Dugesiana, Año 27, No. 2, julio 2020-diciembre 2020 segundo semestre de 2020), es una publicación semestral, editada por la Universidad de Guadalajara, a través del Centro de Estudios en Zoología, por el Centro Universitario de Ciencias Biológicas y Agropecuarias. Camino Ramón Padilla Sánchez # 2100, Nextipac, Zapopan, Jalisco, Tel. 37771150 ext. 33218, http://148.202.248.171/dugesiana/index.php/DUG/index, glenusmx@gmail.com. Editor responsable: José Luis Navarrete-Heredia. Reserva de Derechos al Uso Exclusivo 04-2009-062310115100-203, ISSN: 2007-9133, otorgados por el Instituto Nacional del Derecho de Autor. Responsable de la última actualización de este número: José Luis Navarrete-Heredia, Editor y Ana Laura González-Hernández, Asistente Editorial. Fecha de la última modificación 1 de julio 2020, con un tiraje de un ejemplar.

Dugesiana 27(2): 141-149
Fecha de publicación: 1 de julio 2020

ISSN 1405-4094 (edición impresa)
ISSN 2007-9133 (edición online)
http://zoobank.org/E29797CF-150B-44B5-8758-8E6A6267B468

Artículo

Three new species of *Goja* Navás (Psocodea: 'Psocoptera': Epipsocidae) from Sierra Juárez, Oaxaca, Mexico

Tres nuevas especies de *Goja* Navás (Psocodea: 'Psocoptera': Epipsocidae) de la Sierra Juárez, Oaxaca, México

José Arturo Casasola-González
Instituto de Estudios Ambientales, Universidad de la Sierra Juárez, Ixtlán de Juárez, Oaxaca. C. P. 68725, Oaxaca, México; e-mail: casasola@unsij.edu.mx

ABSTRACT

Three species of *Goja* Navás collected in the mountain communities of Santa Catarina Lachatao, Ixtlán de Juárez and Santiago Comaltepec, are here described and illustrated. All of them are endemic to Sierra Juárez, Oaxaca. This report increases the number of species described in the genus to 33 and the number of species recorded in Mexico to 25. *G. garcialdretei* is similar to *G. martinezi* Casasola-González & García Aldrete, another species that also occurs in the same region. *G. cuspidata* and *G. bicuspidata* are similar species on account of their phallosome, but are quite distinct on wing venation.

Key words: Epipsocetae, Taxonomy, Ixtlán District, Endemism.

RESUMEN

Tres especies de *Goja* Navás, colectadas en las comunidades serranas de Santa Catarina Lachatao, Ixtlán de Juárez y Santiago Comaltepec, son aquí descritas e ilustradas. Todas ellas son endémicas de la Sierra Juárez, Oaxaca. Este informe incrementa a 33 el número de especies descritas en el género y a 25 el número de especies registradas en México. *G. garcialdretei* es similar a *G. martinezi* Casasola-González & García Aldrete, otra especie que también se localiza en la misma región. *G. cuspidata* y *G. bicuspidata* son especies muy similares por su falosoma, pero son bastante distintas en la venación de las alas.

Palabras claves: Epipsocetae, Taxonomía, Distrito de Ixtlán, Endemismo.

Goja is one of the 31 genera that presently constitute the family Epipsocidae (García Aldrete, 2017a; Johnson & Smith, Psocodea Species File Online [retrieved 17 April, 2020]). Most of the species are neotropical; their distribution goes from central Mexico to southern Brazil and includes two Andean species (Casasola-González & García Aldrete, 2002). Initially, the genus was established considering a single diagnostic character, the supernumerary venation of the fore- and hind wings of the male (Navás, 1927). Later, *Goja* was redefined based mainly on the presence of a crossvein Rs-M in the hindwing and endophallic sclerites in the phallosome of the male, while the supernumerary venation was considered a secondary diagnostic character (Mockford, 1996; 1998). Casasola-González & García Aldrete (2002) diagnosed the genus based on a combination of morphological characters of the head, thorax and abdomen, of both sexes; they described 35 new species, 29 with supernumerary venation and six with caeciliusid venation; and they recognized it as a monophyletic group. Later, Casasola-González (2006) analyzed the phylogenetic relationships of the genera of the infraorder Epipsocetae and found that monophyly of *Goja* was not supported. In 2012, García Aldrete re-appraised the definition of the genus and separated the recognized species into two well-defined groups: in Group I, he retained the genus *Goja* Navás and included the species that had the original diagnostic character, that is, the supernumerary venation of the fore- and hind wings of the male, while in Group II, he established the new genus *Gojaoides*, separating the species that had a caeciliusid venation. For the purposes of this article, I will follow the diagnosis of the genus *Goja* Navás proposed by García Aldrete (2012).

To date, 30 species of *Goja* have been described (García Aldrete, 2012), of which 22 (73%) are recorded in Mexico, 3 (10%) are in Central America and 5 (17%) are in South America (Casasola-González & García Aldrete, 2002). However, there are several species, particularly from Mexico (personal collection) and from Colombia (García Aldrete et al., 2018), that remain undescribed.

The Sierra Juárez, located in the north of the Mexican state of Oaxaca and considered by Conabio as Priority Terrestrial Region 130 for the conservation of biodiversity, is an area of high biological richness and high levels of endemism for plants and vertebrates (García González et al., 2004; García Mendoza & Meave, 2011). For the above and as part of a project that I started 13 years ago in this mountain region, in collaboration with Dr. Alfonso Neri García Aldrete, of the Biology Institute, UNAM, it has been possible to collect a considerable number of specimens of Psocodea: 'Psocoptera' (Insecta). The collection has allowed not only the discovery of new species in several genera (García Aldrete & Casasola-González, 2012; García Aldrete, 2016;

Sandoval Arango et al., 2017) but also a large number of undescribed species and probably some new genera (García Aldrete, pers. com.). In this paper, I present the description of three new species of *Goja* that are part of the mentioned above collection and also are endemic to the region.

