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Records and descriptions of *Anacroneuria* from Ecuador (Plecoptera: Perlidae)

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ABSTRACT

Forty one *Anacroneuria* Klapálek species are recorded from Ecuador including 25 described as new to science. *Anacroneuria camposi* (Banks) is redescribed from type material and five previously described species are considered nomina dubia [*A. biloba* Klapálek, *A. lacunaris* (Navás), *A. longinqua* (Navás), *A. media* (Navás) and *A. trinervis* (Navás)]. A provisional key for males is presented.

Key words: *Anacroneuria*, Perlidae, Plecoptera, Ecuador

IZVLEČEK

Nahajališča in opisi vrst *Anacroneuria* iz Ekvadorja (Plecoptera: Perlidae) - Za Ekvador je ugotovljenih enainštirideset vrst iz rodu *Anacroneuria* Klapálek. Od teh je 25 novih za znanost. *Anacroneuria camposi* (Banks) je ponovno opisana na osnovi tipskega materiala, medtem ko je pet v preteklosti opisanih vrst uvrščenih med dvomljive vrste [*A. biloba* Klapálek, *A. lacunaris* (Navás), *A. longinqua* (Navás), *A. media* (Navás) and *A. trinervis* (Navás)]. Predstavljen je provizorični ključ za določevanje samcev.

Ključne besede: *Anacroneuria*, Perlidae, Plecoptera, Ekvador

In contrast to the situation in Colombia where 20 *Anacroneuria* species were described by Enderlein, Klapálek, Navás and other workers from the 19th and early 20th centuries (STARK et al. 1999), only ten were proposed from Ecuador during this period (BANKS 1920, ENDERLEIN 1909a, Klapálek 1922, NAVÁS 1911, 1915, 1934). Unfortunately, of the ten Ecuadorian species described in these studies only *A. ohausiana* (ENDERLEIN) is based on an adequately described male specimen (ZWICK 1973). Three other Enderlein species (*A. hieroglyphica*, *A. pistacina*, *A. schmidtii*) based on females have also been redescribed by ZWICK (1973) but type material for the four Navás species (*A. lacunaris*, *A. longinqua*, *A. media*, *A. trinervis*) and *A. biloba* Klapálek are apparently lost and are considered nomina dubia. The remaining species, *A. camposi* (BANKS), is redescribed from the holotype.

In this study, records are given for 41 *Anacroneuria* species including 25 described as new primarily from specimens in the National Museum of Natural History, Washington, DC (USNM), the Carnegie Museum of Natural History, Pittsburg, PA (CMNH) and the University of Missouri, Columbia (UM). The eleven recently described species for which new records are available include eight known from Colombia (STARK et al. 1999), two known from Venezuela (STARK 1995, 1999) and one known from Peru (STARK & SIVEC 1998). A few male specimens related to *A. guambiana* ZÚÑIGA & STARK (STARK et al. 1999) are not included in this study, but are part of a forthcoming revision of this species complex (STARK & ZÚÑIGA unpublished). No new records are available for the above mentioned Enderlein and Banks species.

Provisional key to known Ecuadorian male *Anacroneuria*

1. Aedeagal apex trilobed (Figs. 5, 28).....2
Aedeagal apex simple (Figs. 10, 14).....4
2. Forewing length at least 14 mm; mesal aedeagal lobe notched (Fig. 5).....*antizana*
Forewing length no more than 11 mm; mesal aedeagal lobe rounded (Fig. 28).....3
3. Dorsal aedeagal keel triangular (Fig. 100); ocellar area dark brown.....*rugosa*
Dorsal aedeagal keel of two curved ridges (Fig. 28); ocellar area diffuse brown or pale.....*cayapa*
4. Dorsal aedeagal keel triangular (Fig. 105).....5
Dorsal aedeagal keel variable, but not triangular.....8
5. Aedeagal hooks somewhat chelate (Fig. 103).....6
Aedeagal hooks slender (Fig. 71).....7
6. Apices of aedeagal hooks turned abruptly inward; aedeagal apex beyond hooks about 1.5X long as wide.....*rosita*
Apices of aedeagal hooks gradually curved (Fig. 103);
aedeagal apex beyond hooks about 2X long as wide.....*spangleri*
7. Aedeagal apex slightly constricted beyond hooks, apex notched (Fig. 71).....*parva*
Aedeagal apex wide and gradually narrowed beyond hooks, apex very narrow and rounded (Fig. 54).....*kitchensi*
8. Ventral aedeagal apex with one or two conspicuous membranous lobes (Figs. 35, 41).....9
Ventral aedeagal apex without conspicuous membranous lobes (Fig. 8).....20
9. Forewing length at least 15 mm.....10
Forewing length less than 12 mm.....13
10. Forewing length at least 20 mm; aedeagal hooks wide at apex (Fig. 36).....*major*
Forewing length 15-16 mm; aedeagal hooks slender (Fig. 51).....11
11. Mesal pale pronotal band narrow, mesal head pattern predominantly brown (Fig. 49).....*jivaro*
Mesal pale pronotal band wide, mesal head pattern predominantly yellow.....12

12. Ventral membranous aedeagal lobes cover most of apex (Fig. 41); dorsal aedeagal keel weak (Fig. 43)...	<i>cotopaxi</i>
Ventral membranous aedeagal lobes small (Fig. 35); dorsal aedeagal keel well developed (Fig. 37)...	<i>cotacachi</i>
13. Dorsal aspect of aedeagal apex distinctly notched (Figs. 111, 120).....	14
Dorsal aspect of aedeagal apex truncate or rounded.....	15
14. Apical aedeagal notch triangular, hooks slender, dorsal keel complex (Figs. 118, 120).....	<i>tzapino</i>
Apical aedeagal notch narrow, U-shaped, hooks chelate, dorsal keel of two ridges (Figs. 109, 111).....	<i>tena</i>
15. Aedeagal apex with a pair of small laterally directed horns.....	<i>caraca</i>
Aedeagal apex without horns.....	16
16. Ventral membranous aedeagal lobes project beyond lateral margins (Fig. 87).....	17
Ventral membranous aedeagal lobes not projecting beyond lateral margins.....	18
17. Aedeagal hooks subchelate, dorsal keel of two short curved ridges.....	<i>portilla</i>
Aedeagal hooks slender, dorsal keel of two obscure straight ridges (Fig. 89).....	<i>quijo</i>
18. Dorsal aedeagal keel arcuate, hooks reach near apex.....	<i>azul</i>
Dorsal aedeagal keel not arcuate, hooks not approaching apex.....	19
19. Ridges of dorsal aedeagal keel strongly diverge anteriorly, hooks subchelate.....	<i>aymara</i>
Ridges of dorsal aedeagal keel parallel, hooks slender (Fig. 76, 78).....	<i>pastaza</i>
20. Aedeagal hooks digitate, chelate or scalloped along inner margins (Figs. 8, 61).....	21
Aedeagal hooks slender and unmodified.....	25
21. Aedeagal hooks subchelate, aedeagal apex beyond hooks about as long as wide (Fig. 8).....	22
Aedeagal hooks digitate or with inner margins scalloped, apex about 2X long as wide (Fig. 6).....	24
22. Forewing length 9-11 mm; ocellar area dark.....	<i>auca</i>
Forewing length at least 15 mm; ocellar area pale or dark.....	23
23. Forewing length 16-18 mm; dorsal keel reaches aedeagal apex; ocellar area pale.....	<i>quilla</i>
Forewing length 20-22 mm; dorsal keel ends before aedeagal apex; ocellar area dark.....	<i>guayaquil</i>
24. Aedeagal apex abruptly narrowed at shoulders, dorsal keel obscure (Fig. 63).....	<i>kondratieffi</i>
Aedeagal apex with constant width from bases of hooks, dorsal keel conspicuous.....	<i>angusticollis</i>
25. Dorsal aedeagal keel reaches apex (Figs. 23, 84).....	26
Dorsal aedeagal keel ends before apex (Fig. 95).....	29
26. Dorsal aedeagal keel Y-shaped (Fig. 23).....	27
Dorsal aedeagal keel of two, more or less, parallel ridges (Fig. 84).....	28
27. Forewing length at least 17 mm; Y-arms of aedeagal keel much shorter than stem.....	<i>ohausiana</i>
Forewing length at most 15 mm; Y-arms of aedeagal keel about as long as stem.....	<i>carchi</i>
28. Aedeagal apex beyond hooks about 3X long as apical width (Fig. 114).....	<i>tungurahua</i>
Aedeagal apex beyond hooks about 2X long as apical width (Fig. 82).....	29
29. Inner angles of aedeagal shoulders project over hooks, keel of moderate length (Figs. 17, 19).....	<i>canelo</i>
Inner angles of aedeagal shoulders not projecting over hooks, keel long (Figs. 82, 84).....	<i>puna</i>
30. Forewing length at least 16 mm.....	31
Forewing length at most 14 mm.....	33
31. Aedeagal apex beyond hooks about 2X long as wide, dorsal keel much longer than apical aedeagal width (Fig. 95).....	<i>rawlini</i>
Aedeagal apex beyond hooks about as long as wide, dorsal keel obscure or, if distinct, much shorter than apical aedeagal width (Figs. 14, 32).....	32
32. Aedeagal apex conspicuously narrower than shoulders, dorsal keel obscure (Fig. 14).....	<i>camposi</i>
Aedeagal apex about as wide as shoulders, dorsal keel distinct but short (Fig. 32).....	<i>chimboraazo</i>
33. Lateral margins of aedeagal apex gradually narrowed from hooks to tip (Fig. 48).....	34
Lateral margins of aedeagal apex constricted beyond hooks at shoulders (Fig. 125).....	35

34. Forewing length at least 12 mm; aedeagal apex beyond hooks about as long as greatest shoulder width (Fig. 46).....*jewetti*
 Forewing length at most 10 mm; aedeagal apex beyond hooks about 1.5X long as greatest shoulder width.....*bati*
35. Aedeagal apex abruptly constricted near tip (Figs. 125, 130).....36
 Aedeagal apex gradually narrowed to tip37
36. Forewing length at least 13 mm; dorsal aedeagal keel about as long as greatest shoulder width (Fig. 125).....
 Forewing length at most 11 mm; dorsal aedeagal keel about half as long as greatest shoulder width (Fig. 130).....*zunigae*
37. Forewing length at least 12 mm; ocellar area pale.....*planada*
 Forewing length at most 10 mm; ocellar area dark.....*anchicaya*

***Anacroneuria anchicaya* BAENA & ZÚÑIGA, 1999**

Anacroneuria anchicaya BAENA & ZÚÑIGA, in STARK et al. 1999: 22. Holotype male, Alto Anchicayá, Valle del Cauca, Colombia

Material. Ecuador: Cotopaxi, 133 km W Latacunga, 1080 m, 2 July 1975, A. Langley, J. Cohen, 3 males (USNM). Napo, Rio Misahualli, Archidona, 650 m, 11 September 1990, O.S. Flint, 1 male (USNM). Napo, Tena, 23 May 1977, P. Spangler, D.R. Givens, 1 male (USNM). Pichincha, Rio Umachaca, Forest Station Maquipucuna, 5 km E Nanegal, 1250 m, 4-5 September 1990, O.S. Flint, 6 males (USNM).

Comments. This species was previously known from two Colombian males (STARK et al. 1999). The Cotopaxi and Pichincha specimens are slightly larger than those in the original sample, but direct comparison of the aedeagus with that of the holotype revealed no obvious differences. The Napo specimens, however, lack a dark ocellar spot and have a larger aedeagal keel and shorter, stouter hooks than the holotype.

***Anacroneuria angusticollis* (ENDERLEIN, 1909)**

Neoperla angusticollis ENDERLEIN, 1909b: 409. Holotype male, Rio Magdalena, Colombia

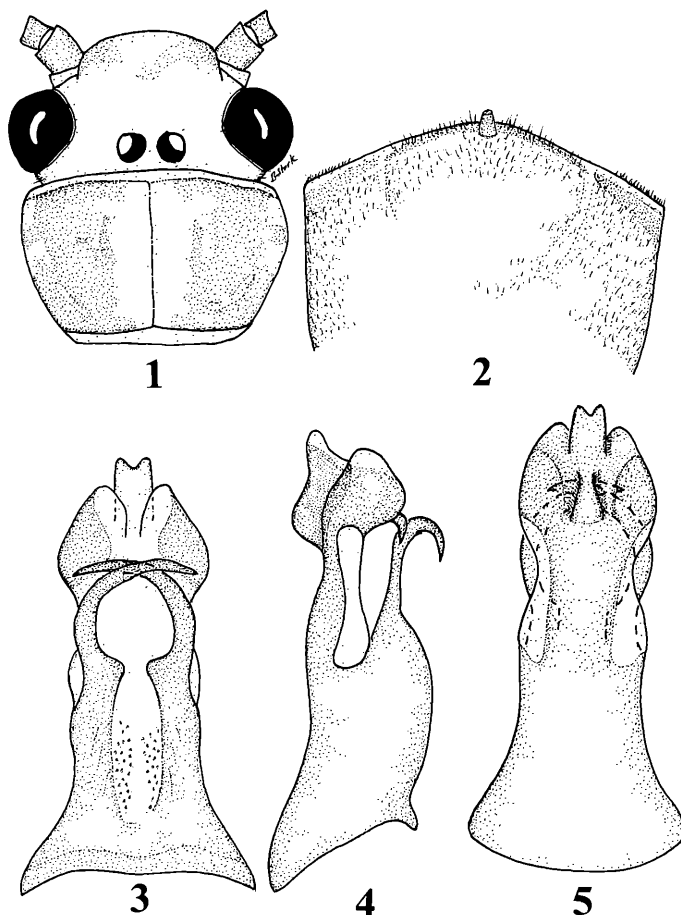
Anacroneuria unicolor Klapálek, 1922: 94. Syn. ZWICK, 1973

Material. Ecuador: Napo, Misahualli, 1 January 1989, R.W. Sites, 1 male (UM). Napo, Tena, 23 May 1977, P. Spangler, D.R. Givens, 1 male (USNM). Napo, Rio Misahualli, Archidona, 650 m, 11 September 1990, P.J. Spangler, 1 male (USNM). Pastaza, 3 km N Puyo, 30 May 1975, J. Cohen, A. Langley, 1 male, 1 female (USNM). Pastaza, Puyo, 1-8 February 1976, P. Spangler et al., 11 males (USNM). Pastaza, 25 km N Puyo, 20 May 1977, D.L. Vincent, S.S. Vincent, 2 males (USNM). Pastaza, Puyo, 11 May 1977, P. Spangler, D.R. Givens, 1 male (USNM). Pastaza, 16 km W Puyo, 3 February 1976, P. Spangler et al., 2 males (USNM). Pastaza, 1.5 km S Puyo, 14-21 May 1977, P. Spangler, D.R. Givens, 14 males (USNM). Zamora Chinchipe, Rio Chicana, 9 km N Yanzatza, 880 m, 20 September 1990, O.S. Flint, 2 males (USNM). Zamora Chinchipe, Yanzatza, 15 June 1976, A. Langley et al., 1 male (USNM). Zamora Chinchipe, Rio Sabanilla, 1420 m, 8 km NW Zamora, 1 November 1987, C. Young, R. Davidson, C. Rawlins, 1 male (CMNH). Zumbi, Rio Zamora, 700 m, 7 December 1941, D. Laddey, 1 male (USNM).

