

A journal of world insect systematics

INSECTA MUNDI

0903

Ardella magnaemirabilis
(Coleoptera: Scarabaeidae: Melolonthinae: Ardellini),
a new scarabaeoid species, genus and tribe from
the southwestern United States

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Date of issue: December 31, 2021

Center for Systematic Entomology, Inc., Gainesville, FL

Paulsen MJ. 2021. *Ardella magnaemirabilis* (Coleoptera: Scarabaeidae: Melolonthinae: Ardellini), a new scarabaeoid species, genus and tribe from the southwestern United States. *Insecta Mundi* 0903: 1–5.

Published on December 31, 2021 by
Center for Systematic Entomology, Inc.
P.O. Box 141874
Gainesville, FL 32614-1874 USA
<http://centerforsystematicentomology.org/>

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Ardella magnaemirabilis
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a new scarabaeoid species, genus and tribe from
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Abstract. An interesting new taxon of scarabaeoid beetle is described from western Texas, USA. The remarkably small chafer, *Ardella magnaemirabilis* **new genus, new species** (Coleoptera: Scarabaeidae: Melolonthinae: Ardellini) is described and compared to other diminutive scarabaeoid genera from drier habitats of the southwestern USA. The tribe Ardellini, **new tribe**, is erected to accommodate the unusual genus.

Key words. Taxonomy, xerophilic, Tanyproctini, Pachydemini, Acomini, Podolasiinae, Oncerinae.

ZooBank registration. urn:lsid:zoobank.org:pub:6FA2B3CD-156A-44E3-B15F-928E0D3682D6

Introduction

After a few centuries with entomologists scouring the continent, the discovery of unknown Nearctic scarab genera is no longer commonplace. The western United States, in particular, is biogeographically diverse with pockets of endemism that makes such discoveries still possible, driving collectors to continue sampling in unique places and isolated habitats. Harsh, xeric habitats are often home to species with very brief periods of activity. These species are not commonly collected unless one happens to be in the right place at the exact right time. In particular, many genera of chafers in the subfamily Melolonthinae (Scarabaeidae: Coleoptera) and related groups are known from rather inhospitable desert habitats. This paper describes a new taxon from such a habitat in western Texas that has thus far remained unknown.

Historically, untangling the relationships of these desert-adapted genera has been a significant taxonomic problem. Frequently these taxa do not feed as adults, and the convergence of atrophied morphologies obscures relationships and suggests erroneous groupings of taxa with similar life histories. The dry conditions could lead to further convergence related to the necessity of conserving water, which is likely to be related to the placement of spiracles on the abdomen, a character frequently used in melolonthine classification (Evans and Smith 2020). Furthermore, females of these groups are often unknown, with a tendency to flightlessness and secretive, sedentary habits so that they are not attracted to light, almost never encountered by collectors, and cannot be studied (Howden 1997; Warner 2011).

For these reasons the taxonomic extent of Melolonthinae becomes most problematic with respect to the genera from desert areas that have been treated as *incertae sedis* or within the xeric-taxon dumping ground of Tanyproctini (formerly Pachydemini), confirmed as a polyphyletic grouping by Eberle et al. (2019), albeit based only on Old World taxa. Recently, Evans and Smith (2020) re-examined the Nearctic tribes of Melolonthinae, and created four new tribes for some of these taxa: Acomini, Chnaunanthini, Phobetusiini, and Warwickiini. Two other tribes were removed from the Melolonthinae and elevated to subfamilial rank: Oncerinae and Podolasiinae (Evans and Smith 2020). In each case, these changes are primarily justified by the position of all abdominal spiracles within the pleural membrane. In the new taxon described here the sclerotized portions of the tergites are narrow and the membrane extensive. In this way the new taxon agrees with Oncerinae and Podolasiinae thus indicating that a new subfamily may be appropriate. Because the placement of spiracles in desert-adapted beetles is of great importance in avoiding desiccation and probably subject to convergence, it may not be a character of

taxonomic significance. Conservatively, I choose to place this taxon in Melolonthinae until molecular studies can more definitively place it and reveal the actual significance of spiracle placement, if any.

Materials and Methods

Specimens and taxonomic material. The following institutions and private collections provided specimens or are designated as the repository for specimens examined in this study.

CMNC Canadian Museum of Nature, Ottawa, ON, Canada

FSCA Florida State Collection of Arthropods, Gainesville, FL, USA

TAMU Texas A&M University Collection, College Station, TX USA

UNSM University of Nebraska State Museum, Lincoln, NE, USA

Taxonomic Treatment

Ardella Paulsen, new genus

Fig. 1–9

Type species. *Ardella magnaemirabilis* Paulsen, new species, here designated.

