



New species of *Triplocania* Roesler with forewing M₃ forked (Psocodea: 'Psocoptera': Ptiloneuridae), from Brazil

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Abstract

Four new Brazilian species of *Triplocania* with forewing M₃ forked are described and illustrated based on male specimens, namely: *Triplocania lamasi* n.sp. (Mato Grosso: Brazil), *Triplocania mariateresae* n.sp. (Rio de Janeiro: Brazil), *Triplocania newi* n.sp. (Tocantins: Brazil) and *Triplocania plaumanni* n.sp. (Santa Catarina: Brazil). They differ from all the other species in the genus, in which the males are known, by the hypandrium and phallosome structures.

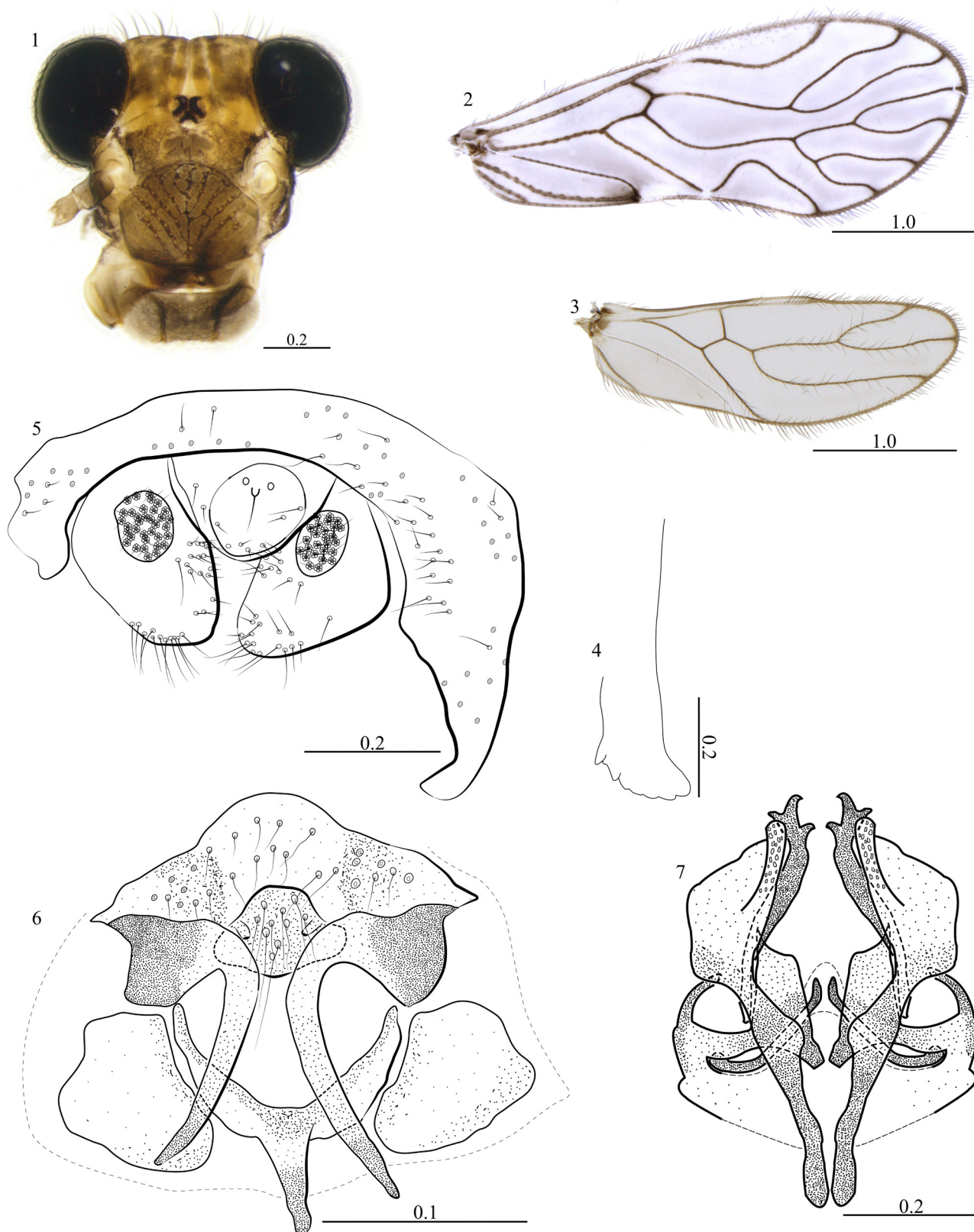
Key words: Epipsocetae, taxonomy, neotropics.

