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The Plecoptera of Panama. III. The genus *Anacroneuria* (Plecoptera: Perlidae) in Panama's national parks: 2017 survey results

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Abstract

Two new species of *Anacroneuria* are described. *Anacroneuria bandido* **sp. n.** is described from Coclé and Veraguas provinces of central Panama, and *A. tuberculata* **sp. n.** is proposed to provide a new name for a species previously identified from Costa Rica as *A. magnirufa* Jewett, 1958. New locality records are presented for eight species previously reported from Panama. The female of one species from Bocas del Toro province is described under an informal designation. There are now 26 recognized species of Plecoptera known from Panama.

Key words: Plecoptera, Perlidae, *Anacroneuria*, Panama, new species, new records

Introduction

In 2017, a new project was initiated involving biological surveys of Panama's national parks. Designated Proyecto Sistema de Producción Sostenible Conservación de la Diversidad (PSPSCD). This project was managed by Panama's Ministerio de Ambiente and, in collaboration with the Instituto Commemorativo Gorgas de Estudios de la Salud (Gorgas Institute), executed by their Colección Zoológica Dr. Eustorgio Méndez (COZEM). Primary funding was provided by the World Bank. The various components of this project included one on aquatic invertebrates. This paper reports on the results of the first year (2017) of collecting for the aquatic insect order Plecoptera, or stoneflies.

All stoneflies known from Panama are species included in the perlid genus *Anacroneuria* Klapálek, 1909. The history of research and publications for this genus in Panama was summarized by Stark and Armitage (2018). In this paper, one new species is added to the Panama stonefly fauna, increasing the total known species to 26. One additional potential species (unassociated females) is described under an informal designation (*Anacroneuria* PA-4). We also provide a new name for a species previously misidentified from Costa Rica.

Among the material studied herein were male and female adults of *A. magnirufa* Jewett, 1958, a species originally described from a female holotype from El Volcán, Chiriquí Province, Panama. However, the concept of the male of this species was based on specimens from Costa Rica (Stark 1998). The Panamanian males and females studied for this paper are considered the true *A. magnirufa,* and the closely related species from Costa Rica as treated by Stark (1998) is given a new name.

Material and methods

Panama has been divided into 52 hydrographic basins (cuencas), established as a result of the Central American

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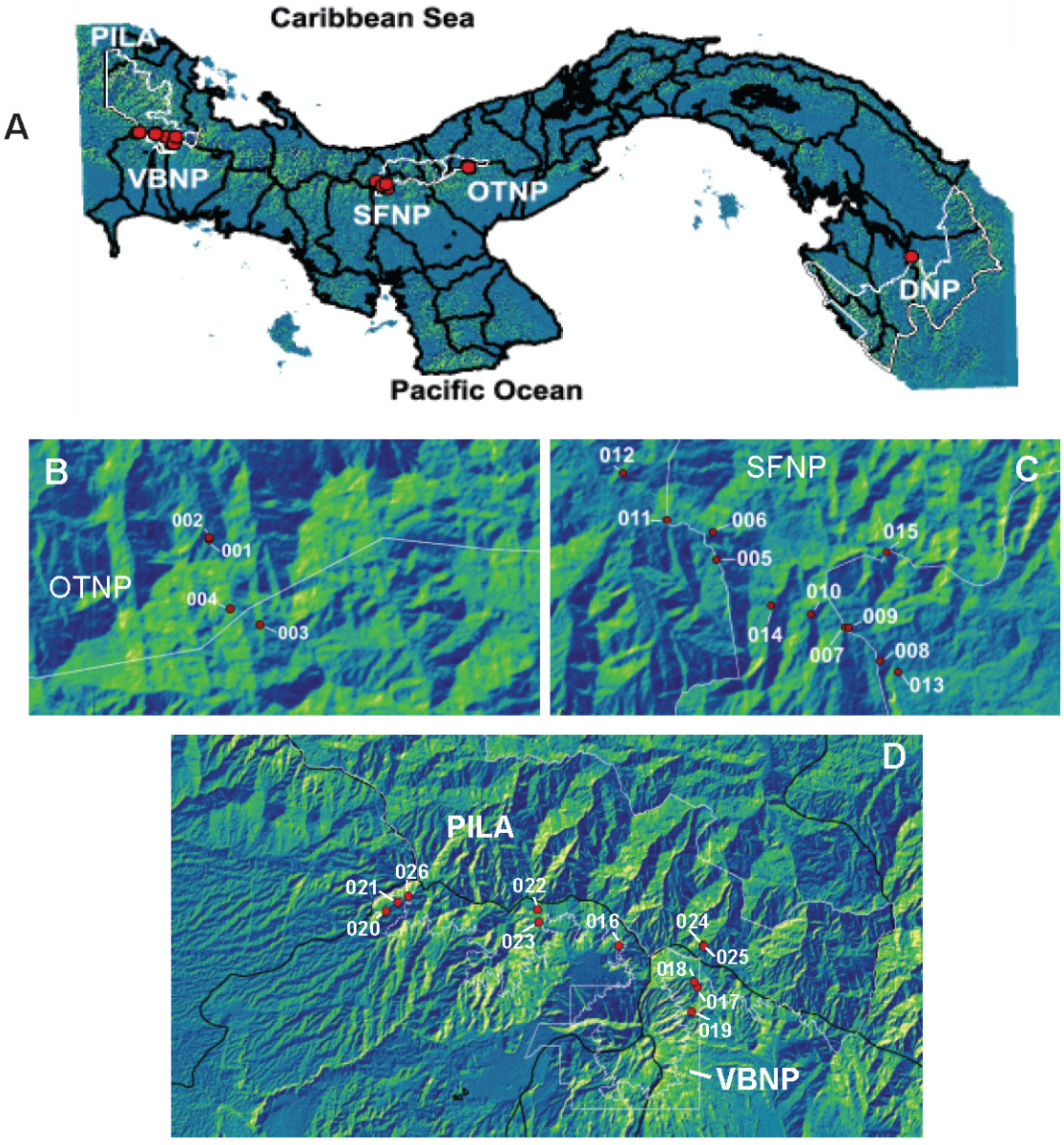
Hydrometeorological Project (http://www.hidromet.com.pa/cuencas.php?idioma=ing). Sample stations were selected for each park, where possible, to include all cuencas. Generally, these were represented by a Caribbean and a Pacific Ocean drainage basin.

