



Two new species of *Tricorythodes* Ulmer, 1920 (Insecta, Ephemeroptera) from Southeastern Brazil

INÊS C. GONÇALVES¹, ELIDIOMAR R. DA-SILVA² & JORGE L. NESSIMIAN³

¹Programa de Pós-Graduação em Zoologia, Museu Nacional do Rio de Janeiro, Laboratório de Entomologia, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro, Caixa Postal 68044, 21941–971, Rio de Janeiro, RJ, Brasil. E-mail: inescg@ig.com.br

²Laboratório de Insetos Aquáticos, Departamento de Zoologia, Instituto de Biociências, Universidade Federal do Estado do Rio de Janeiro, 22290-240, Rio de Janeiro, RJ, Brasil. E-mail: elidiomar@pq.cnpq.br

³Laboratório de Entomologia, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro, Caixa Postal 68044, 21941–971, Rio de Janeiro, RJ, Brasil. E-mail: nessimia@acd.ufrj.br

Abstract

Two new species of *Tricorythodes* are described from both, nymph and male imago: *Tricorythodes chalaza* **sp. nov.** and *Tricorythodes diasae* **sp. nov.** Imagoes of *T. diasae* **sp. nov.** can be characterized as follows: vein CuP of wings absent or incomplete; distal 3/4 of hind legs black; inner margins of styliger plate projected; penes rectangular with lateral margins sclerotized, forming two distal lobes inserted apico-dorsally with rounded margins whereas imagoes of *T. chalaza* **sp. nov.** present: vein CuP incomplete or absent; inner margins of styliger plate projected; basal swelling on segment II of forceps shaded with black; penes pyramidal with lateral margins sclerotized, divided apically.

Key words: Atlantic Rainforest, Neotropics, Rio de Janeiro State

Introduction

Widely distributed in South America, the Pan American genus *Tricorythodes* was erected by Ulmer (1920) for the species *Tricorythus explicatus* Eaton, 1892 (Dias *et al.* 2009). According to Domínguez *et al.* (2006), the genus shows great specific diversity and those authors expect the description of several new species from the Neotropics. Currently, 20 species are known to occur in South America, nine of which also reported from Brazil: *Tricorythodes arequita* Molineri, 2002 (Rio Grande do Sul State); *T. barbatus* Allen, 1967 (Santa Catarina State); *T. bullus* Allen, 1967 (Santa Catarina and Rio de Janeiro States); *T. cristatus* Allen, 1967 (Southern Region); *T. molinerii* Dias and Salles, 2006 (Minas Gerais State); *T. quizeri* Molineri, 2002 (Mato Grosso State); *T. rondoniense* Dias, Cruz and Ferreira, 2009 (Roraima and Rondônia States); *T. sallesi* Dias, Cabette and Souza, 2009 (Mato Grosso State); and *T. santarita* Traver, 1959 (Rio de Janeiro State) (Da-Silva *et al.* 2009; Dias *et al.* 2009; Salles 2010).

Two new species of *Tricorythodes* were collected on Macaé river Basin (Rio de Janeiro State - Brazil), at the municipalities of Nova Friburgo, Casimiro de Abreu and Macaé.

