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## A new species of *Apocellus* Erichson, 1839 (Coleoptera: Staphylinidae) from Argentina with ecological notes

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### Abstract

*Apocellus andinus* sp. nov. from Argentina is described and illustrated, detailed information on its ecology is provided, and a key to species of *Apocellus* from southwestern South America is given. This species was collected in riparian areas of a mountain dam at 1355 m elevation, and it was found in an unstable wetland environment in association with species tolerant to human perturbations. Lectotypes are designated for *Apocellus argentinus* Bernhauer, 1908 and *Apocellus opacus* Bernhauer, 1908.

**Key words:** Andean region, distribution, mountain wetlands, new species, Oxytelinae, *Apocellus*

### Introduction

The genus *Apocellus* Erichson (1839) (Staphylinidae: Oxytelinae) is currently represented by 38 species restricted to the New World (or the “Americas”) (Herman, 2001; Newton and Thayer, 2005). Twenty-nine of these species are found throughout the Neotropical region (Newton *et al.*, 2000) including southern South America (i.e. southern Chile and Argentina), which has been largely recognized as a biogeographical unit *per se* (e.g. Newton and Thayer, 2005; Morrone, 2009). *Apocellus* species have been variously found in forest leaf litter and open grassy areas, on dung, on bare soil among lawn grasses, along streams near moss and litoral or riparian areas of lakes (Newton *et al.*, 2000; Brunke *et al.*, 2011; Webster *et al.*, 2012), also in association with ants in Mexico (Navarrete *et al.*, 2002).

Four species have been cited from southwestern South America (Herman, 2001; Newton and Thayer 2005), within the so-called South American transition zone and Andean region (Morrone, 2009). Only one of them, *Apocellus mendozanus* Steinheil 1869, was redescribed after its original description (Lynch-Arribálzaga, 1884). Until the present work, no information has been reported on the ecological traits of any of the South American species of *Apocellus*.

The present paper is based primarily on material from a mountain wetland area of the Mendoza River Watershed collected by the junior author. Material obtained from the samples included a few specimens of *Apocellus* which proved to be an undescribed species.

The objectives of this study are to describe a new species of *Apocellus*, provide a key to species of *Apocellus* from southwestern South America and contribute to the knowledge on distribution and ecology of this species.

### Material and methods

*Study area.* The province of Mendoza stretches at the foothills of the Andes Cordillera along west-central Argentina between 32° and 37° 35' South and 66° 30'-70° 35' West, over an area of 150,839 km<sup>2</sup>. It features an arid to semiarid climate with an annual rainfall average of about 250 mm. Precipitation in the mountains occurs mostly as winter snow, ranging from 250 to 300 mm per year (Departamento General de Irrigación 1997, 1999).

The Potrerillos Dam (S 32° 57.335' W 69° 10.840') is located on the low section of the Mendoza River Watershed, in the Andean locality of Potrerillos (Mendoza province). The Mendoza River is born in the Andes from the confluence of the Cuevas, Horcones, Tupungato and Vacas rivers. It is a high gradient mountain river and traverses different geomorphologic units (cordillera, precordillera, piedmont, plain) until flowing into the Rosario lakes (Departamento General de Irrigación 1997, 1999).

**Sampling.** Specimens were collected in the nearby of The Potrerillos dam, in a riparian area with abundant Poplar trees (*Populus* sp.; Salicaceae) which belonged to a former camping ground, flooded by the Mendoza river after the dam was constructed. This sampling site is a non-permanent wetland due to the alternation of wet and dry phases throughout the year which is caused by fluctuations in the dam water level. Macroinvertebrates samples were carried out monthly in the site only during the wet phases (October 2007, February 2008 and from March to August 2008) over a complete annual cycle, between October 2007 and September 2008. Three replicate samples were taken using hand held net (900 µm mesh size) from within the vegetation and from the bottom of the system. Samples collected in the field were preserved in 95% ethanol and were deposited in the Entomology Laboratory of IADIZA-CCT CONICET Mendoza.

