



Seven new species of *Canthochilum* Chapin from Hispaniola (Coleoptera: Scarabaeidae: Scarabaeinae)

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Abstract

Seven new species, *Canthochilum brodzinskyorum* NEW SPECIES, *Canthochilum magnum* NEW SPECIES, *Canthochilum matthewsi* NEW SPECIES, *Canthochilum mimicum* NEW SPECIES, *Canthochilum nebulonemi* NEW SPECIES, *Canthochilum platycnemis* NEW SPECIES, and *Canthochilum xericum* NEW SPECIES, are described from Hispaniola. New distribution records are given for *C. cibony* Matthews and *C. darlingtoni* Matthews in the Dominican Republic.

Key words: Scarabaeinae, dung beetles, West Indies, Greater Antilles, new species

Resumen

Canthochilum brodzinskyorum ESPECIES NUEVAS, *Canthochilum magnum* ESPECIES NUEVAS, *Canthochilum matthewsi* ESPECIES NUEVAS, *Canthochilum mimicum* ESPECIES NUEVAS, *Canthochilum nebulonemi* ESPECIES NUEVAS, *Canthochilum platycnemis* ESPECIES NUEVAS, and *Canthochilum xericum* ESPECIES NUEVAS son descritas para La Española. Nuevos reportes de distribución para *C. cibony* Matthews y *C. darlingtoni* Matthews en la Republica Dominicana.

Introduction

Canthochilum Chapin is a Greater Antillean endemic genus of small to very small scarabaeines (2.3–6.0 mm) found in forested habitats across a wide variety of moisture and elevational gradients. Chapin (1934) proposed the genus *Canthochilum* for two new species from Puerto Rico and a third previously described species from Cuba. He added a fourth species a year later (Chapin 1935). In a series of papers in the 1960s (Matthews 1965, 1966, 1969; Zayas & Matthews 1966) Matthews and his coauthor added 12 more species, one of which, *Canthochilum* sp. (Matthews 1969), remained unnamed because it was represented by only a partial singleton. These species are distributed on Cuba (8 species), Hispaniola (3 species) and Puerto Rico (5 species).

In a situation similar to that of *Canthonella* (Ivie & Philips 1990, 2008), the number of species on Hispaniola has proven to be greatly under-reported. The results of numerous expeditions to remote areas of that large and mountainous island in the last 20 years, using new techniques, especially the flight intercept trap, have provided us with a number of undescribed species of *Canthochilum*. It seems that each new mountain range sampled yields 1 or more new species of this genus. We take this opportunity to describe the 7 additional species so far discovered, bring the total number of *Canthochilum* species to 23, with 10 of those on Hispaniola. Matthews' enigmatic unnamed species from Etang Lachaux, Haiti, is not among these, still awaiting rediscov-

ery after 75 years. We have no doubt that it is not alone, and that more species await discovery in the unsampled mountain ranges of Hispaniola and perhaps also on Cuba and even Jamaica. This genus now represents more than half of the known scarabaeines of the Greater Antilles (Ivie & Philips 2008).

Ivie & Philips (2008) provided a checklist of the Scarabaeinae of the Greater Antilles, listing our 7 species by number (*Canthochilum* #1–#7). As mentioned in that paper, the West Indian fauna includes many endemic species of conservation interest, including all those described herein. Continuing threats from human encroachment and invasive exotic species put this fauna at great risk in what is considered by many scientists to be one of the world's biological hotspots (Smith *et al.* 2006).

Material and methods

Descriptions of new species follow the format of Matthews (1966; 1969) and Ivie & Philips (1990, 2008). In the transcription of label data from type specimens the end of each line on a label is indicated by a “;” (semicolon); the individual labels are separated by a “/” (slash). The term “clypeal teeth” refers only to projections from the anterior margin of the clypeus itself, and does not include the small to moderate projections at the clypeo-genal suture. Thus, a species with 4 clypeal teeth may have 6 projections from the anterior margin of the head. Specimens cited are housed in collections indicated with the following codens:

CMNC	Canadian Museum of Nature, Ottawa.
CMNH	Carnegie Museum of Natural History, Pittsburg, PA.
NMNH	National Museum of Natural History, Washington, DC.
PESC	P. E. Skelly collection, Gainesville, FL.
TKPC	T. K. Philips collection, Bowling Green, KY.
UVCC	University of Vermont Collection, Burlington, VT.
UCBC	University of California, Berkeley Collection, CA
WIBF	West Indian Beetle Fauna Project, Bozeman, MT.

