



<http://dx.doi.org/10.11646/zootaxa.4033.2.6>

<http://zoobank.org/urn:lsid:zoobank.org:pub:C25DB618-2AF3-4D5E-BDF6-C83E91A6ED16>

Description of the last instar larva of *Anacroneuria tucuman* Stark (Plecoptera: Perlidae) from northern Argentina

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Abstract. The last instar larva of *Anacroneuria tucuman* Stark is described based on material from the Yungas Forest in Jujuy Province, Argentina. This is the first record of the species for the Province.

Key words. Stoneflies, *Anacroneuria*, immature, Jujuy Province

Introduction

The perlid genus *Anacroneuria* Klapálek is distributed from northern Argentina to the southwestern United States (Stark 2007) with more than 300 known species (Froehlich 2010, Stark 2013, Righi-Cavallaro *et al.* 2013). *Anacroneuria* is the most diverse and taxonomically complex genus of Plecoptera in the Neotropical Region (Froehlich 2010). The genus is represented in Argentina by at least 24 species (Stark 2013) mainly known from the Yungas and the Parana forests of the Amazonian and Parana subregions (Morrone 2006). Most of these species were treated or described by Froehlich (2002). There are many records and description of new species in neighboring countries (e.g. Stark & Baumann 2011, Stark *et al.* 2012, Righi-Cavallaro *et al.* 2013, Bispo *et al.* 2014) that may be potential additions to the fauna of Argentina. The discovery of new species is also very likely due to the speciose nature of the genus with many areas not adequately sampled. Argentinean aquatic entomologists have devoted little attention to this interesting genus with the exception of Orce (2003).

The knowledge of immature stages of *Anacroneuria* is restricted to the descriptions of only 26 species (Ferreira Ribeiro & De Sousa Gorayeb 2014). From the Argentinean species, only the larva of *A. debilis* (Pictet) has been described (Avelino-Capistrano *et al.* 2011). This imposes limitations in identifying immatures for needed ecological studies.

Material and methods

Specimens of *Anacroneuria tucuman* used in this study were collected using a Surber sampler and standard D-frame nets from second order streams located in the Yungas Rainforest, Department of General Belgrano, Jujuy Province, Argentina. These streams drain the Reyes River Basin (24° 05' 21" and 24° 18' 02"S. , 65° 43' 22" and 65° 22' 47" W), covering an area of 450 km² with W-E orientation. The climate of this region is montane, with subtropical rainfall patterns. Rainfall occurs between October and March with an average of 850 mm. Monthly average temperatures in summer (January) are 21°C and in winter (July) 10.5°C.

All specimens were preserved in 70% ethanol. Identification was confirmed using Froehlich (2002) and Stark (2013) descriptions of species. Figures were drawn with the aid of a camera lucida coupled to a Leica MZ6 stereomicroscope.

To evaluate the relationship between physicochemical parameters (dissolved oxygen, temperature, pH, salinity, conductivity) and the change in relative abundance of species, Spearman correlation coefficient was measured to test statistical dependence using PAST (Hammer *et al.* 2001). Groups of aquatic insect species with similar requirements and significant physical-chemical values were identified.