The following physical and chemical variables were measured in the sampling site: conductivity (µS cm<sup>-1</sup>; Hanna conductivity meter HI 9033), pH (Hanna pH meter, HI 9025), transparency (m; Secchi disk), water and air temperature (°C; digital thermometer), depth (m; calibrated stick), humidity (%; Hygrotherm HT05), and % Oxygen saturation (% O<sub>2</sub>; Hach Dissolved Oxygen), substrate type and macrophytes identification.

**Preparing specimens.** For detailed morphological examination, the specimens were cleared in KOH, then washed in distilled water and mounted onto temporary slides in glycerin. Observations were made using a Leica MZ6 dissecting scope. Photographs were taken using a digital camera attached to the dissecting scope. All measurements (given in millimeters) were made with an eyepiece linear micrometer and taken from six specimens. Overall body length was measured from the apex of the clypeus to the apex of the abdomen. Other measurements were taken and abbreviated as follows: HW- maximum head capsule width, across the widest postocular line; HL- length of head capsule, from anterior margin of clypeus to neck constriction (along midline); PW- maximum pronotum width; PL- pronotum length (along midline); EL- eye length (seen from above); TL- temple length (from the posterior margin of the eye to the nuchal groove; seen from above); EtL- elytra length at sides (from humerus to apex; seen from above); EtL-elytra length along suture; EtW-elytra width at base. Terminology follows Blackwelder (1936), Herman (1970), Newton *et al.* (2000) and Thayer (2005).

**Material.** Type specimens are deposited in the following collections:

FMNH Field Museum of Natural History, Chicago, USA.

IADIZA Instituto Argentino de Investigaciones de las Zonas Aridas, Mendoza, Argentina.

Additional material in the present study was borrowed from the Field Museum of Natural History, Chicago (FMNH).

## Results

### *Apocellus andinus* sp. nov.

(Figs 1–9)

**Diagnosis.** *Apocellus andinus* is very similar in general appearance to the southern South American species *A. mendozanus* Steinheil. Both species have eyes as long as the temples seen from above and the neck is about one half as wide as the head behind the eyes. The new species may be identified, and distinguished from *A. mendozanus*, by having the head slightly narrowed behind the eyes and the antennal segments 7 to 10 quadrate.

**Description.** Body length 3.5–4.0 mm, body shape somewhat myrmecoid, head and thorax distinctly narrower than elytra and abdomen; pronotum subrectangular and globose; abdomen tapering toward fifth and sixth visible abdominal terga, with distinctly scarce setation. Coloration. Head, thorax, elytra and abdomen testaceous-brunneous, apical (sixth to eighth visible) abdominal segments darker; antennae, palpi and legs testaceous.

Head subrectangular, slightly narrowed behind eyes, with broadly rounded hind angles (Fig. 1); moderately

wider than long ( $HW/HL=1.30-1.35$ ), about as wide as to slightly wider than pronotum at widest point ( $HW/PW=1.05-1.07$ ); dorsal and ventral surface of head glabrous with fine and sparse punctuation; labrum, clypeus and frons each with one pair of short and strong setae at the anterior margin. Eyes distinctly convex and coarsely faceted, as long as temples ( $EL/TL=1.0$ ) seen from above (Fig. 1). Antennae inserted on ridges at epistomal suture (Fig. 1), moderately long, filiform; first three segments bearing only sparse setae, segments 4 to 11 densely punctate, segment 3 longer than segment 2, segments 2 + 3 about as long as to slightly longer than segment 1, segment 4 elongate, segments 5 to 10 quadrate, last segment about twice as long as penultimate segment and narrowed into a subacute apex (Fig. 2). Labrum transverse and broadly arcuate (Fig. 1). Clypeus well developed, subrectangular. Epistomal suture distinct (Fig. 1). Mandibles stout and symmetric, each with four teeth. Maxilla with galea elongate and densely setose at apex, galea much shorter than lacinia and densely setose medially. Maxillary palpus with last segment acicular and about one half as long as segment 3 (Fig. 1), segment 3 robust and broadened apically, segment 2 narrower than maximum width of segment 3 and no more than 0.7 times as long, segment 1 minute. Gular sutures confluent on anterior half and strongly divergent near base of head. Mentum and submentum subequal in length. Labial palpus with first two segments subequal in length, segment 3 slightly shorter and narrower than segment 2. Neck one half as wide as head at widest point ( $NW/HW=0.5$ ).

