

A new species of *Tricorythodes* Ulmer from Amazon region of Colombia (Ephemeroptera: Leptohyphidae)

Lucimar Gomes Dias¹; Alix Rosa Mary Solano-Figueroa² & Carlos Molineri³

¹ Universidad de Caldas, Facultad de Ciencias Exactas y Naturales, Departamento de Ciencias Biológicas, Grupo de Investigación Bionat: Biodiversidad y Recursos Naturales. Manizales, Caldas, Colombia.

ORCID: [0000-0001-6480-7688](https://orcid.org/0000-0001-6480-7688). E-mail: lcimaris.dias@ucaldas.edu.co

² Instituto Amazónico de Investigaciones Científicas SINCHI, Grupo Ecosistemas Acuáticos. Leticia, Amazonas, Colombia.

ORCID: [0009-0002-3646-4467](https://orcid.org/0009-0002-3646-4467). E-mail: arsolano@sinchi.org.co

³ Universidad Nacional de Tucumán, Instituto de Biodiversidad Neotropical (Consejo Nacional de Investigaciones Científicas y Técnicas). Yerba Buena, TU, Argentina.

ORCID: [0000-0003-2662-624X](https://orcid.org/0000-0003-2662-624X). E-mail: carlosmolineri@gmail.com (corresponding author)

Abstract. We here describe and illustrate a peculiar new species of *Tricorythodes* Ulmer (Leptohyphidae) based on a single nymph from a remote area of the Amazon biome in Colombia. The single nymph described here as *T. spinosus* sp. nov., presents a unique combination of characteristics: spiny tubercles on head, thorax and abdomen, elongated body and long and thin legs. Possible relations with other species in the genus are discussed.

Keywords. *Tricorythodes*; New species; Taxonomy; Larval description; Mayfly; Pannota.

INTRODUCTION

Tricorythodes Ulmer is one of the most species rich genera of mayflies and their representatives present a wide disparity of forms (Dias *et al.*, 2019). Seventy-four valid names are proposed, from which 34 are known to occur in South America, and nine in Colombia (Molineri *et al.*, 2025). In this study, we describe a peculiar new species based on a single nymph from the Vaupés department, in a very hard-to-reach locality, in a remote area of the Amazon biome in Colombia. Despite efforts to reach it, we were unable to access the stream. The new species shows distinctive features, such as highly developed spiny dorsal tubercles on the head, thorax, and abdomen, which are sufficient to distinguish it from all other species in the genus. The new species remember *Loricyphes* Molineri & Mariano, 2015 that is characterized by a heavy body armature, with spiny dorsal tubercles on head, thorax and abdomen, the spine arrangement is similar in both species, but the new species lacks the armature. Based on molecular and morphological characters, Dias *et al.* (2019) proposed a phylogeny of *Tricorythodes*, defining several species groups within the genus. According to the combination of morphological characters used by these authors, the new species described

here, shares certain characteristics with the *bullus* species group.

MATERIAL AND METHODS

The nymph was photographed with a ZEISS Axio-Cam ICc 5 mounted on a Stemi 508 stereo microscope and a Leica M205C stereomicroscope with an attached Leica MC-170HD camera. Mouthparts and legs were dissected and mounted in Euparal. Gills were removed, drawn with a camera lucida attached to a stereo microscope Olympus BX51 and disposed in alcohol 96° with the remaining parts of the body.

