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PANAMANIAN *ONTHOPHAGUS* (COLEOPTERA: SCARABAEIDAE):
DESCRIPTION OF A NEW SPECIES, AND A REVISED KEY TO THE SPECIES

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ABSTRACT

A new Panamanian species of scarab beetle of the subfamily Scarabaeinae, *Onthophagus cambrai* **sp. nov.**, is described and illustrated. The character states of this species do not allow it to be placed in a known species-group of the New World. A revised key to the 26 species known from Panama is presented.

Key Words: taxonomy, scarab beetle, Scarabaeinae, Panama

RESUMEN

Se describe e ilustra una nueva especie panameña de escarabajo de la subfamilia Scarabaeinae, *Onthophagus cambrai* **sp. nov.** Los estados de carácter presentes en esta especie no permiten ubicarla en algún grupo de especies conocido de América. Se presenta una clave de identificación actualizada para las 26 especies conocidas de Panamá.

Translation provided by the authors.

Palabras Clave: taxonomía, escarabajo, Scarabaeinae, Panamá

The genus *Onthophagus* Latreille (Coleoptera: Scarabaeidae) is the most diverse genus of Scarabaeoidea as well as one of the larger genera of Coleoptera. It includes just over 1,750 species worldwide, with about 790 of them occurring in Africa (Scholtz et al. 2009). In the Americas 169 species are recognized of which 89 are known from Mexico (Pulido-Herrera & Zunino 2007; Kohlmann & Solís 2012).

The Panamanian species of *Onthophagus* were studied extensively in the classic faunal work on the subfamily Scarabaeinae by Howden & Young (1981). Since that publication, there have been several additions and changes to the list of species of this genus: *Onthophagus dorsipilulus* Howden & Gill, *O. atriglabrus* Howden & Gill, *O. propraecellens* Howden & Gill, *O. barretti* Génier & Howden, and *O. turgidus* Kohlmann & Solís were described as new species from Panama (Howden & Gill 1987; Génier & Howden 1999; Kohlmann & Solís 2012); *O. orphnoides* Bates was revalidated for the Central American specimens previously assigned to *O. mirabilis* Bates by Howden & Young (1981) (Génier & Howden 1999); specimens formerly cited as *O. belorhinus* Bates by Howden & Young (1981) were assigned to a new species *O. grataehelenae* Kohlmann & Solís (Kohlmann & Solís 2001); *O. crinitus* pana-

mensis Bates was synonymized under *O. crinitus* Harold by Kohlmann & Solís (2001); *O. quetzalis* Howden & Gill was originally described from Costa Rica and Panama (Howden & Gill 1993), but Solís & Kohlmann (2003) later described the Panamanian specimens as a new species *O. xiphias* Solís & Kohlmann.

In this work we add a new species of this genus to the fauna of Panama, collected in the southern region of the Veraguas Province, and include a key to the 26 species now known from this country.

MATERIALS AND METHODS

Morphological structures were studied using a Carl Zeiss Stemi SV-6 stereomicroscope. Measurements are given in millimeters. Microphotographs were made by a Jeol JSM-5600LV scanning electron microscope. Length was measured from the apex of the clypeus to the apex of the pygidium, and width across the widest portion of the elytra. The characters and terminology used are those of Howden & Young (1981).

Abbreviations for institutions cited in this study are: Museo de Invertebrados G. B. Fairchild, Universidad de Panama, Panama (MIUP); Canadian Museum of Nature, Ottawa, Canada

(CMNC); California Academy of Sciences, San Francisco, USA (CASC); Smithsonian Tropical Research Institute, Panama City, Panama (STRI); Colección Nacional de Insectos de la Universidad Autónoma de México, Mexico City, Mexico (CNIN); Colección Entomológica del Instituto de Ecología, A. C., Xalapa, Mexico (IEXA); M. Zunino collection, Urbino, Italy (MZCI); W. B. Warner collection, Chandler, USA (WBWC); M. A. Morón collection, Xalapa, Mexico (MAMC); D. J. Curoe collection, Mexico City, Mexico (DJCC); L. Delgado collection, Mexico City, Mexico (LLDC).

