Mayorga, A. 2016. A new species of *Anacroneuria* Klapálek (Plecoptera: Perlidae) and complementary descriptions of three additional species from Mexico, with comments on the current knowledge of Mexican species of the genus. *Illiesia,* 12(12):64-73. Available online: http://illiesia.speciesfile.org/papers/Illiesia12-12.pdf

http://zoobank.org/ urn:lsid:zoobank.org:pub:9A7BCA7F-E6CC-4B8E-8E13-BD85A0301DC2

A NEW SPECIES OF *ANACRONEURIA* KLAPÁLEK (PLECOPTERA: PERLIDAE) AND COMPLEMENTARY DESCRIPTIONS OF THREE ADDITIONAL SPECIES FROM MEXICO, WITH COMMENTS ON THE CURRENT KNOWLEDGE OF MEXICAN SPECIES OF THE GENUS

Alfredo Mayorga

Instituto de Biología (IBUNAM), Departamento de Zoología, Colección Nacional de Insectos (CNIN), Universidad Nacional Autónoma de México (UNAM), Mexico City, Mexico
E-mail: amayorga.entomology@gmail.com

ABSTRACT

A new species of the perlid genus *Anacroneuria*, *A. barbai* sp. nov., is described and illustrated based on male specimens from Tabasco, Mexico. The presence of *A. pallida* Jewett, 1958 is confirmed for Mexico and a complementary description of the female and egg provided. A complementary description of the male and female of *A. quadriloba* Jewett is also provided as is a new distribution record for the widespread *A. litura* (Pictet, 1841). Brief comments on the current knowledge of the distribution and descriptions of adults and larvae of all *Anacroneuria* known to inhabit Mexico are included.

Keywords: Plecoptera, stoneflies, *Anacroneuria*, Mexico, Neotropical, Oaxaca, Tabasco, Veracruz

INTRODUCTION

In the last 50 years only two comprehensive studies on Mexican *Anacroneuria* Klapálek have been published (Jewett 1958, Stark & Kondratieff 2004). The latter study reviewed 39 species including descriptions of new species from Mexico and adjacent countries. As a result, there are currently 30 valid species and two species that are considered *nomina dubia* known from Mexico (Stark & Kondratieff 2004, DeWalt et al. 2016). Seven of these were described by Jewett (1958) and sixteen proposed by Stark & Kondratieff (2004). *Anacroneuria pallida* Jewett, 1958 was described from a female holotype and three paratype females from Guatemala, and an additional female paratype from Chiapas, Mexico. The latter specimen, reportedly deposited in the Escuela Nacional de Ciencias Biológicas by Jewett (1958), was not studied by Stark & Kondratieff (2004), and currently the location of this Mexican type is unknown. Consequently, the presence of this species in Mexico was not verified. *Anacroneuria quadriloba* Jewett, 1958 was described from male and female adults collected in Mexico. At present, the only illustration of the subgenital plate of this species is by Jewett (1958).

Despite the fact that there are more *Anacroneuria*

specimen records known from Mexico than any other country in Central America, relatively little is known of the genus (Gutiérrez-Fonseca 2009, Froehlich 2010). The southern Mexican states of Chiapas, Oaxaca and Veracruz currently have the highest reported number of *Anacroneuria* species. Alternatively, Tabasco, another southern state that should have a rich fauna, has the fewest records of any state for *Anacroneuria*. Currently, no species have been described from there and only two species have been reported (i.e. *A. lineata* (Navás, 1924) and *A. perplexa* Stark, 1998) (Stark & Kondratieff 2004). Consequently, this low number of species indicates a relative lack of knowledge of *Anacroneuria* in this tropical state. Examination of existing collections and initiation of new field work should dramatically increase the number of species in the genus.

The main objective of the current study is to describe a new species, *A. barbai* sp. nov., from Tabasco. In addition, the presence of *A. pallida* in Mexico is confirmed, providing new distributional records and a complementary description of the female and egg. A complementary description is also presented for the male aedeagus and subgenital plate of the female for *A. quadriloba* Jewett. Moreover, one new distributional record for the widespread *A. litura* (Pictet, 1841) is given. A checklist of *Anacroneuria* species for Mexican states and the life stages known for each species is presented.