RESULTS

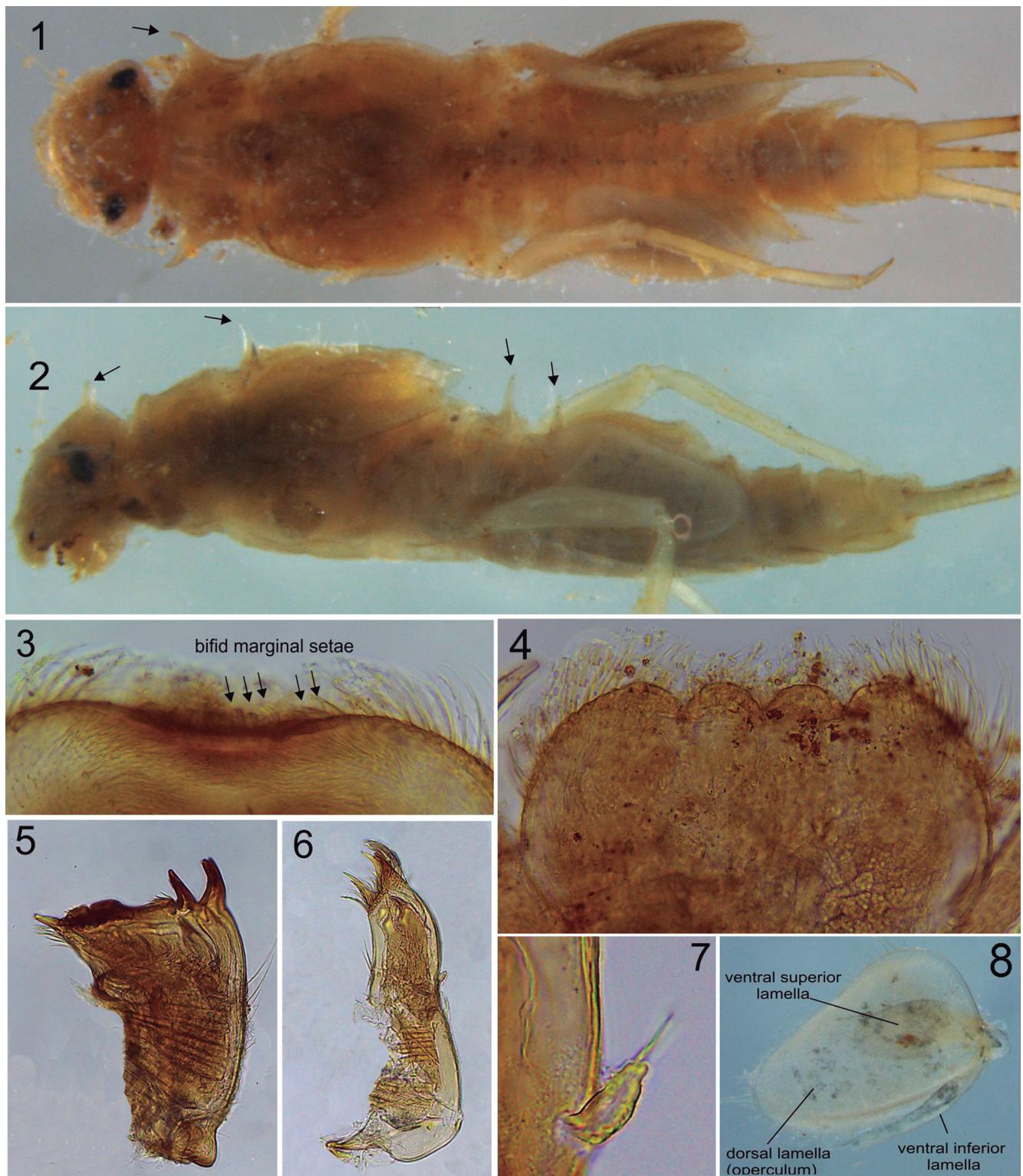
***Tricorythodes spinosus* sp. nov.**
(Figs. 1-24)

<https://zoobank.org/444C6A35-DEB8-42CE-84D3-B1AE45D22EF8>

Material: Holotype female nymph from COLOMBIA (deposited in SINCHI), Vaupés, Mitú, caño 1 arriba de Garrafa, 01°17'23.5"N, 70°18'40.4"W (Fig. 25), 20.vii.2012, Solano-Figueroa A. Col. Instituto Amazónico de Investigaciones Científicas – SINCHI.

Diagnosis: This species can be separated from others in the genus by the following combination of characters in the nymph: 1) general aspect thorny, medium size, glabrous, dark (Figs. 1-2); 2) head with two submedian long pointed tubercles on occiput (Figs. 9 and 21); 3) labrum with very shallow anteromedian emargination, bifid setae along entire anterior margin (including median emargination) (Fig. 3); 4) maxillary palp elongated, 1-segmented

with long apical setae (Figs. 6-7); 5) pronotum with very large pointed anterolateral projection (Figs. 1 and 10); 6) mesonotum with a large acute median tubercle near fore margin (Fig. 2, 11 and 20); 7) femora slender (forelegs broken off and lost, total length/maximum width ratio of hind legs = 4.3), as figs. 23-24; 8) transverse row of setae on dorsal surface of anterior femur unknown; 9) tarsal claws with 5-8 small triangular basal denticles and with