Four of Panama's national parks were sampled during 2017. Map 1 shows the location of the parks (1A) and the collection locations (1B–D) with their associated location codes. In Table 1, all of the locations sampled during 2017 are listed, with the locations yielding *Anacroneuria* specimens so indicated. In most cases, sampling was carried out by UV light traps and Malaise traps, although not all stations were sampled by the latter method. Omar Torrijos National Park was sampled in the fourth week of March. Santa Fé National Park was sampled in the second and third weeks of April. Volcán Barú National Park was sampled in the second week of May. Finally, La Amistad International Park was sampled twice, once in the third week of May, and a second time in the last week of August to early September. Additional material from Darién National Park in eastern Panama, not a park targeted for 2017, was made available to us, and we record the information herein.



MAP 1. Map of Panama indicating locations of the parks (1A) and the collection locations (1B–D) with their associated location codes.

TABLE 1. All of the Panama locations sampled during 2017 are listed, with the locations yielding *Anacroneuria* specimens so indicated with an "x" to the right.

National Park	Station Subcode	Major Watershed	Stream Name	Latitude	Longitude	Altitude (m)	Marine Drainage	
Omar Torrijos	**001**	103	Quebrada Corazones	8.67760	-80.60007	728	Caribbean	**x**
Omar Torrijos	**002**	103	Afluente de la Quebrada Corazones	8.67801	-80.60006	792	Caribbean	
Omar Torrijos	**003**	134	Quebrada La Máquina	8.65800	-80.58845	612	Pacific	
Omar Torrijos	**004**	134	Quebrada Las Yayas	8.66168	-80.59522	602	Pacific	**x**
Santa Fe	**005**	97	Afluente Río Calovebora	8.54318	-81.16398	536	Caribbean	**x**
Santa Fe	**006**	97	Río Calovebora	8.55038	-81.16486	461	Caribbean	**x**
Santa Fe	**007**	132	Río Mulabá 2do Brazo	8.52577	-81.13045	623	Pacific	**x**
Santa Fe	**008**	132	Río Mulabá-Afluente del 1erBrazo	8.51706	-81.12140	770	Pacific	**x**
Santa Fe	**009**	132	Río Mulabá-1er Brazo	8.52560	-81.12956	623	Pacific	**x**
Santa Fe	**010**	132	Río Mulaba 3er Brazo	8.52906	-81.13943	662	Pacific	**x**
Santa Fe	**011**	97	Río Piedra de Moler	8.55343	-81.17675	395	Caribbean	**x**
Santa Fe	**012**	97	Río Llanito	8.56553	-81.18817	340	Caribbean	
Santa Fe	**013**	132	nr Río Santo Maria	8.51423	-81.11679	859	Pacific	
Santa Fe	**014**	132	Afluente Rio Mulaba	8.53143	-81.14975	746	Pacific	**x**
Santa Fe	**015**	132	Rio Mulaba - Isleta	8.54513	-81.11970	412	Pacific	**x**
Volcan Baru	**016**	108	Quebrada Landao	8.87550	-82.55336	2117	Pacific	
Volcan Baru	**017**	108	Quebrada Carracedo	8.84570	-82.49097	1801	Pacific	
Volcan Baru	**018**	108	Quebrada Cascante	8.84939	-82.49349	1947	Pacific	**x**
Volcan Baru	**019**	108	Quebrada Lamastus	8.82786	-82.49534	1765	Pacific	
La Amistad	**020**	102	Río Candela-Jurutungo	8.89968	-82.73786	1728	Pacific	**x**
La Amistad	**021**	102	Río Candela-Finca Felix	8.90614	-82.72882	1799	Pacific	**x**
La Amistad	**022**	102	Quebrada Cascada (PILA)	8.90124	-82.61817	2354	Pacific	**x**
La Amistad	**023**	102	Afluente Quebrada Cascada (PILA)	8.89209	-82.61682	2178	Pacific	**x**
La Amistad	**024**	91	Río Holcón	8.87616	-82.48667	1785	Caribbean	**x**
La Amistad	**025**	91	Quebrada sin nombre	8.84523	-82.48599	1804	Caribbean	**x**
La Amistad	**026**	102	Río Candela-Finca del Sr. Guillén	8.91040	-82.72054	1957	Pacific	**x**

TABLE 2. List of known *Anacroneuria* (Plecoptera: Perlidae) from Panama. Modified from Stark and Armitage (2018).