MATERIAL AND METHODS

Holotypes, paratypes, and all other specimens examined for this study are stored in 80% EtOH in the Colección Nacional de Insectos (CNIN), Instituto de Biología, Universidad Nacional Autónoma de México, 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 a Canon EOS 80D EF 18-133 mm and Auto-Montage system attached to a Zeiss Axio Zoom V16 stereomicroscope. Editing of the images was conducted using "Ipiccy", a free and online photo editor (http://ipiccy.com/).

RESULTS AND DISCUSSION

Anacroneuria barbai sp. nov.

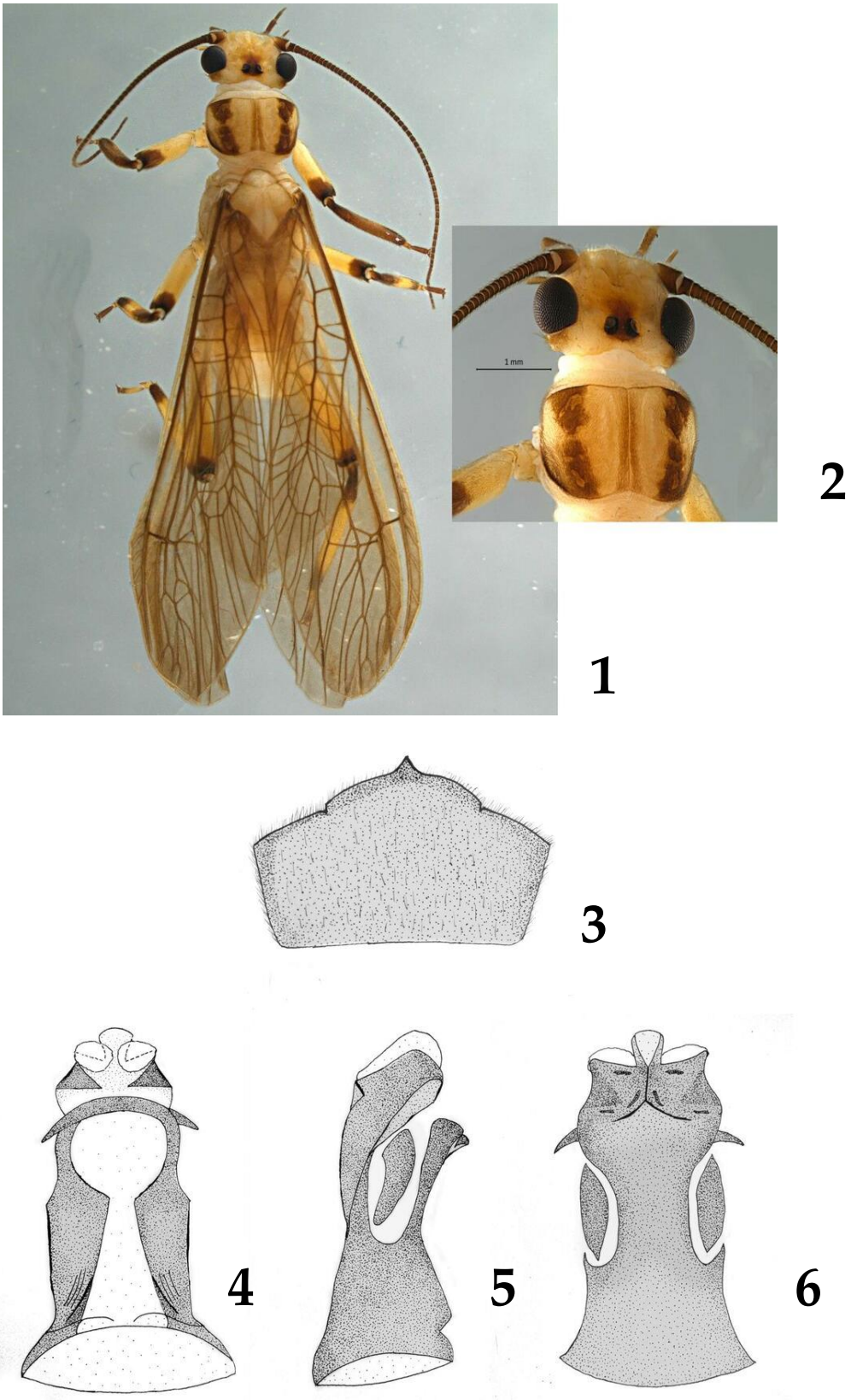
(Figs. 1-6)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:494619

Material examined. Holotype ♂ (CNIN-PLH-1) and 1 paratype ♂ (CNIN-PLP-2). **MEXICO: Tabasco**, Mpio. Huimanguillo, Ejido Villade Gpe, Cascada Cerro de las Flores, 17°21′39″ N, 93°37′29″ W, Rta. Malpasito-Carlos A. Madrazo, 26 June 1999, J. Bueno, R. Barba cols.

