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A third species of *Haroldiellus* Gordon and Skelley, 2007
from Mexico and Central America
(Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini)

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A third species of *Haroldiellus* Gordon and Skelley, 2007
from Mexico and Central America
(Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini)

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Abstract. *Haroldiellus woodruffi* Skelley and Keller, **new species**, (Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini), from Costa Rica, Guatemala, Mexico, and Panama is described. An updated key for the genus, updated distributions, and diagnoses for the other two species are provided.

Key words. Taxonomy, biodiversity, dung beetles, Mexico, Guatemala, Costa Rica, Panama.

Resumen. Se describe la **nueva especie** *Haroldiellus woodruffi* Skelley y Keller (Coleoptera: Scarabaeidae: Aphodiinae: Aphodiinae) de Costa Rica, Guatemala, México y Panamá. Se provee una clave, distribuciones y diagnósis actualizadas para las otras dos especies.

Palabras clave. Taxonomía, biodiversidad, escarabajos coprófagos, México, Guatemala, Costa Rica, Panamá.

ZooBank registration. urn:lsid:zoobank.org:pub:B6862B03-E882-437A-B9E0-3B5FB1443602

Introduction

Worldwide, the scarabaeid subfamily Aphodiinae Leach, 1815 (when including Aegialiinae Laporte, 1840) consists of about 3200 species in 14 tribes and around 280 genera (Nikolajev 2008; Skelley 2008; Minkina 2020; Catalogue of Life 2021). Revisionary work has been recently accomplished for most of the New World fauna (PES pers. observation), yet new species are still being discovered and need description. The genus *Haroldiellus* (Type species: *Aphodius sallei* Harold 1863), consists of two species which are known from the United States south to Colombia and Jamaica, Hispaniola and the U.S. Virgin Islands in the West Indies. Here we describe a third species in the genus *Haroldiellus* Gordon and Skelley, 2007, present a key to the species in the genus, and provide diagnoses and updated distributions for *H. lansbergei* (Harold, 1874) and *H. sallei* (Harold, 1863).

Materials and Methods

We examined material and received distribution data from the following institutional collections:

CMN Canadian Museum of Nature, Ottawa, Ontario, Canada (Andrew Smith)

DCGI Dellacasa Collection, Genoa, Italy (Marco Dellacasa)

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

LSAM Louisiana State Arthropod Museum, Baton Rouge, LA, USA (Victoria Bayless, Able Chow)

SEMC Snow Entomological Museum Collection, Lawrence, KS, USA (Zack Falin)

TAMU Texas A&M University, College Station, TX, USA (Karen Wright)

Specimens were examined using a Leica MS5 stereomicroscope equipped with an ocular grid. Photographs were taken with a Syncroscopy Auto-Montage system with a JVC 3-CCD, KY-F75U digital camera through a Leica Z16 APO lens.

Verbatim label data are cited for all designated type material. Separate labels are indicated by space, double slash, space (//), and line breaks by slash, space (/). Additional information and remarks are placed in brackets.

The holotype of the new species has a printed red label with: “HOLOTYPE ♂/ *Haroldiellus/ woodruffi* P.Skelley/ & O.Keller des. 2022”. The allotype has a blue with: “ALLOTYPE ♀/ *Haroldiellus/ woodruffi*/ P.Skelley/ & O.Keller des. 2022”. The paratypes have yellow labels: “PARATYPE [sex symbol]/ *Haroldiellus/ woodruffi* P.Skelley/ & O.Keller des. 2022”. Specimens studied are deposited at the FSCA (Holotype, Allotype and three paratypes), the SEMC (one paratype), the DCGI (eleven paratypes), and the CMN (two paratypes).

Distribution data was recorded at the level of administrative divisions (departments, parishes, provinces, states) for each country, and maps were created with SimpleMappr (Shorthouse 2010).

Morphological descriptions and terminology followed the descriptions given in Gordon and Skelley (2007) and followed recommendations on useful characters for identifications and diagnostic keys by Dellacasa et al. (2002).

Results

Haroldiellus Gordon and Skelley, 2007

Haroldiellus Gordon and Skelley 2007: 269. Type species: *Aphodius sallei* Harold 1863: 336, by original designation.

Diagnosis. [Modified from Gordon and Skelley 2007, and Skelley’s website (Skelley 2008)] Body length 4.3–5.8 mm, ovate, robust, dark brown to black. Body not fimbriate. Head with three tubercles along frontal suture, lateral ones weak, most prominent in males. Clypeus lacking teeth and setal fringe. Scutellum small, pentagonal. Elytral striae deep and coarsely punctate. Protibial dorsal surface with few punctures in an indistinct longitudinal row, lost in some species. Metatibial apical spinules short and equal in length.