MATERIAL AND METHODS

The specimens studied were collected in the communities of the Santa Catarina Lachatao, Ixtlán de Juárez and Santiago Comaltepec, all of them belonging to the Ixtlán District, between 2010 and 2013. 26 specimens (10 males, 4 females and 12 nymphs) were examined, of which 7 males and 2 females were dissected in 80 % ethanol, and their parts (head, right antenna, right wings and legs, and genitals) were mounted on slides in Canada Balsam following standard procedures. Color was recorded by observation of the specimens, before dissection, under a dissecting microscope, illuminated with cold white light, at 50X. Parts mounted on the slides were photographed utilizing a multifocal automatic microscope (Leica Z16 APOA) with an 8 mega-pixel camera (Leica DFC490) and Leica Suite 2.8.1 software. Later the images were processed in image editor Adobe® Photoshop® 7.0.

Measurements were taken, on parts mounted on the slides, utilizing an American Optical filar micrometer, mounted on the compound microscope. Abbreviations of parts measured are the following: FW: forewing length, HW: hindwing length, F: length of hind leg femur, T: length of hind leg tibia, t1 and t2: lengths of tarsomeres 1 and 2 of right hind leg, ctt1: number of ctenidiobothria on t1, f1… fn: length of flagellomeres 1…n, Mx4: length of fourth palpomere, IO: minimum distance between compound eyes, d: transverse diameter of right compound eye, D: antero-posterior diameter of right compound eye, PO: d/D.

The types are deposited in the National Insect Collection (CNIN), Zoology Department, Institute of Biology, National Autonomous University of Mexico, México City.

RESULTS

Family Epipsocidae

Goja garcialdretei n. sp.

(Figs. 1-10)

http://zoobank.org/589796CD-B9B3-4B7C-890B-8366D8FC9174

Description. MALE. Color. Body light yellowish. Head (Fig. 1) with front, postclypeus and labrum pigmented, a semicircular dark brown narrow strip between compound eyes and ahead of ocellar group, other V-shaped dark brown marks on postclypeus, with lateral ends ringed, lateral surfaces between compound eyes and antennal sockets pigmented, genae with a curved dark brown mark. Compound eyes black, ocelli hyaline, with dark brown centripetal crescents. Scape, pedicel and flagellomeres posterior to f1 slightly more pigmented. Apex of Mx4 more pigmented than rest of the palpomere. Thorax more pigmented dorsally, a pair of dark brown longitudinal bands on each pleuron, the ventral ones reaching the level of the second pair of coxae. Femora unpigmented. Tibiae with brown middle spot and other smaller and more pigmented spots distally. Tarsomeres pigmented, except the proximal third of t1. Wings hyaline; forewings (Fig. 2) with a slight brown band and a series of distal, small, unpigmented areas, along wing margin from R4+5 to posterior end of areola postica; other arched slightly brown band from nodulus to anterior end of areola postica; distal ends of Rs and M branches with dark brown small spots; pterostigma with two dark brown spots as described for the genus (see Casasola-González & García Aldrete, 2002). Hindwings (Fig. 2) with a slight brown band along wing margin, wider at R4+5 and narrowing to the first branch of M; other slightly pigmented spots between R2+3 and costal margin; a small brown spot at distal end of CuP. Dorso-lateral surface of first three abdominal segments, and ventro-lateral surface of first five abdominal segments dark brown, other segments with several irregular small spots dorsally, terminal segments pigmented.

Morphology. Middle ocellus as described for the genus (see Casasola González & García Aldrete, 2002). Distal ends of labral sclerites joined medially. Distal end of f11 blunt. Lacinial apex wide, outer cusp with nine rounded denticles. Mirror of coxal organ small, about ¾ the diameter of the rasp. Forewings with supernumerary asymmetric veins (Fig. 2); Rs-M longer than anterior segment of Rs; CuP with setae; Rs stem shorter that R2+3 and R4+5; R2+3 stem shorter that R4+5; R2+3 usually with four or five branches; R4+5 with two to five branches; M1 with five to seven branches; M2 two branched, sometimes unbranched; M3 with two to four branches, sometimes unbranched. Pterostigma six times as long as maximum width. Areola postica 3½ times as long as maximum height, not joined to M3 (the presence of a connection is considered as an aberration). Hindwings with supernumerary veins (Fig. 2); length of Rs stem variable; R2+3 and R4+5 unbranched; M with three or four branches, sometimes with six branches. Distal segment of hypandrium (Fig. 7) with a brown wide band at the ends, narrow in the middle, postero-lateral corners with fields of long setae on well-developed lobes. Phallosome (Fig. 4) with basal struts curved; closed anteriorly; aedeagal arch projected posteriorly a distance, aedeagal apex with an obtuse rectangular sclerite; external parameres membranous, joined to mesal sclerites rectangular semi-curved, each one ended in two small claws (Fig. 5) and connected to endophallus by a thin sinuous sclerotic strip. Endophallic sclerites: first pair central forming a big V, each one with the middle widened and projected laterally in small curved tip; second pair central forming a big inverted V above the previous pair, each one with anterior ends pointed and with a small sharp preapical protrusion and distally curved, in the middle of them a hook-shaped sclerite; third pair lateral, each one slightly elongated and curved, distally hook-shaped; fourth pair lateral, proximal and thorn-shape. Epiproct (Fig. 9) trapeziform, with field of setae posteriorly; two macrosetae on basal third. Paraprocts

(Fig. 9) slightly pigmented, with field of setae posteriorly, sensory fields with 49-56 trichobothria, issuing from basal rosettes.