Adult habitus. Body ground color pale-yellow, but with well-defined brown pigmentation on head, thorax, legs and veins of wings (Fig. 1). Head with brown, cone-shaped pigment pattern between ocelli; lappets unpigmented and indistinct; M-line absent; small brown area posterior to compound eyes clothed with fine setae and scattered bristles; occiput and post-occiput paler than rest of head. Pronotum with narrow, hairy mesal light brown stripe; mediolateral bands brown with scattered rugosities, each band moderately constricted at middle; posterolateral margins more darkly pigmented than rest of pronotal margin, the area densely hirsute (Fig. 2). Fore leg brown and pale-yellow, femur pale except well-defined distal encircling brown band; tibiae and tarsi entirely brown, meso- and metathoracic legs similarly pigmented except that tibia is pale medially. Wing membrane amber and veins brown; costal vein transparent and subcosta dark brown (Fig. 1).

Male. Forewing length 13 mm (n=2). Hammer pointed and nipple-like with mediolateral weak emarginations at border of anterior margin (Fig. 3). Ventral: aedeagus apex and base of similar width (Fig. 4, 5); apex rounded at tip and transparent with moderately sized, oval ventral membranous lobes; aedeagus constricted subapically; shoulders as well-sclerotized equilateral triangle impressions. Hooks elongate; space between hooks forming "skeleton key-hole-like" appearance; frontal walls of aedeagal base with longitudinal bristles and short carina forming isosceles triangle-shaped area; a pair of small transparent bulges at center from



Figs. 1-6. *Anacroneuria barbai* sp. nov. 1. Male adult habitus. 2. Head and pronotum. 3. Hammer. 4. Aedeagus, ventral. 5. Aedeagus, lateral. 6. Aedeagus, dorsal.

base of aedeagus (Fig. 4). Lateral: anterior part like forelock with semi rounded border of margin; angular bulge at median area and concave at base (Fig. 5). Dorsal: apical diameter greater than base (Fig. 6); apex a narrow scoop extending forward and connected to keel; keel a longitudinal, sclerotized line at middle that ends in an inverted V-shaped figure; lower section of shoulders with scattered, lightly sclerotized rugosities; shoulders with lateral projections upward and moderately sharp at tip, followed by a constriction downward and widened at crossing point of hooks; aedeagus medially constricted with lateral structures attached over transparent membrane (Fig. 5), irregular ellipse-shaped and acute at poles; distal section of aedeagus wider than medially (Fig. 6).

Female. Unknown.

Larva. Unknown.

Diagnosis. The pigment patterns on head and pronotum (Fig. 2) look similar to a Costa Rican species, *A. tornada* Stark, 1998, but the male of *A. barbai* is smaller and the aedeagus is quite distinctive (Figs. 1, 3-5 and Figs. 108-110, in Stark, 1998). Among the Mexican species, *A. barbai* appears most similar in size and head pigment patterns to *A. contrerasi* Stark & Kondratieff, 2004. The aedeagus of *A. barbai* can be distinguished from others in the genus by the triangular structure of the shoulders in ventral view (Fig. 4), as well as the distinctive keel and the scattered rugosities of the lower part of shoulders in dorsal view (Fig. 6).

Etymology. The species name honors the aquatic entomologist Rafael Barba-Álvarez, who has motivated and supported my study of aquatic insects. He was the collector of most of the Mexican stoneflies that I have examined in the CNIN, including the types of this new species.

Comments. These specimens were initially separated from a large number of adults because of the distinctiveness of their habitus. Additional adults available in the CNIN from Tabasco state were determined, but no more specimens of this species have been found. The aedeagus of the paratype male appeared slightly twisted but conspecific with the holotype.

