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Associated with Decaying Carcasses in Argentina, with Remarks
on the Tribal Assignment of *Achanius* Erichson**

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TWO EVANIOSOMINI SPECIES (COLEOPTERA: TENEBRIONIDAE) ASSOCIATED WITH DECAYING CARCASSES IN ARGENTINA, WITH REMARKS ON THE TRIBAL ASSIGNMENT OF *ACHANIUS* ERICHSON

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ABSTRACT

Thinobatis profana Kulzer is transferred from *Thinobatis* (Pimeliinae: Thinobatini) to *Vanosus* Kulzer (Pimeliinae: Evanosomini) on the basis of constant tribal level characters. The genus *Thinobatis* Eschscholtz is thereby removed from the Argentine fauna and confined only to coastal areas of Chile. The genus *Achanius* Erichson (including the subgenus *Ambigatus* Fairmaire) is transferred from Edrotini (Eurymetopini of Doyen) to Evanosomini based on the structure of the internal female reproductive tract and mandible configuration. *Achanius* (*Ambigatus*) *antofagastensis* Flores and Aballay, **new species**, is described. Redescriptions of *Thinobatis*, *Vanosus*, and *Achanius*, with habitus photographs, SEM images, and illustrations of female genital features, are provided. The eating habits of *V. profana* and *A. antofagastensis* feeding on decomposing pig and llama carcasses are given for the first time. These two species showed preferences for microhabitat conditions and association with stages of decomposition. They should be considered for potential forensic importance on bodies found in arid environments.

Key Words: behavior, taxonomy, darkling beetles, Pimeliinae, *Thinobatis*, *Vanosus*, seasonality, Chuck Triplehorn

The tribe Evanosomini (Pimeliinae) was established by Lacordaire (1859) to include the South American genera *Evaniosomus* Guérin-Méneville and *Melaphorus* Guérin-Méneville. Gemminger and Harold (1870) added *Aryenis* Bates and *Evelina* Thomson. Gebien (1910) added *Chorasmius* Bates, but listed *Melaphorus* in Triorophini. Later, Gebien (1937) transferred *Achanius* Erichson from Epitragini and *Ambigatus* Fairmaire from Triorophini to Evanosomini. Kulzer (1956) transferred *Melaphorus* from Triorophini to Evanosomini and described a new genus *Vanosus* Kulzer, Evanosomini. Doyen (1994) transferred *Achanius* and *Ambigatus* to Eurymetopini (later synonymized under Edrotini by Bouchard *et al.* 2005). Finally, Endrödi-Younga (1998) transferred the South African *Oppenheimeria* Koch from Epitragini to Evanosomini.

Species of Evanosomini inhabit arid and semiarid lands from central Peru to central Argentina in South America and also occur in Namibia in southern Africa. The Evanosomini include winged and flightless genera, but all species can be recognized by a slender, elongate body and cylindrical prothorax that is noticeably more slender than the elytra.

Kulzer (1956) also revised the South American tribe Thinobatini (Pimeliinae), describing the new genus *Cordibates* and some new species of *Thinobatis* Eschscholtz. Species of both genera can be found in Pacific coastal areas of Chile and Peru (Peña 1974a, b), with the exception of *Thinobatis profana* Kulzer that

inhabits central Argentina and does not fit the definition of the genus (Peña 1974b).

In recent years, one of us (FHA), studying arthropod succession on pig carcasses in several places across Argentina, found specimens of two tenebrionid species characterized by a slender, elongate body and cylindrical prothorax noticeably more slender than the elytra, which we interpreted as belonging to the Pimeliine tribe Evanosomini. For the first species, we requested pictures of the types of *T. profana* from the Natural History Museum in Basel, Switzerland and confirmed it belongs to this species. The second is a new species of *Achanius* according to the definition of the genus by Kulzer (1950).

Later, we studied other known species of *Thinobatis*, and a character analysis was performed to establish whether or not *T. profana* belongs to Thinobatini as described originally, since there are no other members of this tribe described for South America east of the Andes mountains (Flores and Pizarro-Araya 2006). We also examined most of the known species of *Achanius* and of *Melaphorus*, *Aryenis*, and *Vanosus* to establish whether *Achanius* belongs to Evanosomini (Gebien 1937) or to Edrotini as defined by Doyen (1994).

The objectives of this study are to redescribe and illustrate the genera *Thinobatis*, *Vanosus*, and *Achanius*, to describe and illustrate a new species of *Achanius*, to establish a generic placement for *T. profana* and a natural tribal placement

for *Achanius*, and to present the biology of these two species in different microhabitat conditions. This paper is dedicated to Dr. Charles A. Triplehorn for celebrating his 88th birthday.

MATERIAL AND METHODS

The present study is based on examination of specimens from the collection of the Instituto Argentino de Investigaciones de las Zonas Áridas, Mendoza, Argentina (IADIZA, Sergio Roig-Juñent, curator). Photographs of the types of Fairmaire, Erichson, and Kulzer were obtained with help from the following collections and curators: Muséum National d'Histoire Naturelle, Paris, France (MNHN, Antoine Mantilleri); Museum für Naturkunde der Humboldt Universität, Berlin, Germany (MNHUB, Bernd Jaeger); Natural History Museum, Basel, Switzerland (NHMB, Eva Sprecher, Isabelle Zürcher). Photographs of specimens from Natal, Brazil that were studied by Doyen (1994) and currently deposited in the California Academy of Sciences, San Francisco, CA, USA (CAS) were generously sent by Rolf Aalbu.

Type specimens of the new species are deposited in the following collections: Field Museum of Natural History, Chicago, IL, USA (FMNH); IADIZA; Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (MACN); Museo de Entomología Klaus Raven Büller, Universidad Nacional Agraria La Molina, Lima, Peru (MEKRB); Museo de La Plata, La Plata, Argentina (MLPA); NHMB.

We used various sources to identify species from the IADIZA collection: keys by Kulzer (1950) and Peña (1974b) and comparisons with photographs of the types of Fairmaire, Erichson, and Kulzer. Terminology used in the descriptions follows recent papers dealing with Pimeliinae (Kulzer 1956; Doyen 1994; Flores 2000). For specialized terms employed for mouthparts, we used mandibular cusp (Doyen 1994; Torre-Bueno *et al.* 1989) for the pointed process on the dorsolateral margin on both mandibles (Doyen 1994, fig. 12, characters 9 and 10, named tooth) and tooth for the acute angulation or short, pointed process from the anterior margin of the clypeus (Figs. 6, 17). For paraproct/coxite length, the ratio proposed by Doyen (1994) was used (P/C). Dissection methods are those used by Tschinkel and Doyen (1980) for genital structures. Drawings were made with a camera lucida adapted to a stereoscopic microscope. Exact label data are cited only for the type material of the new species, where brackets delimit the text of individual labels. Digital images of the holotype of the new species were taken with a Canon S50 adapted to a Leica MZ6 stereomicroscope from multiple images stacked in CombineZM (Hadley 2006). Scanning electron

microscopy pictures were obtained using a JEOL JSM-6610 LV.

