR_025; GenBank: ON619662 • 1 ♂; same collection data as for preceding; AR_026; GenBank: ON619663.

Description

Male

Total length 6.6. Carapace yellow, darker over ocular quadrangle, around fovea and clypeus. Sternum surface yellow, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide.

Fig. 48. *Anyphaena megamedia* sp. nov., paratype, ♂ (CNAN-T01558). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Pedipalp, ventral view. **F**. Pedipalp, retrolateral view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Endites yellow, rectangular, broader at tip (Fig. 48A–C). Chelicerae dark yellow without dorsal pattern (Fig. 48B, D), promargin with four teeth, retromargin with eight to nine denticles. Abdomen surfaces white, hirsute, covered with darker spots except posterior to tracheal spiracle located at middle (Fig. 48A, C). Ventral tegular projection long, curved retro-ventrally, retrolateral edge with small transparent edge, prolateral base enlarged. Embolus filiform (Fig. 49A–B). RTA anterior branch largest, spine-shaped, RTA posterior branch small and squared. Prolateral apophysis present. Tibia longer than wide. Ventral branch of median tibial apophysis present (Figs 48E–F, 49A–D). Cephalothorax length 2.93, thoracic width 2.24, cephalic width 1.06. Clypeus height 0.12. Eye diameters: AME 0.09, ALE 0.11, PME 0.12, PLE 0.12. Eye interdistances: AME–AME 0.05, AME–ALE 0.04, ALE–PLE 0.12, PME–PME 0.17, PME–PLE 0.11. Femur lengths: I 3.16, II 2.68, III 2.24, IV 3.02. Leg spination: femur I d1-1-1, p0-0-1, r0-0-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-0-1, r0-0-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-0-1, r0-0-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-0-1, r0-0-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Female

Unknown.

Variation

Males (N = 5): total length 6.12 (± 0.49), cephalothorax length 2.79 (± 0.14), thoracic width 2.18 (± 0.06), cephalic width 1.05 (± 0.06), femur I 3.44 (± 0.14).

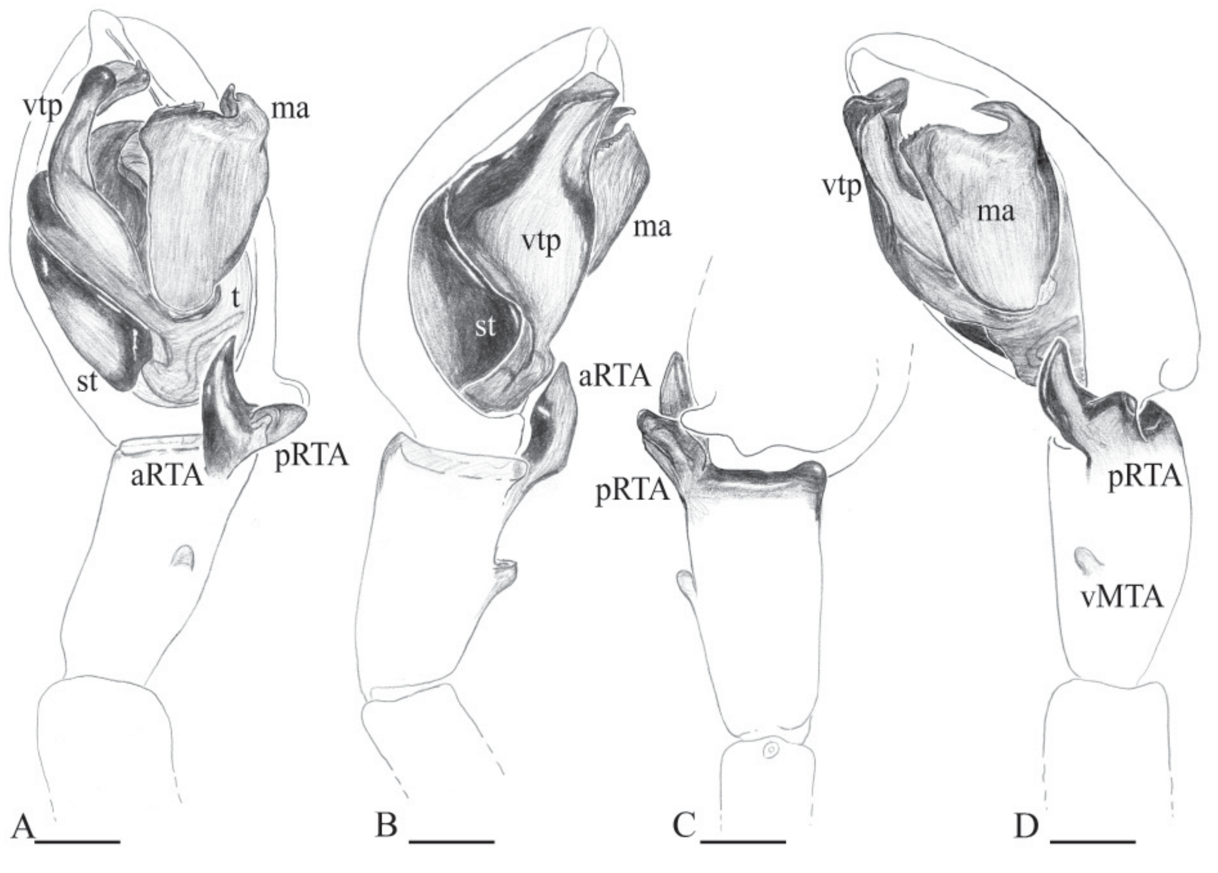

Fig. 49. *Anyphaena megamedia* sp. nov., paratype, ♂ (CNAN-T01558). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. Scale bars: 0.2 mm.

