



THE NEW SPECIES *ANACRONEURIA BRAVA* (PLECOPTERA: PERLIDAE), WITH PROVISIONAL DESCRIPTION OF AN UNASSOCIATED FEMALE, AND NEW DISTRIBUTION RECORDS FROM MEXICO

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ABSTRACT

Anacroneuria brava Mayorga & Contreras-Ramos, 2017 (Plecoptera: Perlidae) is described as new from Estado de Mexico. A second species, *Anacroneuria* sp. MX-1, is provisionally described from a single female from the state of Oaxaca. The distribution of the *Anacroneuria* species known from Mexico is updated and the first stonefly records for the states provided for Hidalgo and Querétaro. Moreover, new distribution records are provided for *A. annulicauda* (Pictet, 1841), *A. lineata* (Navás, 1924), *A. nigrolineata* Jewett, 1958, *A. planicollis* Klapálek, 1923 and *A. quadriloba* Jewett, 1958.

Keywords: *Anacroneuria brava* Mayorga & Contreras-Ramos, 2017, Plecoptera, Perlidae, Mexico, Estado de México, Oaxaca, stoneflies.

INTRODUCTION

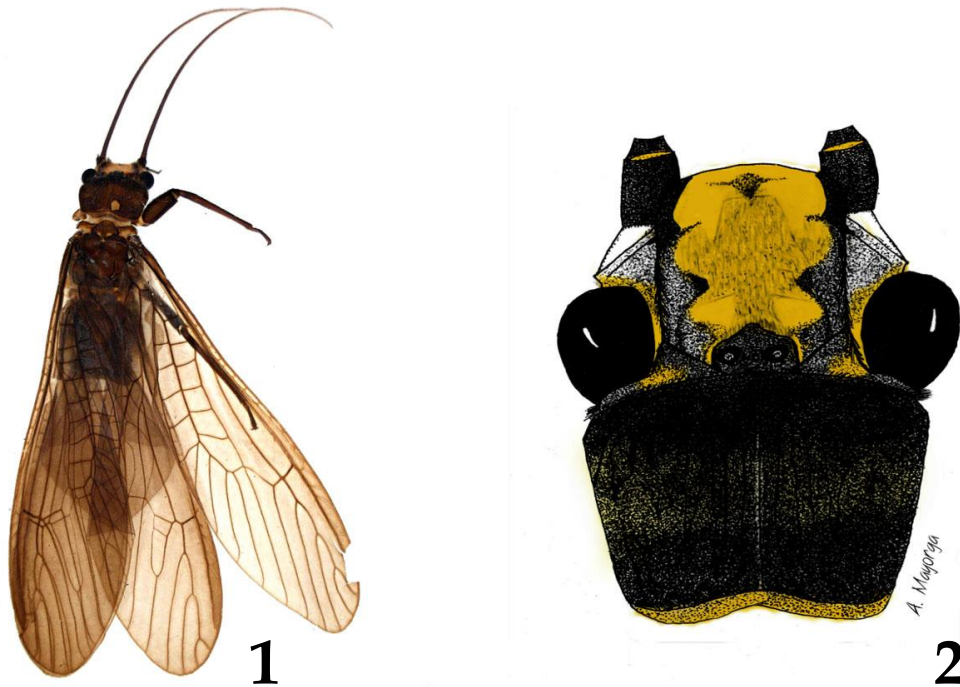
The *Anacroneuria* from Mexico are better known from the states of the south than elsewhere. Currently, the Mexican states with the greatest number of recorded *Anacroneuria* species are Chiapas, Veracruz, and Oaxaca, with 16, 10, and 14 species, respectively. Heretofore, just 18 of the 32 Mexican states (56%) have records of *Anacroneuria* species. Therefore, there is great potential to increase the known species richness in many states in Mexico (Mayorga 2016, Gutiérrez-Fonseca 2009, Stark & Kondratieff 2004).