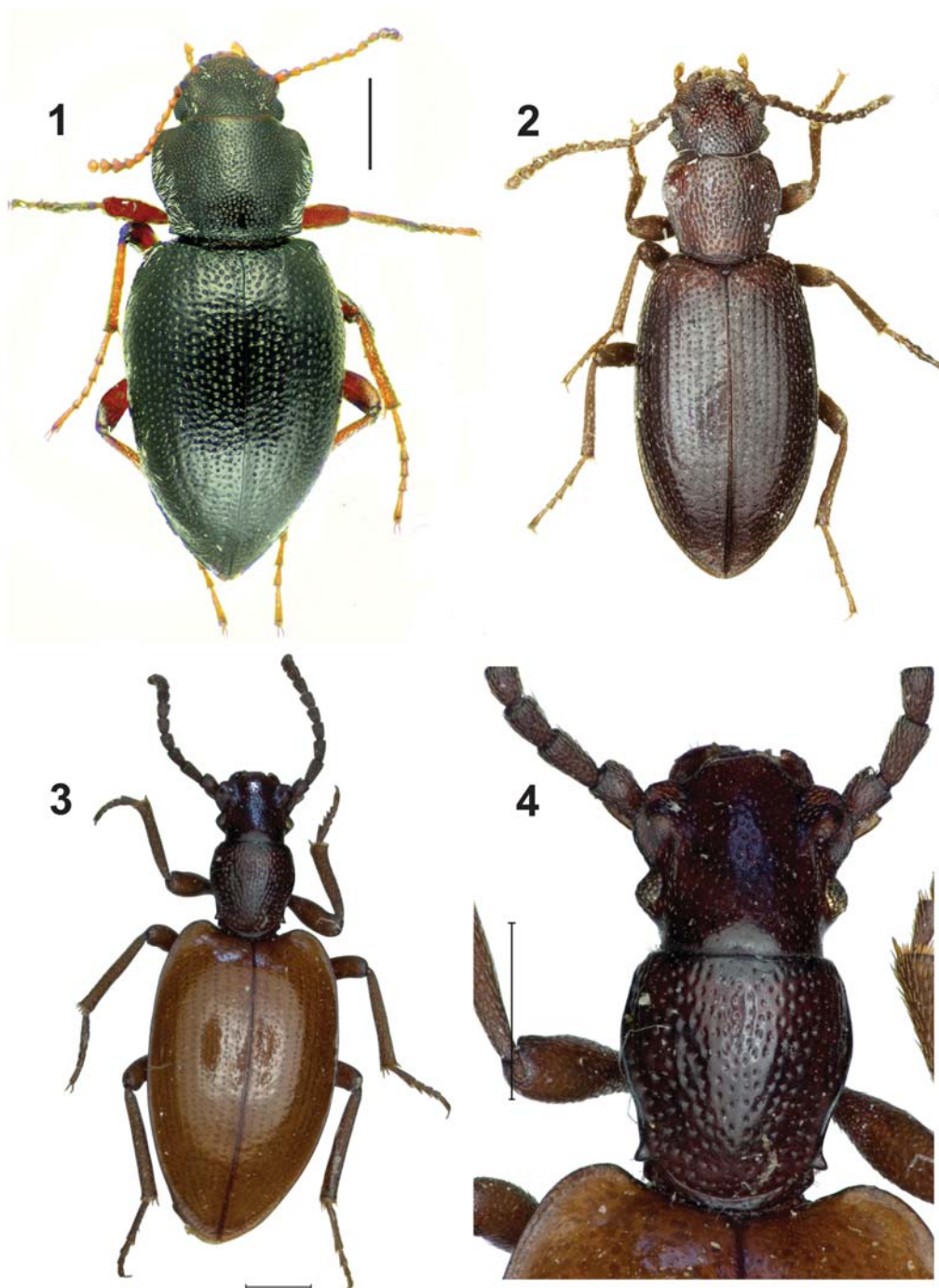
Kulzer (1950) stated that Fairmaire (1892) did not know the genus *Achanius* when he described *Ambigatus*. Kulzer (1950) considered both taxa congeneric, placing *Ambigatus* as a subgenus of *Achanius*. In addition, Kulzer noted that some *Achanius* species were apterous and others winged. Among the former is the type species of *Achanius*, *Achanius anthicoides* Erichson. For this reason, he separated the subgenera by the presence or not of wings and elytral humeri raised or not, and he designated *Achanius stricticollis* Fairmaire, one of two winged species described by Fairmaire (1892), as the type species of the subgenus *Ambigatus*. Doyen (1994) considered *Achanius* and *Ambigatus* as separate genera. In this study, we agree with Kulzer's (1950) criterion, for we found more characters in common with all species of *Achanius* and add some characters to differentiate both subgenera.

RESULTS AND DISCUSSION

Common Characteristics among *Thinobatis*, *Achanius*, and *Vaniosus*. Besides belonging to different tribes, species of *Thinobatis*, *Achanius*, and *Vaniosus* may be recognized by: prothorax cylindrical, punctured, disc more raised than lateral margins, lateral margins slightly or well-marked, posterior angles well-marked; prothorax more slender than elytra, widest behind mid-point, posterior margin convex, extending beyond elytral humeri (Figs. 1–4 and 13–16); prosternum short, prominent, not exceeding procoxae, without process; mesosternum inclined forward, separated from prosternum (Fig. 20); elytra oval, convex, with punctures forming longitudinal rows; legs long, pro- and mesocoxae globular, tibiae and tarsi slender (Figs. 1–4 and 13–16).

In addition, these three genera also share the following characters: Mandibles asymmetric, both bifurcated distally, longer than oral foramen; labrum wider than long, clypeus and frons punctured (Fig. 6); mentum subtrapezoidal, subgenal processes contiguous with submentum and at least base of mentum (Doyen 1994: fig. 25); maxillary articulation of cardo covered by subgena and submentum (Doyen 1994: figs. 24–25); postmental region elevated along oral foramen (Doyen 1994: fig. 19); submentum continuous with gula (Doyen 1994: fig. 25; Fig. 8); eyes round, not compressed nor interrupted by genae (Fig. 19); antennomere 1 longer than 2; epipleuron conspicuous throughout, anterior quarter twice as wide as posterior half; mesotrochanter present, metacoxae transverse; metacoxa enclosed laterally by metepisternum (Fig. 20).

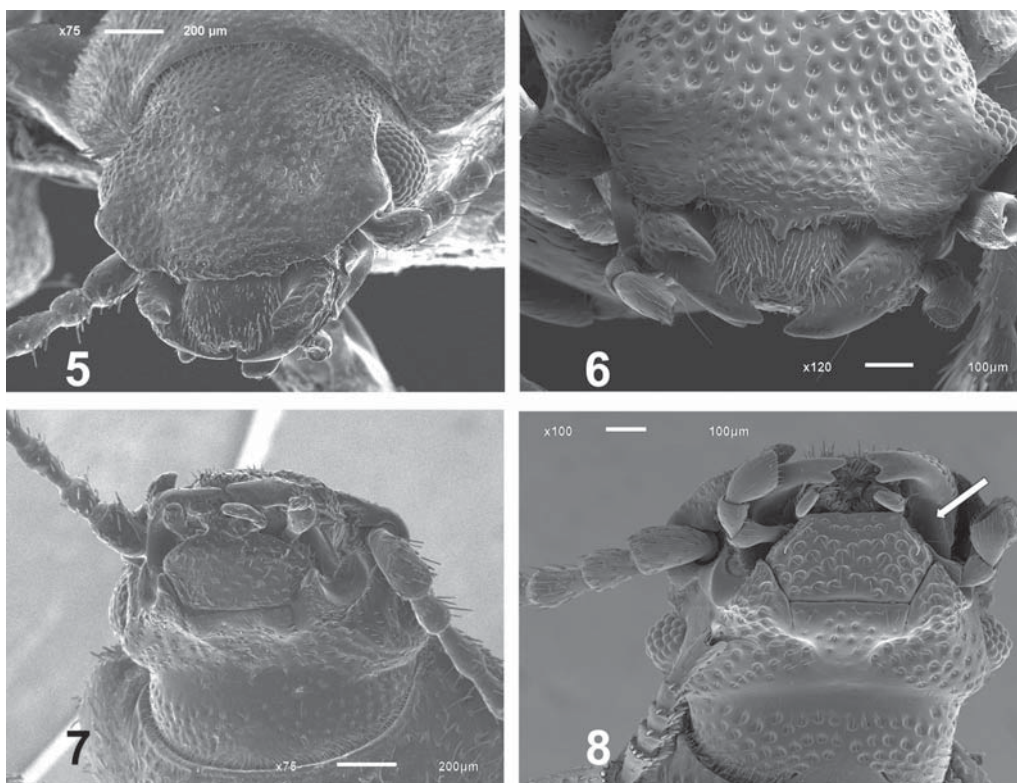
Generic Placement of *T. profana*. We have studied the following shared tribal level characters