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Most specimens were collected over vegetation by direct searching or with a beating tray.

Anyphaena stigma sp. nov.

urn:lsid:zoobank.org:act:E3896101-5F6D-4CD5-BF28-C484B68151E7

Figs 50–52

Differential diagnosis

Males of *A. stigma* sp. nov. are differentiated from all those of the *pectorosa* and *pacifica* groups by the presence of the following features: middle section of ventral tegular projection broad, retrolateral edge with a translucent edge, prolateral surface also distended; distal edge of median apophysis flat and curved, ventral edge with a transparent lamella (Figs 50E–F, 51A–D). RTA anterior branch spine-shaped with a blunt tip, longer than posterior branch, which is shaped as a curved lamella. Coxae II and III with a mid-ventral tubercle, coxa IV with two tubercles (Figs 50E–F, 51A–F). Ventral tegular projection with broad middle sections and translucent retrolateral edges are also present in *A. zorynae* (Durán-Barrón *et al.* 2016: figs 5, 9), *A. pacifica* (Dondale & Redner 1982: fig. 336), *A. tonoi* sp. nov. (Fig. 46A) and *A. miniducta* sp. nov. (Fig. 32A). Similar RTA are present in *A. scopulata* (Pickard-Cambridge F. 1900: pl. 7 fig. 17), *A. simplex* (Pickard-Cambridge O. 1896: pl. 7 fig. 11) and *A. tonoi* sp. nov. (Fig. 47A, D).

Etymology

The species epithet is derived from the Latin '*stigma*' ('mark' or 'brand'), in reference to the several dark spots on the scutum and epiandrous region.

Holotype

MEXICO • ♂; Veracruz, Calcahualco, Xamaticpac, Plot I; 19.14172° N, 97.20597° W; alt. 1710 m; 4–17 Feb. 2014; Aracnolab team leg.; oak and tropical wet forest fragment, CRP; AR_022; GenBank: ON619667; CNAN-T01539.

Paratype

MEXICO • 1 ♂; same collection data as for holotype; AR_021; GenBank: ON619666; CNAN-T01574.

Description

Male

Total length 6.5. Carapace yellow, darker over ocular quadrangle, around fovea and clypeus. Sternum surface white, intercoxal triangles present on all legs. Labium brown, white at tip, longer than wide. Endites yellow, rectangular, broader at tip (Fig. 50A–C). Chelicerae brown, paturon dorsal surface covered with black reticulated pattern (Fig. 50D), promargin with four teeth, retromargin with eight to nine denticles. Abdomen dorsal and lateral surfaces white, hirsute, covered with black marks, ventral surface pattern diffused. Tracheal spiracle at center of abdomen (Fig. 50A, C). Prolateral apophysis present. Tibia longer than wide. Ventral branch of median tibial apophysis present (Figs 50E, 51A–D). Cephalothorax length 2.98, thoracic width 2.29, cephalic width 1.06. Clypeus height 0.11. Eye diameters: AME 0.11, ALE 0.13, PME 0.15, PLE 0.15. Eye interdistances: AME–AME 0.05, AME–ALE 0.02, ALE–PLE 0.05, PME–PME 0.17, PME–PLE 0.09. Femur lengths: I 2.98, II 2.68, III 2.24, IV 2.93. Leg spination: femur I d1-1-1, p0-1-1, r0-1-1. Tibia I v2-2-0, p1-1-1, r1-1-1. Metatarsus I v2-2-0, p1-1-1, r1-1-1. Femur II d1-1-1, p0-1-1, r0-1-1. Tibia II v2-2-0, p1-1-1, r1-1-1. Metatarsus II v2-2-0, p1-1-1, r1-1-1. Femur III d1-1-1, p0-1-1, r0-1-1. Tibia III v2-2-2, p0-1-1, r0-1-1. Metatarsus III v2-2-2, p1-1-2, r1-1-2. Femur IV d1-1-1, p0-1-1, r0-1-1. Tibia IV v2-2-2, p0-1-1, r0-1-1. Metatarsus IV v2-2-2, p1-1-2, r1-1-2.

Female

Unknown.

Variation

Males (N=2): total length 6.4 (±0.14), cephalothorax length 2.93 (±0.07), thoracic width 2.29 (±0.0), cephalic width 1.05 (±0.02), femur I 2.98 (±0.0).

