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# *Tricorythodes macuira* (Ephemeroptera: Leptohyphidae), new species from Colombia

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## Abstract

*Tricorythodes macuira* sp n. is described and illustrated based on nymphs of both sexes and eggs from Colombia. This species can be recognized by the following combination of characters: maxillary palp 2-segmented and small, pronotum with rounded anterolateral projection, pronotum and mesonotum with thick and long setae on margins, femora I and II with transverse row of long setae at dorsum, tarsal claws with marginal row of 5–8 denticles and subdistal double row of 4-2 + 1-2 submarginal denticles, subtriangular operculate gills shaded black on a basal stripe, ventralmost lamellae of gills III–V with dorsal extension very well developed, abdominal segments VII–IX with small posterolateral spines. Eggs with one polar cap, polygonal chorionic plates with elevated margins and long adhesive filaments near the uncapped pole.

**Key words:** Mayfly, Pannota, taxonomy, neotropics, South America

## Introduction

*Tricorythodes* Ulmer (1920) is a Panamerican genus within Leptohyphidae that attains its maximum diversity in South America. The genus is currently known from 58 species (some of them included in other genera by some authors, Wiersema & McCafferty 2000, Baumgardner & Avila 2006). In South America, 24 species are described (Dias & Salles 2006, Dias *et al*. 2009, Emmerich 2007, Gonçalves *et al*. 2010, Molineri 2002, Molineri & Zúñiga 2006, Dias *et al*. 2011, Belmont *et al*. 2012, Souto *et al*. 2017). In Colombia the genus is represented only by five species: *T. zunigae* Molineri from Chocó; *T. trifasciatus* Molineri and Zúñiga from Valle del Cauca; *T. capuccinorum* Emmerich and *T. uniandinus* Emmerich both from Cundinamarca, and *T. caunapi* Dias, Bacca and Ferreira from Nariño (Molineri 2002, Domínguez *et al*. 2006, Emmerich 2007, Molineri & Zúñiga 2006, Dias *et al*. 2011).

In the present paper one new species from Colombia is described: *Tricorythodes macuira* **sp. nov.** based on nymphs and eggs.

## Material and methods

The material used in this study was collected in two streams (Mekijano and Alvarado), from La Guajira and Tolima departments of Colombia, respectively (Fig. 1), using Surber net (250 µm of mesh size and 0.09 $m^2$ of area) and manual sieve.

The material was preserved in ethyl alcohol 96%. The mouthparts and legs were dissected and mounted on microscope slides using Euparal® or Canada Balsam. The material is deposited in the following institutions: Colección Entomológica del Programa de Biología de la Universidad de Caldas, Caldas, Colombia (CEBUC) and Colección Entomológica del Instituto de Biodiversidad Neotropical, Tucumán, Argentina (IBN). Drawings were made using a camera lucida on a microscope OlympusBX51 and a stereomicoscope Nikon SMZ-10. Pictures were

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taken using a Leica M205C stereomicroscope and some characters were examined through SEM, with a QUANTA 250 (30 KV), at low vacuum except figures 4C, 4D and 4E that were washed with neutral soap, ultrasonicated (for further cleaning), dehydrated and sputter coated with gold and then observed under high vacuum. Eggs were extracted from nymphs ready to molt to subimago, and they were not cleaned before SEM study.