Comments. The Napo records for this species were previously given by STARK et al. (1999).

***Anacroneuria antizana*, spec. nov.**

Figs. 1-5



Anacroneuria antizana.

1. Head and pronotum.
2. Male 9th sternum.
3. Aedeagus, ventral.
4. Aedeagus, lateral.
5. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Napo, 1920 m, 6 km S Baeza, 20 July 1993, Sites, Linit, Nichols (UM).

Description

Adult habitus. Head forward of ocelli pale yellow brown with a sinuate transverse brown band connecting brown lappets. Median pronotal band pale, lateral bands brown (Fig. 1). Wing membrane brown, veins dark brown except pale costa.

Male. Forewing length 14 mm. Hammer thimble shaped, height greater than basal diameter (Fig. 2). Aedeagal apex trilobed, lateral lobes bulging, median lobe spatulate with notched tip. Hooks slender, wide dorsal keel convergent apically (Figs. 3-5).

Female. Unknown.

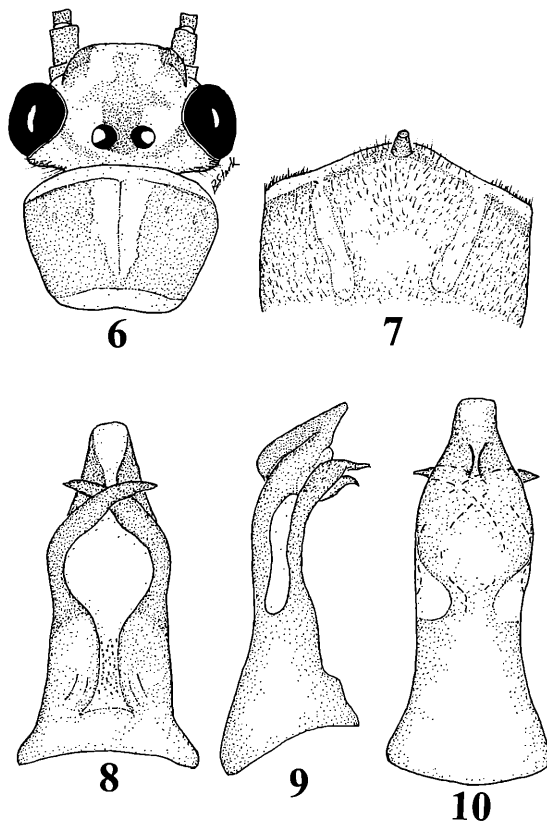
Nymph. Unknown.

Etymology. The species name is based on the prominent peak near Baeza and is used as a noun in apposition.

Diagnosis. This species is similar to *A. pinza* STARK (STARK 1995) and *A. zunigae*, described below, but is the largest member of this complex. The aedeagal body is slender and the aedeagal tip slightly notched which distinguishes it from related species.

***Anacroneuria auca*, spec. nov.**

Figs. 6-10



Anacroneuria auca.

6. Head and pronotum.

7. Male 9th sternum.

8. Aedeagus, ventral.

9. Aedeagus, lateral.

10. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Pastaza, Tzapino, 32 km NE Tigueno, 400 m, 25 May 1976, J. Cohen (USNM). Paratypes: Ecuador: Pastaza, Rio Cononaco, 70 mi SE Limoncocha, Anglo Airstrip, 28-30 May 1976, J. Cohen, 2 males (USNM).

Description

Adult habitus. Dark pigment covers ocelli and extends forward to near anterior margin of head; pigment band expands laterally near M-line. Lappets and a narrow arched band behind ocelli brown. Pale median pronotal band wide anteriorly, narrowed posteriorly (Fig. 6). Wing membrane brown, veins, particularly R, dark brown.

Male. Forewing length 9 mm. Hammer thimble shaped, height greater than basal diameter (Fig. 7). Aedeagal apex simple, tip slightly expanded. Ventral membranous lobes absent, hooks wide, scythe shaped. Dorsal keel consists of two closely spaced, short ridges (Figs. 8-10).

Female. Unknown.

Nymph. Unknown.

Etymology. The species name honors the Auca people and is used as a noun in apposition.

Diagnosis. The aedeagus of this species is superficially similar to *A. chiquita* STARK, but that species bears a membranous ventral lobe and falcate hooks (STARK 1995).

***Anacroneuria aymara* STARK & SIVEC, 1998**

Anacroneuria aymara STARK & SIVEC, 1998: 7. Holotype male, Erika, Manu, Madre de Dios, Peru

Material. Ecuador: Pastaza, 22 km W Puyo, 5 February 1976, P. Spangler et al., 1 male (USNM).

Comments. The aedeagus of this specimen differs subtly from the holotype of *A. aymara* in having a small apical notch and in lacking a distinctly offset aedeagal apex. For these reasons it is listed tentatively as *A. aymara* pending the acquisition of more material.

***Anacroneuria azul* ROJAS & BAENA, 1999**

Anacroneuria azul ROJAS & BAENA, in STARK et al., 1999: 23. Holotype male, Rio Azul, Valle del Cauca, Colombia

Material. Ecuador: Pastaza, 70 km SE Limoncocha, Rio Conanaco, 30 May 1976, J. Cohen, 1 male (USNM). Pichincha, 113 km via Puerto Quito, 24 June 1976, J. Cohen, 2 males (USNM). Pichincha, E Santo Domingo, 8-14 May 1988, Bohart, Hanson, 3 males (Utah State University). Same location, 6-12 May 1990, W. J. Hanson, 1 male (Utah State University). Pichincha, 12 km E Santo Domingo de los Colorados, 13 May 1985, Clausen, Cerventa, 1 male (University of Minnesota).

Comments. The aedeagal apex for Ecuadorian specimens is somewhat narrower and more rounded than for the *A. azul* holotype.

***Anacroneuria bari* STARK, 1995**

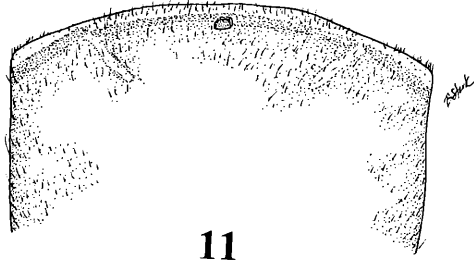
Anacroneuria bari STARK, 1995: 226. Holotype male, El Tucuco, 45 km SW Machiques, Zulia, Venezuela

Material. Ecuador: Napo, Rio Jondachi, 950 m, 30 km N Tena, 10 September 1990, O.S. Flint, 2 males (USNM). Napo, Tena, 520 m, 10-13 September 1990, O.S. Flint, 1 male (USNM).

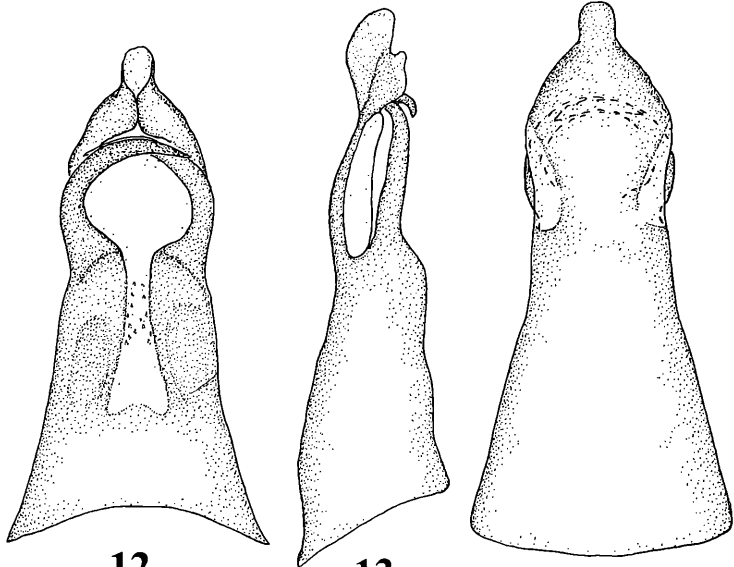
Comments. The aedeagus of this species is similar to that of *A. pachacuti* STARK & SIVEC but lacks the slight subapical constriction of that species (STARK & SIVEC 1998).

Anacroneuria camposi (BANKS, 1920)

Figs. 11-14

Neoperla camposi BANKS, 1920:322. Holotype male, Pifo, Ecuador

11



12

13

14

Anacroneuria camposi.11. Male 9th sternum.

12. Aedeagus, ventral.

13. Aedeagus, lateral.

14. Aedeagus, dorsal.

Material. Ecuador: Pichincha, Pifo, Campos, holotype male (MCZ).

Description

Adult habitus. Obscured by specimen condition. Head appears yellow without dark markings except on lappets. Wings pale with brown veins.

Male. Forewing length reported as 24 mm (BANKS 1920). Hammer small, chisel shaped (Fig. 11). Aedeagal apex simple, tip narrowed beyond shoulders forming a scoop shaped hook in lateral aspect. Ventral membranous lobes and dorsal keel obscure, hooks slender (Figs. 12-14).

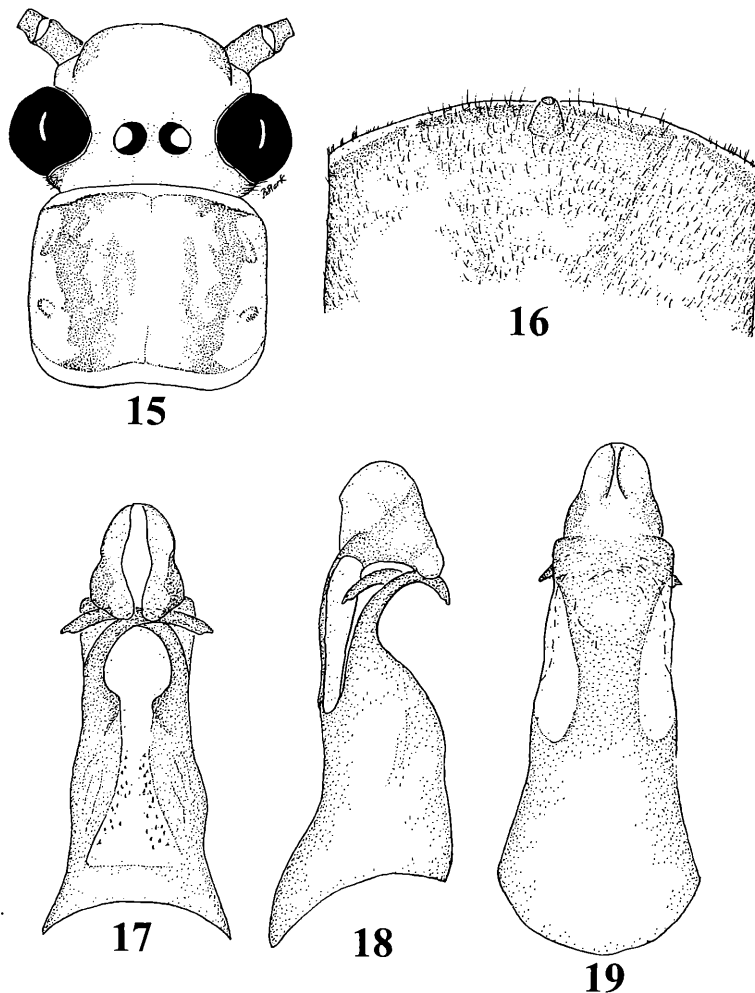
Female. Unknown.

Nymph. Unknown.

Diagnosis. This species is a member of the *A. guambiana* ZÚNIGA & STARK species group but it appears to differ from other members in the unusual hammer shape and in shape of the aedeagal apex (STARK & SIVEC 1998, STARK et al. 1999). This species complex is currently under review (STARK & ZÚNIGA, unpublished). The holotype, previously studied by Benedetto bears his “lectotype” label, but no lectotype designation is needed since only one specimen was included in the original description.