Heretofore, the Plecoptera material in the CNIN was not organized systematically—I have begun this process. In addition, I am now assigning unique identifiers (catalog numbers) to Plecoptera specimens, staring with the types of *A. barbai* n. sp. The unique identifier begins with the collection coden (CNIN), followed by PL for Plecoptera, then the first letter of the kind of type of the specimen (holotype, allotype, paratype, etc), and ending with a unique number. Non-type specimens will lack letters used to denote types. Eventually, CNIN will have an on-line database of Plecoptera specimens.

Anacroneuria litura (Pictet, 1841)

http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1850

Perla litura Pictet, 1841:242. Holotype (ZMHB), Mexico

Anacroneuria crenulata Jewett, 1958. Syn. Stark & Sivec 2001

Anacroneuria proxima Klapálek, 1923. Syn. Stark & Kondratieff 2004

Anacroneuria comanche Stark & Baumann, 1987. Syn. Stark & Kondratieff 2004

Material examined. MEXICO: Tabasco, Teapa, Río "Puyacatengo", 7 March 1988, 106 m.a.s.l., R. Barba, E. Barrera, A. Cadena cols. 1♂.

Comments. This species is one of the most common *Anacroneuria* collected in Mexico. The male collected at Rio Puyacatengo represents the first record for Tabasco state.

Anacroneuria pallida Jewett, 1958

(Figs. 7-10)

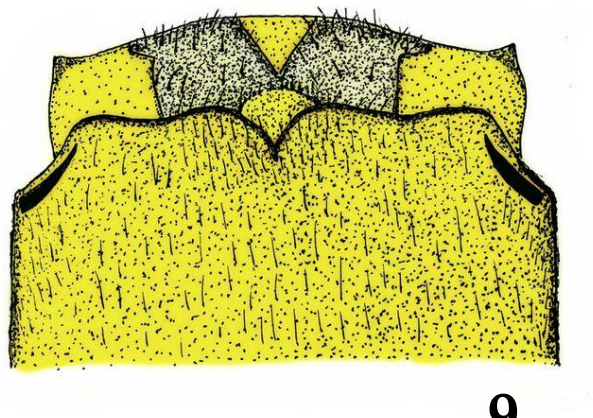
http://lsid.speciesfile.org/urn:lsid:Plecoptera.speciesfile.org:TaxonName:1806

Anacroneuria pallida Jewett, 1958: 161. Holotype ♀ (FMNH), Yepocapa, Chimaltenango, Guatemala

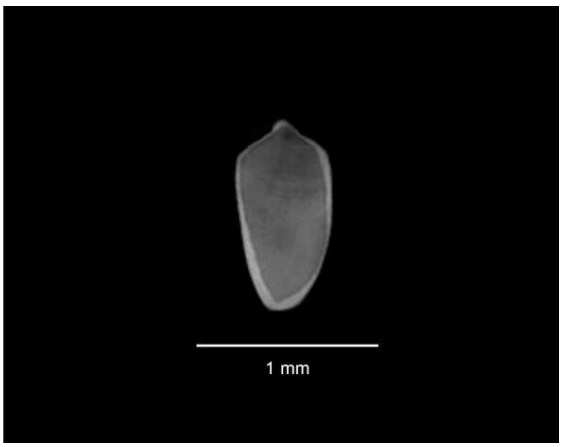
Material examined. MEXICO: **Chiapas**, Cacahuatán, B. Juárez, El Plan, Cascada "Sangre del Tacaná", 23 February 2011, B. Gómez, 1♀; **Oaxaca**, Puerto Ángel, 16 June 1982, A. Ibarra, M. García, E. Barrera, L. Torres, 1♀; **Tabasco**, Mpio. Huimanguillo, Ejido Villa de Gpe, Cascada Cerro de las Flores, 17°21′39″ N, 93°37′29″ W, Rta. Malpasito-Carlos A. Madrazo, 26 June 1999, J.

7

8



9



10

Figs. 7-10. *Anacroneuria pallida*. 7. Female adult habitus. 8. Head and pronotum. 9. Female subgenital plate. 10. Outline of egg.

Bueno, R. Barba, 1♀; **Veracruz**, San Andrés Tlalnelhuayocan, arroyo "Aguita Fría", 19°31′9" N, 96°59′27" W, 1400 m.a.s.l., 1 April 2008, L. Cervantes, 1♀.

