7-28-2017

A new species of *Dipropus* Germar (Coleoptera: Elateridae) from Florida, with taxonomic and morphological notes and a new key to the species of the eastern United States

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INSECTA MUNDI A Journal of World Insect Systematics

0566

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Date of Issue: July 28, 2017

CENTER FOR SYSTEMATIC ENTOMOLOGY, INC., Gainesville, FL

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Insecta Mundi 0566: 1–7

ZooBank Registered: urn:lsid:zoobank.org:pub:5FECE071-77D5-4401-B4C6-C5FBDCE20904

Published in 2017 by
Center for Systematic Entomology, Inc.
P. O. Box 141874
Gainesville, FL 32614-1874 USA
http://centerforsystematicentomology.org/

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Layout Editor for this article: Eugenio H. Nearns

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Abstract. *Dipropus tequesta* Johnson **new species** (Coleoptera: Elateridae) is described from southern Florida. *Dipropus fuscus* (LeConte) is a **new synonym** of *D. soleatus* (Say), and *D. granosus* (Fall) is a **new synonym** of *D. asper* (LeConte). The flightless female of *D. asper* is described and provides the first report of brachyptery and endogean habits in *Dipropus*. A key to the species of the eastern United States and a new checklist of species for the country are provided.

Key Words. Taxonomy, fauna, checklist, endogean.

Introduction

The genus *Dipropus* Germar, 1839 is one of the largest and most taxonomically diverse genera of elaterids in the Americas. Champion (1895) was the first to revise *Dipropus* for the Mesoamerican portion of North America. Clark later (1963) revised the genus for the United States in an unpublished thesis. Still, *Dipropus* remained a genus of difficult to identify species. Clark (1963) and Johnson (2002) recognized eight species in America north of Mexico. Johnson (2016) reviewed and keyed the species of northwestern Mexico and the southwestern United States, describing five new species and designated a lectotype for *Elater soleatus* Say, and helped stabilize the genus in the United States by correcting historical misidentifications by Clark and others. This study brought the total number of species known from the United States to 11.

The external morphological uniformity of the species of *Dipropus* often makes species-level identification difficult. *Dipropus* shares with most other North American Dicrepidiina a complete and arcuate frontal carina, the pronotosternal suture excavated and reflexed anteriorly, membranous lobes present on tarsomeres 2 and 3 in most species, and tarsal claws simple and without basal setae. Casari (2008) presented a phylogenetic analysis of Dicrepidiina (as a subtribe of Ampedini) and showed that, as presently delineated, *Dipropus* is apparently polyphyletic.

Here, the species of the eastern United States are summarized, with a new species described from southern-most Florida, the female of *D. asper* described, and two new synonymies are proposed. A key is given to the species of the United States from the Great Plains and eastward (no species of the genus are known from Canada), with a revised checklist of species from the country.

Materials and Methods

Primary types were examined for all pertinent taxa, except the type of *Tricrepidius triangulicollis* Motschulsky that was examined in proxy with a specimen compared by M.C. Lane in 1964 and his notes on his study (unpublished notebook at USNM), confirming Horn's (1881) assessment.

Specimens were examined from the following institutions: ABSC (Archbold Biological Station Collection, Venus, Florida), BAMC (Blaine A. Mathison personal collection, Salt Lake City, Utah), BMNH

(British Museum of Natural History, London, United Kingdom), FSCA (Florida State Collection of Arthropods, Gainesville, Florida), CMNH (Carnegie Museum of Natural History, Pittsburg, PA), MCZ (Museum of Comparative Zoology, Cambridge, Massachusetts), MEM (Mississippi Entomological Museum, Starkville, Mississippi), UGCA (University of Georgia Collection of Arthropods, Athens, Georgia), USNM (U.S. National Museum, Washington, D.C.), VGIC (Vince Golia personal collection, Wellington, Florida). Standardized collection abbreviations are from Evenhuis (2013).

