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Article

Tricorythodes guayabito sp. nov. Ulmer, 1920 a new species and first record of *Vacupernius packeri* (Allen, 1967) (Ephemeroptera: Leptohyphidae) from Venezuela

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Robert Leal-Sáncez, Belkys Pérez-García*, Aura Jimenez
Centro de Estudios de Zoología Aplicada (CEZA), Museo de Zoología de la Universidad de Carabobo (MZUC), Facultad Experimental de Ciencias y Tecnología, Universidad de Carabobo, Venezuela. E-mails: rels.130588@gmail.com, belperezster@gmail.com, belperez@uc.edu,ve*, aureliaurita90@gmail.com*

Abstract

Tricorythodes guayabito sp. nov. is described and illustrated based on nymphs from Venezuela. The genus *Vacupernius* Wiersema and McCafferty, 2000 and the species *Vacupernius packeri* (Allen, 1967) are also recorded for first time from Venezuela. With this records, the number of species of Leptohyphidae in Venezuela increases from 10 to 12 species.

Additional keywords: nymphs, mayflies, Neotropics, aquatic insects.

Introduction

Tricorythodes Ulmer is a Pan American genus with extensive distribution in South America.Constitutes one of the most diverse and studied genera of Leptohyphidae (Allen and Murvosh 1987, Baumgardnerand Avila 2006, Molineri 2001, 2002, 2010); to date, this genus includes 69 species described from the Americas (Dias *et al.* 2019, Barber *et al.* 2020), more of 30 are known from the Neotropic (Dias *et al.* 2009, Granados *et al.* 2018, Dias *et al.* 2019, Barber– James *et al.* 2020, Dominguez *et al.* 2020), and three of them has been reported formally from Venezuela: *Tricorythodes lichyi* Traver, 1943, *Tricorythodes faeculopsis* Belmont, Sallesand Hamada, 2011 (Molineri*et al.* 2014), and *Tricorythodes pemonensis* (Molineri, Grillet, Nieto, Dominguez and Guerrero, 2011), (Molineri *et al.* 2019). Molineri (2002) notes that in spite of the adult stage (male genitalia) being rather homogeneous throughout the genus, nymphs show a wide variety of body forms and associated heterogeneity in mouthparts, legs and gills. This differentiation in the nymphs led different authors to recognize numerous groups of species, sometimes formalized as subgenera or genera (Wiersema and McCafferty 2000, Baumgardner and Avila 2006): *Asioplax* Wiersema and McCafferty, 2000, *Cabecar* Baumgardner and Avila, 2006; *Epiphrades* Wiersema and McCafferty, 2000; *Homoleptohyphes* Allen and Murvosh,1987; and *Tricoryhyphes* Allen and Murvosh, 1987. Formal phylogenetic analyses failed to distinguish these taxa as monophyletic (Molineri 2002, 2006, Dias *et al.* 2019). So, until a comprehensive classification of the group can be attained through the phylogenetic analysis of all the species, we follow Molineri (2002),

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and consider *Tricorythodes* (*sensulato*) as a unity. In this survey, we described a new species of *Tricorythodes* based on nymphs collected in Yaracuy and Cojedes states and record for the first time the genus *Vacupernius* Wiersema and McCafferty (2000) and the species *Vacupernius packeri* (Allen, 1967) from Venezuela. Their distribution is mapped, and the morphological characters are illustrated.

In this study we also reported *Vacupernius genus that* was established by Wiersema and McCafferty (2000), three species of this genus are known from Central America, Antilles and North America (Domínguez *et. al.* 2006): *V. packeri* (Allen, 1967), *V. paraguttatus* (Allen, 1978), *V. rolstoni* (Allen, 1973). *Vacupernius packeri* for first time from South America by Bacca *et al.* (2020), based on adult males. In this research, is reported for first time for Venezuela; the morphology of the nymphs is illustrated in Figures 20-28; specimens examined were morphologically similar to those described by Allen (1967) to establish the species.

Materials and methods

Collections were made between September of 2014 and April of 2015, in the river Guayabito, municipality San Felipe, Yaracuy state (Figure 1). Nymphs were captured with aquatic entomological net (pore size: 300μm). The collected specimens were preserved in 96% ethanol. Additional material collected in 2012 and 2014, in deciduous forest at Palambra del Doctor, in the river Tirgüa, municipality Ezequiel Zamora, Cojedes state, was also examined the mouthparts, legs, gills and other parts of the body of the nymphs were dissected and treated in a battery of alcoholic dehydration (70%, 80% and 100% concentration). They were mountedin Balsam of Canada, according to Edmunds *et al.* (1976), and Waltz and McCafferty (1987). Finally, the slides were allowed to dry in a stove at 60°C for 15 minutes.

Specimens were examined and illustrated using an OPTIK stereoscopic microscope; further details, such as maxilla, labrum and tarsal claws, were studied with a Konus compound microscope. The length of the body, mesonotum, legs and caudal filaments were measured in mature nymph using stereoscopic microscope with millimetric ocular. The nymphs were labeled, photographed and illustrated. All material is deposited at the Museo de Zoología de la Universidad de Carabobo (MZUC) del Centro de Estudios de Zoología Aplicada (CEZA), Universidad de Carabobo, Valencia, Venezuela.

