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New records and combinations for Neotropical Leptophlebiidae (Ephemeroptera)

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Abstract

Several species of Leptophlebiidae (Atalophlebiinae) from South and Central America are given new generic combinations based on improved knowledge of the Leptophlebiidae of the region. These are: *Tikuna bilineata* (Needham & Murphy, 1924, *Choroterpes*) **comb. n.**; *Terpides vinculum* (Traver, 1947, *Choroterpes*) **comb. n.**; *Hermanella costalis* (Navás, 1934, *Thraulus*) **comb. n.**; *Ulmeritoides haarupi* (Esben-Petersen, 1912, *Thraulus*) **comb. n.** (synonyms *Deleatidium vittatum*, Thew, 1960 **syn. n.** and *Ulmeritoides fidalgoi* Domínguez, 1995 **syn. n.)**. In addition, we give new distribution records for *Tikuna bilineata*, report *Choroterpes* from Colombia, and describe *Hagenulus marshalli* **sp. n.** from Ecuador based on two male imagos. *Hagenulus marshalli* **sp. n** can be distinguished from other members of the genus by the asymmetrical fork of MP (small cross vein present) and the short, slightly twisted penes without apical spines. These are the first confirmed records for *Choroterpes*, *Tikuna* and *Hagenulus* from continental South America, extending *Hagenulus* from the Greater Antilles into Ecuador, *Choroterpes* from Central America into Colombia, and *Tikuna* from Costa Rica into Brazil, Colombia, Ecuador, Surinam and Venezuela.

Key words: Ephemeroptera, Leptophlebiidae, Neotropics, Atalophlebiinae, Hagenulus, Hermanella, Choroterpes, Terpides, Tikuna, *Ulmeritoides*

Introduction

Recent collaborative research has clarified the answers to a number of small, but important, questions on the systematics of the Leptophlebiidae of South America. We take this opportunity to consolidate this information and make it available in one place, thereby laying the groundwork for further studies. This paper includes new generic combinations

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based on improved knowledge of the Leptophlebiidae of the region. Several new geographic records are also included. A new species of *Hagenulus* from Ecuador, *H. marshalli*, is described. Also, the taxonomic status of other species is discussed.

Tikuna bilineata (Needham & Murphy) comb. n.

Choroterpes bilineata Needham & Murphy 1924:48; Traver 1947:156.

The genus *Tikuna* was established by Savage et al. (2005) and *Choroterpes atramentum* Traver, 1947, was designated as the type species. Following this publication, two species from South and Central America remain incorrectly placed in *Choroterpes*. The first, *Choroterpes bilineata* Needham & Murphy, 1924, originally described from female imagos and male subimagos from La Chorrera, Putumayo Dist., Peru (now a part of Colombia), also belongs to the genus *Tikuna*, requiring the new combination *Tikuna bilineata*. The holotype and paratypes (Cornell University) were studied by one of us (H.M. Savage); additional specimens deposited at the U. S. National Museum of Natural History, Florida A&M University, and the Zoologische Sammlung des Bayerischen Staates were recorded from Brazil, Ecuador, Surinam, and Venezuela. New records for *T. bilineata* follow:

BRAZIL: 1 female imago, Pará State, Rio Cururu, about 100 km above Mission Cururu, at light, 25–I–1962, E.J. Fittkau.

ECUADOR: Pastaza Prov., coll. J. Cohen: 37 female imagos, Tzapino, 32 km NE Tigueno, 1°11' S, 77°14' W, 400 m, 25–V–1976; 2 female imagos, Limoncocha (70 miles SE), 30–V–1976; 3 female imagos, Cononaco, 30–V–1976.

SURINAM: 1 female imago, Wijne Dist., Moengo, Boven, 1/28–V–1927, P.P. Babiy.

VENEZUELA: Zulia State: 1 male subimago, Dist. Mara, Río Socuy, Campamento Corpozulia, 50 km W of Carrasquero, 6/7–X–1979, H.M. Savage & R.A. Romero; 1 female imago, Perija El Tucuco, Mission El Tucuco, Río El Tucuco, 1/2 km from church, 1/5–X–1979, H.M. Savage.