Adult habitus. Body and head ground color pale yellow (Fig. 7). Head without dark pigment between ocelli; M-line almost indistinguishable; lappets yellow, small, indistinct, and triangular. Pronotum with paler, moderately wide mesal stripe; present brown irregular rugosities over the mediolateral and lower area of discs (Fig. 8); elongate pale bands at border of lateral margins. Wing membranes transparent-yellowish with darker yellow veins. Fore leg yellow with small spots and band at apex of femora; tibia clothed with small fine setae along the surface and becoming darker at base (Fig. 7).

Male. Unknown.

Female. Forewing length 19-24 mm (n=4). Subgenital plate (Fig. 9) weakly 4-lobed with posterior margin slightly curved; lateral margins of lobes shorter than their width; two sclerotized and elongated plates present at lateral margins; mesal notch V-shaped with scattered bristles and bearing above a transparent circular membrane. Sternum 9 without transverse sclerite, but with darker median V-shaped sclerite that has a combination of long and short hairs, center of sclerous area membranous with only short hairs; lateral areas of sternum 9 membranous, their corners pointed posteriorly (Fig. 9).

Egg. General color yellow-brown. Length: 0.45-0.48 mm. Width: 0.24-0.26 mm (n=3). Outline typical for genus, spindle shaped, anterior pole rounded, collar a low, rounded process; collar end wider than anterior pole; lateral margins almost straight and convergent to anterior pole (Fig. 10).

Larva. Unknown.

Distribution. Guatemala and Mexico (Chiapas, Oaxaca, Tabasco and Veracruz).

Diagnosis. Stark & Kondratieff (2004) mentioned that the adult female of this species is similar to that of *A. naomi* Needham & Broughton, 1927 (Figs. 93 & 94 in Stark & Kondratieff, 2004). In *A. naomi*, the anterior margin of lobes in the subgenital plate is more curved and the median notch is narrower and deeper in *A. naomi* than in *A. pallida* (Fig. 9). The pigment pattern of the head of *A. naomi* seems to distinguish both species. In the case of *A. naomi*, the posterior part of head has a dark pigmentation reaching the occiput, whereas, *A. pallida* lacks this pigmentation (Figs. 7, 8).

Comments. Adult specimens of this species from the CNIN were remarkable for the yellowish coloration and large size (Fig. 7), features frequently uncommon for Mexican *Anacroneuria*. Additionally, the brown pigmented mediolateral and posterolateral areas of the pronotal disc were found only in the Tabasco, Oaxaca and Veracruz specimens (Fig. 8). These pigment patterns were not reported by Jewett (1958) or Stark & Kondratieff (2004), perhaps due to the age of the material being examined or it may be an intraspecific variation of the Mexican specimens. The smallest *A. pallida* was from Tabasco (19 mm), whereas specimens from Chiapas, Oaxaca and Veracruz (23, 24, 24 mm) and the Guatemalan types (22-23 mm) were larger (Jewett 1958). It looks as if there is a large range of body size, however, the specimens revised in this work are close to the Guatemalan types. Body coloration and subgenital plate shape were diagnostic for determining female specimens (Fig. 9), although male characters should provide more diagnostic features to identify this species. The presence of this species in Chiapas is confirmed, as reported by Jewett (1958). First records are presented for the species in Oaxaca, Tabasco and Veracruz.

Anacroneuria quadriloba Jewett, 1958

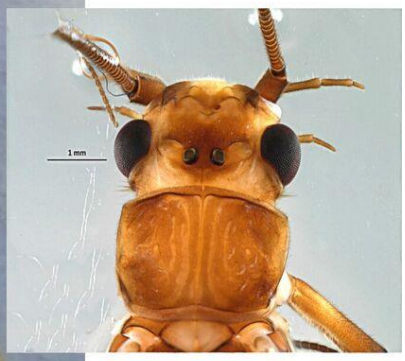
(Figs. 11-16)

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

Anacroneuria quadriloba Jewett, 1958:166. Holotype ♀ (FMNH), Metlac, Veracruz, Mexico

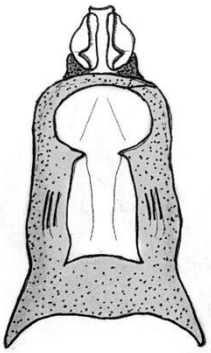
Material examined. MEXICO: Oaxaca, km 11, carr. Cuicatlán-Sgo. Quiotepec, 17°36′12.46" N 96°35′44" W, 610 m.a.s.l., 12 July 1996, R. Barba, A. Rojas, 1 ♂, 1♀.