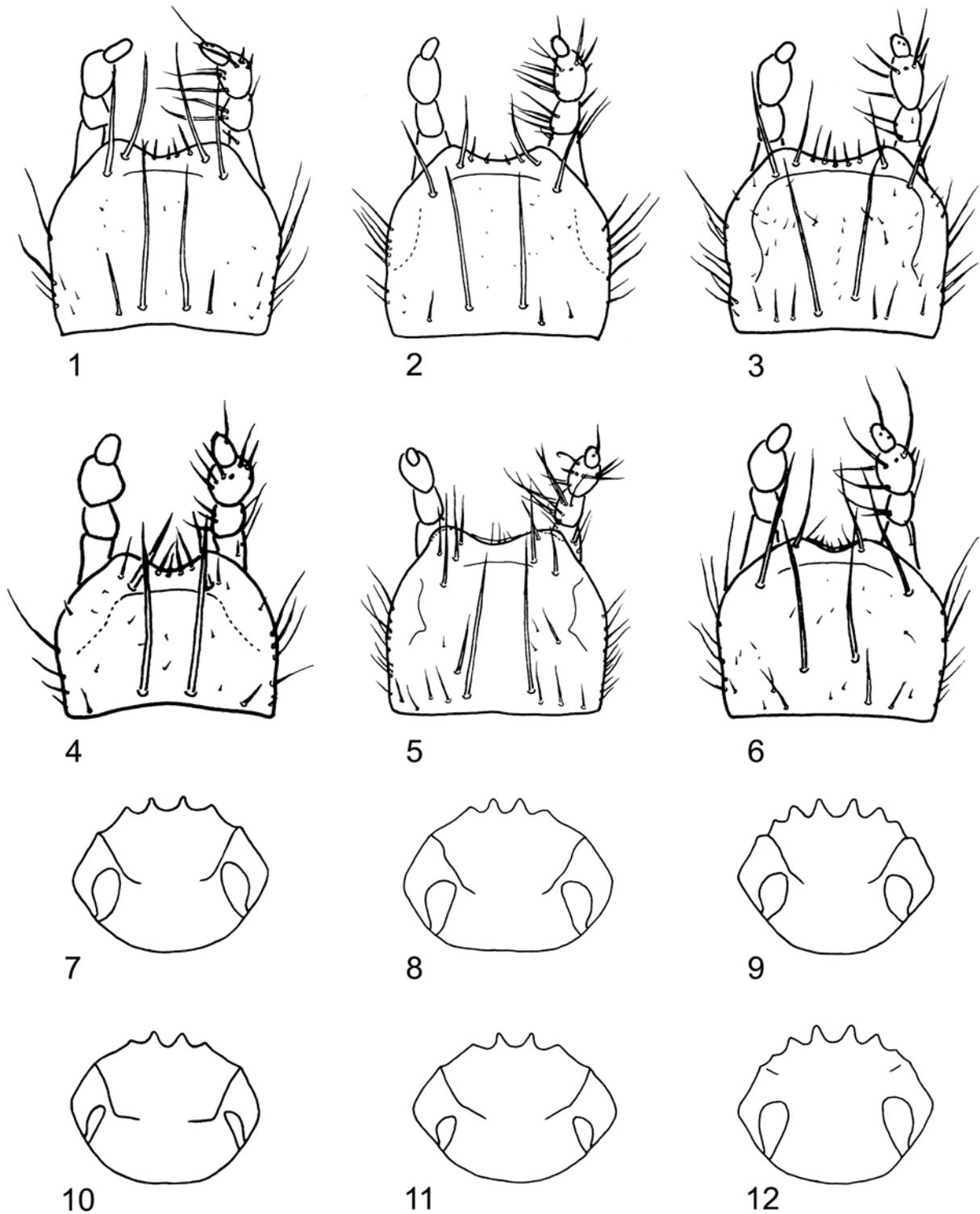
Canthochilum brodzinskyorum Philips & Ivie, new species

Figs. 1, 7, 13, 19, 25, 34

Diagnosis. This species can be diagnosed by the elytron being evenly rounded laterally, without a trace of a lateral carina or angulate margin between seventh and eighth striae, and the surface of the head smooth and lacking any shagreening.