Figs. 1–4. Dorsal habitus. **1)** *Thinobatis rufipes rufipes*; **2)** *Vaniosus profana*, holotype, (Image courtesy of Eva Sprecher, NHMB); **3)** *Vaniosus paradoxus*, holotype (Image courtesy of Isabelle Züercher, NHMB); **4)** *V. paradoxus*, holotype, pronotum and head (Image courtesy of Isabelle Züercher, NHMB). Scale bars = 1 mm.

within the species of *Thinobatis* and species of genera of Evaniosomini, some of which have been used to study the relationships among the tribes of Pimeliinae (Doyen 1994) and to differentiate tribes within Pimeliinae (Flores 2001; Flores and Vidal 2009).

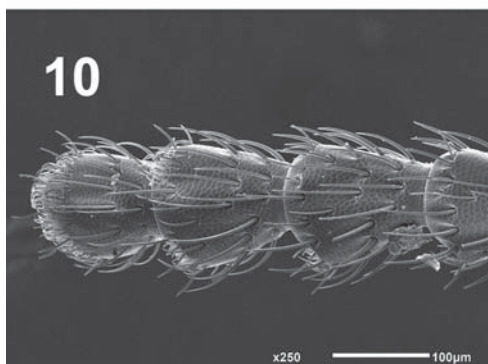
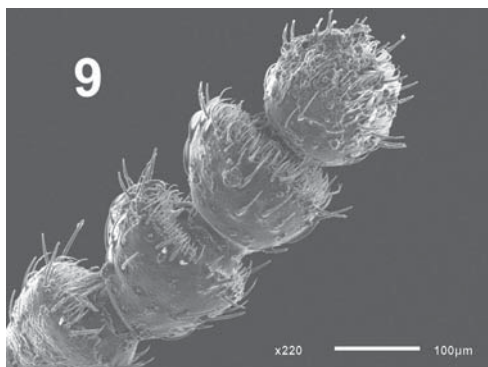
1. Mandible, form (Flores 2001): thick, base two times wider than apex in *Thinobatis*; finer, base 1.5 times wider than apex in *Vaniosus*, *T. profana*, and *Achanius*.
2. Dorsal cusp on basal half of both mandibles (Doyen 1994: fig. 12, characters 9 and 10): cusp shorter on right than on left mandible in *Thinobatis* (Fig. 5); cusp longer on right than on left mandible in *Vaniosus* and *T. profana* (Fig. 6).
3. Ventral fossa on both mandibles (Doyen 1994: fig. 14, character 12): lacking in *Thinobatis* (Fig. 7); present in *Vaniosus*, *T. profana*, *Achanius*, and *Aryenis* (Fig. 8).
4. Labrum, structure: entirely sclerotized in *Thinobatis* (Fig. 5); partially sclerotized in *Vaniosus* and *T. profana* (Fig. 6).
5. Clypeus, anterior margin: lacking row of teeth in *Thinobatis* (Fig. 5); armed with row of teeth directed downwards in *Vaniosus*, *T. profana*, and *Achanius* (Fig. 6).
6. Prementum, structure (Doyen 1994: character 22): partially sclerotized in *Thinobatis* (Fig. 7); entirely membranous in *Vaniosus*, *T. profana*, *Achanius*, and *Aryenis* (Fig. 8).
7. Prementum, position (Doyen 1994: character 23): base concealed beneath mentum in *Thinobatis* (Doyen 1994: fig. 28; Fig. 7); nearly concealed beneath mentum in *Vaniosus*, *T. profana*, *Achanius*, and *Aryenis* (Doyen 1994: fig. 29; Fig. 8).
8. Mentum, anterior margin (Doyen 1994: character 26): narrowly notched in *Thinobatis* (Doyen 1994: figs. 24–25) (Fig. 7); straight or slightly concave in *Vaniosus*, *T. profana*, *Achanius*, and *Aryenis* (Doyen 1994: fig. 21; Fig. 8).
9. Eyes: not protruding in *Thinobatis* (Fig. 5); protruding in *Vaniosus* and *T. profana* (Figs. 4, 6).



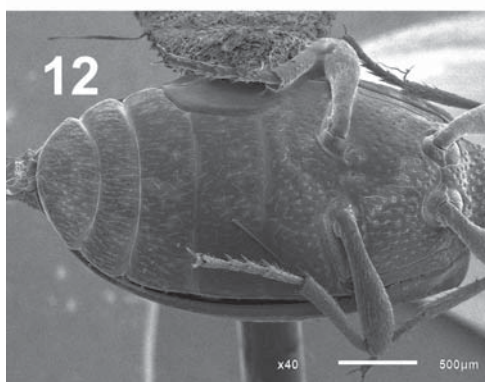
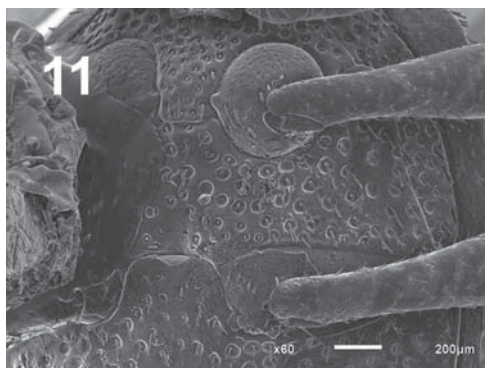
Figs. 5–8. Head. **5)** *Thinobatis rufipes rufipes*, frontal view; **6)** *Vaniosus profana*, frontal view; **7)** *Thinobatis rufipes rufipes*, mouthparts, ventral view; **8)** *Vaniosus profana*, mouthparts, ventral view, white arrow indicates ventral fossa on mandible.

10. Epicanthus, relative size: 1.5X length of eye in *Thinobatis* (Fig. 5); 2.5X length of eye in *Vaniosus* and *T. profana* (Figs. 2, 4).
11. Antennal length: reaching posterior margin of pronotum in *Thinobatis* (Fig. 1); surpassing posterior margin of pronotum in *Vaniosus*, *T. profana*, *Achanius*, and *Aryenis* (Figs. 2, 3, 15).
12. Antennomeres 9 and 10: triangular, very expanded outwards, wider than long in *Thinobatis* (Fig. 9); cylindrical, not expanded outwards, longer than wide in *Vaniosus* and *T. profana* (Fig. 10).
13. Distance between meso- and metacoxae (Flores 2001; Flores and Vidal 2009): equal to metacoxal length in *Thinobatis* (Fig. 11); twice metacoxal length in *Vaniosus* and *T. profana* (Fig. 12).

