

## Three New Species of *Thraulodes* (Ephemeroptera: Leptophlebiidae: Atalophlebiinae) from Venezuela

Maria Marleny Chacón<sup>1</sup>, Samuel Segnini<sup>1</sup> and Eduardo Domínguez<sup>2</sup>

<sup>1</sup>Department of Biology, University of Los Andes, Mérida, Venezuela

<sup>2</sup>Faculty of Natural Sciences, National University of Tucumán, Tucumán, Argentina

### ABSTRACT

Three new species of *Thraulodes* from Venezuela are described. One species is known from male and female imagines, and the other two only from male imagines. With this, the known *Thraulodes* species for Venezuela are four. A key for the male imagines of the known species of *Thraulodes* from Venezuela is provided.

KEYWORDS: Ephemeroptera, Atalophlebiinae, *Thraulodes*, systematics, South America, taxonomy.

### INTRODUCTION

The genus *Thraulodes* is widely distributed in the Americas, from 25–28° S to 30–40° N. With its approximately 45 described species it is one of the most species rich genera in the family, and a very conspicuous component of the benthic South American fauna. Although it is very diverse in northern South America, only one species has been described from Venezuela: *T. venezuelana* Ulmer, 1943. The finding of these three new species in a rather restricted area, probably indicates that there are several more undescribed in this country. The genus was previously revised by Traver and Edmunds (1967), and Allen and Brusca (1978). In both papers, groups of species were proposed, in the first based on male imaginal genitalia and in the second on gill structures of nymphs. Unfortunately, the groups proposed in both papers were not congruent, and have not been followed. Although some local reviews have been made (e.g. Domínguez, 1987), no global revisions of the genus have been undertaken recently. The terms used to describe the genitalia follow Traver and Edmunds (1967).

Key to the Venezuelan Male Imagines of *Thraulodes*

- 1a. Dorsum of abdomen brownish, no essential difference between terga II–V; apical portions of costal and subcostal spaces of fore wings brown-tinged ..... *T. venezuelana* Ulmer
- 1b. Dorsum of abdominal segments II–V or II–VI whitish or yellowish, translucent; costal and subcostal spaces of fore wings not tinged with brown ..... 2
- 2a. Abdominal segments II–V whitish, translucent, with central area tinged with red (Fig. 15); terga VI–X reddish; genitalia as in Figs. 17, 18 ..... *T. marreroi* sp. nov.
- 2b. Abdominal segments II–VI yellowish, translucent, no reddish marks as above; terga VII–VIII with white areas as in Figs. 4, 9 ..... 3
- 3a. Longitudinal veins of fore wings yellowish, darker towards apex, cross veins light brown; genitalia as in Figs. 5, 6 ..... *T. mucuy* sp. nov.
- 3b. Longitudinal and crossveins of fore wings yellowish-white; genitalia as in Figs. 11, 12 ..... *T. guanare* sp. nov.