Remarks. A key to genera of Aphodiini in the US is in Gordon and Skelley (2007). A key to New World genera can be found at Skelley (2008). Gordon and Skelley’s (2007) generic description was based primarily on *H. sallei*. Specimens of *H. lansbergei* and the new species were not available at that time. The protibial punctation partially used to define *Haroldiellus* is present only on *H. sallei*, not on the other species.

The tribe Aphodiini can be divided easily by genera that possess a punctate dorsal protibial surface and those that do not. However, the vast majority of those with a punctate surface are covered with scattered, more densely spaced punctures. In *H. sallei* and *Gordonius* Skelley, the protibial punctures are few, sparse and arranged in a couple more or less longitudinal, medial rows. In the New World, the body shape of those with dense protibial punctation is more elongate and flattened, while *Haroldiellus* and *Gordonius* are robust and more rounded.

Key to species of *Haroldiellus*

1. Protibial dorsal face with punctures in both sexes (Fig. 4); male median frontal tubercle narrow, prominently conical (Fig. 6); body brown, elytra with dark striae and paler intervals on disc, otherwise no discernible color pattern (Fig. 1); southern US to Colombia ***H. sallei* (Harold)**
- Protibial dorsal face lacking punctures in both sexes (Fig. 5); male median frontal tubercle transversely widened (Fig. 7, 9); body dark brown, often with color pattern on elytra (Fig. 2–3) **2**
2. Elytral striae weakly impressed, intervals weakly convex; elytra with dark striae and pale intervals on disc, rarely intervals dark (Fig. 2); male median frontal tubercle transversely widened, not distinctly bifid (Fig. 7); high elevations in southern Mexico ***H. lansbergei* (Harold)**
- Elytral striae deeply impressed, intervals convex; elytra with dark striae on disc, intervals pale with undulating diagonal black marking (Fig. 3); male median frontal tubercle transversely widened and distinctly bifid (Fig. 9); high elevations in Mexico, Guatemala, Costa Rica, and Panama ***H. woodruffi* Skelley and Keller, new species**

***Haroldiellus lansbergei* (Harold)**

Figures 2, 7, 10

Aphodius lansbergei Harold 1874: 179 ~ Bates 1887: 84; Blackwelder 1944: 212; Dellacasa et al. 1998: 158 (habitus, epipharynx and aedeagus figured; lectotype designated).

Aphodius (Bodilus) lansbergei Harold ~ Schmidt 1913: 123.

Agrilinus lansbergei (Harold) ~ Dellacasa et al. 2002: 161.

Haroldiellus lansbergei (Harold) ~ Gordon and Skelley 2007: 270.

Diagnosis. Length 4.3–5.0 mm, width 1.9–2.4 mm. A member of *Haroldiellus* distinguished from other species by: Elytral striae weakly impressed, intervals weakly convex, interval color pale, lacking distinct markings (Fig. 2). Female lacking median frontal tubercle; male median frontal tubercle transverse (Fig. 7). Protibia with dorsal surface lacking punctures.

Distribution. (Fig. 10). **Mexico** (Chiapas, Hidalgo, Michoacán, Oaxaca, Querétaro, San Luis Potosí, Veracruz). Records here are repeated from Dellacasa et al. 2002; Skelley et al. 2007; Halffter et al. 2012; Minor 2017.

Material examined. MEXICO: Chiapas/ 10 km. e. La Trinitaria/ August 14, 1967/ under dung/ W.W. Gibson // TAMU-ENTO/ X0081443/ Barcode // *Haroldiellus/ lansbergei*/ det.P.E.Skelley 2021 (1 TAMU); MEXICO: State of/ Hidalgo, 1Km.N / Jacala, 5000Ft. // R.E.Woodruff/ 24-X-70/ Cow Dung (4 FSCA); MEXICO: Hidalgo/ Puerto de la Zora/ 24-X-1970, light/ R. E.Woodruff (1 FSCA); E. DO MICHOACAN / rd. Méx-37 Uruapan / – Nueva Italia / La Gallina dint. // m 1250-23.07.2001 / N19°19' -W102°04' / M. Dellacasa & / I. Martinez leg. (1 CMN); MEXICO: Querétaro; Mpio:/ Jalpan; nr.Valle Verde,/ Bio.St.El Pilon/ 21°27'41"N, 99°10'41"W/ 11-DEC-2013, 1284m/ P.Skelley, P.Kovarik, R. Jones (1 FSCA); Rancho Pextlán/ (Xico)/ 19°25'28.9"N/ 97°01'43.0W/ 19.III.2005 - m 1465 // MEXICO/ Edo. Veracruz/ Leg. González O. &/ Suarez T./ *excr. bovino* // *Haroldiellus/ lansbergei* (Harold, 1874)/ Det. Dellacasa, 2011 (1 FSCA); Rancho Pexatlan/ Mpio. Xico/ 19°25'28.9"N/ 97°01'43.0W/ 12.IX.2005 - m 1465 // MEXICO/ Edo. Veracruz/ Leg. Cruz M. Cabrero F. & Suarez T./ *excr. vaca* // *Haroldiellus/ lansbergei* (Harold, 1874)/ Det. Dellacasa, 2011 (1 FSCA).

