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NEW SPECIES AND RECORDS OF *ANACRONEURIA* (PLECOPTERA: PERLIDAE) FROM ECUADOR AND PARAGUAY

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ABSTRACT

Five new species of *Anacroneuria* Klapálek are described from Ecuadorian specimens. New taxa include *A. apuela*, *A. cushueme, A. kayceae, A. malkini,* and *A. pichincha.* New distribution records are also presented for six species including three, *A. atrifrons* Klapálek, *A. chavin* Stark & Sivec and *A. guambiana* Zúñiga & Stark, not previously reported from Ecuador. An additional species represented by a female specimen is described under an informal designation, the larva of *A. gaumbiana* is described, and a checklist of 54 species reported for Ecuador is presented. The first Paraguayan specimens of *A. atrifrons* are also reported.

Keywords: *Anacroneuria*, Plecoptera, Perlidae, New species, Ecuador, Paraguay

INTRODUCTION

Genus *Anacroneuria* is the dominant stonefly group throughout much of the Neotropics, and this condition certainly applies to Ecuador. Forty six *Anacroneuria* species are currently recognized as valid for Ecuador, and another five, originally described from the country are regarded as nomen dubium (Stark 2001; Stark & Zúñiga 2003; Zúñiga et al. 2006); the only other stonefly genus reported for Ecuador is *Claudioperla* (Turcotte & Harper 1982 a, b), presently considered a monotypic member of family Gripopterygidae (Illies 1963). The present study is based on a small sample of *Anacroneuria* collected at high elevation sites (>1980 m) by two of the authors (BCK, BG), or on material included in the S.G. Jewett collection, but forwarded to us for study together with specimens from the Monte L. Bean Museum at Brigham Young University, and an additional small series from Paraguay in the C.P. Gillette Museum. Study of these specimens resulted in discovery of five previously undescribed species along with specimens of three species not previously reported from Ecuador, and one species record new for Paraguay. These discoveries bring the *Anacroneuria* species list for Ecuador to 54 species and the Paraguayan *Anacroneuria* list to four species (Stark & Baumann 2011).

MATERIAL AND METHODS

Terminal abdominal segments were clipped and boiled in 10% KOH briefly before study with a Wild M5 dissecting microscope, using the procedures outlined in Stark & Zúñiga (2003). Holotype specimens are deposited in the United States

National Museum of Natural History, Washington, D.C. (USNM) or the California Academy of Sciences, San Francisco, California (CASC) as indicated in the text; other specimens are deposited in the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado (CSUC) or the Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah (BYUC). Other museum designations used in the text are: Natural History Museum London (NHML) and Museo de Entomología de la Universidad del Valle, Cali, Colombia (MEUV).

RESULTS AND DISCUSSION

Anacroneuria anchicaya Baena & Zúñiga

Anacroneuria anchicaya Baena & Zúñiga *in* Stark et al., 1999:22. Holotype ♂ (MEUV), Alto Anchicayá, Valle Del Cauca, Colombia
Anacroneuria anchicaya: Stark, 2001:4. Ecuador records

Material examined. Ecuador: Pastaza, Cushueme, Rio Cushueme, 320 m, 150 km SE Puyo, 15-30 May 1971, B. Malkin, 1♂ (CASC).
Comments. This species was previously reported from Colombia and from Cotopaxi, Napo and Pichincha provinces in Ecuador (Stark et al., 1999; Stark 2001).

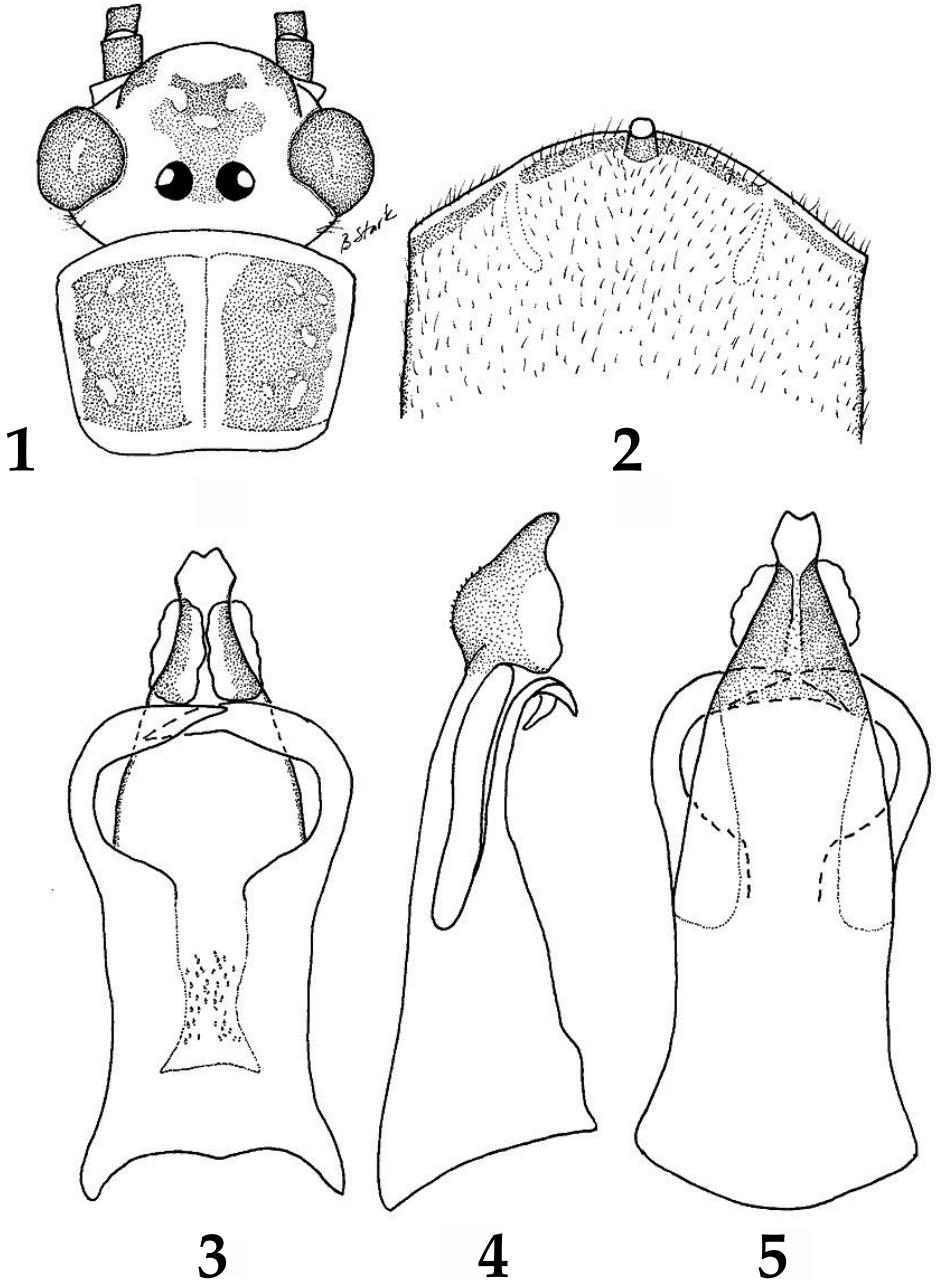
Anacroneuria apuela Stark & Gill sp. n.
(Figs. 1-5)