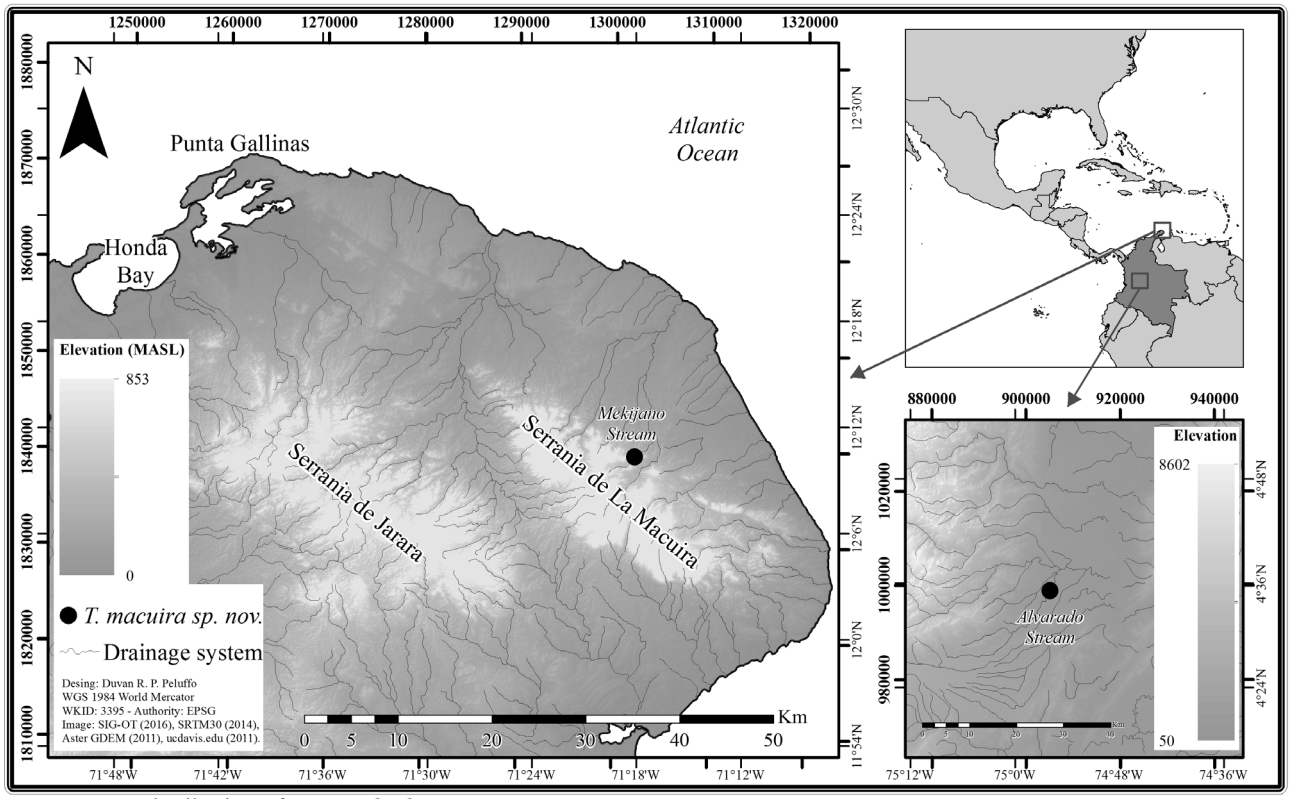



**FIGURE 1.** Distribution of *Tricorythodes macuira* **sp. n.**

## Results and discussion

### *Tricorythodes macuira* sp. nov.

(Figs. 2–4)

**Type material.** Holotype nymph female from Colombia, La Guajira, Macuira, Mekijano stream, 120 m, N 12º 10' 19.6"–W 71° 18.5' 9.4", IX/2014, Granados-Martinez C. col. (CEBUC). Paratypes: 5 nymphs (3 males and 2 females), same data as holotype (CEBUC); 2 nymphs (1 female and 1 male nymph, slides IBN770CM and IBN788CM) same data as holotype (IBN).

**Additional material.** Four nymphs (3 males and 1 female), Colombia, Tolima, Alvarado, Alvarado river, 365 m, N 4° 35' 8"–W 74° 55' 59", 26/II/2016, Meza-Salazar A. col. (CEBUC);1 male nymph (slide IBN769CM) same data (IBN).

