

Three new species of *Anacroneuria* Klapálek (Plecoptera: Perlidae) from Panama

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Abstract

In Central America, the Plecoptera is represented by the genera *Anacroneuria* and *Perlesta*, both from the Perlidae family. A total of 45 species have been reported for the region, of which 16 have been found in Panama, all of the genus *Anacroneuria*. Three new species for Panama are described in this study: *Anacroneuria darien*, *A. embera*, and *A. laru*.

Key words: Central America, Darién, Mesoamerica, stonefly

Resumen

En Centroamérica, el orden Plecoptera está representado por los géneros *Anacroneuria* y *Perlesta*, ambos de la familia Perlidae. Un total de 45 especies han sido reportadas para la región. En Panamá se han reportado 16 especies, todas del género *Anacroneuria*. En este trabajo se describen tres especies nuevas para Panamá: *Anacroneuria darien*, *A. embera* y *A. laru*.

Palabras claves: Centroamérica, Darién, Mesoamérica, plecóptero

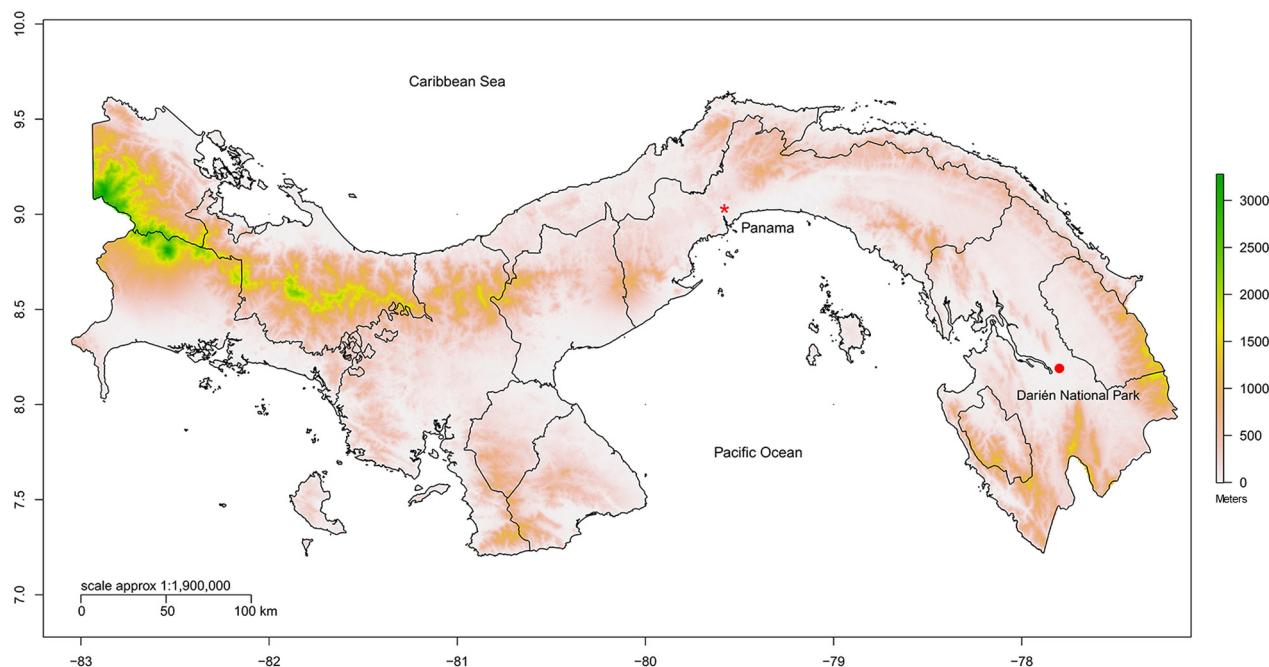
Introduction

Two stonefly genera have been reported for Central America, *Anacroneuria* Klapálek 1909 and *Perlesta* Banks 1906, both from the Perlidae family. *Anacroneuria* is widely distributed from the southern United States to north of Argentina and Bolivia, whereas *Perlesta* is North American but was recently reported for the Central America (Gutiérrez-Fonseca & Springer 2011). *Anacroneuria* is the most speciose genus in the Plecoptera with at least 330 species recorded from the Neotropical Region and 45 species reported for Central America (Froehlich 2010, Stark 2014).