Adult habitus. General body ground color brown (Fig. 11). Head brown medially; pigment pattern extends from occiput, through ocelli and anterior to M-line and lappets; M-line wide and pale,

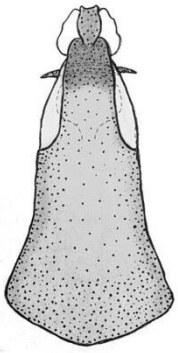


12

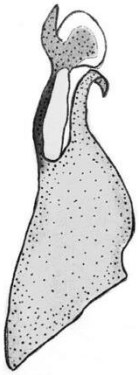
11



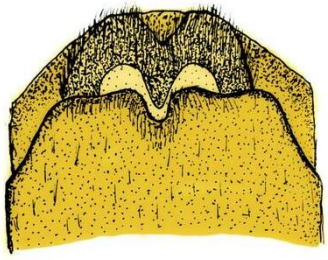
13



14



15



16

Figs. 11-16. *Anacroneuria quadriloba*. 11. Male adult habitus. 12. Head and pronotum. 13. Aedeagus, ventral. 14. Aedeagus, dorsal. 15. Aedeagus, lateral. 16. Female subgenital plate.

interrupted by a space and continued forward with a brown pattern V-shaped curved; lappets large, brown with small tufts of bristles at the base; brown circum-antennal ridges connect lappets to anterior margin of eyes; darker shading posterior to eyes and clothed with variously sized bristles. Pronotum with pale, narrow band at center, discs patterned with elongate, pale, C-shaped stripes; mediolateral areas of discs with dark rugosities; lateral margins pale, anterior and posterior margins with narrow, dark line (Fig. 12). Wing membranes amber, veins brown, costa transparent and sub-costa darker. Forelegs brown; femora grading from pale to dark banded at apex (Fig. 11).

Male. Forewing length 18 mm. General body color as above. Ventral: aedeagal apex truncate with notched tip; aedeagus constricted subapically and bearing a pair of large membranous lobes covering most of apex and shoulders (Fig. 13); shoulders rounded and sclerotized; hooks typical in appearance, the space between hooks "skeleton-key shaped"; medial processes of hooks forming sharp corners; mediobasal area of hooks with bristles moderate in length (Fig. 13). Lateral: apex rounded frontally and with posterior projection with pointy tip; protuberance at median area and concave at base (Fig. 14). Dorsal: of aedeagus without keel; apex as discussed above; apex divergent (Fig. 15).

Female. Forewing length 23 mm. General body color as above. Subgenital plate 4-lobed with slightly curved, setose posterior borders; lateral margins of lobes same in length as in their width; shallow U-shaped notch at middle of lobes. Sternum 9 without transverse sclerite; dark, mesal sclerite M-shaped with a deep and U- or V-shaped notch at apex, entire structure covered with long hairs; rest of sternum 9 mostly membranous with few hairs (Fig. 16).

Diagnosis. This species is similar in head and pronotal coloration to the recently described *A. quetzali* Gutiérrez-Fonseca & Springer, 2015 from Costa Rica. However, A. *quetzali* is overall a larger species, its aedeagus subapex is not constricted, and its apical membranes are smaller than in *A. quadriloba.*

Distribution. Guatemala, Mexico (Chiapas, Oaxaca and Veracruz), Panama (DeWalt et al. 2016).

Comments. This species was redescribed by Stark & Kondratieff (2004), but because of the age of the material, only a diffuse pigment pattern was present on the head and pronotum. Examination of fresh specimens revealed a distinctive head and pronotal pattern (Figs. 11&12). The female subgenital plate is illustrated from recently collected specimens (Fig. 16).

Current knowledge

The addition of *A. barbai* sp. nov. brings to 31 the total number of *Anacroneuria* species known from Mexico (Table 1). Only 18 of the 32 states (56%) are known to support *Anacroneuria.* Surely, this is just an artifact of limited research on the genus in Mexico. This paper reports five new state records, including a species new to science, and confirmed the presence of another species in Mexico. With concerted effort, most if not all states will eventually be reported to support one or more species of *Anacroneuria*.