Results

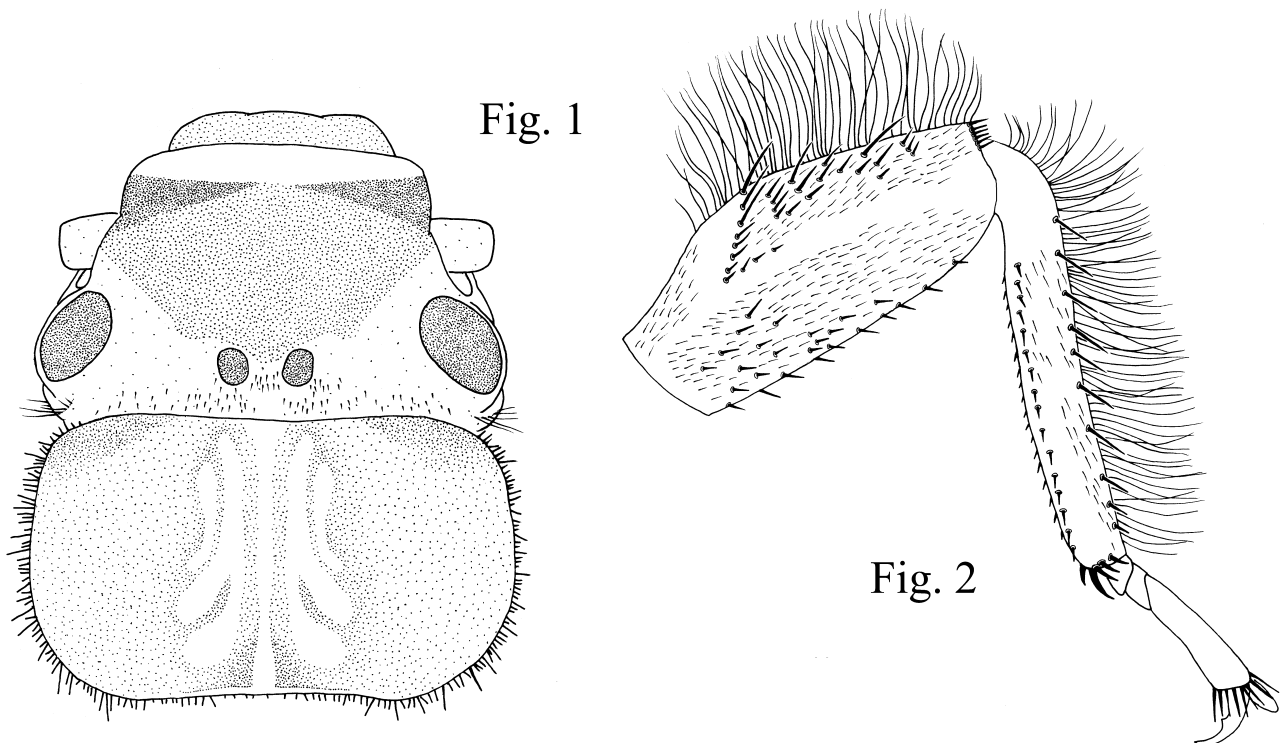
Anacroneuria tucuman Stark, 2013 (Figs. 1–8)

Anacroneuria tucuman Stark, 2013: 97, figs. 5–9 (male description, type locality: Horco Molle, Tucumán, Argentina; illustrations of head, sternum 9, and aedeagus in dorsal, lateral and ventral views).