Species	Male	Female	Nymph
A. acutipennis Klapálek, 1923	Stark, 1998	Stark, 1998	Unknown
A. annulipalpis Klapálek, 1922	Stark, 1998	Stark, 1998	Unknown
A. azul Rojas & Baena, 1999	Rojas & Baena in Stark et al., 1999	Unknown	Unknown
A. bandido n. sp.	Kondratieff & Armitage 2018	Kondratieff & Armitage 2018	Unknown
A. benedettoi Stark, 1998	Stark, 1998	Stark, 1998	Gutiérrez-Fonseca & Springer, 2011
A. blanda Needham & Broughton, 1927	Stark, 1998	Stark, 1998	Unknown
A. chiriqui Stark & Armitage, 2018	Stark & Armitage, 2018	Stark & Armitage, 2018	Unknown
A. choco Stark & Bersosa, 2006	Stark & Bersosa, 2006	Unknown	Unknown
A. costana (Navás, 1924)	Navás, 1924	Unknown	Unknown
A. curiosa Stark, 1998	Stark, 1998	Unknown	Unknown
A. darien Gutiérrez-Fonseca, 2015	Gutiérrez-Fonseca, 2015	Gutiérrez-Fonseca, 2015	Unknown
A. embera Gutiérrez-Fonseca, 2015	Gutiérrez-Fonseca, 2015	Unknown	Unknown
A. harperi Stark, 1998	Stark, 1998	Stark, 1998	Unknown
A. laru Gutiérrez-Fonseca, 2015	Gutiérrez-Fonseca, 2015	Gutiérrez-Fonseca, 2015	Unknown
A. lineata (Navás, 1924)	Stark, 1998	Stark & Kondratieff, 2004	Gutiérrez-Fonseca & Springer, 2011
A. magnirufa Jewett, 1958	Kondratieff & Armitage 2018	Kondratieff & Armitage 2018	Unknown
A. marca Stark, 1998	Stark, 1998	Stark, 1998	Gutiérrez-Fonseca & Springer, 2011
A. ngabe Stark & Armitage, 2018	Stark & Armitage, 2018	Stark & Armitage, 2018	Unknown
A. PA-1	Unknown	Stark & Armitage, 2018	Unknown
A. PA-2	Unknown	Stark & Armitage, 2018	Unknown
A. PA-3	Unknown	Stark & Armitage, 2018	Unknown
A. PA-4	Unknown	Kondratieff & Armitage, 2018	Unknown
A. planicollis Klapálek, 1923	Stark, 1998	Stark, 1998	Unknown
A. plutonis (Banks, 1914)	Stark, 1998	Stark, 1998	Unknown
A. quetzali Gutiérrez-Fonseca & Springer, 2015	Gutiérrez-Fonseca & Springer, 2015	Unknown	Unknown
A. talamanca Stark, 1998	Stark, 1998	Stark, 1998	Fenoglio, 2007
A. totumas Stark, 2014	Stark, 2014	Unknown	Unknown
A. uatsi Stark, 1998	Stark, 1998	Stark, 1998	Stark, 1998
A. varilla Stark, 1998	Stark, 1998	Stark, 1998	Gutiérrez-Fonseca & Springer, 2011
A. zarpa Stark, 1998	Stark, 1998	Unknown	Unknown

Following methodology of Stark (1998), the abdomens of adult stoneflies were removed, placed in 10% KOH and studied. The holotype and other specimens are deposited in the Colección Zoológica Dr. Eustorgio Méndez (**COZEM**) of the Instituto Conmemorativo Gorgas de Estudio de la Salud (Gorgas Institute), in C. P. Gillette Museum of Arthropod Diversity (**CSUC**), Fort Collins, Colorado, United States Museum of Natural History, Washington, D.C. (**USNM**). Additional material was borrowed from the Monte L. Bean Life Sciences collection, Brigham Young University, Provo, Utah (**BYUC**).

Results

Two new species of *Anacroneuria* are described. *Anacroneuria bandido* **sp. n.** is described from Coclé and Veraguas Provinces in central Panama. *Anacroneuria tuberculata* **sp. n.** is proposed to provide a new name for a species previously identified from Costa Rica as *A. magnirufa* Jewett, 1958. New locality records are presented for several species previously reported from Panama.

Ninety-three *Anacroneuria* specimens representing at least ten species of *Anacroneuria* were collected in this survey of four national parks. Two species, represented by male and female specimens, are undescribed. Descriptions for these species are given below along with records of eight previously described species. One species represented by unidentified females is recognized by informal designation. Table 2 provides a summary of information about all species of *Anacroneuria* known from Panama.

Anacroneuria acutipennis Klapálek, 1923

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:2002

Anacroneuria acutipennis Klapálek, 1923: 23. Holotype ♀ (National Museum of Natural History, Prague), Volcán, Chiriquí, Panama.

Anacroneuria expansa Klapálek, 1923: 22: Lectotype ♀ (National Museum of Natural History, Prague), Guatemala. Syn. Stark 1998: 554.

Anacroneuria sp. C: Harper, 1992: 118.

Material examined. PANAMA: Chiriquí Province, La Amistad International Park, Cuenca 102, Quebrada Cascada, PSPSCD-PILA-C102-2017-022, 8.90124°N and 82.61817°W, 2354 m, trampa Malaise, E. Álvarez, T. Ríos, and E. Pérez, 17–21 June 2017, 1 ♂ (COZEM).

Stark (1998) lists two additional males from Volcán, Chiriquí.

Anacroneuria annulipalpis Klapálek

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1688

Anacroneuria annulipalpis Klapálek, 1922: 91. Lectotype ♀ (National Museum of Natural History, Prague), Chiriquí, Panama

Anacroneuria quadriloba Jewett, 1958: 166. (in part, specimens listed by Harper (1992) from Panama are considered by Stark (1998) to be *A. annulipalpis*)

Material examined. PANAMA: Chiriquí Province, La Amistad International Park, Cuenca 102, Río Candela, Jurutungo, PSPSCD-PILA-C102-2017-020, 8.89969°N and 82.73786°W, 1728 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos, 19 June 2017, 1 ♂ (COZEM); same except, Río Candela, Jurutungo, PSPSCD-PILA-C102-2017-020, 8.89969°N and 82.73786°W, 1728 m, trampa Malaise, E. Álvarez, E. Pérez, and T. Ríos, 17–21 June 2017, 1 ♀ (COZEM); same except, Río Candela, Finca Félix, PSPSCD-PILA-C102-2017-021, 8.90614°N and 82.72882°W, 1799 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos, 19 June 2017, 4 ♀ (COZEM); same except, Afluente Río Candela, estación MiAmbiente PILA, PSPSCE-PILA-C102-023, 8.89209°N and 82.61682°W, 2178 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos, 19 June 2017, 2 ♂, 3 ♀ (COZEM).