Table 1 also summarizes the life stages described for all *Anacroneuria* known from Mexico (Jewett 1958, Stark & Kondratieff 2004, and Mayorga & Barba-Álvarez 2016). A total of 11 species are known from only one sex. Eight species are known solely from males (25.8%), while three (9.7%) are known only from females. One species, *A. nigrocincta* (Pictet, 1841), is known from only a single female without a complete illustration of the adult habitus and subgenital plate (Zwick 1972). Despite their importance in the freshwater ecosystems, larvae of only four species of *Anacroneuria* have been described (Table 1, Stark & Kondratieff 2004, Gutiérrez-Fonseca & Springer 2011) and none have been critically compared. These gaps in basic taxonomic knowledge of the genus are an impediment for detailed water quality assessment, stream ecological research, and conservation of stoneflies (Stewart & Stark 1988; Gutiérrez-Fonseca & Springer 2011).

ACKNOWLEDGEMENTS

I thank Professor Rafael Barba-Alvarez (Instituto de Biología, UNAM) for providing me the specimens examined in this study. Dr. Atilano Contreras-Ramos (IBUNAM) motivated me to continue studying aquatic insects and supplied laboratory equipment. Biologist Susana Guzmán

Table 1. Current checklist of Anacroneuria species known to occur in Mexico by state. Brief tally of published descriptions of larvae and adult sexes: M=male, F=female, L=larva. Ones and blank spaces indicate presence/absence in states. Presence in bold indicates new Mexican state records.

Species↓ Mexican States→	Aguascalientes	Baja Cal.	Baja Cal. Sur	Campeche	Chiapas	Chihuahua	Ciudad de Méx.	Coahuila	Colima	Durango	Estado de Méx.	Guanajuato	Guerrero	Hidalgo	Jalisco	Michoacán	Morelos	Nayarit	Nuevo León	Oaxaca	Puebla	Querétaro	Quintana Roo	San Luis Potosí	Sinaloa	Sonora	Tabasco	Tamaulipas	Tlaxcala	Veracruz	Yucatán	Zacatecas	Described
Anacroneuria aethiops (Walker)					1															1	1										1			M,F
Anacroneuria annulicauda (Pictet)					1								1					1		1						1					1			M,F
Anacroneuria baumanni Stark & Kondr.						1																												M,F,L
***Anacroneuria barbai* sp. nov.**																											1							M
Anacroneuria brailovskyi Stark & Kondr.																															1			M
Anacroneuria buenoi Stark & Kondr.																															1			M
Anacroneuria contrerasi Stark & Kondr.																			1															M,F
Anacroneuria coronata Needh. & Broug.					1																													M,F
Anacroneuria costana (Navás)					1															1						1					1			M,F
Anacroneuria flavifacies Jewett											1																							M
Anacroneuria flavolineata Jewett																																1		F
Anacroneuria flavominuta Jewett					1																				1						1			M,F
Anacroneuria hoogstraali Jewett																			1					1										M,F
Anacroneuria izapa Stark & Kondr.					1																													M,F
Anacroneuria lineata (Navás)					1						1					1		1	1	1				1			1	1			1			M,F,L
Anacroneuria litura (Pictet)					1								1				1			1							**1**	1						M,F
Anacroneuria mixteca Stark & Kondr.																				1														M
Anacroneuria naomi Needh. & Broug.																				1														M,F
Anacroneuria nigrocincta (Pictet)																																		F?
Anacroneuria nigrolineata Jewett													1														1							M,F
Anacroneuria olmec Stark & Kondr.																															1			M,F
Anacroneuria pallida Jewett					1															1							**1**				**1**			F
Anacroneuria pareja Stark & Kondr.					1																													M
Anacroneuria perplexa Stark					1																						1							M,F,L
Anacroneuria planicollis Klapálek					1								1			1	1		1	1	1			1	1						1			M,F
Anacroneuria quadriloba Jewett					1															1											1			M,F,L
Anacroneuria quetzalcoatl Stark & Kondr.					1																													M
Anacroneuria ratcliffei Stark & Kondr.					1																										1			M,F
Anacroneuria shepardi Stark & Kondr.					1																													M,F
Anacroneuria sonora Stark & Kondr.																										1								M,F
Anacroneuria zaga Stark & Kondr.																															1			M
Total species known	**0**	**0**	**0**	**0**	**16**	**1**	**0**	**0**	**0**	**1**	**2**	**0**	**4**	**0**	**1**	**2**	**1**	**3**	**3**	**10**	**2**	**0**	**0**	**4**	**1**	**4**	**5**	**2**	**0**	**14**	**0**	**0**	