Pronotum as wide as to slightly wider than long ( $PW/PL=1.05-1.12$ ), narrowed posteriad; front margin broadly arcuate, hind margin truncate, anterior angles broadly rounded, posterior angles obtusely rounded; surface with fine and sparse punctuation; hypomeron broad and slightly inflexed (visible in lateral view of prothorax). Prosternum subtrapezoidal (Fig. 3). Mesosternum with mesosternal process short and truncate apically. Scutellum small, triangular, with a heart-shaped impression (Fig. 4). Legs moderately long with three segmented tarsi; surface of all segments glabrous except for scattered, short marginal setae; front femora as long as front tibiae; all tarsi with first and second segments reduced and subequal in length, third tarsal segment one third as long as tibia, tarsal claws distinctly developed, about one half as long as third tarsal segment.

Elytral epipleural ridge present. Elytra both at suture ( $EtL/PL=1.05-1.12$ ) and at sides slightly longer than pronotum at midline ( $EtL/PL=1.15-1.20$ ), at base wider than pronotum; punctuation fine and scattered.

Abdomen. Terga 2 to 7 (first to sixth visible) with basolateral ridge; tergum 7 (sixth visible) with whitish apical seam of microtrichae; surface with scattered minute punctuation. Tergum 8 (seventh visible) with posterior margin subtruncate.

Male. Sternum 7 with posterior margin broadly and deeply arcuate and membranous (Fig. 5). Sternum 8 with posterior margin broadly and deeply emarginate, strongly reduced at middle and mostly membranous, excepting lateral margins (Fig. 6). Tergum 9 with two pairs of ventral struts, the anteromedial pair distinctly longer than the anterolateral pair (Fig. 7). Tergum 10 with posterior margin subangulate (Fig. 7); slightly sclerotized apically, with two long subapical macrosetae and two short and fine apical setae. Aedeagus with parameres moderately long and broad, branched at middle, converging apically beyond apex of median lobe. Median lobe with base bulbous and apical portion truncate. Internal armature of median lobe well sclerotized, with two pairs of short longitudinal processes (Fig. 8).