Onthophagus cambrai Delgado and Curoe, **sp. nov.**
(Figs. 1 and 2)

Type Material

HOLOTYPE ♂ and ALLOTYPE ♀ labeled: "PANAMÁ: Veraguas, Cerro Hoya, 1-6-VI-2008, Alt. 1,450 m, trampa de intercepción de vuelo, D. Curoe col.". PARATYPES (7 ♂♂, 13 ♀♀) with same data as holotype.

The holotype and allotype are deposited in MIUP. Twenty paratypes are deposited in: CMNC (1♂ 1♀), CASC (1♀), STRI (1♀), CNIN

(1♀), IEXA (1♂ 1♀), MZCI (1♂ 1♀), WBWC (1♀), MAMC (1♀), DJCC (2♂♂ 3♀♀), and LLDC (2♂♂ 2♀♀).

Description. HOLOTYPE male (Fig. 1). Total length: 9.3 mm; width: 5.6 mm. Color of basal half and sides of pronotum and elytra dull grayish-black, surface finely alutaceous; head, anterior portion of pronotum, venter and legs shining black. Anterior margin of clypeus wide, rounded, reflexed at the central $\frac{3}{4}$; sides of clypeus arcuate; clypeal surface concave, with shallow, median punctures. Clypeal-frontal carina straight, highest at the central $\frac{3}{4}$, almost absent to sides. Frons slightly convex with larger punctures than those of clypeus. Vertex with two lateral, long, divergent horns placed in line with median portion of eyes, horns connected by low, rounded carina; surface of vertex almost smooth. Pronotum without basal margin; anterior angles right and rounded, median angles widely rounded, anterolateral and posterior angles obtuse. Pronotum anteriorly with broad, flat, shelf-like projection extending above posterior edge of vertex, apex of projection bifurcate with rami directed toward sides; anterior half of pronotum with two lateral concavities. Basal half and sides of pronotum with small to