In this work, we describe *A. brava*, sp. nov. from

Estado de México, and provisionally describe *Anacroneuria* sp. MX-1 from Oaxaca. Moreover, new records for *A. annulicauda* (Pictet, 1841), *A. lineata* (Navás, 1924), *A. nigrolineata* Jewett, 1958, *A. planicollis* Klapálek, 1923, and *A. quadriloba* Jewett, 1958 are presented. The known distribution of *Anacroneuria* species in Mexico is updated with first time records for the states of Hidalgo and Querétaro.

MATERIALS AND METHODS

The holotype and all other specimens examined for this study are stored in 80% EtOH in the



Figs. 1-2. *Anacroneuria brava* sp. nov. 1. Adult habitus. 2. Male head and pronotum.

Colección Nacional de Insectos (CNIN), Instituto de Biología, Universidad Nacional Autónoma de México (UNAM), Mexico City. Terminalia were clipped and cleared in 10% KOH using the procedures of Stark & Zúñiga (2003). An American Optical Company stereomicroscope was used to examine the specimens. Illustrations were hand drawn. Photographs of specimens were taken with an Auto-Montage system attached to a Zeiss Axio Zoom V16 stereomicroscope. Editing of the images was conducted using "Ipiccy", a free, online photo editor (<http://ipiccy.com/>).

RESULTS AND DISCUSSION

Anacroneuria brava Mayorga & Contreras-Ramos, sp. nov.

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:497668>

(Figs. 1-5)

Material Examined. Holotype ♂ (CNIN-PLH-3): MEXICO: Estado de México, Valle de Bravo,

[19.19512, -100.13261, post-processed to 10 km radius; mean elevation 1800 m a.s.l.], July 1979, J. Bueno.

Adult habitus. General color of body dark (Fig. 1). Head pigmentation with complex pattern. Pigment pattern over ocelli pentagonal-shaped and black tinted; a truncated arrow-shaped pattern defined by short, fine setae replaces usual M-line; a dark, diamond-shaped area centered on clypeus; lappets obscure and elongate; mesal area of head well defined and sclerotized; anterior to ocelli a zig-zag pattern extends to bases of antennae; circumantennal ridges connect lappets by dark shading to anterior margin of eyes; white rhomboidal-shaped plate located above the ridges; dark triangles with middle inclined brown band at posterior area of eyes. Pronotum with narrow, brown mid longitudinal stripe; discs dark with scattered rugosities obscured; a paler, wide transverse band (Fig. 2). Wing membrane dark brown with veins darker (Fig. 1). Fore leg completely dark brown, with subtle dark stripe at proximal end of femur.

Male. Forewing length 20 mm. Hammer absent. Ventral: Aedeagal apex truncate and straight, little constricted at base; aedeagus arms slightly widened and curved subapically bearing a pair of small membranous lobes at center. Hooks slender, typical in appearance; space between hooks forming an antique door lock-shape; interior corners from the base of hooks sclerotized with a small bulge on both sides at vertex; frontal walls of mesal area with some bristles on each side (Fig. 3). Dorsal: Simple. Aedeagal keel consists of a lengthened projection with straight margins laterally, circular anteriorly and triangular posteriorly, poorly sclerotized and transparent (Fig. 5).

Female. Unknown.

Larva. Unknown.