Measurements (in μm). FW: 6120, HW: 4460, F: 1334, T: 2381, t1: 1224, t2: 310, ctt1: 40, Mx4: 355, f1: 1176, f2: 997, f3: 725, f4: 523, f5: 287, f6: 259, f7: 201, f8: 189, f9: 174, f10: 168, f11: 185, IO: 408, D: 326, d: 298, IO/d: 1.36, PO: 0.91.

FEMALE. Color. Same as the male. Head with vertex pigmented. Femora with a middle and a distal brown spot. Winglets (Fig. 3) with mid dorsal surface pigmented.

Morphology. Compound eyes as in the male. Without ocelli and coxal organ. Winglets elongate (Fig. 3), with a few scattered thick setae. Subgenital plate (Fig. 8) with pigmented concave area anteriorly, sides converging to slightly concave apex. Gonapophyses (Fig. 6): V1 slender, acuminate, about half as long as v2+3; this with long, stout proximal heel, distal process straight, acuminate, armed with numerous microspines, v3 forming an elongated bulge on side of v2, with a row of 10 or 12 setae. Ninth sternum (Fig. 6) with an anterior, pigmented, kidney shaped sclerotic transverse area; spermapore small, surrounded by a pigmented irregular rim, located in the concavity of the "kidney". Posterior border of clunium, over the area of the epiproct, with a pair of middle lateral projections. Epiproct (Fig. 10) elongate, pigmented laterally and posteriorly, anteriorly convex and posteriorly rounded, a field of macrosetae posteriorly, and one macroseta near anterior border. Paraprocts (Fig. 10) elongate, pigmented except for the sensorium, macrosetae posteriorly, sensory fields with five to six trichobothria, one longer than the others, all issuing from basal rosettes.

Measurements (in μm). FW: 446, F: 1048, T: 1678, t1: 903, t2: 274, f1: 705, f2: 503, IO: 428, D: 303, d: 272, IO/d: 1.57, PO: 0.90.

Type locality. MEXICO. Oaxaca. Ixtlán District. Santiago Comaltepec. km 96.5 of the Hwy 175 Tuxtepec-Oaxaca, trail "La Capilla", 17°35'16.9" N: 96°27'16" W, 2212 m., 28.XI.2012, on rock surface with mosses, J. A. Casasola-González. Holotype male, allotype female, 1 female paratype, 7 nymphs.

Records. MEXICO. Oaxaca. Ixtlán District. Ixtlán de Juárez, trail "El Portillo-La Luz", 17°30'10.7" N: 96°23'36.4" W, 2195 m, 18.VIII.2010, on *Pinguicula* sp. leaves (Lentibulariaceae), J. A. Casasola-González, 1 male. La Luz, "Campamento La Luz", 17°32'39.6" N: 96°23'8.2" W, 2020 m, 18.VIII.2010, on *Quercus* buttress, J. A. Casasola-González, 2 females, 5 nymphs. Santiago Comaltepec, km 68.4 of the Hwy 175 Tuxtepec-Oaxaca, trail "El Mameyal", 17°40'33.2" N: 96°19'26.4" W, 1862 m, 30.III.2011, on tree trunk, J. A. Casasola-González, 2 males.

Etymology. The specific name is dedicated with great esteem to Dr. Alfonso Neri García Aldrete (Instituto de Biología, UNAM), in recognition for his valuable work in the taxonomy of Psocoptera from México, Central and South America, and in gratitude for sharing his fascination for these wonderful insects with me.

Goja cuspidata n. sp. (Male)
(Figs. 11-16)
http://zoobank.org/81F8DF54-EF25-412C-90BB-06A24F-C6F7ED

Description. Color. Body light yellow. Head (Fig. 11) pigmented, except the vertex, which has a pair of dark brown longitudinal stripes; epicranial suture pigmented. Compound eyes black, ocelli hyaline with dark brown centripetal crescents. Scape, pedicel and flagellomeres posterior to f1 slightly more pigmented. Mx4 slightly more pigmented than the other palpomeres. Thorax with pleura dark brown. Coxae and femora pigmented. Tibiae with a brown middle spot and a smaller, more pigmented one distally. Tarsomeres pigmented, except the proximal third of t1. Wings hyaline; fore wings (Fig. 12) with a light brown band and a series of distal, small, unpigmented areas, along wing margin from R4+5 to nodular area, extended to CuA; M, Rs-M crossvein and anterior segment of Rs; distal ends of Rs and M branches and nodulus with dark brown small spots; pterostigma with two dark brown bands. Hindwings (Fig. 12) with a pale brown band and two distal small unpigmented areas along wing margin, wider at R4+5 and narrowing towards M; a small brown spot at the distal end of CuP. Dorsal surface of abdominal segments irregularly pigmented, ventral surface clear, terminal segments pigmented.

