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**The Argentinean dung beetle genus *Anomiopsoides*
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for *A. heteroclyta***

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**El género argentino de escarabajos estercoleros
Anomiopsoides (Scarabaeidae: Scarabaeinae: Eucraniini):
descripción de una especie nueva y nuevas sinonimias para
*A. heteroclyta***

■ **ABSTRACT.** The taxonomy of the genus *Anomiopsoides* Blackwelder is revised. The species *A. catamarcae* Martínez and *A. aurita* (Burmeister) are placed in synonymy with *A. heteroclyta* (Blanchard). *Anomiopsoides fedemariai* sp. nov. is described from Argentina. The genus *Anomiopsoides* now consists of four species: *A. biloba* (Burmeister), *A. cavifrons* (Burmeister), *A. fedemariai* sp. nov. and *A. heteroclyta* (Blanchard). A key is presented for the identification of the species of *Anomiopsoides*.

KEY WORDS. Dung beetles. Monte biogeographic province. Scarabaeinae. Eucraniini.

■ **RESUMEN.** Se hace una revisión de la taxonomía del género *Anomiopsoides* Blackwelder. Las especies *A. catamarcae* Martínez y *A. aurita* (Burmeister) son consideradas como sinónimos de *A. heteroclyta* (Blanchard). Se describe una especie nueva, *A. fedemariai* sp. nov., especie nueva de Argentina. El género *Anomiopsoides* consiste ahora en cuatro especies, *A. biloba* (Burmeister), *A. cavifrons* (Burmeister), *A. fedemariai* sp. nov. y *A. heteroclyta* (Blanchard). Se presenta una clave para la identificación de las especies de *Anomiopsoides*.

PALABRAS CLAVE. Escarabajos estercoleros. Provincia biogeográfica del Monte. Scarabaeinae. Eucraniini.

INTRODUCTION

Anomiopsoides Blackwelder is a relatively small genus of dung beetles that belongs to the tribe Eucraniini (Scarabaeidae: Scarabaeinae). Eucraniini consists in four genera, *Anomiopsoides*, *Ennearabdus* van Lansberge, *Eucranium* Brullé and

Glyphoderus Westwood. This tribe is endemic to the Chaco and Monte biogeographic provinces in Argentina (Zunino et al 1989; Monteresino & Zunino 2003; Ocampo 2004, 2005)

Species of the genus *Anomiopsoides* show a high degree of intraspecific variation. This variation, expressed particularly in the shape

of the clypeal armature has caused the description of several synonyms, most of them within one species, *A. heteroclyta* (Blanchard). Clypeal armature in species of this genus consists of two central and two lateral processes. Sexual dimorphism in the clypeal armature is expressed in all but one species of *Anomiopsoides*, *A. biloba* (Burmeister) (Ocampo, 2005).

Anomiopsoides heteroclyta (Blanchard, 1845), the first-described species in the genus, was originally placed in the genus *Anomiopsis* Westwood 1837. *Anomiopsis* Westwood is a synonym of *Eucranium* Brullé 1834. Burmeister (1861: 62) proposed the name *Anomiopsis* as a «section» of *Eucranium* and created a homonym, even when in the same publication he considered the name *Anomiopsis* as a synonym of *Eucranium*. As indicated above, the name *Anomiopsis* was preoccupied by *Anomiopsis* Westwood 1837 (junior synonym of *Eucranium*) (Scarabaeidae: Scarabaeinae). In the same publication, Burmeister (1861) described four species: *Eucranium* (*Anomiopsis*) *aurita*, *Eucranium* (*Anomiopsis*) *biloba*, *Eucranium* (*Anomiopsis*) *cavifrons*, and *Eucranium* (*Anomiopsis*) *furciferum*. Burmeister (1873) considered *Anomiopsis* Burmeister as a «subgenus» of *Eucranium*. Gillet (1911) elevated *Anomiopsis* to the generic level. Martínez (1944) described one species, *Anomiopsis pereirai*, and variety, *A. biloba* var. *schaeferi*. Blackwelder (1944) acknowledged the mistake (creation of the homonym) made by Burmeister (1861) and fixed it replacing the name *Anomiopsis* with *Anomiopsoides*. Martínez (1945a, 1945b) redescribed the genus *Anomiopsoides*, redescribed the known species, synonymized *A. furciferum* (Burmeister) with *A. heteroclyta* (Blanchard), and described three new species, *A. aberrans*, *A. catamarcae*, and *A. xerophila*. Barbero & Palestrini (1993) described the larvae of *A. cavifrons*, the only known larva of the genus. Ocampo (2005) revised the genus *Anomiopsoides* and synonymized several species and a subspecies: *A. aberrans* Martínez, *A. pereirai* Martínez, and *A. xerophila* Martínez were synonymized with *A. heteroclyta* (Blanchard) and *A. biloba* var. *schaeferi* Martínez was synonymized with *A.*

biloba (Burmeister). Ocampo (2005) also provided a checklist of the tribe Eucraniini.