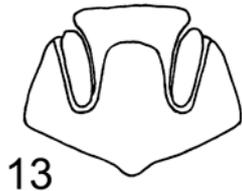
Description (male). Body oblong, reddish-black, legs similar color (Fig. 34); dorsal surface of head with extremely fine, widely spaced punctures, separated by 6 to 9X their diameter, surface faintly shagreened near posterior margin, otherwise smooth; clypeus with 4 teeth anteriorly, mesal teeth acute, nearly parallel-sided, laterad pair acute, but much broader basally, with strongly diverging sides, clypeal-genal projections smaller (Fig. 7); dorsal ocular area large, eyes separated by a distance equal to 3.5 to 4X their transverse width (Fig. 7); elytral striae distinct, with fine punctures along length, elytral intervals very slightly convex, surface finely shagreened, with scattered fine punctures visible under high magnification; elytra evenly rounded laterally, without trace of lateral carina or angulate margin between seventh and eighth striae, punctures of eighth stria row variable in strength, with first and 5–10 much more distinct than remainder; protibiae with 3 teeth, distal end truncate, tooth not bending forward (Fig. 19); protibial spur broad, blunt and curved mesad near tip, reaching fourth tarsomere; mesosternal suture anteriorly rounded (Fig. 13); metafemur weakly arcuate; pygidium entirely margined, slightly convex, surface finely, sparsely punctured and smooth; aedeagus with basal

piece apex acutely pointed posteriorly, parameres large, trapezoidal with acute tip (Fig. 25). Length: 3.2–4.3 mm, measured along midline from anterior margin of pronotum to tip of elytra.

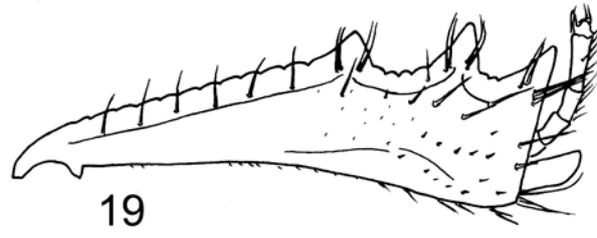


FIGURES 1–6. Labia. 1. *Canthochilum brodzinskyorum*; 2. *Canthochilum magnum*; 3. *Canthochilum matthewsi*; 4. *Canthochilum mimicum*; 5. *Canthochilum nebulonemi*; 6. *Canthochilum platycnemis*.

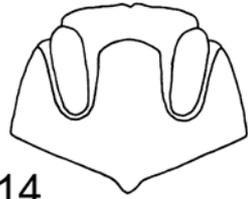
FIGURES 7–12. Heads 7. *Canthochilum brodzinskyorum*; 8. *Canthochilum magnum*; 9. *Canthochilum matthewsi*; 10. *Canthochilum mimicum*; 11. *Canthochilum nebulonemi*; 12. *Canthochilum platycnemis*.



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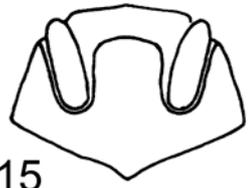
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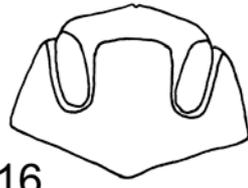
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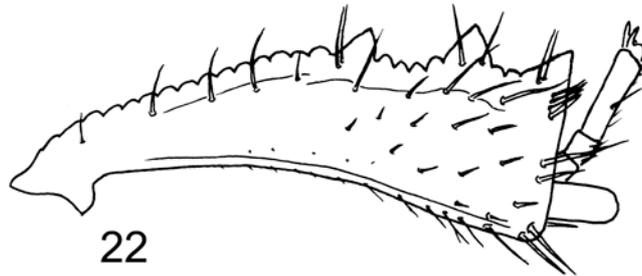
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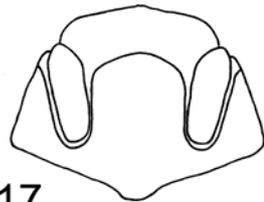
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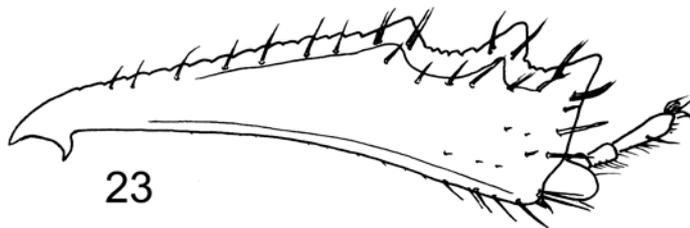
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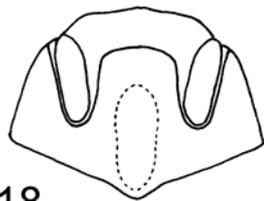
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FIGURES 13–18. Meso- and metasterna. 13. *Canthochilum brodzinskyorum*; 14. *Canthochilum magnum*; 15. *Canthochilum matthewsi*; 16. *Canthochilum mimicum*; 17. *Canthochilum nebulonemi*; 18. *Canthochilum platycnemis*.