Morphology. Middle ocellus as described for genus (see Casasola González & García Aldrete, 2002). Distal ends of labral sclerites not joined medially. Distal end of f11 blunt. Lacinial apex wide, outer cusp with eight round denticles. Mirror of coxal organ small, about ¾ the diameter of the rasp. Forewings with supernumerary asymmetric veins (Fig. 12); Rs-M longer than anterior segment of Rs; CuP with setae; Rs longer than R2+3 and R4+5 stems; R2+3 and R4+5 of variable length; R2+3 two branched, occasionally unbranched; R4+5 two or three branched; M1 usually with three or four branches, occasionally with two branches or unbranched; M2 and M3unbranched, sometimes two branched. Pterostigma five times as long as maximum width. Areola postica 3⅓ times as long as maximum height, not joined to M3. Hindwings without supernumerary veins (Fig. 12); length of Rs variable; R2+3 and R4+5 unbranched; M two branched. Distal segment of hypandrium (Fig. 14) with a brown band wide at the ends and narrow in the middle, posterior margin straight, postero-lateral corners with fields of long setae on poorly developed lobes. The two segments anterior to hypandrium pigmented. Phallosome (Fig. 13), closed anteriorly, with side struts curved; aedeagal arch extended posteriorly a distance, aedeagal apex broad and rounded; external parameres membranous, joined to mesal sclerites elongate and curved, each one ended in a conical acute apex (Fig. 15) and connected to endophallus by long twisted sclerotic bands. Endophallic sclerites: first pair posterior, each one wide based, curved and distally acuminate; second pair median, each one elongate and with the anterior end hook-shaped; third pair anterior, each one in inverted Y-shaped; fourth pair lateral, each one straight and elongate, with the anterior end acuminate and distally hook-shaped. Epiproct (Fig. 16) trapeziform, pigmented, except for a small central area, with field of setae posteriorly, and three macrosetae mesally, near anterior border. Paraprocts (Fig. 16) pigmented, except for the sensorium; setal field posteriorly, sensory fields with 23-26 trichobothria, issuing from basal rosettes.

Measurements (in μm). FW: 3775, HW: 2861, F: 1025, T: 1649, Mx4: 287, f1: 808, f2: 707, f3: 545, f4: 394, f5: 240, f6: 240, f7: 195, f8: 190, f9: 179, f10: 171, f11: 178, IO: 329, D: 223, d: 176, IO/d: 1.86, PO: 0.79.

Type locality. MEXICO. Oaxaca. Ixtlán District. Santa Catarina Lachatao. 21.5 km SW of Santa Catarina Lachatao, "Terrenos del General", 17°31'59.5" N: 96°27'37.5" W, 2831 m, 30.IX.2013, on *Pinguicula* sp. leaves (Lentibulariaceae), J. A Casasola-González. Holotype male.

Records. MEXICO. Oaxaca. Ixtlán District. Ixtlán de Juárez, trail "El Portillo-La Luz", 17°30'10.7" N: 96°23'36.4" W, 2195 m, 18.VIII.2010, on *Pinguicula* sp. leaves (Lentibulariaceae), J. A. Casasola-González, 3 males. Santa Catarina Lachatao, "Las Vigas", 17°11'17" N: 96°27'13.5" W, 2790 m, 27.VIII.2013, beating fern fronds, J. A. Casasola-González, 1 male.

Etymology. The specific name is the feminine of the Latin word *cuspidatus* (having an apex or cusp) and refers to the single acute cusp that have the mesal sclerites, joined to the external parameters.

Goja bicuspidata n. sp. (Male)
(Figs. 17-22)
http://zoobank.org/71A78CFA-4F12-4740-B124-70837A6EC24C

Diagnosis. Color. Body light yellowish. Head (Fig. 17) pigmented from vertex to labrum, with a semicircular dark brown wide band between compound eyes, over ocellar group; V-shaped dark brown bands in postclypeus, with distal ends ringed; a pair of dark brown lateral spots from lower compound eyes to each gena. Compound eyes black, ocelli hyaline, with dark brown centripetal crescents. Scape, pedicel and flagellomeres posterior to f1 slightly more pigmented. Apex of Mx4 more pigmented than rest of the segment. Thorax dark brown. Proximal ends of coxae pigmented. Femora with middle and distal brown spots. Tibiae with three brown spots, the distal one smaller and more pigmented than the others. Tarsomeres pigmented, except the proximal third of t1. Wings hyaline; forewings (Fig. 18) with a slight brown band and a series of distal, small, unpigmented areas along wing margin, from R4+5 to areola postica; a brown spot on nodulus, extended to distal end of CuA; pterostigma with two dark brown spots, as described for the genus (see Casasola González & García Aldrete, 2002). Hindwings (Fig. 18) with a slight brown band, and one distal, small unpigmented area along wing margin, wider at R4+5 and narrowing beyond M; a small brown spot at distal end of CuP. Dorso-lateral surface of abdominal segments irregularly pigmented, ventral surface clear, terminal segments pigmented.

Morphology. Middle ocellus as described for the genus (see Casasola González & García Aldrete, 2002). Distal ends of labral sclerites joined medially. Distal end of f11 blunt. Lacinial apex wide, outer cusp with nine rounded denticles. Mirror of coxal organ small, about ¾ the diameter of the rasp. Forewings with supernumerary asymmetric veins (Fig. 18); Rs-M longer that anterior segment of Rs; CuP without setae; Rs stem about as long as R2+3 and shorter than R4+5; R2+3 shorter than R4+5; R2+3 three branched; R4+5 three or four branched; M1 four or five branched; M2 two or three branched; M3 three or four branched. Pterostigma six times as long as maximum width. Areola postica 3½ times as long as maximum height, not joined to M3. Hindwings with supernumerary veins (Fig. 18); length of Rs variable; R2+3 unbranched; R4+5 two branched; M four or five branched. Distal segment of hypandrium (Fig. 20) with a brown band, wide at the ends and narrow in the middle, postero-lateral corners with fields of long setae on well-developed lobes; anterior segment slightly pigmented. Phallosome (Fig. 19) closed anteriorly, with side struts curved; aedeagal arch projected posteriorly a distance, aedeagal apex narrow, slightly sclerotized and straight; external parameres membranous, joined to mesal sclerites elongate and curved, each one ended in two conical acute apices (Fig. 21) and connected to endophallus by long sclerotic strip. Endophallic sclerites: first pair posterior, each one wide based, curved and distally acuminate; second pair median, each one elongate and with the anterior end hook-shaped; third pair anterior, each one small, inverted Y-shaped; fourth pair lateral, each one elongate and outward curved, with the anterior ends acuminate and distally hook-shaped. Epiproct (Fig. 22) trapeziform, pigmented, with field of setae posteriorly and three macrosetae almost in line near anterior border. Paraprocts (Fig. 22) with field of setae posteriorly and sensory fields with 35-42 trichobothria, issuing from basal rosettes.