Remarks. The specimen from Querétaro is slightly larger than other specimens presently available. It also has the discal intervals of the elytra darkened, appearing as a single dark mark. Other morphological features like the more flattened intervals and lack of protibial punctures indicate it is *H. lansbergei* as presently understood. The Chiapas (Mexico) record published in Minor (2017) represents most likely the new species described herein, but needs to be re-examined based on its locality.

***Haroldiellus sallei* (Harold)**

Figures 1, 4, 6, 11

Aphodius sallei Harold 1863: 336 ~ Blackwelder 1944: 213; Dellacasa et al. 1998: 159 (habitus, epipharynx and aedeagus figured; lectotype designated).

Aphodius sallaei (Harold) ~ Bates 1887: 83 (incorrect spelling); 1889: 391.

Aphodius (Bodilus) sallei (Harold) ~ Schmidt 1913: 166; 1922: 304; Dellacasa 1988: 373.

Agrilinus sallei (Harold) ~ Dellacasa et al. 2002: 159.

Aphodius (Agrilinus) freyi Balthasar 1941: 164 ~ M. Dellacasa 1988: 366; Dellacasa et al. 2000: 15 (synonymy).

Haroldiellus sallei (Harold) ~ Gordon and Skelley 2007: 270.

Diagnosis. Length 3.5–5.5 mm, width 1.8–2.0 mm. A member of *Haroldiellus* distinguished from other species by: Elytral striae deeply impressed, intervals convex; interval color pale lacking distinct marks (Fig. 1). Female lacking median frontal tubercle; male median frontal tubercle conical, not transversely widened (Fig. 6). Protibia with dorsal surface lacking punctures (Fig. 4).

Distribution. (Fig. 11). **USA** (Arizona, south central Texas); **Mexico** (Chiapas, Durango, Estado de México, Guerrero, Hidalgo, Jalisco, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, Quintana Roo, San Luis Potosí, Sonora, Tabasco, Tamaulipas, Veracruz, Yucatán); **Guatemala** (Alta Verapaz, Baja Verapaz, El Progreso, Escuintla, Guatemala, Izabal, Quetzaltenango, Sacatepéquez, Santa Rosa, Zacapa); **El Salvador** (Chalatenango, Cuscatlán, La Libertad, San Salvador, San Vicente, Santa Ana); **Honduras** (Comayagua, Copán, Cortés, El Paraíso, Francisco Morazán, Ocotepeque, Olancho); **Nicaragua** (Boaco, Jinotega, León, Managua, Río San Juan, Rivas); **Costa Rica** (Alajuela, Cartago, Guanacaste, Heredia, Limón, Puntarenas, San José); **Panama**

(Chiriqui, Coclé, Panama, Veraguas); **Colombia** (Valle de Cauca); **Jamaica** (Clarendon, Manchester, Portland, Saint Andrew, Saint Ann, Saint Catherine, Saint Thomas, Trelawny); **Haiti** (Artibonite, Ouest, Sud-Est); **Dominican Republic** (Azua, Barahona, La Altagracia, La Vega, Monte Cristi, Pedernales, San Cristobal, Santo Domingo); **US Virgin Islands** (St. Thomas).

These are records repeated from Bates 1887, 1889; Balthasar 1941; Dellacasa et al. 2002; Skelley et al. 2007; Ramírez-Ponce et al. 2009; Cruz R. et al. 2012; Halffter et al. 2012; López-Collado et al. 2017; Minor 2017; Perez-Gelabert 2020; Rivera-Gasperin and Escobar-Hernández 2020; and Warner 2022 *in press*. Additional records are from museum specimens deposited in CMN; FSCA; LSAM; TAMU. In the United States, the only records we were able to confirm are from southern Texas and Arizona. The distributional comments in Dellacasa et al. (2002) of “southern coast, from South Carolina and Florida to Texas” is in error.

Materials examined. Over the years, we have examined hundreds of specimens in the museums cited above plus many more. These data are too voluminous to present in this paper. Their distribution is abbreviated above.

Remarks. As noted by Dellacasa et al. (2002), *H. sallei* is a widespread common lowland species. It is often collected in cow dung.