Morphological terms use follows Johnson (2016). Similarly, basic measurements were taken with an ocular micrometer at 0.1 and 0.01 mm increments. Body length was measured from the anterior margin of the frons to the elytra apices, and width is measured across the elytral humeri. The ocular index is the distance between the eyes divided by the distance across the eyes (Campbell and Marshall 1964). Antennomere lengths are measured along the lateral midline from antennomere base to apex, and values are rounded to one decimal place. The ratio string is given only for antennomeres 2, 3 and 11, with antennomeres 4–10 equal in length to antennomere 3. Pronotal length is along the midline from anterior margin to the antescutellar emargination, and width is at midlength or base of the hind angles, whichever is widest. Tarsomere lengths are measured along the dorsal midline, from base to apex, and values are rounded to two decimal places. Aedeagus total lengths were measured from the median lobe apex to the basal-most extension of the basal piece; paramere length from apex to posterior-most point along mesal margin; paramere tip along midline from apex to lateral spine; basal piece length from basal lateral angle to apex of shoulder junction with paramere. Aedeagal ratios are basal piece length/total length, paramere length/total length, paramere apex/paramere total length.

Label data is presented verbatim, except dates are standardized to the dd.mm.yyyy format, with the month in lower case Roman type.

Dipropus tequesta Johnson, new species

(Fig. 1–2)

Description. Male (Fig. 1): Length 8.4–10.1 mm, width 2.3–2.9 mm. Integument castaneous to rufotestaceous, venter slightly paler, antennae infuscate, legs colored as venter. Pubescence moderately sparse, pale blond.

Head with vertex and frons coarsely, umbilicately punctate; frons depressed, shallowly concave discally; frontal margin subcarinate, evenly arcuate, moderately projecting. Ocular index 55–64. Antenna of male long, midlength of antennomere 8 at apex of hind angle, apex of antennomere 10 reaching epipleural notch at body midlength; antennomere 2 short, length 0.8x width, antennomeres 3–10 moderately serrate, antennomere 2–3 and 11 length ratio 1.0:3.6, 6.0.

Pronotum width 1.1x length; trapezoidal; moderately, evenly convex; lateral margin carinate, obsolete shortly before reaching anterior pronotal margin; integument shining, punctures shallow, umbilicate, close anterolaterally, becoming simple, sparse, separated by 1.5–2.5x own diameters, small, shallow medially and distant posteriorly. Hind angles subparallel at base, incurved apically; with dorsal carina at median, extending to pronotal basal third; posterior margin with short incisions

Elytra with integument shining, finely microreticulate; stria with serial punctures rounded to slightly elongate-oval, setose; intervals shallowly convex basally, flattening apically, each with single irregular series of setose punctures; apices separately rounded, obliquely subemarginate near suture.

Mesoventral fossa broadly V-shaped; sides shallowly inclined. Mesocoxal lamina with obtuse to narrowly rounded, triangular posterior angle at basal third. Ventrites with moderately sparse, shallow, setate punctures.

Metaleg with tibia 1.1x length of femur, tarsus same length as tibia; tarsomeres 2 and 3 with broad ventroapical membranous lobes, tarsomeres 1 and 2 with moderately dense ventral brush of aureous setae; tarsomere length ratio 1.00:0.47:0.29:0.23:0.76.

Aedeagus (Fig. 2) length 1.05 mm; basal piece 0.46x total length, paramere 0.48 total length, paramere apex sagittate, 0.26 paramere length; median lobe narrow, constricted, downturned and narrowly obtuse at apex.

Female. Unknown.