Anacroneuria is the only Plecoptera genus reported for Panama. The first mention of stoneflies from Panama was made by Klapálek (1922, 1923), Needham and Broughton (1927) and Jewett (1958). It was not until Harper (1992) that a more extensive study of the stoneflies of Panama was made available, reporting nine species. However, several unnamed specimens are known (Froehlich 2010). Recently, Stark (1998, 2014) studied the *Anacroneuria* species of Costa Rica and Panama, increasing the number of records and recognizing some of the species left unnamed by Harper (1992). Table 1 shows the current list of the known *Anacroneuria* species for Panama, as well as references for the most recent and complete descriptions of male, female and nymphs. In this study, three new species are described for Panama, based on specimens collected in Darién National Park.

TABLE 1. List of known *Anacroneuria* (Plecoptera: Perlidae) species from Panama.

Species	Male	Female	Nymph
<i>A. acutipennis</i> Klapálek, 1923	Stark 1998	Stark 1998	Unknown
<i>A. annulipalpis</i> Klapálek, 1922	Stark 1998	Stark 1998	Unknown
<i>A. azul</i> Rojas & Baena, 1999	Rojas & Baena in Stark <i>et al.</i> 1999	Unknown	Unknown
<i>A. benedettoi</i> Stark, 1998	Stark 1998	Stark 1998	Gutiérrez-FONSECA & Springer 2011
<i>A. blanda</i> Needham & Broughton, 1927	Stark 1998	Stark 1998	Unknown
<i>A. curiosa</i> Stark, 1998	Stark 1998	Unknown	Unknown
<i>A. harperi</i> Stark, 1998	Stark 1998	Stark 1998	Unknown
<i>A. lineata</i> (Navás, 1924)	Stark 1998	Stark & Kondratieff 2004	Gutiérrez-FONSECA & Springer 2011
<i>A. litura</i> (Pictet, 1841)	Stark & Kondratieff 2004	Stark & Kondratieff 2004	Unknown
<i>A. magnirufa</i> Jewett, 1958	Stark 1998	Stark 1998	Unknown
<i>A. marca</i> Stark, 1998	Stark 1998	Stark 1998	Gutiérrez-FONSECA & Springer 2011
<i>A. planicollis</i> Klapálek, 1923	Stark 1998	Stark 1998	Unknown
<i>A. talamanca</i> Stark, 1998	Stark 1998	Stark 1998	Fenoglio 2007
<i>A. totumas</i> Stark, 2014	Stark 2014	Unknown	Unknown
<i>A. varilla</i> Stark, 1998	Stark 1998	Stark 1998	Gutiérrez-FONSECA & Springer 2011
<i>A. zarpa</i> Stark, 1998	Stark 1998	Unknown	Unknown

**FIGURE 1.** Site collection (red circle) at Darién National Park, Panama.

Material and methods

Study site. This study was conducted at Darién National Park ($7^{\circ} 12'$, $8^{\circ} 31'$ N; $77^{\circ} 09'$, $78^{\circ} 25'$ W) located in southeastern Panama (Fig. 1). Darién National Park has an area of 575,000 ha, extending across an elevation range of 0 to 1875m asl, making this park one of the largest protected areas in Central America.

The material was collected in 17–21 November 2014, at the Darién field station near to the Perresenico stream and several tributaries ($8^{\circ} 01' 10.41''$ N; $77^{\circ} 44' 17.44''$ W). The Perresenico stream is a first order stream bordered by mature forest. Dominant substrata are sand, rock, and abundant leaf litter.

Specimen collection and preparation. Most specimens were collected with light traps operated from 16:00 to 21:00h. Direct collection of newly emerged specimens was also conducted in the Perresenico stream before dawn. All specimens were preserved in 80% ethanol.

The abdomen apex was cut and placed in 4% KOH, allowed to stand in the solution for 24 hours, and then the aedeagus was removed from the genital capsule for subsequent study and drawing. Drawings of ventral, dorsal, and lateral views were performed, as well as the 9th abdominal sternum of the male and female subgenital plate. The specimens are deposited in the following collections, as indicated in the text.