## DESCRIPTIONS

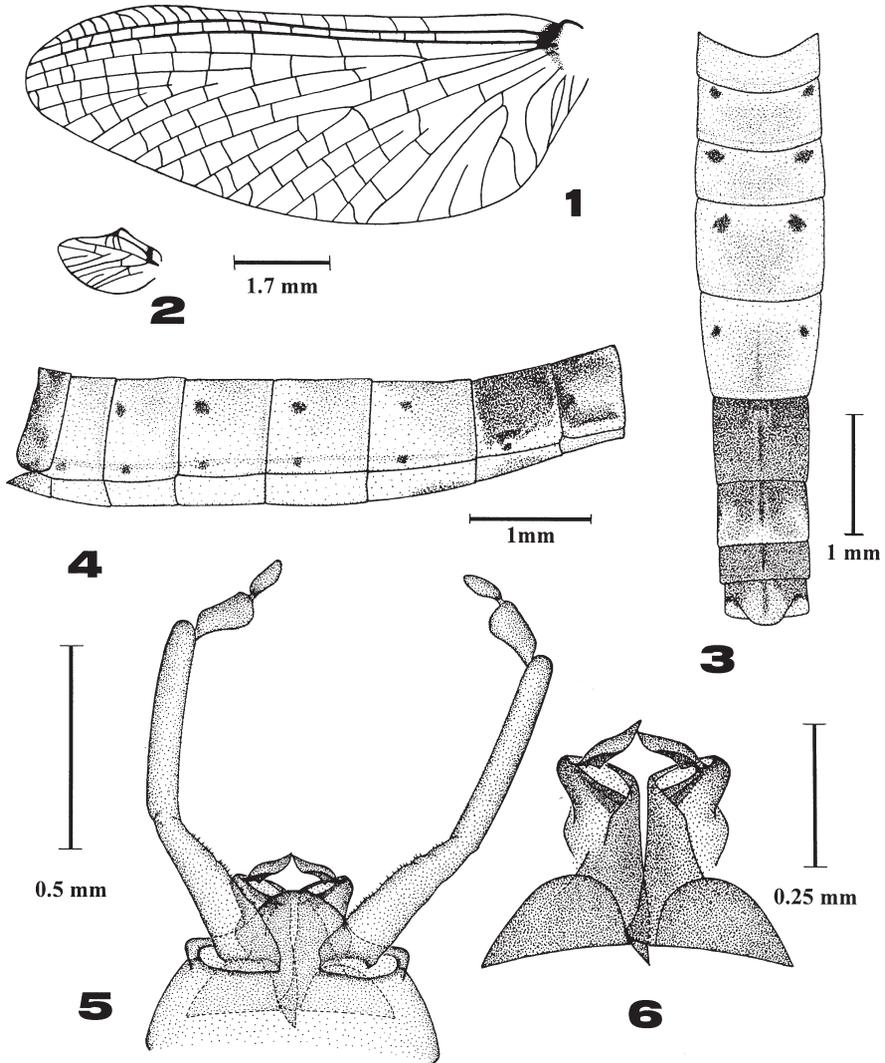
*Thraulodes mucuy* sp. nov. (Figs. 1–6)

*Male imago* (in alcohol, wings and genitalia on slides). Length: body, 10.3–10.8 mm; fore wings, 12.4–12.8 mm; hind wings, 2.2–2.3 mm. General coloration reddish-brown, abdomen translucent.

Head: Yellowish-brown, washed with orange-brown between ocelli. Upper portion of eyes orange brown darker at base; lower portion grayish-black. Ocelli white, base with a narrow yellow ring, followed with a wider black ring. Antennae: scape whitish, washed with black; pedicel dark brown; flagellum whitish-brown.

Thorax: Pronotum yellowish-white, washed with brown on medial area, close to posterior margin. Meso- and metanotum reddish-brown, except two anterolateral triangular spots and part of lateral margins of scutum whitish and center of scutum yellowish-brown; scutellum and metanotum with variable whitish marks. Pleurae and sterna yellowish-brown to reddish-brown, with membranous parts whitish, washed with black. Wings (Figs. 1, 2): Membrane of fore wings hyaline, with brownish-black spot at base; 4 cross-veins basal and 15 distal to bullae. Basal ½ of main veins yellowish, darker toward apex; cross-veins light brown. Membrane of hind wings hyaline, with grayish-black spot at base of wing. Veins C and Sc yellowish, remaining veins whitish. Legs: Legs I: coxae, trochanters and femora whitish, with apical 1/3 of femora yellowish-brown, darker toward apex; tibiae and tarsi I–IV yellowish-white, with apex of tibiae brownish-black; tarsi V yellowish, washed with brown. Tarsal claws yellowish-brown. Legs II: coxae and trochanters yellowish-white, tinged with reddish-brown. Legs III similar to legs I, except band on femora subapical.