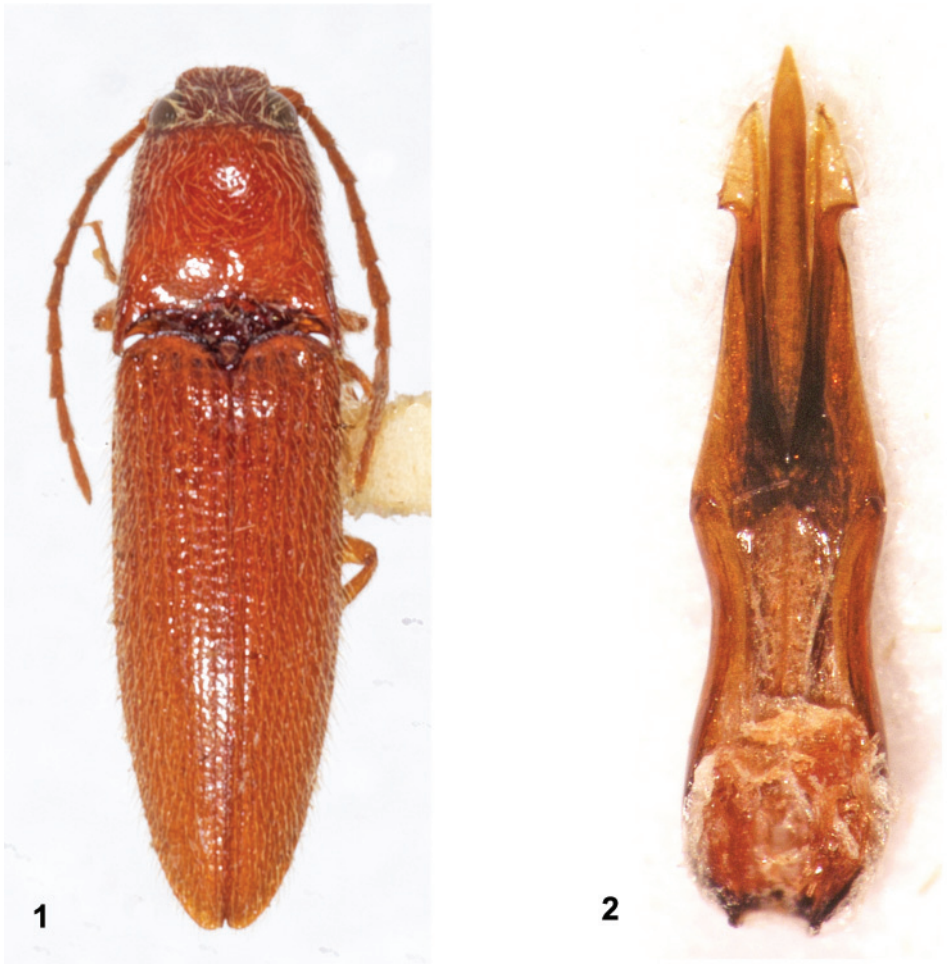
Type material. Holotype male, labeled: FLA, Monroe Co., Fleming Key, 6.vi.1979, John A. Acree & H.V. Weems, Jr., insect light trap (FSCA).

Paratypes (15), same as holotype (3, FSCA); same, 1.vi.1979 (1, FSCA); same, 4.vi.1979 (3, FSCA); same, 8-10.vi1979 (2, FSCA); same, 29-30.vi-1.vii.1979 (1, FSCA); same, 23.vii.1979 (1, FSCA); same, 30.vii.1979 (1, FSCA); Florida, Dry Tortugas, Loggerhead Key, 7.vi.1962, Woodruff, Weems, black light trap (2, FSCA).

Additional material. FLA: Monroe Co., USA, upper Key Largo, 10.v.1974, Bl, light, C. L. Smith, CLS 148//Ischiodontus sp., det. E. C. Becker (1, UGCA); same, Sugar Loaf Key, 4.vi.1983, W. H. Cross// blacklight trap (2, MEM); FLA: Monroe Co, upper Key Largo, 6-9 June 1994, R. Androw, M. Brattain (3, BAMC).

Etymology. The species epithet "tequesta" is treated as a noun in apposition and is in honor of the Tequesta indigenous people who once lived in southeastern Florida and the Keys, and are now apparently extinct.

Notes. *Dipropus tequesta* is apparently endemic to southern-most Florida, and is morphologically similar to certain undescribed *Dipropus* species from Cuba. It differs from other described species of *Dipropus* in the eastern United States by the characters used in the key below, in addition to the combination of the antennal length, antennomere length ratio, pronotal punctation, and aedeagal (Fig. 2) characters as described and illustrated.



Figures 1-2. *Dipropus tequesta* Johnson, new species. **1)** Male habitus. **2)** Aedeagus, dorsal aspect.

***Dipropus soleatus* (Say)**

Elater soleatus Say, 1834:79 [see Johnson (2016) for bibliography]
Ischiodontus oblitus Candèze, 1859:101
Anchastus fuscus LeConte, 1878:404 **new synonym**