Comments. This species has been previously reported several times from Chiriquí Province in Panama (Klapálek 1922; Stark 1998; 2014; Armitage and Stark 2017, Stark and Armitage 2018).

Anacroneuria nr. *blanda* Needham and Broughton

Anacroneuria blanda Needham and Broughton, 1927: 117. Holotype ♀ Cornell University Insect Collection), Barro Colorado Island, Panama

Material examined. PANAMA: Coclé Province, Omar Torrijos National Park, Cuenca 134, Quebrada Las Yayas, La Pinada, El Harino, PNGDOTH, 0545277°N and 0957066°W, 617 m, trampa de luz, A. Cornejo, T. Ríos, E. Álvarez, and E. Pérez, 22 March 2017, 1 ♂ (COZEM).

Comments. This single male is closest to *A. blanda*, a species originally described from Panama. Additional material needs to be examined from the same area to confirm this species. Previously, Stark (1998) reported several additional specimens of *A. blanda*, from Panama. Additionally, Cornejo and Gutiérrez (2015) previously reported *A. blanda* from this park from a tributary of Quebrada Las Yayas (Tama de Agua Barrigon, PGOTH Cocle, 26.ii.2015).

Anacroneuria darien Gutiérrez-Fonseca, 2015

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:471636

Anacroneuria darien Gutiérrez-Fonseca, 2015: 71. Holotype ♂ (United States National Museum), Darién National Park, Panama

Material examined. PANAMA: Darién Province, Darién National Park, Cuenca 156, Rancho Frío (Pirre 1), 8.01981°N and 77.73250°W, 125 m, A. Thurman, 5–12 February 2018, 1 ♂ (COZEM).

Comments. This species was originally described from Darién National Park, a 575,000 ha spectacular landscape in southeastern Panama. This area is considered one of most important protected areas of Central America and is a UNESCO World Heritage site. The male of *A. darien* is distinctive among all described Panamanian species by its almost completely pale-yellow coloration with black marked femoral apices, as illustrated by Gutiérrez-Fonseca (2015).

Anacroneuria laru Gutiérrez-Fonseca, 2015

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:471637

Anacroneuria laru Gutiérrez-Fonseca, 2015: 71. Holotype ♂ (United States National Museum), Darién National Park, Panama

Material examined. PANAMA: Darién Province, Darién National Park, Cuenca 156, Rancho Frio (Pirre 1), 8.01981°N and 77.73250°W, 125 m, A. Thurman, 5–12 February 2018, 1 ♂ (COZEM).

Comments. This species also was described also from Darién National Park and as the above species, is also distinctive, strikingly marked with black and yellow with fumose wings (Gutiérrez-Fonseca 2015).

Anacroneuria lineata (Navás)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:2027

Neoperla lineata Navás, 1924: 73. Holotype ♂ (Museum National d'Histoire Naturelle, Paris), Costa Rica

Material examined. PANAMA: Coclé Province, Omar Torrijos National Park, Cuenca 134, Quebrada Las Yayas, La Pinada, El Harino, PSPSCD-PNGDOTH-C134-2017-004, 8.66168°N and 80.59520, 586 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos, 25 March 2017, 1 ♂ (COZEM). **Veraguas Province, Santa Fé National Park, Cuenca 097**, Afluente Río Calovebora, PSPSCD-PNSF-C097-2017-005, 8.54318°N and 81.16398°W, 536 m, trampa de luz, T. Ríos, E. Álvarez, and C. Nieto, 21 April 2017, 1, ♂8 ♀ (COZEM); same except, trampa Malaise, 19–23 April 2017, 1 ♀ (COZEM); same except, Río Calovebora, PSPSCD-PNSF-C097-2017-006, 8.55038°N and 81.16486°W, 461 m, trampa de luz, A. Cornejo, T. Ríos, E. Álvarez, and C. Nieto, 23 April 2017, 1 ♀ (COZEM); same except, **Cuenca 132**, Río Mulabá—2do Brazo, PSPSCD-PNSF-C132-2017-007, 8.52577°N

and 81.13045°W, 623 m, trampa Malaise, A. Cornejo, T. Ríos E. Álvarez, and C. Nieto, 19–23 April 2017, 1 ♂ (COZEM); same except, Río Mulabá—Afluente del 1er Brazo, PSPSCD-PNSF-C132-008, 8.51706°N and 81.12140°W, 770 m, trampa Malaise, T. Ríos E. Álvarez, and C. Nieto, 19–23 April 2017, 1 ♂ (COZEM); same except, Río Mulabá—1er Brazo, PSPSCD-PNSF-C132-2017-009, 8.52560°N and 81.12956°W, 623 m; trampa de luz, E. Álvarez, T. Ríos, and C. Nieto, 19 April 2017, 9 ♀ (COZEM); same except, same except, Río Mulabá—3er Brazo, PSPSCD-PNSF-C132-2017-010, 8.52906°N and 81.139435°W, 662 m, trampa de luz, T. Ríos E. Álvarez, and C. Nieto, 19 April 2017, 2 ♂, 5 ♀ (COZEM); same except, Afluente Río Mulabá, antes de caseta MiAmbiente, PSPSCD-PNSF-C132-2017-014, 8.53143°N and 81.14975°W, 859 m, tramp de luz, T. Ríos, E. Álvarez, C. Nieto, 21 April 2017, 4 ♀ (COZEM); same except, Río Mulabá, Isleta, PSPSCD-PNSF-C132-2017-015, 8.54513°N and 81.1197°W, 412 m, trampa de luz, T. Ríos E. Álvarez, and C. Nieto, 22 April 2017, 1 ♂ (COZEM).

Comments. Additional Panamanian records for this relatively common and widespread Central American species were given recently by Stark and Armitage (2018).