Abdomen (Figs. 3, 4): Tergum I yellowish-brown, tinged with black on anterolateral corners; terga II–VI yellowish, translucent, washed with brown on central



Figs. 1-6. *Thraulodes mucuy*. 1, Fore wing; 2, hind wing; 3, abdominal terga II-X; 4, abdominal segments I-VIII, lateral view; 5, male genitalia, ventral view; 6, penis, detail.

area; two brownish-black spots on anterior part of terga III-VI (Fig. 3), and spiracular area tinged with black (Fig. 4). Terga VII-IX reddish-brown, with lateral areas of VII-VIII whitish (Fig. 3) and anterolateral margins of IX yellowish, translucent. Tergum X yellowish, washed with reddish-brown. Sterna whitish, sterna I and V-VIII washed with reddish-brown; ganglia and connectives visible. Genitalia (Figs. 5, 6): Styliiger plate yellowish, washed with reddish-

brown; forceps yellowish-white. Base of penes and recurved fold yellowish-brown, darker toward apex. Penes and spine short and stout; spine yellowish. Apicolateral area not forming 'ear'. External margin forming lateral pouch. Recurved fold produced in an angulate structure ('lapel'). [Caudal filaments broken-off and missing].

*Female imago and nymph:* Unknown.

*Material:* *Holotype*, male imago, VENEZUELA, Edo. Mérida, Rio La Mucuy, 2,000 m; 4/XII/1995. M.M. Chacón, S. Segnini, E. Domínguez col. male paratype, same data as holotype. Holotype in Universidad de Los Andes, Mérida, Venezuela; paratype in Instituto Miguel Lillo, Tucumán, Argentina.

*Etymology:* From the Tatuy word meaning 'Place of the dams'.

*Biology and habitat:* The adults were attracted by light, in complete darkness on a cloudy day. La Mucuy River is a turbulent, clear mountain stream. The day of collection, the temperature of the water oscillated between 11.8–13 °C. The width of the river-bed was about 5 m, most of it being shaded by riparian vegetation. The substratum was composed mainly of stones, with sand in slow current portions. The vegetation where the species was collected can be classified as wet mountain forest. More information on this river can be found in Chacón and Segnini (1996).

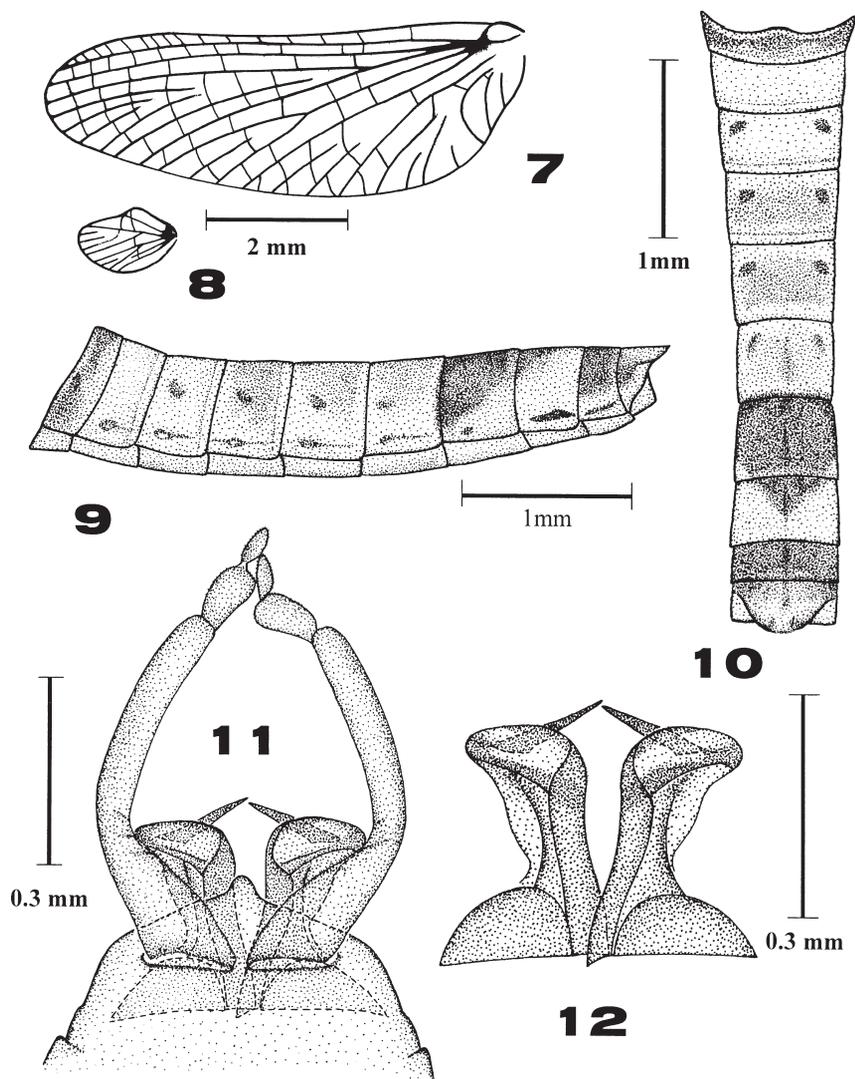
*Discussion:* *T. mucuy* can be distinguished from the male imagines of the other species by the following combination of characters: (1) In fore wings 4 cross-veins basal to bulla present; (2) basal half of main longitudinal veins yellowish, darker toward apex; (3) abdominal color pattern as in Figures 3, 4; (4) femora I with apical 1/3 covered with a yellowish-brown band; (5) penes and spine short and stout; external margin forming lateral pouch and recurved fold forming 'lapel'.