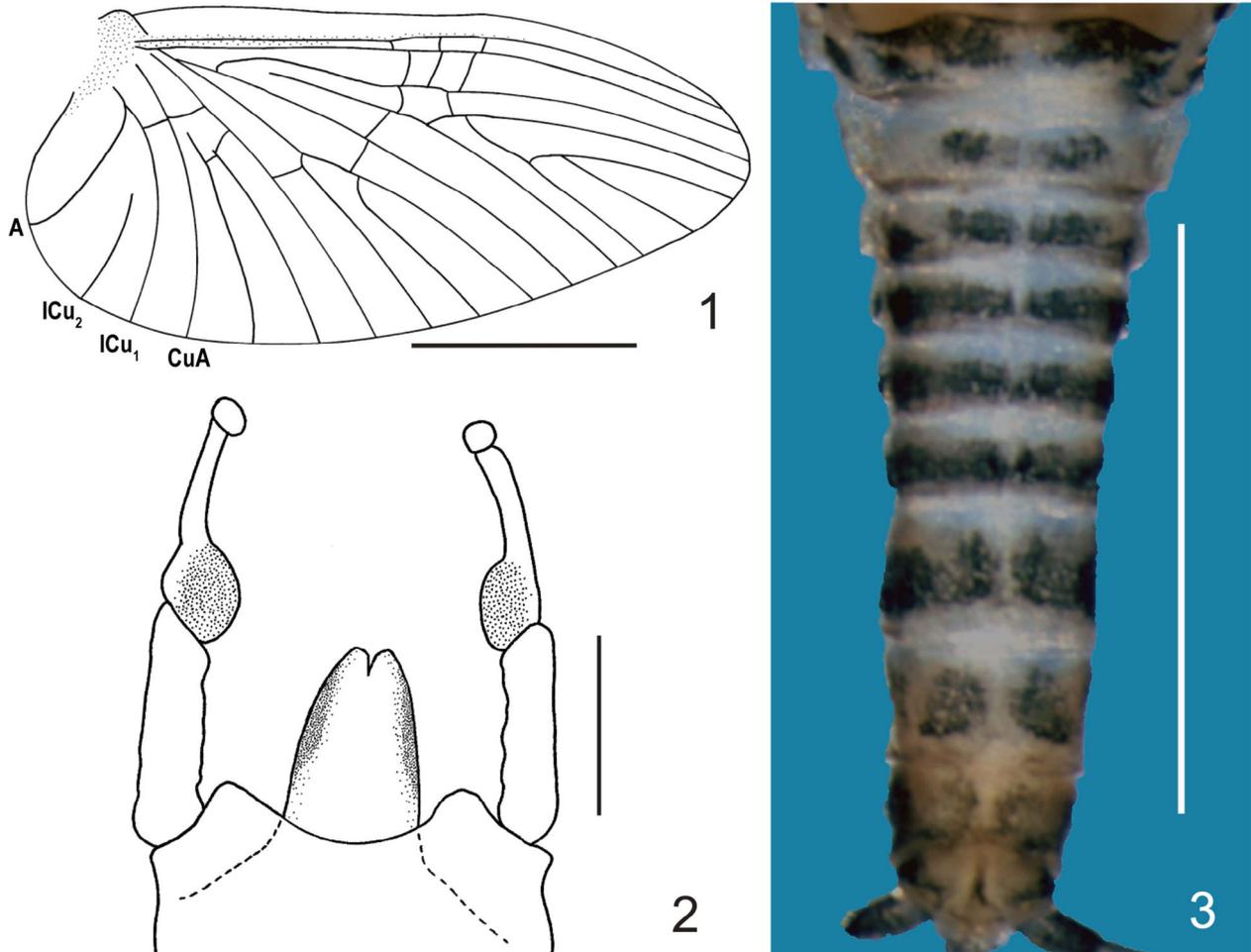
Material and methods

Specimens were preserved in 80% ethanol. Adults were caught on light traps. Association of male imagoes and nymphs were possible by dissecting the end of the abdomen of male mature nymphs, allowing observation of the subimago genitalia. Adult females of both species are unknown. Type material is deposited at Coleção Entomológica José Alfredo Pinheiro Dutra (DZRJ)—Departamento de Zoologia, Universidade Federal do Rio de Janeiro / UFRJ. Gill formula is in accordance to Molineri (2003), and show the number of membranous lamellae on abdominal segments II–VII. Drawings were made with the aid of camera lucida. Gills and genitalia were drawn at microscope stereoscope by temporary mounting on slides with 70% ethanol gel. Collecting sites were marked with a GPS using the datum WGS84.

Tricorythodes chalaza sp. nov. Gonçalves, Da-Silva and Nessimian

Male Imago. *Diagnosis:* 1) Vein CuP incomplete or absent (Fig. 1); 2) inner margins of styliger plate projected (Fig. 2); 3) basal swelling on segment II of forceps shaded with black (Fig. 2); 4) penes pyramidal with lateral margins sclerotized, divided apically (Fig. 2).

Nymph. *Diagnosis:* 1) Maxillary palpi one segmented with distal setae (Fig. 7); 2) genal projections absent; 3) anterolateral projections of pronotum absent; 4) pronotum with prominent median tubercle (Fig. 5); 5) tarsal claws with 13–14 denticles without distal setae (Fig. 6); 6) dorsal surface of fore femora with transversal row of setae on submedian region (Fig. 9); 7) femora narrow, bordered by a row of setae as in Figs. 8–9; 8) abdominal color pattern as in Fig. 4; 9) lateral margins of abdominal terga III–VII expanded, tergum VIII possessing posterolateral spines (Fig. 4); 10) opercular gills triangular, yellow, with blackish shade (Fig. 10).



FIGURES 1–3. *Tricorythodes chalaza* sp. nov. (male imago). 1—Forewing, 2—Genitalia, and 3—Abdominal color pattern (scale: 1.0mm except Fig. 2: 0.1mm).