Description. Males. (females unknown). **Color:** Dorsum light reddish-brown, pronotum appearing lighter than elytra (Fig. 1–2); abdomen varying from dark brown except pygidial disc lighter to entirely light brown. **Head:** Antenna of 9 antennomeres with 1st–2nd globose, 3rd–5th elongate and flat (3rd as long as 4th + 5th), 6th small, 7th–9th forming club of elongate lamellae; lamellae longer than antennomeres 1–6 together (Fig. 5). Eyes large. Ocular canthus triangular, projecting, lower than frons and separated from it by supraocular carina. Frons raised medially, foveate each side near canthus. Clypeus concave, subcircular with base triangular (Fig. 1, 5), surface sparsely and coarsely punctate. Clypeal suture evident, triangularly raised medially. Labrum not visible, apparently absent. Mandibles absent. Mentum narrow, flat (Fig. 4). **Thorax:** Pronotum appearing strongly rounded in dorsal view, subangulate in lateral view, disc glabrous, convex (drying can cause irregular shrinking), punctate; punctures mixed fine and large. Pronotal margins finely beaded except membranous anterior margin. Lateral margin with long, sparse setae. Scutellum rounded, U-shaped. Elytra elongate, subparallel, surface with only sutural stria impressed in basal half, beginning behind scutellum; other striae suggested by rows of sparse, setose punctures; setae long, as long as distance between punctures (Fig. 1). Sutural interval appearing raised in basal half where sutural stria is present. Metathoracic wings present (Fig. 9). Metepisternum narrow, reaching metacoxa. **Abdomen:** Venter with 5 ventrites, sutures broadly membranous, more or less parallel and subequal in length (4 somewhat longer); ventrites and tergites including propygidium separated by wide membranous sutures; spiracles located in membranes. Pygidium triangular with rounded apex; position almost vertical. Surface smooth with fine punctures and long setae. Male genitalia with parameres contiguous, narrow, elongate and perpendicular to basal piece (Fig. 6). **Legs:** Procoxae conical, contiguous. Protibia tridentate, lacking apical spur. Mesotibia and metatibia each with 1 transverse carina and paired, articulated apical spurs. Metatibial spurs arising well before metatibial apex so that spurs not reaching past apex in normal position (Fig. 8), spurs arising subcontiguously, metatarsi not passing between (dorsal groove present to receive tarsi interior to spurs), one spur arising below tarsal insertion in lateral view (*sensu* Evans and Smith 2020). Metatarsomeres 1–4 with ventral carina that appears crenulate/fluted. Tarsal claws dissimilar, protarsal and mesotarsal claws toothed and cleft (Fig. 7); metatarsal claws with indistinct tooth near base and appearing simple (not cleft).

Remarks. The new taxon and potential relatives were assessed for the following characters that were considered potentially informative: labrum absent, or if present, hidden or visible dorsally; claws simple or toothed; presence/absence of ocular canthus; presence/absence of protibial spur; clypeal base elevated or not; club antennomeres elongate vs. short with oval club; ventrites 2 to 5 connate or separated; and the presence of fluting on metatarsomere 1 (Table 1). This new genus does not share all characters with any other genus studied, and appears to differ in important ways that would preclude its membership in a known genus. It shares the most characters

Table 1. Generic characters of similar xerophilic groups of Scarabaeoidea.

Taxon	Labrum dorsally visible [absent 0]	Claws toothed	Ocular canthus present	Protibial spur present	Clypeus elevated basally	Antennal club elongate	Ventrites 2–5 not connate	Fluting on metatarsomere 1
MELOLONTHINAE								
<i>Ardella</i>	0	+	+	–	+	+	+	+
Acomini	–	–	+	+	+	+	–	–
Chasmatopterini	–	+	+	+	+	+	+	+
Chnaunanthini	–	+	+	–	+/-	–	–	–
ONCERINAE								
<i>Nefoncerus</i>	+	+	+	–	–	–	+	+
<i>Oncerus</i>	+	+	+	–	+	–	–	–
PODOLASIINAE								
<i>Podolasia</i>	–	–	–	–	+	–	–	–
<i>Podostena</i>	–	–	+	–	+	–	–	–

with species of *Chasmatopterus* Dejean from western Europe and northern Africa, but differs from those taxa in having an elongate antennal club and distinct (not connate) abdominal ventrites.

The most similar taxon with respect to the clypeus, antennal form, and claws is the South American tanyproctine genus *Luispenaia* Martínez (Mondaca et al. 2019), however, species of that genus possess a distinct labrum, mandibles, and protibial spurs. In the key to tribes of Nearctic Melolonthinae in Evans and Smith (2020), *Ardella* will key to Phobetusini in couplet 9, however it differs significantly from *Phobetus* LeConte in lacking a labrum, protibial spur, and sternal spiracles. The proximal position of the metatibial spurs in *Ardella* such that they barely reach the metatibial apex appears to be unique among all taxa studied.