***Thraulodes guanare* sp. nov. (Figs. 7–12)**

*Male imago* (in alcohol, wings and genitalia on slide). Length: body, 6.7–7 mm; fore wings, 7.2–7.5 mm; hind wings, 1.5–1.8 mm. General coloration yellowish-brown; some abdominal segments translucent.

Head: Yellowish-brown, lighter between ocelli. Upper portion of eyes orangish-brown, lower portion grayish-black. Ocelli white, with base blackish. Antennae: scape and pedicel dark brown; flagellum whitish-brown.

Thorax: Pronotum grayish-brown, with white spots; mesonotum yellowish, uniformly washed with brown and with anterolateral orangish triangular spots. Metanotum yellowish-white, with two anterolateral marks and posterior margin brownish-black. Pleurae brownish-black with membranous parts whitish. Sterna



Figs. 7–12. *Thraulodes guanare*. 7, Fore wing; 8, hind wing; 9, abdominal segments I–X, lateral view; 10, abdominal terga I–X; 11, male genitalia, ventral view; 12, penis, detail.

yellowish-brown, with margins darker; area around articulations whitish. Wings (Figs. 7, 8): Membrane of fore and hind wings hyaline, black spot at base. 4 cross-veins basal and 13 distal to bulla in fore wings; veins of both wings yellowish-white. 7–8 cross-veins in hind wings. Legs: coxae, trochanter and basal 2/3 of femora whitish; apical 1/3 of femora reddish-brown, bordered with black (this band subapical in femora II and III); tibiae yellowish, with base and apex tinged

with black. Tarsi I–IV yellowish-white, tarsi V light brown. Hooked tarsal claws light brown, blunt one whitish, with a brown spot.

Abdomen (Figs. 9, 10): Tergum I yellowish, stained with dark brown; terga II–VI yellowish-translucent, with two light blackish spots close to anterior margins on segments III–VI (Fig. 10); terga IV–VI slightly washed with brown in medial area; terga VII–X orange-brown, with whitish areas on segments VII–VIII and X as in Figs. 9–10; tergum VIII with lateral blackish stripes; spiracular area blackish. Sterna I–VII yellowish-translucent, VIII–IX whitish; ganglia and connectives visible from below. Genitalia (Figs. 11, 12): Styliiger plate and forceps yellowish-white; penes yellowish. Penes relatively long and stout; spine long and narrow; apicolateral area forming an ‘ear’. External margin forming lateral pouch. Recurved fold parallel to internal margin (‘not forming lapel’). Caudal filaments whitish, with half of basal segments covered with a dark-brown band; in medial and apical segments alternately dark brown and white segments; intersegmental joints darker in all segments.