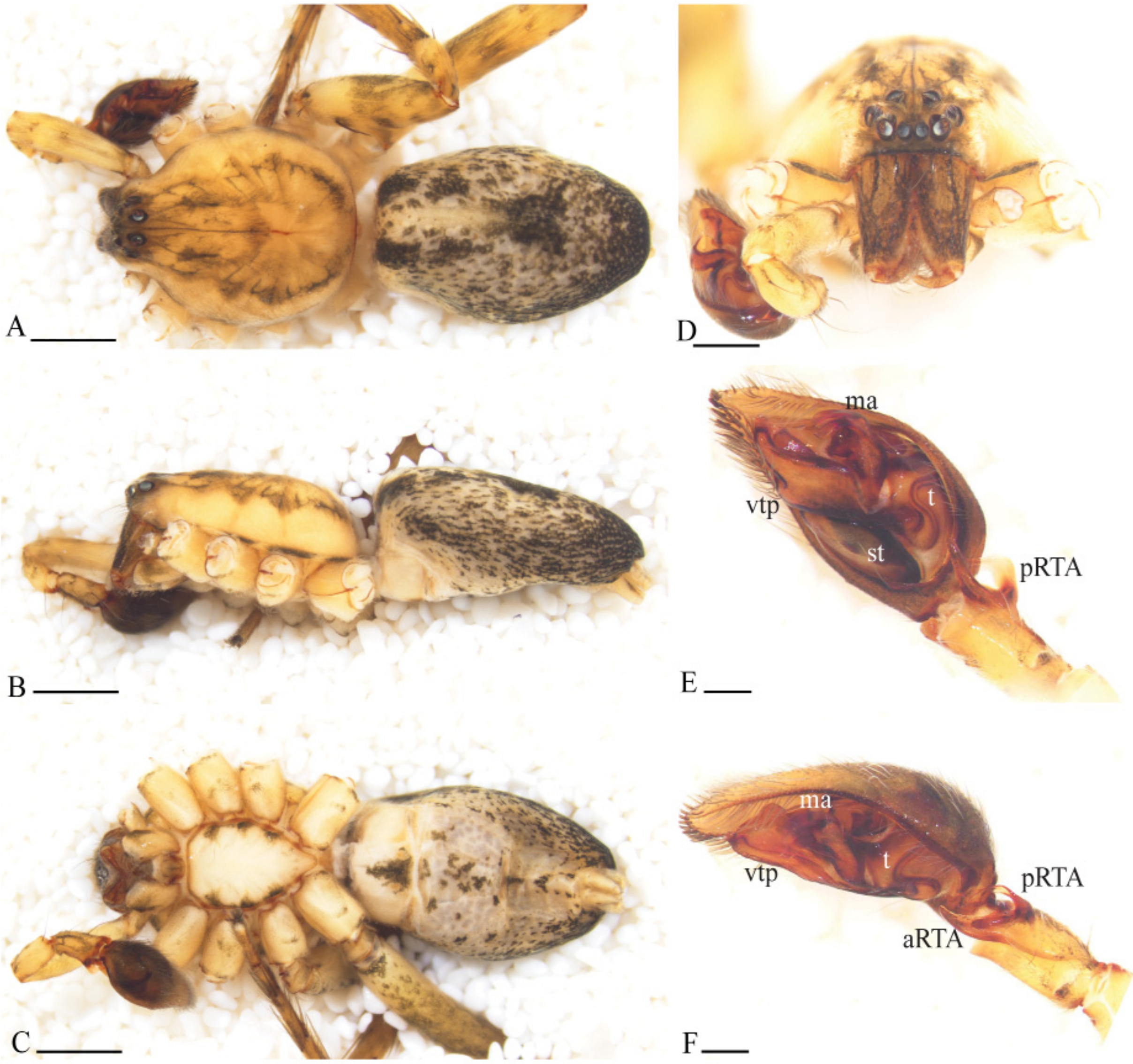

Fig. 50. *Anyphaena stigma* sp. nov., paratype, ♂ (CNAN-T01574). **A**. Dorsal habitus. **B**. Lateral habitus. **C**. Ventral habitus. **D**. Prosoma, anterior view. **E**. Pedipalp, ventral view. **F**. Pedipalp, retrolateral view. Scale bars: A–C = 1.0 mm; D = 0.5 mm; E–F = 0.2 mm.

Distribution

This species is found in oak and tropical wet forest fragments around Pico de Orizaba Volcano National Park (Fig. 52).

Natural history

Both specimens were collected by cryptic searching over leaf litter and tree bark.