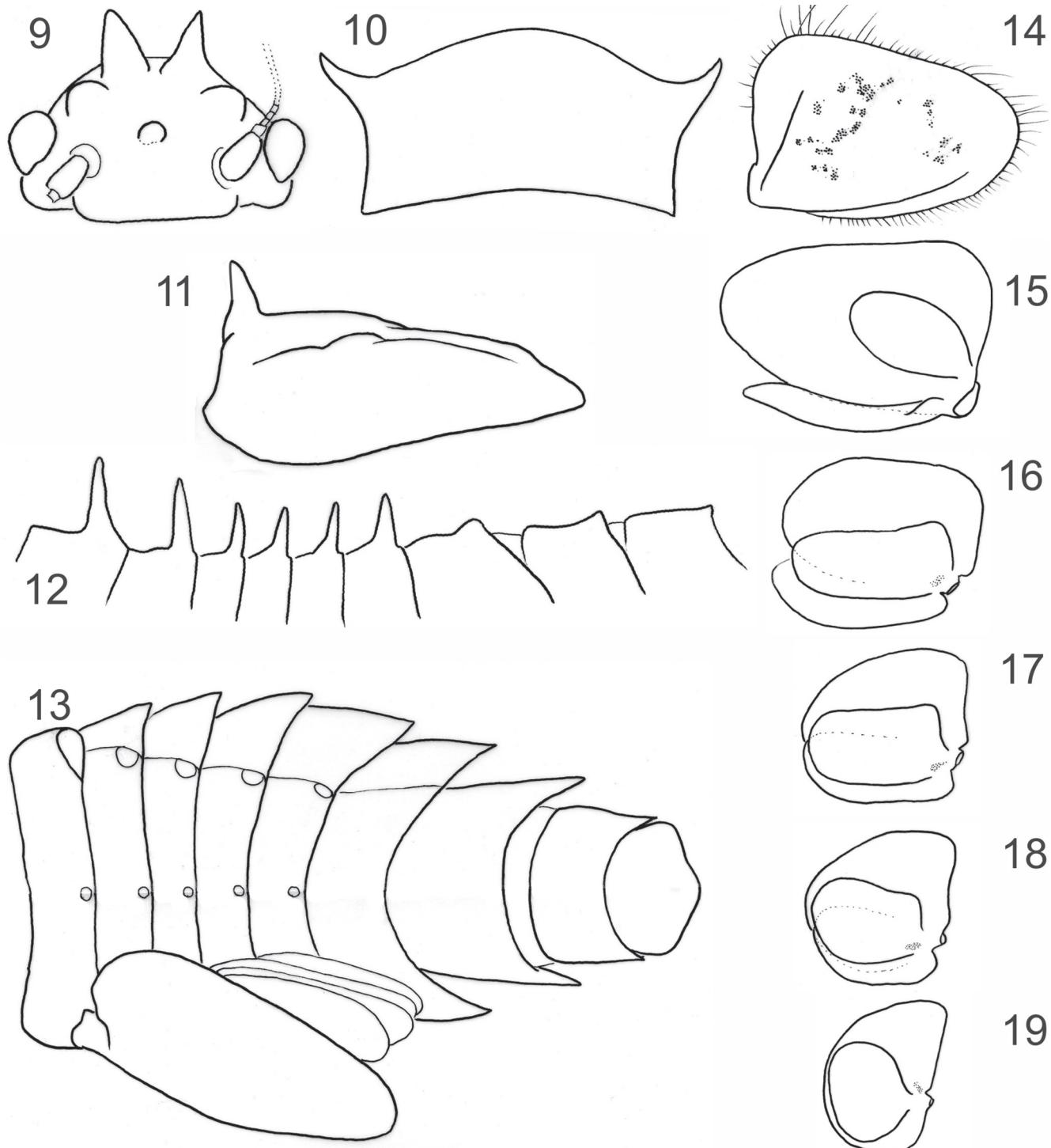


Figures 1-8. *Tricorythodes spinosus* sp. nov., nymph: (1) general habitus, dorsal; (2) general habitus, lateral; (3) labrum, detail of fore margin, dorsal; (4) labium, detail of glossae and paraglossae; (5) right mandible; (6) right maxillae; (7) detail of maxillary palp; (8) opercular gill, dorsal.

small subapical denticles 1+2 (Fig. 22); 10) operculate gill subtriangular shaded widely with grayish marks (Fig. 8); gill formula 3/3/3/3/2 (Figs. 14-19); 11) posterolateral spines present on abdominal segments III-IX (larger on VII-VIII), as figs. 2, 12 and 20; flanges on III-VII (Fig. 13).