Description. Male Imago: Length: 2.3–3.2mm body; 2.8–3.1mm wing. General coloration yellowish with black markings.

Head: Yellowish, with black markings on posterior margin and two brownish markings near posterior margin and ocelli. Ocelli grayish white surrounded by black. Scape and pedicel whitish suffused with brown; flagellum light brown.

Thorax: Pronotum whitish with black markings; two wide postero-lateral light brown markings on pronotum. Mesonotum light brown; lateral margins black on anterior and posterior ends; membranous filaments absent. Metanotum light brown. Sterna light brown.

Wings: Membrane hyaline; longitudinal veins grayish and cross veins translucent white. Base of wings and vein C shaded with gray. Vein ICuA usually not jointed at base to CuA; when jointed, vein ICuA becomes very light colored and translucent near junction. CuP incomplete or absent (Fig. 1).

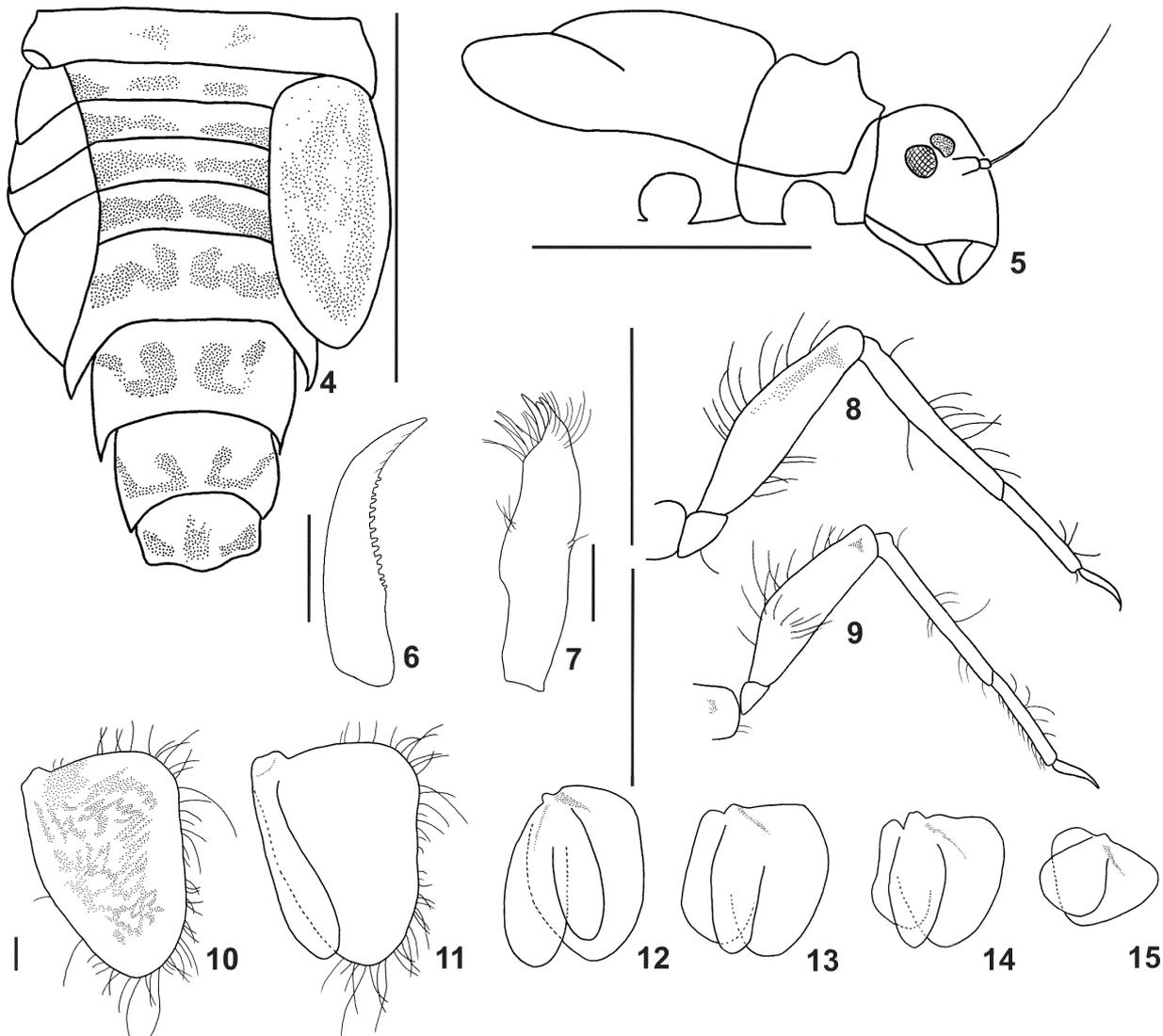
Legs: Coxae and trochantères of fore legs whitish with black markings; coxae and trochantères of mid and hind legs yellowish with black markings. Femora whitish possessing black markings. Mid legs more suffused with black than fore legs, only lightly shaded; hind leg more strongly suffused than fore and mid leg. Tibiae whitish. Tarsal segments and tarsal claws yellowish; fourth tarsal segment of fore legs lightly shaded with gray on basal half.