FIGURES 19–24. Protibia, dorsal view. 19. *Canthochilum brodzinskyorum*; 20. *Canthochilum magnum*; 21. *Canthochilum matthewsi*; 22. *Canthochilum mimicum*; 23. *Canthochilum nebulonemi*; 24. *Canthochilum platycnemis*.

Female: Differs from the male in being slightly larger in the small series on hand; the protibial spur is narrow, acute and less curved near tip; and the metatibia is very slightly less curved than in the male.

Types. HOLOTYPE MALE, ALLOTYPE FEMALE: DOM.REP: Pedernales; Province, Las Abejas; ca. 35 km N. Cabo Rojo; 26 AUG– 9 SEP 1988, 1250m; dung-pitfall trap [NMNH]. PARATYPES. 1 MALE — same data as holotype [WIBF]. 1 FEMALE — DOM. REP.: Prov. Pedernales; ca. 35 km N. Cabo Rojo, 1250 m; Las Abejas, 26 AUG– 9 SEP 1988, flight intercept trap; M. Ivie, Philips & Johnson. [WIBF].

Etymology. We take great pleasure in naming this species after Jacob and Mariannella Brodzinsky, who showed us great hospitality and assistance in Santo Domingo during our visits to the Dominican Republic.

Notes. The habitat of this species is a small pocket of moist broadleaf forest in the Sierra de Bahoruco near the Haitian border on the southern paleoisland. It is an unusually diverse and unique place, and although under legal protection as part of the Parque Nacional Sierra de Bahoruco, it is under constant threat.

Canthochilum magnum Philips & Ivie, new species

Figs. 2, 8, 14, 20, 26, 35

Diagnosis. The moderately large size (4.8–6.0 mm) and deep purplish black body color, together with four clypeal teeth, weakly indicated elytral striae, and lateral carina on the elytra will separate this species from the other known Hispaniolan *Canthochilum*.

Description (male). Body oblong, deep purplish-black, legs and anterior edge of clypeus reddish brown (Fig. 35); dorsal surface of head with fine punctures separated by 4 to 8X their diameter, surface distinctly shagreened throughout; clypeus with 4 teeth, mesal teeth acute, but tips blunt, outer teeth obtuse, clypeal-genal projections obsolete (Fig. 8); dorsal ocular area large, eyes separated by a distance equal to 3.5 to 4X their transverse width (Fig. 8); first and eighth elytral striae distinct, second stria weakly visible, 3–7 apparent only as lines and not impressed, punctures absent; elytral intervals flat except for first and perhaps second which are very slightly convex, surface finely shagreened, very fine scattered punctures visible under high magnification; elytron with lateral carina or relatively abruptly angulate margin between seventh and eighth striae, punctures of eighth stria weak except for slightly stronger series near middle; protibia with 3 teeth, distally bent slightly obliquely forward from spur by tarsal insertion (Fig. 20); protibial spur blunt and strongly hooked near tip, reaching fourth tarsomere; metatibia only very slightly curved; mesosternal suture anteriorly obtusely angled (Fig. 14); pygidium entirely margined, slightly convex, surface finely punctured and shagreened; aedeagus with basal piece apex blunt and projecting ventrally, parameres elongate dorso-ventrally (Fig. 26). Length: 4.0 – 4.8 mm, measured along midline from anterior margin of pronotum to tip of elytra