MIUP	Museo de Invertebrados G. B. Fairchild, Universidad de Panamá, Ciudad de Panamá, Panamá.
PEGFC	Pablo E. Gutiérrez-Fonseca Collection, University of Puerto Rico, San Juan, Puerto Rico
USNM	United States National Museum of Natural History, Washington, D.C., U.S.A.

Results

Anacroneuria darien, sp. n.

(Figs. 2–7)

Material examined. Holotype ♂ (USNM), **Panama:** Darién, Darién National Park, field station near to the Perresenico stream, $8^{\circ} 01' 10.41''$ N; $77^{\circ} 44' 17.44''$ W, 94 m asl, 17–22 November 2014, R. Salas, PE Gutiérrez Fonseca, light trap. Paratypes: 1♂, 3♀ (PEGFC). Same location. 1♂, 2♀ (MIUP). Same location.

Adult habitus. General color yellow. Head yellow, with a small brown spot, very diffuse, between ocelli; antennae brown with base yellow. Pronotum yellow, sides with a soft light brown, and margin yellow. Femora mostly yellow with a dark apical band. Tibiae dark yellow with a dark apical band. Wing membrane transparent, veins yellow. Cerci yellow (Fig. 2).

Male. Forewing length 9.5–10 mm. Hammer thimble-shaped, with height subequal to apical diameter (Fig. 3). Aedeagal apex simple, rounded at tip; shoulders project slightly, giving apex a trilobed appearance (Fig. 4). Lateral aspect of aedeagus with acute tip (Fig. 5). Ventral membranous lobes large, covering shoulders and most of apex (Fig. 6). Dorsal keel absent, aedeagal hooks slender.

Female. Forewing length 11.5–12.5 mm. Body coloration similar to male. Subgenital plate with four subequal lobes, median notch deep and V-shaped. Mesal sclerite of sternum 9 V-shaped; sterna covered with short fine setae, lateral areas sparsely clothed with large setae (Fig. 7).

Nymph. Unknown.

Etymology. The species name, based on the type locality at the Darién National Park, is used as a noun in apposition.

Comments. *Anacroneuria darien* is similar to *A. curiosa* Stark 1998. However, the lateral bands of the pronotum are dark brown in *A. curiosa* and light brown in *A. darien*. The aedeagus is also similar to that of *A. curiosa*, but *A. darien* lacks a dorsal keel. The aedeagus of *A. darien* is also similar to the Colombian species *A. albimacula* Klapálek 1921 (Stark *et al.* 1999), differing in several structures, such as the membranous lobes. These species also differ in their pronotal stripes. In addition, the description of the subgenital plate of *A. darien* is very similar to the description of *Anacroneuria* sp. F. by Harper (1992). However, the pronotum of *Anacroneuria* sp. F. is pale with two narrow sublateral darker stripes.