Nymph: Length (without filaments): 3,5 mm; thorax: 1,3 mm, caudal filaments, 3,9 mm. General aspect (Figs. 1-2) elongated and armored with spines on head, thorax, abdomen; coloration almost completely faded. Head (Figs. 9 and 21). Genal and frontal projections

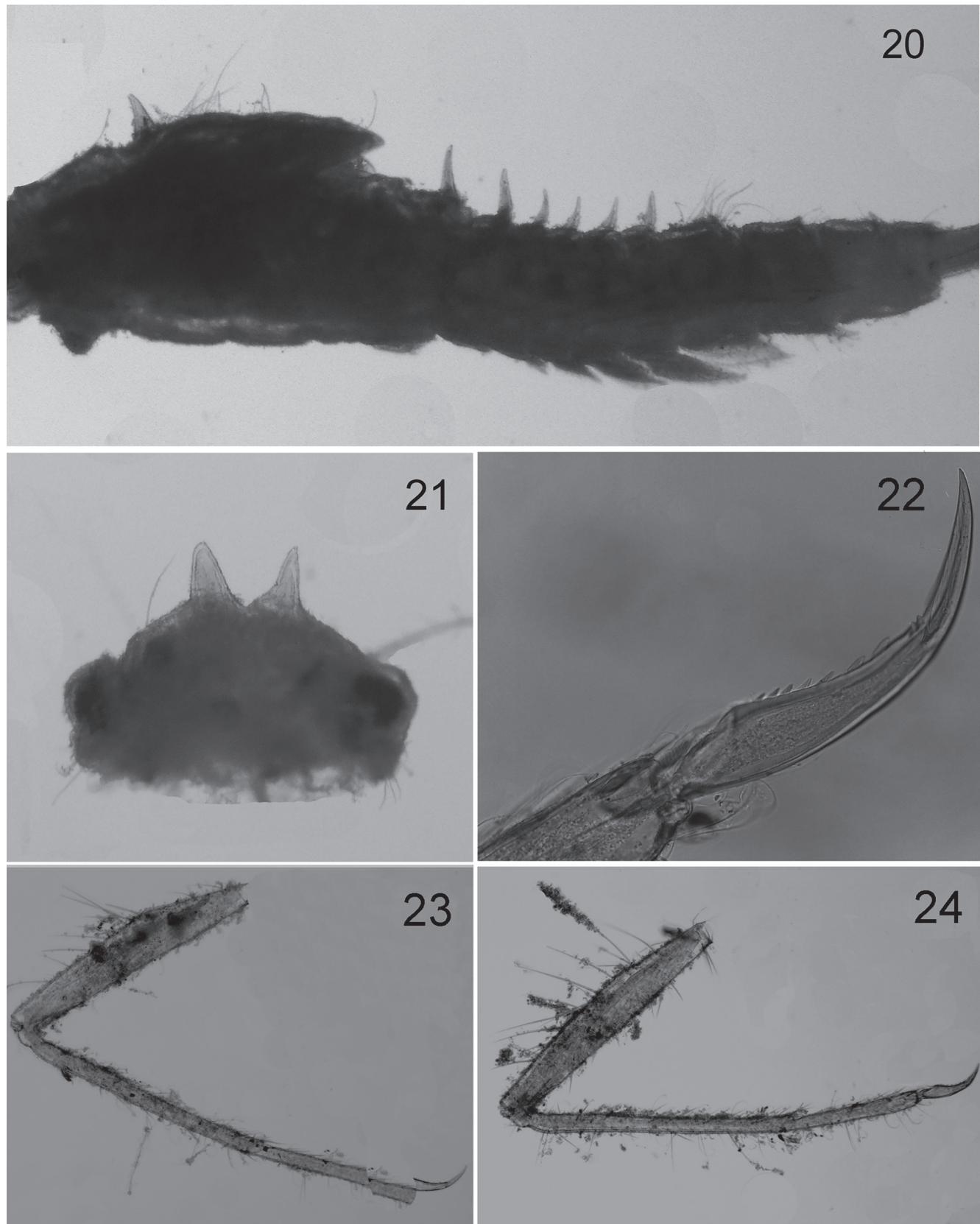
not developed; two submedian long pointed tubercles on occiput as figs. 9 and 21; broad low humps on lateral ocelli. Antennae long, reaching middle coxa. Mouthparts: labrum (Fig. 3) with slightly marked anteromedian emargination, bifid setae present along entire anterior margin; maxillary palp small, elongated, 1-segmented (one or two slight constrictions may give a 2-segmented appearance) with a long apical seta (Figs. 6 and 7); mandibles normal (Fig. 5, right mandible); labium (Fig. 4) with apically rounded paraglossae, mediodorsal seta of glossa relatively short. Thorax. Pronotum (Figs. 1 and 10) with