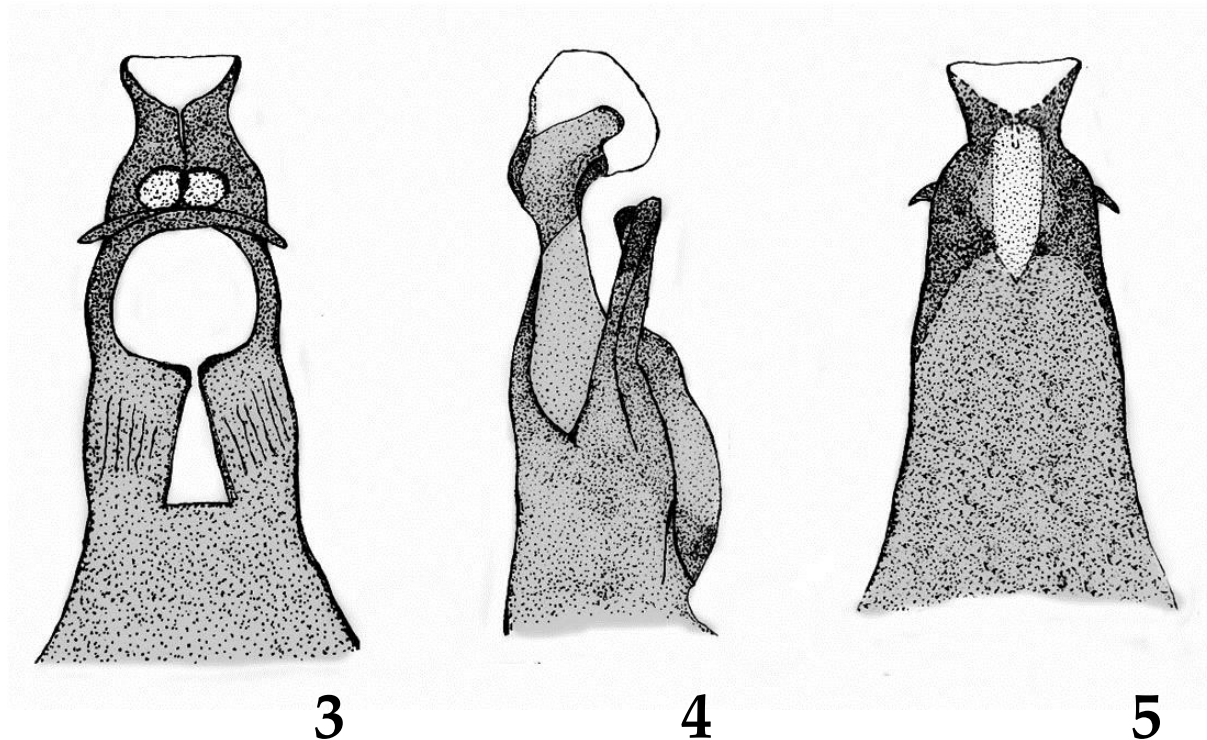
Distribution. Mexico, Estado de México, Valle de Bravo.

Diagnosis. This species is similar to *A. aethiops* (Walker, 1852), *A. brailovskyi* Stark & Kondratieff,

2004, *A. flavifacies* Jewett, 1958 and *A. ratcliffei* Stark & Kondratieff, 2004 in pronotal pigment pattern, however that of *A. brava* is far more complex (Fig. 2). The body size of *A. brava* is also larger than *A. aethiops*, *A. brailovskyi* and *A. flavifacies*. The aedeagus of *A. brava* is similar to *A. brailovskyi* but its apex is truncate, while in *A. brailovskyi* it is concave. The shape of the dorsal, transparent keel (Figs. 3, 5), clearly distinguishes this one from all other *Anacroneuria* species.

Comments. This is one of the largest and darkest species of Mexican *Anacroneuria* (Fig. 1). The specimen was found pinned on the pronotum, and was unpinned and transferred to EtOH; body coloration, pigment patterns, and diagnostic structures are well preserved.

Etymology. The species name, used as a noun in apposition, is based to the type locality of "Valle de Bravo".



Figs. 3-5. *Anacroneuria brava* sp. nov. 3. Aedeagus, ventral. 4. Aedeagus, lateral. 5. Aedeagus, dorsal.

Anacroneuria sp. MX-1
(Figs. 6-8)

Material examined. MEXICO: Oaxaca, Mpio.

Santiago Comaltepec, Sierra Juárez, Localidad “La Esperanza”, 17°38′28.20″ N, 96°22′02.81″ W, 6 May 2016, 1750 m a.s.l., A. Mayorga, R. Turrent, 1♀ (CNIN-PLH-4).