This character comparison between Thinobatini and Evaniosomini clearly shows that *T. profana* is not congeneric with the remaining species of *Thinobatis*, that it shares all of these characters with one or some genera of the tribe Evaniosomini, and that it fits within the definition of *Vaniosus*.



Figs. 9–10. Antennomeres 9–11. **9)** *Thinobatis rufipes*; **10)** *Vaniosus profana*.



Figs. 11–12. Meso- and metasterna. **11)** *Thinobatis rufipes rufipes*; **12)** *Vaniosus profana*.

For this reason, *T. profana* is here transferred from *Thinobatis* (Thinobathini) to *Vaniosus* (Evaniosomini).

Tribe Thinobatini

Genus *Thinobatis* Eschscholtz, 1831

(Figs. 1, 5, 7, 9, 11)

Thinobatis Eschscholtz 1831: 8. Solier 1835: 407; Laporte 1840: 196; Solier 1851: 126; Lacordaire 1859: 65; Gemminger and Harold 1870: 1836 (catalog); Philippi 1887: 722 (catalog); Gebien 1910: 19 (catalog), 1937: 588 (catalog); Blackwelder 1945: 513 (catalog); Kulzer 1956: 903 (revision); Freude 1960: 24; Peña 1966: 405 (catalog), 1974b: 243. Type species: *Thinobatis ferruginea* Eschscholtz, 1831, by monotypy.

Description. In addition to the characters stated above: Mandibles thick, base 2X wider than apex, both mandibles with dorsal cusp on basal half, shorter on right than on left mandible (Fig. 5), lacking ventral fossa; labrum exposed, entirely sclerotized; clypeus short, not covering labrum, anterior margin straight or concave, nearly at same level with

antennal insertions, lacking row of teeth (Fig. 5); prementum partially sclerotized, base concealed beneath mentum; anterior margin of mentum narrowly notched (Fig. 7); eyes small, not protruding, upper margin lacking carina; length of epicanthus 1.5X length of eye (Fig. 5); antennae reaching posterior margin of pronotum, antennomere 1 as long as 3, emerging from distal half of antennal insertion (Fig. 7), antennomere 3 longer than 2 (Fig. 5), antennomeres 9 and 10 triangular, strongly expanded outwards, wider than long, antennomere 11 equal to or longer than 10 (Fig. 9). Pronotum with anterior angles acute, directed forwards, or rounded sloping towards venter (Fig. 1). Metasternum short, as long as mesosternum. Metacoxae separated by less than half metacoxal width; metacoxal width 3X metacoxal length; distance between meso- and metacoxae equal to metacoxal length (Fig. 11). First tarsomere of hind legs longer than 2+3 combined.

Species Included. *Thinobatis ferruginea* Eschscholtz, *Thinobatis rufipes rufipes* Solier, *Thinobatis rufipes penai* Freude, *Thinobatis rotundicollis* Waterhouse, *Thinobatis intermedia* Philippi and Philippi, *Thinobatis kuscheli* Kulzer, *Thinobatis brevicollis* Kulzer, *Thinobatis calderana* Kulzer, *Thinobatis melcheri* Freude, *Thinobatis simplex* Peña, *Thinobatis punctata* Peña, *Thinobatis confusa* Peña, and *Thinobatis arenaria* Peña (Peña 1974b).

Material Examined. *Thinobatis intermedia*, *T. melcheri*, *T. rufipes rufipes*, and *T. rufipes penai* (IADIZA). We also examined *T. rotundicollis*, but it should be classified in a distinct genus because of the shape and proportional length and width of the pronotum, rounded pronotal posterior angles, lack of a dorsal cusp on both mandibles, and clypeus and frons with protuberances.

Tribe Evaniosomini

Genus *Vanosus* Kulzer, 1956

(Figs. 2–4, 6, 8, 10, 12, 21)

Vanosus Kulzer 1956: 896. Type species: *Vanosus paradoxus* Kulzer, 1956, by monotypy.

Description. In addition to the characters stated above: Mandibles finer, acute, base 1.5X wider than the apex, both mandibles with a dorsal cusp on basal half longer on the right than on the left mandible (Fig. 6), both mandibles with a ventral fossa (Fig. 8); labrum exposed, partially sclerotized; clypeus short, not covering the labrum, anterior margin triangular nearly at same level with antennal insertions, armed with a row of teeth directed downwards, in the apex with a large tooth prolonged anterad (Fig. 6); prementum entirely membranous, nearly concealed beneath mentum; anterior margin of mentum straight or slightly con-

cave (Fig. 8); eyes small, protruding out, upper margin lacking carina; length of epicanthus 2.5x the length of eye (Fig. 6); antennae surpassing posterior margin of pronotum, antennomere 1 sticks out distal half of antennal insertion (Fig. 8), antennomeres 9 and 10 cylindrical, not expanded outwards, longer than wide, antennomere 11 equal in length to 10 (Fig. 10). Pronotum with anterior angles obtuse, sloping towards venter (Figs. 2–4). Metasternum twice the length of mesosternum. Metacoxae separated by less than half metacoxal width; metacoxal width 3X metacoxal length; distance between meso- and metacoxae twice the metacoxal length (Fig. 12).

Female genitalia (Fig. 21). Spiculum without arms. Paraprocts long ($2.0 < P/C \leq 3.0$), basal lobe of coxite not extended over paraproct. Vagina saccate. Spermathecal accessory gland longer than vagina, with annulate duct. Spermatheca single, compact, locular, at the end of vagina, near the duct of spermathecal accessory gland.

Species included. *Vanosus paradoxus* Kulzer and *Vanosus profana* (Kulzer).

KEY TO THE SPECIES OF *VANOSUS* KULZER

1. Head widest at epicanthus; antennomere 1 longer than 3, antennomere 2 longer than 3; posterior angles of pronotum very protruding, pointed outwards (Fig. 4); humeri not elevated; hind wings absent; first tarsomere of hind legs longer than 2–4 combined (Fig. 3) ***Vanosus paradoxus* Kulzer**
- 1'. Head widest at eyes; antennomere 1 as long as 3, antennomere 2 shorter than 3 (Fig. 8); posterior angles of pronotum obtuse, not protruding; humeri elevated; hind wings present, reduced, as long as elytra, not folded; first tarsomere of hind legs as long as 2–3 combined (Fig. 2)..... ***Vanosus profana* (Kulzer)**

***Vanosus paradoxus* Kulzer, 1956**

(Figs. 3–4)

Vanosus paradoxus Kulzer 1956: 897.

Diagnosis. See Kulzer (1956).

Type Material. Holotype: Cerro Caramailloj, bei Cajamaros, Peru, 3000 m, II-1942, leg. W. Weyrauch (NHMB) (Figs. 3–4).

Distribution. Known only from the type locality in Cajamarca, Peru.

***Vanosus profana* (Kulzer, 1956), new combination** (Figs. 2, 6, 8, 10, 12, 21)

Thinobatis profana Kulzer 1956: 906. Freude 1960: 31; Peña 1974b: 244.

Diagnosis. See Kulzer (1956).

Type Material. **Holotype:** Santiago del Estero, Forres, XII-1934 (NHMB) (Fig. 2). **Paratype:** Catamarca, Caspinchango, 12.III.21 (NHMB). These and all localities mentioned in the original description correspond to Argentina and not to Peru, as stated by Kulzer (1956).