Material examined. Holotype ♂ and 1♂ paratype, **Ecuador**, Province Imbabura, Canton Cotacachi, Rio Intag, Apuela, 5020 ft, 00° 21.2'N, 78° 31.0'W, 6 November 2009, S.M. Clark, H.R. Hinkson (Holotype USNM, paratype BYUC).
Adult habitus. General color brown patterned with darker brown. Ocellar region covered with moderately dark brown pigment extending to central frons, becoming darker forward of poorly defined M-line; lappets and antennae brown (Fig. 1). Pronotum pale along median suture and along lateral margins; disk predominantly brown with scattered pale rugosities. Wing membrane pale brown, veins darker except costa pale. Femora dark over apical half and along dorsal and ventral margins for most of length; tibiae dark along outer margin and in basal and apical fourth.
Male. Forewing length 10 mm. Apical section of aedeagus gradually narrowed from shoulders, then slightly widened subapically and narrowed again to slightly notched tip (Fig. 3). Dorsal keel consists of two narrowly separated and broken lines which diverge sharply and reach lateral margins near subapical wide point (Fig. 5). Ventral aedeagal apex covered by a large pair of membranous lobes. Hooks large, subchelate and narrowed to acute tips. Lateral aspect of apical section shaped somewhat like a bird's head (Fig. 4). Hammer thimble shaped (Fig. 2).
Female. Unknown.
Larva. Unknown.
Etymology. The species name, used as a noun in apposition, is based on the type locality.
Diagnosis. This species is a member of the *A. aymara* Stark & Sivec, 1998 species group discussed by Zúñiga & Stark (2002). The group also includes *A. chaima* Stark, 1999, *A. cotacachi* Stark, 2001, *A. farallonensis* Rojas & Baena, 1993 (see Zúñiga & Stark 2002), *A.perija* Stark, 1999, *A. portilla* Stark & Rojas, 1999 (in Stark et al. 1999), *A. ricki* Zúñiga & Stark, 2002, *A. segnini* Stark & Maldonado, 2002 (in Maldonado et al. 2002), and *A. toni* Zúñiga & Stark, 2002, and appears to be widely distributed in the northern and central Andes. The new species is most similar to *A. toni* in structure of the dorsal aedeagal keel, sharing with that species the long, apically divergent pair of keel lines. However, in *A. apuela* these lines are broken, and appear as a series of small bumps separated by narrow gaps. In addition, the ventral membranous lobes are much larger than in *A. toni* (see Zúñiga & Stark 2002, Figs. 17-19).

Anacroneuria atrifrons Klapálek

Anacroneuria atrifrons Klapálek 1922:89. Holotype ♂ (NHML). Amazon River, São Paulo de Olivença, Brazil
Anacroneuria montera Stark & Sivec 1998:41. Holotype ♂ (USNM). Iquitos, Loreto, Peru. Syn. Froehlich, 2008:129.
Anacroneuria montera: Stark et al., 2001:121. Colombian records

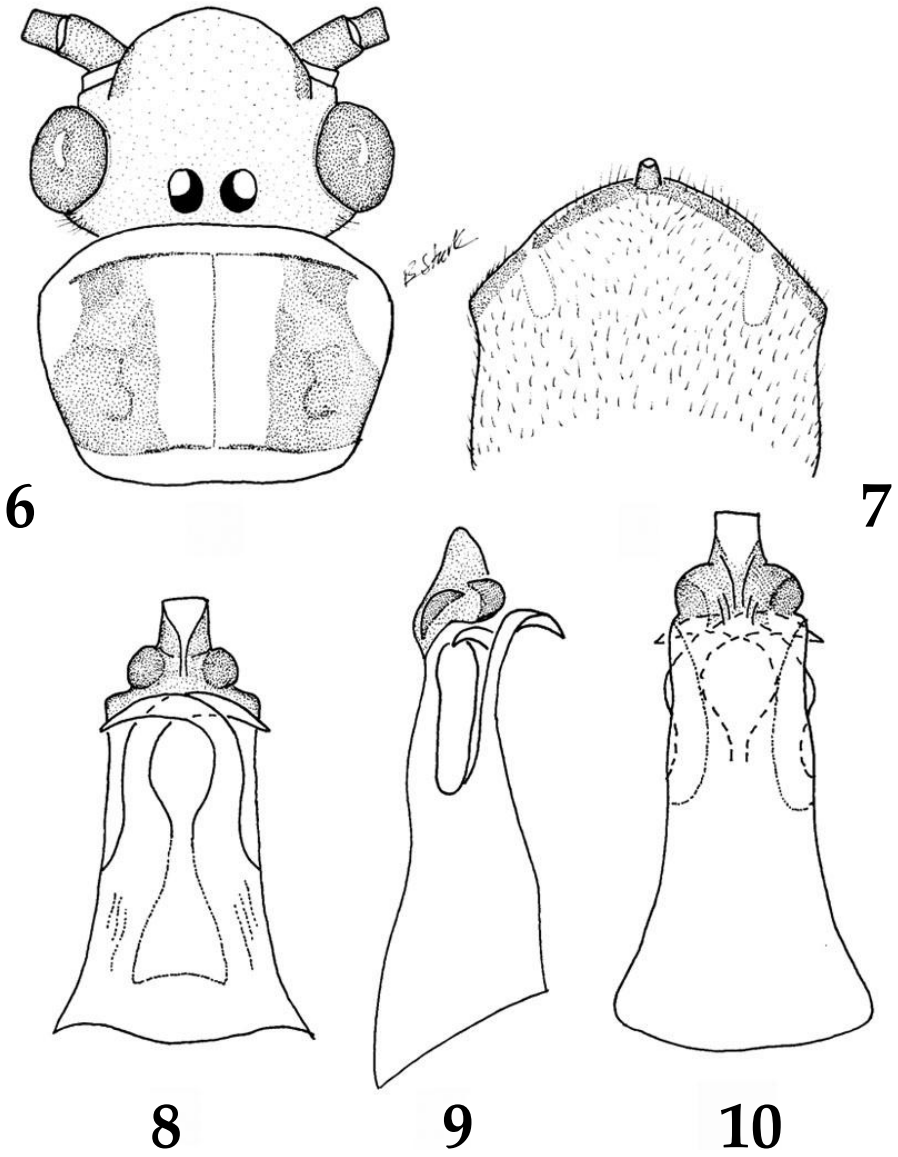
Material examined. Ecuador: Pastaza, Rio Cushueme, Cushueme, 150 km SE Puyo, 320 m, 15-30 May 1971, B. Malkin, 1♂ (CASC). Same site, 23 July 1971, B.