***Anacroneuria canelo*, spec. nov.**

Figs. 15-19



Anacroneuria canelo.

- 15. Head and pronotum.
- 16. Male 9th sternum.
- 17. Aedeagus, ventral.
- 18. Aedeagus, lateral.
- 19. Aedeagus, dorsal.

Types. Holotype male (pinned) and two male paratypes from Ecuador, Napo, Rio Jondachi, 30 km N Tena, 950 m, 10 September 1990, O.S. Flint (USNM).

Description

Adult habitus. Head yellow with brown lappets and diffuse brown pigment at posterior angles of occiput. Pronotum with irregular midlateral brown bands and scattered diffuse brown areas within the mesal yellow field (Fig. 15).

Male. Forewing length 13-13.5 mm. Hammer thimble shaped, height greater than basal diameter (Fig. 16). Aedeagal apex simple, short and wide in lateral aspect. Inner angles of shoulders extend over hooks. Dorsal keel of two close set ridges; hooks slender (Figs. 17-19).

Female. Unknown.

Nymph. Unknown.

Etymology. The species name honors the Cañelo people and is used as a noun in apposition.

Diagnosis. The aedeagus of this species is most similar to that of *A. carchi* (described below) but differs from that species in lacking Y-arms on the dorsal keel and in having the inner angles of the shoulders projecting over the hooks. In addition, the habitus of *A. canelo* is somewhat darker than of *A. carchi*.

***Anacroneuria caraca* STARK, 1995**

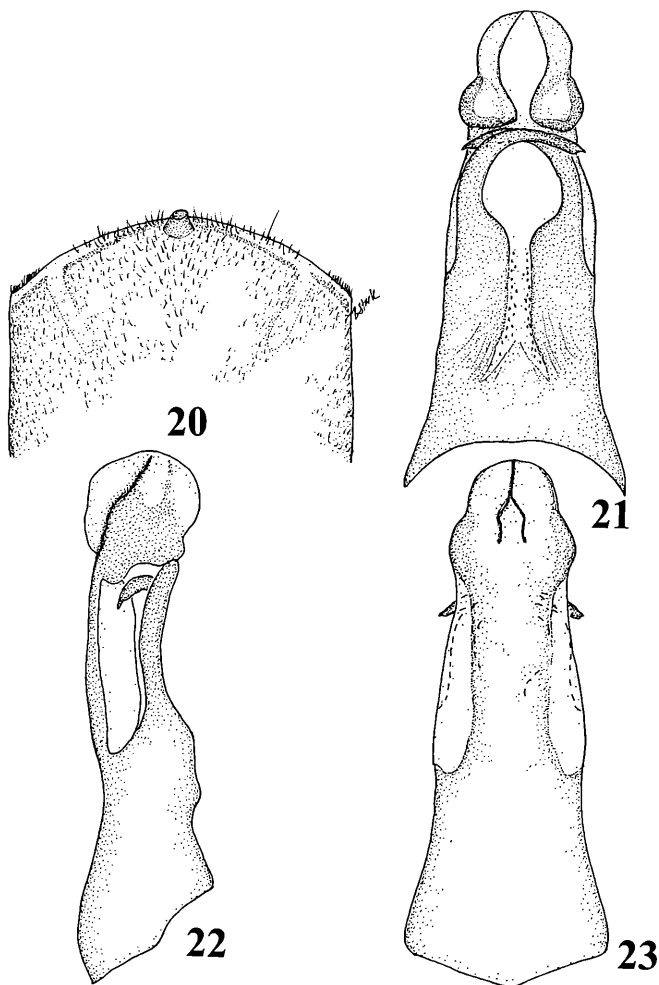
Anacroneuria caraca STARK, 1995: 228. Holotype male, Aragua, P.N. Henri Pittier, Rio Limon, Venezuela

Material. Ecuador: Napo, Pano, 550 m, 12 September 1990, O.S. Flint, 1 male (USNM).

Comments. This specimen has a more truncate aedeagal apex and slightly more prominent apical horns than is typical for Venezuelan specimens, but it is tentatively placed here pending acquisition of more material.

Anacroneuria carchi, spec. nov.

Figs. 20-23



Anacroneuria carchi.

20. Male 9th sternum.

21. Aedeagus, ventral.

22. Aedeagus, lateral.

23. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Carchi, Chical, 1250 m, 16 July 1983, J. Rawlins, M. Smyers (CMNH).

Description

Adult habitus. Head yellow; wide median pronotal band pale, midlateral brown bands narrow. Wing membrane transparent, veins pale brown.

Male. Forewing length 14 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 20). Aedeagal apex simple, subapical margins strongly sclerotized and bulging. Dorsal keel well developed, Y-shaped with long arms. Hooks slender (Figs. 21-23).

Female. Unknown.

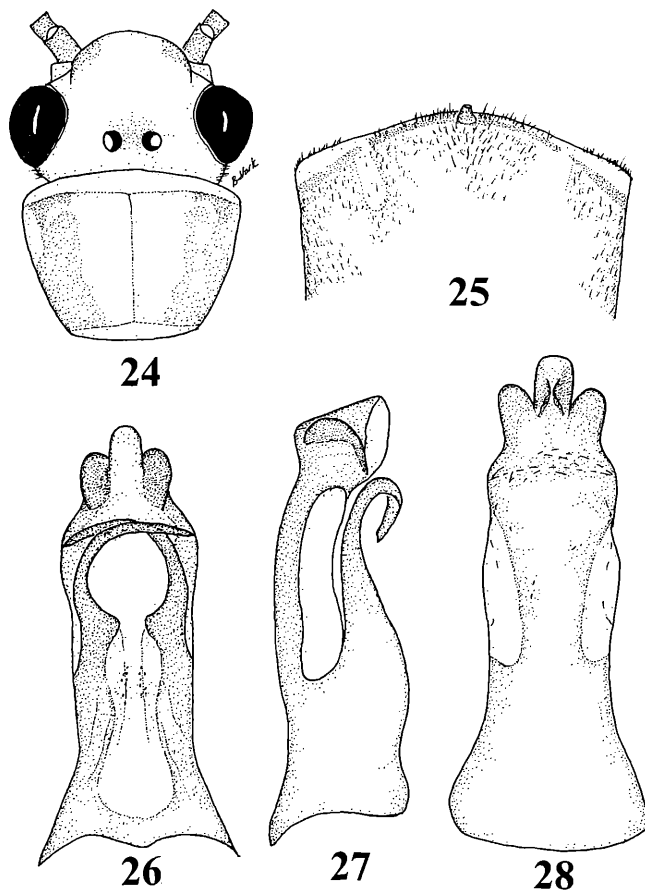
Nymph. Unknown.

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

Diagnosis. The aedeagus of this species is similar to that of *A. ohausiana* (Enderlein) (ZWICK 1973), but the dorsal keel arms are much more extensive and the lateral aspect of the aedeagal apex more expansive in *A. carchi*.

***Anacroneuria cayapa*, spec. nov.**

Figs. 24-28



***Anacroneuria cayapa*.**

24. Head and pronotum.

25. Male 9th sternum.

26. Aedeagus, ventral.

27. Aedeagus, lateral.

28. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Pichincha, 14 km E Santo Domingo de los Colorados, 5 July 1975, A. Langley, J. Cohen (USNM).

Description

Adult habitus. Head yellow with small, diffuse ocellar spot and brown lappets. Median pronotal stripe pale, lateral bands brown (Fig. 24). Wing membrane transparent, veins brown except pale costa and subcosta.

Male. Forewing length 10 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 25). Aedeagal apex trilobed; lateral lobes projecting anterolaterally, median lobe bent ventrad. Hooks slender, dorsal keel bases divergent (Figs. 26-28).

Female. Unknown.

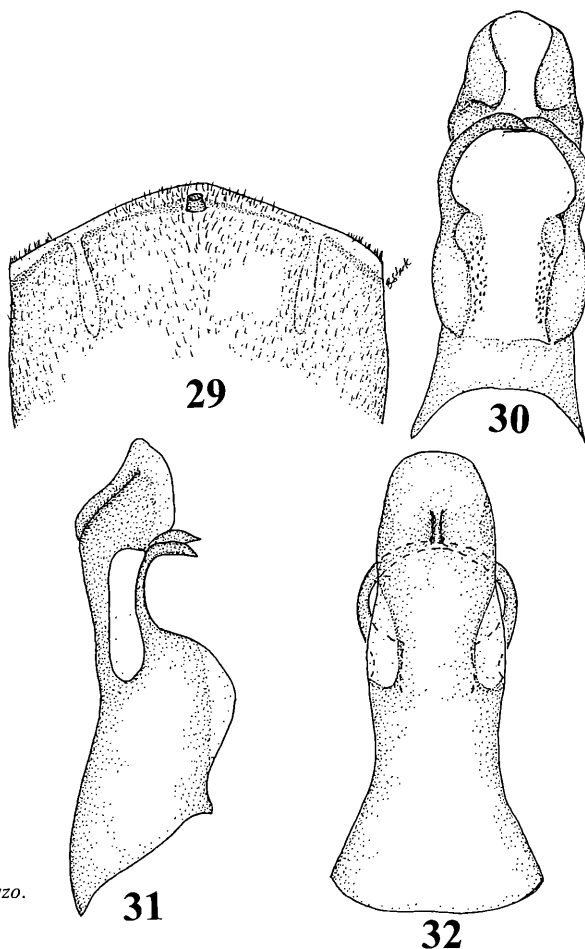
Nymph. Unknown.

Etymology. The species name honors the Cayapa people and is used as a noun in apposition.

Diagnosis. This species is most closely related to *A. benedettoi* STARK from Costa Rica but the aedeagal apex is wider, the dorsal keel more prominent, and the shoulders less prominent than in that species (Stark 1998).

***Anacroneuria chimborazo*, spec. nov.**

Figs. 29-32



Anacroneuria chimborazo.

29. Male 9th sternum.

30. Aedeagus, ventral.

31. Aedeagus, lateral.

32. Aedeagus, dorsal.

Types. Holotype male and 1 male paratype from Ecuador, Chimborazo, 7 km N Penipe, 2340 m, 16 September 1990, O.S. Flint (USNM).

Description

Adult habitus. Head mostly yellow but with dark lappets and an obscure brown area forward of ocelli. Narrow median pronotal stripes pale, broad lateral bands brown, but pale along lateral margins. Wing membrane transparent, veins brown; R and Sc dark brown.

Male. Forewing length 16 mm. Hammer thimble shaped, height less than basal diameter (Fig. 29). Aedeagal apex simple, robust. Ventral membranous lobes absent, dorsal keel of two short, slightly convergent ridges. Hooks slender, scythe shaped (Figs. 30-32).

Female. Unknown.

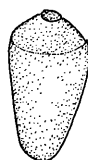
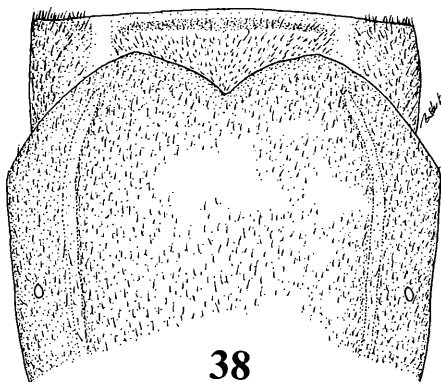
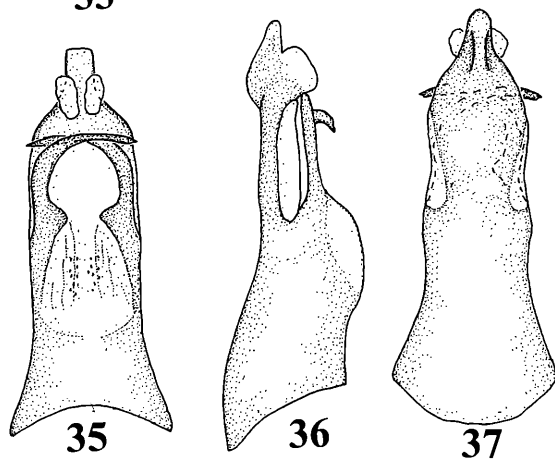
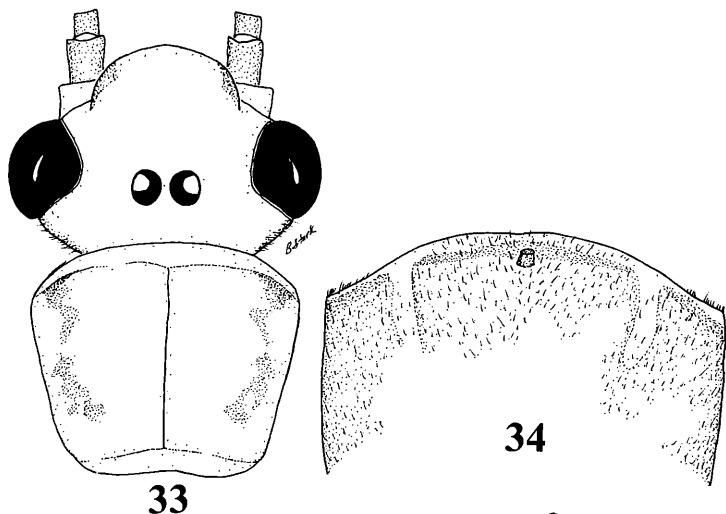
Nymph. Unknown.