***Haroldiellus woodruffi* Skelley and Keller, new species**

Figures 3, 5, 8–9, 12–17

Diagnosis. Length 5.3–5.8 mm, width 2.4–2.7 mm. A member of *Haroldiellus* distinguished from other species by: Elytral intervals convex, striae deeply impressed; interval color pale with distinct diagonal black marking (Fig. 3). Female lacking median frontal tubercle (Fig. 8); male median frontal tubercle transverse and bifid (Fig. 9). Protibia with dorsal surface lacking punctures (Fig. 5).

Description. Male holotype. Length 5.6 mm, width 2.6 mm. Body robust, not flattened. Body (Fig. 3, 12–13) color dark reddish brown except head and lateral pronotum pale reddish brown; elytra yellowish brown, striae darkened over disk, intervals with an irregular diagonal dark mark notably contrasting with pale part of intervals; legs paler yellowish brown. Dorsal surface glossy; glabrous; body not fimbriate; ventral surface with moderately long, moderately dense pubescence. Anterior clypeal margin with angles rounded, margin between angles thickened, emarginate. Clypeus and epistome coarsely punctured, flat. Frontal suture trituberculate (Fig. 9), median tubercle broad and bifid. Genae moderately developed, slightly deflexed. Pronotum shiny; with intermixed moderate and fine punctures, all punctures separated by 1–2 times their diameter on disc. Scutellar shield weakly pentagonal, not depressed. Elytra with striae deeply impressed, coarsely punctured; intervals convex, glossy, finely punctured. Ventral surface and metafemur with few coarse punctures. Male metaventricle not deeply excavated, without patch or fringe of dense setae. Protibia lacking dorsal punctures (Fig. 5), unmodified; protibial spur and protarsus unmodified. Inferior mesotibial spur straight at apex, lacking tooth. Metatrochanter with a single seta. Metafemur robust, wider than metacoxa; posterior margin of metafemur smooth, glabrous. Metatibia robust, apically flared, not compressed; apex of metatibia fringed with short, equal spinules. Metatarsus as long as metatibia, tarsomeres slender, cylindrical, with basal tarsomere as long as superior tibial spur, slightly longer than tarsomeres 2 and 3 combined. Epipharynx transverse, side rounded, anterior margin concave towards middle; epitorma conical; corypha slightly protruding, with apical clump of long, slender celtetes; pedia pubescent, with several stout, scattered chaetae; chaetopariae moderately dense, moderately elongate (Fig. 14). Male genitalia unmodified; parameres slightly widening at apex, without membranous appendage (Fig. 15–16).

Female allotype. Length 5.3 mm, width 2.4 mm. Body more elongate, less robust than male; median frontal tubercle reduced to simple swelling (Fig. 8).

Variation. Paratypes show some variation in the thickness of the black elytral markings, but they are always well-defined.

Type material. Holotype male (FSCA) label data: GUATEMALA: El Progreso;/ Sierra de las Minas; nr.Pinalon,/ nr.Finca la Tormenta,/ nr.15.07222,-89.94891;/ 15-17-V-2010; ~2199m;/ P.Skelley, moist oak forest // [red paper] HOLOTYPE ♂/ *Haroldiellus woodruffi* P.Skelley/ & O.Keller. **Allotype** female (FSCA) label data: // GUATEMALA:Guat./ Puerta Parada/ 14°33'24" -90°27'48"/ 26.III-6.IV.2005/ J.Schuster, 1840m // [blue paper] ALLOTYPE ♀/ *Haroldiellus woodruffi* P.Skelley/ & O.Keller. **Paratype** (18 total) label data: COSTA RICA: Prov.

of/ San Jose, San Isidro/ de Coronado, Finca, Holanda, 5,500 Ft. // Aphodius/ near *sallei* Har./ # 29 [red ink] Gordon #21 [pencil]/ DET. R.E.Woodruff -72 (1m FSCA); GUATEMALA: Guatemala,/ Santa Catarina Pinula,/ Puerta Parada, Casa-Jack/ Schuster, 1860m,/ N 14.45572 W 90.4653/ 4-11-VII-2009, J.Schuster (1m FSCA); GUATEMALA: San Marcos:/ Parque Municipal Refugio/ del Quetzal 1810m 14.93916/ -91.87295 4-11-VI-2015 ZHFalin/ ex. flight intercept trap. cloud/ forest GUAT1F15 099 // Barcode/ SEMC1464610/ KUNHM-ENT (1f SEMC); PANAMA: Chiriqui/ Mt. Totumca Lodge/ 19-25-VI-2012/ J.B.Heppner, at light(1m FSCA); PANAMA: Chiriqui/ Prov. 2km W Cerro/ Punta 8°51'N/ 82°36'W 3.vi.1977/ H.& A.Howden (1m CMN); PANAMA, Chiriqui/ Prov. 2-3km E Cerro/ Punta, 2000-2200m, 1./ VI.77 H. & A. Howden // *Haroldiellus*/ n.sp./ det. P. Skelley/ det. , 20 2012 (1m CMN); Chiquihuite dint./ 15°05'41.0"N/ 092°06'04.3"W/ 23.VI.2007 - m 2060 // MEXICO/ Edo. Chiapas/ Leg. Dellacasa M./ & Fresi C. (1m, 7f DCGI, 1f FSCA); MEXICO: Chiapas/ Mpio: Motozintla/ Boquerón/ 10/V/ 2003/ B. Gómez (1f DCGI); MEXICO: Chiapas/ Mpio: Motozintla/ Boquerón/ 29/I/ 2004/ B. Gómez (1m DCGI); // MEXICO: Chiapas/ Mpio: Motozintla/ Boquerón/ 11/V/ 2003/ B. Gómez (1m DCGI);