Measurements (in μm). FW: 5895, HW: 4424, F:1409, T: 2468, t1: 1226, t2: 340, ctt1: 40, Mx4: 371, f1: 1323, f2: 1177, f3: 799, f4: 546, f5: 298, f6: 292, f7: 231, f8: 231, f9: 196, f10: 200, f11: 215, IO: 391, D: 332, d: 292, IO/d: 1.33, PO: 0.88.

Type locality. MEXICO. Oaxaca. Ixtlán District. Santiago Comaltepec. 9 km S of La Esperanza, trail "El Relámpago", 17°35'31" N: 96°23'5.3" W, 2010 m, 5.III.2013, on tree trunk with mosses, J. A. Casasola-González. Holotype male.

Etymology. The specific name is composed to the prefix bi- (two) and the feminine from the Latin *cuspidatus* (having an apex or cusp) and refers to the two acute cusps that have the mesal sclerites that are joined to the external parameters.

DISCUSSION

Based on the descriptions presented in this paper, the males of the three new species exhibit all the diagnostic characters of the genus *Goja* Navás (see García Aldrete, 2012). The genus is related phylogenetically to the genera *Gojaoides* García Aldrete, *Ianthorntonia* García Aldrete and *Rogojiella* García Aldrete, mainly on account of males characters (Casasola, 2006; García Aldrete, 2012). The males of *Goja* are unequivocally recognizable by the combination of the main diagnostic characters they present, as explained below. In the first case, they are similar because they have a crossvein Rs-M in the hindwing and endophallic sclerites in the phallosome, but they differ because the males of *Goja* have supernumerary venation in the fore- and hind wings, while the males of *Gojaoides* have a caeciliusid venation (García Aldrete, 2012). In the second case, they are similar because they have supernumerary venation in fore- and hind- wings, and endophallic sclerites in the phallosome, but they differ because the males of *Goja* have a crossvein Rs-M in the hindwing, whereas in the males of *Ianthorntonia* Rs and M veins are fused (García Aldrete, 2004b). In the latter case, they are similar because they have endophallic sclerites in the phallosome, but they differ because males of *Goja* have supernumerary venation in fore- and hind- wings, and a crossvein Rs-M in the hind wing, whereas the males of *Rogojiella* have a caeciliusid venation and Rs and M veins are fused (García Aldrete, 2004a).

With respect to females, their recognition is more complicated because they are all very similar among the genera mentioned above, except in *Rogojiella* where females are not known. All exhibit neotenic characters, the forewings are brachypterous, lack hindwings, and the epiproct and paraprocts are elongated (García Aldrete, 2012), except in *Ianthorntonia*, which are reduced (García Aldrete, 2017). In this case, the only females collected were found associated to the males of *Goja garcialdretei* and their morphological analysis made it possible to establish without doubt their belonging to the genus.

According to García Aldrete (2012), among the species of *Goja*, there are some that have supernumerary venation in Rs and M veins of the forewing, but caeciliusid venation in the hindwing or with the Rs 2-branched and M supernumerary, whereas others have supernumerary venation in the Rs and M veins of both wings. Considering the above, *Goja garcialdretei* and *G. cuspidata* would correspond to the first group, while *G. bicuspidata* would be in the second. However, the number of branches of Rs and M in both wings is so variable that, until now, it has not been a useful character for separate to the species in groups, much less to relate them phylogenetically (Casasola-González & García Aldrete, 2002). For example, the venation of the wings of *G. cuspidata* and *G. bicuspidata* is totally different, but their phallosomes are very similar, so depending on the character used will be the interpretation of their similarity and relationship.

Considering other characters, *G. garcialdretei* is more similar to *G. martinezi* Casasola-González & García Aldrete, from Santa Catarina Lachatao, than to any of the other species in the genus, by the phallosome, particularly the apex of the mesal sclerites, the subgenital plate and the ninth sternum. But the particular design of the endophallic sclerites (Fig. 3), differences in the subgenital plate pigmentation (Fig. 8) and details of the ninth sternum (Fig. 6), justify their uniqueness.

Goja cuspidata and *G. bicuspidata* are peculiar species because firstly, they have a phallosome with a similar structure, but the difference in the number of cusps on the mesal sclerites apices (Figs. 13 and 19), from which their specific epithets derive, in addition to details in the shape of the endophallic sclerites and the wings venation, among other characters (see the corresponding descriptions in this paper), make them species totally different from each other. Furthermore, none of the other known species in the genus present a phallosome similar to theirs. Secondly, both species occur in the same region of the Sierra Juárez, but *G. cuspidata* was collected in Ixtlán de Juárez and Santa Catarina Lachatao, in the extreme south, while *G. bicuspidata* was collected in Santiago Comaltepec, in the extreme north, with a distance of approximately 76 km., between them. Therefore, given their genital morphological similarity and distribution pattern, they are probably allopatric. Finally, the three described species are known until now, only from the Sierra Juárez, so they add to the characteristic endemisms of this region.