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

Diagnosis. This species is a member of a complex which includes *A. puna* (described below), *A. chavin* STARK & SIVEC and *A. brunneilata* JEWETT among others (STARK & SIVEC 1998). These three species are smaller than *A. chimborazo* and they vary subtly in details of the dorsal aedeagal keel, hook shape and aedeagal dimensions. *Anacroneuria chimborazo* and *A. chavin* are similar in having a short and relatively poorly formed dorsal keel; these species may be distinguished on the basis of size or by the narrow, dark lines behind the aedeagal shoulders in *A. chavin* (STARK & SIVEC 1998).

Anacroneuria cotacachi, spec. nov.

Figs. 33-39

*Anacroneuria cotacachi*.

33. Head and pronotum.

34. Male 9th sternum.

35. Aedeagus, ventral.

36. Aedeagus, lateral.

37. Aedeagus, dorsal.

38. Female terminalia.

39. Egg.

Types. Holotype male and 7 female paratypes from Ecuador, Pichincha, Rio Umachaca, 5 km E Nanegal, Forest Station Maquipucuna, 1250 m, 4-5 September 1990, O.S. Flint (USNM). Additional paratype: Ecuador: Pichincha, Rio Umachaca, 9.5 km N Nanegalito, Maquipucuna Biological Station, 1250 m, 4-5 September 1990, P.J. Spangler, 1 male (USNM).

Description

Adult habitus. Head pale yellow, lappets brown. Broad median pronotal stripe pale, narrow lateral bands brown (Fig. 33). Wing membrane transparent, veins, except dark brown median, pale brown. Window beyond cord obscure.

Male. Forewing length 15 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 34). Aedeagal apex simple and small, greatly narrowed to truncate tip in ventral aspect. Dorsal keel of two well developed parallel ridges. Ventral membranous lobes present, hooks slender (Figs. 35-37).

Female. Forewing length 16-18 mm. Subgenital plate bilobed. Median notch broadly V-shaped. Median sclerite and transverse sclerite of sternum 9 covered with fine short setae. Egg typical of genus (Figs. 38-39).

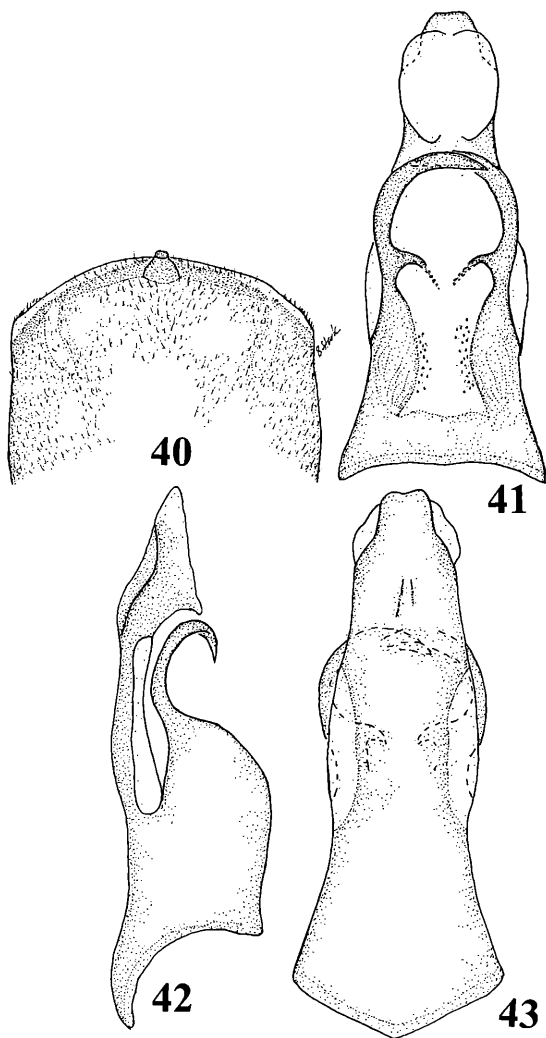
Nymph. Unknown.

Etymology. The species name, used as a noun is apposition, is based on the Andean peak north of the type locality.

Diagnosis. The aedeagus of this species is similar in ventral aspect to *A. perija* STARK but lacks the U-shaped dorsomesal process of that species and consequently is quite distinct in lateral aspect (STARK 1999).

Anacroneuria cotopaxi, spec. nov.

Figs. 40-43



Anacroneuria cotopaxi.

40. Male 9th sternum.

41. Aedeagus, ventral.

42. Aedeagus, lateral.

43. Aedeagus, dorsal.

Types. Holotype male (pinned) and 1 male paratype from Ecuador, Cotopaxi, San Francisco de Las Pampas, Otonga, 2000 m, 30-31 July 1993, E. Tapia, G. Onore, C. Young (CMNH).

Description

Adult habitus. Head pattern obscured by specimen condition. Wide mesal pronotal band yellow, narrow midlateral bands brown. Wing membrane transparent, veins pale except M vein and radial crossvein which are brown.

Male. Forewing length 15.5 mm. Hammer thimble shaped with wide base, height subequal to basal diameter (Fig. 40). Aedeagal apex with large membranous ventral bubble like process covering simple scoop. Dorsal keel weak, of two short ridges. Hooks slender, curved, with a strong basal spur on inner basal margin (Fig. 41-43).

Female. Unknown.

Nymph. Unknown.

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

Diagnosis. Other Andean species with a large ventral membranous process include *A. flavifrons* JEWETT and *A. mochica* STARK & SIVEC (STARK & SIVEC 1998). The latter species shares few other characters with *A. cotopaxi* and is easily separated on the basis of the triangular aedeagal keel. *Anacroneuria flavifrons* is more similar in general aedeagal features but is a much smaller species with extensive dark pronotal pigment.

***Anacroneuria guayaquil* ZÚÑIGA & ROJAS, 1999**

Anacroneuria guayaquil ZÚÑIGA & ROJAS in STARK et al. 1999:28. Holotype male, Rio Quindio, Reserva Guayaquil, Quindio, Colombia

Material. Ecuador: Chimborazo, 21 km ESE Licto, above Rio Alao, 3500 m, 18-19 September 1987, J. Rawlins, C. Young, R. Davidson, 1 male (CMNH).

Comments. This species was previously known from the Colombian holotype.

***Anacroneuria hieroglyphica* (ENDERLEIN, 1909)**

Neoperla hieroglyphica ENDERLEIN, 1909a: 167. Holotype female, Balzapampa, Ecuador

Description (Modified from ZWICK 1973)

Adult habitus. Body color pale ochre yellow with brown submarginal pronotal stripes. Wing membrane pale, veins largely pale brown.

Male. Unknown.

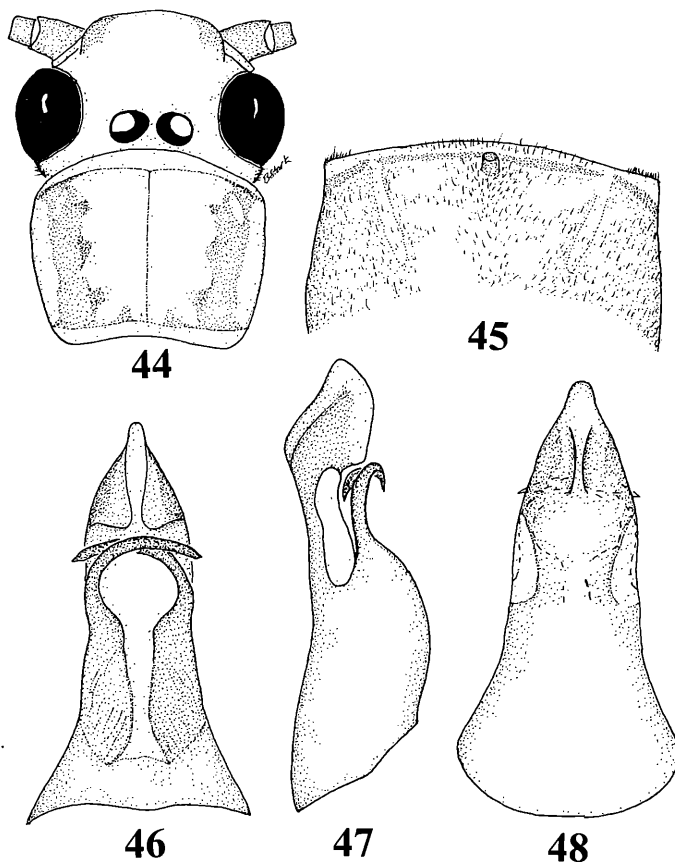
Female. Forewing length not reported. Subgenital plate bilobed. Lobes truncate and separated by a small U-shaped notch. Transverse sclerite of sternum 9 obscure, median sclerite covered with setae of rather uniform size.

Nymph. Unknown.

Comments. ZWICK (1973) redescribed the female of this species from the type series. No additional records are available.

Anacroneuria jewetti, spec. nov.

Figs. 44-48

*Anacroneuria jewetti*.

44. Head and pronotum.

45. Male 9th sternum.

46. Aedeagus, ventral.

47. Aedeagus, lateral.

48. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Napo, San Francisco de Borja, 15 May 1975, P. Spangler, A. Gurney, A. Langley, J. Cohen (USNM). Paratypes: Ecuador: Azuay, 8 km NE Giron, 2600 m, 8 November 1987, J. Rawlins, C. Young, R. Davidson, 1 male (CMNH). Azuay, Rio Leon, 6 km N Ona, 1860 m, 26 October 1987, J. Rawlins, C. Young, R. Davidson, 5 males (CMNH). Lojas, Rio Yaguachi, 45 km SSE Portovelo, 1080 m, 4 November 1987, R. Davidson, J. Rawlins, C. Young, 1 male (CMNH). Morona Santiago, Macas, 4 March 1975, A. Langley, 1 male (USNM). Morona Santiago, 0.5 km W Alshi, 25 October 1997, Kippenhan, 2 males (Colorado State University). Pichincha, Rio Umachaca, 1250 m, Forest Station Maquipucuna, 5 km E Nanegal, 4-5 September 1990, O.S. Flint, 3 males (USNM).

Description

Adult habitus. Head yellow, lappets brown. Pale median pronotal stripe broad, dark lateral bands narrow, margins pale (Fig. 44). Wing membrane transparent, veins pale brown, R dark.

Male. Forewing length 12-14 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 45). Aedeagal apex simple, tip narrow. Dorsal aedeagal keel of two long ridges. Hooks slender (Figs. 46-48).

Female. Unknown.

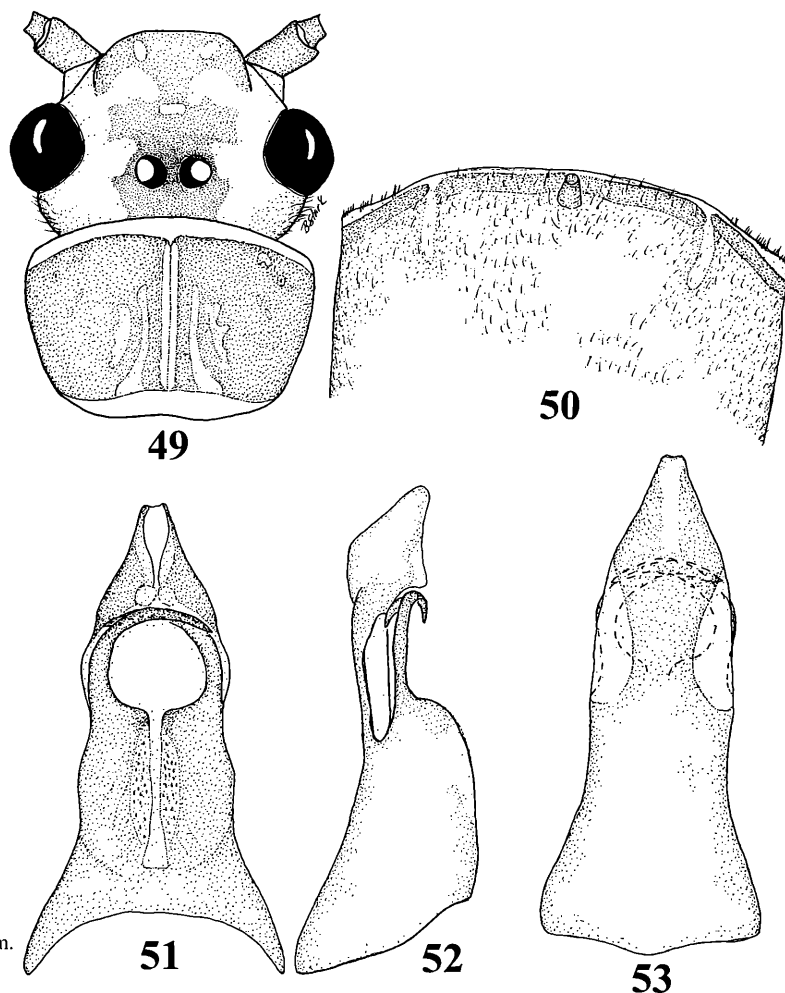
Nymph. Unknown.

Etymology. The patronym honors the memory of S.G. Jewett for his contributions to *Anacroneuria* systematics.

Diagnosis. This species is part of a complex which includes *A. anchicaya* BAENA & ZÚÑIGA (STARK et al. 1999) and *A. brunneilata* JEWETT (STARK & SIVEC 1998). The latter species is more similar in size but differs in having a wide, broadly rounded aedeagal apex whereas the former species is smaller, darker and the neck region of the aedeagal apex is slightly constricted.

***Anacroneuria jivaro*, spec. nov.**

Figs. 49-53



Anacroneuria jivaro.