Adult habitus. General body color yellow and dark brown. Head pale yellow, locally hirsute. Pigment pattern over ocelli and M-line defined by short setae; a lightly pigmented T-shaped area extends from compound eyes medially and caudally toward occiput; a well-defined, basal transverse line posterior to ocelli; a wide, curved V-shaped pattern extends onto clypeus; lappets dark brown with long vertical rows of thick setae extending from foot of lappets to anteromedial corners of compound eyes; circumantennal ridges connect lappets to anterior margin of eyes, forming a right triangle; white rhomboid-shaped plate present anterior to ridges; darkened area posterolateral to compound eyes formed by long, stout setae. Pronotum with narrow medial band; mediolateral pale bands wide and setose centrally; lateral discs dark brown with slightly lighter rugose areas; russeted areas laterally occupy length of pronotum. Antennae dark, scape in dorsal view with discrete yellow, basal rugosity. Wing membranes brown, veins darker. Fore legs mostly pale, femur distally ringed with dark pigment extending medially on dorsal surface. Tibia dark at basal and distal rings, these usually connected dorsally.

Male. Unknown.

Female. Forewing length 20 mm. Subgenital plate 4-lobed; lobes connected by a white membrane; inner lobes shorter than wide, posterior margins obscure and truncate, separated by a wide, shallow, V-shaped notch, margins well sclerotized. Outer lobes narrow and square posteriorly, margins well-sclerotized; a narrow, V-shaped notch separating outer and inner lobes. A large, V-shaped bulge present anterior to median notch, bulge covered with scattered bristles. Mesal field of sternum 9 with dispersed fine setae, anterior margin closely follows subgenital plate lobes; posterolateral margins of segment darkly pigmented.

Larva. Unknown.

Distribution. Mexico, Oaxaca, Sierra Juárez, La Esperanza.

Diagnosis. This species differs from other Mesoamerican *Anacroneuria* species because of the complexity of the subgenital plate, the densely setose areas around the lappets, and a unique pigmentation of the head.

Comments. This species was the only stonefly that came to our light trap the day we collected at La Esperanza, Oaxaca. This location was about 1 km from the nearest stream source, supporting that species in the genus are capable of moderate dispersal. A pinned, similarly pigmented, female specimen was found in the CNIN from Oaxaca, 1955. Unfortunately, its poor condition negated positive identification. We hope to discover additional specimens, including males, and formally describe this species.

Anacroneuria annulicauda (Pictet, 1941)

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1983>

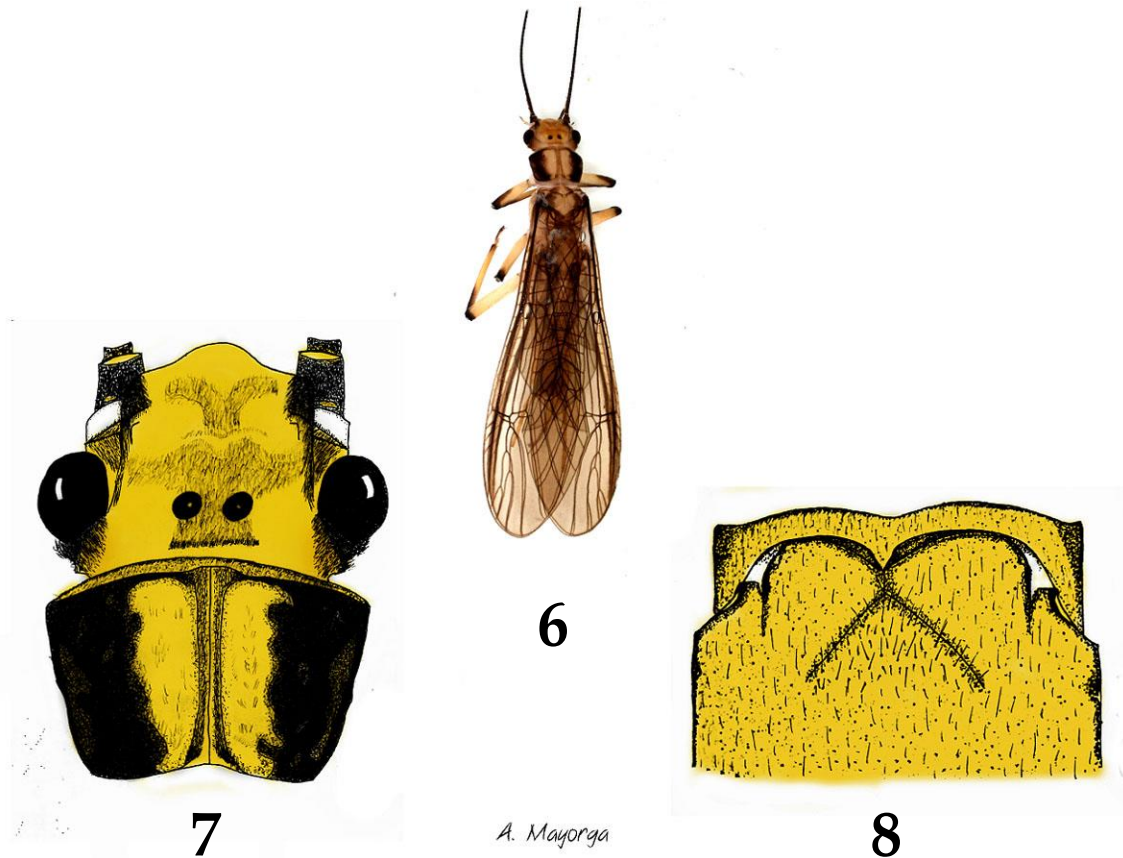
Material Examined. MEXICO: Puebla, Mpio. Zihuateutla, Barranca de Patla, Río Necaxa, 20°15′11.33″N, 97°52′02.47″W, 6 September 2015, 481 m a.s.l., Rafael Turrent, 1♀; same data and collector, 17-18 June 2016, 3♀; Puebla, Mpio. Hueytamalco, Rancho “La Carolina”, E Ayotoxco, 30 m a.s.l., April 1989, F. López, 1♀.