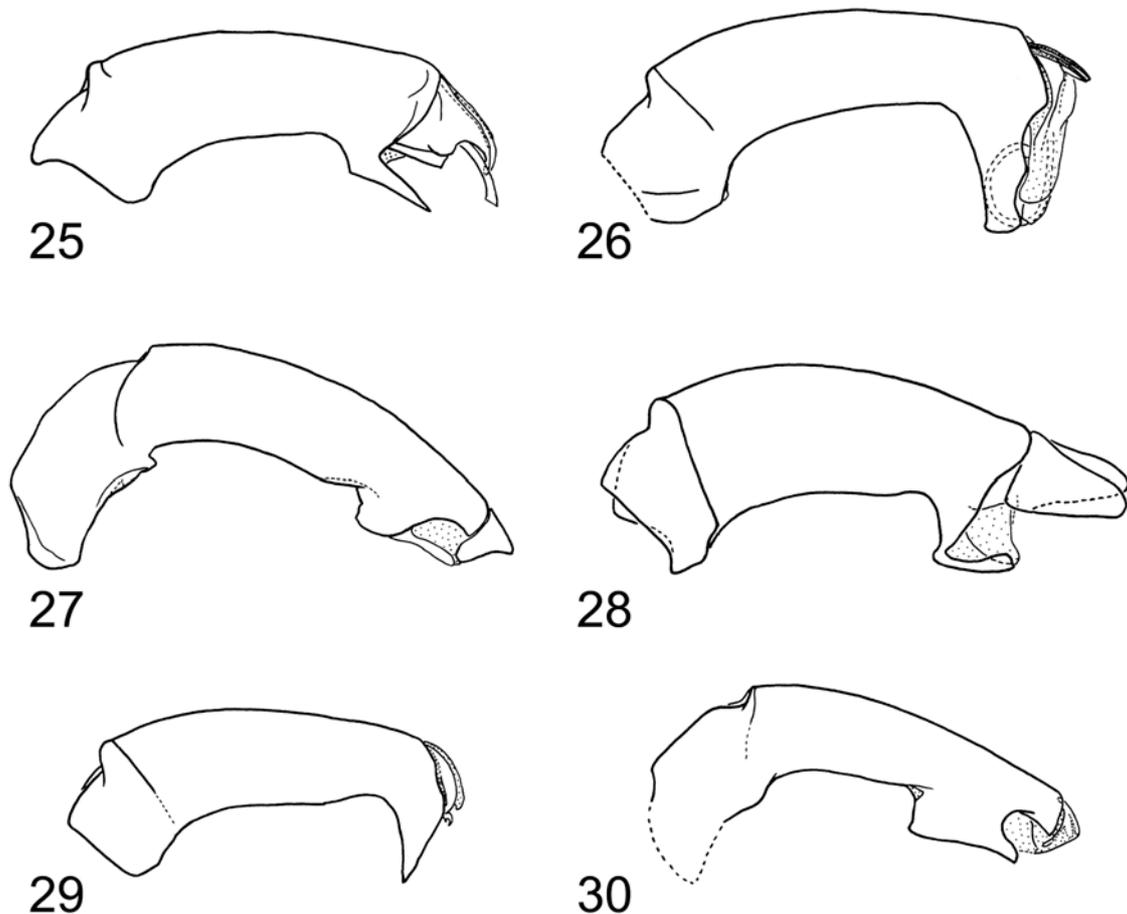
Female: Differs from the male in having the protibial spur smaller, apically acute and less curved at the tip; the metatibia very slightly, if at all, less curved than in the male.

Types. HOLOTYPE MALE, ALLOTYPE FEMALE: DOM.REP: Prov. Santiago; Par. Nac. A. Bermudez; Los Tablones, 1,290m; M. A. & R. O. Ivie colr; flight intercept trap/ on Rio Izquierda; 19°03'N, 70°50'W; 09 APR–07JULY 1992 [NMNH]. PARATYPES. 53 MALES, 15 FEMALES — same data as holotype [MNHD, NMNH, TKPC, WIBF]. 8 MALES, 6 FEMALES — DOM.REP: Prov. La Vega; Par. Nac. Armando Bermudez; Los Tablones, 1,245m, 19°03' N, 70°50'W, 07JULY–25AUG; 1992, M. A. Ivie & D.S. Sikes/ flight intercept trap [TKPC, WIBF]. 5 MALES, 1 FEMALE — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienega; 19.VII – 2.VIII.95, 1000 m; trop. evrgn. For., FIT; S + J Peck, 95-32 [CMNC, TKPC, WIBF]. 1 MALE — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienega; 19.VII–2.VIII.95, 1010m; trop.evgrn.for., FIT; S + J Peck, 95-33 [CMNC]. 7 MALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienega; 19.VII–2.VIII.95, 1100m; trop.evgrn.for., FIT; S + J Peck, 95-36 [CMNC, TKPC, WIBF]. 3 MALES, 2 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienega; 21.VII–4.VIII.95 for.; carrion

traps, 1000m; S + J Peck, 95-39 [CMNC, TKPC]. 3 MALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII.95, 1000m; for. carrion traps; S + J Peck, 95-38 [CMNC, WIBF]. 4 MALES, 1 FEMALE — DOMINICAN REPUBLIC: La; Vega, 2.5 km SW Pinar; Bonito, 18-51N, 70-43W; 1430m. 26 Nov 1992/ J.Rawlins, R.Davidson,; M.Klingler, S.Thompson; riparian vegetation near; stream in pine woodland [CMNH, WIBF].