49. Head and pronotum.

50. Male 9th sternum.

51. Aedeagus, ventral.

52. Aedeagus, lateral.

53. Aedeagus, dorsal.

Types. Holotype male and two male paratypes from Ecuador, Cañar, Rio Chaucas, 3 km N Zhud, 2910 m, 17 September 1990, O.S. Flint (USNM). Additional paratypes: Ecuador: Azuay, Rio Llaviuco, 16 km W Quenca, 3010 m, 18 September 1990, O.S. Flint, 2 males (USNM).

Description

Adult habitus. Head with dark pigment covering entire mesal field from ocelli to clypeus. Pronotum mostly brown, but with a narrow mesal yellow band and scattered pale areas on disc (Fig. 49). Wing membrane pale brown, veins brown.

Male. Forewing length 17-18 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 50). Aedeagal apex simple with weak dorsal keel lacking distinct ridges. Hooks slender, ventral membranous lobes poorly delineated (Figs. 51-53).

Female. Unknown.

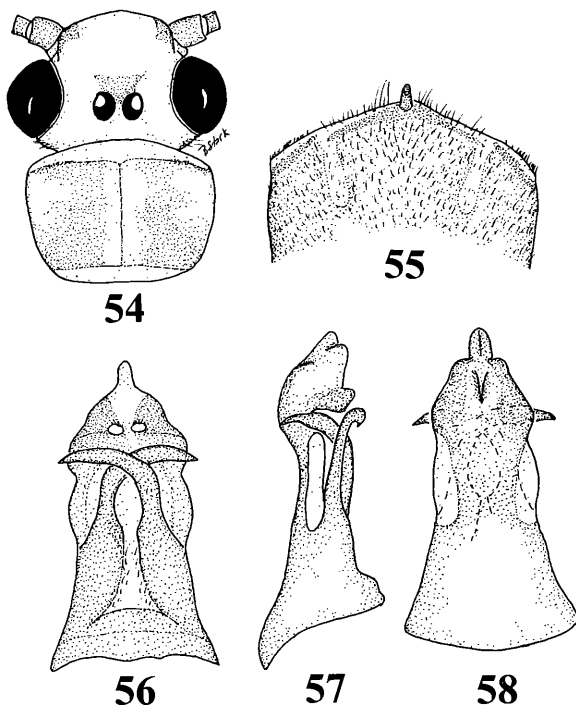
Nymph. Unknown.

Etymology. This species honors the Jivaro people and is used as a noun in apposition.

Diagnosis. The aedeagus and size of this species suggest it is related to the *A. guambiana* complex, but in lateral aspect the aedeagal apex lacks the hooked appearance typical of that group, the hammer is larger and the head pattern is also atypical of that group.

***Anacroneuria kitchensi*, spec. nov.**

Figs. 54-58



Anacroneuria kitchensi.

54. Head and pronotum.

55. Male 9th sternum.

56. Aedeagus, ventral.

57. Aedeagus, lateral.

58. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Pastaza, Puyo, 11 May 1977, P. Spangler, D.R. Givens (USNM). Paratypes: Ecuador: Pastaza, 1.5 km S Puyo, 21 May 1977, P. Spangler, D.R. Givens, 2 males (USNM).

Description

Adult habitus. Head with small dark spots over ocelli, near anterior margin of frons and covering lappets. Narrow median pronotal band pale, broad lateral bands dark; anterolateral margins pale (Fig. 54).

Male. Forewing length 9 mm. Hammer thimble shaped, somewhat laterally compressed, height greater than basal diameter (Fig. 55). Aedeagal apex narrowed to a slender scoop; subapical area with a pair of small ventral knobs. Dorsal keel triangular, hooks expanded in apical third (Figs. 56-58).

Female. Unknown.

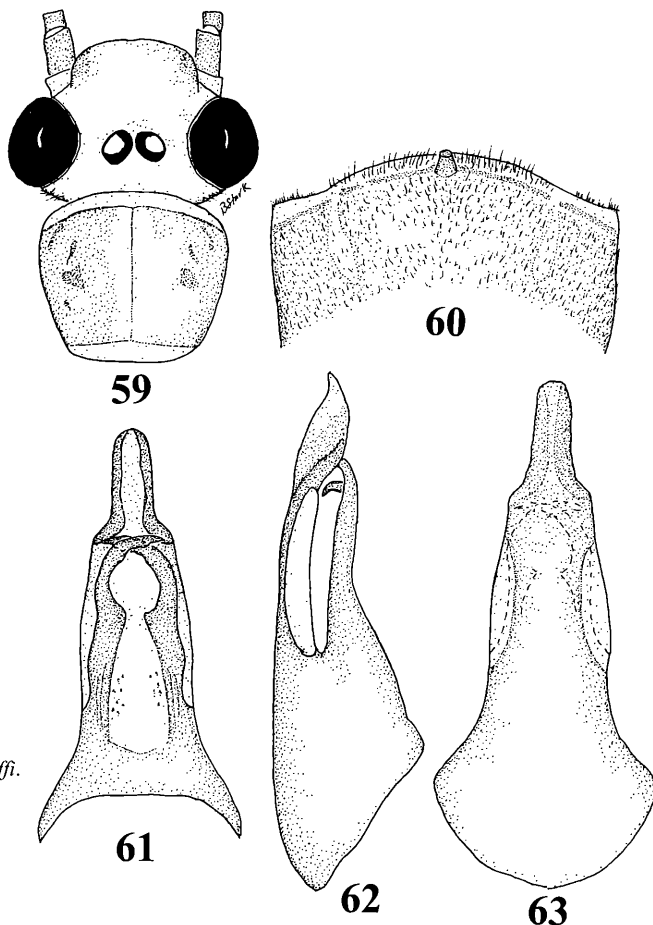
Nymph. Unknown.

Etymology. The patronym honors Mr. Clyde Kitchens of Red Oak, Oklahoma, for his role in influencing me to pursue a career in the natural sciences.

Diagnosis. The slender aedeagal apex distinguishes this species from others having a triangular dorsal keel. In Peru this includes *A. atrinota* and *A. heppneri* (STARK & SIVEC 1998), in Colombia, *A. rosita* (STARK et al. 1999), in Venezuela and Guyana, *A. achagua* and *A. pictipes* (STARK 1999), and in Ecuador, *A. parva* (described below).

Anacroneuria kondratieffi, spec. nov.

Figs. 59-63



Anacroneuria kondratieffi.

59. Head and pronotum.

60. Male 9th sternum.

61. Aedeagus, ventral.

62. Aedeagus, lateral.

63. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Los Rios, 56 km N Quevado, Rio Palenque Biological Station, 250 m, 28-29 July 1976, J. Cohen (USNM).

Description

Adult habitus. Head diffuse brown forward of ocelli, lappets brown. Median pale pronotal band narrow, dark lateral bands with scattered darker rugosities (Fig. 59). Wing membrane transparent, veins brown.

Male. Forewing length 11 mm. Hammer thimble shaped, height subequal to basal diameter. Aedeagal apex long and slender (Fig. 60). Hooks short and irregularly scalloped along inner margins. Ventral membranous lobes absent or obscure, dorsal keel absent (Figs. 61-63).

Female. Unknown.

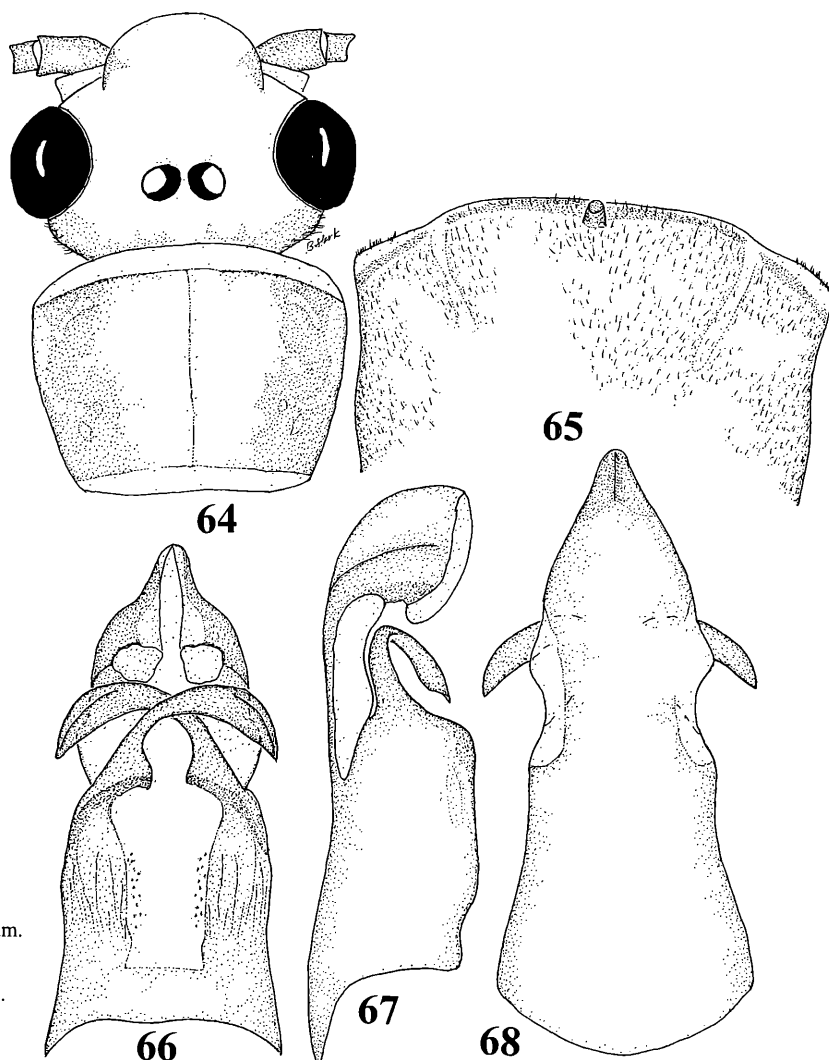
Nymph. Unknown.

Etymology. The patronym honors Boris Kondratieff for his generosity in sharing information from his studies of Mesoamerican species and type material.

Diagnosis. This species is similar in aedeagal structure to *A. angusticollis* (ENDERLEIN) and *A. handlirschi* (KLAPÁLEK) (STARK et al. 1999, STARK & SIVEC 1998). The ventral apex is longer and more nearly parallel sided than in the latter species whereas the former species has a distinct dorsal keel and digitate hook apices.

***Anacroneuria major*, spec. nov.**

Figs. 64-68



***Anacroneuria major*.**

64. Head and pronotum.

65. Male 9th sternum.

66. Aedeagus, ventral.

67. Aedeagus, lateral.

68. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Azuay, Rio Llavincó, 16 km W Quenca, 3010 m, 18 September 1990, O.S. Flint (USNM).

Description

Adult habitus. Head yellow with brown lappets and diffuse brown markings posterolaterally on occiput and anterior to ocelli (Fig. 64). Wing membrane transparent, veins brown.

Male. Forewing length 23 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 65). Aedeagus massive with simple apex and small membranous ventral lobes. Hooks wide and keeled in apical third, bases of hooks swollen and darkly sclerotized. Dorsal keel narrow and sharp (Figs. 66-68).

Female. Unknown.

Nymph. Unknown.

Etymology. The name refers to the large size of this species.

Diagnosis. The aedeagus of this species is somewhat similar to that of several other large Andean species such as *A. guayaquil* ZÚÑIGA & ROJAS (STARK et al. 1999) particularly in shape of the aedeagal hooks. *Anacroneuria major* differs from this and other related species in having a narrow aedeagal tip in ventral aspect, and in having a thick base in lateral aspect.

***Anacroneuria ohausiana* (ENDERLEIN, 1909)**

Neoperla ohausiana ENDERLEIN, 1909a: 164. Lectotype male, Loja, Ecuador. Desig. ZWICK, 1973

Description (Modified from ZWICK 1973)

Male. Forewing length 17-20 mm. Hammer present. Aedeagal apex simple, narrowed forward of shoulders to a broad, rounded tip; lateral aspect of apex relatively wide with prominent keel.

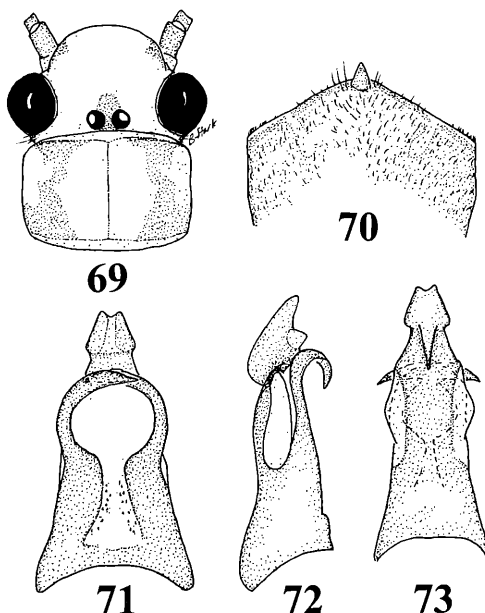
Female (putative). Forewing length not reported. Subgenital plate bilobed. Truncate lobes separated by small quadrate or U-shaped notch. Transverse sclerite of sternum 9 obscure. Median sclerite covered with setae. Lateral setae slightly larger than mesal setae.

Nymph. Unknown.

Comments. ZWICK (1973) redescribed the male and a putative female of this species from the type series. The aedeagus is similar to that of *A. carchi* (see comments for that species below). No additional records are available.

***Anacroneuria parva*, spec. nov.**

Figs. 69-73



Anacroneuria parva.

69. Head and pronotum.

70. Male 9th sternum.

71. Aedeagus, ventral.

72. Aedeagus, lateral.

73. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Napo, 5 km N Lago Agrio, 26 September 1975, A. Langley (USNM).