Other Material Examined. 237 specimens in IADIZA. **ARGENTINA:** Salta: Dto. Chicoana: 2 km E Escoipe, 1856 m, 7-XI-2004, G. Flores - G. Zalazar, 70; Dto. Cafayate: Tolombón, 1812 m, 8-XII-2003, G. Flores, 4. Tucumán: Dto. Tañi del Valle: Ruinas de Quilmes, 17-X-1997, S. Roig, 16. Catamarca: 2 km N Villa Vil, 2358 m, 16-XI-2009, G. Flores, 1; Punta de Balasto, 3-5-II-2001, G. Arriagada, 1. La Rioja: Dto. Famatina: 2 km S Campanas, 10-XII-2003, G. Flores, 4, 10 km NE Pituil, 15-X-1997, S. Roig, 11; Dto. Gral. Belgrano: 20 km N Olta, 21-X-1997, S. Roig, 3. Córdoba: 15 km N Capilla del Monte, 11-XII-2000, C. Domínguez - S. Roig, 2. San Juan: Dto. Valle Fértil: Astica, 13-V-1979, S. Roig, 1, 10 km E Marayes, 23-X-1997, S. Roig, 1. Mendoza: Dto. La Paz: Desaguadero, 16-XI-1997, S. Roig, 2, 20 km E La Paz, 16-XI-1997, S. Roig, 1; Dto. Santa Rosa: Reserva Ñacuñán, 560 m, pitfall: 13-IX-1997, S. Lagos, 1, 20-X-1997 to 22-XI-1997, S. Lagos, 1, 7-II-1998, S. Lagos, 1, 15-V-1998, S. Claver, 1, 31-V-1998, S. Lagos, 1, 12-XII-1998, S. Lagos, 4, VI-1999, S. Lagos, 2, 9-V-1999 to 11-VI-1999, S. Lagos, 4, 24-III-2010 to 25-IV-2010, G. Arriagada, 1, 22-III-2011, F. Ocampo, 1, Campo Quemado, 7-II-1998, S. Lagos, 1; Dto. Lavalle, Reserva Telteca, 548 m, pitfall: 9-VIII-1994 to 6-IX-1994, G. Flores, 1, 15-XII-1994 to 3-II-1995, G. Flores, 2, 15-II-1996 to 25-III-1996, G. Flores, 1, 15-IV-2008, L. Muñoz, 2, Campo Norte, 17-XI-1999, S. Roig, 2; Dto. Capital: CCT CONICET, 839 m, 91 specimens collected on pig carcasses (*Sus scrofa* L.): 15-V-2007, F. Aballay, 1, 17-V-2007, F. Aballay, 1, 18-V-2007, F. Aballay, 2, 19-V-2007, F. Aballay, 1, 24-VII-2007, F. Aballay, 1, 8-IV-2008, F. Aballay, 1, 12-IV-2008, F. Aballay, 1, 18-IV-2008, F. Aballay, 1, 21-IV-2008, F. Aballay, 1, 24-IV-2008, F. Aballay, 5, 28-IV-2008, F. Aballay, 12, 30-IV-2008, F. Aballay, 5, 8-V-2008, F. Aballay, 5, 15-V-2008, F. Aballay, 6, 30-V-2008, F. Aballay, 4, 30-X-2008, F. Aballay, 9, 31-X-2008, F. Aballay, 9, 1-XI-2008, F. Aballay, 3, 2-XI-2008, F. Aballay, 1, 3-XI-2008, F. Aballay, 1, 4-XI-2008, F. Aballay, 4, 7-XI-2008, F. Aballay, 2, 10-XI-2008, F. Aballay, 1, 11-XI-2008, F. Aballay, 4, 14-XI-2008, F. Aballay, 2, 15-XI-2008, F. Aballay, 3, 16-XI-2008, F. Aballay, 2, 17-XI-2008, F. Aballay, 1, 17-XII-2008, F. Aballay, 2.

Distribution. Argentina: Salta, Tucumán, Catamarca, La Rioja, Santiago del Estero, Córdoba, San Juan, and Mendoza provinces.

Habitat. This species occurs in xerophilous warm steppes and dry forests east of the Andes, in the biogeographic provinces of Monte and Chaco (Morrone 2014) at altitudes of 150 to 2,400 m. Specimens were collected throughout the year, even in the coldest months.

Biology. Specimens collected in Mendoza at the Science and Technology Center (91 individuals) were found feeding on decomposing pig carcasses, mainly on the carcass in direct sunlight (88 individuals) and very few on the carcass in the shade (3 individuals). These specimens were recorded in greatest abundance in autumn (46 individuals) and spring (44 individuals), with only one record in the winter and none in the summer. This species was associated with the Advanced Decay and Dry Remains stages of decomposition defined by Payne (1965).

Because of these three behavioral characteristics, 1) preference for carcasses under direct sun, 2) seasonality (autumn and spring), and 3) association with specific stages of decomposition (Advanced Decay and Dry Remains), this species should be considered for potential forensic importance for estimating time of death (PMI = Post Mortem Interval) in bodies found in arid environments.

Specimens that were collected using pitfall traps partly filled with water and propylene glycol in two reserves of Mendoza province, Telteca and Ñacuñán, could have been attracted by the smell of decomposition of propylene glycol, similar to the smell of a carcass.

Genus *Achanius* Erichson, 1847

(Figs. 13–20, 22)

Achanius Erichson 1847: 118. Lacordaire 1859: 82; Gemminger and Harold 1870: 1842 (catalog); Gebien 1910: 30 (catalog), 1937: 579 (catalog); Blackwelder 1945: 511 (catalog); Kulzer 1950: 30 (revision), 1956: 898 (revision); Peña 1966: 404 (catalog); Doyen 1994: 500. Type species: *Achanius anthicoides* Erichson, 1847, by monotypy.

Description. In addition to the characters stated above: Mandibles finer, acute, base 1.5X wider than apex, with dorsal cusp only on right mandible on basal half, left mandible with sharp, raised dorsal edge (Fig. 17), both mandibles with ventral fossa (Fig. 18); labrum not exposed, entirely membranous; clypeus oval, produced anteriorad of antennal insertions, covering labrum, anterior margin triangular or concave and armed with row of teeth directed downwards, apically with a large tooth prolonged anteriorad, genoclypeal suture well-marked (Fig. 17), epicanthus separated from clypeus (Fig. 19); prementum entirely membranous, nearly

concealed beneath mentum; anterior margin of mentum straight or slightly concave (Fig. 18); eyes not protruding, upper margin with slightly or well-marked carina always present, starting posterior to epicanthus and ending in posterior margin of eye; length of epicanthus equal to length of eye, head widest at eyes, postgenal margin inconspicuous (Fig. 19); antennae surpassing posterior margin of pronotum, all antennomeres longer than wide, antennomere 1 longer than 3, emerging from distal $\frac{3}{4}$ of antennal insertion (Fig. 19), antennomere 2 equal to or longer than 3 or shorter than 3 but almost equal (proportion $2/3 = 17/19$) (Fig. 19); antennomeres 9 and 10 triangular, expanded outwards, longer than wide (Figs. 13, 14). Pronotum with anterior angles rounded, sloping towards venter. Metacoxae transverse, separated by less than third of metacoxal width (Fig. 20). First tarsomere of hind legs longer than 2 + 3 combined (Figs. 14, 16). Female genitalia as in Fig. 22. Spiculum without arms. Paraprocts long ($2.0 < P/C \leq 3.0$), basal lobe of coxite not extended over paraproct. Vagina saccate. Spermathecal accessory gland longer than vagina, duct not annulate. Spermatheca single, compact, locular, emptying at end of vagina, spermathecal accessory gland emptying inside spermatheca.