Abdomen: Whitish heavily suffused with black, so that only a median whitish longitudinal line can be seen on terga (Fig. 3). Sterna translucent white, gonads can be seen by transparency on final terga. Caudal filaments whitish shaded by black becoming fainter toward apex.

Genitalia: Whitish; inner margin of forceps projected, basal swelling on segment II of forceps heavily shaded with black. Penes pyramidal with lateral margins strongly sclerotized; penes with apical division (Fig. 2).

Variations: Some specimens had overall body coloration more heavily shaded with black, particularly on the head, thoracic terga and legs. In a few individuals, penes also presented a pair of black markings at base.

Female Imago: Unknown.



FIGURES 4–15. *Tricorythodes chalaza* sp. nov. (nymph). 4—Abdominal color pattern, 5—Head and thorax (lateral view), 6—Tarsal claw, 7—Maxilla, 8—Hind leg, 9—Foreleg, 10—Gill II (dorsal view), 11–15—Gills II–VI (ventral view) (scale: Figs.: 4–5 and 8–9: 1.0mm; Figs.: 6–7 and 10–15: 0.1mm).

Mature Nymph: Length: 3.3–3.7mm body; 2.3–3.0mm caudal filaments. General coloration yellowish with black markings.

Head: Yellow with median region and posterior margin of head bearing black markings. Antennae yellowish. Mouthparts yellow. Maxillary palpi one-segmented with apical setae (Fig. 7). Genal projection absent.

Thorax: Pronotum yellow with blackish markings; possessing a prominent tubercle medially (Fig. 5). Antero-lateral projection absent. Mesonotum yellow, bearing scattered blackish markings on lateral margins and between wing pads. Wing pads blackish. Sterna yellow.

Legs: Yellow; dorsal surface of femora shaded with black, more so on mid than on fore femora, and heavily on hind femora (Figs. 8–9). Dorsum of fore femora with a transverse row of setae on sub median region (Fig. 9). Tarsal claws with 13–14 denticles, without distal setae (Fig. 6).

Abdomen: Yellow heavily shaded with black. Forming a yellow median longitudinal line and yellow sub-lateral areas on terga. Lateral expansions of abdomen yellow; lateral margins of segments III–VII expanded with postero-lateral spines on segment VIII. Posterior margin of terga bearing setae (Fig. 4). Sterna yellow. Operculate gills triangular, yellow, with blackish shade. Remaining gills translucent white, suffused with black at base. Gill formula: 2–3–3–3–2 (Figs. 10–15). Caudal filaments light brown bearing setae at joints.

Biology. *Tricorythodes chalaza* **sp. nov.** was found on rivers with slow current and sandy and muddy bottoms. Nymphs were collected in marginal banks and vegetation.

Etymology. “chalaz” meaning “tubercle”, in allusion to the presence of a prominent tubercle on pronotum.

Type material. Holotype: Brazil, RJ, Macaé, Córrego das Aduelas, 10m, 22°12'27.9"S/41°50'24.2"W, 15.III.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1556). Paratypes: Brazil, RJ: Macaé, Córrego das Aduelas, 10m, 22°12'27.9"S/41°50'24.2"W, 15.III.2009, Gonçalves, I.C. *leg.* 11 male imagoes (DZRJ1560); Macaé, Córrego das Aduelas, 28m, 22°11'10.4"S/41°49'09.9"W, 15.IV.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1561); Macaé, 1° order tributary of Córrego das Aduelas, 15m, 22°12'11.8"S/41°50'55.4"W, 15.IV.2009, Gonçalves, I.C. *leg.* 2 male imagoes (DZRJ1558); Macaé, Cachoeiros de Macaé, Rio Macaé, 68m, 22°25'49.5"S/42°12'06.6"W, 05.IV.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1562); Macaé, Rio Macaé, 22°17'42.9"S/41°52'48"W, 16.IV.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1557); same data, 3 male imagoes (DZRJ1559); same data except Ferreira-Jr, N. *leg.* 11 nymphs (DZRJ1563, DZRJ1564, DZRJ1566, DZRJ1568, DZRJ1570, DZRJ1575, DZRJ1576, DZRJ1577); same locality, 21.I.2008, Ferreira-Jr *leg.* 2 nymphs (DZRJ1565 and DZRJ1574); same locality, 2005, no *leg.* 4 nymphs (DZRJ1567, DZRJ1569, DZRJ1573); Macaé, Sana, Córrego Alegre, 22°15'38.8"S/42°10'08.2"W, 19.II.2009, Gonçalves, I.C. *leg.* 1 nymph (DZRJ1571); Brasil, RJ, Nova Friburgo, Cascata, Rio Macaé, 22°22'03.2"S/42°15'27.8"W, 08.III.2009, Gonçalves, I.C. *leg.* 2 nymphs (DZRJ1572 and DZRJ1578).