Anacroneuria magnirufa Jewett

(Figs. 1–6)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1842

Anacroneuria magnirufa Jewett, 1958: 162. Holotype ♀ (American Museum of Natural History), El Volcán, Chiriquí, Panama
Anacroneuria magnirufa, *nec* Stark 1998: 572 (Costa Rican specimens)

Adult habitus. General body color brown. Head yellow with a brown mustache-shaped mark arching laterally from ocelli (Fig. 1), sometimes interrupted medially between ocelli. Pronotum brown with yellow mesal band varying from narrow to wide (Fig. 1) Femora yellowish, tinged with brown, tibia yellowish, distinctly banded with dark brown proximally, distally brown, tarsi brown. Wing membrane hyaline, veins brown.

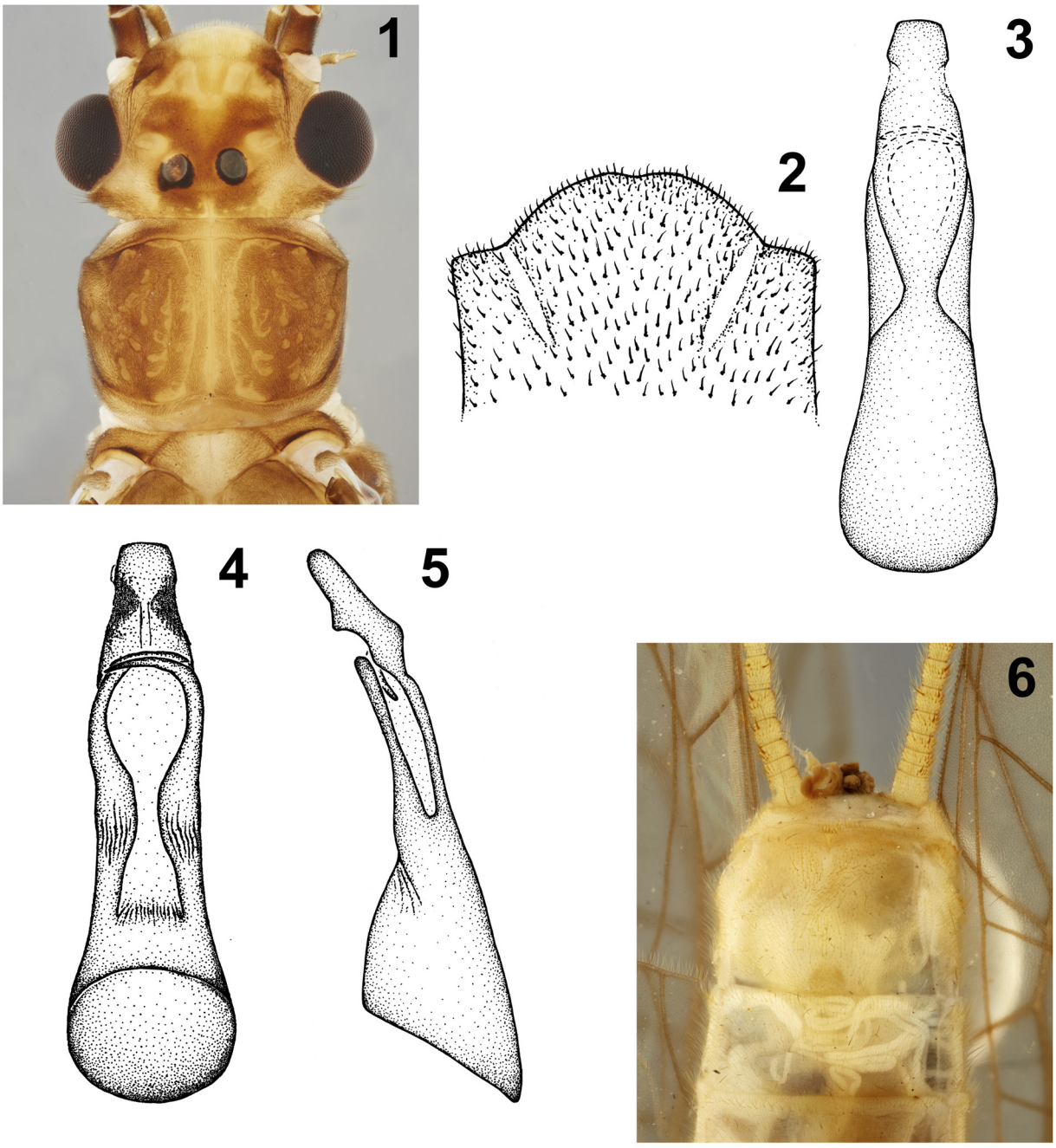
Male. Forewing length 20–22 mm. Hammer absent (Fig. 2). Aedeagus apex simple, scoop-like (Figs. 3–5), broadly rounded at apex, shoulders slightly developed (Figs. 3, 4); ventrally, subapically with triangular darker sclerotization (Fig. 4). Dorsal keel weakly developed (Fig. 4). Hooks slender (Fig. 4).

Female. Forewing length 20–22 mm. Subgenital plate broadly bilobed, margin truncate to slightly rounded. Mesal notch shallow. Transverse sclerite absent from sternum 9 (Fig. 6).

Larva. Unknown.