*Female imago* (in alcohol). Length: body, 6.5–7 mm; fore wings, 7–7.5 mm; hind wings, 1.1–1.3 mm. Similar to male imago, except as follows.

Head yellowish-white, with reddish stripes between lateral ocelli and posterior margin of head. Eyes grayish-black. Thorax: sclerites light yellowish-brown instead of the brown coloration present in males. Abdomen: terga I–VI light brown, with anterior margin of tergum I washed with black; terga VII–VIII as in male imago; terga IX–X reddish, with posterior margins of tergum X tinged with black. Black submedial spots on anterior margins of segments I–VII and IX. Two tenuous parallel black stripes along medial line of terga I–VII. Spiracular area unpigmented in all segments. Sterna translucent yellowish-white, except segments VIII and IX whitish.

Associations between male and female imagines from the same locality were based on similar leg color pattern and presence of black lateral stripes on tergum VIII.

*Nymphs*: Unknown.

*Material*: *Holotype*, male imago, VENEZUELA, Edo. Portuguesa, Rio Guanare, 200 m; 9/XII/1995. M.M. Chacón, S. Segnini, E. Domínguez col. *Allotype*, 7 male paratypes and 5 female paratypes, same data as holotype. *Holotype*, *Allotype*, 4 male and 3 female paratypes in Universidad de Los Andes, Mérida, Venezuela; 3 male and 2 female paratypes in Instituto Miguel Lillo, Tucumán, Argentina.

*Etymology*: From the Guaiba word ‘*guanare*’, name for a stone amulet. Also the name of the river where the species was collected.

*Variations*: In some of the male paratypes the mesothorax is much darker than in the holotype, and tergum VII of abdomen is washed more intensely with black.

*Biology:* The adults of *T. guanare* were attracted by light, in complete darkness. Along with this species, were attracted to the light trap specimens of *T. marreroi* sp. nov., *Baetis* (Baetidae), *Campsurus* (Polymitarcyidae), *Leptohyphes* and *Tricorythodes* (Leptohyphidae). The air temperature oscillated that day between 25 and 29°C. Guanare River is a slow, warm river, especially in the dry season (November to March). The river-bed was about 30 m wide, generally with low, patchy vegetation on its margins. The substratum was mainly composed of middle sized stones, with some sandy areas in the margins. The vegetation in the area can be classified as tropical dry forest.

*Discussion:* *T. guanare* can be distinguished from the male imagines of the other species by the following combination of characters: (1) In fore wings 4 cross-veins basal to bulla present; (2) main longitudinal veins yellowish; (3) abdominal color pattern as in Figures 9, 10, tergum VIII with lateral blackish stripes; (4) femora I with apical 1/3 covered with a reddish-brown band; (5) penes relatively long and stout, spine long and narrow; apicolateral area forming an 'ear'; external margin forming lateral pouch and recurved fold parallel to internal margin, not forming a 'lapel'.