Material Examined. Syntype of *A. (Achanius) anthicoides* (MNHUB) (Fig. 13); three specimens of *Achanius (Achanius) bembidioides* Fairmaire (1 NHMB, 2 IADIZA); six specimens of *Achanius (Achanius) minutus* Kulzer (IADIZA); holotype (MNHN) and 113 specimens (IADIZA) of *Achanius (Ambigatus) rufonitens* Fairmaire; holotype (NHMB) and three specimens (IADIZA) of *A. (Ambigatus) stricticollis*; holotype (NHMB) and 39 specimens (IADIZA) of *Achanius (Ambigatus) bicolor* Kulzer; holotype of *Achanius (Ambigatus) rhinosomoides* Kulzer (NHMB); paratype of *Achanius (Ambigatus) piceus* Kulzer (IADIZA); holotype of *Achanius (Ambigatus) wittmeri* Kulzer (NHMB) (Fig. 16); holotype, allotype, and nine paratypes of *A. (Ambigatus) antofagastensis* Flores and Aballay, new species.

Subgenus *Achanius (Achanius)* Erichson, 1847 (Fig. 13)

Achanius Erichson 1847: 118.

Achanius (Achanius): Kulzer 1950: 36 (revision); Kulzer 1956: 898 (revision). Type species: *Achanius anthicoides* Erichson, 1847, by monotypy.

Diagnosis. Kulzer (1950 in key) stated the humeri are not elevated and hind wings are absent. This study: metasternum 2X length of mesosternum; metacoxal width twice metacoxal length; distance between meso- and metacoxae exceeding metacoxal length but not longer than 1.5X metacoxal length.

Biology. Species of *Achanius (Achanius)* are apterous and have been collected under stones or

using pitfall traps partly filled with water and propylene glycol (Flores *et al.* 2004; Lagos 2004).

Species included. *Achanius anthicoides*, *A. bembidioides*, *Achanius (Achanius) castanescens* Fairmaire, *Achanius (Achanius) piceofuscus* Fairmaire, *A. minutus*, *Achanius (Achanius) obscurus* Kulzer, *Achanius (Achanius) peruensis* Kulzer, *Achanius (Achanius) puncticollis* Kulzer, and *Achanius (Achanius) angusticollis* Kulzer (Kulzer 1950, 1956).

Subgenus *Achanius (Ambigatus)* Fairmaire, 1892 (Figs. 14–20, 22)

Ambigatus Fairmaire 1892: 246. Gebien 1910: 81 (catalog), 1937: 579 (catalog); Bruch 1915: 264 (catalog); Blackwelder 1945: 511 (catalog); Doyen 1994: 500. Type species: *Ambigatus stricticollis* Fairmaire, 1892.

Achanius (Ambigatus): Kulzer 1950: 31 (revision), 1956: 901 (revision).

Diagnosis. Kulzer (1950 in key) stated the humeri are not elevated and hind wings are present. This study: metasternum 3X length of mesosternum; metacoxal width 3X metacoxal length; distance between meso- and metacoxae 2.5X metacoxal length (Fig. 20).

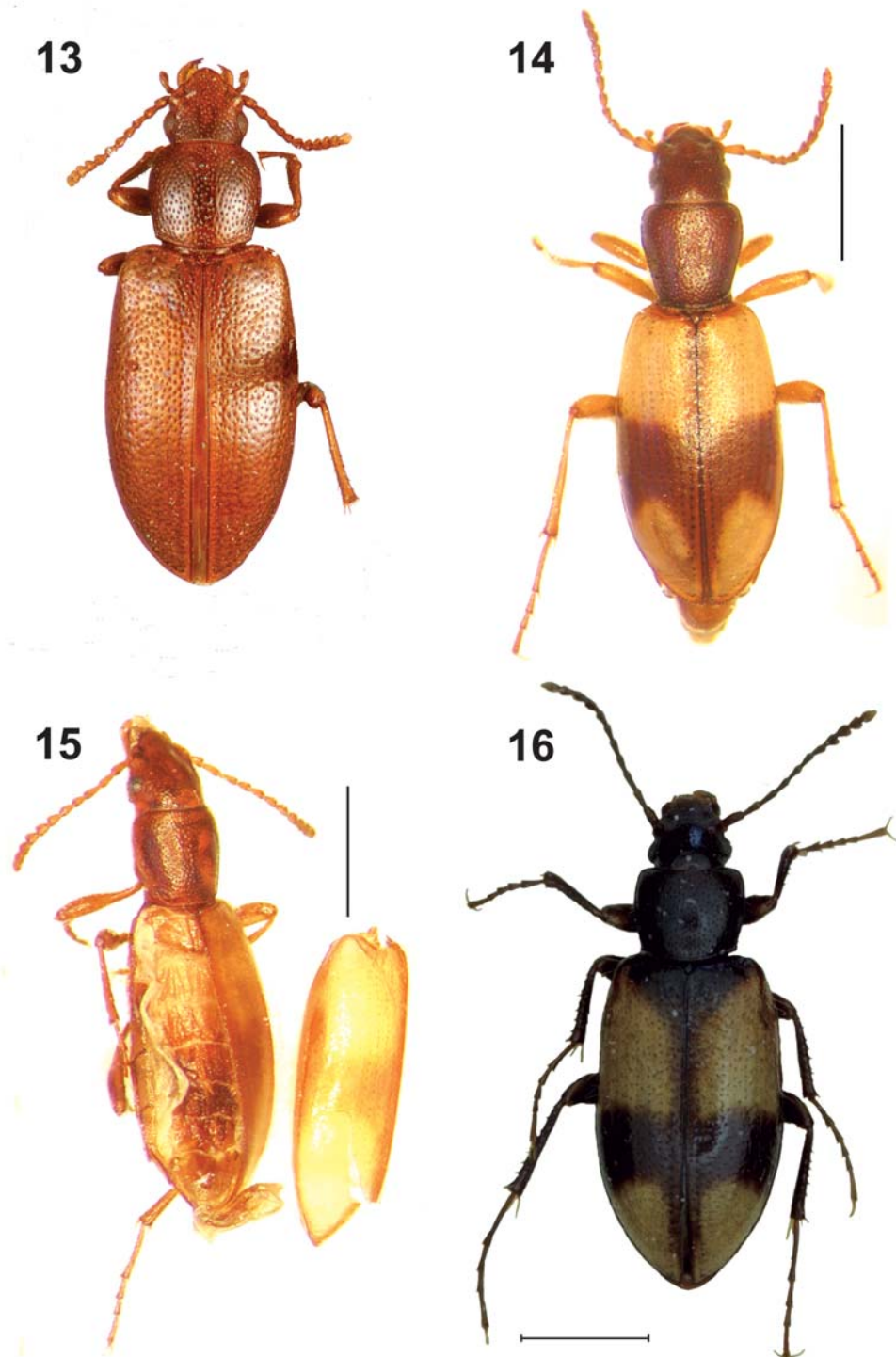
Biology. Species of *Achanius (Ambigatus)* are winged, capable of flying, and of crepuscular and nocturnal habits. They were collected at white and UV lights, also using pitfall traps partly filled with water and propylene glycol (Flores *et al.* 2004; Lagos 2004), and cattle dung-baited pitfall traps.