Terpides vinculum (Traver) comb. n.

Choroterpes vinculum Traver, 1947:147.

A second species originally placed in *Choroterpes*, *C. vinculum* Traver, 1947, is actually a species of *Terpides*. *Terpides vinculum* new combination was described from a single female imago from Costa Rica. The holotype is in the collections of Florida A&M University and is sufficient for generic placement, but more material from the type locality is needed to discover the male and expand the description past the original work of Traver (1947).

***Choroterpes* sp.**

Although there are no described species of *Choroterpes* known from South America, we have two nymphs of a species of *Choroterpes* from Antioquia Province, Colombia, collected in 1983 by Humberto Moreno of Medellin University. This record is not unexpected based on several records of *Choroterpes* s.s. from Mexico (Eaton 1892; Allen & Brusca 1973; Lugo-Ortiz & McCafferty 1996) and Costa Rica (Instituto Nacional de Biodiversidad collections, verified by R.W. Flowers). These are the first confirmed specimens of *Choroterpes* from the continent of South America.

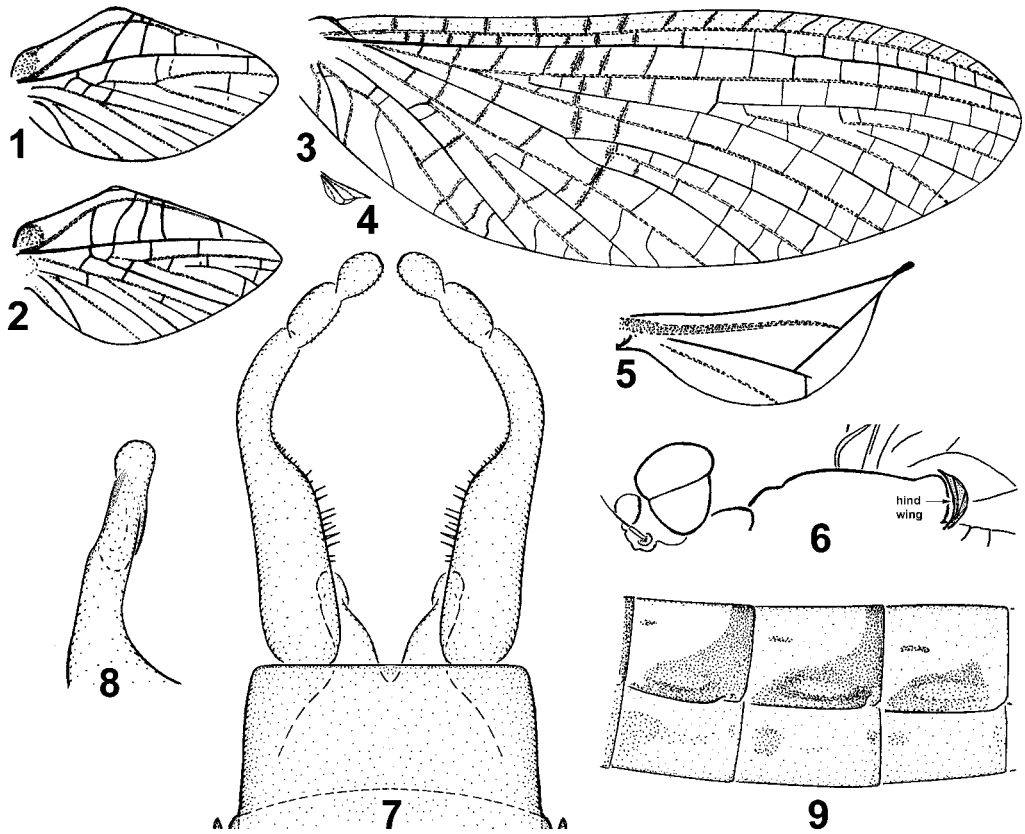
***Ulmeritoides haarupi* (Esben-Petersen) comb. n.**
(Figures 1–2)