Comments. This species was previously reported for the states of Chiapas, Guerrero, Nayarit, Oaxaca, Sonora, and Veracruz (Stark & Kondratieff 2004, Mayorga 2016). This is the first record of this species from Puebla.

Anacroneuria lineata (Navás, 1924)

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:2026>

Material Examined. MEXICO: Puebla, Metlac, 17 February 1977, J. Bueno, 3♂; Querétaro, Km 8 Neblinas Agua-Zarca, 21 July 1998, 21°15′14″ N, 99°04′58″ W, E. Barrera, C. Mayorga, 1♀.



Figs. 6-8. *Anacroneuria* sp. MX-1. 6. Adult habitus. 7. Female head and pronotum. 8. Subgenital plate.

Comments. This *Anacroneuria* species has one of the widest distributions in Mexico (Stark & Kondratieff 2004). We present the first records of this species for both Puebla and Querétaro states.

***Anacroneuria nigrolineata* Jewett, 1958**

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1818>

Material Examined. MEXICO: Querétaro, km 8 Neblinas Agua-Zarca, 21 July 1998, 21°15'14" N, 99°04'58" W, E. Barrera, C. Mayorga, 1♂.

Comments. We present the first ever record for this species in Querétaro state. Previously, the species was reported from Guerrero and Sonora (Stark & Kondratieff 2004).

***Anacroneuria planicollis* Klapálek, 1923**

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1784>

Material Examined. MEXICO: Hidalgo, Huasca,

Rancho Sta. Elena, Manantial de las Vigas, 20°07'52.2" N, 98°31'39.0" W, 2480 m a.s.l. 21-03 May 2005, A. Contreras-Ramos, E. Meléndez, Malaise trap, 1♂, 1♀.

Comments. The specimens of this species were collected together with *A. quadriloba*. *A. planicollis* is another widely distributed species in Mexico. We present the first state record from Hidalgo.

***Anacroneuria quadriloba* Jewett, 1958**

<http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1771>

Material Examined. Mexico: Hidalgo, Huasca, Rancho Sta. Elena, Manantial de las Vigas, 20°07'52.2" N, 98°31'39.0" W, 2480 m a.s.l. 21-03 May 2005, A. Contreras-Ramos, E. Meléndez, Malaise trap, 3♂, 1♀; Puebla, Ahuatlán, 1200 m a.s.l., 18 March 1987, H. Brailovsky, 1♀.

Table 1. *Anacroneuria* species known to occur in Mexico by state. 1 = species present (bold = new state record), blank space = species absent.