Introduction

The genus *Triplocania* Roesler, 1940 is one of 11 genera of the family Ptiloneuridae, and it is the most species rich genus of this family. The *Triplocania* species, according to wing venation, can be separated in two groups: a very large one, with caeciliusid venation (e.g., forewing Rs 2-branched, M with three primary branches), and a smaller group, characterized by having Rs 2-branched, and M with three primary branches, with M₃ forked, resulting in M_{3a} and M_{3b}. The genus presently includes 27 described species, and over a hundred undescribed ones (García Aldrete 2012); of the described species *Triplocania furcata* New and *Triplocania calcarata* New, belong in the second group mentioned above. The last article describing a species of *Triplocania* with forewing M₃ forked, dates from 1980 (*T. calcarata* New, 1980). The purpose of this work is to describe and illustrate four new Brazilian species of *Triplocania* with forewing M₃ forked.

Material and methods

Seven specimens were available for study; they were dissected in 80% ethanol; their parts (head, right legs and wings, and genitals) were mounted in Canada balsam. Before dissecting, whole specimens were placed in 80% ethanol under a dissecting microscope, illuminated with cold, white light, and observed at 50X to record color. Standard measurements (in µm), were taken with a filar micrometer. Abbreviations of parts measured are as follows: FW and HW: right fore- and hind- wing length, F, T, t1, t2 and t3: lengths of femur, tibia and tarsomeres 1, 2 and 3 of right hind leg, fl...fn: lengths of flagellomeres 1...n of right antenna, Mx4: length of fourth segment of right maxillary palpus, IO: minimum distance between compound eyes in dorsal view of head, D and d: antero-posterior and transverse diameter, respectively, of right compound eye in dorsal view of head, PO: d/D. The types of three species will be deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil; the species from Mato Grosso will be deposited in the collection of the Museum of Zoology, University of São Paulo (MZSP), São Paulo, Brazil.



FIGURES 1–7. *Triplocania lamasi* n.sp. (Holotype male). 1. Front view of head. 2. Forewing. 3. Hindwing. 4. Lacinial tip. 5. Clunium, paraprocts and epiproct. 6. Hypandrium. 7. Phallosome. Scales in mm.

***Triplocania lamasi* n.sp. (Male)**

(Figures 1–7)

Diagnosis. Differing from the known species of *Triplocania*, in having the hypandrium of four pieces, and in having a distinct, elliptic protuberance mesally on the epiproct.

Color. Body yellowish brown, with dark brown spots as indicated below. Compound eyes black, ocelli hyaline, with ochre centripetal crescents; head pattern (Fig. 1). Scape and pedicel pale brown; flagellomeres pale yellow. Mx4 pale yellow. Tergal lobes of meso- and metathorax reddish brown; episternum of mesothorax ochre. Coxae, trochanters and femora creamy white, tibiae and tarsomeres pale yellow. Forewings almost hyaline, as illustrated (Fig. 2); a brown spot on confluence of Cu₂-1A; veins brown. Hindwing (Fig. 3), almost hyaline throughout, veins brown.

Morphology. Compound eyes with interommatidial setae. Outer cusp of lacinial tip broad, with six denticles (Fig. 4). Forewing pterostigma long, widest in the middle. Areola postica wide basally, slanted posteriorly, apex round, narrow. R₂₊₃ and R₄₊₅ sinuous, M stem concave, M₁ almost straight, M₂ sinuous, M₃ branched, with sinuous branches. Hindwing Rs almost straight, R₂₊₃ sinuous, R₄₊₅ almost straight. Paraprocts broad, wide proximally, narrowing to round apex; with a field of short setae along inner margin, other setae as illustrated; sensory fields with 32–34 trichobothria on basal rosettes (Fig. 5). Epiproct mesally with an almost elliptic protuberance, with setae along sides and posterior margin, and three large mesal setae (Fig. 5), next to anterior margin. Hypandrium (Fig. 6) of four sclerites, broader anterior piece, anteriorly rounded; two long sickle-shaped lateral projections posteriorly, heavily sclerotized proximally and distally, a well-defined, setose sclerotized area in the middle; one posterior sclerite, anteriorly concave, with a stout, mid posterior projection, flanked by two large, rounded sclerites. Phallosome (Fig. 7) with side struts independent, V shaped, fused posteriorly to external parameres, these stout, each with an elongate projection on inner margin, with field of pores; three pairs of endophallic sclerites, a posterior pair parallel to the inner margin of the external parameres, with three acuminate projections distally; a mesal pair, narrow, elongate and curved, with ends almost together in the middle of endophallus, and an anterior pair, with each arm branched posteriorly and membranous, fused with the other arm.