Figs. 1-5. *Anacroneuria apuela* male structures. 1. Head and pronotum. 2. Abdominal sternum 9. 3. Aedeagus, ventral. 4. Aedeagus, lateral. 5. Aedeagus, dorsal.

Malkin, 2♂ (CASC). **Paraguay**: Dept. Canindeyu, R.N.B. Mbaracayu, 183 m, 24° 08.1'S, 55° 31.7'W, 8-10 January 2012, D. Brzoska, 1♂, 4♀ (CUSC).

Comments. This species has been widely reported from the upper Amazonas region of Brazil, Colombia and Peru (Froehlich 2008; Stark & Sivec 1998; Stark et al. 2001), but not previously from Ecuador or Paraguay.



Figs. 6-10. *Anacroneuria cushueme* male structures. 6. Head and pronotum. 7. Abdominal sternum 9. 8. Aedeagus, ventral. 9. Aedeagus, lateral. 10. Aedeagus, dorsal.

Anacroneuria azul Rojas & Baena

Anacroneuria azul Rojas & Baena *in* Stark et al., 1999:23. Holotype ♂ (MEUV), Rio Azul, Valle del Cauca, Colombia
Anacroneuria azul: Stark, 2001:7. Ecuador records

Material examined. Ecuador: Pichincha, Santo Domingo de Los Colorados, 500 m, 3-8 April 1971, B. Malkin, 1 ♂ (CASC).

Comments. Stark (2001) previously reported this species from three sites in the general vicinity of this collection in Pichincha.

Anacroneuria carchi Stark

Anacroneuria carchi Stark 2001:11. Holotype ♂ (CMNH), Chical, Carchi, Ecuador

Material examined. Ecuador: Esmeraldas, Cantón San Lorenzo, Rio Lita, 1830 ft, 00° 51.64'N, 78° 27.16'W, 2 December 2008, R.C. Mower, 2♂ (BYUC).
Comments. This species was known previously from the holotype (Stark 2001).

Anacroneuria chavin Stark & Sivec

Anacroneuria chavin Stark & Sivec 1998:16. Holotype ♂ (CASC). 67 mi E Tingo Maria, Yurac, Peru

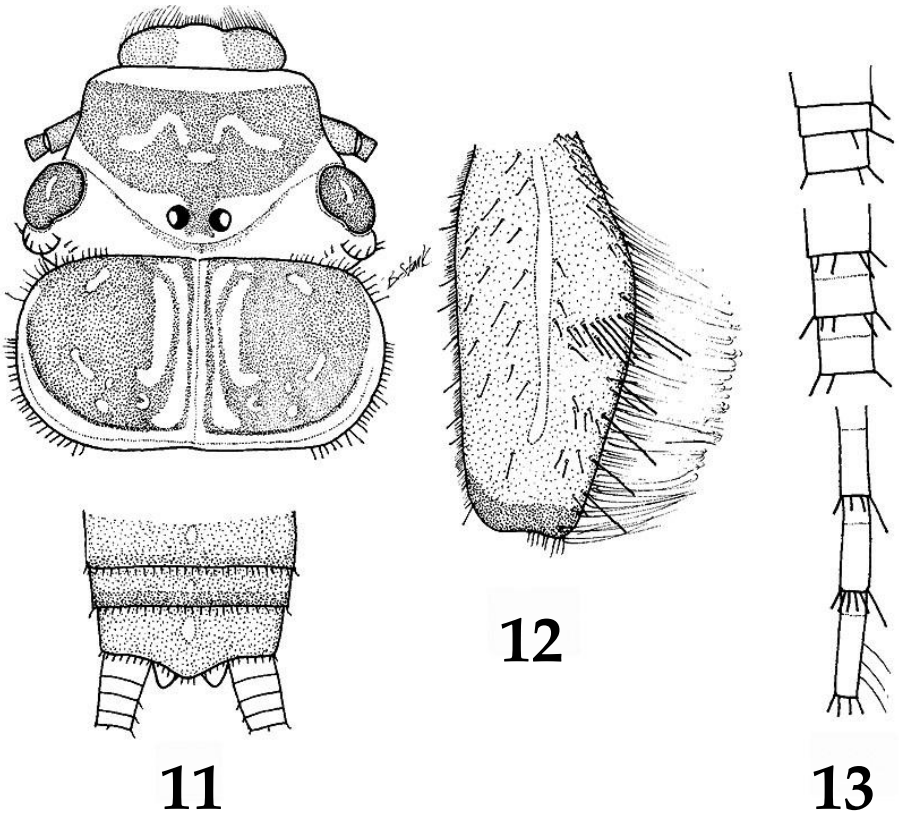
Material examined. Ecuador: El Oro, 9 mi S Santa Rosa, 23 January 1955, E.I. Schlinger, E.S. Ross, 11♂ (CASC).
Comments. Forewing lengths for these males range from 8-9 mm and the holotype forewing length is 10.5 mm. This difference and subtle differences in the aedeagal apex suggest these specimens may represent a sibling species in this complex. Specifically, the narrow dark markings along the posterior shoulder margins are less distinct for the Ecuadorian specimens and the lateral margins of the aedeagal apex are not constricted at the shoulder as they are in the holotype. A larger sample from the type locality in Peru is needed to more fully evaluate the status of these specimens.