Description

Adult habitus. Ocellar area and lappets brown, frons yellow. Broad mesal pronotal band yellow, narrow midlateral bands brown (Fig. 69). Wing membrane transparent, veins brown except for pale costal area. Femora dark in distal third, tibiae banded.

Male. Forewing length 8.5 mm. Hammer conical (Fig. 70). Aedeagal apex simple, slightly notched at tip. Hooks slender, dorsal keel narrow, V-shaped (Figs. 71-73).

Female. Unknown.

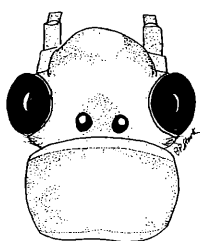
Nymph. Unknown.

Etymology. The name refers to the small size of this species.

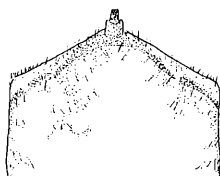
Diagnosis. *Anacroneuria parva* does not seem closely related to any described species but bears a superficial similarity to *A. heppneri* STARK & SIVEC in aedeagal features. The two are easily separated on the basis of size and the much longer keel of *A. parva* (STARK & SIVEC 1998).

Anacroneuria pastaza, spec. nov.

Figs. 74-80



74



75

Anacroneuria pastaza.

74. Head and pronotum.

75. Male 9th sternum.

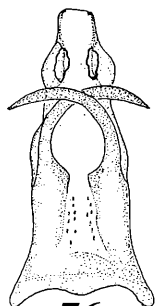
76. Aedeagus, ventral.

77. Aedeagus, lateral.

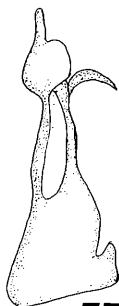
78. Aedeagus, dorsal.

79. Female terminalia.

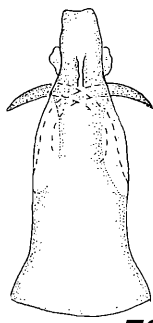
80. Egg.



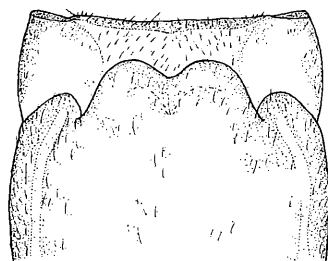
76



77



78



79



80

Types. Holotype male and two female paratypes from Ecuador, Pastaza, Rio Cononaco, 70 mi SE Limoncocha, 28 May 1976, J. Cohen (USNM). Additional paratypes: Ecuador: Napo, 18 km NW Lago Agrio, 30 August 1975, A. Langley, J. Cohen, 1 male (USNM).

Description

Adult habitus. Ocellar area covered by brown pigment; lappets connected by diffuse brown band. Median pronotal stripe pale, broad lateral stripes brown with scattered pale rugosities (Fig. 74). Wing membrane brown, veins brown except pale C and Sc.

Male. Forewing length 8 mm. Hammer somewhat conical, height greater than basal diameter (Fig. 75). Aedeagal apex simple, tip truncate. Ventral membranous lobes well developed, dorsal keel weak, hooks slender (Figs. 76-78).

Female. Forewing length 10 mm. Subgenital plate four lobed, mesal lobes projecting well beyond lateral lobes; mesal notch shallow and U-shaped. Transverse sclerite of sternum nine well developed; median sclerite T-shaped with prominent lateral setae and fine short setae on stem (Fig. 79). Egg spindle shaped with collar button like. Chorion smooth, posterior pole elongated into a prominent spine (Fig. 80).

Nymph. Unknown.

Etymology. The species name, based on the Ecuadorian province where the holotype was collected, is used as a noun in apposition.

Diagnosis. This species is similar in aedeagal and subgenital plate structure to *A. montera* STARK & SIVEC, however that species is much darker and has relatively straight aedeagal hooks (STARK & SIVEC 1998). *Anacroneuria pastaza* eggs are spined like those of *A. blanca* STARK but these species are not otherwise similar (STARK 1995).

***Anacroneuria pistacina* (ENDERLEIN, 1909)**

Neoperla pistacina ENDERLEIN, 1909a: 166. Lectotype female, Balzapamba, Ecuador. Desig. ZWICK, 1973

Description (Modified from ZWICK 1973)

Adult habitus. Body pale yellow brown. Pronotum with broad median band pale, narrow submarginal bands brown. Wing membrane pale with brown veins but veins in basal area of wing pale except cubitus; an obscure small window located beyond cord.

Male. Unknown.

Female. Forewing length not reported. Subgenital plate four lobed; outer lobes narrow, separated from wider median lobes by deep notches; median notch V-shaped. Sclerites of sternum 9 obscure, but transverse sclerite armed with row of thickened setae; median sclerite with rather sparse pilosity.

Nymph. Unknown.

Comments. ZWICK (1973) redescribed the female of this species from the type series. No additional records are available.

***Anacroneuria planada* BAENA & ROJAS, 1999**

Anacroneuria planada BAENA & ROJAS, in STARK et al. 1999: 34. Holotype male, Reserva Natural La Planada, Nariño, Colombia

Material. Ecuador: Napo, 6 km S Baeza, 1920 m, 20 July 1993, Sites, Linit, Nichols, 6 males, 1 female (UM). Napo, Las Minas, nr. Misahualli, 503 m, 21 July 1993, Sites, Linit, Nichols, 1 female (UM).

Female. Forewing length 15-17 mm. Subgenital plate bilobed, median notch V-shaped and narrow. Median sclerite of sternum 9 triangular and densely setose; hairs short and thin. Transverse sclerite with fine setae laterally but hairless on meson. Egg typical.

Comments. This species was previously known from male specimens collected at two Colombian localities (STARK et al. 1999).

***Anacroneuria portilla* STARK & ROJAS, 1999**

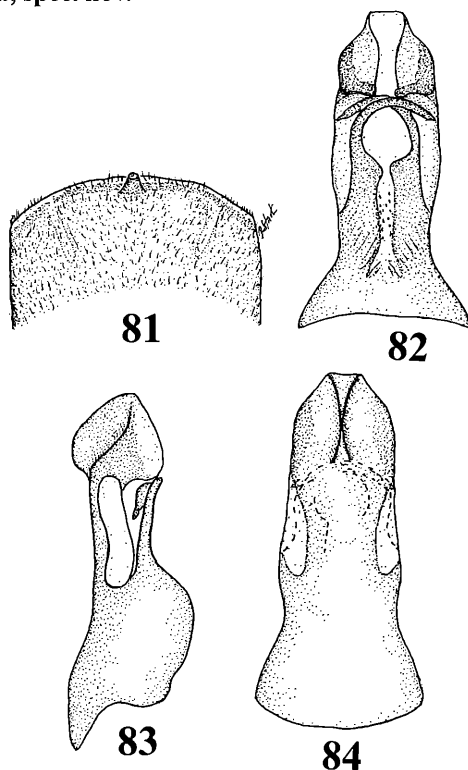
Anacroneuria portilla STARK & ROJAS, in STARK et al., 1999: 35. Holotype male, 18 km N Popayan, Cauca, Colombia

Material. Ecuador: Loja, Rio Yaquachi, 45 km SSE Portovela, 1080 m, 4 November 1987, J. Rawlins, R. Davidson, C. Young, 4 males (CMNH). Napo, Tena, 23 May 1977, P. Spangler, D.R. Givens, 1 male (USNM). Pichincha, Rio Umachaca, Forest Station Maquipucuna, 5 km E Nanegal, 4-5 September 1990, O.S. Flint, 2 males (USNM). Pichincha, Tinalandia, 6 km W Alluriquin, 16 April 1977, E.R. Hodges, 1 male (USNM).

Comments. This species, previously known from the type locality in Colombia, is part of a complex which includes *A. aymara* STARK & SIVEC. It differs from this species in having a much larger dorsal aedeagal keel and a broader aedeagal apex (STARK & SIVEC 1998).

***Anacroneuria puna*, spec. nov.**

Figs. 81-84



Anacroneuria puna.

81. Male 9th sternum.

82. Aedeagus, ventral.

83. Aedeagus, lateral.

84. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Cotopaxi, San Francisco de Las Pampas, Otonga, 2000 m, 30-31 July 1993, E. Tapia, G. Onore, C. Young (CMNH).

Description

Adult habitus. Head yellow except a narrow dark band extends around anterior margin to lappets. Pale mesal pronotal band wide, narrow lateral bands dark brown. Fore femora dark on dorsal margin, pale ventrally; tibiae entirely dark. Wing membrane brown, veins, especially R, dark brown.

Male. Forewing length 11 mm. Hammer thimble shaped; height subequal to basal diameter (Fig. 81). Aedeagal apex simple, subapical margins bulging and sclerotized in a narrow band. Dorsal keel extends full length of apex beyond hooks; keel of two sharp ridges, closely appressed mesally; dorsolateral margins of apex dark. Hooks slender (Figs. 82-84).

Female. Unknown.

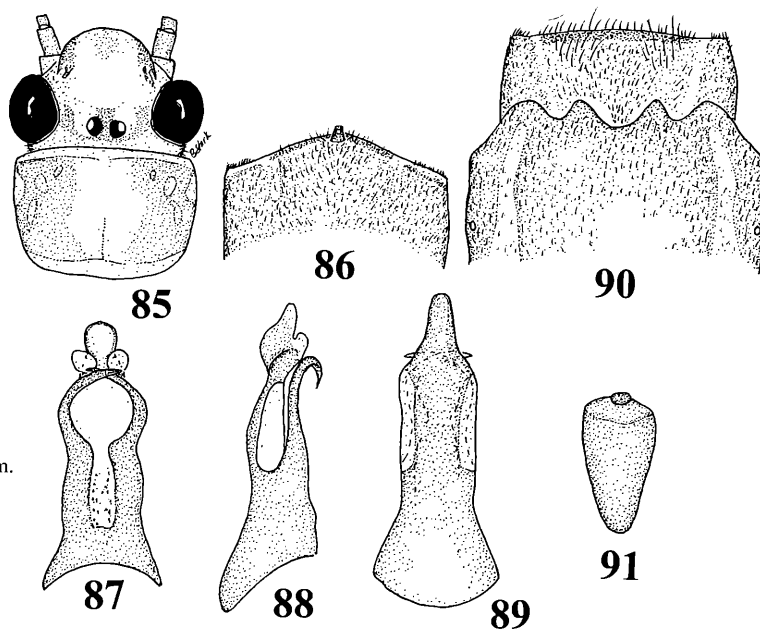
Nymph. Unknown.

Etymology. The species name honors the Puná people and is used as a noun in apposition.

Diagnosis. This species is similar to *A. chimborazo*, described above, but has a much longer and more developed dorsal aedeagal keel and a much wider median pronotal stripe.

Anacroneuria quijo, spec. nov.

Figs. 85-91



Anacroneuria quijo.

85. Head and pronotum.

86. Male 9th sternum.

87. Aedeagus, ventral.

88. Aedeagus, lateral.

89. Aedeagus, dorsal.

90. Female terminalia.

91. Egg.

Types. Holotype male and two female paratypes from Ecuador, Napo, 5 km N Lago Agrio, 26 September 1975, A. Langley (USNM).

Description

Adult habitus. Ocellar area and lappets dark brown, anteromesal area of frons with diffuse spot and a pair of dark areas near compound eyes connected to ocellar spot. Median pronotal band pale, lateral bands brown with scattered pale rugosities (Fig. 85). Wing membrane transparent, veins brown. Femora yellow on basal half, brown distally; tibiae brown.

Male. Forewing length 7.5 mm. Hammer thimble shaped, height greater than basal diameter (Fig. 86). Aedeagal apex simple, margins constricted subapically, tip rounded. Ventral membranous lobes present, hooks slender. Dorsal keel short, inconspicuous (Figs. 87-89).

Female. Forewing length 8.5 mm. Subgenital plate four lobed; inner lobes narrow and separated by wide U-shaped notch. Mesal sclerite of sternum nine with large setae posterolaterally. Transverse sclerite well developed (Fig. 90). Egg typical (Fig. 91).

Nymph. Unknown.

Etymology. The species name honors the Quijo people of Ecuador and is used as a noun in apposition.

Diagnosis. This species is similar to *A. mocha* STARK & SIVEC in aedeagal structure but the hooks of that species are wide and darkly sclerotized, and the entire aedeagus more robust (STARK & SIVEC 1998).