Results and discusion

Description. Mature nymphs (Figure 2). Length measurements (mm) were taken from 3 nymphs male: body 54–61 mm; mesonotum, 0,9mm–1,0mm; caudal filaments 2,4 mm. General coloration yellowish with grayishs–black marks. **Head**: brown without marks in the dorsal region, occiput mostly translucent although with irregular gray marks, ventrally light brown; antennae yellowish translucent; mouthparts: maxillae with distal brush with about 15 long and curved setae, stipes 1,0X the length of galea – lacinia, inner proximal margin of the galea – lacinia (opposite to palpus) with row of 4 setae (Figure 6), maxillary palp small, 1 – segmented with a small apical seta (Figure 7); labium with glossa – paraglossa fused; submentum with about 18 marginal setae (Figure 8). **Thorax**: pronotum almost completely shaded with gray, small anterolateral projection present; mesonotum shaded with diffuse grayish-black spots, wingpads yellowish translucent (some mature nymphs with blackish veins); metanotum yellowish, with a gray transversal strip yellowish thoracic sternum. **Legs** (Figures 9–14): whitish, except tibia and tarsus yellowish, black macula at base of each tibia;foreleg (Figure 9) with a proximal portion of transverse row of long setae at 0,7 of total femoral length from base; total length / maximum width of femur 2,9 mm, tarsal claw with 4 marginal and with 1 submarginaldenticles (Figure 10); middle leg (Figure 11) with color pattern as foreleg, tarsal claw with 5 marginal and 1 submarginal denticles (Figure 12); hindleg (Figure 13) femur with two grayish stripes, tarsal claw with 7 marginal denticles, submarginal denticle absent (Figure 14). **Abdomen** (Figure 2) whit terga shaded uniformly with grayish-black; posterolateral spines present on segments VI–IX; operculate gills subtriangular (Figure 15), completely tinged with grayish-black, with two ventral lamella; gill formula 3/3/3/3/2 (Figures 16–19); caudal filaments whitish yellow, with short setae at joining.

Adults unknown.

Material examined: HOLOTYPE: 1♂mature nymph, VENEZUELA: Estado Yaracuy, Río Guayabito, Sector Guayabito, P.N. Yurubí, Municipio Albárico, 103 msnm, lat 10º28´25" N –long 68º40´23" W, IX/2014 - III/