Anacroneuria cushueme Stark & Gill sp. n.
(Figs. 6-10)

Material examined. Holotype ♂ and 1♂ paratype, Ecuador, Pastaza, Rio Cushueme, Cushueme, 150 km SE Puyo, 320 m, 15-30 May 1971, B. Malkin (CASC).
Adult habitus. General color pale yellow patterned with pale brown. Head pattern indistinct, almost entirely yellow with only slightly darkened lappets (Fig. 6). Pronotum with sublateral pale brown bands; area adjacent to median suture and anterolateral margins pale. Femora pale brown, tibiae slightly darker at apex and base. Wings transparent, veins pale amber.
Male. Forewing length 9 mm. Apical section of aedeagus with median, projecting lobe narrowed slightly from base and truncate at tip (Fig. 8). Shoulders strongly sclerotized, bulging laterad; body of aedeagus wider proximal to shoulder bases. Dorsal keel consists of two long, divergent ridges and two pairs of shorter ones near base of longer median keel lines (Fig. 10). Hooks relatively wide and acute. Lateral lobes on apical section project away from aedeagal body, one pair lunate and the other almost quadrate (Fig. 9). Hammer thimble shaped (Fig. 7).
Female. Unknown.
Larva. Unknown.
Etymology. The species name, used as a noun in apposition, is based on the type locality.
Diagnosis. Based on aedeagal morphology, this species is related to the *A. yameo* Stark & Sivec 1998 group of species, which also includes *A. pakitza* Stark & Sivec 1998, *A. pinza* Stark 1995, and *A. zunigae* Stark 2001. The new species bears a greater similarity in aedeagal structure to *A. yameo* and *A. pakitza* but in these species the shoulder region bulges toward the aedeagal apex creating an apically trilobed structure; this is quite distinct in the dorsal aspect and differs from the comparable structures in *A. cushueme* which bulge more laterad. In *A. cushueme* the mesal projection of the aedeagal apex is truncate at the tip and broad at the base which also differs from both related species.

Anacroneuria guambiana Zúñiga & Stark
(Figs. 11-13)

Material examined. Ecuador, Napo Province, 6.38 km W Baeza, Hwy E-20, 1,987 m, 25 January 2012, B.C. Kondratieff, B. Gill 1♂, 1♀, 1 larva, 1 exuvium (CSUC). Napo Province, 8.68 km NW Baeza, Hwy E-20, 2,134 m, 24 January 2012, B.C. Kondratieff, B. Gill, 1♂, 1 exuvium (CSUC).
Larva. Body length pre-emergent female 16-17 mm. General color brown, patterned with dark brown. Head brown with pale areas at frontoclypeus, M-line, lateral to ocelli and over most of occiput (Fig. 11); M-line incomplete adjacent to pale mesal spot. Pronotum brown but with pale leg shaped areas adjacent to median suture, and with a few additional pale rugosities. Lateral pronotal setal fringe incomplete anterolaterally. Femora pale brown but darker along ventral and apical margins; fine setal

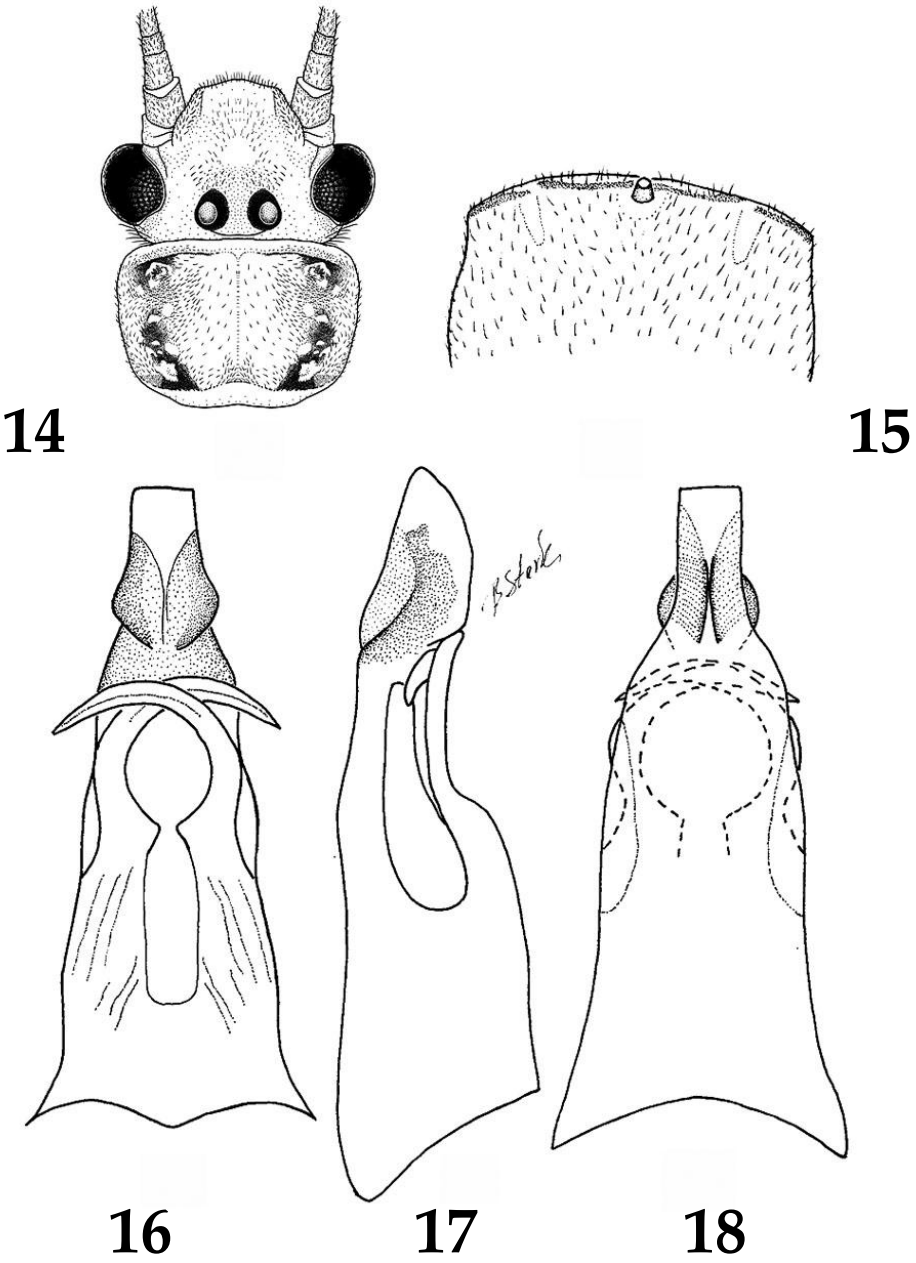


Figs. 11-13. *Anacroneuria guambiana* larval structures. 11. Head, pronotum and terminal abdominal segments. 12. Left fore femur. 13. Cercal segments 5-7, 16-18, 31-33, lateral.