Distribution. (Fig. 17). Mexico (Chiapas), Guatemala (El Progreso, Guatemala, San Marcos), Costa Rica (San José), Panama (Chiriqui).

Etymology. This species is named after Robert Woodruff, friend and mentor, who first studied this species and recognized it as something different, but near *H. sallei*.

Remarks. *Haroldiellus woodruffi*, like *H. lansbergei*, appears to be a species occupying higher elevations.

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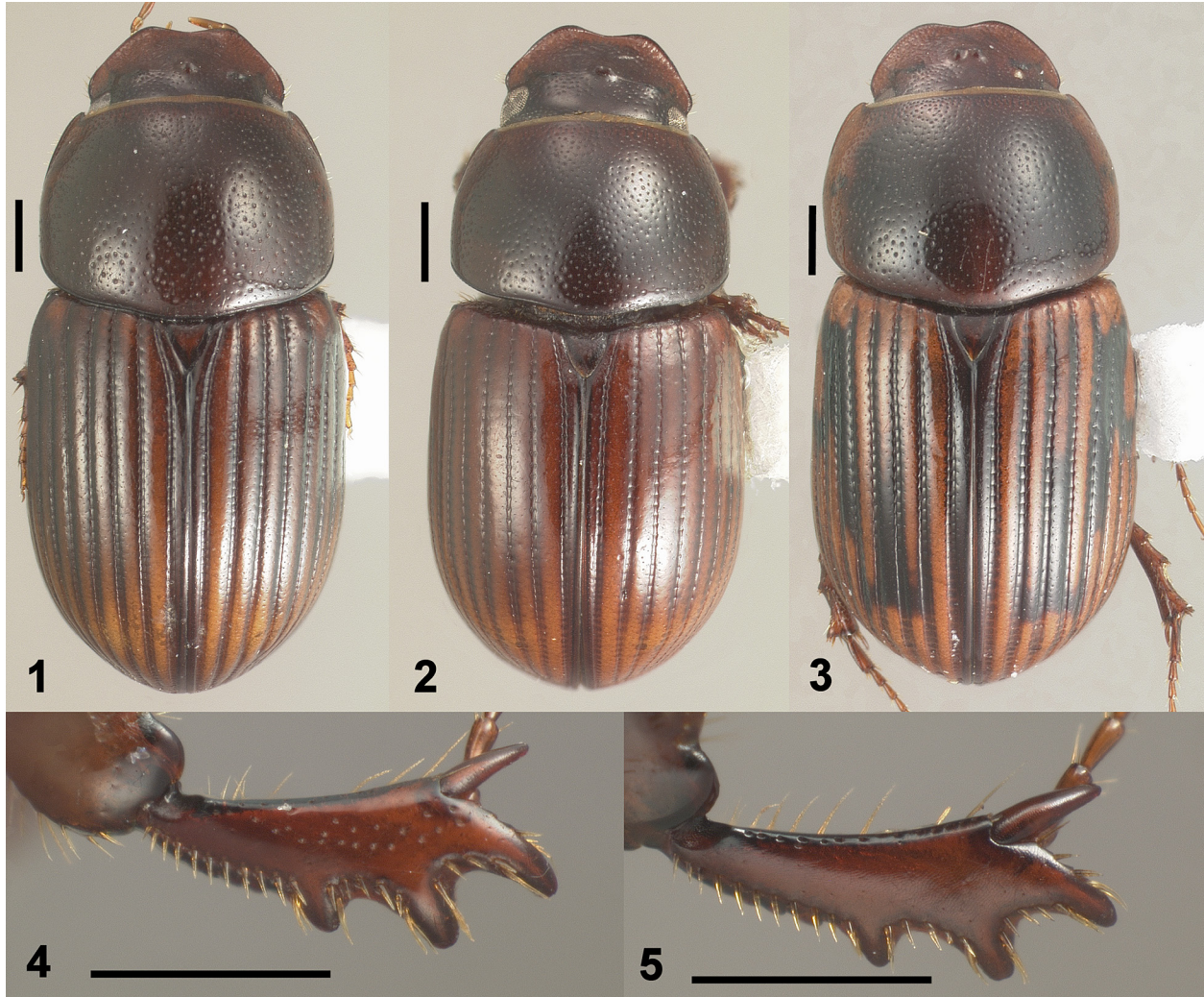
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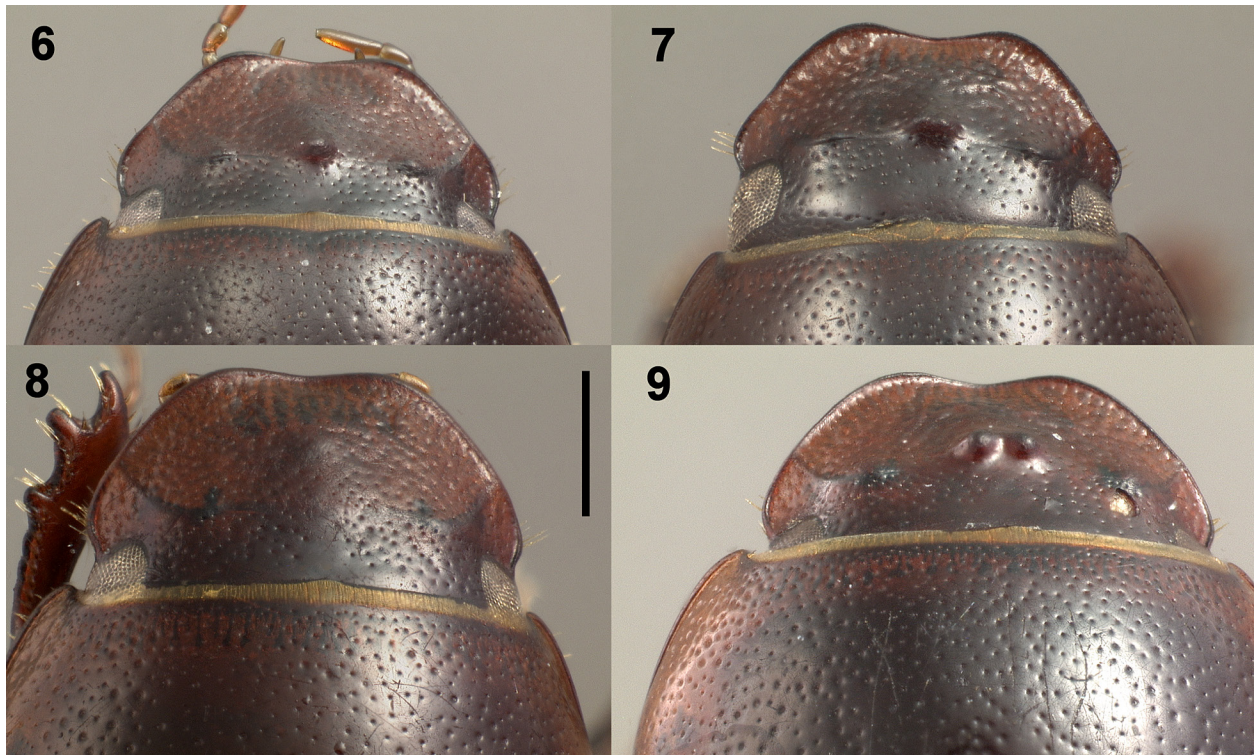
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Figures 1–5. *Haroldiellus* species. 1) *H. sallei* dorsal habitus. 2) *H. lansbergei* dorsal habitus. 3) *H. woodruffi*, holotype, dorsal habitus. 4) *H. sallei* protibia dorsal surface with punctures. 5) *H. woodruffi* protibia dorsal surface without punctures. Scale line = 0.5 mm.



Figures 6–9. Heads of *Haroldiellus* species. **6)** *H. sallei*. **7)** *H. lansbergei*. **8)** *H. woodruffi* female allotype. **9)** *H. woodruffi* male holotype. Scale line = 0.5 mm (all figures).