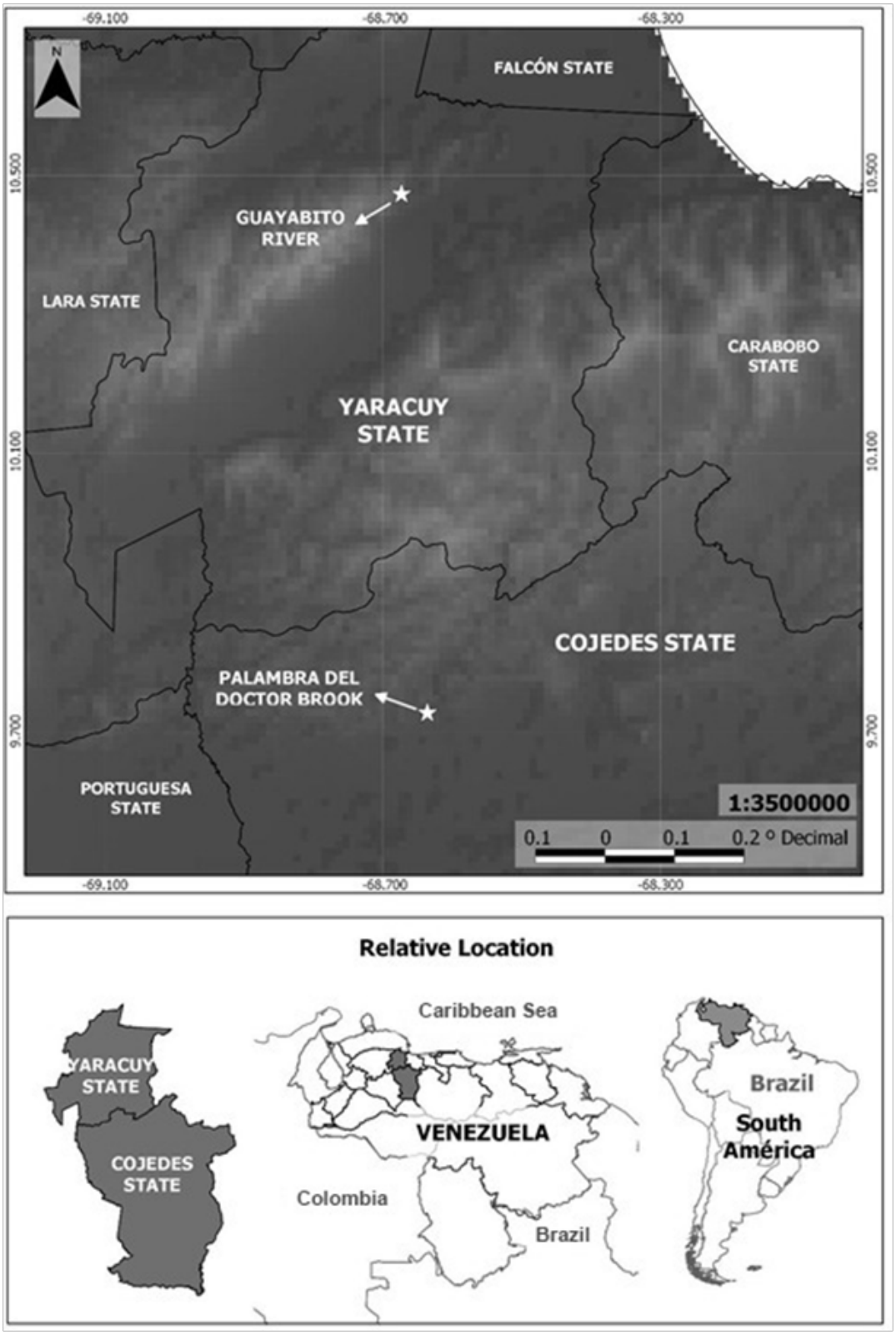


Figure 1. Map showing the localities for *Tricorythodes guayabito* sp. nov. from Venezuela.

2015, J Escobar col. Deposited at MZUC.

PARATYPES: 4 mature nymphs (3♀, 1♂), VENEZUELA, Estado Cojedes, río Tirgüa, Sector Palambra del Doctor, cerca del Parque Nacional Tirgüa, Municipio Ezequiel Zamora, San Carlos, lat 9º43'36"N, long 68º38'09"W, 220 msnm, 08/II/2014, B Pérez, L Nieto Cols. Deposited at MZUC.

Etymology The epithet of the new species is a reference to Guayabito river, locality where the holotype was collected.

Distribution: in rivers from Cojedes state located in the plains of the Llanos bioregion, sector Llanos Altos, and riversfrom Yaracuy states located in forest ecosystems (from disturbed to pristine) in the bioregion of the Cordillera de la Costa, Serranía del Interior.

Diagnosis. *Tricorythodes guayabito* **sp. nov.,** known from nymphs, can be distinguished from the other species of the genus by following combination of characters: 1) maxillary palp small 1-segmented with apical seta, galea – lacinia 1X the length of the stipes (Figure 6); 2) length of femora 2X their maximum width (Figure 9); 3) proximal portion of transversal row of long setae on dorsum of forefemora located at 0,7 of total femoral length from base (Figure 9); 4) tarsal claws with 4–7 marginal denticles and 0–1 submarginal denticles (Figures 10, 12 and 14); 5) operculate gills subtriangular, grayish black except pale area near outer-basal corner (Figure 15); 6) lateral flanges on abdominal segments 3–8, and postero lateral spines on segments 7–9.

Discussion. The nymphs of *Tricorythodes guayabito* sp. nov. can be easily be distinguished from *T. faeculopsis* Belmont, Salles & Hamada, 2011, *T. lichyi* Traver, 1943, and *T. pemonensis* Molineri *et al*., 2011 b*y* the subtriangular opercular gill shaded with black on basal region. Nevertheless, the following unique characteristic that would serve to distinguish it from all other species: transversal row of dorsal setae present not only on fore femur but also on middle femur (Figure 3F), ventral lamella of gill II with a broad apical emargination and ventral lamella of gills III–V with dorsal extension strongly developed.

Distribution: EEUU, Honduras, Guatemala (Allen 1978, Wiersema and McCafferty 2000); Belize, Mexico, Costa Rica (Wiersema and McCafferty 2000); Colombia (Bacca *et al.* 2020); Venezuela, new record.

Material examined: VENEZUELA: 8 nymphs, Estado Yaracuy, río Guáquira en los potreros, Hacienda La Guáquira, Sector La Marroquina, Municipio San Felipe, lat 10°16'58"N, long 68°39'30"W, 143 msnm, 11/III/2012, B. Pérez Col. 4 nymphs, Estado Cojedes, Río Tirgüa, Sector Altos de Palambra, San Carlos, lat 9º43'56,17"N, long 68º37'20,23"W, 188 msnm, 18/VI/2014, A. Jiménez Col. 4 nymphs, Estado Yaracuy, río Guayabito, Sector Guayabito, Parque Nacional Yurubí, Municipio Albárico, lat 10°28´25"N, long 68°40´23"W 103 msnm, 20/III/2015, J. Escobar col. 8 nymphs, Estado Cojedes, río Tirgüa, Sector Palambra del Doctor, cerca del Parque Nacional Tirgüa, Municipio Ezequiel Zamora, San Carlos,21/IV/2015, lat 9º43'56,17"N, long 68º37'20,23"W, 188 msnm, A. Jiménez Col. Deposited at MZUC.

Habitat description: in Guáquira stream where *V. packeri* nymphs were collected, the geomorphology of channel was riffles-pools. This section was moderately confined, with a slope of 0,5%, without woody logs fallen in the channel and with predominance of medium-sized boulders, which are concentrated in the areas that generate turbulence forming the riffles; accompanied by deep and slow waters which cover almost the entire section, with a heterogeneous substrate composed of gravel, sand and clay in the extensive areas of pools, that acted as deposition zones. Evidence of deforestation was observed on the right bank. Physicochemical data indicate values of pH 7,45, temperature 22ºC, turbidity 2,03 NTU, dissolved oxygen 7,33 $mg.L^{-1}$ and conductivity 214 µS.