fringe well developed; basal patch of short thick setae extensive along dorsal margin; transverse setal row consists of ca. 7 long, thick setae; scattered thick setae sparse beyond transverse row and with ca. 16 on lower half of femoral surface. Ventral margin with a few thick setae and interspersed fine short setae (Fig. 12). Abdomen dark brown but apical segments with a small median pale spot (Fig. 11), terga without apparent intercalary setae. Cerci without well-developed fine setal fringe (Fig. 13), only a few fine setae occur along dorsal margin of apical segments; cercal segments bear apical whorls of short, thick setae, except on some basal segments.

Comments. The male specimen from the first site listed above varies slightly from typical *A. guambiana* specimens in having the apical aedeagal section with convergent lateral margins and in having the aedeagal shoulders approaching the apical section at an obtuse angle. Larger samples are needed to resolve whether this specimen represents a sibling member of the *A. guambiana* complex. The larva is generally similar to that of *A. paleta* Stark 1995 (Maldonado et al. 2002), but that species has a complete M-line and more extensive dark pigment on the occiput. These specimens are the first representatives of this species to be reported for Ecuador.

The first site listed in the materials section above (Figs. 32-33) is located in the lower montane cloud forest at 1,987 m, and is composed mainly of alternating step-pools. The substrate ranges from depositional fines to large boulders, however, size extremes of sand and boulders dominate. The stream channel has numerous debris dams and downed trees from adjacent riparian zones. Steep walls surrounding the stream are covered with plants that



Figs. 14-18. *Anacroneuria kayceae* male structures. 14. Head and pronotum. 15. Abdominal sternum 9. 16. Aedeagus, ventral. 17. Aedeagus, lateral. 18. Aedeagus, dorsal.

confine the channel and create approximately 71% canopy cover. The channel is 1.56 m wide and depth averaged 0.13 m. Discharge measured during the collection at this site was 37.1 L s^{-1}. Interestingly, the substrate was partially covered at the time of the collection by filamentous algae not typically seen in the region. The second stream (Fig. 34) is characterized by stretches of cobble filled riffle between cascades formed by large boulders. The channel is braided and narrow at various points, and is relatively free of debris dams or downed trees. Channel width is 2.32 m and depth averages 0.19 m.

Discharge was measured at 105.3 L s^{-1} during collecting. Canopy cover varies from open to closed along the channel. Adjacent riparian areas are composed of vegetation typical of lower montane cloud forest.

Anacroneuria jewetti Stark

Anacroneuria jewetti Stark 2001:19. Holotype ♂ (USNM). San Francisco de Borja, Napo, Ecuador
Anacroneuria jewetti: Zúñiga et al., 2006:55. Female description

Material examined. Ecuador: Imbabura Province, Cantón Cotacachi, Rio Intag, Apuela, 5020 ft, 00° 21.2'N, 78° 31.0'W, 6 November 2009, S.M. Clark, H.R. Hinkson 8♂ (BYUC).
Comments. These specimens are the first to be reported from Imbabura Province.

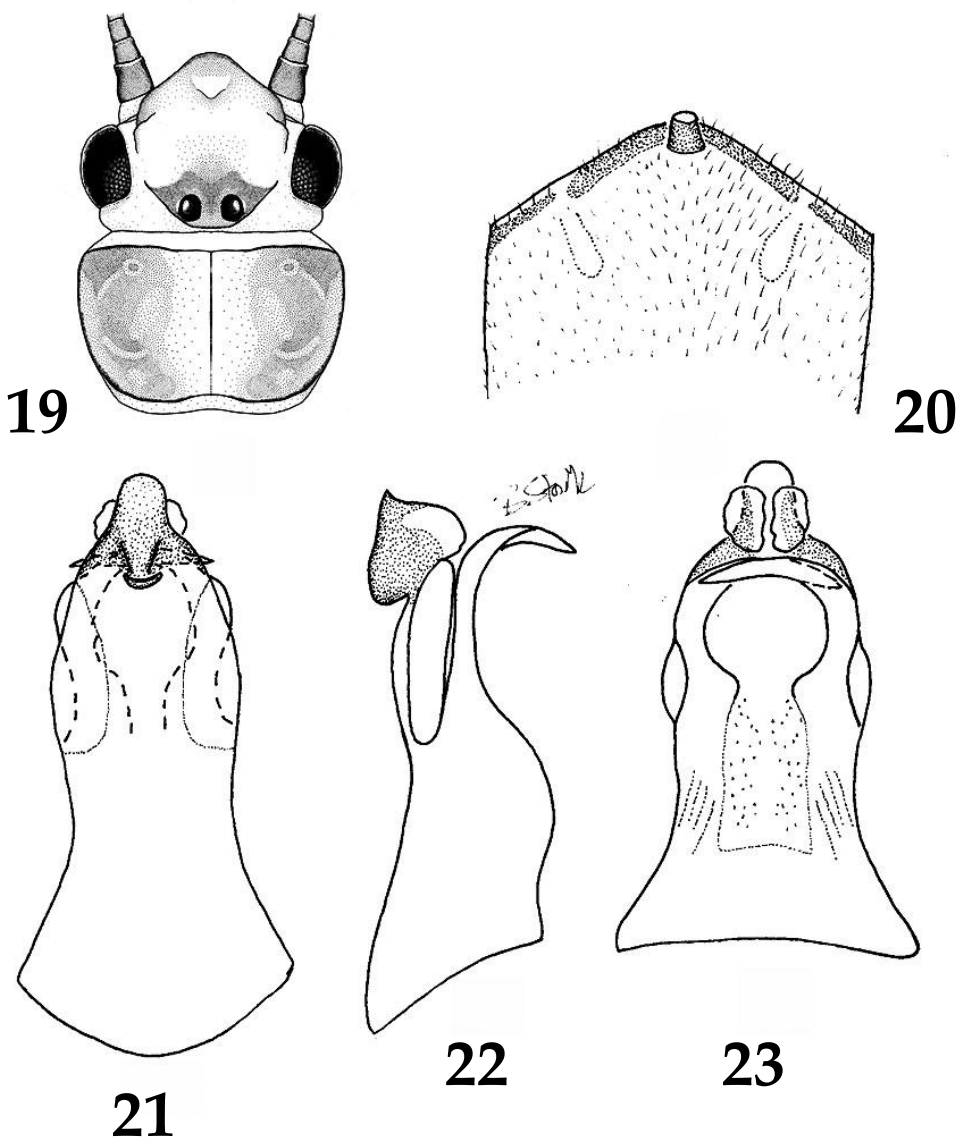
Anacroneuria kayceae Kondratieff & Gill sp. n.
(Figs. 14-18)