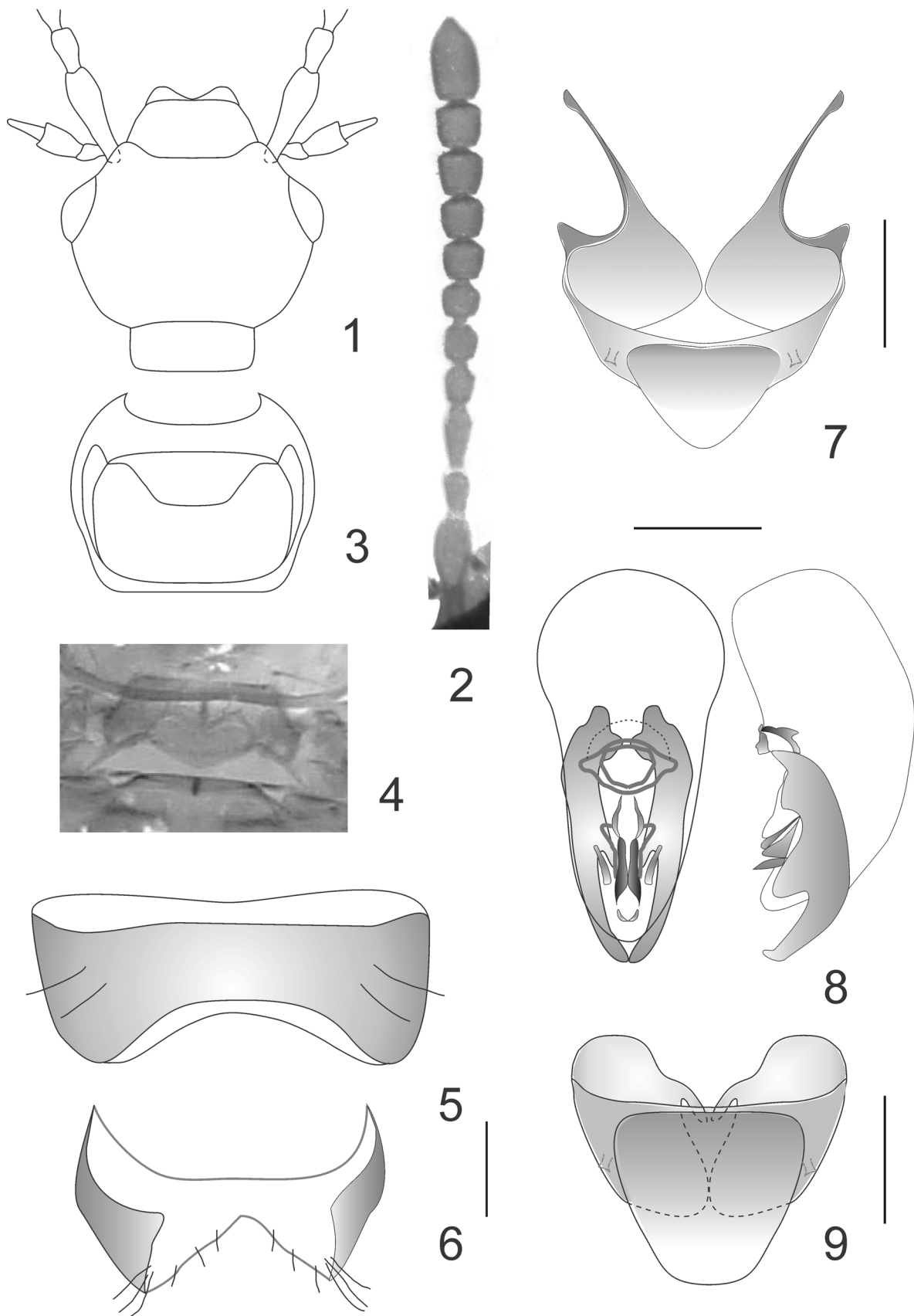
Female. Tergum 9 with one pair of medioventral struts (Fig. 9). Tergum 10 with posterior margin subtruncate (Fig. 9). Spermatheca with receptacle sclerotized.

**Etymology.** The specific name *andinus* refers to the Andes where the species was discovered.

**Type material.** Holotype, ♂, with labels: "Argentina. Mendoza: Dto. Luján de Cuyo, Potrerillos, S 32° 57.335' W 69° 10.840', 15-II-2008, wetland, 1350 m, E. Scheibler", "Holotype *Apocellus andinus* n. sp. des. Chani-Posse & Scheibler, 2013" (IADIZA). Allotype, ♀, with the same data as holotype (IADIZA). Four paratypes with the same data as holotype (2 IADIZA, 2 FMNH).