Etymology. This species was named “*magnum*” because of its large size, second only among the known *Canthochilum* to *C. nebulonemi*.

Notes. This species occurs at mid-elevations in the Cordillera Central.



FIGURES 25–30. Male genitalia, lateral view. 25. *Canthochilum brodzinskyorum*; 26. *Canthochilum magnum*; 27. *Canthochilum matthewsi*; 28. *Canthochilum mimicum*; 29. *Canthochilum nebulonemi*; 30. *Canthochilum platycnemis*.

***Canthochilum matthewsi* Philips & Ivie, new species**

Figs. 3, 9, 15, 21, 27, 36, 45, 46

Diagnosis. This species can be differentiated from others by the clypeal margin with six teeth (excluding the angulation at clypeo-genal margin), the elytral interspaces rounded at top of elytral declivity, and the transversely subcarinate at the elytral apex in rear view.

Description (male). Body oblong, reddish-black, legs and anterior edge of clypeus reddish brown (Fig. 36); dorsal surface of head with fine punctures separated by 4X diameter on anterior 1/2, becoming larger, separated by 1X diameter on vertex, near posterior margin and near eyes, surface shagreened near posterior margin only; clypeus with 6 teeth anteriorly, mesad teeth largest, acute but tips blunt, remaining teeth progressively smaller laterally, obtuse, clypeal-genal projections smaller, obtuse (Fig. 9); dorsal ocular area large,

eyes separated by a distance equal to 3.5 to 4X their transverse width (Fig. 9); elytral striae distinct, deep, with fine punctures along length; elytral intervals distinctly but shallowly convex, row of very weak bumps down center, very fine scattered punctures visible under high magnification, surface coarsely shagreened; elytron with lateral carina or relatively abruptly angulate margin between seventh and eighth striae, punctures of eighth stria dorsad margin of epipleuron coarse, row evenly spaced; protibia with 3 teeth, distally bent strongly, obliquely, forward from tarsal insertion (Fig. 21); protibial spur broad, moderately hooked, reaching third tarsomere; metatibia slightly arcuate; mesosternal suture anteriorly slightly obtusely angled (Fig. 15); metasternum with a distinct longitudinally elongate depression at middle; pygidium entirely margined, nearly flat, surface finely punctured and smooth; aedeagus with basal piece with small finger-like projection attached at apex to basal paramere region, parameres small and triangular (Fig. 27). Length: 2.9 – 3.6 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female. Differs from the male by the smaller protibial spurs that are less curved apically; the significantly less curved metatibia, and the less deep metasternal depression.

Types. HOLOTYPE MALE: DOM.REP: Par. Nac. Almando; Bermudez, Cordillera Cent.; Los Tablones, 1,220m; 03 SEP 1988, M. A. Ivie; K. Philips & K. A. Johnson [NMNH].

ALLOTYPE FEMALE: DOM.REP: Prov. Santiago; Par. Nac. A. Bermudez; Los Tablones, 1,290m; M. A. & R. O. Ivie colr; flight intercept trap/ on Rio Izquieria; 19°03'N, 70°50'W; 09 APR–07JULY 1992 [NMNH]. PARATYPES. 1 MALE — same data as Holotype [WIBF]

1 MALE, 3 FEMALES — same data as Allotype [WIBF]. 1 MALE — DOM.REP: Prov. La Vega; Par. Nac. Armando Bermudez; Los Tablones, 1,245m, 19°03' N, 70°50'W, 07JULY–25AUG; 1992, M. A. Ivie & D.S. Sikes/ flight intercept trap [WIBF]. 1 FEMALE — Colonia, 1.5; 1000m 1972/ Rep. Dominic.; J. & S. Klapperich [CMNC]. 3 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1000m; trop.evgrn.for, FIT; S + J Peck, 95-32 [CMNC, TKPC]. 5 MALES, 7 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1010m; trop.evgrn.for., FIT; S + J Peck, 95-33 [CMNC, TKPC, WIBF]. 2 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1020m; trop.evgrn.for., FIT; S + J Peck, 95-34 [CMNC, TKPC]. 3 MALES, 3 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII–2.VIII.95, 1100m; trop.evgrn.for., FIT; S + J Peck, 95-36 [CMNC, TKPC]. 2 MALES, 3 FEMALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 21.VII–4.VIII.95 for.; carrion traps, 1000m; S + J Peck, 95-39 [CMNC, MNHD, WIBF]. 2 MALES — DOM.REP: La Vega Prov.; PN A. Bermudez, Cienaga; 19.VII.95, 1000m; for. carrion traps; S + J Peck, 95-38 [CMNC, WIBF]. 1 MALE — DOM.REP: La Vega Prov.; PN Bermudez, 1 km W; Cienaga, 1050m; 2.VIII.95, forest litter; S + J Peck, 95-53 [CMNC].