Conclusion

With the description of *Trichorythodes guayabito* sp. nov. and the first record of *Vacupernius packeri* from Venezuela, the number of species of Leptohyphidae increases from 10 to 12 species. With the first record of *Vacupernius* the number of genera of Leptohyphidae increases to 7 for Venezuela: *Allenhyphes* Hofmann and Sartori, 1793; *Amanahyphes* Salles & Molineri, 2006; *Leptohyphes* Eaton, 1882; *Macunahyphes* Dias, Salles and Molineri, 2005; *Tricorythodes* Ulmer 120; *Tricorythopsis* Traver 1958 and *Vacupernius* Wiersema and MCafferty 2000.

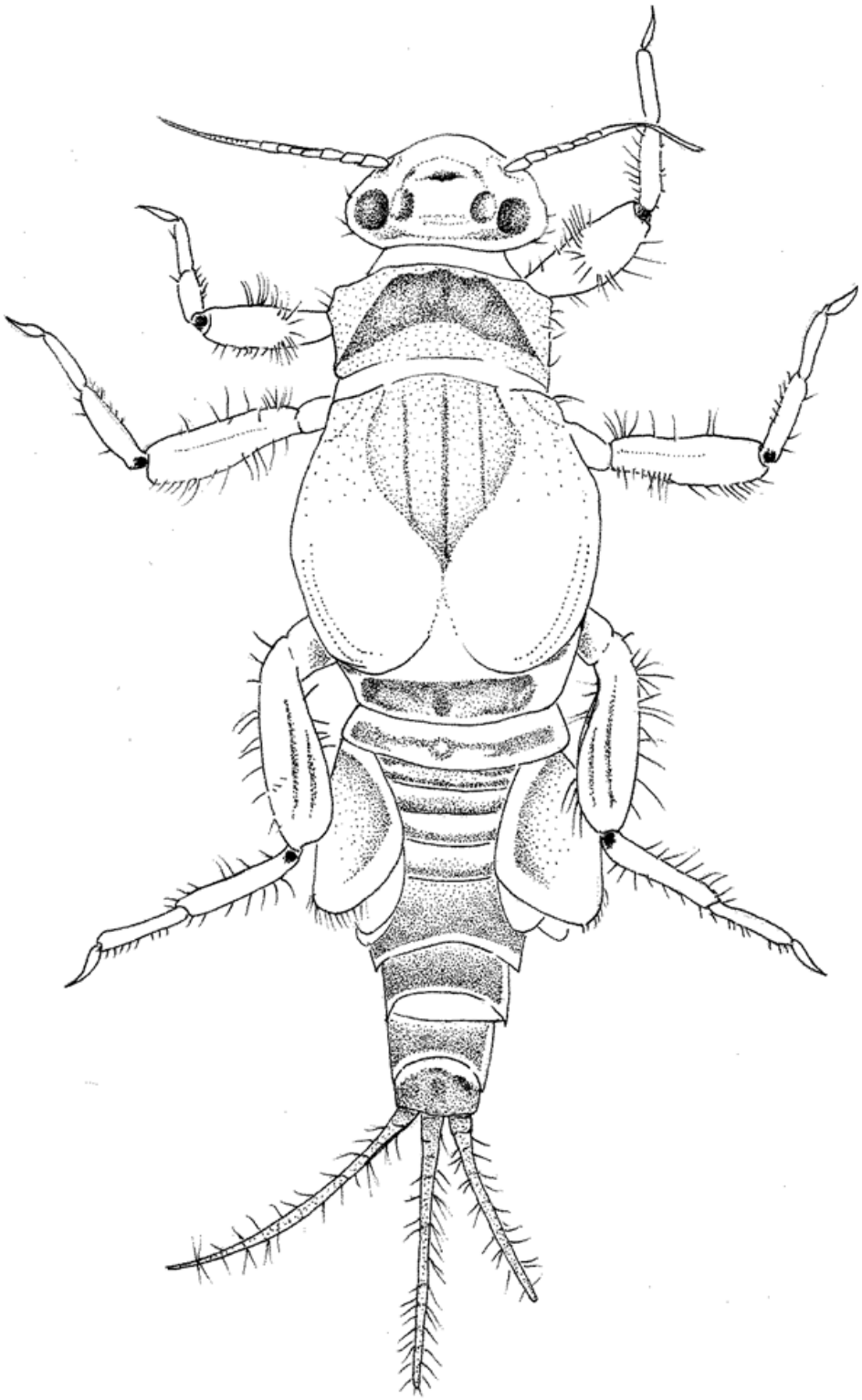
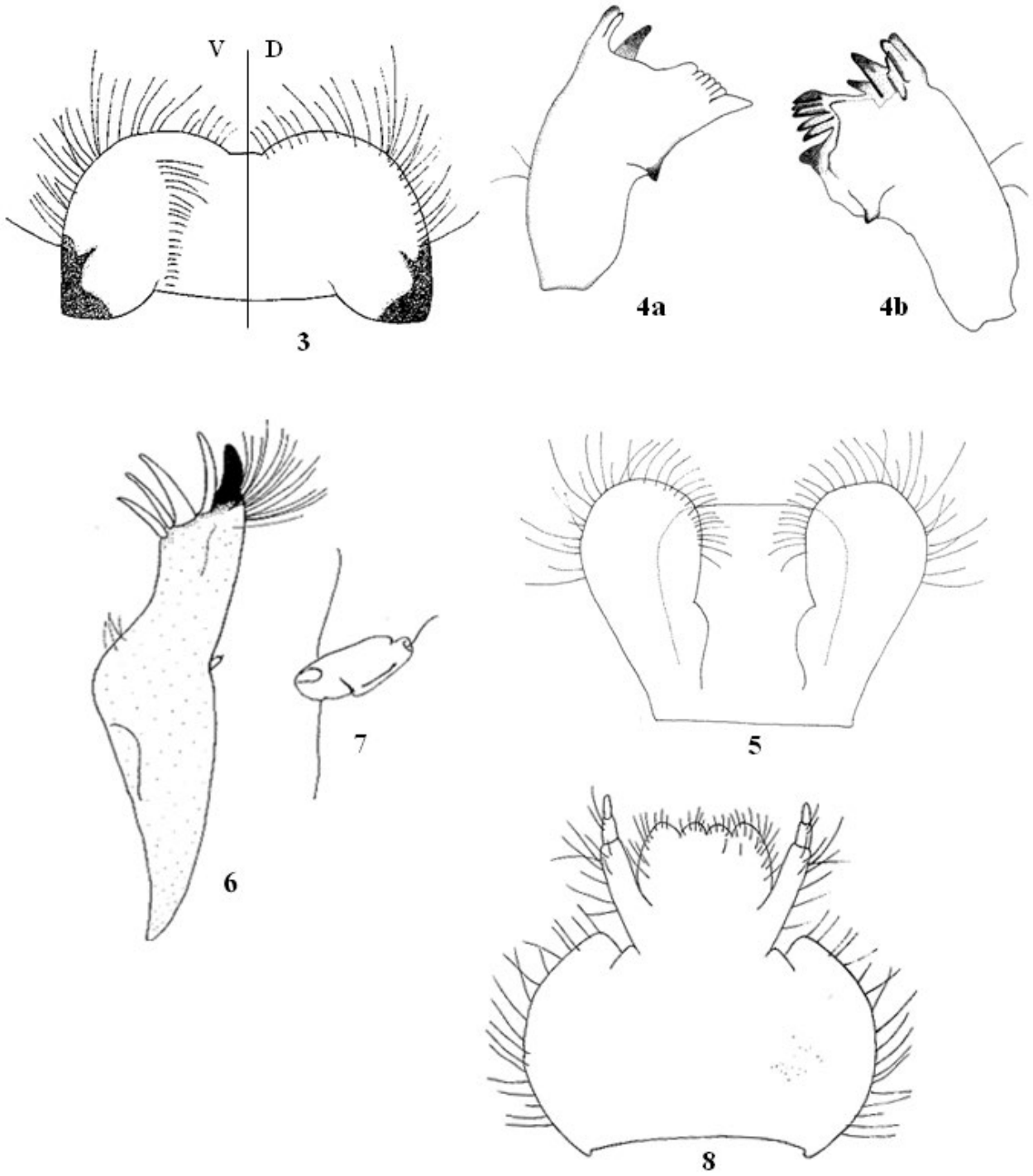
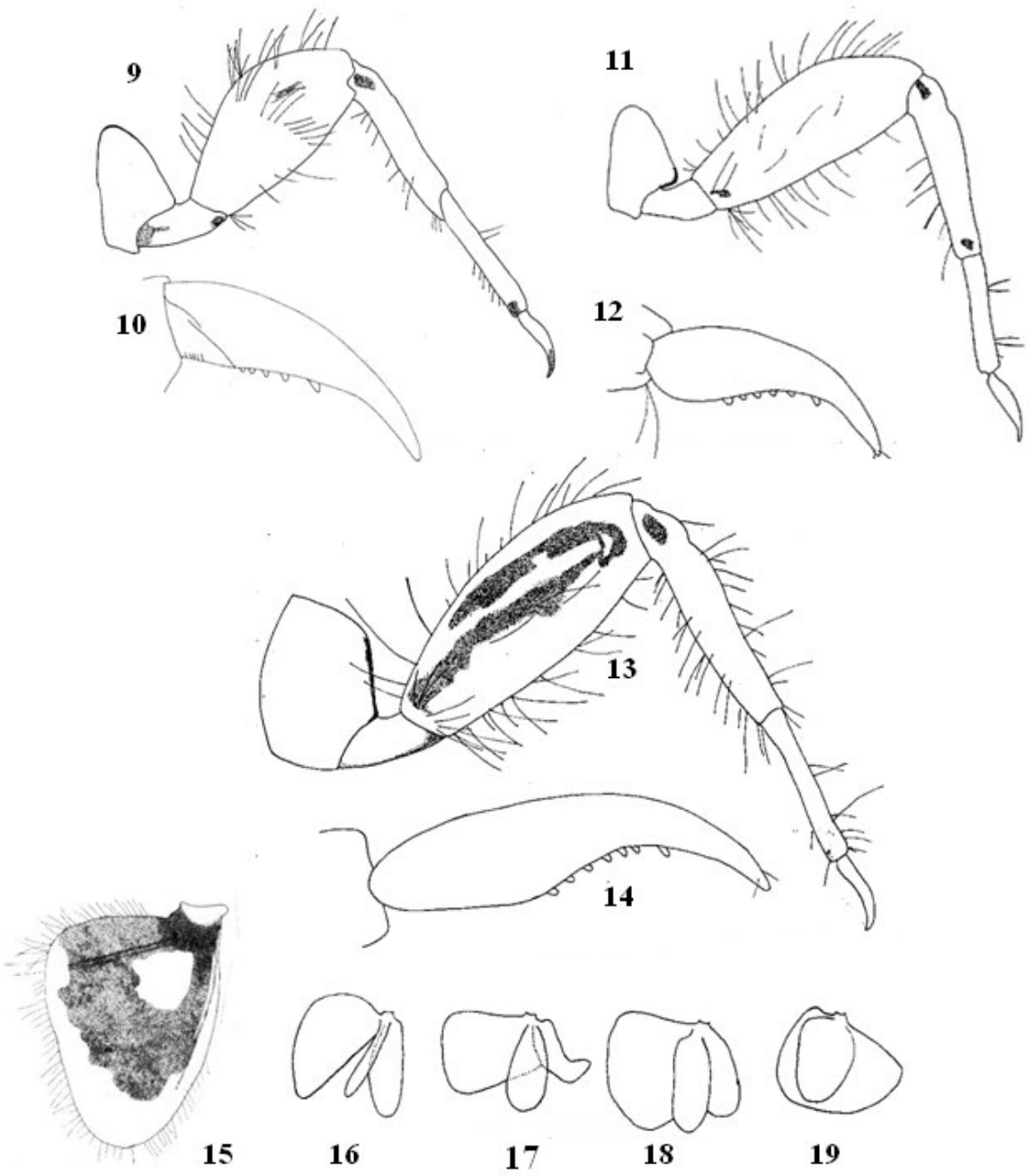