ACKNOWLEDGMENTS

I thank the community authorities of Ixtlán de Juárez, Santa Catarina Lachatao and Santiago Comaltepec, for the facilities provided to explore their forested areas and carry out the collecting. I also tank Juan Santiago Hernández, for his friendship throughout all these years and for his valuable collaboration in the fieldwork. Special thanks to Susana Guzmán Gómez of Multifocal Photography area (Laboratory of Microscopy and Photography of the Biodiversity, Instituto de Biología, UNAM) for their help in taking photographs of the specimens.

LITERATURE CITED

Casasola-González, J. A. 2006. Phylogenetic relationships of the genera of Epipsocetae (Psocoptera: Psocomorpha). *Zootaxa* 1194: 1-32.

Casasola-González, J. A. & A. N. García Aldrete. 2002. *A taxonomic revision of the genus Goja (Psocoptera: Epipsocidae)*. Publicaciones Especiales 18. Instituto de Biología, UNAM. México.

García Aldrete, A. N. 2004a. A new genus of Bolivian Epipsocidae (Psocoptera). *Journal of the New York Entomological Society* 112(4): 217-220.

García Aldrete, A. N. 2004b. A new epipsocid genus (Psocoptera: Epipsocidae) from Bolivia. (pp. 99-113). In: García Aldrete, A. N., C. Lienhard & E. L. Mockford (eds). *Thorntoniana. A commemorative volume for Ian W. B. Thornton.* Publicaciones Especiales del Instituto de Biología 20. Universidad Nacional Autónoma de México, México, D. F.

García Aldrete, A. N. 2012. A new genus of Epipsocidae (Psocodea:'Psocoptera'), from Valle del Cauca, Colombia, and a re-appraisal of *Goja* Navás, 1927. *Caldasia* 34(1): 247-256.

García Aldrete, A. N. 2016. A new *Lachesilla* species, in species group *Texcocana*, endemic to the Sierra Juárez, Oaxaca, México (Psocodea: 'Psocoptera': Psocomorpha: Lachesillidae). *Dugesiana 23(2): 117-119.*

García Aldrete, A. N. 2017a. A new monotypic genus of Epipsocidae (Psocodea: 'Psocoptera': Psocomorpha) from Cusco, Peru. *Dugesiana* 24(2): 121-123.

García Aldrete, A. N. 2017b. A new species of *Ianthorntonia* García Aldrete, from Bolivia, and description of the female *Ianthorntonia marshalli* García Aldrete (Psocodea: Psocomorpha: Epipsocetae: Epipsocidae). *EntomoBrasilis* 10(2): 123-126.

García Aldrete, A. N. & J. A. Casasola-González. 2012. New species of *Triplocania* and *Lachesilla* from Sierra Juárez, Oaxaca, México (Psocodea: 'Psocoptera': Ptiloneuridae, Lachesillidae). *Dugesiana* 19(2): 135-141.

Recibido: 28 abril 2020
Aceptado: 17 junio 2020

García Aldrete, A. N., N. Soraya Carrejo, J. Mendivil, N. Calderón, O. Saenz, J. Panche, C. Román & Ranulfo González Obando. 2018. Checklist of 'Psocoptera' (Psocodea) of Colombia and identification key to the families. *Dugesiana* 25(2): 77-103.

García González, G., M. Briones Salas y A. M. Alfaro. 2004. Integración del conocimiento faunístico del estado. (pp. 449-466). *En*: García Mendoza, A. J., M. J. Ordoñez & M. Briones Salas (eds.). *Biodiversidad de Oaxaca.* Instituto de Biología, UNAM-Fondo Oaxaqueño para la Conservación de la Naturaleza-World Wildlife Fund, México.

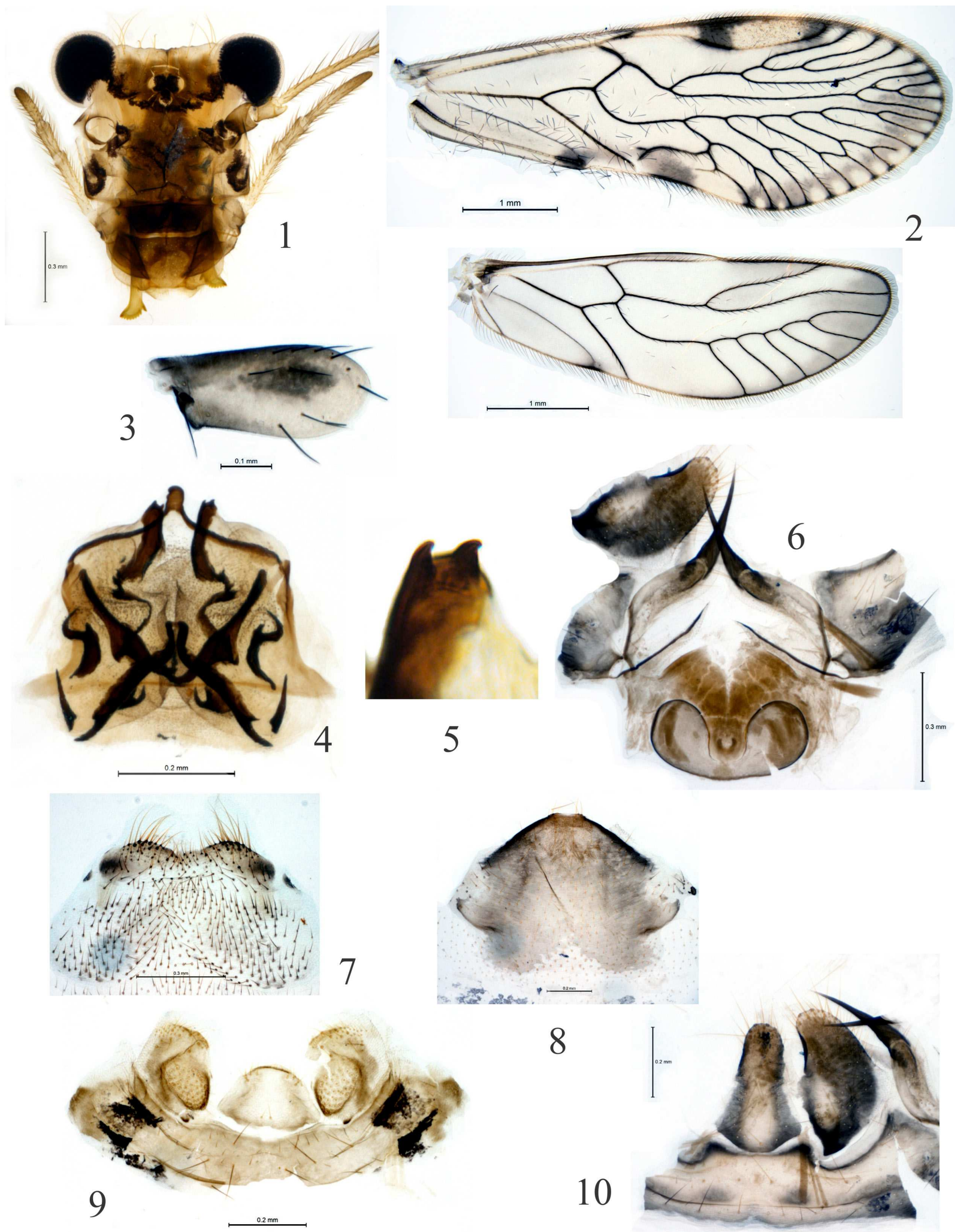
García Mendoza, A. J. y J. A. Meave (eds.). 2011. *Diversidad Florística de Oaxaca: de musgos a angiospermas (colecciones y lista de especies).* Universidad Nacional Autónoma de México-Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. México.