Etymology. This species is named after Eric Matthews, in recognition to the tremendous advances he made in the study of West Indian Scarabaeinae.

Notes. This species is sympatric with *Canthochilum magnum* and both species can sometimes be found together in the same trap.

***Canthochilum mimicum* Philips & Ivie, new species**

Figs. 4, 10, 16, 22, 28, 37

Diagnosis. The elytron with a yellow-orange patch at the base and the evenly rounded sides laterally without trace of lateral carina or angulate margin between seventh and eighth striae will diagnose this species.

Description (male). Body oblong, black, legs distinctly paler, elytron with yellow-orange patch at basal 2/5, starting from near the base at usually 2nd (but sometimes 1st) interval, running obliquely posteriorly to fourth interval, continuing approximately transversely and slightly irregularly to lateral margin (Fig. 37); dorsal surface of head with extremely fine punctures separated by 6 to 9X their diameter, surface smooth through-

out; clypeus with 4 teeth anteriorly, mesal teeth relatively more acute than those more laterad, tips blunt, clypeal-genal projections lacking (Fig. 10); dorsal ocular area very small, eyes separated by a distance equal to 8X their transverse width (Fig. 10); elytral striae moderately distinct, with fine punctures along length; elytral intervals very slightly convex, with very fine scattered punctures visible under high magnification, surface smooth and shining; elytra evenly rounded laterally, without trace of lateral carina or angulate margin between seventh and eighth striae, punctures of eighth stria continuous and coarse except at extreme base; protibiae with 3 teeth, distally truncate (Fig. 22); protibial spur broad, slightly hooked, nearly reaching 5th tarsomere; metatibia very weakly arcuate; mesosternal suture anteriorly nearly truncate (Fig. 16); pygidium lacking margin middle of lower margin, slightly convex, surface very finely punctured and smooth; aedeagus with basal piece apex with small finger-like process projecting posteriorly and distant from large triangular paramere lobes (Fig. 28). Length: 2.3 – 2.4 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female. Differs from the male in the smaller, straight protibial spurs.

Types. HOLOTYPE MALE, ALLOTYPE FEMALE: DOM.REP: Prov. Pedernales; 20 km N. Cabo Rojo, 365m; Las Mercedes turn-off; 21–22 AUG 1988; dung baited pit-fall trap [NMNH]. PARATYPES. 5 MALES, 4 FEMALES — same data as holotype [MNHD, TKPC, WIBF]. 2 MALES, 1 FEMALE — DOM. REP: Prov. Pedernales; 24 km N. Cabo Rojo, 610m; 20 AUG – 09 SEP 1988, flight; intercept trap, M. A. Ivie.; T. K. Philips & K. A. Johnson [TKPC, WIBF].

Etymology. The name “*mimicum*,” derived from Greek for an actor or mime, refers in this case to the close resemblance of our species in size and color pattern to *Canthonella isabellae* Matthews, with which it is sympatric.

***Canthochilum nebulonemi* Philips & Ivie, new species**

Figs. 5, 11, 17, 23, 29, 38, 44

Diagnosis. The four clypeal teeth, eyes separated dorsally by a relatively large distance equal to 6 times their transverse width, a total body length usually greater than 6 mm, and the elytra with a lateral carina or relatively abruptly angulate margin between seventh and eighth striae will diagnose this species.