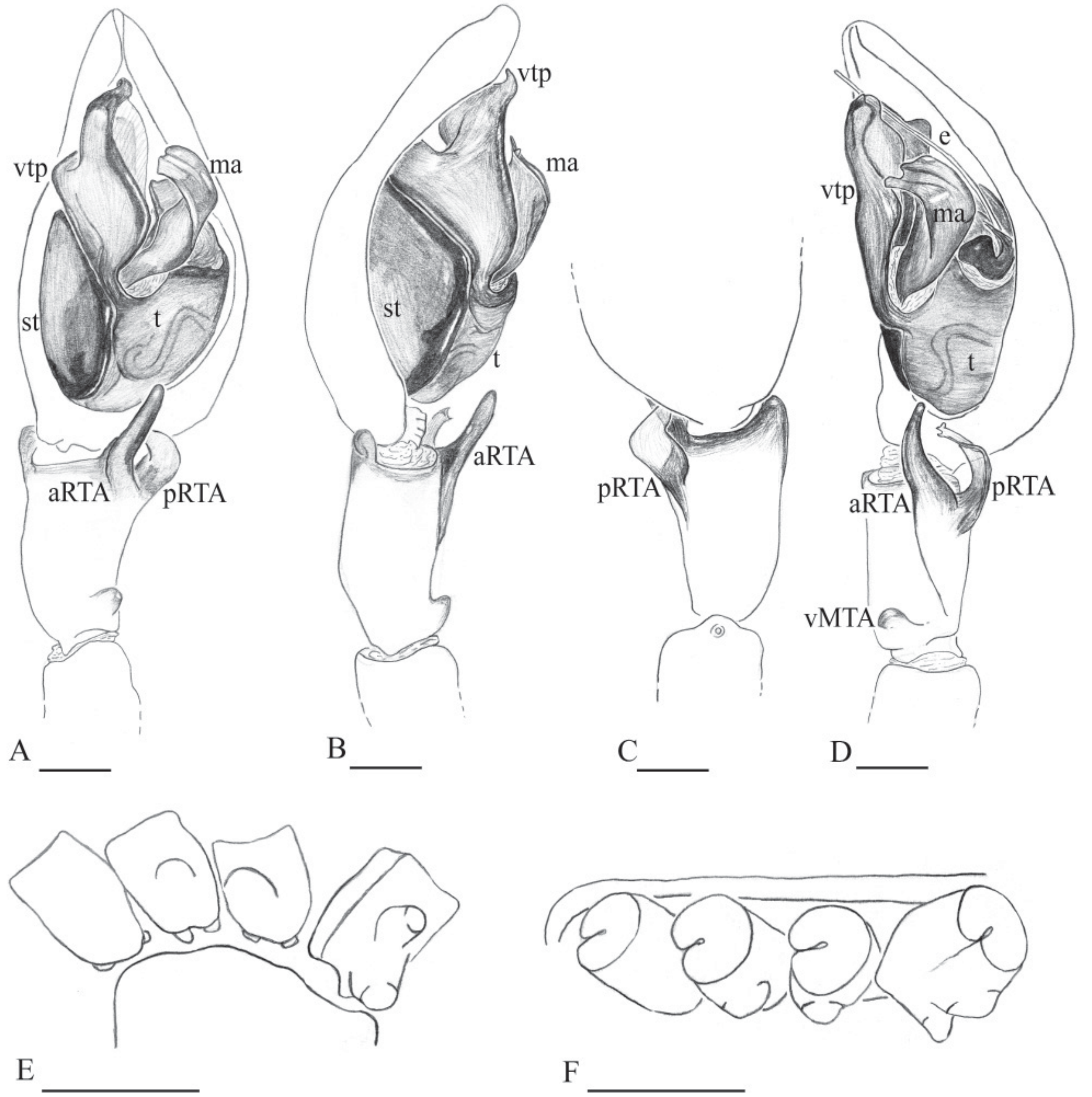

Fig. 51. *Anyphaena stigma* sp. nov., paratype, ♂ (CNAN-T01574). **A**. Pedipalp, ventral view. **B**. Pedipalp, prolateral view. **C**. Pedipalp, dorsal view. **D**. Pedipalp, retrolateral view. **E**. Coxae, ventral view. **F**. Coxae, lateral view. Scale bars: A–D = 0.2 mm; E–F = 1.0 mm.