This species was originally described from Indiana and is currently known from throughout much of the eastern United States. There are no type specimens for this species in the MCZ where the remaining Say types were deposited (Johnson 2016) and the type is believed to have been destroyed. Johnson (2017) examined the type of *Ischiodontus oblitus* housed in the BMNH, which had been labeled as *I. soleatus* by Becker in 1975, and designated it as the lectotype of *I. soleatus* (for a complete history of this specimen, see Johnson 2016). Clark (1963) previously considered *I. oblitus* a synonym of *D. simplex* (LeConte, 1853). The aedeagus of Johnson's lectotype is not consistent with the written description of the *D. soleatus* genitalia as described by Clark (1963). It appears that Clark based his descriptions on previously identified material and was possibly examining a specimen of *D. simplex* when he described the aedeagus of *D. soleatus*. Clark also used the texture of the elytra to separate *D. fuscus* and *D. soleatus*, but these characters are highly variable and unreliable to diagnose species of *Dipropus*. The aedeagus of the *I. oblitus* type is identical to that of LeConte's type of *A. fuscus* and we hereby propose *A. fuscus* as a **new synonym** of *D. soleatus*. Examination and dissection of many specimens throughout the study region show a strong correlation between the *I. oblitus-D. fuscus* aedeagus type and the shape of the pronotum. Other characters, such as body size and size of membranous tarsal pads, appear variable with no apparent correlation with one or the other.

***Dipropus asper* (LeConte)**
(Fig. 3)

Anchastus asper LeConte, 1878:104
Ischiodontus granosus Fall, 1925:180 **new synonym**

LeConte (1878) described *A. asper* from Cedar Keys, Levy Co., Florida. Fall (1925) described *I. granosus* from three specimens from Palm Beach County and Hog Island, Sumter Co., Florida (the holotype coming from the former), but evidently made no comparison to *A. asper*. Fattig (1951) and Peck and Thomas (1998) recorded both species from Georgia. The holotypes of both species (MCZ) were examined. The two types are superficially similar externally, with the type of *I. granosus* being a slightly more robust, paler in color, and having denser pronotal vestiture. The aedeagi, however, are essentially identical. Clark (1963) used the presence (*I. granosus*) or absence (*A. asper*) of a row of strong spines on tarsomere I, and the size of the membranous tarsal pads to separate the two species. An examination of the types of both species shows that these spines (thick, more heavily sclerotized setae) are present in the type of *A. asper* as well. Examination of nearly 200 specimens identified as either *A. asper* or *I. granosus* show that the size and prominence of these spines is variable and the spines, as to be expected in a fossorial species, may be prone to breakage and denuding. Other external characters, such as body size, pronotal shape, color, density of vestiture, and size of the membranous tarsal pads also appear to vary among individuals, with no correlation between one character or another. The most consistent character is the aedeagus, which differs only in size correlating roughly to the overall size of the specimen. Different morphotypes were also collected at the same locality. We hereby designate *I. granosus* as a **new synonym** of *D. asper*. At the time of their descriptions, neither the female of *D. asper* nor *I. granosus* were known. Clark (1963) did not mention the females for either species. We describe here the female of *D. asper* based on two specimens from Franklin and Highlands Counties, Florida.

Description of female of *D. asper* (Fig. 3). Body length 5.8–5.9 mm, width 1.9 mm wide; robust, convex, laterally subparallel; integument red-brown, pronotum slightly lighter than elytra; appendages concolorous with body; vestiture long, dense, yellow-gray in color.

Head with frons densely punctate, punctures shallow, umbilicate, separated by a distance less than their diameter; frontal margin formed by supra-antennal carinae complete, broadly rounded in dorsal view; eyes present but smaller than in male, partially concealed by both the frontal area of the head and the anterior margin of the pronotum; antennae very short, not reaching mid-length of pronotum, antennomere 1 long, antennomeres 2–11 short, rounded, moniliform.

Pronotum subquadrate, slightly wider than long, 1.5 mm long by 1.7 mm wide, slightly shiny, densely punctate, punctures shallow, umbilicate, separated by a distance less than their own diameters; hind angles very slightly divergent, unicarinate, carina short, not reaching base of hind angle and gently curving along lateral margin; hypomeron and prosternum sparsely punctate, punctures very shallow, umbilicate; prosternal sutures closed; prosternal process sharply reflexed upwards.

Elytra with strial punctures large, narrowly separated; intervals distinctly punctured, granulose; conjointly rounded at apex.

Metathoracic wings present, not folded, just reaching the last abdominal tergite.

Legs shorter than in male; row of stout spines on tibia and tarsomeres 1–3; tarsomeres shorter than in male, tarsomeres 2–3 lacking membranous lobes; claws simple.