*Thraulodes marreroi* sp. nov. (Figs. 13–18)

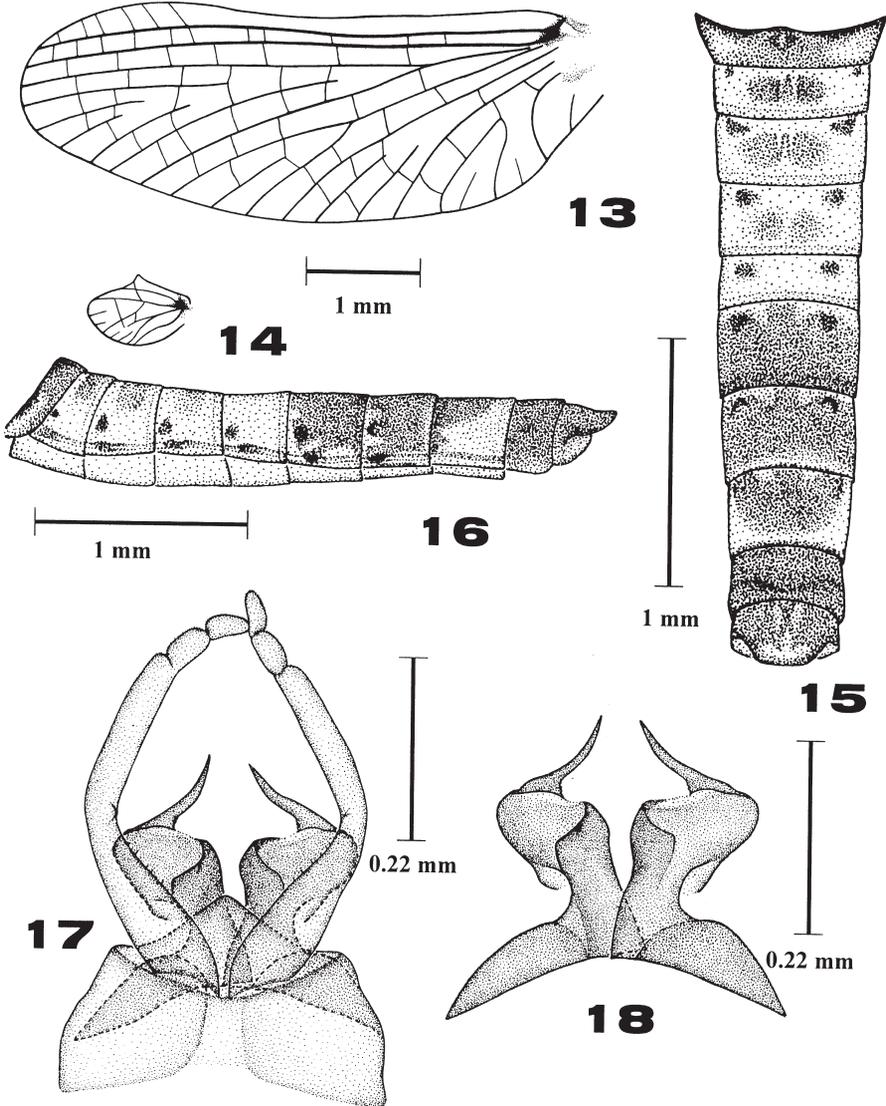
*Male imago* (in alcohol, wings and genitalia on slide). Length: body, 4.9–5.6 mm; fore wings, 5.1–6 mm; hind wings, 1.0–1.2 mm. General coloration light brown; some abdominal segments translucent, tinged with red.

Head: light brown, blackish on anterior margin. Upper portion of eyes yellowish-brown, lower portion blackish. Ocelli white, with base black. Antennae: scape and pedicel light brown; [flagellum broken-off and missing].

Thorax: pronotum yellowish-white at center, light brown toward lateral margins; mesonotum light brown, with scutellum II heavily washed with black and sutures black. Metanotum yellowish-brown, with posterior margins blackish. Pleurae brown, with membranous parts and areas surrounding bases of legs II, whitish. Sterna brown, with sutures blackish. Wings (Figs. 13, 14): Membrane of fore and hind wings hyaline, brownish-black spot at base. No crossveins basal and 7–10 distal to bulla in fore wings. Longitudinal veins in fore wings and basal half of longitudinal veins in hind wings yellowish, remaining veins translucent. 5–6 crossveins in hind wings. Legs: Legs I: coxae, trochanters and femora whitish, with apical 1/5 of femora covered by a tricolored spot, black basally, reddish in the middle and light brown close to articulation with tibiae; tibiae brown in the articulation with femora, whitish in the central 3/4, yellowish towards apex; tarsi yellowish. Tarsal claws grayish, margins black. Legs II and III: Coxae brownish, trochanters, femora and tibiae whitish; except apical 1/4 of femora covered by a

tricolored spot as in legs I. Tarsi light yellow, apical segments darker. Tarsal claws grayish-brown.