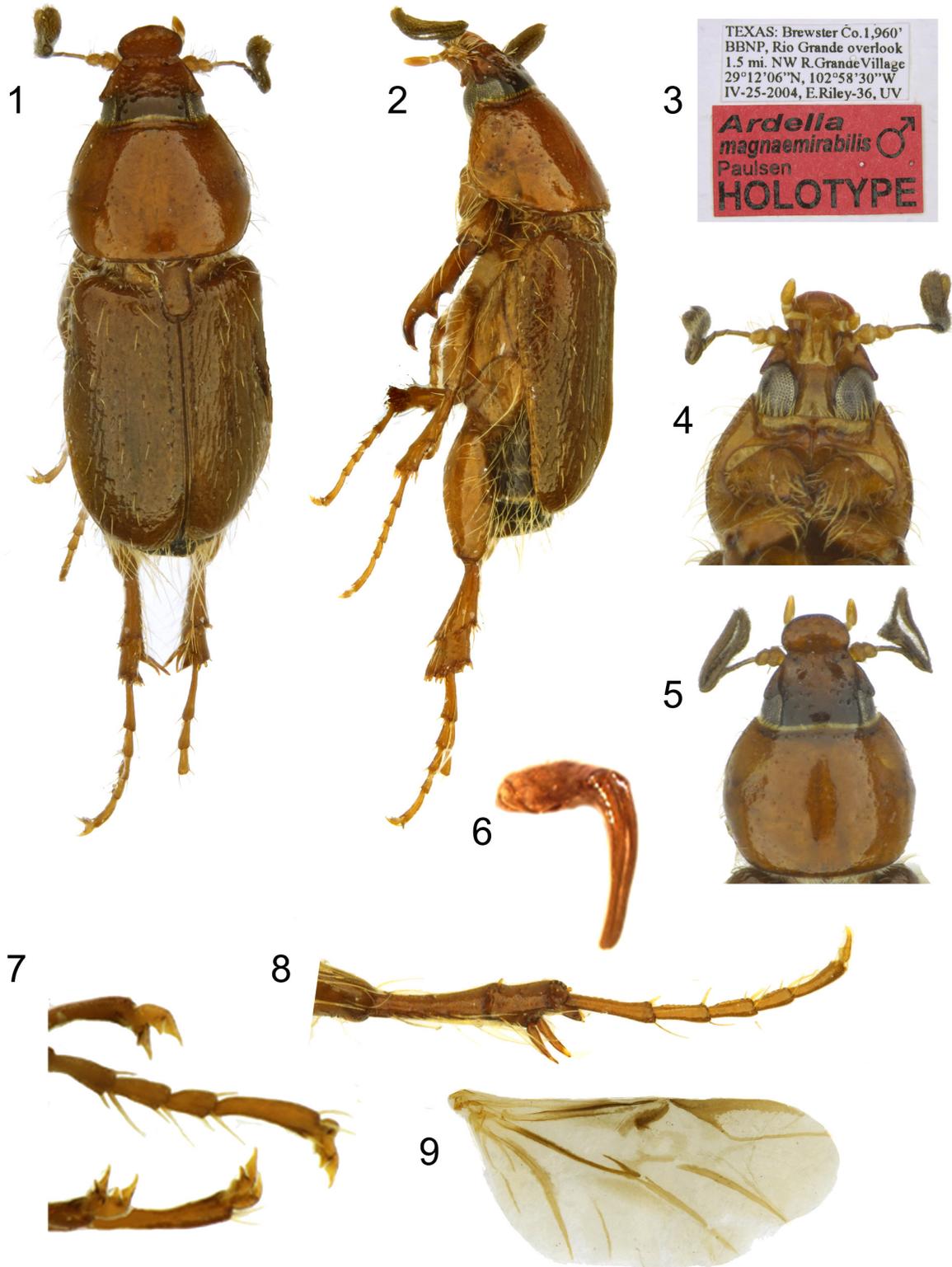
Etymology. *Ardella*, gender feminine, is dedicated to my late sister Ardell A. Paulsen.