The biology of this genus was described by Zunino *et al.* (1989), Monteresino & Zunino (2003), and Ocampo (2005, 2007).

The aim of this paper is to propose new synonymies for *A. heteroclyta*, describe a new species of *Anomiopsoides* from the Monte biogeographic province in Argentina, and provide a new key for the identification of the species.

MATERIAL AND METHODS

Body measurements, puncture density, puncture size, fovea density, fovea size, and density of setae are based on the following standards. Body length was measured from the apex of the pronotum (at the middle) to the apex of the elytra (head is excluded because of the variable position of the head, and length of clypeal processes render it unpractical to include in the body length). Body width was measured across mid-pronotum. Puncture density was considered «dense» if punctures were nearly confluent to less than two puncture diameters apart, «moderately dense» if punctures were two to six diameters apart, and «sparse» if punctures were separated by more than six diameters apart. Puncture size was defined as «small» if punctures were 0.02 mm or smaller, «moderate» if 0.02-0.07 mm, and «large» if 0.07 mm or larger. Surface was defined as «sparsely foveate» if there was (on average) a space of more than one diameter between foveae, «moderately dense» if there were 0.5-1 diameters between foveae, and «densely foveate» if foveae were confluent or the space in between them is less than 0.5 diameters. Setae were defined as «sparse» if there were few setae, «moderately dense» if the surface was visible but with many setae, and «dense» if the surface was not visible through the setae. Elytral carinae were counted from the elytral suture. Specimen labels were copied literally using «/» between lines.

The «Phylogenetic Species Concept» (Wheeler & Platnik, 2000) was used to diagnose species: «Species are the smallest