Johnson, K. P. & V. S. Smith. Psocodea Species File Online. Version 5.0/5.0 [retrieved 17 April, 2020]. <http.//Psocodea.SpeciesFile.org>

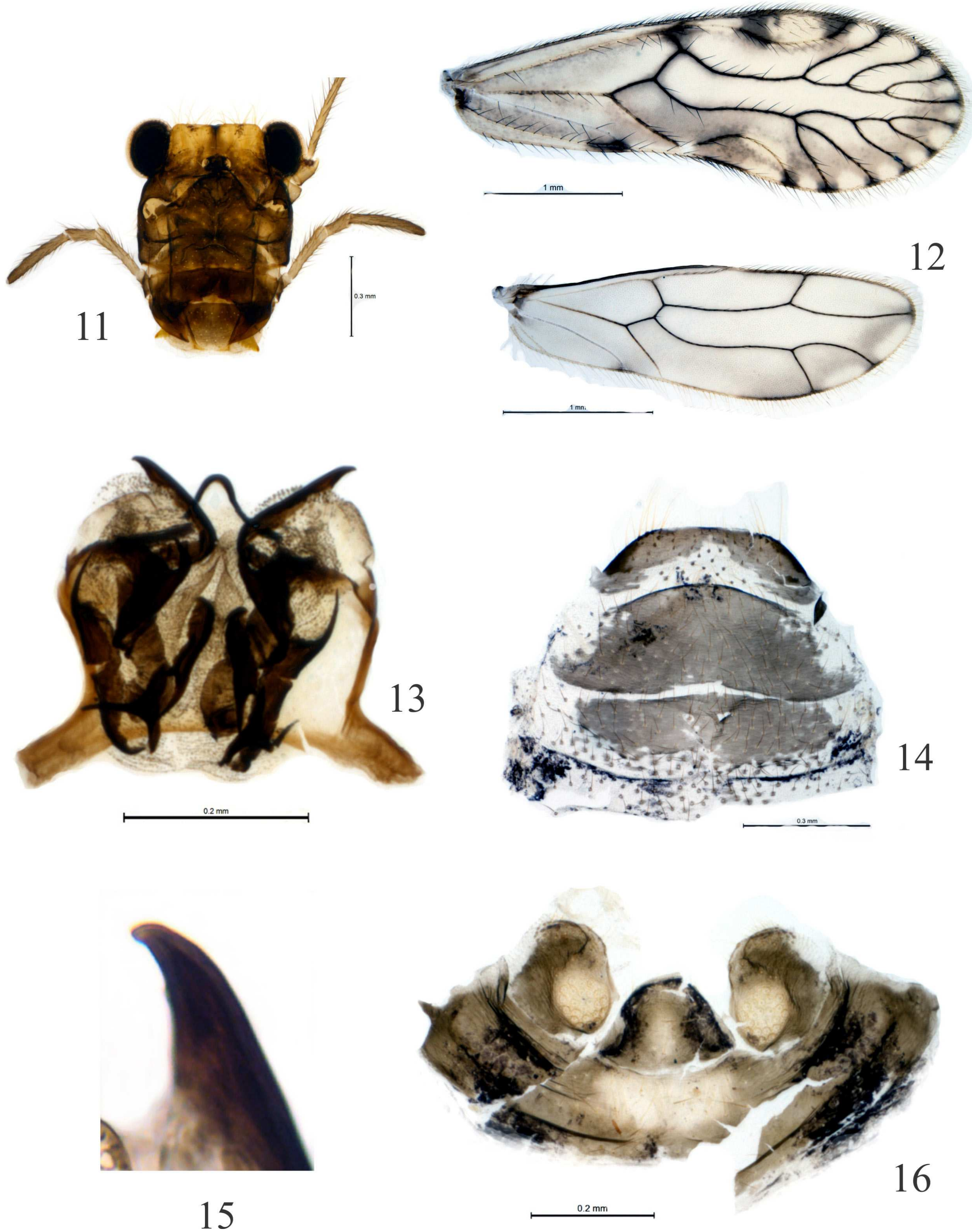
Mockford, E. L. 1998. Generic definitions and species assignments in the Family Epipsocidae (Psocoptera). *Insecta Mundi* 12(l-2): 8l-91.