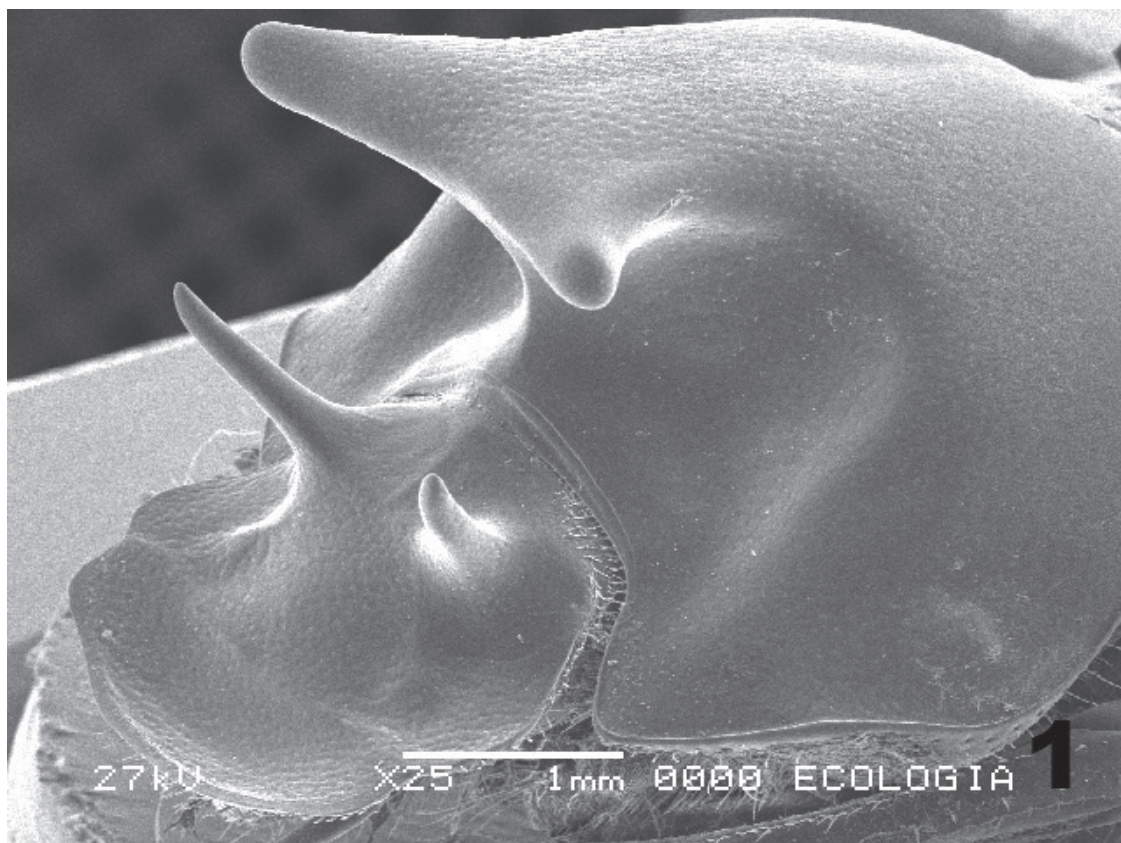


Fig. 1. *Onthophagus cambrai* **sp. nov.** Head and pronotum of male, $\frac{3}{4}$ view.

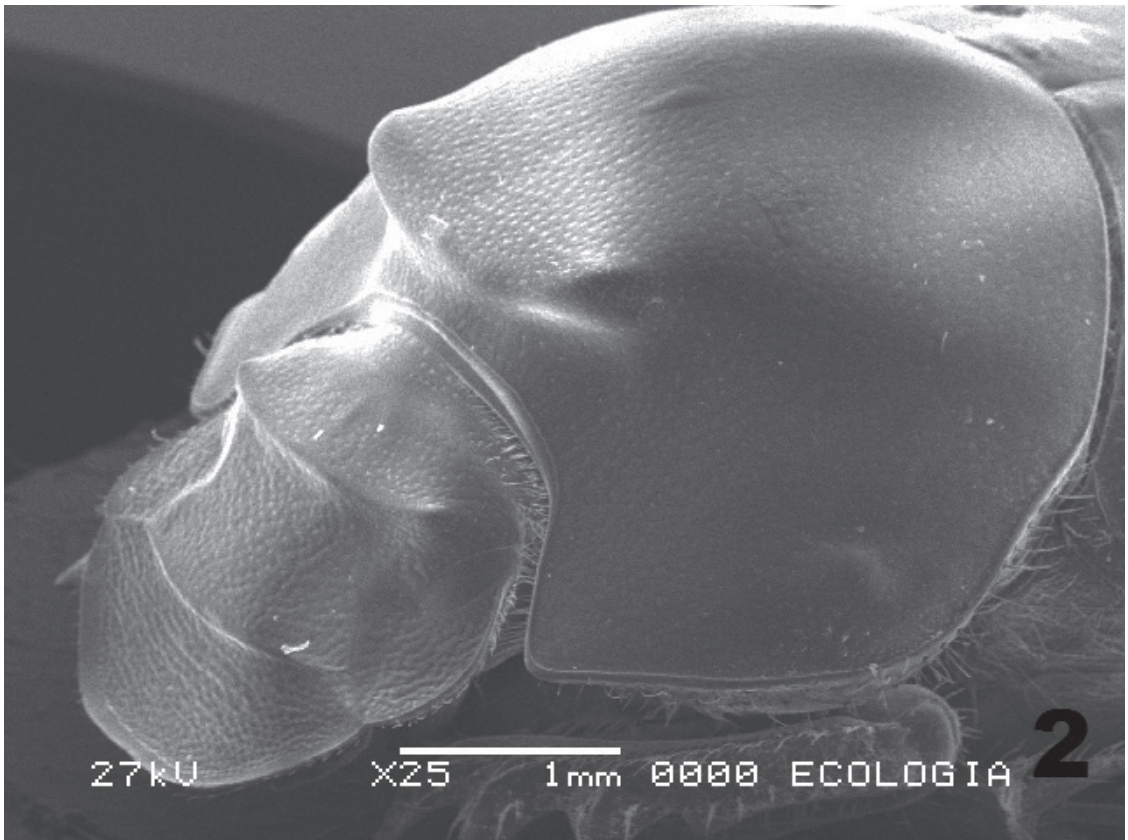


Fig. 2. *Onthophagus cambrai* sp. nov. Head and pronotum of female, $\frac{3}{4}$ view.

minute punctures, denser and larger on the dorsal surface of projection; concavities shining with shallow, small punctures.