Figure 2. *Tricorythodes guayabito* sp. nov., habitus: nymph, dorsal view.

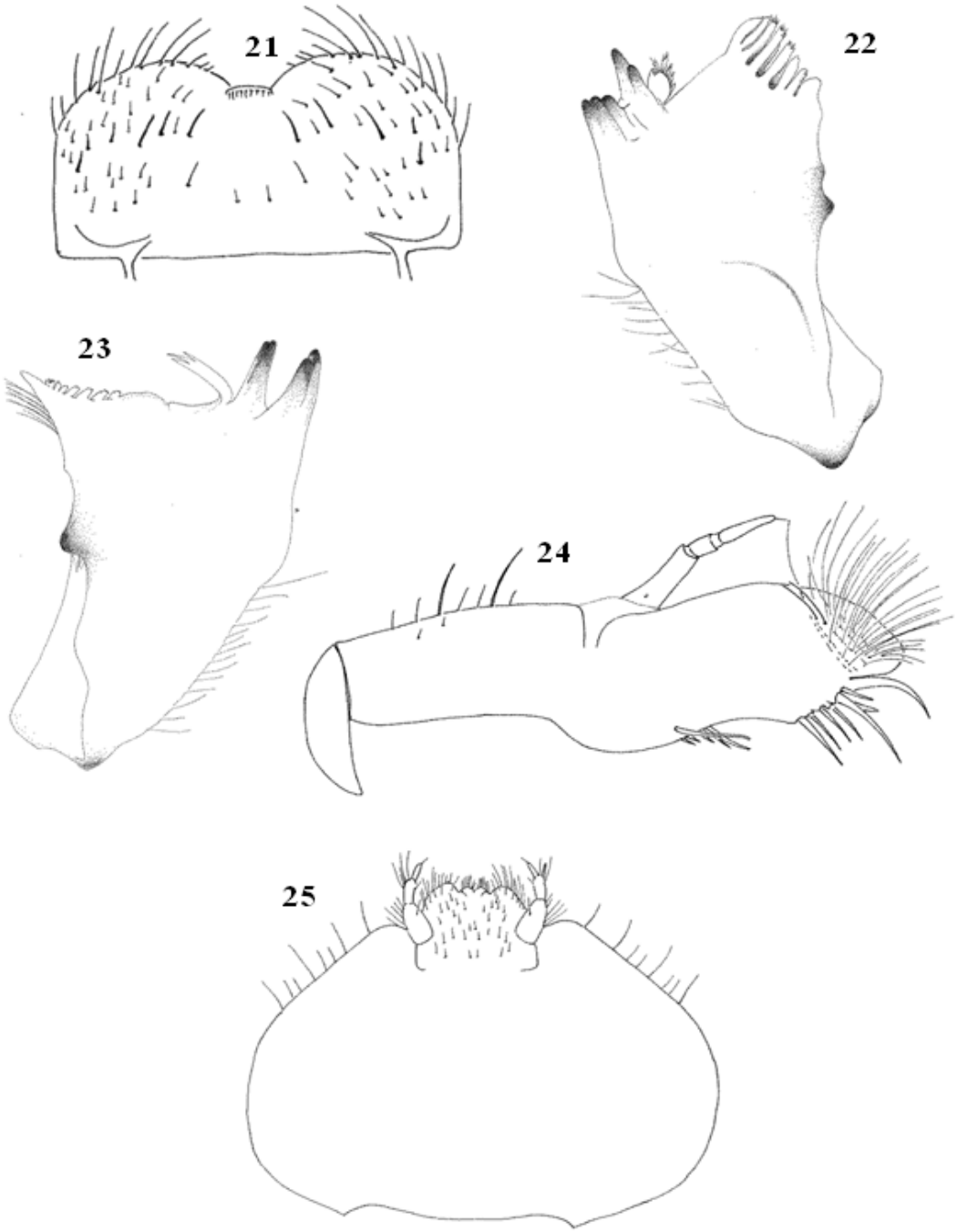


Figures 3 - 8. *Tricorythodes guayabito* sp. nov. 3. Labrum (left – Ventral view, right – Dorsal view), 4a. Right mandible in dorsal view (d.v.), 4b. Left mandible in ventral view (v.v.), 5. Hypopharynx (v. v.), 6. Maxilla (d. v.), 7. detail of maxillary palp (d. v.), 8. Labium (v. v.).