Navás, L. 1927. Comunicaciones entomológicas. 8. Socópteros del Museo de Hamburgo. *Revista de la Academia de Ciencias de Zaragoza* 11: 35-52.

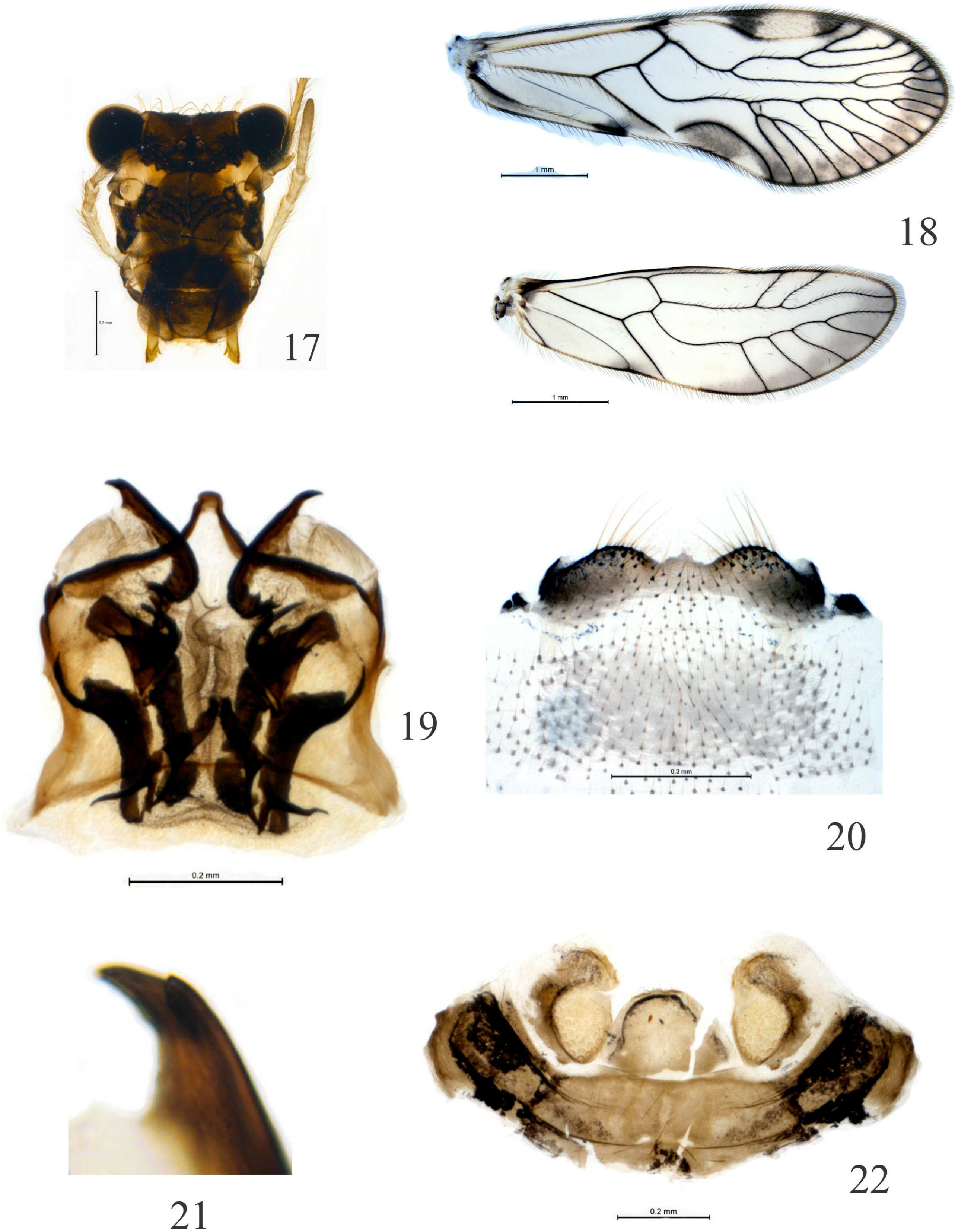
Sandoval Arango, S., R. González Obando & A. N. García Aldrete. 2017. New species of *Prolachesilla* Mockford & Sullivan (Psocodea: 'Psocoptera': Lachesillidae: Graphocaeciliini) from Bolivia and Mexico. *Zootaxa* 4244 (3): 440–450.



Figures 1-10. *Goja garcialdretei* **n. sp.** (Holotype). 1. Front view of head male. 2. Male fore- and hind- wings. 3. Female winglest. 4. Male phallosome. 5. Apex of mesal sclerite. 6. Female gonapophyses and ninth sternum. 7. Male hypandrium. 8. Female subgenital plate. 9. Male epiproct and paraprocts. 10. Female epiproct and left paraproct. Scales in mm.



Figures 11-16. *Goja cuspidata* **n. sp.** (Holotype). 11. Front view of head. 12. Fore- and hind- wings. 13. Phallosome. 14. Hypandrium. 15. Apex of mesal sclerite. 16. Epiproct and paraprocts. Scales in mm.



Figures 17-22. *Goja bicuspidata* **n. sp.** (Holotype). 17. Front view of head. 18. Fore- and hind- wings. 19. Phallosome. 20. Hypandrium. 21. Apex of mesal sclerite. 22. Epiproct and paraprocts. Scales in mm.