Material examined. Car[r]abelle [sic] Beach, Franklin Co. FL, 7 July 1982, M. & S. Deyrup/coastal scrub habitat / Dipropus asper (LeConte), det. B. Mathison 2013 (1, ABSC); FL: Highlands Co., Archbold Biol. Sta., 14 May 1996, M. Deyrup / Head-down, about 4 mm below surface of sand, *in copula* with male (1, ABSC).

Figure 3. Dorsal (left) and lateral (right) views of the female of *D. asper*.

Discussion. Both specimens were found associated with males, with the Highlands County specimen found *in copula*. The female possesses brachypterous metathoracic wings, not longer than the elytra. Other distinctive features of the females such as the shorter legs and tarsi and reduced eyes and antennae are seen in the females of other psammophilous elaterids from the southeastern and southern Coastal Plains (e.g. *Floridelater americanus* (Horn) and *Selonodon* spp.). The lack of membranous lobes the tarsomeres and the proportionately large tibial spines, brachypterous metathorax, and the stout body form, and the collecting situations suggest that the females of *D. asper* are most-likely generally flightless and are adapted to subterranean activity in sandy substrates.

A key to the species of *Dipropus* of the eastern United States
(see Johnson (2016) for a key to the western species)

1. Side of pronotum nearly parallel for entire length; elytron elongate, about 3.0x as long as wide; antenna long, extending beyond apex of pronotal hind angle by 5 antennomeres in males, antennomeres 3–10 elongate and strongly serrate with extension of posteroventral angle ... . ***D. schwarzi* (Becker)**
— Side of pronotum not parallel beyond basal two-thirds, gradually converging apically; elytron shorter, never more than 2.5x as long as wide; antennae variable in length, flagellar antennomeres serrate **2**

2(1). Pronotal hind angle divergent; hind tibia and tarsomere 1 usually with row of strong, stout spines; small species, most specimens less than 6.5 mm in length ..... ***D. asper* (LeConte)**
— Pronotal hind angle scarcely to slightly divergent if at all; hind tibia lacking strong, stout spines; size variable, most specimens longer than 6.5 mm **3**

3(2). Species red-brown in color; pronotum longer than wide, widest at base of hind angle and clearly narrowing anteriorly; known only from Monroe County, Florida .... ***D. tequesta* new species**
— Species dark red-brown to black; pronotum as long as wide; species more widely distributed in the East and Southeast **4**

4(3). Pronotum trapezoidal, gradually tapering from posterior to anterior; aedeagus with median lobe subparallel, tapering subapically to subacute apex ..... ***D. simplex* (LeConte)**
— Pronotum subparallel in basal two-thirds, then gradually tapering anteriorly; aedeagus with median lobe gradually tapering from base to subacute apex ..... ***D. soleatus* (Say)**

Synonymical checklist of the *Dipropus* species of the United States (extralimital state records from Mexico in brackets)

Species	**Distribution**
Dipropus asper (LeConte)	USA: FL, GA
Ischiodontus granosus Fall	
D. ferreus (LeConte)	USA: NM, TX
D. reinae Johnson	USA: AZ, NM; [Mexico: SON]
D. schwarzi Becker	USA: AL, FL, SC
Ischiodontus parallelus Schwarz	
D. simplex (LeConte)	USA: AL, Fl, GA, LA, MS, TX
D. soleatus (Say)	AL, DC, FL, GA, IN, KS, KY, LA, MD, MI,
Ischiodontus oblitus Candèze	NJ, NY, OH, SC, TN, TX, VA
Anchastus fuscus LeConte	
D. sonora Johnson	USA: AZ; [Mexico: SON]

D. tequesta Johnson	USA: FL
D. warneri Johnson	USA: AZ, NM, TX
D. yaqui Johnson	USA: AZ, NM; [Mexico: SON]

Acknowledgments

We would like to thank Terry Schiefer, Mississippi Entomological Museum (MEM), Rick Hoebeke, University of Georgia Collection (UGCA), Mark Deyrup, Archbold Biological Research Station Collection (ABSC), Vince Golia (VGIC), Paul Skelley, Florida State Collection of Arthropods (FSCA), Robert Androw, Carnegie Museum of Natural History (CMNH), and others cited by Johnson (2016) for making specimens available during the course of this study. Robert Otto, Suring, WI and Sam Wells, Southern Utah University, St. George, UT kindly reviewed the manuscript.

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Received April 23, 2017; Accepted June 19, 2017.
Review Editor M.J. Paulsen.