Total species known	0	0	0	0	0	16	1	1	1	0	0	1	3	0	4	2	1	2	1	3	3	11	5	2	0	4	1	4	5	2	0	14	0	0
Species↓ Mexican States→	Aguascalientes	Baja Cal.	Baja Cal. Sur	Campeche	Chiapas	Chihuahua	Ciudad de M�x.	Coahuila	Colima	Durango	Estado de M�x.	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoac�n	Morelos	Nayarit	Nuevo Le�n	Oaxaca	Puebla	Qu�rtaro	Quintana Roo	San Luis Potosi	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veraacruz	Yucat�n	Zacatecas		
<i>Anacroneuria aethiops</i> (Walker)					1															1	1									1				
<i>Anacroneuria amulicauda</i> (Pictet)					1								1					1		1	1				1					1				
<i>Anacroneuria baumanni</i> Stark & Kondr.						1																												
<i>Anacroneuria barbai</i> Mayorga																											1							
<i>Anacroneuria brailovskyi</i> Stark & Kondr.																															1			
<i>Anacroneuria brava</i> sp.nov.											1																							
<i>Anacroneuria buenoi</i> Stark & Kondr.																															1			
<i>Anacroneuria contrerasi</i> Stark & Kondr.																			1															
<i>Anacroneuria coronata</i> Needh. & Broug.					1																													
<i>Anacroneuria costana</i> (Nav�s)					1															1						1					1			
<i>Anacroneuria flavifacies</i> Jewett											1																							
<i>Anacroneuria flavolineata</i> Jewett																															1			
<i>Anacroneuria flavominuta</i> Jewett					1																			1							1			
<i>Anacroneuria hoogstraali</i> Jewett																			1					1										
<i>Anacroneuria izapa</i> Stark & Kondr.					1																													
<i>Anacroneuria lineata</i> (Nav�s)					1						1					1		1	1	1	1	1		1			1	1			1			
<i>Anacroneuria litura</i> (Pictet)					1								1				1											1	1					
<i>Anacroneuria mixteca</i> Stark & Kondr.																				1														
<i>Anacroneuria naomi</i> Needh. & Broug.																				1														
<i>Anacroneuria nigrocincta</i> (Pictet)																																		
<i>Anacroneuria nigrolineata</i> Jewett													1										1		1									
<i>Anacroneuria olmec</i> Stark & Kondr.																															1			
<i>Anacroneuria pallida</i> Jewett					1															1							1				1			
<i>Anacroneuria pareja</i> Stark & Kondr.					1																													
<i>Anacroneuria perplexa</i> Stark					1																						1							
<i>Anacroneuria planicollis</i> Klap�lek					1					1			1	1	1	1		1		1	1			1	1					1				
<i>Anacroneuria quadriloba</i> Jewett					1									1							1									1				
<i>Anacroneuria quetzalcoal</i> Stark & Kondr.					1																													
<i>Anacroneuria ratcliffei</i> Stark & Kondr.					1																										1			
<i>Anacroneuria shepardii</i> Stark & Kondr.					1																													
<i>Anacroneuria sonora</i> Stark & Kondr.																														1				
<i>Anacroneuria</i> sp. MX-1																																		
<i>Anacroneuria zaga</i> Stark & Kondr.																																1		

Table 1. *Anacroneuria* species known to occur in Mexico by state. 1 = species present (bold = new state record), blank space = species absent.

Comments. This species was previously reported from Chiapas, Oaxaca, and Veracruz. These are the first records for Hidalgo and Puebla.

CONCLUSIONS

The description of *A. brava* sp. nov. brings the number of *Anacroneuria* species known from Mexico to 32. The number of states with specimen records for this genus increases to 20 (62%) (Table 1). This paper reports seven new state records, with first ever records for *Anacroneuria* in the states of Hidalgo and Querétaro. With concerted effort, most states will eventually be shown to support one or more species of *Anacroneuria*. In addition, 19 of the 32 (59%) species are exclusively present in Mexico (Stark & Kondratieff 2004, Mayorga 2016), this highlights the importance of the group within the aquatic insect diversity from this country.

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