Gómez (IBUNAM) provided helpful advice on using the Auto-Montage system and Professor Enrique Mariño Pedraza (IBUNAM) helped prepare photographs presented in this work. Cristina Mayorga (IBUNAM) kindly permitted access to the collection. Additionally, I thank Dr. R. Edward DeWalt (University of Illinois), Dr. Bill P. Stark (Mississippi College), and an anonymous reviewer for their earlier reviews and helpful comments that improved the manuscript.

REFERENCES

DeWalt, R. E., M. D. Maehr, U. Neu-Becker and G. Stueber. 2016. Plecoptera Species File Online. Version 5.0/5.0. 10/31/2016. http://Plecoptera.SpeciesFile.org

Froehlich, C.G. 2010. Catalogue of Neotropical Plecoptera. Illiesia, 6:118-205.

Gutiérrez-Fonseca, P.E. 2009. Ecología, reproducción, taxonomía y distribución de *Anacroneuria* spp. Klapálek 1909 (Insecta: Plecoptera: Perlidae) en Costa Rica. Bachelor´s degree thesis, San José, Costa Rica: Universidad de Costa Rica, Facultad de Ciencias, Escuela de Biología. Pages. 69.

Gutiérrez-Fonseca, P.E. & M. Springer. 2011. Description of the final instar nymphs of seven species from *Anacroneuria* Klapálek (Plecoptera: Perlidae) in Costa Rica, and first record for an additional genus in Central America. Zootaxa, 2965: 16-38.

Gutiérrez-Fonseca, P.E. & M. Springer. 2015. A new species of *Anacroneuria* Klapálek 1909 (Plecoptera: Perlidae) and notes on the altitudinal distribution of the genus in Costa Rica. Zootaxa, 4058: 595-600.

Jewett, S.G. 1958. Stoneflies of the genus *Anacroneuria* from Mexico and Central America. The American Midland Naturalist, 60:159-175.

Mayorga, A. & R. Barba-Álvarez. 2016. Complementary description of *Anacroneuria izapa* (Plecoptera: Perlidae) from Mexico. Illiesia, 12:31-34.

Pictet, F.J. 1841. Histoire naturelle générale et particulière des insectes Névroptères. Famille des Perlides. I partie: 423 pp.

Stark, B.P. 1998. The *Anacroneuria* of Costa Rica and Panama (Insecta: Plecoptera: Perlidae). Proceedings of the Biological Society of Washington, 111:551-603.

Stark, B.P. & B.C. Kondratieff. 2004. *Anacroneuria* from Mexico and upper Mesoamerica (Plecoptera: Perlidae). Monographs of the Western North American Naturalist, 2:1-64.

Stark, B.P., & I. Sivec. 2001. Systematic notes on Plecoptera: *Anacroneuria proxima* Klapalek (Plecoptera: Perlidae). Acta Entomologica Slovenica, 9:35-37.

Stark, B.P., M.C. Zúñiga. 2003. The *Anacroneuria guambiana* complex of South America (Plecoptera: Perlidae). Pages. 229-237. *In*: Gaino, E. [editor]. Research Update on Ephemeroptera and Plecoptera. University of Perugia, Perugia.

Stewart, K.W. & B.P. Stark. 2002. Nymphs of North American Stonefly Genera (Plecoptera). 2nd. Ed. Caddis Press, Columbus, Ohio: 510 pp.

Zwick, P. 1972. Die Plecopteren Pictets und Burmeisters, mit Angaben über weitere arten (insects). Revue Suisse de Zoologie 78:1123–1194.

Submitted 13 September 2016, Accepted 1 December 2016, Published 14 December 2016

Hosted and published at the University of Illinois, Illinois Natural History Survey, Champaign, Illinois, U.S.A.