Material examined. Holotype ♂, Ecuador, Napo, 6.38 km W Baeza, Hwy E-20, 1,987 m, 0° 27.123'S, 77° 56.468'W, 25 January 2012, B.C. Kondratieff, B. Gill (USNM).
Adult habitus. General color pale yellow, white in alcohol. Head with slightly darker, but obscure markings over ocelli, lappets and posterolateral areas of occiput (Fig. 14). Pronotum pale along lateral margins and median suture, but with irregular, dark brown, sublateral bands. Ocelli narrowly separated; wings transparent, veins pale. Legs, antennae and palpi pale.
Male. Forewing length 17 mm. Hammer almost cylindrical, but slightly wider at base than apex (Fig. 15). Aedeagal apex truncate, lateral margins slightly expanded and appearing swollen at base (Figs. 16, 18); hooks strongly sclerotized at base with a distinct dark line outlining inner basal margin, and bearing a strong ventral keel from near midlength to near tips. Dorsal keel consists of two close-set, low ridges, extending for about half of apical area length (Fig. 18). In lateral aspect much of aedeagal apex membranous (Fig. 17).
Female. Unknown.
Larva. Unknown.

Etymology. We honor Dr. Kayce Anderson, Colorado State University, for her dedication to ecological studies in Ecuador, and her appreciation of Neotropical aquatic biology.
Diagnosis. The aedeagus of this species is similar to that of the Peruvian-Bolivian species, *A. pachacuti* Stark & Sivec 1998, particularly in lateral aspect. However, in that species the apical section of the aedeagus is offset by prominent basolateral notches and the aedeagal apex is nipple-shaped rather than truncate (see Stark & Sivec 1998, Figs. 124-126). In addition, *A. pachacuti* is a smaller species (FWL ~11 mm) with a slightly darker habitus. The aedeagus is also similar to that of *A. rawlinsi* Stark, 2001, but in that species the apical aedeagal section lacks swollen basolateral lobes.
Comments. The type locality (Figs. 32-33) is described under *A. guambiana*.

Anacroneuria malkini Stark & Kondratieff sp. n.
(Figs. 19-23)

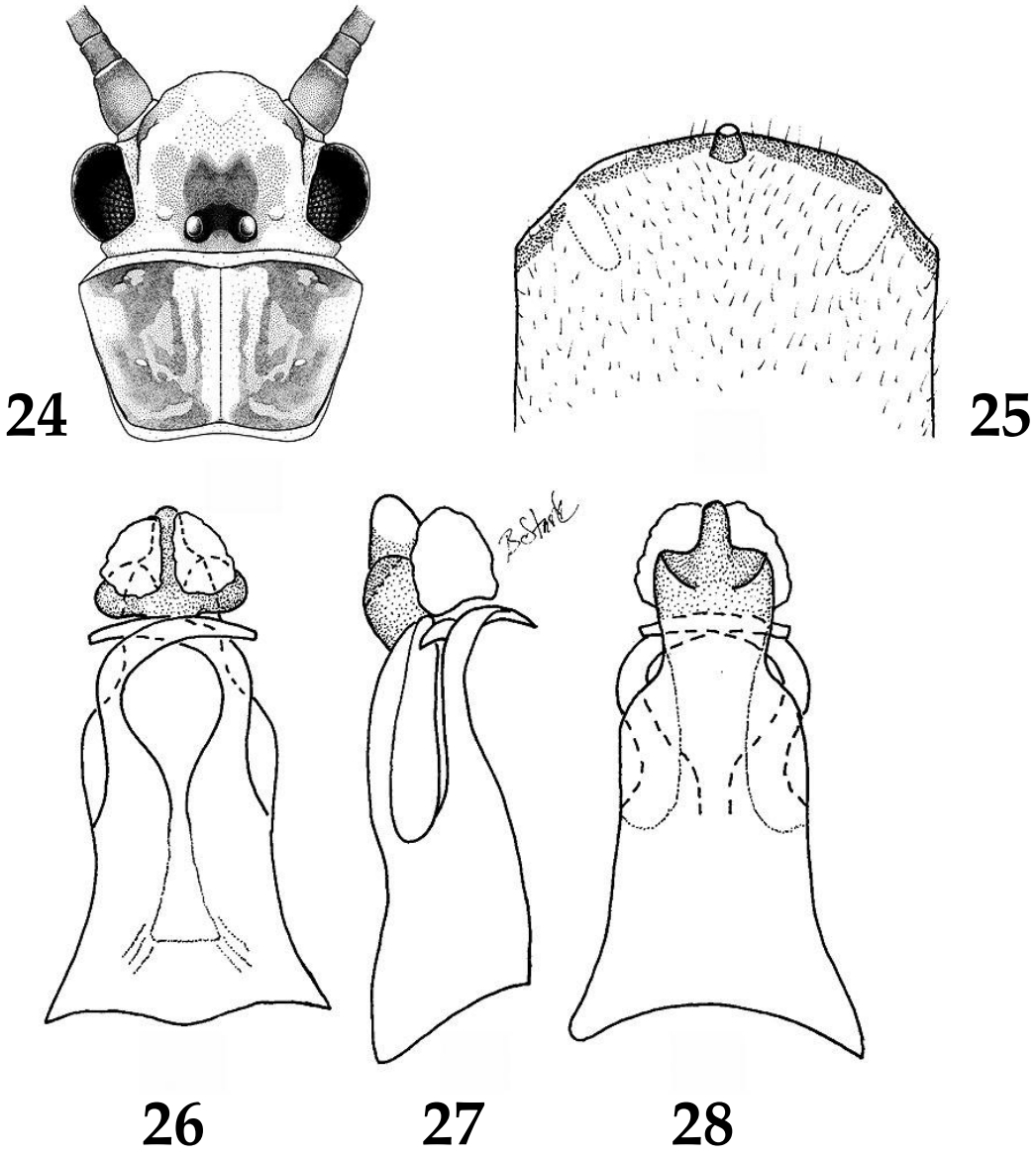
Material examined. Holotype ♂, Ecuador, Pastaza, Rio Cushueme, Cushueme, 150 km SE Puyo, 320 m, 15-30 May 1971, B. Malkin (CASC).
Adult habitus. General color yellow-brown patterned with darker pigment. Head mostly yellow but with a large dark brown patch covering ocelli, and with dark brown lappets. Antennae dark brown, pronotum brown with scattered pale rugosities and with a pale median band and with areas of lighter pigment along lateral margins (Fig. 19). Femora brown in apical half with narrow black band at knee; basal half of femora pale, tibiae brown. Wings transparent with pale amber tint, veins dark amber with R vein dark brown.
Male. Forewing length 8 mm. Aedeagal apex narrowed from shoulders, rounded at tip, and bearing a pair of membranous ventral lobes (Fig. 23). Dorsal keel consists of a pair of divergent, narrow ridges and a small transverse ridge set at the base of the divergent ridges (Fig. 21); lateral aspect of aedeagal apex broad basally, narrowed to an acute tip and directed toward apex (Fig. 22). Aedeagal hooks gradually curved to acute tips. Abdominal sternum 9 bears a thimble shaped hammer (Fig. 20).
Female. Unknown.
Larva. Unknown.