Mature nymph. Length (mm) of female: body, 4.5 mm, caudal filaments, 2.6 mm. Length (mm) of male: body, 3.7 mm, caudal filaments, 1.7 mm. General coloration yellowish with gray markings (Fig. 2). Head pale with slight gray shading on median zone of occiput, among ocelli and inner to antennal base as in Fig. 2. Many thick setae present on genae and clypeus. Mouthparts: labrum with relatively deep anteromedian emargination (Fig. 3A), covered by weak setae; mandibles with thick setae on outer margin; hypopharynx with medially concave lingua; maxillary palp small but elongated, 2-segmented (both segments are cylindrical and slender, Figs. 3B–D and 4A–B), distal brush of maxilla with about 40 long and curved setae, with stipes 1.1 the length of galea-lacinia, inner proximal margin of the galea-lacinia (opposite to palpus) with row of 5 setae (Figs. 3B and 4A); labium with paraglossae and glossae with the same length. Thorax. Pronotum yellowish shaded with gray mainly on anteromedian region, with rounded anterolateral projection, projections and lateral margins of pronotum covered with thick and long setae (Fig. 2B). Mesonotum yellowish shaded extensively with grayish, darker on anterolateral

corners; wingbuds yellowish with gray veins, margins covered with thick setae (Fig. 2A and 2C). Metanotum and thoracic sterna yellowish (Fig. 2A and 2C). Legs (Figs. 3E, 3F and 3G) yellowish, only shaded gray on basal macula of tibiae (Figs. 2A, 2C). Foreleg (Fig. 3E): proximal portion of transverse row of long setae (pl in Fig. 3F) at 1.44–1.50 of total femoral length from base (tl in Fig. 3F); total length (tl, same figure) / maximum width (mw) of femur = 2.8–2.9; fore tarsal claw with 5–8 marginal denticles and with 4-2 + 1-2 submarginal denticles (Figs. 3H–I, 4E). Middle leg: femur dorsally covered with many strong long setae, some forming a transverse row at ½ length from base (Fig. 3F); tarsal claw with 6–8 marginal and 1-2 + 1-2 submarginal subapical denticles (Figs. 3J, 4D). Hind leg (Fig. 3E): femur covered with many strong long setae; total length / maximum width of femur = 2.8–2.9; with long setae along entire hind and fore margins, dorsal surface with 5–7 long setae forming a basal transversal row; tarsal claw with 7–9 marginal denticles and 1-2 + 1-2 subapical sumarginal denticles (Fig. 3K, 4C). Abdomen (Fig. 3L). Abdomen yellowish shaded gray except near margins and medial line on terga I–VI; shading more slightly on VII–VIII. Small posterolateral spines present on segments VII–IX (smaller on IX), lateral flanges present on segments III–VI. Gill formula 3/3/3/3/2 (Figs. 3M–S). Operculate gills subtriangular (Figs. 3M–N), translucent, shaded widely with light gray except on a paler median area , with a black band along transverse basal costa (Figs. 2A, 2C, 3N); ventrally with two lamellae, one basal and located perpendicularly to operculate lamella, and the other (in the same plane than operculum) with an apical indentation (Fig. 3M); gill III–V with ventralmost lamellae with dorsal extension very well developed (Figs. 3O, 3Q–R) and with costa shaded gray, gill VI (Fig. 3S) with two rounded lamellae. Caudal filaments whitish.