Measurements (in microns): FW: 3716, HW: 2554, F: 934, T: 1563, t1: 667, t2: 53, t3: 112, f1: 536, f2: 400, f3: 280, Mx4: 270, IO: 339, D: 393, d: 303, PO: 0.77.

Material examined. Holotype Male (MZSP). Brazil. Mato Grosso. Poconé. Pousada sitio do seu Afrânio. Observation tower (16°36'24"S: 56°43'25"W) 19.I.2013. Light trap. A. M. Silva-Neto. 1 Male paratype (MZSP). Same data and collector as holotype.

Record. Colombia. Putumayo, Puerto Asís, El Horizonte. 5.III.2014. 1 male, light trap, Jeferson Panche, deposited in Entomology Museum, Universidad del Valle (MUSENUV), Santiago de Cali, Colombia.

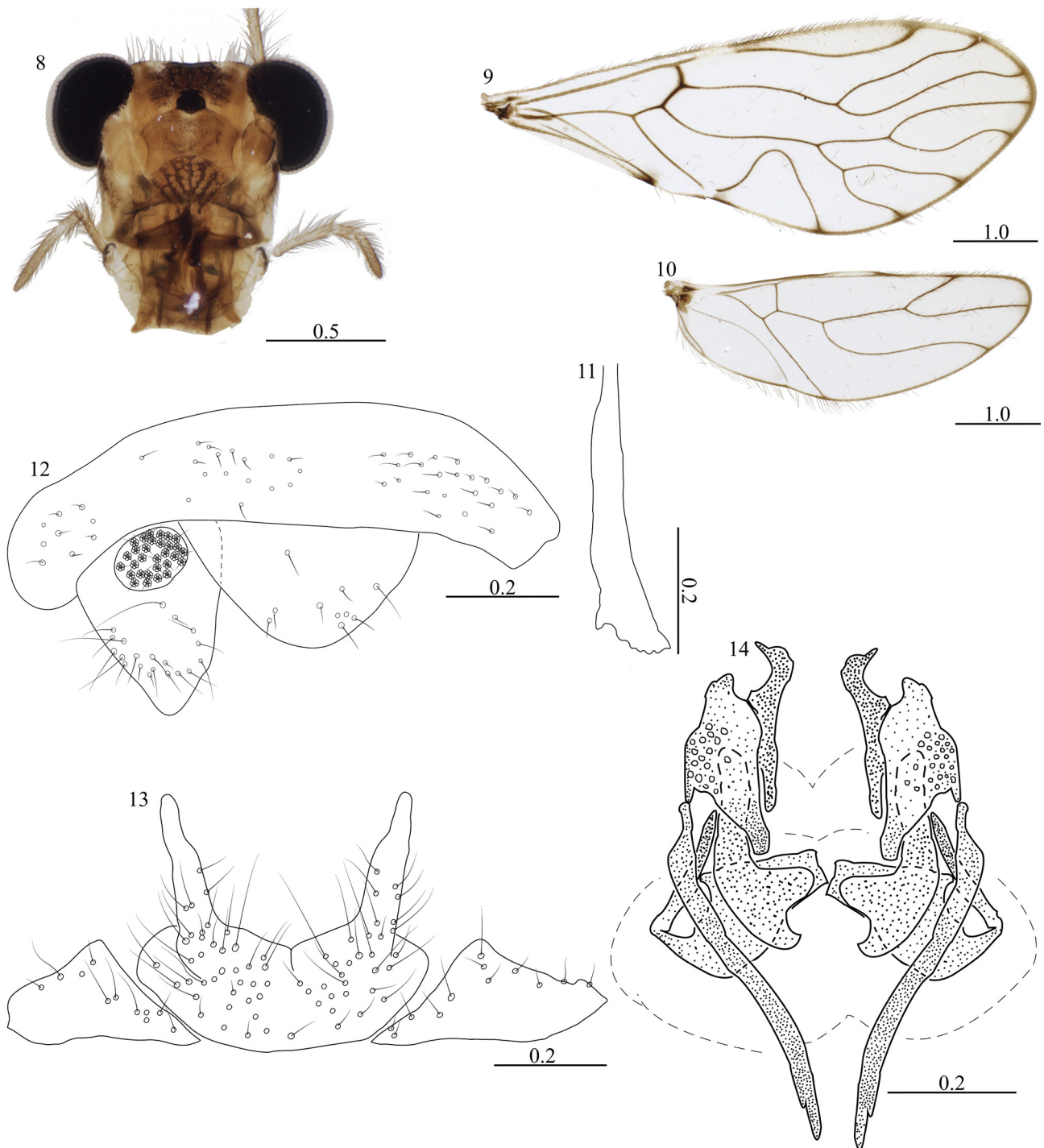
Etymology. This species honors Dr. Carlos José Einicker Lamas (Museu de Zoologia, Universidade de São Paulo), for permission AMSN to collect Psocoptera in his spare time during field work for the project Diptera Sisbiota Brasil in Mato Grosso, and for lending of the specimens.