Figs. 19-23. *Anacroneuria malkini* male structures. 19. Head and pronotum. 20. Abdominal sternum 9. 21. Aedeagus, dorsal. 22. Aedeagus, lateral. 23. Aedeagus, ventral.

Etymology. The patronym honors the late Borys Malkin who collected the holotype of this and many other species. Mr. Malkin was a famed naturalist and friend of the well-known Plecoptera authority, Stanley G. Jewett, Jr. The specimens were part of the Jewett collection directed to us by R.W. Baumann.

Diagnosis. The aedeagus of this species is generally similar to that of *A. tzapino* Stark 2001, a species also known from Pastaza. The aedeagal apex of that species is slightly notched, the dorsal keel arms are parallel for most of their length, and the apical aedeagal region slants slightly ventrad in lateral aspect (see Stark 2001, Figs. 118-120). In addition, *A. tzapino* has a more extensive area of brown pigment on the head and the wings are darker, but also have an obscure pale spot at the cord (Stark 2001).



Figs. 24-28. *Anacroneuria pichincha* male structures. 24. Head and pronotum. 25. Abdominal sternum 9. 26. Aedeagus, ventral. 27. Aedeagus, lateral. 28. Aedeagus, dorsal.

***Anacroneuria pichincha* Stark & Kondratieff sp. n.**
(Figs. 24-28)

Material examined. Holotype ♂, Ecuador, Pichincha, Santo Domingo de Los Colorados, 500 m, 3-8 April 1971, B. Malkin (CASC).

Adult habitus. General color yellow-brown patterned with dark brown. Head with a quadrangular area covering ocellar area forward to about mid-frons; pigmented area with a slight anteromedian notch (Fig. 24); lappets pale brown, antennae brown. Pronotum dark over much of disk but pale along median suture, anterolateral margins and bearing a few small, pale rugosities. Femora pale brown except for narrow, dark knee band; tibiae pale except for small dark bands at base and near apex. Wing membrane dark amber with darker veins; R-vein particularly dark in basal half.

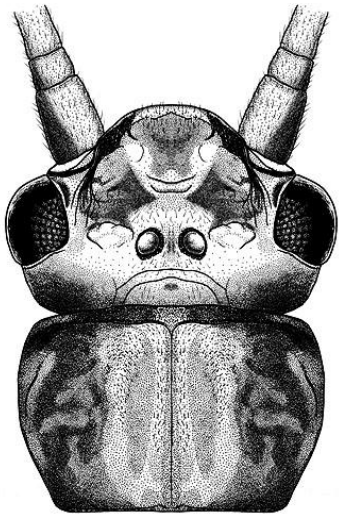
Male. Forewing length 10.5 mm. Apical section of aedeagus indistinctly trilobed with narrow median lobe projecting well beyond lateral, somewhat bulging shoulders (Figs. 26, 28); entire apical area covered by large ventral membranous lobes; shoulders with short dorsal ridges extending inwards toward bases of median, finger-like lobe. Body of aedeagus constricted near apical third, but with low lateral bulges projecting over bases of hooks; tips of hooks narrowly truncate. Lateral lobes of aedeagal apex project away from aedeagal body in ear-like fashion (Fig. 27). Abdominal sternum 9 bears a thimble shaped hammer (Fig. 25).

Female. Unknown.

Larva. Unknown.

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

Diagnosis. Aedeagal morphology places this species near *A. curiosa* Stark 1998, a Mesoamerican species, and *A. cosnipata* Stark & Sivec 1998, a species known from several Peruvian sites. The latter species bears a broad, dorsomedian, mesa-like structure on the aedeagus, and the median lobe on the aedeagal apex is wider than in the new species (see Stark & Sivec 1998, Figs. 53-55). Neither of these related species has the aedeagus strongly constricted proximal to the apical section, neither have the hooks blunt at the tips and neither shares the distinctive color pattern of *A. pichincha.*



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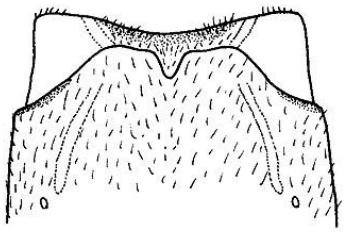

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Figs. 29-31. *Anacroneuria* EC-1 female structures. 29. Head and pronotum. 30. Egg. 31. Abdominal sterna 8-9.

***Anacroneuria* EC-1**
(Figs. 29-31)

Material examined. Ecuador: Napo Province, 2.78 km W Papallacta, Hwy E-20, 3296 m, 25 January 2012, B.C. Kondratieff, B. Gill, 1♀ (CSUC).

Adult habitus. General color dark brown to black. Head yellow, with dark brown patches extending forward of each ocellus toward central frons; lappets dark brown, posterolateral occiput and anteromedian frons pale brown (Fig. 29). Antennae and legs dark brown, femora paler in ventral half. Pronotum dark brown over lateral third, and bearing a thin, dark, diagonal line near anterolateral margin. Wing membrane dark brown to black, veins brown except pale R vein.