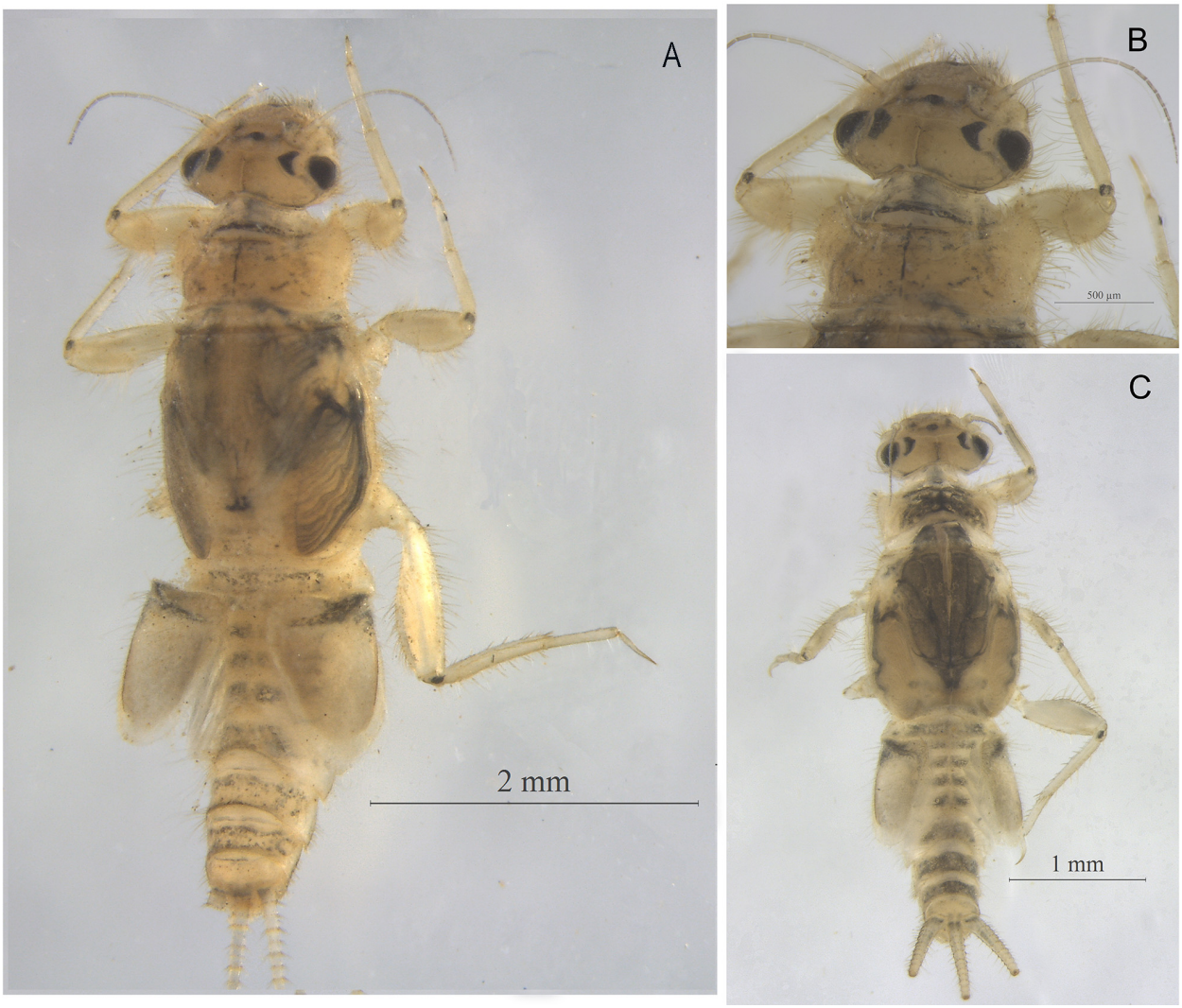



**FIGURE 2.** *Tricorythodes macuira* **sp. n.**, nymphs (dorsal view): A, female; B, detail of head and pronotum; C, male nymph (pharate subimago).