Thraulus haarupi Esben-Petersen, 1912:337; Navás 1917:188.
Deleatidium haarupi; Ulmer, 1920:115; 1938:105; 1943:15.
Atalophlebioides haarupi; Traver, 1946:423.
Ulmeritus (*Ulmeritus*) *haarupi*; Traver, 1959:5; Thew, 1960:123; Domínguez, 1991:160.
Deleatidium vittatum Thew, 1960:130. **syn. n.**
Ulmeritoides fidalgoi Domínguez, 1995:23. **syn. n.**

Esben-Petersen (1912) originally described *Thraulus haarupi* from Bompland, Argentina, from a damaged female which lacked forelegs and cerci. He suggested that this represented a new genus but postponed any action because he did not know the male. Traver (1959) described a female from Uruguay that she attributed to this species although it differed in some characters from the description of *T. haarupi*—particularly size, absence of a median longitudinal line on the mesonotum, coloration of the prothorax (not discussed by Esben-Petersen), and shading on the basal, ventral margin of the metathoracic femur. This species was also treated in *Deleatidium* by Ulmer (1920, 1938, 1943) and *Atalophlebioides* by Traver (1946) based on the fact that it was not *Thraulus.* In 1956, Traver established the genus *Ulmeritus*, which she later divided into three subgenera (Traver 1959): *Ulmeritus*, *Ulmeritoides*, and *Pseudulmeritus*. She placed *T. haarupi* in *Ulmeritus* s.s. based on the hind wing. *Ulmeritoides* was raised to generic status in 1991 and the subgenus *Pseudulmeritus* was synonymized with *Ulmeritoides* (Domínguez 1991).

In 1960, Thew described *Deleatidium vittatum* from Nova Teutônia, Santa Catarina State, Brazil, from two female imagos. He gave no illustrations, but did give a detailed description of coloration. This description matches Traver's (1959) female "*U. haarupi*" from Uruguay, except that Thew did not mention the heavier basal shading on the metathoracic femur described by Traver.

In 1995, Domínguez described another species, *Ulmeritoides fidalgoi*, from male and female imagos and nymphs, also from Bompland, Argentina.



FIGURES 1–9. Figs. 1–2: Hind wings from two female paratypes of *Ulmeritoides fidalgoi*. Figs. 3–9: *Hagenulus marshalli* sp. n., male: 3, forewing; 4, hind wing (proportional); 5, hind wing enlarged; 6, lateral outline of head and thorax showing position of hind wing; 7, genitalia, ventral view; 8, detail of penis lobe; 9, lateral view of abdominal segments 4–6. Concave longitudinal veins stippled in Figs. 1–5.

We (J.G. Peters and R.W. Flowers) have examined the holotypes of *Thraulus haarupi* and *Deleatidium vittatum*, and four paratype females of *Ulmeritoides fidalgoi*. Venation of the holotype of *Thraulus haarupi* is as illustrated by Esben-Petersen (1912), but all color has faded. The holotype of *Deleatidium vittatum* is an *Ulmeritoides* in good condition and the wing venation, reddish brown costal strip, and heavy costal cross veins are still clear; however, body colors are faded. Thus, it is necessary to use the original descriptions by Esben-Petersen (1912) and Thew (1960) for most details of coloration. The paratypes of *Ulmeritoides fidalgoi* retain a good color pattern, including caudal filaments with dark annulations as described by Thew for *Deleatidium vittatum*. The range of forewing length (9 mm to 11 mm) for described and examined specimens of *Ulmeritoides fidalgoi* encompasses the sizes of *Ulmeritus haarupi* and *Deleatidium vittatum*, and the costal wing mark-

ings are identical for all. All described female pronota appear to fall within the range of *U. fidalgoi*, although these details were not given by Esben-Petersen (1912). The presence of a fine longitudinal dark brown line on the mesonotum of *U. haarupi* represents a variation found in *U. fidalgoi*, and the median longitudinal suture may appear lighter or darker depending on source of illumination. The position of the costal projection and length of vein Sc of hind wings differs in males and females; in the hind wing of *U. haarupi* this falls within the variation visible for *U. fidalgoi* (Fig. 1–2). Traver's (1959) concept of *U. haarupi* and Thew's description of *Deleatidium vittatum* match *Ulmeritoides fidalgoi* exactly—with the single exception that Thew did not mention the extent of shading on the ventral base of the metathoracic femora. As the extent of this shading seems to be the only character separating these species, and it is often undescribed or variable, we consider *U. haarupi*, *D. vittatum*, and *U. fidalgoi* to be conspecific, with *Ulmeritoides haarupi* the senior name.