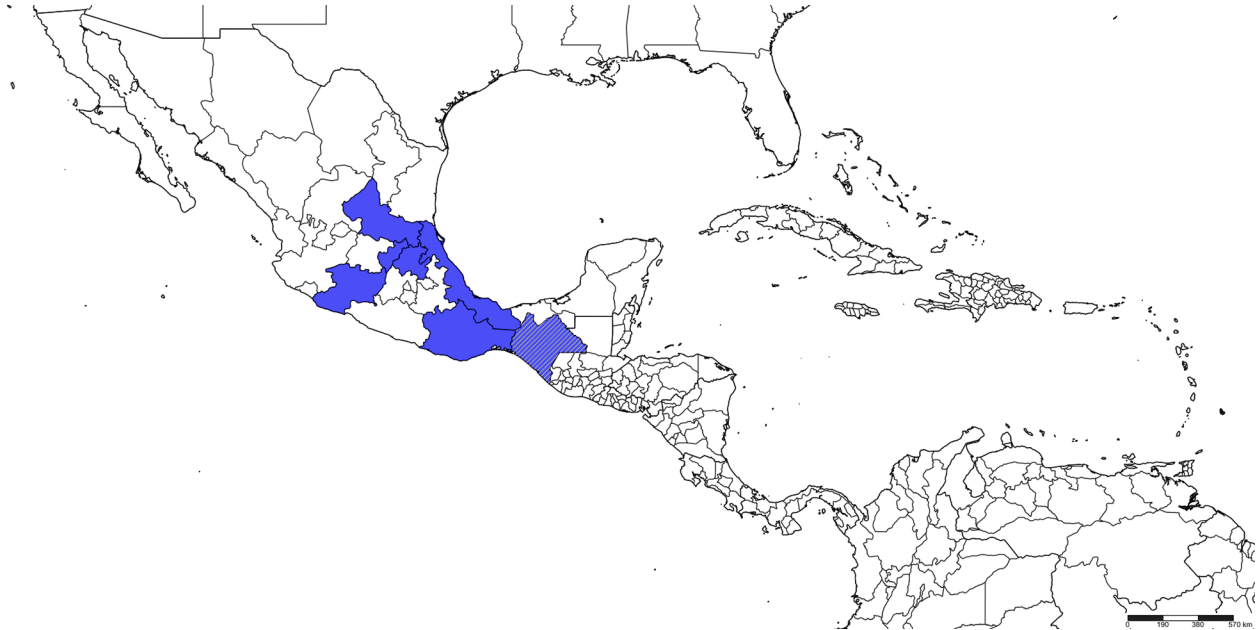


Figure 10. Distribution map of *Haroldiellus lansbergei* (blue) as currently known from specimen labels and literature records. Chiapas, Mexico is striped because it is a literature record that may represent the new species *H. woodruffi* described herein. Map made with SimpleMappr (Shorthouse 2010).