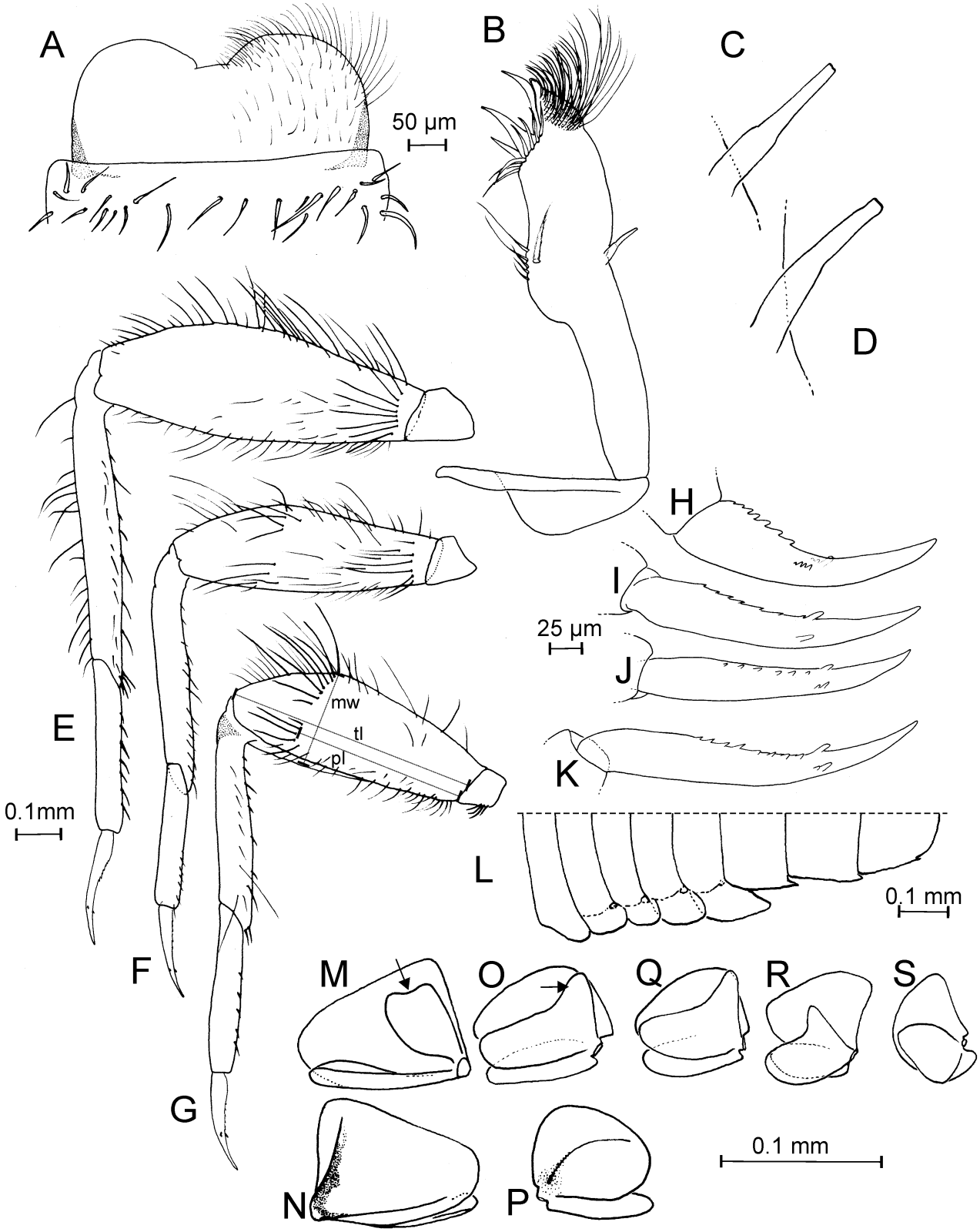



**FIGURE 3.** *Tricorythodes macuira* **sp. n.**, nymph: A, Labrum; B, Maxilla; C–D, maxillary palp; E, hind leg; F, Median leg; G, fore leg; H–I, fore tarsal claw; J, median tarsal claw; K, hind tarsal claw; L, Abdomen (dorsal view); M, gill II (ventral view); N, gill II (dorsal view); O, gill III (ventral view); P, gill III (dorsal view); Q, gill IV (ventral view); R, gill V (ventral view) and S, gill VI (ventral view). Abbreviations: mw = maximum width, pl = proximal length, tl= total length (see text).