***Hermanella costalis* (Navás) comb. n.**
(Figures 10–15)

Thraulus costalis Navás, 1934:26; Traver, 1960:73.

Thraulus costalis Navás, 1934, was described from Brazil (Barão Homem de Mello, Rio de Janeiro) from a male imago in poor condition. Traver (1960) stated that it was not *Thraulus*, but she did not reassign the species. Photographs of the holotype were prepared by C. Kutzscher of the Deutsches Entomologisches Institut im ZALF; P. Grant, who examined the holotype in 1985, provided additional notes on its genitalia. The wings (Fig. 10–11) and genitalia (Fig. 14–15) clearly place the species in the *Hermanella* generic complex as defined by Domínguez & Flowers (1989), but the condition of the styliger plate (blunt median protuberance and no paired dorsal projections) does not fit the definition of any described genus of the complex. Also, the ventral projection on each penis lobe is broad in *Hermanella* and slender in *T. costalis*. Although *T. costalis* is not a species of *Hermanella* in the restricted sense, we prefer not to establish a new genus until the nymphs are known, and thus treat this species as *Hermanella costalis* (Navás) new combination. A set of figures of the imago is included for purposes of future identification (Fig. 10-15). Note that the torn hind wing is hyaline and that the color in Fig. 11 is that of the body showing behind the wing. The only hind wing color is a brown basal strip in the costal area (Fig. 12).