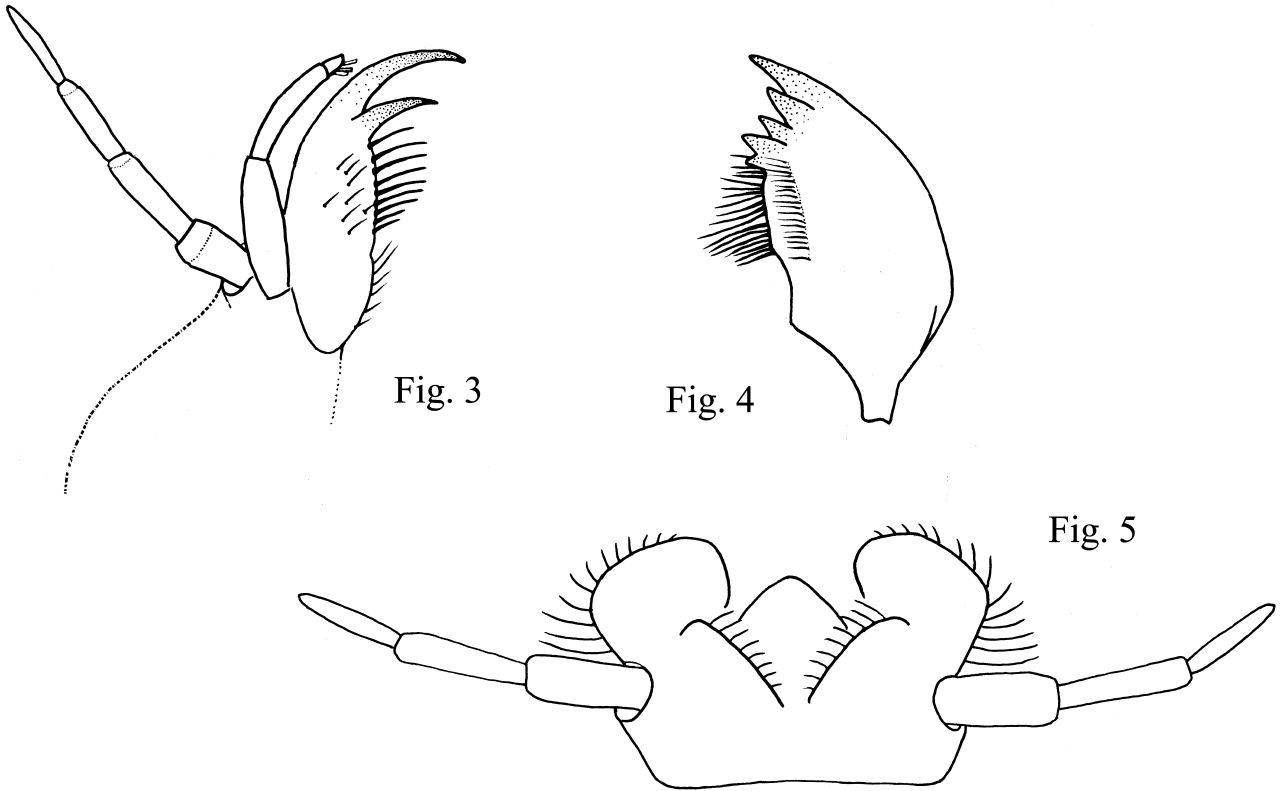
Material studied. One adult male and five larvae (one pharate male, one final instar and three intermediate instars), Argentina, Jujuy Province, Lampazar River approximately 3 km south of Guerrero, 24° 12'48,8" S, 65° 26'45,2" W, 1629 masl, 27.x.2011, M. De Paul leg. Two larva of intermediate instars, same data as previous but Quesera River, 20° 12'48,5" S, 65° 26' 40,7" W, 1621 masl, 8.xi.2010.

Last instar larva description. Dorsum of head (Fig. 1) with a trapezoidal brown area, narrower posteriorly and extending from the ocelli to posterior margin of clypeus; its apical margin with two transverse and long triangular dark brown areas. Clypeus and remainder of head yellow. Mandible (Fig. 4) with five teeth, a row of short thin bristles on dorsal surface close to inner margin and a ventral row of long bristles on ventral surface also close to inner margin. Laciniae (Fig. 3) with a row of nine long bristles on its inner margin basal to apical hooks. Pronotum (Fig. 1) yellow, with lighter scattered areas on its median region, meso- and metanotum light brown with lighter oval medial areas. Fore femur (Fig. 2) with a well-developed dorsal fringe extending from base of medial third to apex; with an oblique row of bristles between basal and medial third, bristles gradually longer towards dorsal margin; with several scattered long and short bristles distal to the oblique row and several short bristles close to the ventral margin; a row of five short bristles in the apical margin. Femoral surface covered by clothing hairs, except a median elongated area and a patch basal to the oblique row of bristles. Mid and hind femora same as forefemur, except for the oblique row of bristles, located on basal third on mid femur and absent in hind femur. Tibiae (Fig. 2) with a well-developed dorsal fringe; a row of long bristles on its dorsal margin, two rows of short bristles on its ventral margin and several thick bristles on its apex. Apices of tarsi with several long and straight bristles. Abdominal terga light brown, sterna whitish, posterior margin with a row of short bristles (Fig. 6). Basal cercomeres with a few short bristles (Fig. 6) increasing in number towards apex (Figs. 7–8).