Figures 9-19. *Tricorythodes spinosus* sp. nov., nymph: (9) head, frontal view; (10) pronotum, dorsal; (11) mesonotum, lateral; (12) abdomen, lateral outline; (13) abdomen, dorsal view; (14) operculate gill, dorsal; (15) operculate gill, ventral; (16-19) gill III-VI, ventral.

long acute and curved anterolateral projections. Mesonotum (Figs. 2, 11 and 20) with a large acute median tubercle near fore margin, tubercle curved forward; and with sparse acuminate setae. Legs: long and slender covered

by very thin and long setae; fore legs broken off and lost. Middle leg (Fig. 23), ratio femur (1): tibia (1.1): tarsus (0.5): claw (0.24). Middle femur ratio length/width = 6.7. Hind leg (Fig. 24), ratio femur (1): tibia (1): tarsus (0.6): claw



Figures 20-24. *Tricorythodes spinosus* sp. nov., nymph: (20) acute tubercles on mesonotum and abdomen in lateral view; (22) head; (22) tarsal claw; (23) middle leg; (24) hind leg.

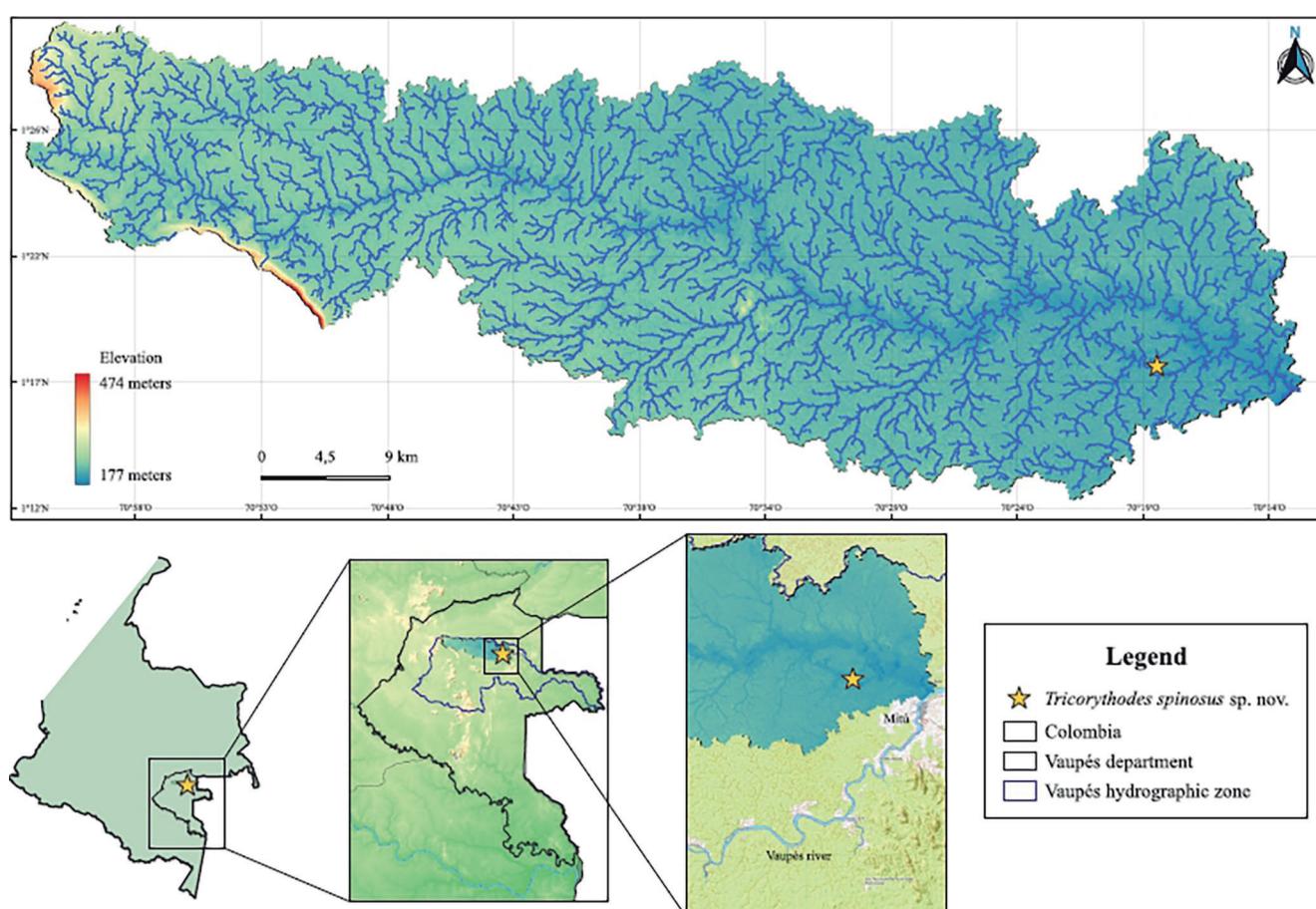


Figure 25. Distribution map of *Tricorythodes spinosus* sp. nov.

(0.27). Hind femur ratio length/width = 6.0. Tarsal claws (Fig. 22) with 5-8 small triangular basal denticles and with small subapical denticles 1+2. Abdomen slender, with large median acute tubercles on terga I-VI (Figs. 2, 12 and 20), terga VII-IX with a low blunt elevation at hind margin. Flanges on III-VII, posterolateral spines on III-IX (larger on VII-VIII) (Fig. 13). Sternum IX truncated apically. Gills (Fig. 14-19): operculate gill (Figs. 8, 14-15) subtriangular, large, with 3 lobes, opercular lobe shaded widely with grayish marks; gill formula 3/3/3/3/2, ventral most lamella of gills III-VI relatively broad (Figs. 16-19). Caudal filaments with whorls of long thin setae at each articulation.

Adults: Unknown.

Etymology: From the Latin “*spinosus*” (adjective, masculine) meaning thorny, because of the general aspect of the nymph.

Physicochemical Characterization of the type locality:

The physicochemical analysis of Caño 1 in July 2012 indicates that it is a characteristic Amazonian aquatic ecosystem of blackwater. It exhibits low electrical conductivity (7.4 μ S/cm), reflecting a low concentration of salts and minerals, and an acidic pH (4.55) due to the presence of fulvic and humic acids. The water temperature (23.8°C) is typical of the tropical region, while the levels of dissolved oxygen (3.65 mg/L) and oxygen saturation (43%) indicate low oxygenation.