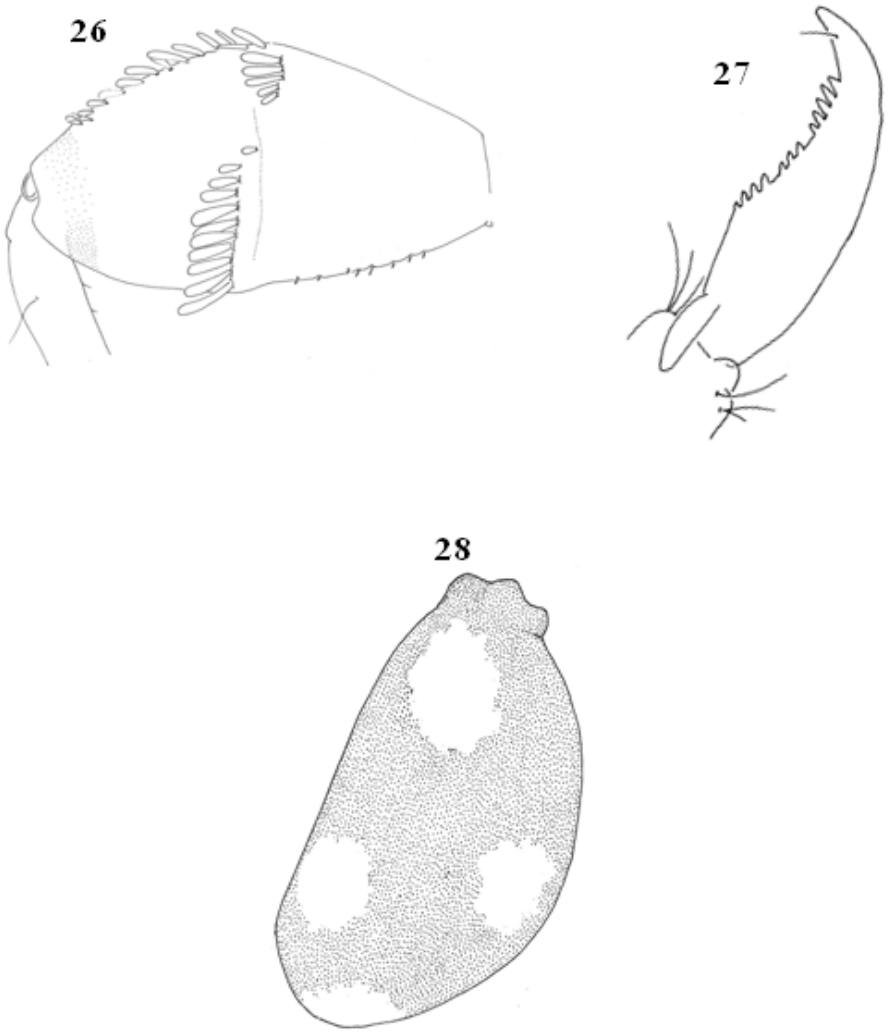


Figures 9 - 19. *Tricorythodes guayabito* sp. nov. 9. Fore leg, 10. Detail of tarsal claw of fore leg, 11. Mid leg, 12. Detail of tarsal claw of mid leg, 13. Hind leg, 14. Detail of tarsal claw of hind leg, 15. Opercular gill (d. v.), 16. Gill II, 17. Gill III, 18. Gill IV, 19. Gill V.

Figures 20. *Vacupernius packeri* nymph, dorsal view.



Figures 21 - 25. *Vacupernius packeri*, nymph. 21. Labrum (v.v), 22. Left mandible (d.v.), 23. Right mandible (v.v.), 24. Maxilla (d.v.), 25. Labium (d.v.).



Figures 26 - 28. *Vacupernius packeri*, nymph. 26. Forefemur (d.v.), 27. Foreclaw (lateral view), 28. Opercular gill (d.v.).

Acknowlegments

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Literature cited

ALLEN RK. 1967. New species of New World Leptohyphinae (Ephemeroptera: Tricorythidae). *The Canadian Entomologist*, 99:350-375.

ALLEN RK. 1978. The nymphs of north and central American *Leptohyphes* (Ephemeroptera:Tricorythidae). *Annals of the Entomological Society of America*, 71(4):537-558.

ALLEN RK, KMURVOSH CM. 1987. Mayflies (Ephemeroptera: Tricorythidae) of the southwestern United States and northern Mexico. *Annals of the Entomological Society of America,* 80: 35-40.