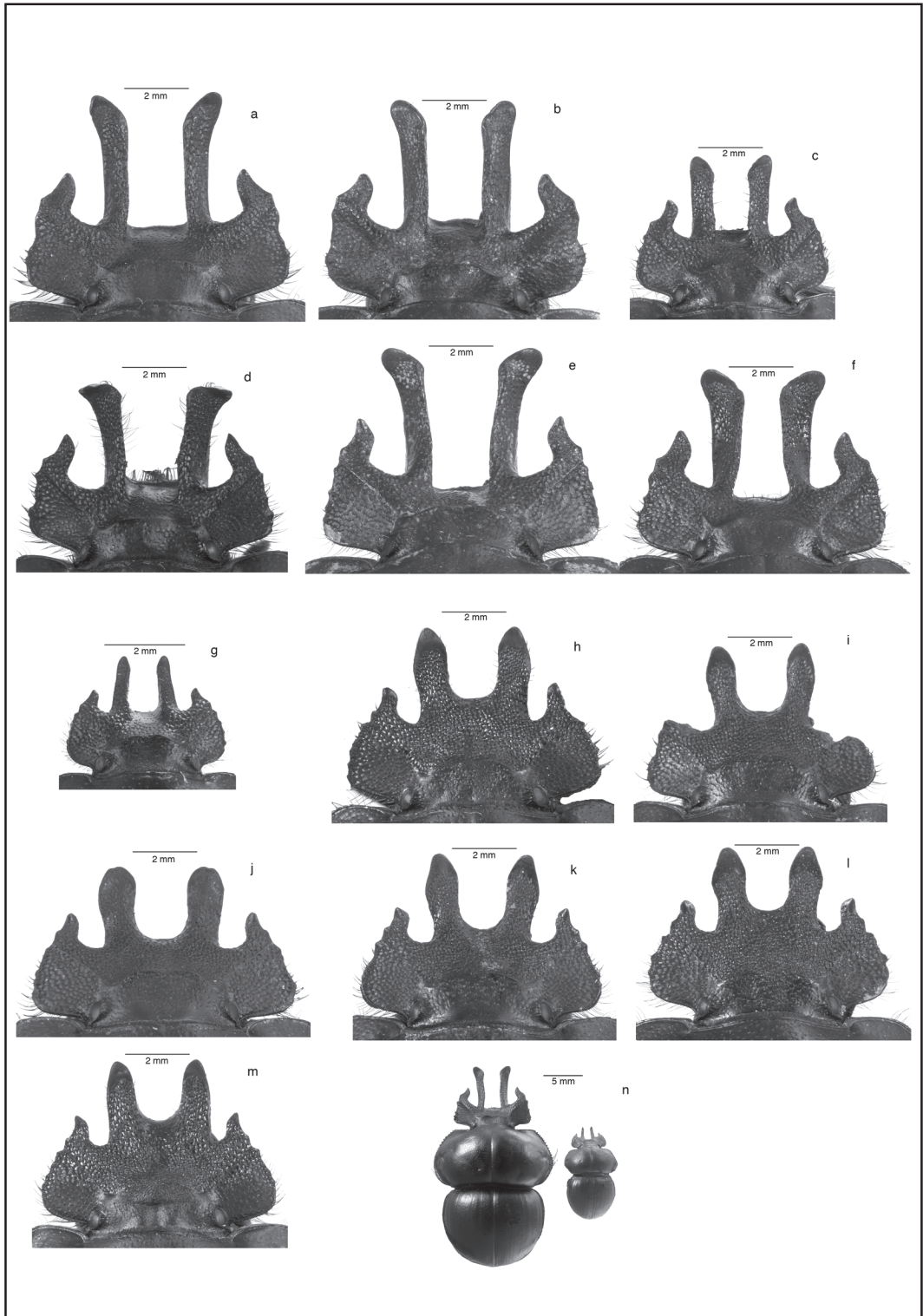
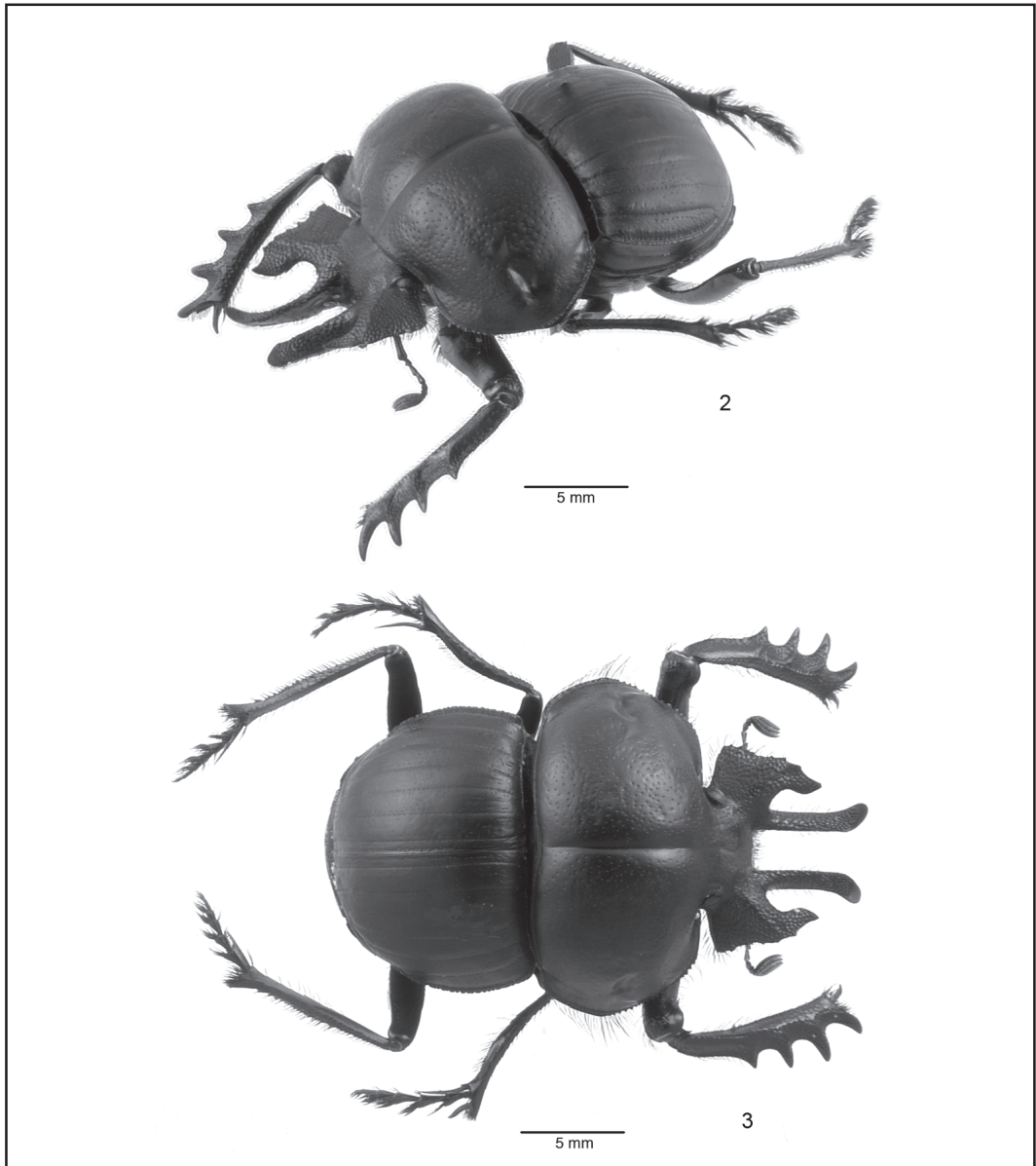