***Triplocania mariateresae* n.sp. (Male)**

(Figures 8–14)

Diagnosis. Close to *T. plaumanni* n.sp., described below; differing from it in having a wider concavity between the posterior projections of the central piece of the hypandrium, in having the side struts of the phallosome not fused to the external parameres, in having the posterior pair of endophallic sclerites distally acuminate, and by the much larger overall size.

Color (in 80% ethanol). Body creamy, with dark brown spots as indicated below. Tergal lobes of meso- and metathorax dark brown; thoracic pleura with irregular brown spots above the level of the coxae. Compound eyes black, ocelli hyaline, with ochre centripetal crescents; head pattern (Fig. 8). Scape and pedicel pale yellow, f₁ pale yellow with a brown area subapically, apex white, f₂- f₆ brown, with distal ends white. Mx4 yellow. Legs pale brown. Abdomen whitish, with ochre, transverse subcuticular bands. Forewings almost hyaline, as illustrated (Fig. 9), veins brown; pterostigma with brown spots proximally and distally, brown spots distally on veins R₂₊₃ to Cu_{1b}, at wing margin. Hindwing (Fig. 10) almost hyaline throughout, veins brown.



FIGURES 8–14. *Triplocania mariateresae* n. sp. (Holotype male). 8. Front view of head. 9. Forewing. 10. Hindwing. 11. Lacinial tip. 12. Clunium, paraprocts and epiproct. 13. Hypandrium. 14. Phallosome. Scales in mm.

Morphology. Compound eyes without interommatidial setae. Outer cusp of lacinial tip broad, with six denticles (Fig. 11). Forewing pterostigma elongate, constricted proximally. Areola postica tall, apex round, slightly slanted posteriorly. R_{2+3} and R_{4+5} sinuous, M stem slightly concave proximally, then almost straight, M_1 almost straight, M_2 sinuous, M_3 branched, with branches sinuous. Hindwing R_s , R_{2+3} and R_{4+5} almost straight. Paraprocts (Fig. 12) triangular, with setae as illustrated, sensory fields with 30–31 trichobothria on small basal rosettes. Epiproct (Fig. 12) wide basally, with sides converging to round apex, with setae as illustrated. Hypandrium (Fig. 13) of three sclerites, a large central one, with a stout, wide based, distally blunt posterior projection on each side, leaving a wide concavity between them; each projection with sides almost parallel on basal two-thirds, distal third

narrow; setae as illustrated; flanked by two smaller, setose, almost triangular sclerites. Phallosome (Fig. 14) with side struts independent, V shaped, joining distally the external parameres, these stout, each with a field of pores mesally on outer margin; three pairs of endophallic sclerites, a posterior pair parallel to the inner margin of the external parameres, distally shaped like a bird head; a mesal pair, broad basally, deeply concave in the inner margin, narrowing posteriorly; and an anterior pair, broad basally, narrowing distally and curving behind the distal ends of the side struts.

Measurements (in microns): FW: 6475, HW: 4185, F: 1176, T: 1672, t1: 787, t2: 98, t3: 153, f1: 1313, f2: 1343, f3: 1225, Mx4: 324, IO: 473, D: 463, d: 311, PO: 0.67.

Material examined. **Holotype** male (INPA). Brazil. Rio de Janeiro. Itatiaia National Park. 200Km E Rio de Janeiro. Ca. waterfall, on rock wall with lichens. 7.IX.2003. A. N. García Aldrete.

Etymology. This species is dedicated to María Teresa Miaja, wife of A. N. García Aldrete, who, while in Rio de Janeiro, insisted on going to Itatiaia, to look for *Ptiloneuropsis immaculata* Roesler, a search that proved successful, resulting in the creation of the neotype of that species.

***Triplocania newi* n.sp. (Male).**

(Figures 15–21)

Diagnosis. Close to *T. calcarata* New, from which it differs in having the mid posterior projection of the hypandrium much longer and blunt ended, in having the side projections of the hypandrium much smaller, and in having the posterior endophallic sclerites of the phallosome ending in three acuminate projections, and in having the mesal, acuminate process of each arm of the posterior pair of endophallic sclerites much larger.