BACCA T, MARULANDA JF, DIAS LG. 2020. First record of *Vacupernius packeri* (Allen) (Ephemeroptera: Leptohyphidae) from Colombia and South America with additional notes on egg morphology. *Revista de la Academia Colombiana de Ciencias Exactas, Fisicas y Naturales,* 44(171):452-457. https://doi.org/10.18257/raccefyn.1018

BARBER-JAMES H, SARTORI M, GATTOLLIAT JL. WEBB J. 2020. FADA Ephemeroptera: World checklist of freshwater Ephemeroptera species (version Feb 2013). En: Roskov Y, Ower G, Orrell T, Nicolson D, Bailly N, Kirk PM, Bourgoin T, DeWalt RE, Decock W, Nieukerken E van, Penev L, editores. Species 2000 &

ITIS Catalogue of Life, 2020-08-01 Beta Digital resource at www.catalogueoflife.org/col. Species 2000: Naturalis, Leiden, the Netherlands. ISSN 2405-8858.

BAUMGARDNER DE, ÁVILA AS. 2006. *Cabecar serratus*, a new genus and species of leptohyphid mayfly from Central America, and description of the imaginal stages of *Tricorythodes sordidus* Allen (Ephemeroptera: Leptohyphidae). *Zootaxa,* 1187: 47–59

DIAS LG, CRUZ PV, FERREIRA PSF. 2009. Taxonomy: A new species of *Tricorythodes* Ulmer (Ephemeroptera: Leptohyphidae) from Northern Brazil. *Annales de Limnologie - International Journal of Limnology,* 45(2): 127-129.https://doi.org/10.1051/limn/2009009

DIAS LG, MOLINERI C, TAKIYA D, BENAVIDES P, BACCA T. 2019. Phylogeny of *Tricorythodes* Ulmer (Leptohyphidae: Ephemeroptera) based on molecular and morphological evidence. *Zoologischer Anzeiger*, 278: 38-45. https://doi.org/10.1016/j.jcz.2018.10.008

DOMÍNGUEZ E, MOLINERI C, PESCADOR ML, HUBBARD MD, NIETO C. 2006. Ephemeroptera of South America. En: Adis J, Arias JR, Rueda-Delgado G, Wantzen KM, Editores. Aquatic Biodiversity of Latin America (ABLA Series), Vol 2, Sofía-MoscowPensoft. 644 pp.

DOMÍNGUEZ E, MOLINERI C, NIETO C, ZÚÑIGA MC. 2019. Lista de especies de Ephemeroptera Sudamericanos. http://ibn.conicet.gov.ar/ (descargado el 02/09/2020).

EDMUNDS GF, JENSEN SL, BERNER L. 1976. Mayflies of North and Central America. Minneapolis: University of Minnesota Press. 330 p

GRANADOS CE, DIAS LG, MOLINERI C. 2018. *Tricorythodes macuira* (Ephemeroptera: Leptohyphidae), new species from Colombia. Zootaxa, 4377 (3): 354-360. https://doi.org/10.11646/zootaxa.4377.3.2.

MOLINERI C. 2001. Una especie nueva de *Tricorythodes* (Ephemeroptera: Leptohyphidae) de la Argentina con notas sobre su biología. *Revista de la Sociedad Entomológica de Argentina*, 60: 61-66.

MOLINERI C. 2002. Cladistic analysis of the South American species of *Tricorythodes* (Ephemeroptera: Leptohyphidae) with the descriptions of new species and stages. *Aquatic Insects*, 24: 273–308.

MOLINERI C. 2006. Phylogeny of the mayfly family Leptohyphidae (Insecta: Ephemeroptera) in South America. *Systematic Entomology,* 31: 1–18.http://dx.doi.org/10.1111/j.1365-3113.2006.00357.x

MOLINERI C. 2010. Las especies de Leptohyphidae (Ephemeroptera) de las yungas de Argentina y Bolivia: diagnosis, distribución y claves. *Revista de la Sociedad de Entomología*, 36: 233–252.

MOLINERI C, GUERRERO EC, GRILLET ME. 2014. *Tricorythodes faeculopsis* (Ephemeroptera: Leptohyphidae), description of new stages and first record from Venezuela. *Revista de la Sociedad Entomológica Argentina,* 73(3–4): 91–97.

MOLINERI C, DIAS LG, GONZALEZ I, NÚÑEZ-AVELLANEDA M. 2019. Nymphal description of *Tricorythodeszagaia* n. comb. and *Tricorythodes pemonensis* n. comb. (Ephemeroptera: Leptohyphidae) and first records from Colombia. *Zootaxa*, 4585(2): 395.http://dx.doi.org/10.11646/zootaxa.4585.2.13

SOUTO PM, BATISTA K, FALCÃO SALLE. 2017. *Tricorythodes tragoedia* sp. nov. (Ephemeroptera: Leptohyphidae), a new species from Rio Doce and surrounding areas, southeastern Brazil. *Zootaxa,* (4): 554–562. https://doi.org/10.11646/Zootaxa.4341.4.7

WALTZ RD, MCCAFFERTY WP. 1987. Generic revision of *Cloeodes* and description of two new genera (Ephemeroptera: Baetidae). *Proceedings of the Entomological Society of Washington*, 89: 177–184

WIERSEMA NA, MCCAFFERTY WP. 2000. Generic Revision of the North and Central American Leptohyphidae (Ephemeroptera: Pannota). *Transactions of the American Entomological Society,* 126 (3+4): 337–371.