Eggs (Figs. 4F–G). Length, 120–130 µm; maximum width, 70–75 µm. One blunt polar cap present (pc in Fig. 4G). One subcircular micropylar area present, surrounded by 5 chorionic plates (ma in Fig. 4F). Polygonal

(pentagonal and hexagonal) chorionic plates (cp in Fig. 4G) contiguous, with an elevated rib along the entire margin (em in Fig. 4G), median area smooth and subcircular. Adhesive filaments (af in Fig. 4F) relatively long and thin, arising near the uncapped pole.

**Variations**. Pigments on body and especially on operculate gills are variably marked in different specimens. Some dark nymphs show operculate gills as described above but paler ones only retain the blackish basal stripe.

**Etymology**. The new species is named after the Macuira mountain range, where the holotype was collected.

**Distribution and ecological notes**. Colombia (Guajira and Tolima). In Guajira, at the moment of specimen collection, the following parameters were recorded: water temperature (28.9ºC), dissolved oxygen (7.2 mg/l), DO saturation (82%), salinity (0.3), conductivity (739 µS/cm), pH (8), the dominant substrate was sand. Additional information can be found in Lasso & Granados (2015).

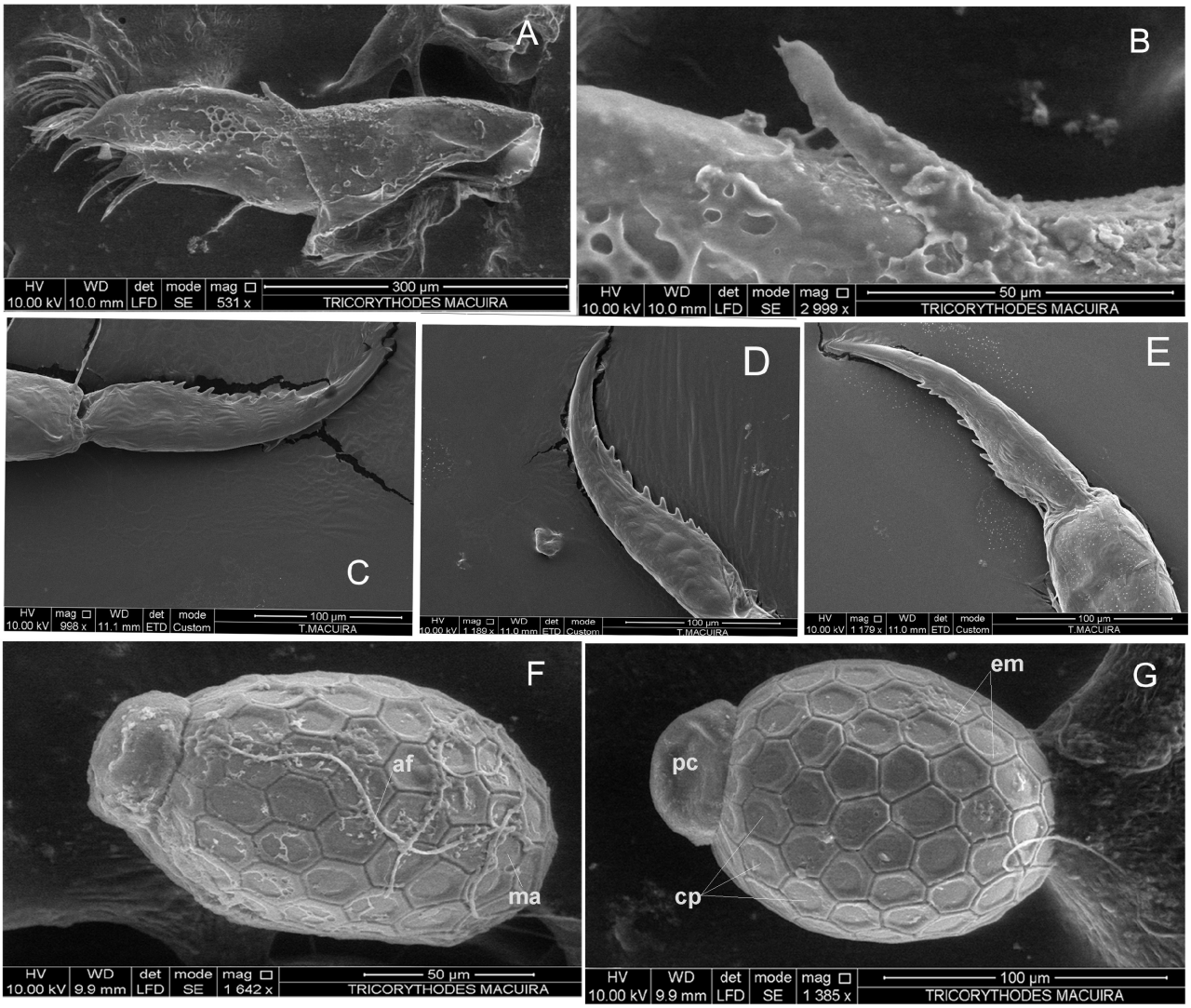



**FIGURE 4.** *Tricorythodes macuira* **sp. n.**, nymph and egg, SEM pictures: A, maxilla; B, maxillary palp; C, hind tarsal claw; D, median tarsal claw; E, fore tarsal claw; F–G, eggs. Abbreviations: af = adhesive filaments, cp = chorionic plate, em = elevated margin of chorionic plate, ma = micropylar area, pc = polar cap.

**Diagnosis.** The nymphs of *Tricorythodes macuira* **sp. nov.** can be distinguished from all other species in the genus by the following combination of characters: 1) maxillary palp 2-segmented (Figs. 3B–D, 4A–B); 2) pronotum with rounded anterolateral projection, margins of pro and mesonotum covered with thick and long setae (Fig. 2B); 3) legs relatively long and slender, covered with long setae (Figs 2A, 2C, 3E–G); middle leg (Fig. 3F) with