DISCUSSION

The single nymph reported here presents a unique combination of characteristics that deserved to be described as a new species. In view of the evidence provided by this species, including the presence of spiny tubercles on each body region, elongated body and slender femora, together with mouthparts and gills typical of *Tricorythodes*, we are inclined to state that the new species described here belongs to the *bullus* group (Dias et al., 2019). The most recent key to South American *Tricorythodes* species is that of Molineri (2002), and since then, numerous new species have been described, with many more known to exist but yet to be formally described. For this reason, we did not attempt to include the new species described here in a formal key. Nonetheless, the distinctive morphological features of this species allow it to be clearly separated from all other congeners.

Although expanding the sampling effort in the Vaupés department is important, the difficulty of access has been an obstacle. The type locality of the new species is accessible only by plane, followed by a challenging boat journey along a section of the Vaupés River, where strong currents and rocks make access difficult. One of us (LGD) has visited the area again and confirmed that it is very difficult to reach, so we think that getting additional material will be difficult. According to physicochemical characterization, the type locality falls within the “blackwater” classification range for freshwater ecosystems in

the Amazon basin (Junk *et al.*, 2011). Consequently, Caño 1 is classified as a blackwater stream with a low concentration of nutrients and dissolved solids, influenced by the surrounding vegetation.

AUTHORS' CONTRIBUTIONS: LGD, ASF, CM: Conceptualization, Methodology, Formal analysis, writing – original draft, Visualization, Investigation; writing – review & editing. All authors actively participated in the discussion of the results, they reviewed and approved the final version of the paper.

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