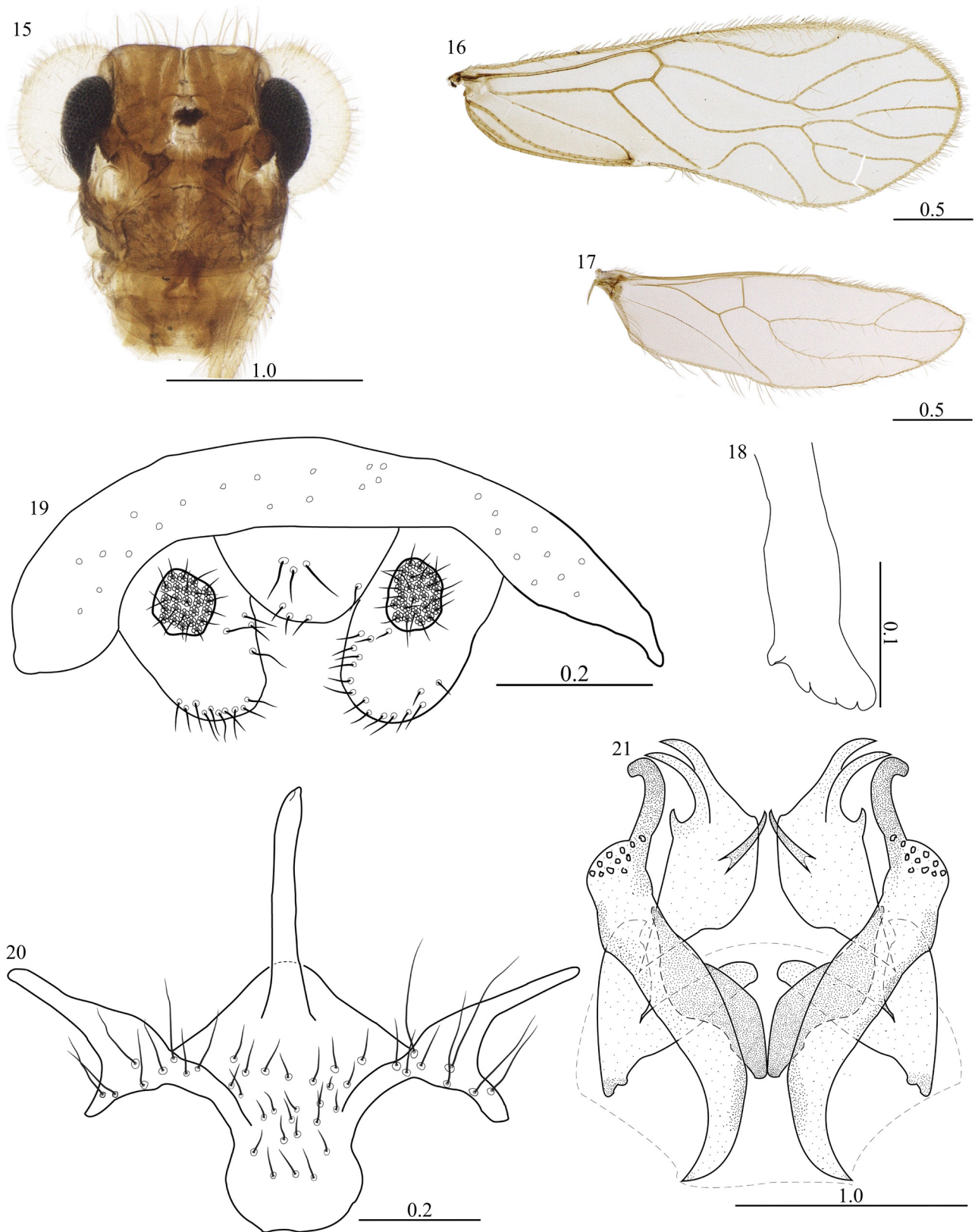
Color. Body pale brown, with dark brown spots as indicated below. Compound eyes black, ocelli hyaline, with ochre centripetal crescents; head pattern (Fig. 15). Thoracic pleura with small ochre spots above the level of the coxae. Scape and pedicel pale brown; flagellomeres pale yellow. Mx4 pale yellow with distal end pale brown. Legs yellow. Forewings hyaline, as illustrated (Fig. 16), veins brown. Hindwing (Fig. 17), hyaline with veins brown. Abdomen whitish, with dark brown, transverse subcuticular bands.