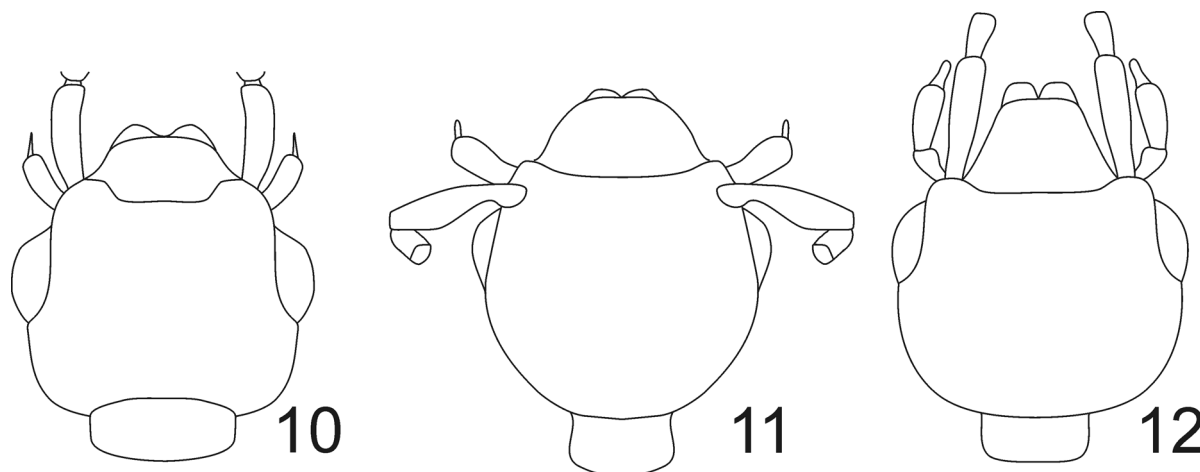
**Distribution.** Known only from the type locality (Andean wetland at 1350 m elevation) in northwestern Mendoza Province, Argentina.

*Apocellus andinus* n. sp. was found in a riparian zone from the Potrerillos dam vulnerable to periods of drought depending on the dam water fluctuations. During the wet phases, the system exhibited highest values of conductivity (Mean= 895.17  $\mu\text{S cm}^{-1}$ ; SD = 300.45), neutral pH values (Mean= 7.29; SD= 0.29) and temperate waters (Mean= 16.85 °C, SD= 4.14). In the sampling period, water temperature varied between maximal values corresponding to the month of February (23.3 °C) and minimal values on July (11.2 °C). The percentage of humidity changed between 28% and 74% during the sampling period. Wetland depth reached minimal values of 0.10 m and maximal values of 0.61 m and the percentage of oxygen saturation had mean values of 78.37%.



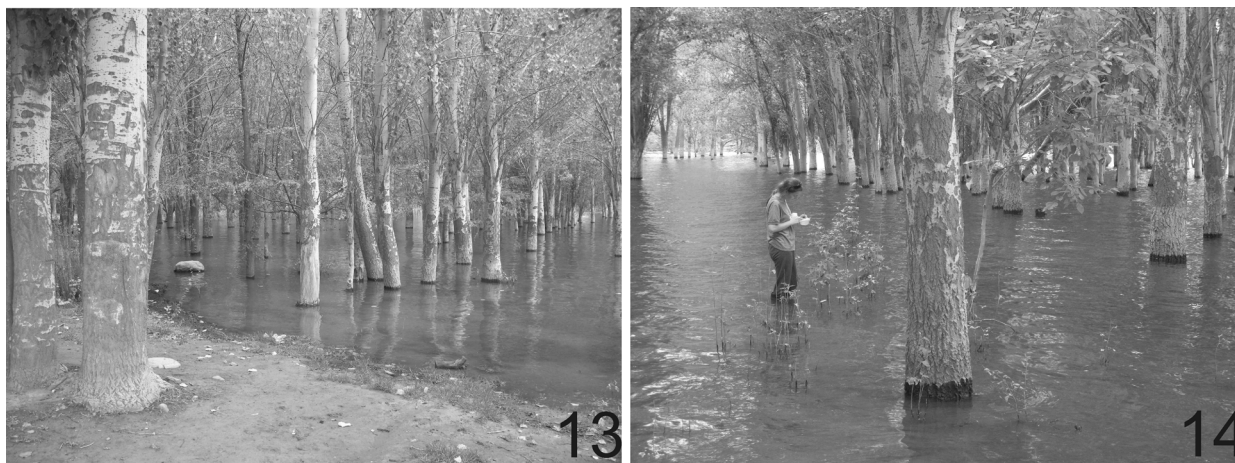
**FIGURES 1–9.** *Apocellus andinus* sp. nov. (1) Head (dorsal view). (2) Left antenna. (3) Pronotum (ventral view) and prosternum. (4) Scutellum. (5) Sternum 7 (male). (6) Sternum 8 (male). (7) Terga 9 and 10 (male). (8) Aedeagus with parameres and internal structures (ventral and lateral view). (9) Terga 9 and 10 (female). Scale bar: (Figs 5–9) = 0.1 mm.