Elytral striae represented by shallowly impressed, shining double lines, interrupted by small punctures separated by 2-3 diam of a puncture; intervals on disc with sparse, minute, simple punctures; lateral intervals with small, setigerous tubercles, setae erect and minute. Pygidium moderately convex, surface finely alutaceous, with fine, shallow punctures, and sparse, small setae. Abdominal sternites microreticulated, laterally with transverse row of setose punctures; last abdominal visible sternite narrowed medially. Metasternum anteriorly tumid, with small, shallow punctures denser at apex and sides. Protibiae distinctly elongated, with a few apical, long setae, lateral margin denticulate between base and first tooth; apical spur short, with apical third abruptly curved downward. Apex of metatibiae with setae alternating between stout and shorter and slender and longer.

Allotype Female (Fig. 2). Total length: 9.6 mm; width: 5.8 mm. Differing from holotype as follows: clypeus narrower, apex truncate and scarcely reflexed; clypeal surface transversely rugose; cly-

peofrontal carina more elevated, anteriorly arcuate; frons with larger and denser punctures; vertex without horns, with strong, anteriorly arcuate carina, lateral ends of carina placed in line with the median portion of eyes; pronotum without projections neither concavities, with anterior, robust, arcuate carina; pygidium less convex; last abdominal visible sternite not narrowed; protibiae not elongated, with larger teeth.

PARATYPES (7♂♂, 13♀♀). Total length: 7.8-10.5 mm; width: 4.8-6.0 mm. Differing from holotype as follows: in the minor males the horns of vertex and pronotal projection are reduced in length, but always evident. In the females the clypeus is truncate to slightly sinuate at apex, and in the minor females the pronotal carina is reduced in size; in both sexes the punctuation slightly varies in density, and the pronotal surface is usually more distinctly punctate in females than in males.

Etymology

It is with great pleasure that we name this species after Roberto Cambra (Universidad de Panamá), in appreciation for many years of friendship, help and field support.

Remarks

At first glance, *O. cambrai* seems to be a member of the *mexicanus* species-group. However, the horns of the vertex (in the males) and the lateral ends of the carina of vertex (in the females) that are aligned with the median portion of eyes are character states different from those of the *mexicanus* species-group, species that present the tubercles, horns or carinae placed behind of eyes. Likewise, the position of the horns and carina on the vertex relates *O. cambrai* with the *dicranus* and *mirabilis* species-groups, but it is distinctly separated from both these species-groups by the lack of a clypeal horn (in males), or by the apex of clypeus truncate or slightly sinuate, not bidentate (in females). We conclude that *O. cambrai* could represent a different group from those already known, but first it is necessary to assess the phylogenetic relationships of the New World species of *Onthophagus*.

Distribution

Onthophagus cambrai is known only from the type locality, which is on the southern flank

of Cerro Hoya, one of the 3 isolated mountains above 1,450 m in the SW region of the Azuero Peninsula on the central Pacific coast of Panama. The Azuero Peninsula and most of central Panama have a pronounced dry season lasting usually from mid-Dec until May. The forest at the type locality (1,400 m) is classified as pre-montane rain forest (Holdridge & Budowski 1959) with scarce underbrush. Dominant tree species include *Oreomunnea mexicana* (Standl) J.-F.Leroy (Juglandaceae), *Quercus lancifolia* Schltld. & Cham. (Fagaceae), *Eschweilera pitieri* Knuth (Lecythidaceae), and *Pterygota excelsa* (Standley & Williams) Kosterm (Sterculaceae) (Sosa de Guerra & Deago 1999; Ibáñez 2006).

Biological Notes

All specimens were caught in a flight interception trap located inside the forest in June.