Material examined. PANAMA: Veraguas Province, Santa Fe National Park, Cuenca 097, Río Piedra de Moler, PSPSCD-PNSF-C097-2017-011, 8.55343°N and 81.17°W, 395 m, trampa de luz, A. Cornejo, E. Álvarez, T. Ríos, and C. Nieto, 20 April 2017, 1 ♀ (COZEM); same except, **Cuenca 132**, Río Mulaba-2do Brazo, PSPSCD-PNSF-C132-2017-007, 8.52577°N and 81.13045°W, 623 m, trampa de luz, A. Cornejo, T. Ríos, C. Nieto, 20 April 2017, 1 ♀ (COZEM). **Chiriquí Province**, Guadalupe Arriba, N 8°52'26", W 82°33'13", 11–17 Sept. 1985, H. Wolda, 2 ♂ (BYUC); **Volcán Barú National Park, Cuenca 108**, Quebrada Cascante, PSPSCD-PNVB-C108-2017-018, 8.84939°N and -82.49349°W , 1947 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos, 8 May 2017, 1 ♂ and 1 ♀ (COZEM). **La Amistad International Park, Cuenca 102**, Río Candela, Jurutungo, PSPSCD-PILA-C102-2017-020, 8.899689°N and 82.73786°W, 1728 m, trampa de luz, E. Álvarez, E. Pérez, and T. Ríos,19 June 2017, 1 ♀ (COZEM); same except, Río Candela, Finca Félix, PSPSCD-PILA-C102-2017-021, 8.90614°N and 82.72882°W, 1799 m, trampa Malaise, E. Álvarez, T. Ríos, and E. Pérez, 01–05 September 2017, 1 ♀ (COZEM); same except, Río Candela, Finca del Sr. Guillén, PSPSCD_PILA-C102-2017-026, 8.9104°N and 82.72054°W, 1957 m, trampa de luz, E. Álvarez, T. Ríos, and E. Pérez, 4 September 2017, 1 ♀ (COZEM).

Diagnosis. Using the key in Stark (1998), the presence of a yellow median pronotal band, the lack of a hammer, and a wing length of 20–22 mm, the male readily runs to "*A. magnirufa*". However, the aedeagus of the true *A. magnirufa* lacks the narrower apex and the thin transverse ridge. Additionally, the dorsal head patterns differ. The complete lack of a hammer of this species is shared by two other Central American species, *A. brava* Mayorga and Contreras-Ramos, 2017 from Mexico (Mayorga and Contreras-Ramos 2017), and the *A. tuberculata* **sp. n.** from Costa Rica. The dark coloration and the distinctive aedeagus of *A. brava* easily distinguish this species from both *A. magnirufa* and *A. tuberculata*.



FIGURES 1–6. *Anacroneuria magnirufa* male., 1. Head and pronotum. 2. Male sternum 9 without hammer. 3. Aedeagus, dorsal. 4. Aedeagus, ventral. 5. Aedeagus, lateral. 6. Female sterna 8 and 9.

Comments. Jewett (1958) described *A. magnirufa* based on a female adult holotype from Chiriquí Province, El Volcán, Panama. The male 'allotype' and a male paratype were from Honduras. Stark (1998) treated *A. magnirufa* based on specimens from Costa Rica, noting however, that the Panamanian males "are larger and have a slightly wider aedeagal apex and less conspicuous dorsal keel than Costa Rican specimens." Additionally, the subgenital plate of the species being provided a new name below has a mesal tubercule near the subgenital plate notch (Stark 1998, fig. 144). The subgenital plate of all Panamanian females of *A. magnirufa* examined in this study lacked this tubercle (Fig. 6).

***Anacroneuria plutonis* (Banks)**
http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1777

Neoperla plutonis Banks, 1914: 610. Lectotype ♀ (Museum of Comparative Zoology), La Trinidad, Costa Rica
Forquilla tristani Navás, 1932: 29. Synonymy (Stark 1998)

Material examined. PANAMA: Coclé Province, Omar Torrijos National Park, Cuenca 105, Quebrada, Corazones, La Pintada, El Harino, PSPSCD-PNGDOTH-C103-2017-001, 8.67760°N and 80.60010°W, 728 m, trampa de luz, A. Cornejo, T. Ríos, E. Álvarez, and E. Pérez, 24 March 2017, 3 ♂ (COZEM). Paratype: **Veraguas Province**, **Santa Fé National Park, Cuenca 097**, Afluente Río Calovebora, PSPSCD-PNSF-C097-2017-005, 8.54318°N and 81.16398°W, 536 m, trampa de luz, T. Ríos, E. Álvarez, and C. Nieto, 21 April 2017, 1 ♂ (COZEM); same except, **Cuenca 132**, Afluente Río Mulabá, antes de caseta MiAmbiente, PSPSCD-PNSF-C132-2017-014, 8.53143°N and 81.14975°W, 746 m, trampa de luz, T. Ríos, E. Álvarez, and C. Nieto, 21 April 2017, 2 ♂ (COZEM); same except, Río Mulaba-3er Brazo, PSPSCD-PNSF-C132-2017-010, 8.52906°N and 81.139435°W, 662 m, T. Ríos E. Álvarez, and C. Nieto, 19 April 2017, 1 ♂, 1 ♀ (COZEM). **Chiriquí Province**, **La Amistad International Park, Cuenca 091**, Río Holcon, PSPSCD-PILA-C091-2017-024, 8.87616°N and 82.48670°W, 1785 m, trampa de luz, 31 August 2017, E. Álvarez, T. Ríos, and E. Pérez, 31 August 2917, 6 ♂, 3 ♀ (COZEM); same except, quebrada sin nombre, PSPSCD-PILA-C091-2017-025, 8.87523°N and 82.48599°W, 1804 m, trampa de luz, 31 August 2017, E. Álvarez, T. Ríos, and E. Pérez, 31 August 2917, 1 ♀ (COZEM); same except, **Cuenca 102**, Río Candela, Finca Félix, PSPSCD-PILA-C102-2017-021, 8.90614°N and 82.72882°W, 1799 m, trampa de luz, E. Álvarez, T. Ríos, and E. Pérez, 4 September 2017, 6 ♂ (COZEM); same except, Río Candela, Finca Félix, PSPSCD-PILA-C102-2017-021, 8.90614°N and 82.72882°W, 1799 m, trampa Malaise, E. Álvarez, T. Ríos, and E. Pérez, 01–05 September 2017, 2 ♀ (COZEM); same except, Río Candela, Finca del Sr. Guillén,, PSPSCD_PILA-C102-2017-026, 8.91040°N and 82.72054°W, 1957 m, trampa de luz, E. Álvarez, T. Ríos, and E. Pérez, 4 September 2017, 1 ♂ (COZEM).