Discussion. *T. chalaza* **sp. nov.** is similar to *T. bullus* by sharing, on the male imagoes: vein CuP incomplete and penes pyramidal with lateral margins strongly sclerotized. Despite the resemblance, imagoes of the new species can be differentiated by having styliger plate projected on inner corner and basal swelling of segment II of the forceps heavily shaded with black, characteristics lacking on *T. bullus*. Moreover, in *T. chalaza* **sp. nov.** the vein CuP may be incomplete or absent, whereas in *T. bullus* this vein is always present though incomplete.

Regarding the nymphs, *T. bullus* and *T. cristatus* also present a tubercle on pronotum as *T. chalaza* **sp. nov.** However, the new species can be differentiated from both by the absence of tubercles on head and mesothorax. An additional difference between these species is the number of denticles on tarsal claws: 13–14 in *T. chalaza* **sp. nov.**, 16–18 in *T. cristatus* and 8–11 in *T. bullus*.

Tricorythodes diasae **sp. nov.** Gonçalves, Da-Silva and Nessimian

Male Imago. *Diagnosis*: 1) Vein CuP of wings absent or incomplete (Fig. 16); 2) distal 3/4 of hind legs black; 3) inner margins of styliger plate projected (Fig. 17); 4) penes rectangular with lateral margins sclerotized, forming two distal lobes inserted apico-dorsally with rounded margins (Fig. 17).

Nymph. *Diagnosis*: 1) Maxillary palpi one-segmented with distal setae (Fig. 22); 2) Genal projection absent; 3) anterolateral projections of pronotum absent; 4) Tubercles absent on head and thorax; 5) tarsal claws with 10–11 denticles, without distal setae (Fig. 23); 6) dorsal surface of fore femora with transversal row of setae on median region (Fig. 21); 7) femora narrow, not bordered by a row of long setae (Figs. 20–21); 8) lateral margins of abdominal terga III–VI expanded, terga VII–VIII bearing posterolateral spines (Fig. 19); 9) opercular gill triangular, yellowish, with scattered blackish dots (Fig. 24).

Description. *Male Imago*: Length: 2.8–3.2mm body; 2.7–3.0mm wing. General coloration translucent white with black markings.

Head: Brown suffused with blackish spots. Eyes and ocelli black. Scape, pedicel and flagellum whitish washed with brown.