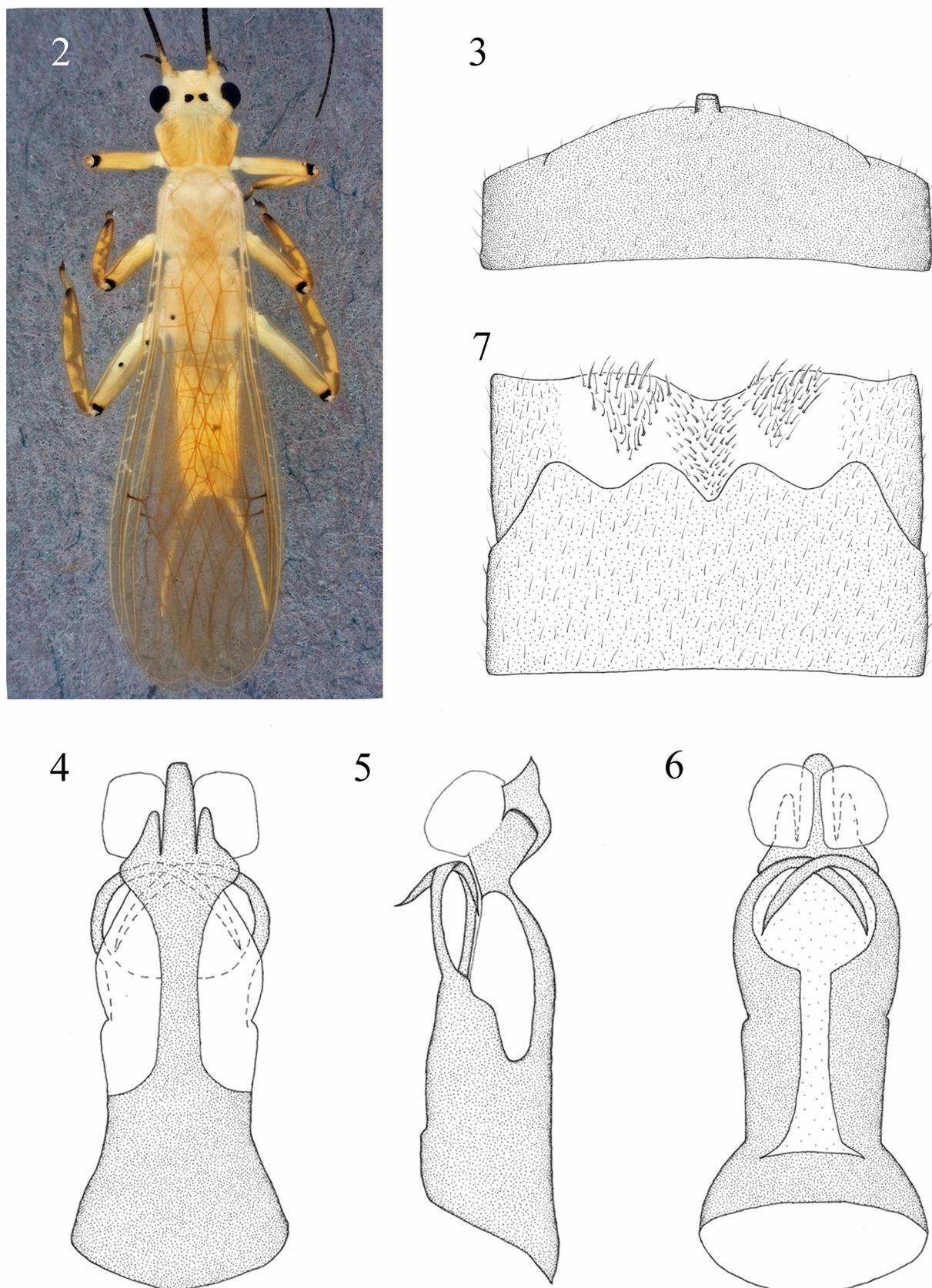
Anacroneuria laru, sp. n.

(Figs. 8–13)