Comments. This species has been previously reported from Panama by Armitage and Stark (2017) and Stark and Armitage (2018) and appears to be a relatively common species.

***Anacroneuria bandido* sp. n.**
(Figs. 7–11)
urn:lsid:zoobank.org:act:98F3BA6A-0ADA-4C3F-83AD-BCDACFCC9825

Material examined. PANAMA: Holotype 1 ♂: **Coclé Province**, Omar Torrijos National Park, Cuenca 134, Quebrada Las Yayas, La Pintada, El Harino, PSPSCD-PNGDOTH-C134-2017-004, 8.66168°N and 80.59520°W, 586 m, trampa de luz, E. Álvarez , E. Pérez, and T. Ríos, 25 March 2017 (COZEM). Paratype: **Veraguas Province, Santa Fe National Park, Cuenca 097**, Río Piedra de Moler, PSPSCD-PNSF-Cuenca 097-2017-011, 8.55343°N and 81.17°W, 395 m, trampa de luz, A. Cornejo, E. Álvarez, T. Ríos, and C. Nieto, 20 April 2017, 1 ♂ (COZEM).

Adult habitus. General body yellow. Head black posteriorly, mask-like, with a distinctive yellow anterior area produce posteriorly nipple-like (Fig. 7). Pronotum black with wide yellow mesal band (Fig. 7). Legs black, except femur of metathoracic leg yellowish basally. Wing membrane fumose, veins brown.

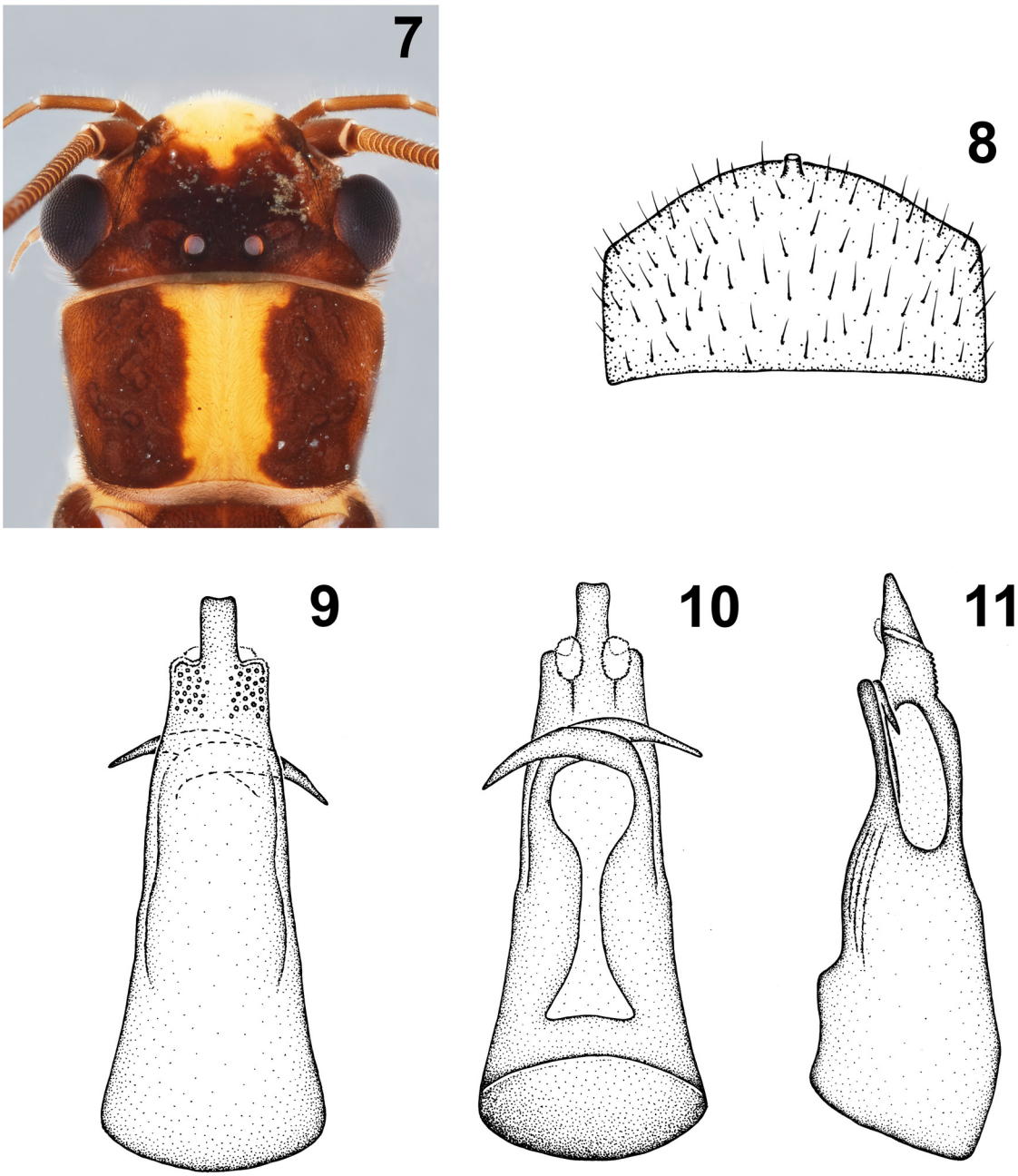
Male. Forewing length 9.5–10.0 mm. Hammer thimble shaped (Fig. 8). Aedeagus apex scoop-like, tip with parallel margins, shoulders conspicuous slightly projecting (Figs. 9–11); no dorsal keel, ventrally with small membranous lobes (Fig. 10); hooks slender (Fig. 10).