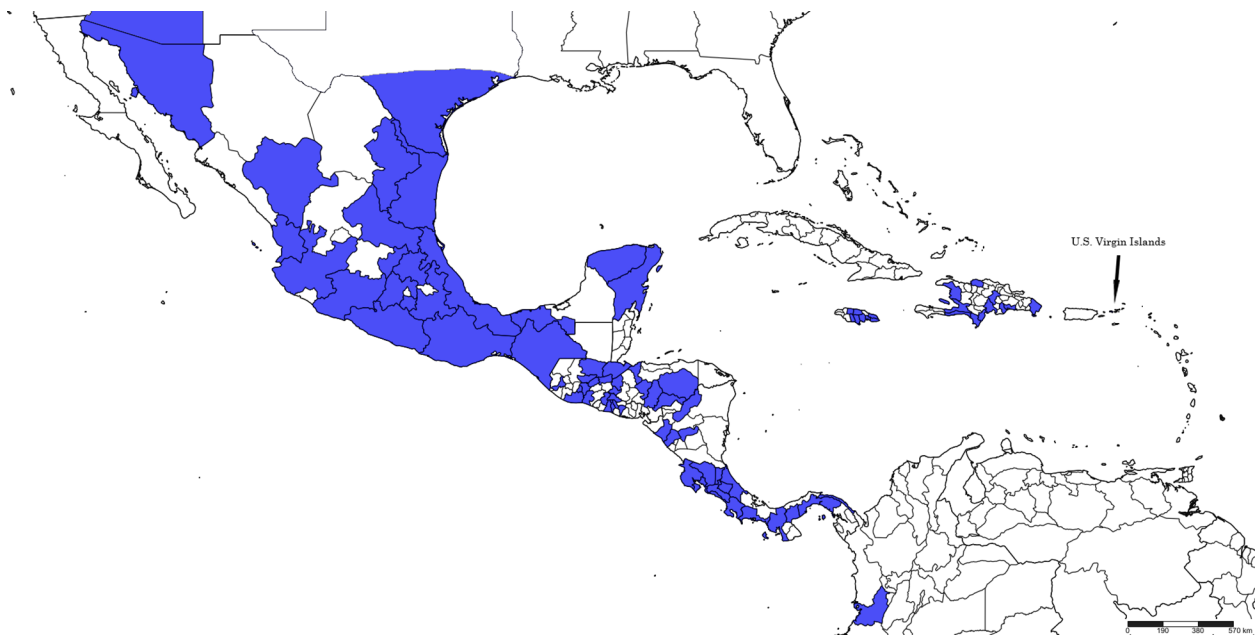
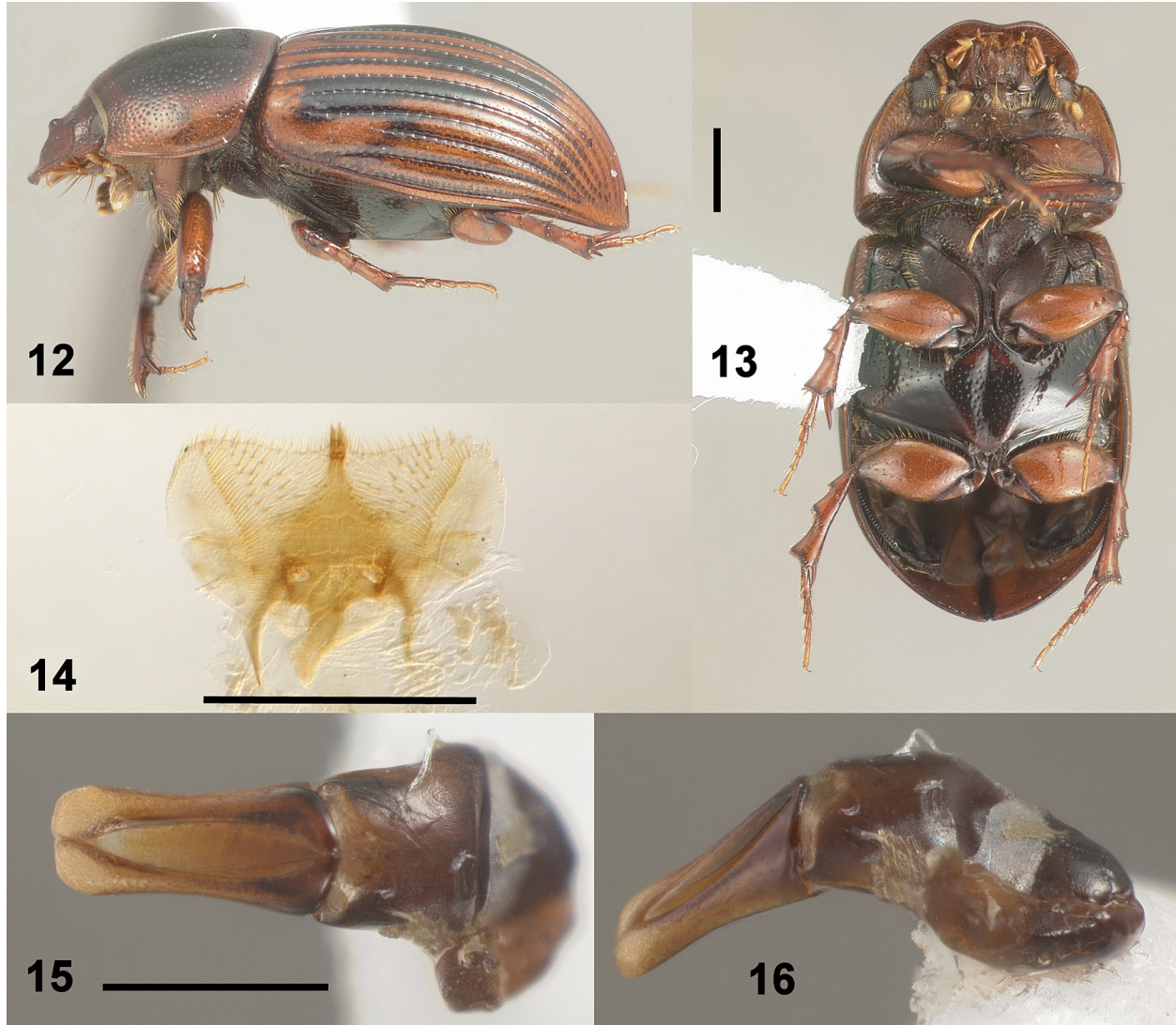


Figure 11. Distribution map of *Haroldiellus sallei* (blue) as currently known from specimen labels and literature records. Map made with SimpleMappr (Shorthouse 2010).



Figures 12–16. *Haroldiellus woodruffi*, male holotype. 12) Lateral habitus. 13) Ventral habitus. 14) Epipharynx. 15–16) Genitalia dorsal and lateral. Scale line = 0.5 mm (figure 12 same scale bar as 13, figure 16 same scale bar as 15).



Figure 17. Distribution map of *Haroldiellus woodruffi* new species (blue) as currently known from specimen labels. Map made with SimpleMappr (Shorthouse 2010).