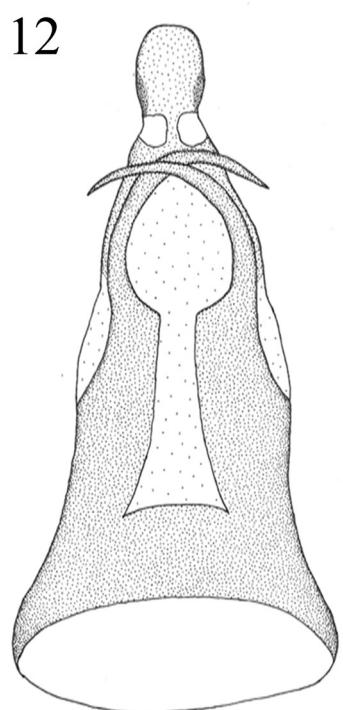
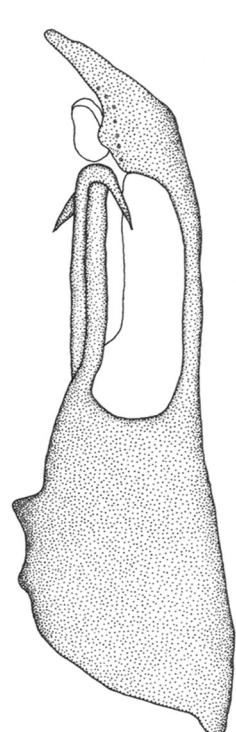
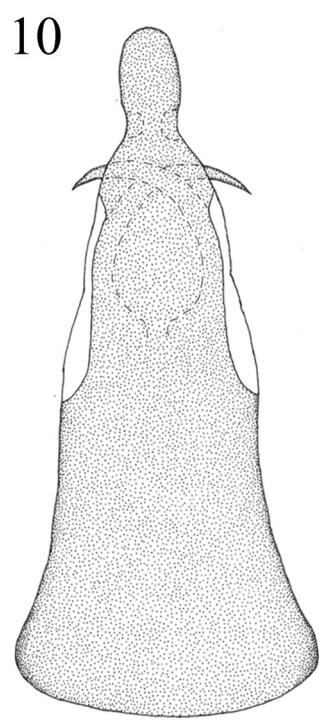
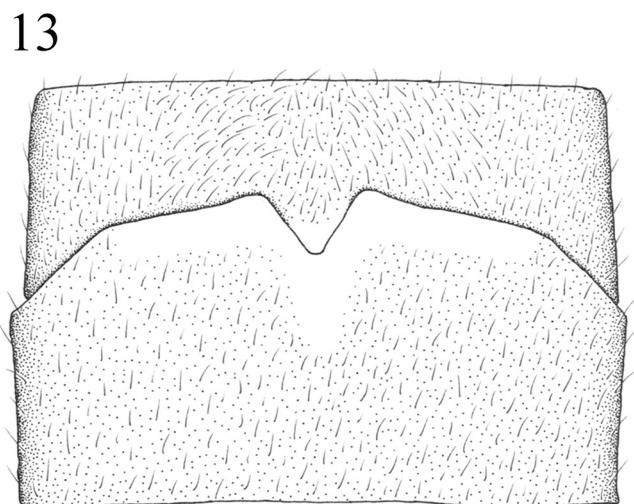
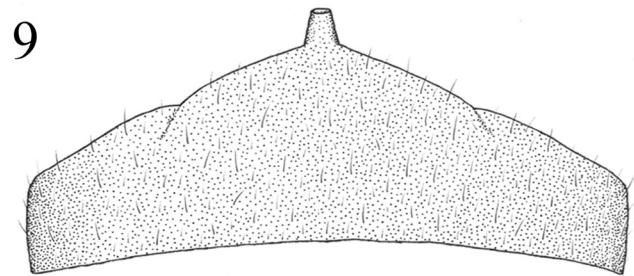
Material examined. Holotype ♂ (USNM), **Panama:** Darién, Darién National Park, field station near to the Perresenico stream, $8^{\circ} 01' 10.41''$ N; $77^{\circ} 44' 17.44''$ W, 94 m asl, 17–22 November 2014, R. Salas, PE Gutiérrez Fonseca, light trap. Paratypes: 1♂, 2♀ (PEGFC). Same location. 1♂, (MIUP). Same location.

Adult habitus. Head with dark brown lateral stripes, mid stripe yellow; stripe patterns extend to the pronotum, antennae evenly dark brown. Pronotum with median stripe yellow and lateral stripes dark brown. Fore femora banded in two sections, base section yellow and apical section dark. Most of mid and hind femora yellow, but apical ends

dark. Fore tibiae dark, mid and hind light brown, but with a dark apical band. Wing membrane and veins dark brown. Cerci lightly brown at the base (Fig. 8).



FIGURES 2–7. *Anacroneuria darien* sp.n. 2, habitus. 3, male sternum. 4, aedeagus dorsal. 5, aedeagus lateral. 6, aedeagus ventral. 7, female sterna 8 and 9.



FIGURES 8–13. *Anacroneuria laru* sp.n. 8, habitus. 9, male sternum. 10, aedeagus dorsal. 11, aedeagus lateral. 12, aedeagus ventral. 13, female sterna 8 and 9.

Male. Forewing length 7–8 mm. Hammer thimble-shaped, height more than apical diameter (Fig. 9). Aedeagal apex long and slender, scoop-shaped with rounded tip (Fig. 10). Lateral aspect of aedeagus spoon-shaped, distinctively arched (Fig. 11). Ventral membranous lobes small (Fig. 12). Dorsal keel absent, hooks slender.