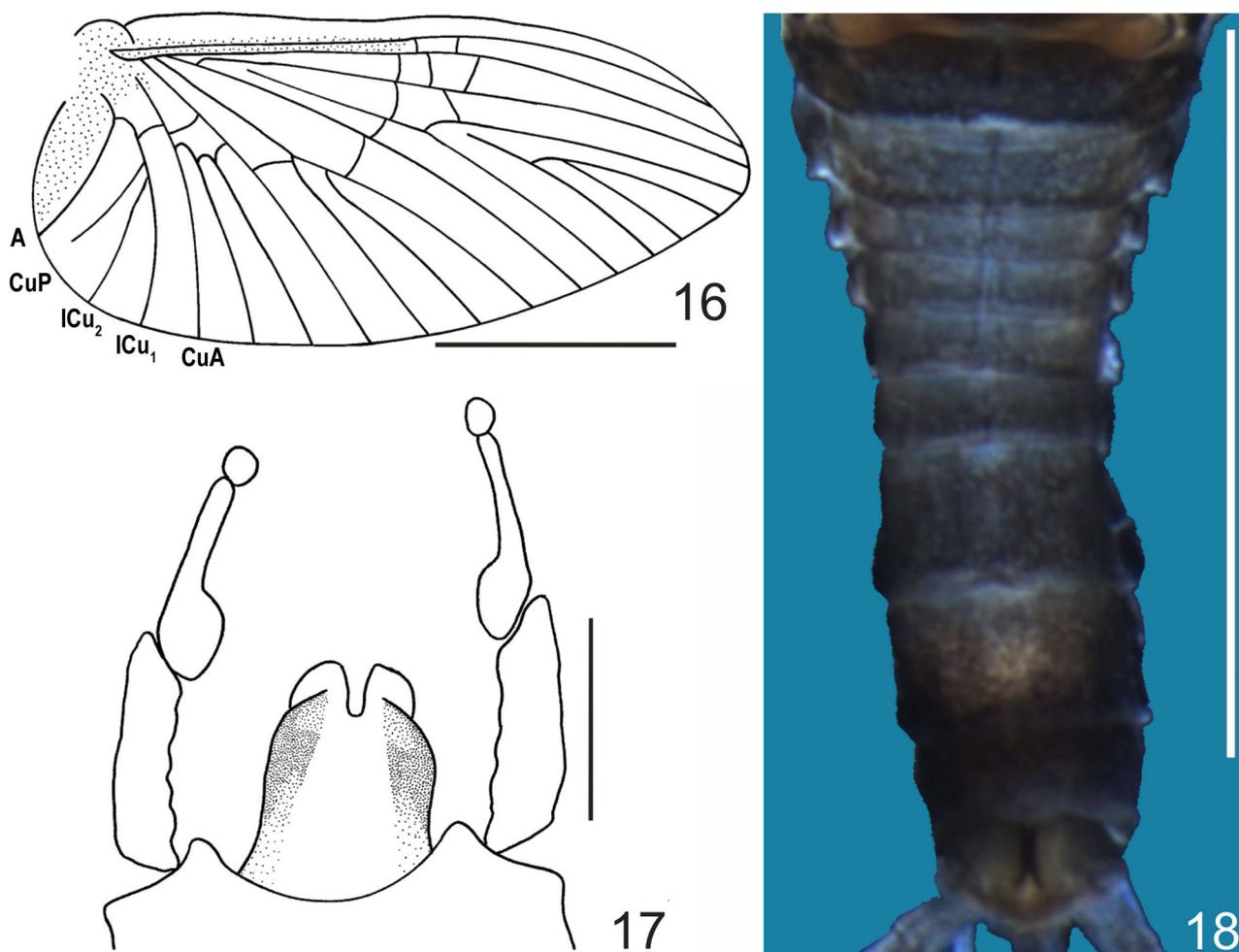
Thorax: Pronotum translucent whitish washed with blackish spots, lateral margins brown. Mesonotum brown, posterior margin blackish. Membranous filaments short, inconspicuous. Metanotum whitish, heavily shaded with black. Prosternum whitish with blackish dots. Meso and metasternum yellowish.

Wings: Membrane hyaline, veins blackish. Basal third of Sc possessing blackish spots along the vein. Vein CuP absent or incomplete (Fig. 16).

Legs: Forelegs with coxae, trochantères and femora yellowish-white; tibiae, tarsus and tarsal claws whitish; last tarsal segment faintly washed with black. Mid legs with coxae, trochantères and femora yellowish-white; tibia, tarsus and tarsal claws whitish. Hind legs with coxae, trochantères and basal fourth of femora yellowish white; distal 3/4 of femora and tibia washed with black; tarsus and tarsal claws whitish.

Abdomen: Terga translucent white heavily washed with black (Fig. 18). Sterna translucent white; lateral margins of sterna I–IV washed with black; remaining segments becoming more heavily shaded towards end of the abdomen. Caudal Filaments translucent white, basal segments washed with black.

Genitalia: Forceps and penes translucent white. Inner margin of forceps projected. Penes rectangular with lateral margins sclerotized; possessing two distal lobes with lateral margins rounded; distal lobes inserted dorso-apically (Fig. 17).