Figs. 32-35. Ecuadorian collecting sites. 32. Napo Province, 6.38 km W Baeza, 1,987 m. 33. Same site as previous figure. 34. Napo Province, 8.68 km W Baeza, 2,134 m. 35. Napo Province, 2.78 km W Papallacta, 3,296 m.

Male. Unknown.

Female. Forewing length 31 mm. Subgenital plate bilobed with truncate posterior margins; lobes separated by a shallow V-shaped notch. Sternum 9 bearing an obscure transverse sclerite, median sclerite covered by dark setae (Fig. 31).

Egg. Somewhat thimble shaped with broadly rounded anterior pole almost as wide as collar end (Fig. 30). Collar small and button shaped. Chorionic surface without follicle cell impressions.

Comments. Females representing more than 30 *Anacroneuria* species have been described under temporary designations consisting of a two letter national code followed by a number. Ten have been proposed for Colombia (Stark et al. 1999; Zuniga & Stark, 2002; Zuniga et al. 2007), five for Guyana (Stark 1999; 2000), three for Paraguay (Stark & Baumann 2011), one for Peru (Stark & Sivec 1998), and twelve for Venezuela (Stark 1995; Maldonado et al. 2002). Several additional species have been proposed as *Anacroneuria* sp., or as *Anacroneuria* sp. A, etc., without a prefix; six of these (sp. A, B, C, D, E, F) were proposed by Harper (1992) for the Panamanian fauna. Only one of these unassociated females, *A.* CO-5 (FWL 24-26 mm), has a forewing length approaching that of this species; both species also have the subgenital plate bilobed, however the former species is quite pale in comparison to *A.* EC-1. Among large *Anacroneuria* species where sufficient specimens are known to generate a significant sample size [e.g. *A. magnirufa* Jewett 1958 or *A. plutonis* (Banks 1914)], male forewing length is approximately 75% of female forewing length (Stark 1998). If this is applied to the current female, the male could be expected to display a forewing length of about 23 mm.

The site (Fig. 35) where this female was collected is a high gradient stream characterized by a series of large waterfalls and short stretches of riffles. The channel width is 1.63 m and average depth at the time of collection was 0.12 m. Discharge was 31.3 L s^{-1} at the time of the collection, and canopy cover was about 47%. Vegetation is typical of high altitude Andean cloud forest; however, it has been disturbed by adjacent anthropogenic activities. This stream is one of the few in the Papallacta area where larvae of the gripopterygid *Claudioperla* cf. *tigrina* (Klapálek) were found in oxygenated areas with smaller substrate in large numbers.

Ecuadorian *Anacroneuria* Species List

Species	Provincial Records
A. anchicaya Baena & Zúñiga 1999 *in* Stark et al. 1999	Cotopaxi, Napo, Pastaza, Pichincha
A. angusticollis (Enderlein 1909)	Napo, Pastaza, Zamora Chinchipe
A. antizana Stark 2001	Napo
A. apuela Stark & Gill sp. n.	Imbabura
A. atrifrons Klapálek 1922	Pastaza
A. auca Stark 2001	Pastaza
A. azul Rojas & Baena 1999 *in* Stark et al. 1999	Pastaza, Pichincha
A. bari Stark 1995	Napo
A. cajas Zúñiga & Vimos 2006 *in* Zúñiga et al. 2006	Azuay
A. camposi (Banks 1920)	Pichincha
A. canelo Stark 2001	Napo
A. caraca Stark 1995	Napo
A. carchi Stark 2001	Carchi
A. cayapa Stark 2001	Pichincha
A. chachis Stark & Vásconez 2006 *in* Zúñiga et al. 2006	Pastaza, Pichincha
A. chavin Stark & Sivec 1998	El Oro
A. chimborazo Stark 2001	Chimborazo

A. choco Stark & Berosa 2006 *in* Zúñiga et al. 2006	Esmeraldas, Pichincha
A. cotacachi Stark 2001	Pichincha
A. cotopaxi Stark 2001	Cotopaxi
A. cushueme Stark & Gill sp. n.	Pastaza
A. guambiana Zúñiga & Stark 1999 *in* Stark et al. 1999	Napo
A. guayaquil Zúñiga & Rojas 1999 *in* Stark et al. 1999	Chimborazo
A. hieroglyphica (Enderlein 1909)	Balzapampa (Bolivar Province ?)
A. jewetti Stark 2001	Azuay, Imbabura, Loja, Morona Santiago, Napo, Pichincha
A. jivaro Stark 2001	Azuay, Cañar
A. kayceae Kondratieff & Gill sp. n.	Napo
A. kitchensi Stark 2001	Pastaza
A. kondratieffi Stark 2001	Los Rios
A. major Stark 2001	Azuay
A. malkini Stark & Kondratieff sp. n.	Pastaza
A. mindo Zúñiga & Vásconez 2006 *in* Zúñiga et al. 2006	Pichincha
A. ohausiana (Enderlein 1909)	Loja
A. parva Stark 2001	Napo
A. pastaza Stark 2001	Napo, Pastaza
A. pichincha Stark & Kondratieff sp. n.	Pichincha
A. pistacina (Enderlein 1909)	Balzapampa (Bolivar Province ?)
A. planada Baena & Rojas 1999 *in* Stark et al. 1999	Napo
A. portilla Stark & Rojas 1999 *in* Stark et al. 1999	Loja, Napo, Pichincha
A. puna Stark 2001	Cotopaxi
A. quijo Stark 2001	Napo
A. quilla Stark & Zúñiga 1999 *in* Stark et al. 1999	Azuay, Carchi, Zamora Chinchipe
A. rawlinsi Stark 2001	Morona Santiago
A. regleta Stark & Rojas 1999 *in* Stark et al. 1999	Carchi, Zamora Chinchipe
A. ricki Zúñiga & Stark 2002	Esmeraldas
A. rosita Stark & Rojas 1999 *in* Stark et al. 1999	Pastaza
A. rugosa Stark 2001	Pichincha
A. schmidti (Enderlein 1909)	Balzapampa (Bolivar Province ?)
A. spangleri Stark 2001	Los Rios, Pichincha
A. tena Stark 2001	Napo
A. tungurahua Stark 2001	Tungurahua
A. tzapino Stark 2001	Pastaza
A. zamora Stark 2001	Zamora Chinchipe
A. zunigae Stark 2001	Napo

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