Female. Forewing length 9 mm. Body coloration similar to male. Subgenital plate bilobed, lobes about equal in length, with median notch V-shaped. Mesal field of sternum 9 uniformly covered with moderately long pale setae (Fig. 13).

Nymph. Unknown.

Etymology. Species name is in honor to biologist Luis Alonso Ramírez Ulate, of initials “laru”, for his outstanding contribution to the organization and consolidation of Macrolatinos, a Latin American network of aquatic scientists.

Comments. The aedeagus of this species is similar to the Mexican species *A. hoogstraali* Jewett, 1958, with the apex spoon-shaped in lateral view and with small membranous lobes (Stark & Kondratieff 2004). However, the pigment patterns in the pronotum and head of these species are markedly different.

Anacroneuria embera, sp. n.

(Figs. 14–18)

Material examined. Holotype ♂ (USNM). **Panama:** Darién, Darién National Park, field station near to the Perresenico stream, 8° 01' 10.41"N; 77° 44' 17.44" W, 94 m asl, 17–22 November 2014, R. Salas, PE Gutiérrez Fonseca, light trap.

Adult habitus. Head with dark pigment over ocelli, extending forward to M-line; antennae mostly brown. Median pronotal stripe yellow, midlateral stripes brown, margin yellow. Femora mostly yellow but with a dark apical band. Tibiae dark yellow. Wing membrane light brown, veins dark brown. Cerci yellow brownish (Fig. 14).

Male. Forewing length 9 mm. Hammer thimble-shaped, height more than apical diameter (Fig. 15). Aedeagal apex simple, slender and truncate at tip, finger-shaped; shoulders project slightly, giving apex a trilobed appearance (Fig. 16). Lateral aspect of aedeagus with spoon-shaped tip (Fig. 17). Ventral membranous lobes small (Fig. 18). Dorsal keel small, triangular and extending to the shoulder. Hooks slender at base but stout in apical half.

Female. Unknown.

Nymph. Unknown.