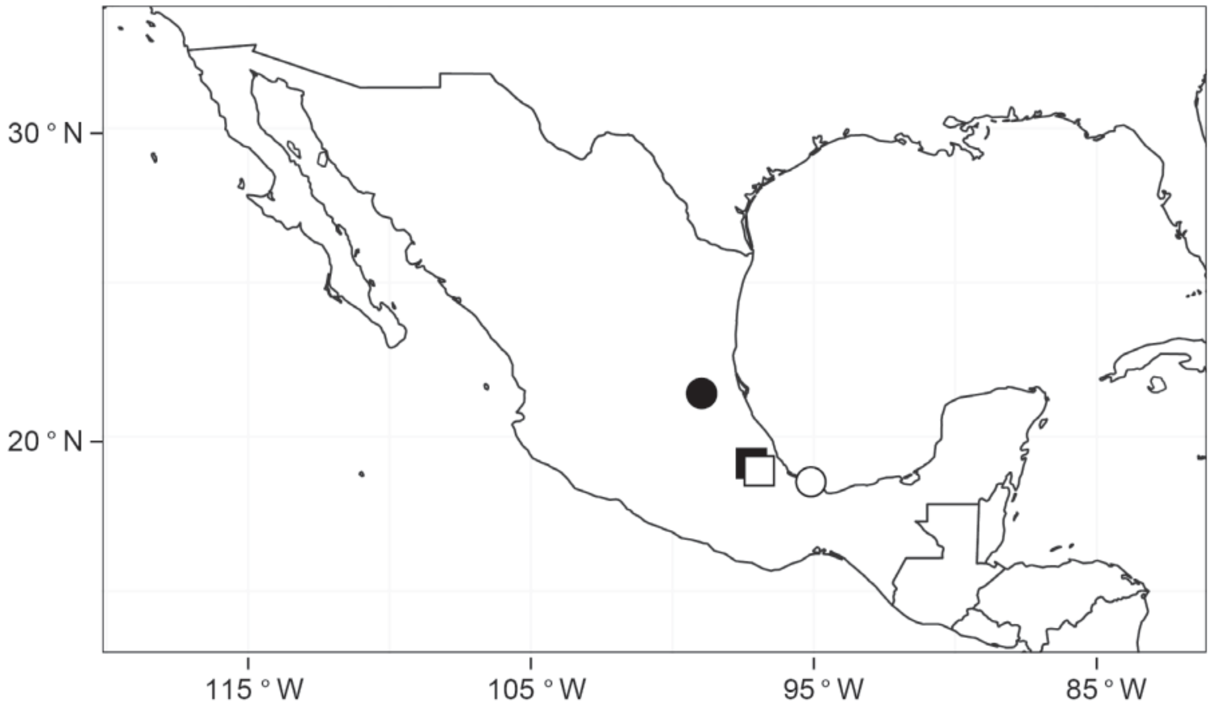

Fig. 52. Localities for the species of *Anyphaena*. Black square = Atotonilco Plots I and II, separated by 400 m, nine species registered: *A. bifurcata* sp. nov., *A. bromelicola* Platnick, 1977 (ON619634-38 Supp. file 1), *A. catalina* Platnick, 1974 (ON619673-75), *A. dulceae* sp. nov., *A. epicardia* sp. nov., *A. fernandae* sp. nov., *A. porta* sp. nov., *A. salgueiroi* sp. nov. and *A. sofiae* sp. nov. White square = Xamaticpac Plots I and II, plots contiguous, eleven species registered: *A. adnani* sp. nov., *A. alachua* Platnick, 1974 (ON619665), *A. fraterna* (Banks, 1896) (ON619671), *A. megamedia* sp. nov., *A. miniducta* sp. nov., *A. natachae* sp. nov., *A. porta* sp. nov., *A. quadrata* sp. nov., *A. rebecae* sp. nov., *A. stigma* sp. nov. and *A. tonoi* sp. nov. Black circle = Xilitla, four species registered: *A. franciscoi* sp. nov., *A. ibarrai* sp. nov., *A. noctua* sp. nov. and *A. triangularis* sp. nov. White circle = Los Tuxtlas, two species registered: *A. jimenezi* sp. nov. and *A. urieli* sp. nov.

Molecular analyses

Maximum Likelihood (Fig. 53) and Bayesian Inference (Fig. 54)

The COI data recovered a highly supported but unresolved *Anyphaena* and *Wulfila* clade. The other 26 terminals represent 19 species and 15 genera of Anyphaenidae (Supp. file 1). Both analyses recovered a paraphyletic *Hibana* at the base with one of its clades sister to the remaining genera, which are clustered in three large clades: 1) *Anyphaena* and *Wulfila*, 2) a cluster of several Anyphaeninae genera (*Xiruana* Brescovit, 1997, *Hatitia* Brescovit, 1997, and *Aysha*), and 3) one group of species of Amaurobioidinae, and *Josa lutea* (Keyserling, 1878) at the base of this triad.

The relations within the *Anyphaena*+*Wulfila* clade have generally low support (ML) or remained unresolved (BI). For the ML analysis, *Anyphaena* is divided in two clades, one formed by the *pacifica*, *accentuata* and *celer* groups; and the other formed by the *pectorosa* group as a sister to *porta*+*Wulfila* (Fig. 53). Our BI was not able to fully resolve the *Anyphaena*+*Wulfila* branch (Fig. 54). However, the *accentuata*+*celer* branch and the *porta* group are recovered as monophyletic with moderate to high support values.