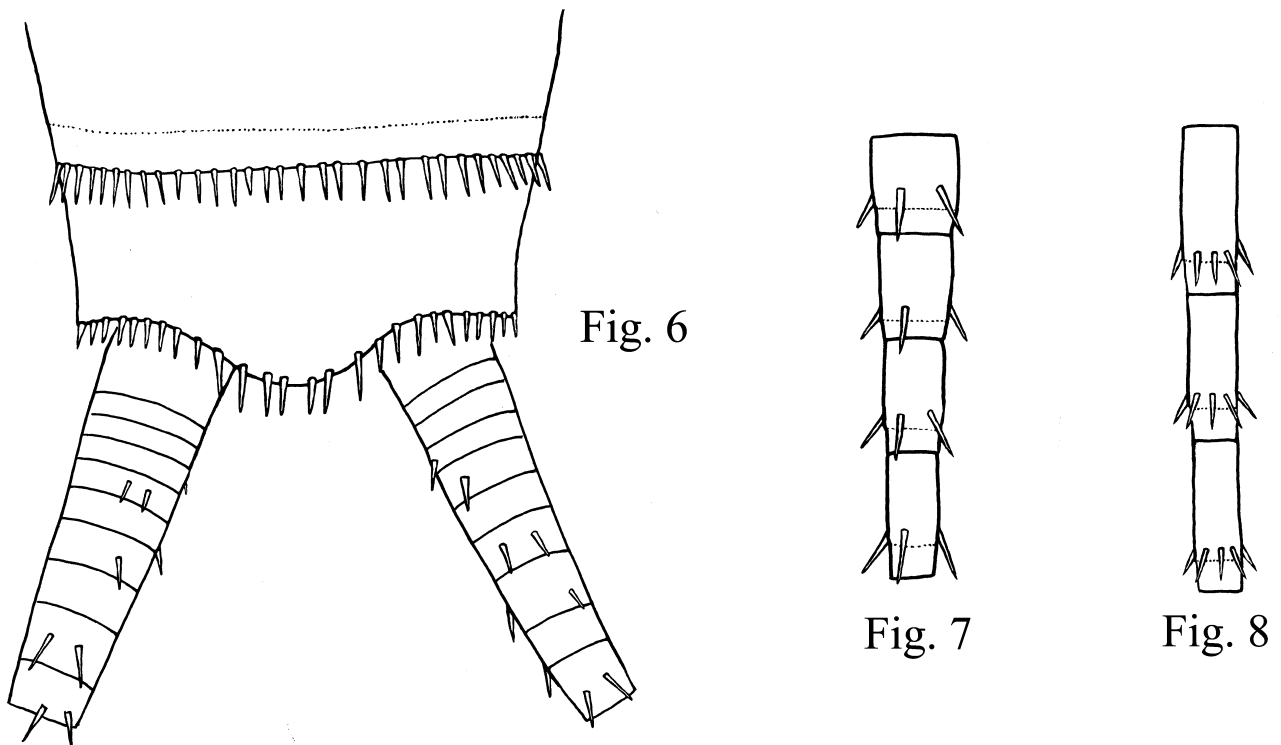
Measurements (in mm, n: 1): body length without cerci 10.8; head length 2.05; head width 2.75; pronotum length 1.55; pronotum width 2.85.



FIGURES 1–2. *Anacroneuria tucuman* Stark larva. 1: head and pronotum, dorsal view. 2: fore leg, dorsal view.



FIGURES 3–5. *Anacroneuria tucuman* Stark larva. 3: left maxillary palp, laciniae and galea, ventral view. 4: right mandible, dorsal view. 5: labium, ventral view.



FIGURES 6–8. *Anacroneuria tucuman* Stark larva. 6: abdominal segments 9–10, dorsal view. 7: cercomerites 14–17. 8: cercomerites 24–26.

Distribution. This species has been previously recorded from the Yungas Rainforest of Tucumán Province, Argentina by Stark (2013). This is the first record of the species for Jujuy Province, also in the Yungas Rainforest, located approximately 400 km north of Tucumán.