Morphology. Compound eyes with interommatidial setae. Outer cusp of lacinial tip broad, with four denticles (Fig. 18). Forewing pterostigma long, narrow anteriorly, wider in the middle. Areola postica wide based, rounded. R_{2+3} and R_{4+5} sinuous, M stem concave, M_1 almost straight, M_2 sinuous, M_3 branched, with branches sinuous. Hindwing R_s almost straight, R_{2+3} and R_{4+5} almost straight, M stem concave proximally, then almost straight. Paraprocts broadly semi-elliptic, a field of setae along inner margin, other setae on apex; sensory fields with 27–28 trichobothria on basal rosettes (Fig. 19). Epiproct wide based, posteriorly rounded, three setae on apex and three large mesal setae, next to anterior margin (Fig. 19). Hypandrium of one sclerite, rounded anteriorly and distally triangular, with a long, slender, acuminate projection posteriorly, one projection on each antero-lateral extreme, deeply concave in outer margin, forming two acuminate projections, setae as illustrated (Fig. 20). Phallosome (Fig. 21) with broad, independent side struts, fused posteriorly to external parameres, these rounded distally, bearing an field of pores, each with an elongate projection distally, outwardly curved at the end; three pairs of endophallic sclerites, a posterior pair parallel to the inner margin of the external parameres, each arm broad, basally narrow with and acuminate projection mesally near inner border, ending in three acuminate extensions, the outer one short, and the outer two long, slender, curved outwards; a mesal pair, narrow at the ends, wide in the middle; and an anterior pair, V-shaped, behind the posterior and mesal sclerites.

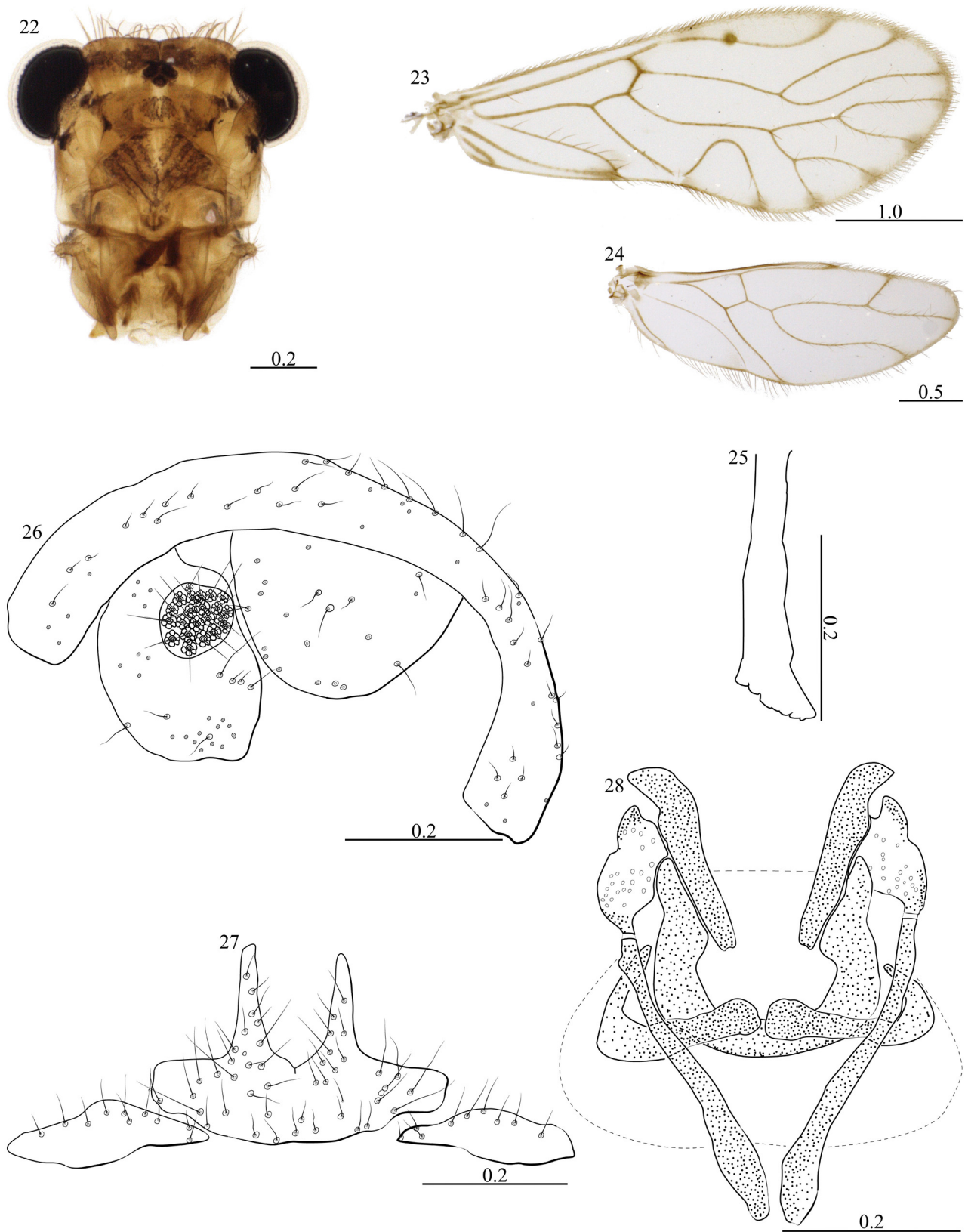
Measurements (in microns): FW: 3171, HW: 2294, F: 772, T: 1312, t1: 566, t2: 46, t3: 107; f1: 506, f2: 372, f3: 327, Mx4: 191; IO: 357, D: 354, d: 238, PO: 0.67.