Species Included. *Achanius rufonitens*, *A. stricticollis*, *A. bicolor*, *A. rhinosomoides*, *A. piceus*, *A. wittmeri* (Kulzer 1950, 1956), and *Achanius (Ambigatus) antofagastensis* Flores and Aballay, new species.

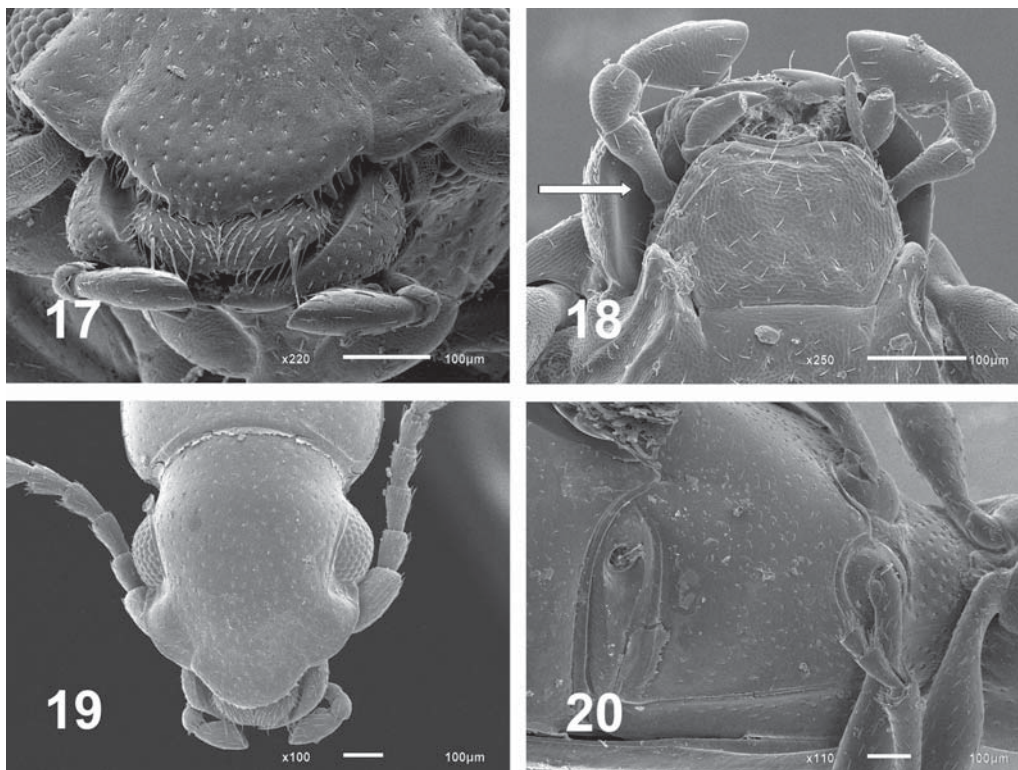
Achanius (Ambigatus) antofagastensis Flores and Aballay, new species (Figs. 14–15)

Diagnosis. Antennomere 2 longer than 3, antennomeres 1–5 subcylindrical, antennomeres 6–10 triangular, longer than wide, antennomere 11 equal to 10, pear-shaped; apical maxillary palpomere ovoid, acuminate; prothorax longer than wide, anterior margin of pronotum exceeding width of posterior margin (Fig. 14).

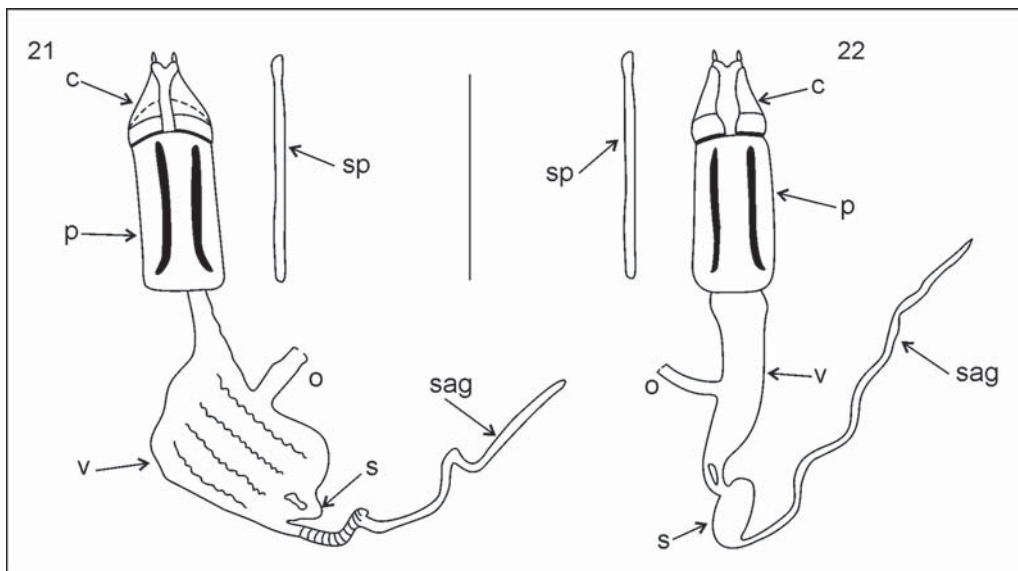
Achanius antofagastensis superficially resembles *A. bicolor* and *A. wittmeri* (Fig. 16) in color pattern. It differs from these species by having reduced wings, antennomere 2 longer than 3 and antennomere 11 equal to 10, whereas *A. bicolor* and *A. wittmeri* have well-developed wings, antennomere 2 shorter than 3, and antennomere 11 longer than 10. In addition, in *A. wittmeri* the prothorax is wider than long, and the elytra have an additional



Figs. 13–16. Dorsal habitus. **13** *Achanius (Achanius) anthicoides*, syntype (Image courtesy of Bernd Jaeger, MNHUB); **14** *Achanius (Ambigatus) antofagastensis*, holotype; **15** *A. antofagastensis*, paratype showing reduced wings (white); **16** *Achanius (Ambigatus) wittmeri*, holotype (Image courtesy of Eva Sprecher, NHMB. Scale bars = 1 mm.



Figs. 17–20. *Achanius (Ambigatus) bicolor*. **17)** Mouthparts, dorsal view; **18)** Mouthparts, ventral view, white arrow indicates ventral fossa on mandible; **19)** Head, frontal view; **20)** Meso- and metasterna.



Figs. 21–22. Ovipositor in ventral view, spiculum and internal female reproductive tract. **21)** *Vaniosus profana*; **22)** *Achanius (Ambigatus) rufonitens*. Abbreviations: c = coxite; o = oviduct; p = paraproct; s = spermatheca; sag = spermathecal accessory gland; sp = spiculum; v = vagina. Scale bar = 1 mm.

triangular dark brown spot pointed backwards between the humeri (Fig. 16).

Description. Length 3.6–4.7 mm. Head and prothorax dark brown, elytra light brown on anterior half and posterior quarter, with dark brown spot on penultimate quarter extending along suture towards apex; antennae, legs, and mouthparts light brown as elytra. One specimen (Fig. 15) with same color pattern but elytra with spot outlined in dark brown. One specimen (Catamarca, 8 km W Antofagasta de la Sierra (16 km W of the holotype locality)) with similar color pattern but head, prothorax, legs, and elytral spot very dark brown. Humeri elevated, wings present, reduced, narrow, reaching 3/4 length of elytra, not folded (Fig. 15); metasternum 3X length of mesosternum; metacoxal width 3X metacoxal length (as in Fig. 20).