FIGURES 10–12. Head (dorsal view). (10) *A. mendozanus* Steinheil. (11) *A. argentinus* Bernhauer. (12) *A. solieri* Bernhauer.

Specimens of *Apocellus andinus* were found during February where the environmental conditions showed the highest values of air and water temperature (28.7°C and 23.3°C respectively), great depth (0.50 m) as well as high values of water mineralization (696  $\mu\text{S cm}^{-1}$ ) and oxygenation (77% of oxygen saturation). The substrate was composed mainly by sand and silt. The vegetation was represented by Poplar trees and algae (*Cladophora* sp.) to a lesser extent in the sampling site (Figs. 13, 14).



FIGURES 13–14. Wetland sampling site.

**Bionomics.** *Apocellus andinus* n. sp. was collected in association with species of *Sigara* (*Tropocorixa jensenhaarupi* Jaczewski (Heteroptera, Corixidae) and *Berosus* sp. (Coleoptera, Hydrophilidae). *Sigara* (*T. jensenhaarupi*) is endemic to Argentina and it is widely distributed in both Andean and extra-Andean environments from Mendoza province (Melo and Scheibler, 2011). This species can tolerate a wide range of salinity in permanent and temporary waters with either scarce or abundant riparian vegetation in extremely arid regions (Bachmann, 1981; Muzón *et al.*, 2005; Melo and Scheibler, 2011; Scheibler and Ciocco, 2011) which are highly impacted by human activities (Muzón *et al.*, 2005). On the other hand, *Berosus* species are well known by their tolerance to diverse pollution sources and they have shown to be largely indifferent to organic pollution (Hellowell, 1986). Species belonging to this genus were found in pools highly exposed to human pollution (von Ellenrieder and Fernández, 2000) as well as in hard and saline waters of the Llanquanelo lake (Scheibler and Ciocco, 2011), a Ramsar wetland located in the south of Mendoza province.

Among others invertebrates associated with *Apocellus andinus*, we can mention the following taxa: *Hyaella* sp. (Anfipoda, Crustacea), Lumbriculidae sp. (Oligochaeta), Chironomidae (Diptera), *Rhionaeschna absoluta* Calvert (Odonata: Aeshnidae). *Cyanallagma interruptum* Selys (Odonata: Coenagrionidae), *Tropisternus lateralis*

(Say) (Coleoptera: Hydrophilidae) and *Liodes flavofasciatus* (Steinheil) (Coleoptera: Dytiscidae). *Cyanallagma interruptum* and *Rhionaeschna absoluta* had been collected in temporary ponds of areas impacted by cattle and modified by human action. (Muzón *et al.*, 2005). *Tropisternus lateralis*, on the other hand, does not show drought resistance such as other invertebrates do (e. g. Chironomidae larvae, some Crustacea) and it tends to quickly colonize non-permanent or temporary habitats (e.g. cattle drinking troughs) (Cook and Kennedy, 2000).

*Apocellus andinus* n. sp. was found once in the unique non-permanent wetland of five lentic sampling sites chosen for a spatial and temporal study of the aquatic entomofauna in the northwest of Mendoza province. Due to the unstable conditions of the area where *A. andinus* was found and the type of association that it had with other macroinvertebrates, we infer that this species belongs to a transient fauna (Scheibler and Ciocco, 2011) adapted to dry periods. From its association with *Berosus* sp., *Sigara* (*T.*) *jensenhaarupi*, *Cyanallagma interruptum* and *Rhionaeschna absoluta*, and given the high conductivity values (800  $\mu\text{S cm}^{-1}$  aprox.) of its system, *A. andinus* could be tolerant to saline waters and environmental impacts caused by human activities. However, further collecting effort must be done to increase the knowledge of the biology and distributional range of this new species.