Fig. 1. Morphological variation observed in the pronotal armature and in size of *Anomiopsoides heteroclyta* (Blanchard), a-g: males, h-m: females, n: dorsal views showing size variation. Specimens pictured here were all collected at the same locality, same day (Argentina, Salta, 4 km N of Cafayate), and at the same time (10:00-12:00 hs).



Figs. 2, 3. *Anomiopsoides fedemariae* sp. nov., 2, dorso-lateral view; 3, dorsal view.

aggregation of populations or lineages diagnosable by a unique combination of character states.»

The results of this study were based on specimens from the following institutions, curators, and collections.

ABTS: Andrew B. T. Smith Collection, Ottawa, Canada.

CASC: California Academy of Sciences, San Francisco, California, USA (R. Brett).

CMNC: Canadian Museum of Nature,

Ottawa, Canada (R. S. Anderson, F. Génier).

FCOC: Federico C. Ocampo Collection, Mendoza, Argentina.

IADIZA: Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (S. Roig-Juñent).

IMLA: Fundación e Instituto Miguel Lillo, Universidad Nacional de Tucumán, Tucumán, Argentina (M. V. Colomo).

MACN: Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina (A. Roig).

MLPA: Museo de La Plata, La Plata, Argentina (A. Lanteri).

MLUH: Martin-Luther-Universität, Zoologisches Institut, Halle, Germany (K. Schneider)

UNSM: University of Nebraska State Museum, Lincoln, NE, USA (B. C. Ratcliffe, M. L. Jameson-Russell).

USNM: United States National Museum, Washington D.C. USA (D. Furth).

RESULTS

New synonymies for *Anomiopsoides heteroclyta* (Blanchard)

Anomiopsoides heteroclyta (Blanchard, 1845: 156).

Anomiopsoides aberrans Martínez, 1945b: 403, syn. by Ocampo (2005).

Anomiopsoides aurita (Burmeister 1861: 63), **new synonymy.**

Anomiopsoides catamarcae Martínez, 1945b: 400, **new synonymy.**

Anomiopsis furciferum Burmeister, 1861: 64, syn. by Martínez (1945b).

Anomiopsis heteroclytum Burmeister 1873: 406 (nec Blanchard, 1845), syn. by Martínez (1945a).

Anomiopsoides pereirai (Martínez 1944: 39), syn. by Ocampo (2005).

Anomiopsoides xerophila Martínez 1945b: 395, syn. by Ocampo (2005).

In my revision of the genus *Anomiopsoides* (Ocampo, 2005), I considered *Anomiopsoides catamarcae* Martínez as a valid species based on the examination of one paratype male deposited at CMNC from Argentina, Catamarca, Tinogasta. At that time, I could not examine the holotype specimen, which was not at the MACN. Recently, Dr. Arturo Roig, made available for my study the holotype specimen of *A. catamarcae*, which was returned to the MACN. Differences observed between type material of *A. catamarcae* and of *A. heteroclyta* are only observed on the shape of the clypeal armature. The shape of the medial clypeal processes of *A. heteroclyta* shows a high degree of variation (Fig. 1 a-m)

and, by itself, it is not a reliable character to separate species of this genus. Based on my observations of the holotype and one paratype of *A. catamarcae* at CMNC, and long series of *A. heteroclyta*, I conclude that there are no character-based differences between *A. heteroclyta* (Blanchard) and *A. catamarcae* Martínez, and so I place these species in synonymy.