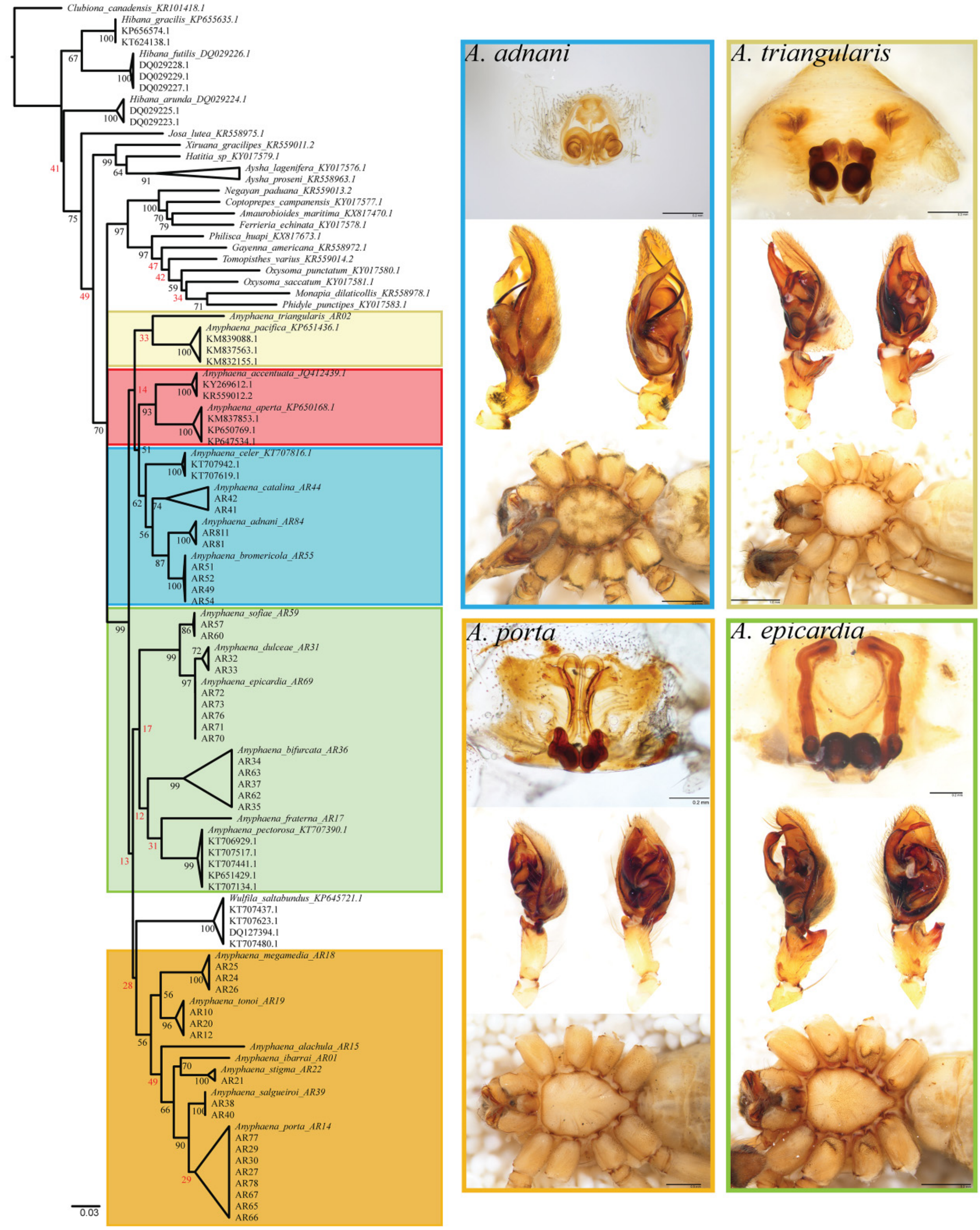

Fig. 53. Tree topology inferred with Maximum Likelihood in RaxML. Colored boxes indicate groups of *Anyphaena*: *pacifica* (gold), *accentuata* (red), *celer* (blue), *pectorosa* (green) and *porta* (ochre). Numbers in the nodes indicate bootstrap support. Support values under 50 are marked in red. Note the position of *Wulfila* O. Pickard-Cambridge, 1895 as a sister of the *porta* group.

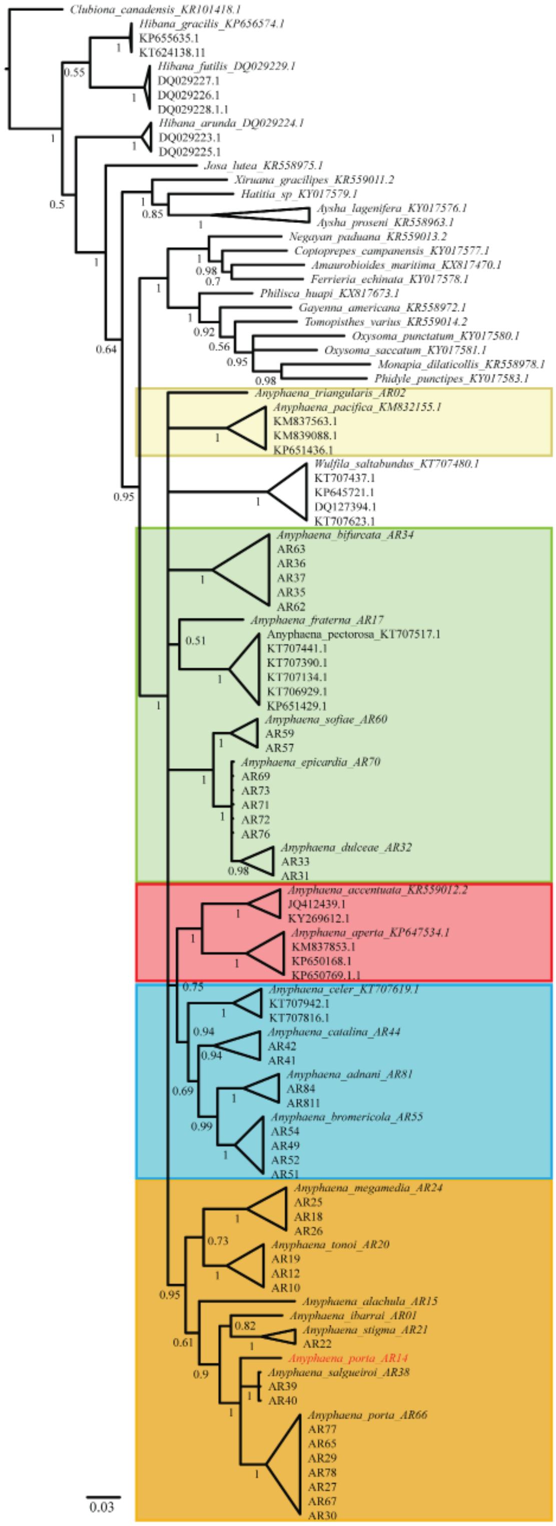

Fig. 54. Tree topology obtained with Bayesian Inference in MrBayes. Colored boxes indicate groups of *Anyphaena*: *pacifica* (gold), *accentuata* (red), *celer* (blue), *pectorosa* (green) and *porta* (ochre). Numbers in the nodes indicate posterior probabilities. Support values under 50 are collapsed. Note that most of the deeper relations within the *Anyphaena*+*Wulfila* clade are not resolved, especially for the *pacifica* and *pectorosa* groups. The *accentuata*+*celer* and the *porta* groups are recovered as monophyletic clades with moderate to high support.

***Accentuata+celer* groups**

The Palearctic and type species *Anyphaena accentuata* is consistently recovered as sister to the Nearctic *Anyphaena aperta* (Banks, 1921), being in turn a sister to the *celer* group, both in the ML and BI analyses. Three new species are described here for the *celer* group: *A. natachae* sp. nov., *A. fernandae* sp. nov. and *A. adnanai* sp. nov. New sequences are provided for *A. catalina* and *A. bromelicola*. Within this group, both analyses show moderate to high support values (60–100 in ML, and 0.71–1 in BI) for all of its branches. Morphologically the *celer* group is also quite different from all other clades of *Anyphaena* and could easily be diagnosed by its unique male and female morphological features; yet species within the *celer* group are anatomically difficult to separate. For example, *A. bromelicola* and *A. adnanai* sp. nov. are confidently separated in both analyses (with ca 90% of internal node support) and are geographically segregated; but their morphology could only be separated by the combination of several features.