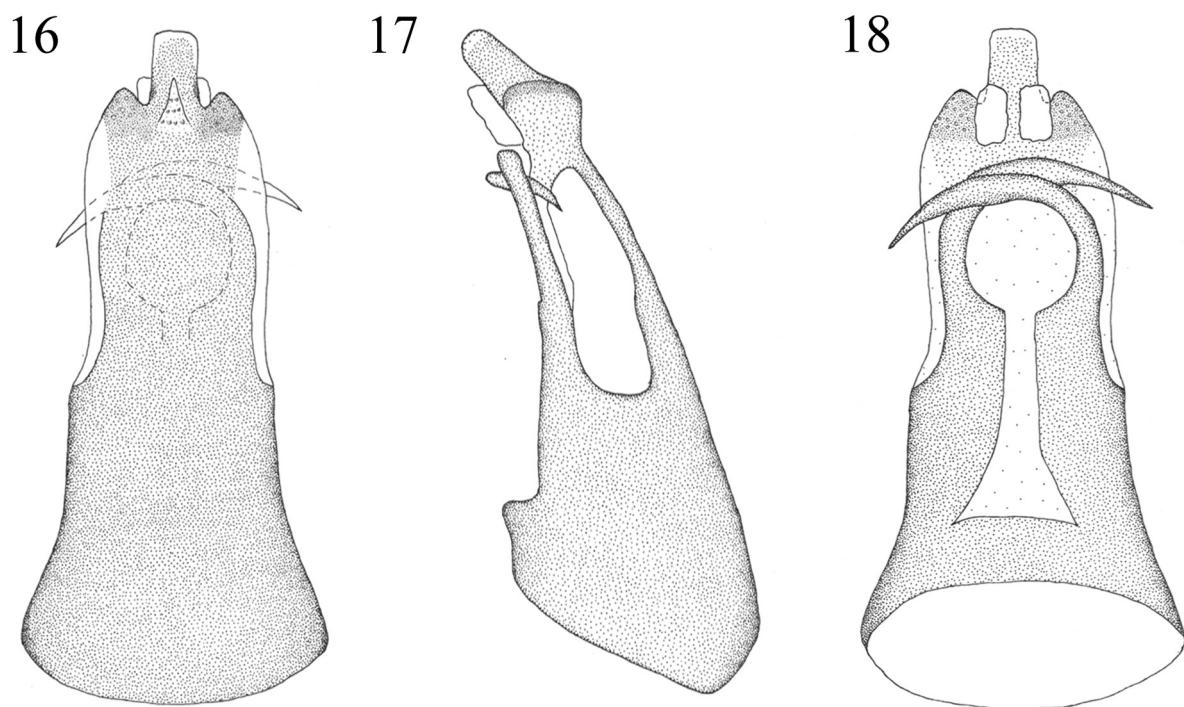
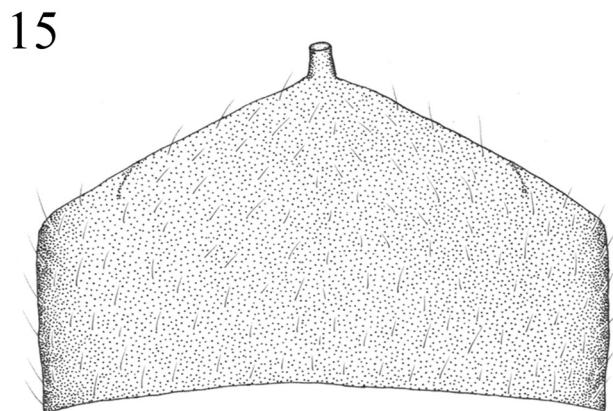
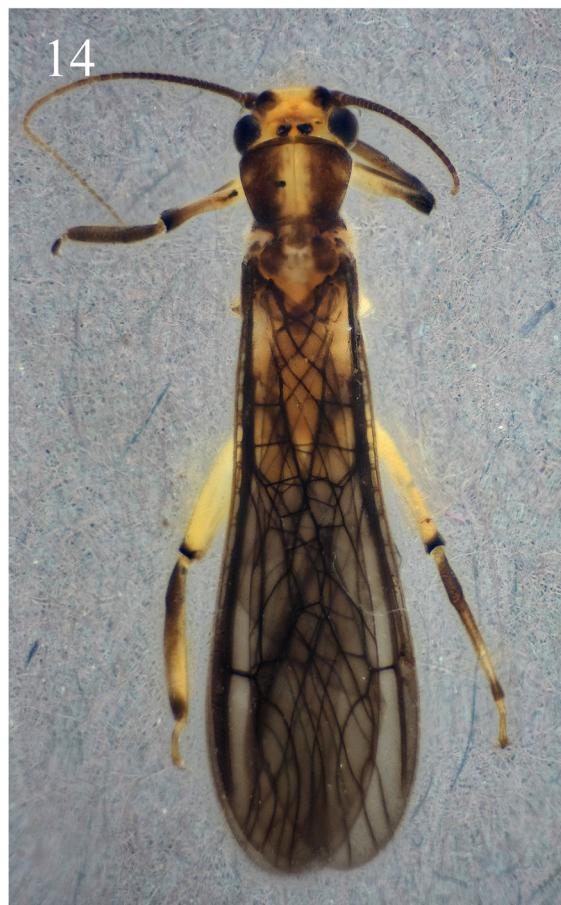
Etymology. The species name honors the Emberá people of Panama, native to the Darien area, and is used as a noun in apposition.

Comments. This species resembles *A. uatsi* Stark 1998 known from Costa Rica and Honduras. However, *A. uatsi* has brown marginal pronotal stripes and lacks membranous ventral lobes of the aedeagus.

Discussion

This study increases the list of formally recognized Panama stoneflies to 19 species. The males of all species are known, while the females of 15 species have been described. It is surprising that the nymphs of 14 *Anacroneuria* species of Panama remain unknown, which should encourage more studies associating nymphs with adults.

The total number of Plecoptera species reported for Panama is relatively low to reports from adjacent countries. There are 30 described species in Costa Rica, while 61 species have been reported in Colombia and 33 in Venezuela. Thus, there is good reason to expect that more species of stoneflies can be found in Panama, which should serve as an incentive to conduct more taxonomic studies in this region.



FIGURES 14–18. *Anacroneuria embera* sp.n. 14, habitus. 15, male sternum 9. 16, aedeagus dorsal. 17, aedeagus lateral. 18, aedeagus ventral.

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