The following key is modified from that of Howden & Young (1981), with additions of Howden & Gill (1987, 1993), Génier & Howden (1999), and Kohlmann & Solís (2001).

KEY TO THE SPECIES OF *ONTHOPHAGUS* FROM PANAMA

1. Pronotal surface with at least some scattered, erect setae, the setae obvious in fresh specimens at 10X, longer than one puncture diameter; elytra uniform in color or bicolored 2
- Pronotal surface lacking setae longer than diameter of puncture; elytra usually but not always uniform in color 6
2. Dorsally brown to black or bicolored; pronotal surface dull if uniformly black, otherwise frequently shining; average size under 8 mm 3
- Dorsally uniformly black, often with green or blue reflections; pronotal surface between setose punctures smooth and shining; average size 8 to 9 mm *O. crinitus* Harold
3. Pronotal punctures appearing annulate; rim abrupt, depressed portion of punctures shallow, flat; color dorsally uniform 4
- Pronotal punctures simply impressed, rim rounded; dorsally mottled or bicolored 5
4. Pronotal punctures not contiguous, mostly separated by distance equal to one-half diameter or more; size moderate, 5 to 8 mm *O. atroseiceus* Boucomont
- Pronotal punctures mostly contiguous; size small, 3.5 to 5.0 mm *O. coscineus* Bates
5. Pronotum at most tumid behind head; clypeus anteriorly rounded, sometimes briefly truncate but not shallowly emarginated; pronotum frequently with sides broadly marked with brown, longitudinal central third or more dark brown to black, sometimes with cupreous reflections *O. lebasi* Boucomont
- Pronotum anteriorly with small V-shaped median prominence often overhanging anterior margin, or prominence very small, rounded or lacking; clypeus anteriorly shallowly emarginated or truncate; pronotum usually mostly or entirely black, frequently with greenish cast *O. landolti* Harold
6. Pronotum and elytra distinctly different in color or elytra mottled or bicolored 7

- Pronotum and elytra similar in color (sometimes pronotum with more pronounced greenish cast but basic color uniformly dark brown or black) 9
- 7. Elytra uniform in color or mottled, never with intervals alternately differing in color 8
- Elytra with intervals alternately tan and dark brown or black *O. marginicollis* Harold
- 8. Pygidial surface basally between punctures dull, finely granular or shagreened; hind femur ventrally with a short row of 3 or 4 coarse punctures, otherwise surface smooth or with a few minute punctures; male with erect horn near inner posterior edge of each eye
. *O. transisthmus* Howden & Young
- Pygidial surface basally between punctures shining, smooth; hind femur ventrally with widely scattered moderate-sized punctures; male with abruptly reflexed, nearly truncate, anterior clypeal margin, lacking horns on head *O. chryses* Bates
- 9. Vertex of head without horns, carinae or tubercles, or with horns or tubercles placed in line with anterior or median portion of eyes; dorsally dull or shining, without metallic reflections . . 10
- Vertex of head with horns, carinae or tubercles placed behind median portion of eyes, or if vertex unarmed color dorsally with metallic reflections 16
- 10. Apex of clypeus rounded, truncate or slightly sinuated *O. cambrai* **sp. nov.**
- Apex of clypeus bidentate or with a median horn 11
- 11. Middle and hind femora bicoloured, base and apex dark brown, median third tan; size less than 7 mm 12
- Middle and hind femora uniformly dark brown; size over 7 mm 14
- 12. Males with pronotal anterior horn projecting over head, or with horn reduced to small truncate swelling; females with clypeal-frontal carina, and with pronotum more strongly convex in median anterior fifth *O. xiphias* Solís & Kohlmann
- Males with pronotum variable but never with anterior horn or swelling; females without clypeal-frontal carina, and with pronotum evenly convex 13
- 13. Setae on each elytral interval fine to obsolete, usually in two rows on second interval; pronotum of major males with two angular, laterally flattened protrusions *O. dicranus* Bates
- Setae on each elytral interval stout, in three or more irregular rows on second interval; pronotum of major males unevenly rounded, lacking protrusions *O. dorsipilulus* Howden & Gill
- 14. Males with anterior pronotal marginal bead abruptly, angularly reflexed medially; pronotum of medium to major males broadly tumescent, with widely separated lateral tubercles; females with pronotum broadly flat or slightly depressed anteriorly, flat area bordered by a low tubercle posteriorly *O. turgidus* Kohlmann & Solís
- Males with anterior pronotal marginal bead not abruptly and angularly reflexed medially; pronotum of medium and major males with anteriorly directed conical process or horn; females with pronotum longitudinally concave or with transverse carina, and without posterior tubercle 15
- 15. Males with clypeal horn wider apically than medially with apex notched, pronotal process not carinate ventrally; females with pronotum longitudinally concave at midline
. *O. orphnoides* Bates
- Males with clypeal horn nearly parallel-sided with apex rounded, pronotal process sharply carinate ventrally; females with pronotal sharp transverse carina anteriorly
. *O. barretti* Génier & Howden
- 16. Pronotum smooth or punctuate, if punctuate, the punctures generally of uniform size in any area 17
- Pronotum distinctly punctuate, punctures centrally of two sizes, medium punctures separated by