The species *Anomiopsoides aurita* (Burmeister) was originally described in the genus *Anomiopsis* Burmeister 1861 (junior homonym of *Anomiopsis* Westwood 1837). According to the original description (Burmeister, 1861) male and female of this species do not exhibit sexual dimorphism. I studied Burmeister material, but I was not able to find any male specimen corresponding to the species described by Burmeister as *A. aurita*. The holotype of *Anomiopsoides aurita* is a female specimen deposited at MLUH. Martínez (1945b), in his revision of the genus *Anomiopsoides*, refers to one male specimen of *A. aurita* in his collection: «...1 ♂ de Catamarca, Tinogasta (Dr. Schaefer-leg)...», I was able to study this specimen and found that is actually a female specimen. I collected extensively in the localities that Burmeister (1961) and Martínez (1945a, 1945b) indicated for *A. aurita* and never found a male specimen that can be identified as such. In my revision of the genus *Anomiopsoides* (Ocampo 2005) I indicated that both males (according to Burmeister 1961 and Martínez 1945b) and females of *A. aurita* can be recognized by «the clypeal surface perpendicular in frontal view between clypeal medial processes», although at that time I had no observations of male specimens attributed to *A. aurita*. The observation of long series of *A. heteroclyta* from Argentina, Catamarca and Salta provinces, indicate that the clypeal armature is highly variable among female specimens of this species (Fig. 1 h-m). Based on current evidence and the absence of male specimens that indicate the contrary, I consider that *A. aurita* is a female of *A. heteroclyta* that presents the normal variation of the clypeal shape found among specimens of this species. I conclude that there are no character-based differences

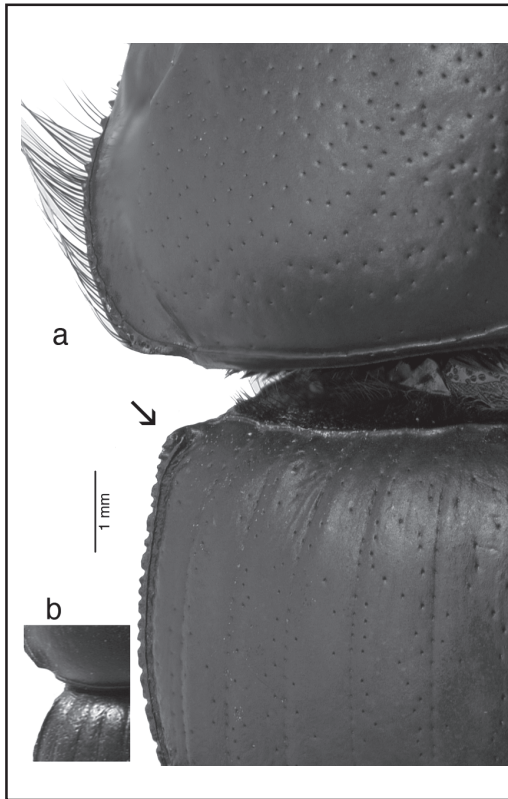


Fig. 4. a: *Anomiopsoides fedemariai* sp. nov., base of elytron and pronotum showing the teeth-like process at the base of the 7th elytral stria, and 7th stria strongly carinated; b: base of elytron and pronotum of *A. heteroclyta* (Blanchard).

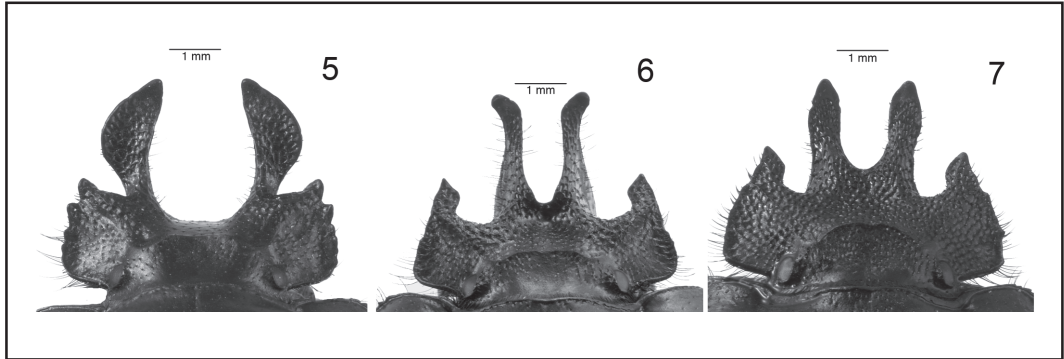
between *A. heteroclyta* (Blanchard) and *A. aurita* (Burmeister), and so I place these species in synonymy.