### Key to species of *Apocellus* from southwestern South America

(See Appendix for list of material examined)

1. Eyes distinctly shorter than temples seen from above; neck distinctly less than 0.5 times as wide as head behind eyes (Figs. 11, 12) ..... 2
- Eyes about as long as temples seen from above; neck 0.5 times as wide as head behind eyes (Figs. 1, 10) ..... 4
2. Head and pronotum rugose and opaque; antennal segments 7 to 10 distinctly transverse; pronotum subrectangular .....  
..... *A. opacus* Bernhauer, 1908.
- Head and pronotum smooth and shiny; antennal segments 7 to 10 not distinctly transverse; pronotum globose ..... 3
3. Antennal segment 7 to 10 quadrate to slightly transverse; last segment of maxillary palpus distinctly less than 0.5 times as long as preceding segment (Fig. 11) ..... *A. argentinus* Bernhauer, 1908.
- Antennal segments 7 to 10 elongate; last segment of maxillary palpus about 0.5 times as long as preceding segment (Fig. 12).  
*A. solieri* Bernhauer, 1927.
4. Head straight behind eyes; last segment of maxillary palpus less than 0.5 times as long as preceding segment and distinctly narrower at base (Fig. 10) ..... *A. mendozanus* Steinheil, 1869.
- Head slightly narrowed behind eyes; last segment of maxillary palpus about 0.5 times as long as preceding segment and moderately narrower at base (Fig. 1) ..... *A. andinus* sp. nov.

### Conclusions

It can be remarked that *Apocellus andinus* n. sp. had a low frequency of occurrence and distribution in the area of study. It was found in wet riparian areas from a temporary Andean wetland (1350 m elevation) in the lower section of Mendoza River Watershed, characterized by oxygenated waters with neutral pH and high conductivity values. This species was associated with species tolerant to human perturbation of the environment. Therefore we conclude here that *A. andinus* may live in environments with scarce aquatic vegetation, with clear, temperate, mineralized and neutral waters, and substrate composed predominantly by sand and silt. *Apocellus andinus* is at present only known from the biogeographical province of Monte in central Argentina which belongs to the South American Transition Zone (Morrone, 2009). From its type of association with other macroinvertebrates, it can be inferred that this species belongs to the typical fauna of temporary environments.

### Acknowledgements

We gratefully acknowledge Dr. Alfred Newton, Dr. Margaret K. Thayer and Mr. James Boone (FMNH) for the loan of material. We are also indebted to Dr. Gustavo Flores for his valuable comments. Special thanks are due to colleagues of our Entomology Lab for their help in the field. This study was financed by the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina, and the following grant: Arthropod Diversity in Mountain Environments of the Argentine Center-West (FONCYT-PICT 01-11120). Dr. M. Chani-Posse and Dr. E. Scheibler are researchers of CCT Mendoza CONICET.

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APPENDIX. Additional material examined.

*Apocellus argentinus* Bernhauer, 1908. Lectotype ♀ (here designated):

ARGENTINA: Mendoza: “Chaunar/ Reg. Ig. Jensen”, “argentinus/ Brnh Typus” (in Bernhauer’s handwriting), “Chicago NHMus./ M. Bernhauer Collection”, (FMNH). With additional label: “Lectotype *Apocellus argentinus* Bernhauer, 1908/ Des. Chani-Posse 2013”.

**Notes.** Only one of the two female specimens mentioned in the original description (Bernhauer 1908: 287) became available to us. Therefore, a lectotype is here designated in order to promote stability of the name (ICZN 1999, Article 74.1).