Female. Unknown

Larva. Unknown.

Diagnosis. This new species is similar in general habitus to *A. laru* Gutiérrez-Fonseca, 2015 known from Darién National Park in southern Panama along the Panama Colombian border. Both are relatively small with darkly pigmented heads and pronota. However, the aedeagus of both species are distinctive, with the shoulders well-developed in *A. bandido* with parallel margins of the apex. Additionally, the black "mask-like marking are interrupted medially by pale pigment in *A. laru* (see fig 8, Gutiérrez-Fonseca, 2015).

Etymology. *Bandido*: Spanish for bandit, alluding to the black mask-like area on the dorsal surface of the head.



FIGURES 7–11. *Anacroneuria bandido* **sp. n.**, male. 7. Head and pronotum. 8. Male sternum 8 with hammer. 9. Aedeagus, venral. 10. Aedeagus, dorsal. 11. Aedeagus, lateral.

***Anacroneuria tuberculata* sp. n.**
urn:lsid:zoobank.org:act:B173E46F-C952-42A5-A938-EECB03FF26B4

Anacroneuria magnirufa, Stark 1998: 572. (nec *Anacroneuria magnirufa* Jewett 1958: 162, Costa Rican specimens).

Material examined. Holotype ♂, **Costa Rica**: Guanacaste: Estación Maritza, Río Tempisquito, blacklight, 27 April 1989 (**USNM**). Paratypes; Same location, 3 ♂ (**BPSC**); Same location, 5 July 1989, 1 ♀ (**BPSC**).

Etymology. The specific epithet refers to the presence of a tubercle anterior to the subgenital plate notch of the female.

Comments. Stark (1998) provides an excellent description and illustrations of this species under *A. magnirufa*. Stark (2014) listed additional specimens of the new species from Heredia Province, Costa Rica.

***Anacroneuria* sp. PA-4**
(Figs. 12–13)

Material examined. PANAMA: Veraguas Province, Santa Fé National Park, Cuenca 097, Afluente Río Calovebora, PSPSCD-PNSF-C097-2017-005, 8.54318°N and 81.16398°W, 536 m, trampa de luz, T. Ríos, E. Álvarez, and C. Nieto, 21 April 2017, 1 ♀ (COZEM); same except, Afluente Río Calovebora, PSPSCD-PNSF-097-2017-005, 8.54318°N and 81.16398°W, 536 m, trampa Malaise, T. Ríos, E. Álvarez, and C. Nieto, 19–23 April 2017, 1 ♀ (COZEM); same except, Río Calovebora, PSPSCD-PNSF-C097-2017-006, 8.55038°N and 81.16486°W, 461 m, trampa de luz, A. Cornejo, T. Ríos, E. Álvarez, C. Nieto, 21 April 2017 1 ♀ (COZEM); same except, **Cuenca 132**, Río Mulabá-2do Brazo, PSPSCD-PNSF-C132-2017-007, 8.52577°N and 81.13045°W, 623 m, trampa Malaise, A. Cornejo, T. Ríos E. Álvarez, and C. Nieto, 19–23 April 2017,1 ♀ (COZEM); same except, Río Mulabá—afluente del 1er Brazo, PSPSCD-PNSF-C132-2017-008, 8.51706°N and 81.12140°W, 770 m; trampa Malaise, E. Álvarez, T. Ríos, and C. Nieto, 19–23 April 2017, 1 ♀ (COZEM).

Adult habitus. General body yellow. Head yellow with black mask-like marking, oval pale spot laterad to ocelli, lappets marked with black, antennae mostly black (Fig. 12). Median pronotal stripe yellow, wide; anterolaterally slightly paler (Fig. 12). Femora banded apical ⅓ black, basal ⅔ yellow, tibia and tarsi black. Wing membrane fumose, veins black.

Male. Unknown.

Female. Forewing length 12.0–13.5 mm. Subgenital plate 4-bilobed, inner lobes larger, with deep and V-shaped posterior margin (Fig. 13). Transverse sclerite on sternum 9 well developed, laterally ear-like, with long setae.

Larva. Unknown.

Diagnosis. This species may be the female of *A. bandido* described above but no associated collections are available. The femora of all legs of this species are banded, whereas in A. *bandido*, the legs are black, except for the metathoracic leg which the femur is yellowish basally. The distinctive head pattern and small size distinguishes it from other known species from other than *A. bandido* and *A. laru* Gutiérrez-Fonseca, 2015. The latter species is smaller, the subgenital plate is bilobed with lobes of almost equal size and the black mask of the head is interrupted medially (see Gutiérrez-Fonseca, 2015, fig. 8 and fig. 13).

FIGURES 12–13. *Anacroneuria* PA-4. 12. Head and pronotum. 13. Female sterna 8 and 9.

Discussion

Recent studies by Gutiérrez-Fonseca (2015), Gutiérrez-Fonseca *et al*. (2015), Armitage and Stark (2017), Stark and Armitage (2018), Castillo Sánchez *et al*. (2018) and this report demonstrate that the stonefly fauna of Panama requires further study. Currently, 26 species of *Anacroneuria* are recorded from Panama (Table 2). One additional species, the fourth to date, is described under a provisional designation. The on-going work of the students of Dr. Juan Bernal at the Universidad Autónoma de Chiriquí (UNACHI) and of COZEM (Gorgas Institute) through their biodiversity surveys of Panama's national parks will undoubtedly reveal more information about the systematics and distribution of this important group of insects. Note: We mention with sadness the recent and sudden passing of Dr. Juan Bernal Vega of UNACHI. He contributed greatly to the study of aquatic invertebrates in Panama and advised many fine students.

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