***Anomiopsoides fedemariai* sp. nov.**
(Figs. 2-4, 8)

Diagnosis. Males and females of this *A. fedemariai* are separated from *A. heteroclyta* by the pseudoepipleura well developed at level of the 7th stria, and the 7th stria strongly carinated, reflexed and with tooth-like process at elytral base (Figs. 2-4). Males are recognized by the clypeal surface perpendicularly angled downwards with respect to the surface of the frons (Figs. 2, 4); the ventral surface absent; the clypeal medial process developed and reflexed, with the inner margin straight or slightly curved, and

the external margin straight or slightly curved, and the apex divergent, reflexed; and the clypeal lateral process developed, with one poorly developed lateral tooth (Fig. 3), this character is different in *A. biloba*, and *A. cavifrons* (Figs. 5, 6). Females of this species are recognized by the clypeus with the medial processes short (shorter or as long as the length of frons plus length of clypeus), apex pointed; and clypeal surface not perpendicular in frontal view with respect to surface of frons and between clypeal medial processes, this character is different in *A. biloba*, and *A. cavifrons* (Figs. 5, 7).

Description. Holotype male. Length 17.0 mm. Width 14.5 mm. Color black, surface shiny to matte. **Head** (Figs. 2, 3): Shape subrectangular, transverse. Frons slightly foveate to punctate. Frontoclypeal and clypeogenal sutures evident. Frontoclypeal suture elevated on sides, slightly sinuate. Clypeogenal surface strongly foveate. Genal posterior angle rounded; lateral margin irregular, setose. Clypeal surface strongly obliquely angled downwards to perpendicular with respect to surface of frons; ventral surface absent; ventral process developed, acute. Clypeal medial process developed, reflexed, parallel; dorsal and external surface strongly foveate, apex smooth; internal surface smooth to slightly foveate, ventral half with fringe of setae; inner margin straight; external margin straight; apex rounded or acute, divergent, reflexed. Clypeal lateral process developed, apex pointed, with 1 lateral tooth. **Pronotum** (Fig. 3): Surface punctate, punctures moderately dense to sparse, small to moderate in size. Lateral margin with long, dense setae on basal half, and moderately dense, short setae on apical half; margin beaded, denticulate, denticles larger at middle. **Elytron** (Figs. 2-4): Striae impressed, punctate; punctures small. Intervals without minute tubercles. Pseudoepipleura well developed at level of 7th stria; 7th stria strongly carinated, reflexed and with tooth-like process at elytral base. **Venter:** Metasternum with small, apical and posterior longitudinal depressions. **Legs:** Protibial teeth with pointed apex. Protibial spur curved at apex. External mesotibial spur



Figs. 5-7. Head of: 5, *Anomiopsoides biloba*; 6 and 7, *A. cavifrons* male and female respectively.