Material examined. Holotype male (INPA). Brazil. GO[iás][Tocantins]. Anaguacena. 26.I.1983. J.A. Rafael. Paratypes: 1 male. Brazil. AM[azonas]. Manaus. P. [arque] Laranjeiras. CDC trap. 15.I–20.II.1982. João e Nonato. 1 male (INPA). Same data as paratype above, except 28.V–3.VII.1981. Light [Trap]. J. Arias.

Etymology. This species is gratefully dedicated to Dr. Timothy R. New (LaTrobe University, Bundoora, Victoria, Australia), in recognition to his important work on South American Psocoptera, particularly in Brazil; he described the first two species of *Triplocania* with forewing M3 forked (*T. calcarata* and *T. furcata*, from the states of Amazonas and Mato Grosso, respectively).



FIGURES 15–21. *Triplocania newi* n.sp. (Holotype male). 15. Front view of head. 16. Forewing. 17. Hindwing. 18. Lacinal tip. 19. Clunium, paraprocts and epiproct. 20. Hypandrium. 21. Phallosome. Scales in mm.



FIGURES 22–28. *Triplocania plaumanni* n.sp. (Holotype male). 22. Front view of head. 23. Forewing. 24. Hindwing. 25. Lacinial tip. 26. Clunium, paraprocts and epiproct. 27. Hypandrium. 28. Phallosome. Scales in mm.

***Triplocania plaumanni* n.sp. (Male).**

(Figures 22–28)

Diagnosis. Close to *T. mariateresae* n.sp., described above. For differences between the two species see diagnosis of the later, above.

Color. Body pale brown, with dark brown spots as indicated below. Tergal lobes of meso- and metathorax slightly more pigmented than rest of the thorax. Epimeron and episternum of mesothorax ochre. Pleura of metathorax with small, irregular ochre spots. Compound eyes black, ocelli hyaline, with ochre centripetal crescents; head pattern (Fig. 22). Scape yellow, pedicel pale yellow, f_1 pale yellow with apex white and a brown band next to it, other flagellomeres brown with apex white. Mx4 light brown distally. Legs yellow. Abdomen whitish, with ochre, transverse subcuticular bands. Forewings almost hyaline, as illustrated (Fig. 23), veins brown; pterostigma with brown spots proximally and distally, a brown spot on confluence of Cu_2-1A , brown spots distally on veins R_{2+3} to Cu_{1b} , at wing margin. Hindwing (Fig. 24) almost hyaline throughout, veins brown.

Morphology. Compound eyes without interommatidial setae. Outer cusp of lacinial tip broad, with seven denticles (Fig. 25). Forewing pterostigma long, basally narrow, wide posteriorly. Areola postica tall, with round apex. R_{2+3} almost straight proximally and concave distally, R_{4+5} sinuous. M stem slightly concave proximally, then almost straight, M_1 stem convex proximally, then almost straight, M_2 sinuous, M_3 branched, M_{3a} convex, M_{3b} short and almost straight. Hindwing Rs almost straight, R_{2+3} short and straight, R_{4+5} sinuous, M sinuous. Paraprocts broadly semi-elliptic, sensory fields with 29–30 trichobothria on basal rosettes, setae as illustrated (Fig. 26). Epiproct almost semi-circular, three mesal setae near anterior border, other setae as illustrated (Fig. 26). Hypandrium (Fig. 27) of three pieces, a large central one, wide based, convex anteriorly, with two stout posterior projections, setose as illustrated, flanked by two smaller, elongate sclerites, with setae on posterior margin as illustrated. Phallosome (Fig. 28) with side struts independent, elongate, wider anteriorly, then narrowing to join the external parameres, these wide distally, with a field of pores as illustrated. Three pairs of endophallic sclerites, an anterior pair curved, distally acuminate, proximally wide, the two arms almost touching in the middle; a mesal U-shaped sclerite, each arm associated distally with the posterior pair, each arm of this stout, slightly curved outwards distally, close to the ends of the external parameres.