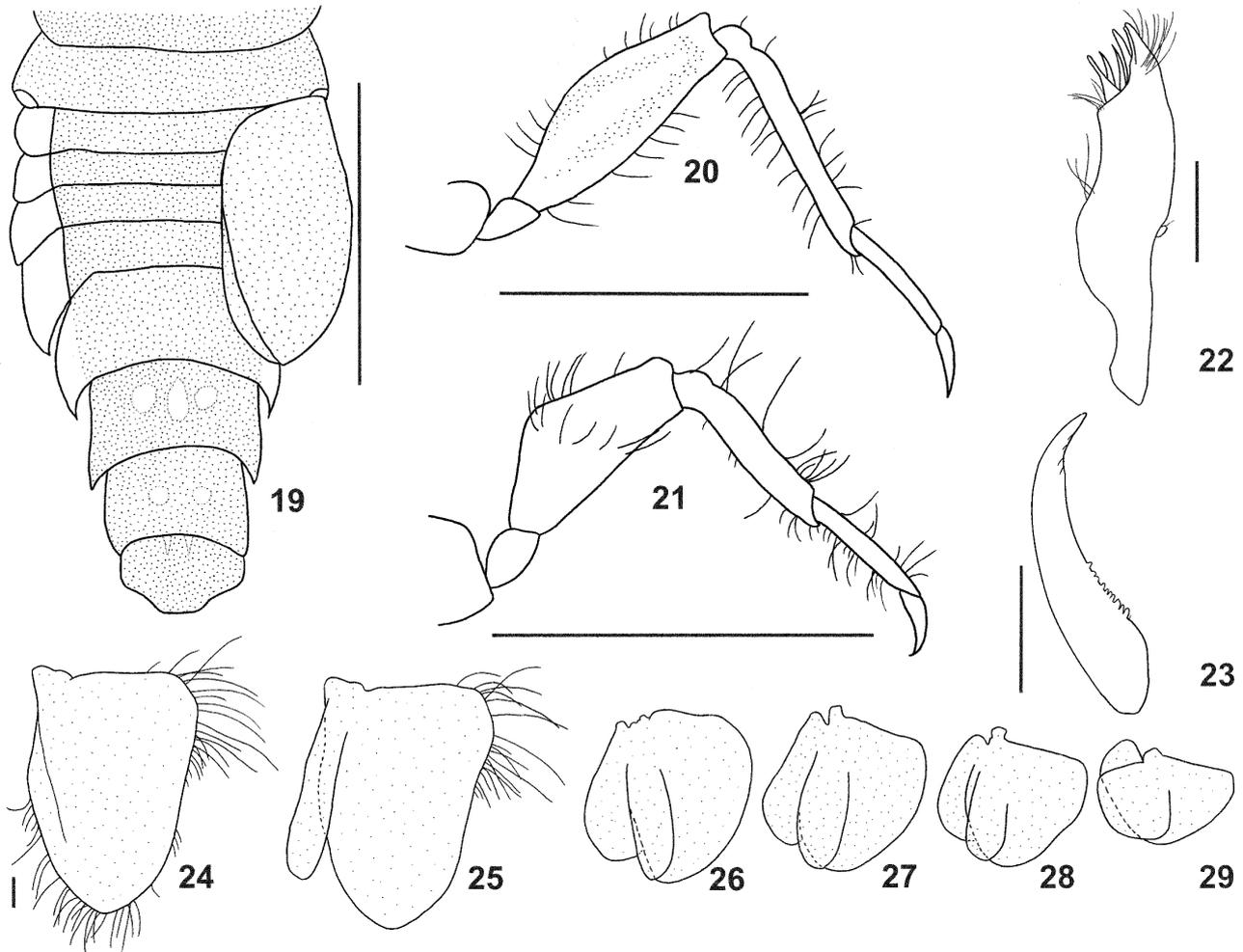


FIGURES 16–18. *Tricorythodes diasae* sp. nov. (male imago). 16—Forewing, 17—Genitalia, and 18—Abdominal color pattern (scale: 1.0mm, except Fig. 17: 0.1mm).

Female Imago: Unknown.

Mature Nymph: Length: 4.5mm body; 2.7–3.2mm caudal filaments. General coloration yellowish with blackish markings.

Head: Yellowish; washed with black between eyes and ocelli. Scape, pedicel and flagellum yellowish. Mouthparts yellow; maxillary palpi one-segmented with apical setae (Fig. 22). Genal projection absent.



FIGURES 19–29. *Tricorythodes diasae* sp. nov. (nymph). 19—Abdominal color pattern, 20—Hind leg, 21—Foreleg, 22—Maxilla, 23—Tarsal claw, 24—Gill II (dorsal view), and 25–29—Gills II–VI (ventral view) (scale: Figs. 19–21: 1.0mm, Figs. 22–29: 0.1mm).

Thorax: Pronotum yellow; heavily shaded with black. Antero-lateral projection absent. Mesonotum yellowish; metanotum whitish yellow. Sterna yellowish.

Legs: Yellowish. Fore femora with median transversal row of long setae (Fig. 21). Hind femora dorsally shaded with faint blackish (Fig. 20). Tarsal claw with 10–11 denticles (Fig. 23).

Abdomen: Terga yellowish heavily shaded by blackish. Sterna yellowish with lateral margins shaded with black. Lateral margins of segments III–VI expanded; segments VII and VIII with postero-lateral spines (Fig. 19). Operculate gills triangular; all gills yellowish with scattered blackish dots. Gill formula 2–3–3–3–2 (figs. 24–29). Caudal filaments yellowish, with row of long setae on joints.