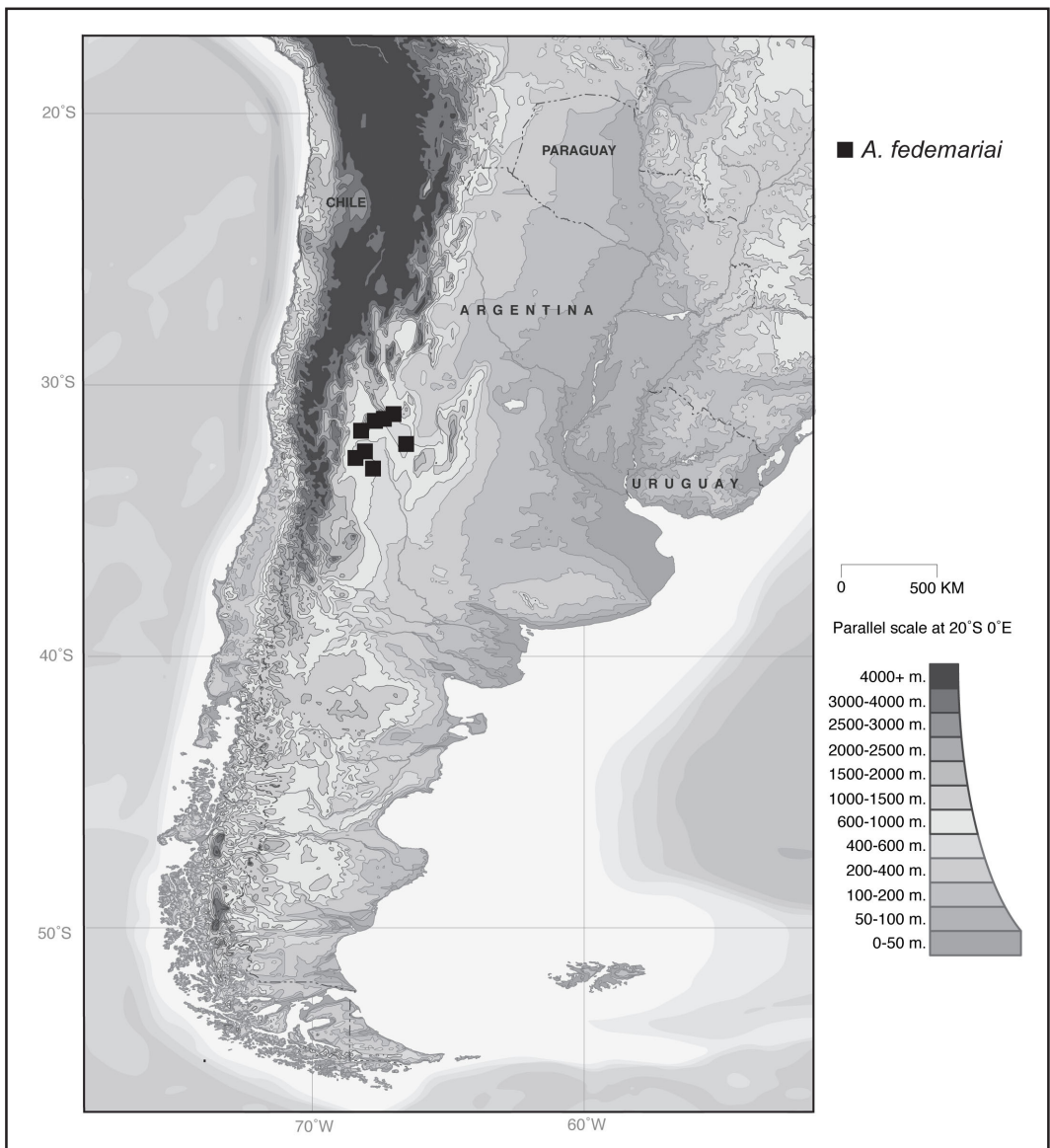


Fig. 8. Distribution map of *A. fedemariai* sp. nov.

slightly curved on apical third, apex pointed.

Allotype female. Length 17.6 mm. Width 14.7 mm. As male except in the following respects: Clypeus with surface obliquely angled downwards with respect to surface of frons, ventral surface developed; ventral process developed, acute. Clypeal medial process developed; dorsal and external surface strongly foveate, apex smooth; internal surface densely foveate; inner and external margins slightly sinuous; apex rounded, reflexed.

Variation in paratypes. 77 males and 68 females. Length 11.2-17.8 mm. Width 8.3-14.8 mm. *Anomiopsoides fedemariai*, like other species of this genus, shows substantial variation in the shape of the medial clypeal processes. These processes vary in length and width at the base and at the apex. Most specimens have their clypeal processes parallel, but different degrees of convergence or divergence toward the apex was observed in some specimens. Variation of the elytral and pronotal puncture density (sparse or moderate), puncture size (small or medium), and elytral striae impression was also observed.

Etymology: I take great pleasure in naming this species after my son Federico Maria, «Fede».

Type material. Holotype male deposited at IADIZA labeled: «ARGENTINA: San Juan / Salinas de Mascalasín, 423 m / S 31°25'39" W 67°04'05" / XII-1-2003. F. C. Ocampo»; *Anomiopsoides/ fedemariai* / HOLOTYPE / F. C. Ocampo» (red label). Allotype with same label as holotype except: «*Anomiopsoides/ fedemariai* / ALLOTYPE / F. C. Ocampo» (red label). Eleven male paratypes (in 95° ethanol) and 10 female paratypes (in 95° ethanol) at FCOC with same label as holotype. Thirty five male (14 in 95% ethanol) and 42 female paratypes (five in 95% ethanol) labeled: ARGENTINA: San Juan / RP 20, 12 km E Encón / S 32°12'55" W 68°40'68" / Jan-4-2003, 524 m / F. C. Ocampo, A. B. T. Smith»; distributed: 20 male (eight in 95% ethanol) and 32 female paratypes (four in 95% ethanol) at FCOC, five males and five females