Measurements (in microns): FW: 4154, HW: 2705, F: 933, T: 1569, t_1 : 619, t_2 : 81, t_3 : 110, f_1 : 687, f_2 : 664, f_3 : 529, Mx4: 212, IO: 423, D: 281, d: 205, PO: 0.729.

Material examined. Holotype male (INPA): Brazil. Santa Catarina. Nova Teutonia. II. 1971. F. Plaumann.

Etymology. This species is dedicated, with great pleasure, to the late Dr. Fritz Plaumann, a great collector of Psocoptera.

Key to the males of *Triplocania* with forewing M_3 forked

1. Hypandrium of four sclerites *T. lamasi* n.sp.
- Hypandrium not more than three sclerites 2
2. Hypandrium of a single sclerite 3
- Hypandrium of three sclerites 4
3. Hypandrium with a long acuminate projection posteriorly, one projection on each antero-lateral extreme, deeply concave in outer margin, forming two acuminate projections, posterior endophallic sclerites with four acuminate projections each, one mesal and three distal *T. newi* n.sp.
- Hypandrium with a short acuminate projection posteriorly, one projection on each antero-lateral extreme, deeply cleft in the middle, posterior endophallic sclerites with three acuminate projections each *T. calcarata* New
4. Central sclerite of hypandrium with five acuminate projections, side struts fused to external parameres *T. furcata* New
- Central sclerite of hypandrium with two projections, side struts not fused to external parameres 5
5. Central sclerite of hypandrium flanked by two large, almost triangular sclerites; posterior projections leaving a wide concavity between them; distal ends of posterior endophallic sclerites acuminate, paraprocts triangular *T. mariateresae* n.sp.
- Central sclerite of hypandrium flanked by two small, elongate sclerites; posterior projections leaving a narrow concavity between them; distal ends of posterior endophallic sclerites blunt, paraprocts semi-elliptic *T. plaumanni* n.sp.



FIGURE 29. Distribution of the *Triplocania* species with forewing M_3 forked.

Discussion

The species of *Triplocania* range from southern Mexico (Zacatlán, Puebla), to southeastern Brazil (Santa Catarina, Nova Teutonia), with a distance between those extremes of some 7400 km (García Aldrete 2012). The species with forewing M_3 forked have distribution almost restricted to Brazil, with one species (*Triplocania lamasi*) also occurring in Colombia (Fig. 29). The species of this group are known only from males. Although we've collected two females with branched M_3 , they were collected in a different biome, and we could not find any other morphological character to safely associate them to the male specimens of *Triplocania* M_3 .

The character of "forewing M_3 forked" appears also in species of *Epipsocus* Hagen, *Mesepipsocus* Badonnel, *Edmockfordia* García Aldrete, and *Mesepipsocoides* García Aldrete & Casasola, although in this, the first branch of

M₃ is forked. Species of *Euplocania* Enderlein also have the forewing M of four branches, but the M₃ is not forked; other than the differences in wing venation, the two genera have male genitalia quite similar.

T. lamasi is close to *T. furcata* New, but differs from it and all other species by the structure of the phallosome and by presenting two striking autapomorphies: epiproct mesally with an almost elliptic protuberance, and hypandrium of four pieces. In some species of this group, the side sclerites are fused proximally to the central sclerite, resulting in a hypandrium of one piece (*T. calcarata*, *T. newi*); in other species (*T. furcata*, *T. plaumanni*, and *T. mariateresae*) the hypandrium has three pieces, a big central one flanked by two smaller pieces.

T. mariateresae is the second largest species of the genus. The largest species being *T. halffterorum*, García Aldrete, from the Mexican state of Veracruz. *T. mariateresae* is similar to *T. plaumanni*, both having a quite similar hypandrium, differing by details of it (e.g., size, posterior projections of central piece and size of concavity between projections). Also, the phallosome in both species is distinct (see Figs 14, 28).

T. newi is close to *T. calcarata*, from which it differs in the structure of the hypandrium and phallosome, particularly in details of the endophallic sclerites, such as different shapes of the mesal pair and by having more than three projections on the posterior pair.

Future phylogenetic studies will be essential to confirm if this group of species of *Triplocania* with forewing M₃ forked is monophyletic within the genus or not.

Acknowledgements

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