Ardella magnaemirabilis Paulsen, new species

Type material. Holotype male (TAMU; Fig. 1–4) labeled (Fig. 3): a) “TEXAS: Brewster Co. 1,960 ft. / BBNP, Rio Grande overlook / 1.5 mi. NW R. Grande Village / 29°12'06"N, 102°58'30"W / IV-25-2004, E. Riley-36. UV”; b) on red paper, “*Ardella / magnaemirabilis* ♂ / Paulsen / HOLOTYPE”. Twelve paratype males (7 TAMU, 2 CMNC, 2 UNSM, 1 FSCA) labeled: a) as holotype, but four specimens with abbreviation “TEX”. Three paratype males (2 TAMU, 1 UNSM) labeled: a) “TEXAS: Brewster Co. / Big Bend National Park, Rio / Grande nr. Boquillas, 1890 ft / 29°11'45"N, 102°55'55"W / 28-IV-2001, MV light trap / Coll. D.E. Baumgardner”. All paratype specimens labeled: on yellow paper, “*Ardella / magnaemirabilis* ♂ / Paulsen / PARATYPE”. Paratype specimens sent or used for molecular analyses, SEM imaging, and dissection (CMNC, FSCA, UNSM, respectively) of such an extremely small taxon are considered to have been destructively sampled and may no longer be extant.

Description. Holotype male (Fig. 1–4). Due to monotypy, the generic description above is entirely applicable to the species description, with these additional characters of the holotype specimen. **Length:** 3.0 mm. **Width:** 1.2 mm. **Color:** Dorsum light reddish-brown, pronotum appearing lighter than elytra; abdomen except pygidial disc dark brown. The holotype specimen is missing left protarsomeres 2–5 and right metatarsomeres 4–5.

Description. Paratype males ($n = 15$) differ from the holotype as follows. **Length:** 2.6–3.1 mm. **Width:** 1.1–1.3 mm. **Elytra:** Except for the incomplete sutural stria, the striae-like longitudinal rugae may be artifacts of desiccation because they do not occur at the same location in all specimens. Some specimens have the abdomen more or less unicolorous with the dorsum, as opposed to that of the holotype which is much darker.



Figures 1–9. *Ardella magnaemirabilis* Paulsen, new species. 1–4) Holotype male. 1) Dorsal view. 2) Lateral view. 3) Labels. 4) Ventral view of head and pronotum. 5–9) Paratype male. 5) Dorsal view of head and pronotum. 6) Oblique view of male genitalia. 7) Cleft protarsal (left) and metatarsal (right) claws. 8) Dorsal view of right metatarsus and metatarsus showing spurs not reaching past tibial apex and simple claws. 9) Right wing, dorsal view.

Remarks. As with some other taxa from arid regions, presumably the metatarsi are folded up above the adjacent spurs into a dorsal groove and the corbels of the metatibial apices are used for locomotion, which may also be related to the metatibial spurs not reaching past the apices.

Etymology. The specific epithet, a feminine adjective in the nominative singular, is formed from the Latin words for ‘great’ and ‘wonderful’, which is an ironic nod to such a small insect. It is inspired by the moniker “The Great and Wonderful Ardell” that my sister often humorously insisted that our nieces and nephews call her. An incredibly unique insect can be great no matter the size, and unquestionably it can inspire wonder.

Distribution. The species is known from a single location in the Big Bend area of west Texas.

Discussion. From the comparisons above, and the recent work on Nearctic melolonthine tribes by Evans and Smith (2020), it is clear that this new taxon does not belong in any currently established tribe. For this reason, I propose Ardellini Paulsen, **new tribe**, with the type genus *Ardella* Paulsen, new genus, within the subfamily Melolonthinae. It is composed of a single monotypic genus, the generic description above pertaining equally to the tribe. The tribe Ardellini can be diagnosed by the characters listed under the generic description, including the unusual subcircular clypeus, elongate antennal club of males, absence of labrum/mandibles and protibial spurs, cleft protarsal and mesotarsal claws, apparently simple metatarsal claws, and, based on the only known species, its diminutive size of ~3mm. The new tribe is composed solely of the monotypic genus *Ardella* Paulsen, new genus, described herein.

Acknowledgments

I thank Ed Riley (TAMU), who has been an incredible mentor to younger coleopterists such as myself, and over a decade ago sent me a weird little “*Acoma*” to name, which turned out to be much, much more puzzling. Thank you to François Génier (Canadian Museum of Nature) for suggesting the correct Latin combining form to create the compound name. Thanks to Andrew Smith (CMNC) for some imaging, discussion and advice on dissections to locate abdominal spiracles on minute, dried specimens, and for reviewing the manuscript. Thanks also to Jean-Bernard Huchet (MNHN, Paris) for reviewing the manuscript. Additional auto-montage images were taken in the Biodiversity Synthesis Laboratory of the University of Nebraska State Museum.

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Received November 15, 2021; Accepted November 16, 2021.

Review editor Paul Skelley.