paratypes at UNSM, four male and four female paratypes at ABTS. Nine males (five in 95% ethanol) and four female (three in ethanol) paratypes at FCOC labeled: «ARGENTINA: Mendoza / RP 142 and Rio Mendoza, / S32°35'38" W68°17'27" / Jan-4-2003, 595 m / F.C. Ocampo, A.B.T. Smith». Six male and five female paratypes at IADIZA labeled: «ARGENTINA: Lavalle / Puente Rio Mendoza / 21 Feb. 2006. E. Ruiz». Three males and one female paratypes (in 95% ethanol) at FCOC labeled: «ARGENTINA: San Juan / Salinas de Mascalasín, 423 m / S 31°25'39" W67°04'05" / XII-1-2003. F. C. Ocampo.» Two males and two females at IADIZA labeled: «ARGENTINA: Mendoza / 18 km N Costa de Araujo / 32°25'32" S 68°18'58" W / 29 Jan 2004, 582 m / G. Debandi». Three males and three females paratypes at IMLA (two males and two females), and IADIZA (one male and one female) labeled: «R. ARGENTINA / SAN JUAN / Mirayes / 12.1.1982 / A. Willink y otros.» One male and one female paratypes at USNM labeled: «Pie de Palo San Juan / 11 Mar.1920 Argentina / Cornell U. expedition». Two male and one female paratypes at IADIZA labeled: «Mendoza, 50 km de / Las Catitas, Puesto / La Josefa. 11-XII-79 / col. A. Roig / Sergio Roig». One female paratype at IADIZA labeled: «Rca Arg Mendoza / El Borbollón / I-79 col. A. Roig / Sergio Roig». One paratype male at IADIZA labeled: «R.A. Mza. Lavalle / 25-2-82 / col. Claver / IADIZA». One female paratype at IADIZA labeled: «Bermejo, San Juan / 12-III-1949 / Biraben col.». One male and one female paratypes at IADIZA labeled: «Mendoza: Lavalle / Ruta 142 km 45 / 6/XII/97. Roig». One male paratype at IADIZA labeled: «Mendoza: Lavalle / Ruta 142 / 6/XII/97. Flores». One paratype male at IADIZA labeled: «Mendoza Lavalle / El Quince 16/II/ 98 / S. Roig G. Dabandi». One paratype male at IADIZA labeled: «R. A. San Luis / Dto Ayacucho / Bella Vista (11 hs.) / 14-4-95. G. Flores / IADIZA». One paratype female at CASC labeled: «Mendoza / Argentina»; «*Anomiopsoides pereirai* / P. Gutierrez 1959». One paratype male at MLPA labeled: «San / Juan»; «*Anomiopsoides pereirai* / A. Martínez 1958». All paratypes with my

yellow paratype label: «*Anomiopsoides fedemariai* / PARATYPE / F. C. Ocampo».

Distribution (Fig. 8). **ARGENTINA (147): Mendoza:** Costa de Araujo (4); El Borbollón (1); El Quince (1); Lavalle (1); Las Catitas, Puesto La Josefa (3); Ruta 142, intersection with Rio Mendoza (24); Ruta Provincial 142 (no mora data) (1) Ruta Provincial 142, km 45 (2). **San Juan:** Bermejo (1); Encón, 12 km E, RP 20 (77); Mirayes (6); Salinas de Mascasín (23); Sierra de Pie de Palo (2). **San Luis:** Bella Vista (1).

Temporal distribution. January (101); February (14); March (3); April (1); December (29).

Remarks. The biology of *A. fedemariai* is similar to the other species of *Anomiopsoides*. Specimens were collected at midmorning and late afternoon to early evening (9:00-12:30 am; 4:30-7:30 pm, [UTC/GMT -3 hours]). According to my observations, the food relocation behavior and food preferences of *A. fedemariai* are as those indicated for *A. heteroclyta* and described by Zunino *et al* (1989), Monteresino & Zunino (2003), and Ocampo (2005). The larva and nidification behavior of *A. fedemariai* are unknown.

Key to species of *Anomiopsoides*

Anomiopsoides species show considerable intraspecific variation due to particular conditions during an individual's development, environmental conditions of the area in which the specimen lived, and/or age of the specimen at the time it was collected. The above factors make identifications difficult for some *Anomiopsoides* specimens.

- 1. Medial processes of clypeus with external margin straight, slightly sinuous, or slightly lobed and medial margin concave or straight (Figs. 1-3, 6, 7) 2
- 1'. Medial processes of clypeus with external margin broadly rounded or lobed (Fig. 5) *A. biloba* (Burmeister)
- 2. Clypeal disc with large fovea before and between medial processes. Clypeus with

medial processes long (longer than rest of head), with apex divergent (male) (Fig. 6) or clypeus with medial processes short (shorter or as long as rest of head), with apex pointed (female) (Fig. 7) *A. cavifrons* (Burmeister)

2'. Clypeal disc without foveae before medial processes. Clypeus with medial process not as above 3

- 3. Pseudoepipleura developed at level of 7th stria, 7th stria not crenated or reflexed, without tooth-like process at elytral base *A. heteroclyta* (Blanchard)
- 3'. Pseudoepipleura well developed at level of 7th stria, 7th stria strongly crenated, reflexed, with tooth-like process at elytral base (Figs. 2-4) *A. fedemariai* sp. nov.

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