Etymology. Named “antofagastensis” after the collection site of Antofagasta de la Sierra, Catamarca province, Argentina.

Type Material. Holotype: Male (Fig. 14): [Argentina: Catamarca, 8 km NE / Antofagasta de la Sierra, Punta de la / Peña 3593 m 26°01'39.54" S, 67° / 20'38.79" W, 17-20-XI-2009 / coll. G. Flores, F. Aballay] [*Achanius (Ambigatus) antofagastensis* n. sp./ HOLOTYPUS male/ Det. G. Flores and/ F. Aballay 2015] (IADIZA). **Allotype:** Female (IADIZA) and four paratypes with the same data as holotype: one male (NHMB), one male (FMNH), one female (MACN), one not sexed (MACN). **Paratypes:** One male: [Argentina: Catamarca/ (Dto.) Antofagasta de la Sierra, 8 km / NE Antofagasta de la Sierra / llama M-4 P-3, 3585 m / 26°01'33.4" S/ 67°20'42.5" W, 21-XI-2009 / coll. F. Aballay] (MEKRB); one female with same label information except M-11, 28-XI-2009 (IADIZA) (Fig. 15); one specimen: [Argentina: Catamarca/ (Dto.) Antofagasta de la Sierra, 8 km / NE Antofagasta de la Sierra / cerdo al sol M-11 P-3, 3578 m 26°01'32.3" S, 67° / 20'36.5" W, 27-XI-2009 / coll. F. Aballay] (MLPA); one male: [Argentina: Catamarca/ (Dto.) Antofagasta de la Sierra, 8 km / NE Antofagasta de la Sierra / cerdo sombra M-17 P-1, 3595 m 26°01'38.2" S, 67° / 20'31.6" W, 03-XII-2009 / coll. F. Aballay] (IADIZA), one specimen with same label information except M-20, 06-XII-2009 without head, not labelled paratype (IADIZA); one specimen: [Argentina: Catamarca 8 km W / Antofagasta de la Sierra, Salar 3434 m / 26°01'54.6" S, 67°27'07.7" W / 11-XII-2009 / coll. G. Flores] (IADIZA).

Biology. Specimens collected in the spring at an altitude of over 3,500 m in Antofagasta de la Sierra, Catamarca province, were found feeding on decomposing pig carcasses (12 individuals) and on llama (*Lama glama* Linnaeus) carcasses (four individuals). These specimens showed a preference for pig carcasses, nine of which were

recorded on the pig carcass in the shade and three under direct sun. This species was associated with the intermediate stages of decomposition (Active Decay and Advanced Decay) defined by Payne (1965). Because of these three behavioral characteristics, this species should be considered for potential forensic importance for estimating time of death (PMI) in arid high environments during the spring.

TRIBAL ASSIGNMENT OF *ACHANIUS* AND *VANIOSUS*

Doyen (1994), in his cladistic relationships among Pimeliinae, found that the tribes were arranged in different clades. One of these was called Eurymetopine and Tentyriine clade, which was supported by characters describing the enclosure of the maxillary bases, closure of the procoxal cavities, and the presence of dorso-basal mandibular cusps, which clasp the labrum. In contrast, features of the ovipositor and internal female reproductive tract differentiate the eurymetopine and tentyriine clades. In Eurymetopini and related tribes, the spermathecae arise serially in multiple tubes from the base of the accessory gland duct (Doyen 1994: figs. 179–180, 183, 184). In the tentyriine group, the apex of the bursa is attenuate and often divided into several lobes (Doyen 1994: figs. 195–197), but discrete spermathecae are absent. Doyen (1994) found that the South American tribes Evanosomini, Thinobatini, and Trilobocarini do not fit easily into this dichotomy.

Doyen (1994) transferred *Achanius* and *Ambigatus* (both treated as genera) from Evanosomini to Eurymetopini because he found that they species agree closely with Eurymetopini in the structure of the internal female reproductive tract by having spermatheca arising serially in multiple tubes from the base of the accessory gland duct (Doyen 1994: figs. 179, 180). We observed that the specimens of *Achanius* sp. and *Ambigatus* sp. studied by Doyen (1994: 479) are from Natal, Brazil, on the opposite side of South America, very far away from the known distribution of both subgenera that encompasses arid and semiarid lands from central Peru to central Argentina. We compared the specimens at IADIZA's collection with the types of well-known species (those of Erichson, Fairmaire, and Kulzer). When making dissections, we found that the internal female reproductive tracts of *Vanosus* and *Achanius* (Figs. 21, 22) are characterized by having compact, locular spermathecae, similar to that in the Evanosomini genera *Melaphorus* and *Aryenis* (Doyen 1994: figs. 160, 161), rather than the tubular type in Edrotini. In addition, Doyen (1994) indicated that *Achanius* and *Ambigatus* lack the specialized mandibles of Evanosomini (Doyen 1994: fig. 14). However, in specimens

of *Achanius* and *Ambigatus*, we found the same specialized mandibles of *Aryenis*, with a ventral fossa present (Fig. 18) as in *Vaniosus* (Fig. 8). Based on these characters, *Achanius* (including the subgenus *Ambigatus*) is here transferred to *Evaniosomini*. *Vaniosus*, which was unknown to Doyen (1994), is confirmed as belonging to *Evaniosomini* (Kulzer 1956).

When we had finished this article, our colleague Rolf Aalbu generously sent us pictures of the three specimens from Natal, Brazil that were studied by Doyen (1994). They resemble *Achanius* in body shape (prothorax cylindrical, punctured, disc more raised than lateral margins, with lateral margins well-marked, posterior angles well-marked, prothorax more slender than elytra, widest behind midpoint; all characters also shared with *Thinobatis* and *Vaniosus*). However, the main differences between these specimens and the species of *Achanius* are antennomeres 6–10 flabellate, very expanded (wider than long), antennomere 2 very short in relation to antennomere 3 (proportion $2/3 = 15/25$), anterior margin of clypeus with two large teeth fused at apex, configuration of the epicanthus (head widest at epicanthus, epicanthus continuous with clypeus), and the postgenal margin blends into the surface of the eye, covering the posterior margin of eye. We think these specimens from Natal, Brazil, belong to a different, probably new genus.

CONCLUSIONS

1. *Thinobatis profana* (Thinobatini) is transferred to *Vaniosus* (Evaniosomini). In this way, the genus *Thinobatis* is removed from the Argentine fauna and confined only to Chile in coastal areas between the parallels 23° S and 37° S (Peña 1974b).

2. The genus *Achanius* (including the subgenus *Ambigatus*) is transferred from Edrotini (Eurymetopini of Doyen 1994) to *Evaniosomini* based on the structure of the internal female reproductive tract and configuration of the mandibles.

3. The tribe *Evaniosomini* needs revision using the characters of Doyen (1994) and this study. *Evaniosomini* should contain the South American genera *Aryenis*, *Chorasmius*, *Evaniosomus*, *Evelina* (Gebien 1937; Doyen 1994), *Vaniosus*, *Melaphorus* (Kulzer 1956), the South African *Oppenheimeria* (Endrödi-Younga 1998), and *Achanius* (including the subgenus *Ambigatus*) (Gebien 1937; Kulzer 1950, 1956; this study).

4. The species *V. profana* and *A. antofagastensis* showed preferences for microhabitat conditions (sun or shade), seasonality, and association with stages of decomposition, and they should be considered for potential forensic importance for estimating time of death (PMI) in bodies found in arid environments in Argentina.

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