***Anacroneuria quilla* STARK & ZÚÑIGA, 1999**

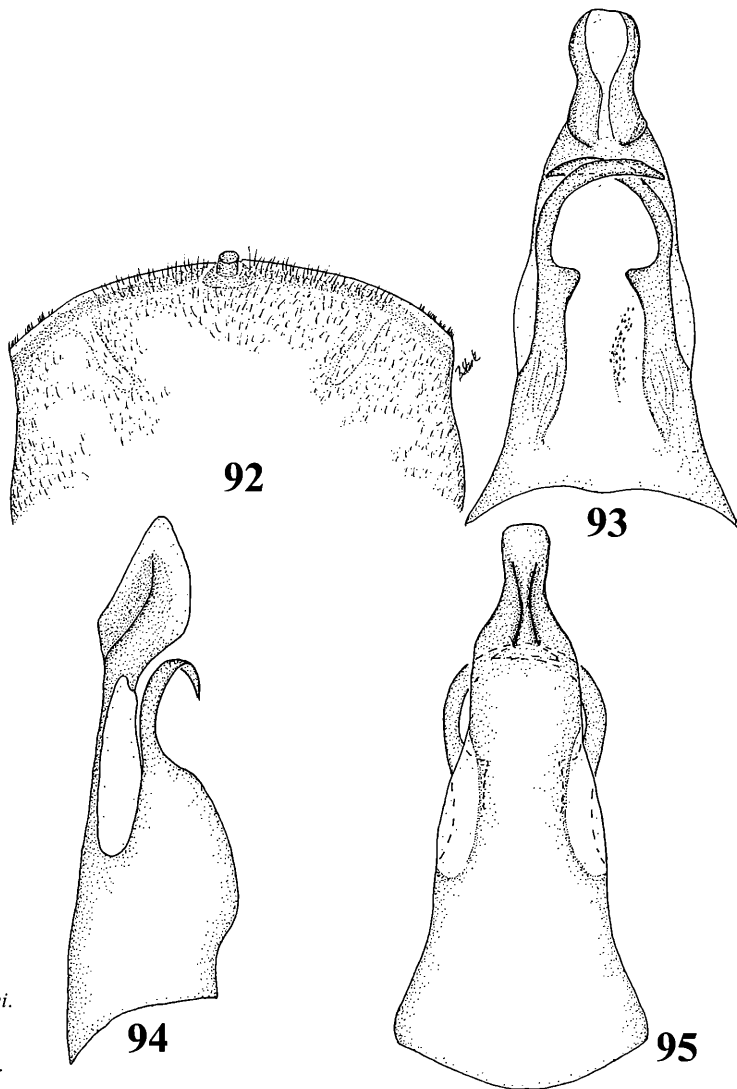
Anacroneuria quilla STARK & ZÚÑIGA, in STARK et al. 1999: 35. Holotype male, Termales de Santa Rosa de Cabal, Risaralda, Colombia

Material. Ecuador: Azuay, Rio Llavinco, 16 km W Quenca, 3010 m, 18 September 1990, O.S. Flint, 9 males (USNM). Carchi, 50 km W Tufimo, 2510 m, 19 November 1987, R. Davidson, C. Young, 1 male (CMNH). Zamora Chinchipe, 30 km E Loja, 2000 m, 23 September 1990, O.S. Flint, 4 males (USNM). Zamora Chinchipe, branch of Rio Zamora, 30 km SE Loja, 2000 m, 23 September 1990, P.J. Spangler, 1 male (USNM).

Comments. This species was formerly known from a few Colombian specimens (STARK et al. 1999). The most closely related species appear to be *A. pallens* Klapálek from Colombia (STARK et al. 1999) and *A. bulbosa* STARK & SIVEC from Peru (STARK & SIVEC 1998). The former species, known only from the Bogota type material, has a poorly developed hammer, whereas the latter has a more widely spaced aedeagal keel.

Anacroneuria rawlinsi, spec. nov.

Figs. 92-95

*Anacroneuria rawlinsi*.92. Male 9th sternum.

93. Aedeagus, ventral.

94. Aedeagus, lateral.

95. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Morona Santiago, Rio Culebrillas, 34 km SE Gualaceo, 2200 m, 22-23 October 1987, J. Rawlins, C. Young, R. Davidson (CMNH).

Description

Adult habitus. Head yellow, pronotum with wide, pale mesal band and narrow, brown lateral bands. Wings transparent, veins pale brown.

Male. Forewing length 17.5 mm. Hammer thimble shaped with wide base; height less than basal diameter (Fig. 92). Aedeagal apex simple, margins constricted mesally. Dorsal keel long, composed of two ridges. Hooks slender, scythe shaped (Figs. 93-95).

Female. Unknown.

Nymph. Unknown.

Etymology. The patronym honors John Rawlins, one of the collectors of this and other previously unknown Ecuadorian stoneflies.

Diagnosis. Several Andean species have an aedeagus similar in general features to this species, however in most species the apex is somewhat triangular in ventral aspect. *Anacroneuria cana* STARK & SIVEC has a similarly shaped aedeagal apex but it is wider and the dorsal keel is Y-shaped (STARK & SIVEC 1998) and *A. timote* STARK, a similar Venezuelan species has a shorter apical aedeagal section (STARK 1999).

***Anacroneuria rosita* STARK & ROJAS, 1999**

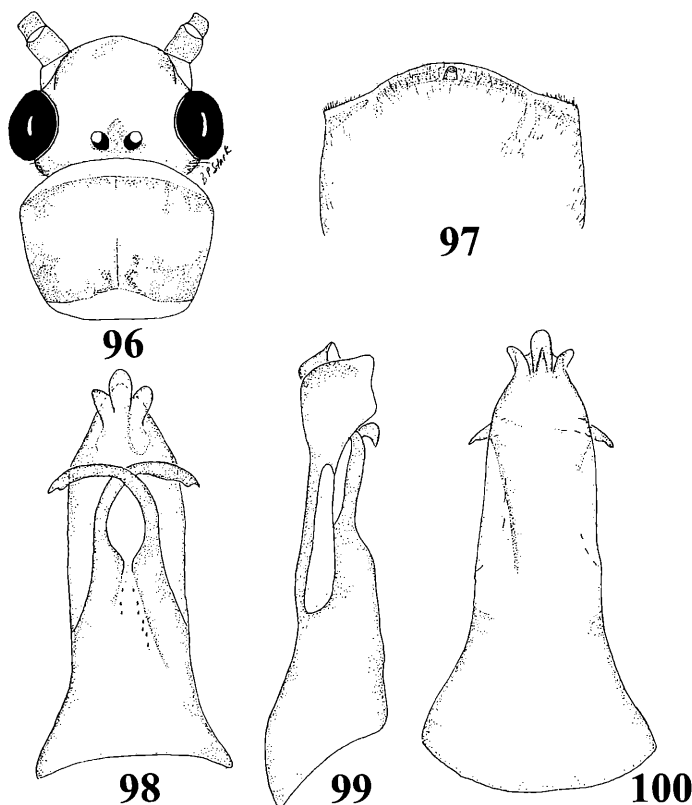
Anacroneuria rosita STARK & ROJAS, in STARK et al. 1999: 38. Holotype male, Rio Bodoquero, Morelia, Caquetá, Colombia

Material. Ecuador: Pastaza, Cononaco, 28 May 1976, J. Cohen, 1 male (USNM). Pastaza, Tzapino, 32 km NE Teyaeno, 24 May 1976, J. Cohen, 1 male (USNM).

Comments. See under *A. spangleri*.

***Anacroneuria rugosa*, spec. nov.**

Figs. 96-100



Anacroneuria rugosa.

96. Head and pronotum.

97. Male 9th sternum.

98. Aedeagus, ventral.

99. Aedeagus, lateral.

100. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Pichincha, via Puerto Quito km 113, 24 June 1970, J. Cohen (USNM).

Description

Adult habitus. Ocellar area covered by brown pigment; lappets dark, anteromesal area of frons between lappets with a diffuse brown spot. Pronotum with scattered dark rugosities; bands indistinct (Fig. 96). Wing membrane brown, veins dark brown except costal area and a small window at the cord.

Male. Forewing length 9.5 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 97). Aedeagal apex trilobed, median lobe slightly larger than lateral lobes. Aedeagal hooks slender, dorsal keel small and triangular (Figs. 98-100).

Female. Unknown.

Nymph. Unknown.

Etymology. The species name refers to the rough areas on the pronotum.

Diagnosis. This species is closely related to *A. albimacula* KLAPÁLEK from Colombia but the lateral lobes of the aedeagal apex are smaller in that species and do not approximate the tip as closely as they do in *A. rugosa* (STARK et al. 1999).

***Anacroneuria schmidtii* (ENDERLEIN, 1909)**

Neoperla schmidtii ENDERLEIN, 1909a: 169. Holotype female, Balzapampa, Ecuador

Anacroneuria variegata KLAPÁLEK, 1921. Syn. ZWICK, 1973

Description (Modified from ZWICK 1973)

Adult habitus. Pale yellowish with narrow brown submarginal pronotal bands and a pair of corresponding brown mesonotal spots.

Male. Unknown.

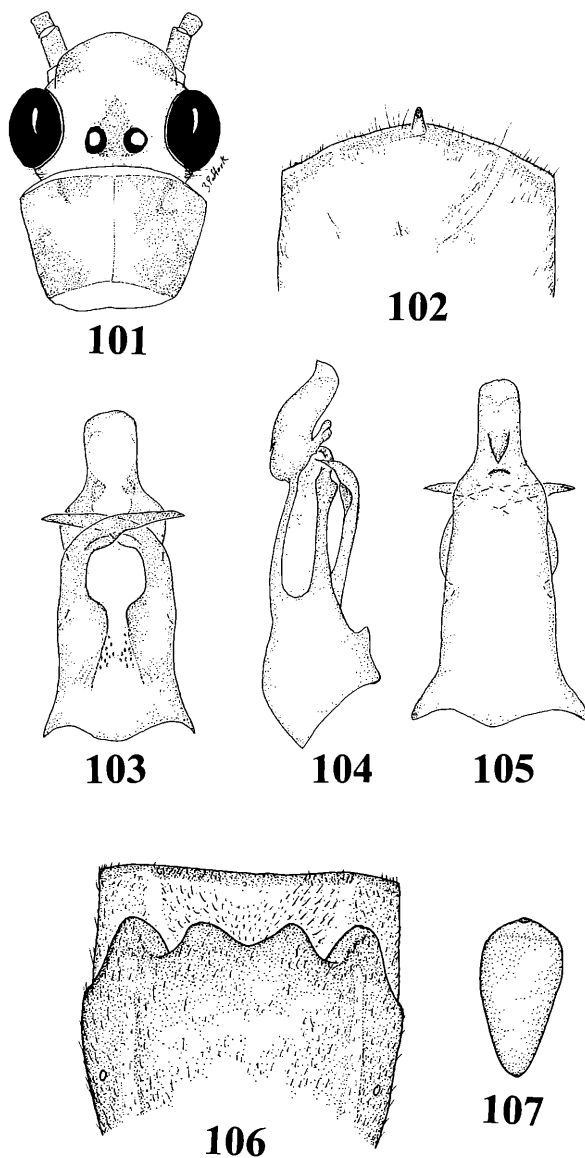
Female. Forewing length 9.5-10.5 mm. Subgenital plate four lobed; outer lobes about as wide as inner lobes and separated by notches much shallower than median V-shaped notch. Transverse sclerite of sternum 9 obscure, median sclerite covered with long thick setae laterally and short fine setae mesally.

Nymph. Unknown.

Comments. Zwick (1973) redescribed the female of this species from the holotype and placed the Colombian species, *A. variegata*, as a synonym. No additional records are available.

Anacroneuria spangleri, spec. nov.

Figs. 101-107

*Anacroneuria spangleri*.

101. Head and pronotum.

102. Male 9th sternum.

103. Aedeagus, ventral.

104. Aedeagus, lateral.

105. Aedeagus, dorsal.

106. Female terminalia.

107. Egg.

Types. Holotype male, 5 male and 17 female paratypes from Ecuador, Pichincha, 29 km W Santa Domingo de los Colorados, 6 May 1975, P. Spangler (USNM). Additional paratypes: Ecuador: Los Rios, 11 km S Quevedo, 3 July 1975, A. Langley, J. Cohen, 4 males (USNM). Los Rios, Quevedo, 11 May 1975, P. Spangler, A.B. Gurney, A. Langley, J. Cohen, 17 females (USNM).

Description

Adult habitus. Ocellar area covered by brown pigment, lappets connected by diffuse brown band. Median pronotal stripe pale, broad lateral stripes brown with darker pigment near basolateral margins and extending, hook like, from anteromesal margin (Fig. 101). Wing membrane transparent, veins brown.

Male. Forewing length 9.5 mm. Hammer somewhat compressed at tip; height about twice basal diameter (Fig. 102). Aedeagal hooks stout and scooped at midlength. Aedeagal apex rounded and somewhat broad; ventral membranous lobes obscure, dorsal keel V-shaped and with a transverse arcuate ridge located near the pointed apex of the keel (Figs. 103-105).

Female. Forewing length 12 mm. Subgenital plate four lobed; lateral lobes separated by deep V-shaped notches, mesal lobes by a broad V-shaped notch. Median sclerite of sternum 9 sparsely setose, lateral setae larger. Transverse sclerite straight and well developed (Fig. 106). Egg typical of genus (Fig. 107).

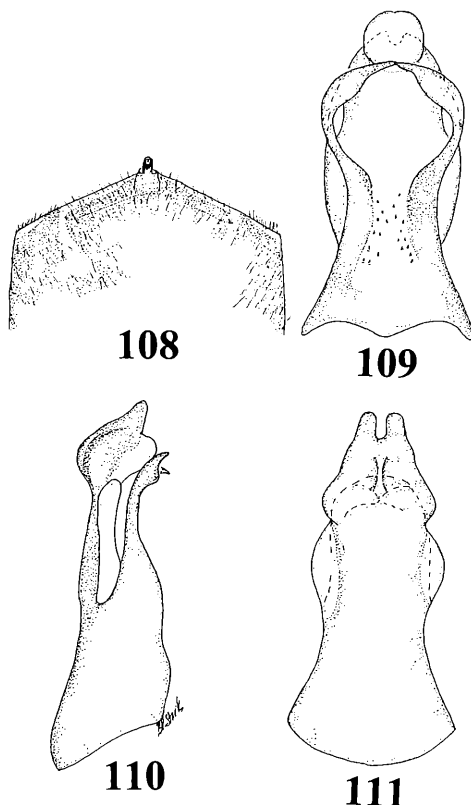
Nymph. Unknown.

Etymology. The patronym honors Paul J. Spangler, collector of the holotype.