Abdomen (Figs. 15, 16): Tergum I reddish, washed with black on anterior margins; terga II–V translucent, with central area of terga II–IV tinged with red,



Figs. 13–18. *Thraulodes marreroi*. 13, Fore wing; 14, hind wing; 15, abdominal terga I–X; 16, Abdominal segments I–X, lateral view; 17, male genitalia, ventral view; 18, penis, detail.

black spots close to anterior margins on segments II–VII (Fig. 15); terga VI–X reddish, with anterior margins of segments VI–VII, and posterior margin and posterolateral corners of segment VIII with white areas as in Figures 15, 16; spiracular area and tracheae blackish. Sterna I–VI whitish, translucent, VII–VIII whitish. Genitalia (Figs. 17–18): Styliger plate whitish, margins tinged with brown; forceps light brown, lighter toward apex; penes light brown, spine orange. Penes long and stout; spine long and narrow; apicolateral area forming a small ‘ear’. External margin forming a small lateral pouch. Recurved fold slightly angulated. Caudal filaments whitish, with blackish bands, wider and more separated towards apex.

*Female imago and nymph*: Unknown.

*Material*: Holotype, male imago, VENEZUELA, Edo. Portuguesa, Rio Guanare, 200 m; 9/XII/1995. M.M. Chacón, S. Segnini, E. Domínguez col. 3 male paratypes, same data as holotype. Holotype, and 1 male paratype in Universidad de Los Andes, Mérida, Venezuela; 2 male paratypes in Instituto Miguel Lillo, Tucumán, Argentina.

*Etymology*: We take pleasure in naming this species after Dr. Crispulo Marrero, aquatic entomologist who helped us to collect this species.

*Variations*: In some of the male paratypes the marks on abdominal terga II–IV are yellowish-red instead of reddish, and the white areas on tergum VIII can cover also the lateral margins of the segment.

*Biology and habitat*: Same information as in *T. guanare*.

*Discussion*: *T. marreroi* can be distinguished from the male imagines of the other species of the genus by the following combination of characters: (1) In fore wings no crossveins basal to bulla; (2) main longitudinal veins yellowish; (3) abdominal color pattern as in Figures 15, 16, central area of terga II–IV tinged with reddish; (4) femora I with apical 1/5 covered with a tricolored spot; (5) penes long and stout, spine long and narrow; apicolateral area forming a small ‘ear’; external margin forming a small lateral pouch; recurved fold slightly angulated.

## REFERENCES

- Allen RK, Brusca RC (1978): Generic revisions of mayfly nymphs. II. *Thraulodes* in North and Central America. *Canad Entomol* 110: 413–433.
- Chacón MM, Segnini S (1996): Reconocimiento taxonómico de las nayades del Orden Ephemeroptera en la deriva de dos ríos de alta montaña en el Estado Mérida, Venezuela. *Bol Entomol Venez N. S.* 11: 103–122.
- Domínguez E (1987): El Género *Thraulodes* (Ephemeroptera: Leptophlebiidae) en la República Argentina. *Acta Zool Lilloana* 39: 47–65.
- Traver JR, Edmunds GF Jr (1967): A revision of the genus *Thraulodes* (Ephemeroptera: Leptophlebiidae). *Misc Pub Ent Soc Amer* 5: 349–395.
- Ulmer G (1943): Alte und neue Eintagsfliegen (Ephemeropteren) aus Süd- und Mittelamerika. *Stett. Entomol. Zeit.* 104: 14–46.