***Pacifica* group**

This group and its relation to other anyphaenas in our phylogenies is vague at best. ML suggests it has a relation to the *Accentuata+celer* clade, being sister to the new species *A. triangularis* sp. nov. However, the bootstrap support is very low in both cases (14% and 33%, respectively). Similarly, the BI fails to give a clear picture of the relations of the *pacifica* group, placing both *A. pacifica* and *A. triangularis* sp. nov. in collapsed branches.

***Pectorosa* group**

The ML tree recovers the *pectorosa* as a lowly supported but monophyletic clade, including *A. fraterna* and *A. pectorosa*, and four of our newly described species: *A. bifurcate* sp. nov., *A. epicardia* sp. nov., *A. dulceae* sp. nov., and *A. sofiae* sp. nov. Most of the deeper nodes within this clade are lowly supported (> 30%); however, the most recent branches have generally higher supports, over 90% in most cases. Similarly, our BI analysis confidently recovered all of the internal subgroups of the *pectorosa* group. However, their relationships to other members of *Anyphaena* are not clear.

***Porta* group**

Both of our phylogenetic analyses recovered this group as monophyletic with moderate to high support values (56 in ML, and 0.95 in BI). ML places this clade as sister to *Wulfila*, while BI again fails to resolve their relation to the rest of *Anyphaena*. This new group is formed by *A. alachua* and six new species: *A. porta* sp. nov., *A. salgueiroi* sp. nov., *A. tonoi* sp. nov., *A. megamedia* sp. nov., *A. ibarrai* sp. nov. and *A. stigma* sp. nov. Internally, most relations are well supported, rarely falling under 50% and reaching 90–100% in most cases. A notable exception is *A. porta* AR14, whose long branch in ML and paraphyletic position in the BI suggest this might be a separate species. However, careful morphological observations failed to show any differences between this or other members of this species. Although COI did not confidently resolve the relationships within *Anyphaena*, there is a clear phylogenetic signal in the data to support our morphological observations. We consider that *Anyphaena* as currently delimited is not a monophyletic clade and new genera have to be erected to accommodate the *pectorosa* and *porta* groups. Still, information from the 'usual suspects' (H3, 12s, 16s, 18s, and 28s), or a subset of them, with a diverse taxonomic sample of other genera of Anyphaenidae would be desirable before making deeper taxonomical changes within the genus.

Genital morphology is informative but can be quite problematic. In the case of males, diagnosing *Anypharena* groups relying solely on male genital anatomy can lead to spurious relationships that are not supported by other somatic character or COI data. We found the male coxal tubercles or spurs to be a reliable diagnostic character that can be used in combination with genital features to efficiently tell species groups apart. For the females, the anatomy of the epigynal plate of *Anyphaena* is more diverse than that of male palps. We found four main types of morphologies. However, substantial interspecific variation is found within the groups, especially in the *pectorosa* and *porta* groups. Stretching the homology to the limit was necessary to fit some species within their groups (as suggested by COI and male genital data).

Discussion

Anyphaena genital morphology

The great heterogeneity within some anyphaenid clades is derived from the very distinctive genital characters shown by species groups that have a relatively limited geographic distribution. As Platnick (1974) mentioned, many such groups might deserve a generic status as unambiguous key characters are available. Nevertheless, a more pragmatic and conservative approach was preferred here selecting nomenclatural stability over the creation of smaller genera that better reflect the natural relationships. This broad concept of *Anyphaena* has grouped together the Palearctic, Nearctic and Neotropical faunas of *Anyphaena*.

Here, we found molecular and morphological evidence that supports the existence of Platnick's (1974) and other species groups. Nevertheless, we argue for a more careful consideration of their classification. The considerable morphological diversity within *Anyphaena* (visually summarized in Supp. file 3), together with the clear phylogenetic signal recovered from our molecular analyses, suggests that only the *celer* group is directly related to the Nearctic *A. accentuata*, and the rest of the species of the *Anyphaena* groups actually deserves a genus of their own. Nevertheless, additional molecular information outside the scope of this work will be necessary to clarify the phylogenetic relationships of the putative *Anyphaena* groups.

Integrative vs minimalistic taxonomic approaches

The present work describes 21 new species of *Anyphaena* from the Neotropics, representing the largest contribution to the knowledge of this genus in the last four decades (WSC 2022). Previous landmarks on the taxonomy of *Anyphaena* can be found in the faunistic work done by several European scientists in the late 19th and early 20th centuries, and the revisionary work done by N. Platnick and his collaborators during the 1970's that resulted in an explosion of new species descriptions. Here, we benefit from several methodological, technological and conceptual breakthroughs that have occurred in the last decades to increase the knowledge of the genus *Anyphaena* by describing new species and testing the former hypotheses about the relationships of several species groups within this genus. The conclusions reached here could only be achieved by the careful assessment of morphological and molecular information in tandem. Any attempt at minimizing either one of the data sources would have resulted in a different picture of the taxonomic relationships between the new species and their position within *Anyphaena*. Furthermore, we would have failed to find and describe all the new species, and greatly complicated – in some cases – the sex matching of males and females. In other words, the reciprocal enlightenment between molecules and morphology should not be understated.