Ecological comments. Hydrological and physicochemical characteristics of the sites are described in Tables 1 and 2. This study was part of a larger project including ecological studies of the Reyes River Basin. This study indicated that aquatic insect abundance in the Lampazar and Quesera rivers were higher than those of other streams of the Basin. This may be related to the fact that these rivers have relatively low anthropic impacts and still have well-developed riparian vegetation. The streams have low salinity, conductivity, and suspended solids. Assemblages with other species in the community of Reyes Basin was tested using Spearman correlation, significant associations values ($p < 0.05$) (Elliot, 1977) were found with *Mortoniella* sp., *Metrichia* sp., *Ochrotrichia* sp., *Nectopsyche* sp., *Helicopsyche* sp. (Trichoptera); *Corydalus* sp. (Megaloptera); Athericidae sp., Psychodidae sp., Tipulidae sp. (Diptera); *Austrelmis* sp., *Neoelmis* sp., *Psephenus* sp. (Coleoptera); *Microvelia hungerfordi* McKinstry, *Eurygerris fuscineris* (Berg), (Hemiptera); *Coleophora* sp. (Lepidoptera).

Notes. An adult male of *A. tucuman* and two last instar larva (one pharate male) were collected in the same day and locality, the specific identification of the larva herein described was confirmed by dissection of genitalia of the pharate male. On the same day and locality another species of *Anacroneuria* was also collected from the Quesera and Lampazar rivers, but was much larger species.

TABLE 1. Physicochemical characteristics of Quesera and Lampazar streams, Jujuy Province, Argentina (data taken in autumn and spring 2010–2011).

Stream	Season	pH	Temperature °C	Conductivity (uS)	Total solids dissolved (mg/L)	NaCl (ppm)	Dissolved oxygen (mg/L)
Quesera	Autumn	8,5	9,8	161,0	39,4	79,2	6,9
Lampazar	Autumn	8,6	17,2	162,5	61,7	84,6	6,9
Quesera	Spring	8,2	15,7	174,9	61,3	90,9	7,6
Lampazar	Spring	8,2	17,8	137,0	53,2	72,4	7,0

TABLE 2. Hydrological characteristics of Quesera and Lampazar streams, Jujuy Province, Argentina (data taken in autumn and spring 2010–2011).

Stream	Altitude (masl)	Mean width (m)	Mean depth (m)	Mean speed (m/s)	Caudal (m ³ /s)
Quesera	1621	6,65	0,345	42,6590278	97,8704745
Lampazar	1549	6,9	0,4175	26,8875	77,4561656

Discussion

Twenty-four *Anacroneuria* species have been recorded from Argentina (Stark 2013), but only the larva of *A. debilis* has been described (Avelino-Capistrano *et al.* 2011). This species is similar to that of *A. tucuman* in head and pronotal coloration patterns and femoral setation. The larvae of *A. tucuman* differs from *A. debilis* in the darker triangular areas posterior to the clypeus and the absence of M-line in the head. The larvae of *A. debilis* have a pale area between the ocelli and an indistinct M-line is present. Additionally, *A. tucuman* differs in the lighter coloration of pronotum, the presence of the spine-like seta on the third tarsal segment, and the presence of nine bristles on the lacinia. In *A. debilis*, the pronotum is darker laterally, the spine-like setae are lacking or poorly developed on the last tarsal segments, and there are only four to seven bristles on the lacinia.

The head coloration pattern of *A. tucuman* is also similar to those of *A. blanca* Stark, *A. otafroehlichii* Righi-Cavallaro & Lecci, and the larva VZ11 (described by Stark 1995, Righi-Cavallaro & Lecci 2010 and Maldonado *et al.* 2002). These species, as in *A. tucuman*, possess a continuous darker coloration on the dorsum of the head, more extensive in the anterior region, clypeus paler, and lack of a M-line found on many species (e.g. *A. shamatar* Stark, *A. paleta* Stark).

Acknowledgements

Our appreciation is extended to Dr. B.P. Stark, for his help in the species identification. We thank Dr. M. Archangelsky for the critical reading of the manuscript and English corrections. This work was supported by the Argentinean Council of Scientific Research (Argentina). This is the contribution number 119 of the LIESA.

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