Diagnosis. This species is similar to the Peruvian species, *A. atrinota* JEWETT and the Colombian species, *A. rosita* STARK & ROJAS in general aedeagal structure (STARK & SIVEC 1998, STARK et al. 1999). The latter species has chelate aedeagal hooks and a shorter, more slender aedeagal apex than *A. spangleri* whereas the former species has a more slender, longer and less sinuate aedeagal apex than *A. spangleri*. Females of *A. spangleri* and *A. atrinota* may be indistinguishable.

Anacroneuria tena, spec. nov.

Figs. 108-111



Anacroneuria tena.

108. Male 9th sternum.

109. Aedeagus, ventral.

110. Aedeagus, lateral.

111. Aedeagus, dorsal.

Types. Holotype male (pinned) from Ecuador, Napo, Tena, 520 m, 10-13 September 1990, O.S. Flint (USNM).

Description

Adult habitus. Dark pigment covers ocelli, lappets, and an area on the anteromesal margin between lappets. Pronotum with a narrow pale mesal band; broad lateral bands dark with scattered pale rugosities. Femora yellow brown except for narrow black apical band; tibiae with basal and apical brown bands. Wing membrane transparent, veins brown except for pale costa.

Male. Forewing length 9 mm. Hammer broad basally with slender cylindrical apex (Fig. 108). Aedeagal apex short and deeply notched on dorsal margin; venter bearing a large membranous lobe. Aedeagal hooks chelate and nearly reaching aedeagal tip. Dorsal keel of two narrowly separated ridges (Figs. 109-111).

Female. Unknown.

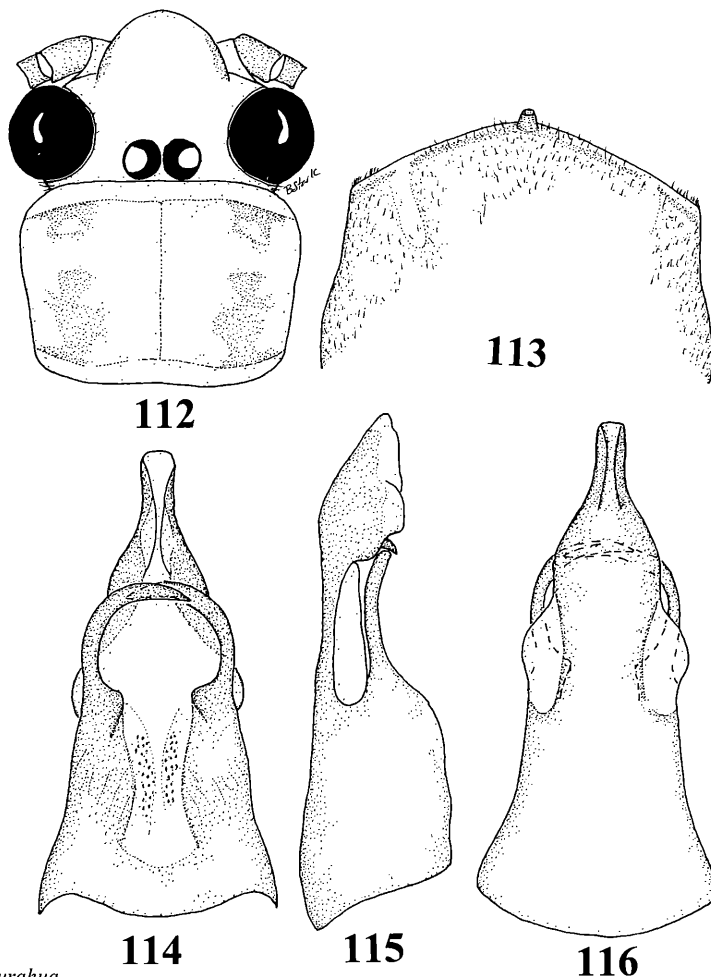
Nymph. Unknown.

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

Diagnosis. This species is readily distinguished from known *Anacroneuria* by the deeply notched dorsoapical aedeagal margin.

Anacroneuria tungurahua, spec. nov.

Figs. 112-116

*Anacroneuria tungurahua*.

112. Head and pronotum.

113. Male 9th sternum.

114. Aedeagus, ventral.

115. Aedeagus, lateral.

116. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Tungurahua, 32 km E Baños, 28 January 1976, P. Spangler et al. (USNM).

Description

Adult habitus. Head yellow, lappets brown. Median pronotal stripe pale; incomplete midlateral bands brown (Fig. 112). Wing membrane transparent, veins pale brown, C and Sc pale.

Male. Forewing length 15 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 113). Aedeagal apex simple, long and slender. Aedeagal body with protruding lateral knobs at bases of hooks; hooks slender. Dorsal keel of two long, narrowly separated ridges (Figs. 114-116).

Female. Unknown.

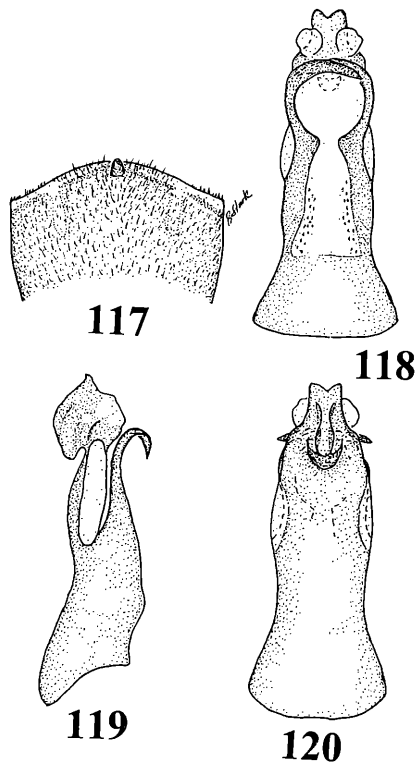
Nymph. Unknown.

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

Diagnosis. The slender, gradually narrowed aedeagal apex and lateral knobs near the hook bases distinguish this species.

***Anacroneuria tzapino*, spec. nov.**

Figs. 117-120



Anacroneuria tzapino.

117. Male 9th sternum.

118. Aedeagus, ventral.

119. Aedeagus, lateral.

120. Aedeagus, dorsal.

Types. Holotype male (pinned) from Ecuador, Pastaza, Tzapino, 400 m, 22 May 1976, J. Cohen (USNM).

Description

Adult habitus. Ocellar spot dark brown, occiput brown; lappets connected by narrow band of brown pigment around anterior margin of head. Middle third of pronotum pale, lateral bands dark brown. Wing membrane brown, veins dark brown; pale spot at cord obscure. Anterior face of fore femora dark brown except for basal fourth; tibiae dark brown.

Male. Forewing length 8 mm. Hammer almost conical, height greater than basal diameter (Fig. 117). Ventral aspect of aedeagal apex scoop shaped with slightly notched tip and a pair of membranous lobes. Dorsal keel well developed, consisting of a pair of sinuate, longitudinal ridges and a mesal U-shaped process. Hooks slender (Figs. 118-120).

Female. Unknown.

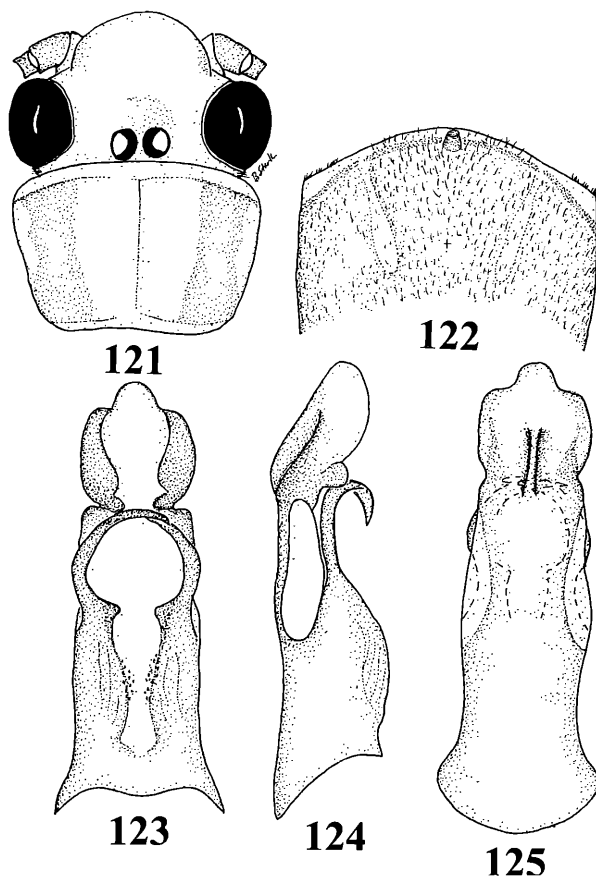
Nymph. Unknown.

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

Diagnosis. The aedeagus of this species resembles that of *A. arcuata* STARK in lateral aspect (STARK 1995) and that of *A. morena* STARK & ZÚÑIGA in ventral aspect (STARK et al. 1999), but the complex dorsal keel of *A. tzapino* readily distinguishes it from these species. A closer relative may be *A. perija* STARK which has a similar, but less well developed, aedeagal keel and a similar color pattern (STARK 1999).

***Anacroneuria zamora*, spec. nov.**

Figs. 121-125



Anacroneuria zamora.

121. Head and pronotum.

122. Male 9th sternum.

123. Aedeagus, ventral.

124. Aedeagus, lateral.

125. Aedeagus, dorsal.

Types. Holotype male from Ecuador, Zamora Chinchipe, Rio Jamboe, 21 km S Zamora, 1340 m, 22 September 1990, O.S. Flint (USNM).

Description

Adult habitus. Head yellow with brown lappets and obscure brown area forward of ocelli. Wide median pronotal band yellow, dark brown lateral stripes narrow, lateral margins pale (Fig. 121). Wing membrane transparent, veins brown, R dark brown.

Male. Forewing length 13 mm. Hammer thimble shaped, height subequal to basal diameter (Fig. 122). Aedeagal apex simple, offset from body by constriction at shoulders, projecting tip about half as wide as aedeagus at shoulders. Dorsal keel of two long parallel ridges; hooks slender (Figs. 123-125).

Female. Unknown.

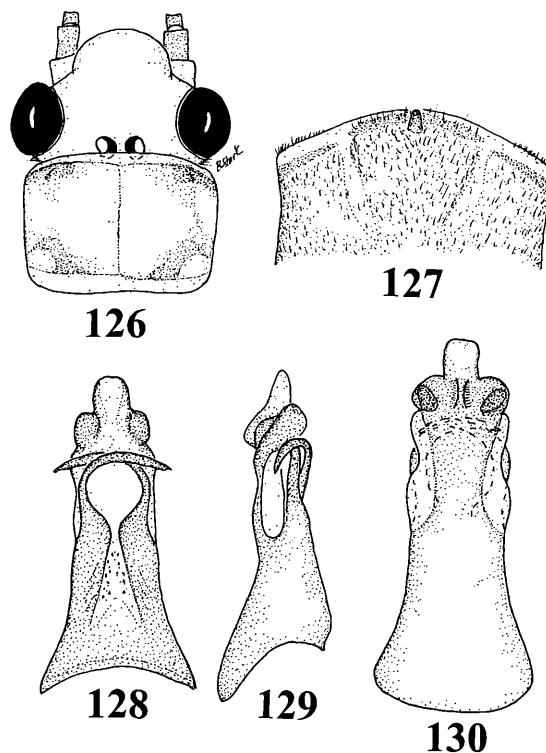
Nymph. Unknown.

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

Diagnosis. The aedeagus of this species is similar to that of *A. pachacuti* STARK & SIVEC from Peru and Bolivia, however in that species the aedeagus is more slender, the apex more attenuated and the dorsal keel somewhat Y-shaped (STARK & SIVEC 1998).

***Anacroneuria zunigae*, spec. nov.**

Figs. 126-130



Anacroneuria zunigae.

126. Head and pronotum.

127. Male 9th sternum.

128. Aedeagus, ventral.

129. Aedeagus, lateral.

130. Aedeagus, dorsal.

Types. Holotype male and seven male paratypes from Ecuador, Napo, 18 km NW Lago Agrio, 30 August 1975, A. Langley, J. Cohen (USNM). Additional paratypes: Ecuador: Napo, 5 km N Lago Agrio, 26 September 1975, A. Langley, 1 male (USNM). Napo, 4 km N Lago Agrio, 26 August 1975, A. Langley, Yingling, 1 male (USNM).

Description

Adult habitus. Head pale, pronotum mostly pale but with dark areas at corners (Fig. 126). Wing membrane pale, most veins pale brown but C and Sc pale, M dark; obscure window beyond cord.

Male. Forewing length 10 mm. Hammer thimble shaped, height greater than basal diameter (Fig. 127). Aedeagal apex trilobed; lateral lobes mound shaped ventrally, double tiered dorsally and bearing a thin dark lateral blade; mesal lobe rounded or slightly notched. Dorsal keel long and narrow, composed of two ridges. Hooks long and slender (Figs. 128-130)

Female. Unknown.

Nymph. Unknown.

Etymology. The matronym honors Maria del Carmen Zúniga de Cardoso for her contributions to the knowledge of neotropical stoneflies.

Diagnosis. This species is part of a complex that includes *A. pakitza* STARK & SIVEC, *A. yameo* STARK & SIVEC, *A. pinza* STARK and *A. vistosa* STARK (STARK 1995, STARK & SIVEC 1998). The thin dorsolateral blades extending from the lateral lobes of the aedeagus will distinguish this species.

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Nahajališča in opisi vrst *Anacroneuria* iz Ekvatorja (Plecoptera: Perlidae)

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