Minimization of morphological data greatly speeds up the process of new species description, at the expense of taxonomic literature usability and functionality. The minimalistic approach suggested by Sharkey *et al.*'s (2021a, 2021b) claims as its main point the time and resources needed for generating images, diagnoses and taxonomic keys. Because of these, they suggest their COI barcode diagnoses that are considered a suite of character states universally shared by all members of a species and unique to the species (Sharkey *et al.* 2021a). The authors highlight that traditional taxonomical approaches are prone to error and that they are only useful for an ever-dwindling number of experts.

We are conscious of the necessary amount of time that needs to be invested in order to produce morphological and molecular data that support new taxonomic descriptions. Although our 21 new species are – to use Sharkey *et al*.'s (2021a) own words – a drop in the bucket, we argue that it is the integration of multiple lines of evidence that gives robustness and ultimately usefulness to taxonomy. Minimization of data might reduce the time needed for describing new species, but at the same time, it reduces their economical support, adequacy, and usability (Janzen *et al*. 2009; Meier *et al*. 2021). As put by Wheeler *et al*. (2004), "the challenge is not merely to speed data access but to expedite taxonomic research". The taxonomic impediment puzzle will not be solved only by accelerating the production of data but also by facilitating their access and increasing their explanatory power. Besides COI being a very cost-effective way (both in terms of time and money), other kinds of information are relevant too.

Sharkey *et al* (2021a) remarked on the need for taxonomy to show governments and the overall public that there is a reason to bother. We consider that these arguments will not come from the number of new taxa alone. Although molecular information is an extremely valuable tool, taxonomy – whether we like it or not – is still an extremely visual science. Unless the knowledge and facilities for analyzing molecular data are available to all the stakeholders, images and other kinds of biodiversity data (e.g., occurrence databases) will still be the best way to transmit taxonomical findings to the public and other scientists.

Well-curated taxonomic catalogs, databases and standardized image libraries expedite the scientific discussion, allowing taxonomy to become a team effort instead of being dependent on individual expert authorities. Despite the constant decrease in outlets, funding and positions in taxonomy and biodiversity (Agnarsson & Kuntner 2007; Carvalho *et al*. 2007; Ebach *et al*. 2011; Zeppelini *et al*. 2020), it is the democratization of information which has allowed taxonomy to keep increasing the number of described species at an ever-growing pace. In the case of spiders, between 500 and 1000 new species have been described every year in the last two decades (WSC 2022).

Morphological data, if done right, is still the best and most accessible way of quickly identifying taxa with minimal equipment and facilities, despite the obvious exemption of many megadiverse and difficult groups. One of the examples of Sharkey *et al*. (2021a) notably illustrates this point by comparing the species *Alabagrus scottshawi* Sharkey *et al*., 2018 and *A. genemonroei* Sharkey *et al*., 2018, where subtle morphological differences were found between both species only after COI indicated the need to revisit these two morphospecies. A similar case was found in our study, where morphological differences between *A. porta* sp. nov. and *A. salgueiroi* sp. nov. only became evident after the molecular data showed them to be different. We found other cases where COI data coincided with segregated geographic distributions resulting in the separation of *A. bromelicola* and *A. adnani* sp. nov., both species with minimal easy-to-miss morphological differences. Still, similarity does not equal invariability and even when morphology might seem to be redundant, it can become an important ally for parsing even some of the toughest cases.

For most of the new spider species treated here, somatic and genital morphology offered an easy and reliable way to identify and classify to species and species groups. This line of evidence (in stark contrast to molecular data) does not require the application of expensive lab equipment or reagents, being easy to do by a trained eye with a good microscope (and ideally a digital camera). Still, this step does require some time and level of familiarity with the taxonomic group and their literature that is not always readily available. Generating open access image libraries (Álvarez-Padilla 2012; Rivera-Quiroz *et al*. 2016; Álvarez-Padilla *et al*. 2020) and taxonomic literature repositories (WSC 2022) allows sharing information worldwide, facilitating communication and reaching experts who can expedite and improve species identifications, even opening the door to 'e-specimens' based collaborations.

With this discussion, we do not mean to appeal to one or the other source of information. On the contrary, we invite the integration of different sources of data and infrastructures that can give taxonomy more robustness and added scientific and social value. If we want to overcome the taxonomic impediment, taxonomy must not be based on individual efforts but on a well-integrated team effort that makes use of the diversity of methods for species documentation, web-based infrastructure, and scientific networks.

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Supplementary material

Supp. file 1. Genbank Data. Table with the Genbank accession numbers for the sequences used in our analyses. Other data like taxonomic information and the combination of primers for the new sequences generated for the present study are also shown. https://doi.org/10.5852/ejt.2023.865.2097.8805

Supp. file 2. Aligned matrix (in Nexus format) used for our BI analysis. The same alignment was transformed to the FASTA format and used for the ML, Haplotype network and genetic distances calculations. We also included here the Trace and Marginal Density charts for our BI analysis. https://doi.org/10.5852/ejt.2023.865.2097.8807

Supp. file 3. Visual summary of the diagnostic characters for the three *Anyphaena* groups represented in our study. Ordering is based on our interpretation of the phylogenetic relations suggested by the molecular analyses plus the morphological characters: green = *pectorosa* group, gold = *pacifica* group, blue = *celer* group, ochre = *porta* group. https://doi.org/10.5852/ejt.2023.865.2097.8809