Variations: In some specimens, shading on terga VIII–X formed a pair of yellowish marks medially.

Biology. *Tricorythodes diasae* sp. nov. nymphs were found on pool litter and marginal banks on slow current areas of rivers. These substrata were usually covered by sediment, commonly found covering the body of nymphs of the genus.

Etymology. The new species is named in honor of Lucimar G. Dias, friend and researcher of Ephemeroptera.

Type material. Holotype: Brazil, RJ, Macaé, Glicério, Córrego Duas Barras, 146m, 22°14'41.2"S 42°03'30.2", 22.III.2009, Jardim G.A. & Sampaio, B.H.L. leg. 1 male imago (DZRJ1579); Paratypes: Brazil, RJ: Macaé, Frade, Rio das Pedras, 262m, 22°14'28"S/42°06'05.7", 20.III.2009, Gonçalves, I.C. leg. 2 males imagoes (DZRJ1580); Macaé, Estrada Frade-Sana, Rio São Pedro, 426m, 22°13'45.1"S/42°07'39.6"W, 20.III.2009, Gonçalves, I.C. leg. 2 male imagoes (DZRJ1581); Macaé, Córrego das Aduelas, 10m, 22°12'27.9"S/41°50'24.2"W, 15.III.2009, Gonçalves, I.C. leg. 1 male imago (DZRJ1582); Macaé, 1° order tributary of Córrego das Aduelas, 15m,

22°12'11.8"S/ 41°50'55.4"W, 15.IV.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1584); Macaé, Cachoeiros de Macaé, Rio Macaé, 68m, 22°25'49.5"S/42°12'06.6"W, 05.IV.2009, Gonçalves, I.C. *leg.* 1 male imago (DZRJ1585); Casimiro de Abreu, Figueira Branca, Ribeirão da Luz, 77m, 22°25'48.2"S/42°12'14.9"W, 05.IV.2009, 21 male imagoes (DZRJ); Nova Friburgo, Lumiar, Córrego dos Patos, 644m, 22°24'08.6"S/42°19'14.2"W, 06.III.2009, Gonçalves, I.C. *leg.* 3 male imagoes (DZRJ1588); Nova Friburgo, Lumiar, Toca da Onça, Rio Bonito, 608m, 22°24'05.6"S/42°19'17.8"W, 05.III.2009, Gonçalves, I.C. *leg.* 8 male imagoes (DZRJ1589 and DZRJ1590); same locality, 2008, Nessimian, J.L., Dumas, L.L. & Santos, A.P.M. *leg.* 1 male imago (DZRJ1591); Nova Friburgo, Cascata, Rio Macaé, 370m, 22°22'03.2"S/42°15'27.8"W, 08.III.2009, Alecrim, V.P. *leg.* 2 nymphs (DZRJ1592 and DZRJ1593); Nova Friburgo, Encontro dos Rios, Rio Macaé, 515m, 22°23'37.1"S/42°18'20.6"W, 08.III.2009, Gonçalves, I.C. *leg.* 3 nymph (DZRJ1594); Nova Friburgo, Lumiar, Rio Boa Vista, 900m, 22°19'02.1"S/42°17'28.5"W, 15.XI.2008, Gonçalves, I.C. *leg.* 1 nymph (DZRJ1595); Nova Friburgo, Lumiar, Rio Macaé, 600m, 22°21'47.3"S/42°18'37.6"W, 16.XI.2008, Gonçalves, I.C. *leg.* 1 nymph (DZRJ1596).

Discussion. Nymphs of *Tricorythodes diasae* **sp. nov.** resemble those of *T. barbatus* Allen, 1967 by having abdominal segments III–VI expanded as well as lack of tubercles on head and thorax, and no subapical black markings on tibiae and tarsi. In spite of that, they can be identified by the maxillary palpi (one-segmented with apical setae), lack of genal projection and antero-lateral projections on prothorax, posterolateral spines of the abdomen on segments VII–VIII, and tarsal claw with 3–4 marginal denticles and 1–2 submarginal denticles. Whereas *T. barbatus* presents maxillary palpi 3-segmented also with apical setae, genal projection and antero-lateral projections of prothorax present, posterolateral spines of the abdomen on segment VII and tarsal claw with one pair of submarginal denticles.

Male imagoes of *T. diasae* **sp. nov.** are quite unique among *Tricorythodes* species from possessing lobes of penes distinctively separated and inserted dorso-apically on penes, with rounded margins.

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