median transverse row of setae on dorsum (similar to foreleg); 4) fore tarsal claws with 5–8 marginal denticles and with 4-2 + 1-2 submarginal denticles (Figs. 3H–I, 4E); 5) abdominal segments with lateral flanges on III–VI and small posterolateral spines on VII–IX (Fig. 3L); 6) subtriangular operculate gills shaded extensively with gray

but darker on a transverse basal stripe (Figs. 2A, 2C, 3N), with ventral lobe apically indented (Fig. 3M, arrow), gills III–V (Figs. 3O, 3Q, 3R) with dorsal extension (Fig. 3O, arrow) strongly developed. The eggs are characterized by: 1) one polar cap present (Figs. 4F–G, pc); 2) chorionic plates (cp) with elevated margin (em) and smooth subcircular central part (Figs. 4F–G); 3) few adhesive filaments (af) present, long and slender, arising near uncapped pole (Figs. 4F–G); 4) circular micropylar area (ma) near the uncapped pole, surrounded by 5 chorionic plates (Fig. 4F).

## Discussion

*Tricorythodes macuira* **sp. nov.** shows some resemblance with *T. popayanicus* Domínguez, 1982, the nymphs having thick setae on head and thorax, and subtriangular opercular gill shaded with black on basal region. Nevertheless, *T. macuira* presents slender legs and 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 (Fig. 3F), ventral lamella of gill II with a broad apical emargination (Fig. 3M), and ventral lamella of gills III–V with dorsal extension strongly developed (Figs. 3O, 3Q–R).

The eggs of *T. macuira* **sp. nov.** are similar to *T. hiemalis* Molineri, 2001 (Molineri 2006) due to the form of the chorionic plates (polygonal and with elevated ridges) and presence of long adhesive filaments in both species. *Tricorythodes macuira* eggs can be distinguished because the chorionic plates (except those surrounding the polar cap) show elevated margins along their entire perimeter, while in the eggs of *T. hiemalis* the elevated margin of each plate is much wider in the side close to the uncapped pole.

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