- one to two diameters with small to minute punctures interspersed; average size 9 mm
. *O. cyanellus* Bates
17. Pronotum bituberculate or with paired swellings either side of midline, some species with acute tubercles deeply separated at midline 18
- . Pronotum evenly convex, slightly flattened, or with median protuberance, carina or bifurcated shelf-like projection, anteriorly not impressed or divided at anterior midline 22
18. Setae at apex of hind tibia mostly stout, with some fine setae between, mostly of similar length; pronotal protuberances narrowly divided 19
- . Setae at apex of hind tibiae alternating between stout and slender, the slender setae often considerably longer; pronotal protuberances separated medially by a distance equal to about half of vertex 21
19. Color dorsally with metallic reflections; species of medium size 6-7.5 mm 20
- . Color dorsally without metallic reflections; species of larger size 6-11 mm
. *O. grataehelena* Kohlmann & Solís
20. Males with small tubercles on vertex *O. praecellens* Bates
- . Males with horns on vertex *O. propraecellens* Howden & Gill
21. Apex of clypeus scarcely reflexed and almost truncate; vertex with horns or strong transverse carina *O. stockwelli* Howden & Young
- . Apex of clypeus with an upright, transverse horn reduced to small reflexed extension in minor specimens; vertex with very feeble transverse carina
. *O. atriglabrus* Howden & Gill (in part)
22. Pronotal surface completely or partially dull, opaque; color dorsally black, occasionally with greenish cast on pronotum *O. nyctopus* Bates
- . Pronotal surface shining, at least medially; Color dorsally frequently with metallic coppery, bluish or greenish cast 23
23. Hind femur relatively slender, width to length about 3:9; clypeal margin medially with distinct, strongly reflexed horn (often expanded apically) or with margin with sharp V-shaped emargination 24
- . Hind femur relatively stout, width to length about 3:7; clypeal margin medially rounded or with wide reflexed area or with broad, rounded acumination 25
24. Males lacking any indication of carina or tubercles on vertex; females with pronotum evenly convex *O. sharpi* Harold
- . Males with very feeble transverse carina on vertex; females with pronotum with anterior, flattened or concave area *O. atriglabrus* Howden & Gill (in part)
25. Metasternum between middle coxae finely, shallowly punctuate near coxal margins 26
- . Metasternum between middle coxae coarsely, distinctly punctuate near coxal margins, punctures separated by approximately one to two diameters *O. batesi* Howden & Cartwright
26. Color dorsally black with blue or blue-green reflections; metasternum anteriorly distinctly prow-shaped; well-developed males with anterior clypeal margin broadly truncate or shallowly emarginate; size frequently over 8 mm *O. incensus* Say
- . Color dorsally very dark brown to black with feeble metallic luster, particularly on pronotum; metasternum anteriorly only feebly tumid medially; well-developed males with anterior clypeal margin obtusely angulate medially; size under 8 mm *O. acuminatus* Harold

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