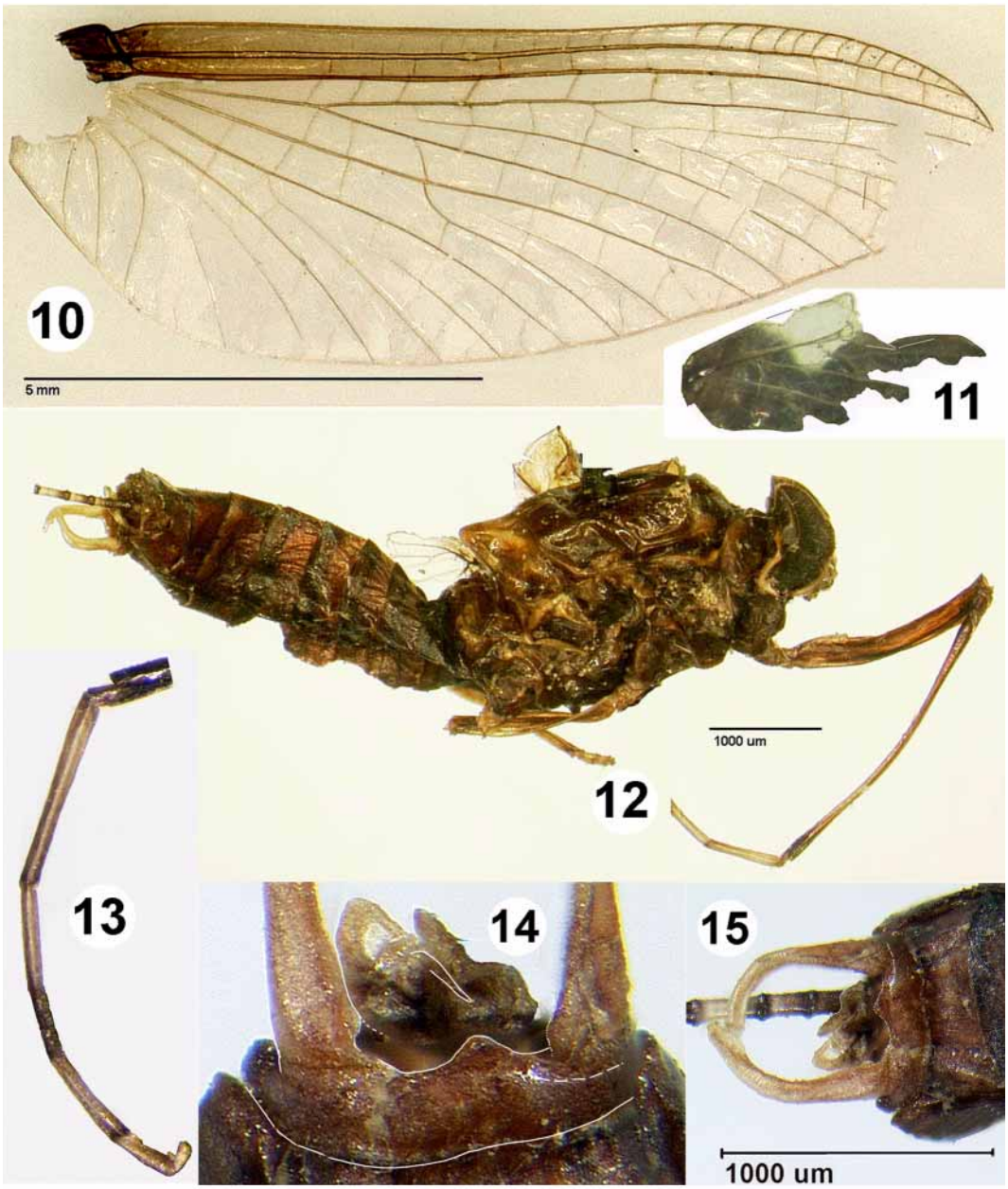


FIGURE 10–15, holotype of *Thraulus costalis*: 10, fore wing; 11, hind wing enlarged (actual size about 1.5 mm); 12, lateral view of body (with left foreleg); 13, detail of foretarsal segments (outer surface); 14–15, male genitalia with detail. Photographs by C. Kutzscher. (Editing: Fig. 12, pin removed; Fig. 11, 14–15 details outlined.)

***Hagenulus marshalli* sp. n.**
(Figures 3–9)

This new species is represented by two unassociated male imagos in good condition from Ecuador. Because it represents a significant generic record for South America, it is

described now even though nymphs and females are unknown. Previously, *Hagenulus* was believed to be restricted to the greater Antilles (Cuba, Haiti, Jamaica and Puerto Rico).

Male imago (in alcohol). Body: 6.0–6.5 mm, forewings 6.8–7.2 mm, hind wing 0.7 mm; foreleg 6.5–7.3 mm; cerci 12.5 mm. Head brown, dorsal portion of eyes meeting on meson of head, ocelli large. Pronotum light brown, heavily washed with blackish brown on median carina and laterally; meso- and metanotum yellowish brown, pleural area extending anteriorly from forewing to pronotum washed with darker brown. Pro- and mesosternum brown, mesobasisternum a little lighter, median margins of mesofurcasternal protuberances darker; metasternum heavily washed with blackish brown. Forewings: Sc brown, R a lighter brown, other longitudinal veins pale yellow-brown to hyaline, cross veins dark brown, surrounded by small blackish brown clouds in basal half of wing, clouds heaviest medially (Fig. 3), membrane of costal and subcostal area pale golden brown, the color fading to hyaline throughout remainder of wing membrane. Hind wings with reduced venation, veins and membrane pale yellow-brown to hyaline (Fig. 4–5); hind wings curved dorsally over scutellum (Fig. 6). Legs: ratios of foreleg segments to tibia (length of tibiae 2.9–3.1 mm): femur 0.46–0.49: tarsal segments 0.03; 0.32–0.34; 0.22–0.29; 0.13–0.14; 0.06–0.07; femur of foreleg brown, faded to pale brown basally and a little darker medially; remainder of foreleg segments with tibia pale yellowish brown and tarsal segments paler, a narrow dark brown band near apex of tibia, apical third to apical half of tarsal segments 2–4 darker brown, tarsal segments 1 and 5 without color markings; other legs with light yellowish brown femora, tibiae and tarsi paler. Abdominal tergum 1 light brown with narrow blackish brown posterior margin and lateral area; terga 2–5 hyaline with short, anterior sublateral dark streaks and blackish brown posterior band extended laterally and anteriorly as in Fig. 9; terga 6 and 7 with similar lateral patterns, although posterior bands reduced or absent; terga 8–10 opaque, light brown, with anterior blackish brown wash on terga 8–9, tergum 10 with only anterior submedian streaks. Abdominal sterna 1 and 2 heavily washed with blackish brown, wash continuing anterolaterally and anterosubmedially to sternum 3; sterna 4–8 with light blackish brown markings anterolaterally, marks progressively reduced in size on posterior sterna; sternum 9 light yellowish brown. Genitalia: styliger plate light brown; forceps pale yellow-brown; penes light brown, divided to near base, divergent, without spines, penes somewhat twisted as in Fig. 7–8. Cerci hyaline with blackish brown rings at articulations; median filament broken off and missing.