Additional material: ARGENTINA: Jujuy: Tilcara, 15. I.1920?, Weiser, Col. Bruch, Chicago NHMus. M. Bernhauer Collection 2 (FMNH). Tucumán: X.1932, JM Bosq, Field Mus. Nat. Hist. 1966 A. Bierig Collection, Acc. Z. 13812, 1 (FMNH); X.36, “*Apocellus argentinus* Brnh”, Field Mus. Nat. Hist. 1966 A. Bierig Collection, Acc. Z. 13812, 1 (FMNH).

*Apocellus opacus* Bernhauer, 1908. Holotype ♂:

ARGENTINA: Mendoza: “Chaunar/ Reg. Ig. Jensen”, “opacus/ Brnh Typus” (in Bernhauer’s handwriting), “Chicago NHMus./ M. Bernhauer Collection”, 1 (FMNH). With additional label: “Holotype *Apocellus opacus* Bernhauer, 1908/ Det. Chani-Posse 2013”.

**Notes.** In the original description Bernhauer (1908) stated that he had a unique specimen (male) of *A. opacus*. The specimen mentioned above agrees with the original description, being the holotype fixed by monotypy (ICZN 1999, Article 73.1.2).

Additional material: ARGENTINA: Buenos Aires: 1. 15. 1915?, Col. Bruch, Chicago NHMus. M. Bernhauer Collection, 2 (FMNH). BOLIVIA: Cochabamba, 22.3.40, W. Wittmer, Chicago Field Mus. Nat. Hist. 1966 A. Bierig Collection, Acc. Z. 13812, 1 (FMNH). BRAZIL: “87”, Rio de Janeiro, XII. 1919?, Sahlberg leg. (in Bernhauer’s handwriting), “opacus Bernh” det. Bernhauer Mus. Helsingfors, Chicago NHMus. M. Bernhauer Collection, 1 (FMNH).

*Apocellus mendozanus* Steinheil, 1869. ARGENTINA: Mendoza: Chaunar Reg. Ig. Jensen, Chicago NHMus. M. Bernhauer Collection, 1 (FMNH). Salta: Depto Cerrillos, Palo Marcado, 1230m, 9-10.II. 1991, at blacklight, D & K. Matusik Ig, Fiel Mus. Nat. Hist. 1 (FMNH). BRASIL?: “mendozanus Sth /Brasil Bang Hass” (in Bernhauer’s handwriting) det. Bernhauer, Chicago NHMus. M. Bernhauer Collection, 1 (FMNH). Mendoza: “mendozanus Sth” (in Bernhauer’s handwriting), col. Richter, Chicago NHMus. M. Bernhauer Collection, 1 (FMNH).

**Notes.** Steinheil (1869) cited *A. mendozanus* from “Aguirre di Chilecito presso San Carlos, Mendoza” (Argentina). Although we were not able to see the original material, the specimens here examined agree with both the original description by Steinheil and the redescription by Lynch-Arribáizaga (1884).

*Apocellus solieri* Bernhauer, 1927. Lectotype ♂ (here designated):

CHILE: Type series of *Apocellus solieri*: 3 syntypes labeled: “Chile. Coll So/ lier & Fairm/ Mus. Germ” (white label, in Bernhauer’s handwriting), “solieri Brnh/ Cotypus/ don. Horn” (in Bernhauer’s handwriting), “Chicago NHMus./ M. Bernhauer Collection” (FMNH). With additional label: “Lectotype *Apocellus solieri* Bernhauer, 1927/ Des. Chani-Posse 2013”. Two paralectotypes, ♀♀, same labels as the lectotype, with additional label: “Paralectotype *Apocellus solieri* Bernhauer, 1927/ Des. Chani-Posse 2013” (FMNH).

**Notes.** Bernhauer (1927) mentions several (“eigenen”) specimens examined in the original description. This specimen and the place of collecting agrees with the description by Bernhauer (1927). Therefore, a lectotype is here designated in order to promote stability of the name (ICZN 1999, Article 74.1).