Etymology: species is named for G. B. Marshall who assisted C. W. and L. B. O'Brien in the collection of many aquatic insects in South America.

Material: Holotype, one male imago, Ecuador: 30 km W of Puyo, 27–IV–1978, L.B. & C. W. O'Brien; paratype, one male imago, same data as holotype. Deposited in collections of Florida A&M University.

Diagnosis: *Hagenulus marshalli* sp. n. can be distinguished from all other described species of *Hagenulus* by the following characters: 1) fork of vein MP in the forewing not symmetrical (MP_2 attached to MP_1 at a cross vein as in Fig. 3); 2) penes without spines and slightly twisted (Fig. 7–8); and 3) color pattern as illustrated in Fig. 9.

Discussion: The variation in foreleg ratios is mostly due to a relatively short third tarsal segment on one of the paratype forelegs. All forelegs were present, but only two other legs of a potential eight were found loose in the vial. The color pattern was the same on both, but it is not known if these were meso- or metathoracic legs or to which specimen each belonged. Both are placed with the holotype. The intensity of color on abdominal segments 8–10 and on the mesosternum is lighter in the holotype than in the paratype.

In the forewings, MP_2 is closely tied to MP_1 by a short cross vein, not joined symmetrically as in other species of *Hagenulus*. Nevertheless, this species is clearly a member of the *Hagenulus* group of genera because of the unique shape of the hind wing, the attachment of ICu_1 to CuP, and forceps typical for the genus.

Kluge (1994) treated as subgenera all members of the *Hagenulus*-group from Cuba previously treated as genera by Peters (1971), including *Hagenulus*, *Borinquena, Careospina,* and *Traverina*, and established two new subgenera, *Poecilophlebia* and *Turquinophlebia*. One species *Hagenulus* (*Careospina*) *evanescens* Kluge, 1994, has the characteristic hind wing of *Hagenulus,* penes somewhat similar to *Hagenulus marshalli* sp. n. , a female with a short ovipositor, and nymphs without filter-feeding adaptations. In addition to wing characters, nymphs of the type species of *Hagenulus (H. caligatus* Eaton, 1882) and a second Cuban species (*H. morrisonae* Peters, 1971) have unique nymphs with filter-feeding adaptations. For this reason, Kluge (1994) removed all non-Cuban species of *Hagenulus* from the subgenus *Hagenulus* as their nymphs were not known with certainty, but he did not give them any new taxonomic placement. The same problem applies to *Hagenulus marshalli* sp. n., which also might represent a species of *Careospina* from which it would then be distinguished by the heavy coloration of the wing, the asymmetrical MP fork, and male eyes which meet dorsally. Staniczek (2003) described one new genus (*Hagenulites*) and three new species of the genus *Borinquena* from Dominican amber (Tertiary: Eocene to Miocene); genera and species described by Staniczek all possess a symmetrical MP fork. The asymmetrical MP fork in *Hagenulus marshalli* n. sp. eventually may indicate a new genus, but it seems best to delay such action until females and nymphs are known. At present, we prefer to retain described species of *Hagenulus* in this, the oldest genus, and to treat all of Kluge's (1994) subgenera as genera until more extensive revisionary work is completed.

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