Description (male). Body ovoid, deep purplish-black, legs and anterior edge of clypeus dark reddish-brown (Fig. 38); dorsal surface of head with fine, ill-defined punctures separated by approximately 3X their diameter, surface distinctly shagreened throughout; clypeus with 4 teeth anteriorly, mesal teeth acute, tips blunt, laterad teeth obtusely pointed, clypeal-genal suture projections much smaller (Fig. 11); dorsal ocular area small, eyes separated by a distance equal to 6X their transverse width (Fig. 11); elytral striae obsolete, barely visible as faint depression, punctures absent; elytral intervals very slightly convex, fine scattered punctures visible under high magnification, surface finely shagreened; elytron with lateral carina or relatively abruptly angulate margin between seventh and eighth striae, punctures in eighth stria continuous, decreasing in size posteriorly; protibiae with 3 teeth, distally truncate; protibial spur broad, moderately hooked, reaching 4th tarsomere (Fig. 23); metatibiae strongly arcuate; mesosternal suture anteriorly rounded (Fig. 17); pygidium completely margined, lower margin distinct but weak, slightly convex, surface with very fine barely perceptible punctures and faintly shagreened; aedeagus with basal piece apex projecting ventrally in an acute point, parameres reduced and crescent-shaped (Fig. 29). Length: 4.6 – 5.8 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female. Differs from the male in having the protibial spurs smaller, straight apically; and in having the metatibiae much less curved.

TYPES. HOLOTYPE MALE: DOM:REP.: Independencia; 32 km NW La Descubierta; Sabana Real, 1800m, cloud; forest carrion tps, 26.XI–5.XII.91, S & J Peck, 91-333 [CMNC]. ALLOTYPE FEMALE:

DOM:REP.: Independencia; 30 km NW La Descubierta; Sabana Real, 1646m, cloud; forest carrion, 25XI-5.XII.91, S & J Peck, 91-331 [CMNC]. PARATYPES.

8 MALES, 6 FEMALES — same data as holotype [CMNH, MNHD, TKPC, WIBF]. 9 MALES, 7 FEMALES — same data as allotype [CMNH, TKPC, WIBF]. 2 MALES, 3 FEMALES — DOM:REP.: Independencia; 30 km NW La Descubierta; Sabana Real, 1646m, cloud; forest dung tps, 25.XI-5.XII.91, S & J Peck, 91-332 [CMNC]. 4 MALES, 1 FEMALE — DOMINICAN REPUBLIC:; Independencia. Sierra; de Neiba just south; of crest, 5 km NNW; Angel Feliz, 1780m./ 18-41N, 71-47W; 13-15 October 1991; J.Rawlins, R.Davidson; C. Young, S.Thomson; Cloud forest [CMNH, WIBF]. 1 MALE, 2 FEMALES — DOMINICAN REPUBLIC: Inde-; pendencia, Sierra de Neiba; south slope near summit.; 4.0 km N Angel Feliz; 18-40-21N 71-46-05W/ 1825m, 1-2 Apr 2004, J.; Rawlins, C. Young, R.; Davidson, broadleaf cloud; forest without pine, hand; collected, sample 34243 [CMNH, WIBF].

Etymology. The specific epithet of this species is derived from the Latin *nebula* (cloud) and *nemus* (patchy forest and pasture), in reference to the remnant patches of cloud forest that make up its habitat.

Notes. This species is the largest in the genus, and seems to be endemic to a high elevation cloud forest in the Sierra de Neiba.

Canthochilum platycnemis Philips & Ivie, new species

Figs. 6, 12, 18, 24, 30, 42

Diagnosis. The clypeal margin with 6 teeth (in addition to the angulation at the clypeal-genal margin), flat elytral interspaces, and the metatibia parallel-sided in basal ½ and suddenly widened in apical ½ will separate this species from the others currently known.

Description (male). Body ovoid, reddish brown-black, legs and anterior edge of clypeus red (Fig. 42); dorsal surface of head with moderate punctures, separated by approximately 1–2X their diameter, surface smooth throughout; clypeus with 6 teeth, mesal pair of teeth nearly parallel-sided, tips blunt, next laterad pair of teeth triangular, barely acute, third pair very small and obtuse, not much larger than the small clypeal-genal projections (Fig. 12); dorsal ocular area very large, eyes separated by a distance equal to 3X their transverse width (Fig. 12); elytral striae distinct, marked by double line on either side of a narrow flat-bottomed depression, punctures absent; elytral intervals broad, nearly flat, very slightly convex, very finely punctuate to slightly microrugose; elytron with lateral carina or relatively abruptly angulate margin between seventh and eighth striae, punctures of eighth stria coarse, continuous to apex; protibiae with 3 teeth, distally bent slightly forward from spur near tarsal insertion (Fig. 24); protibial spurs broad, moderately hooked, reaching fourth tarsomere; metatibiae strongly curved near midpoint; mesosternal suture very slightly obtusely angulate mesally (Fig. 18); pygidium margin complete, slightly convex, surface finely shagreened; aedeagus with basal piece apex with short thumb-like extension, parameres very reduced (Fig. 30). Length: 4.6 – 5.8 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female. Unknown.

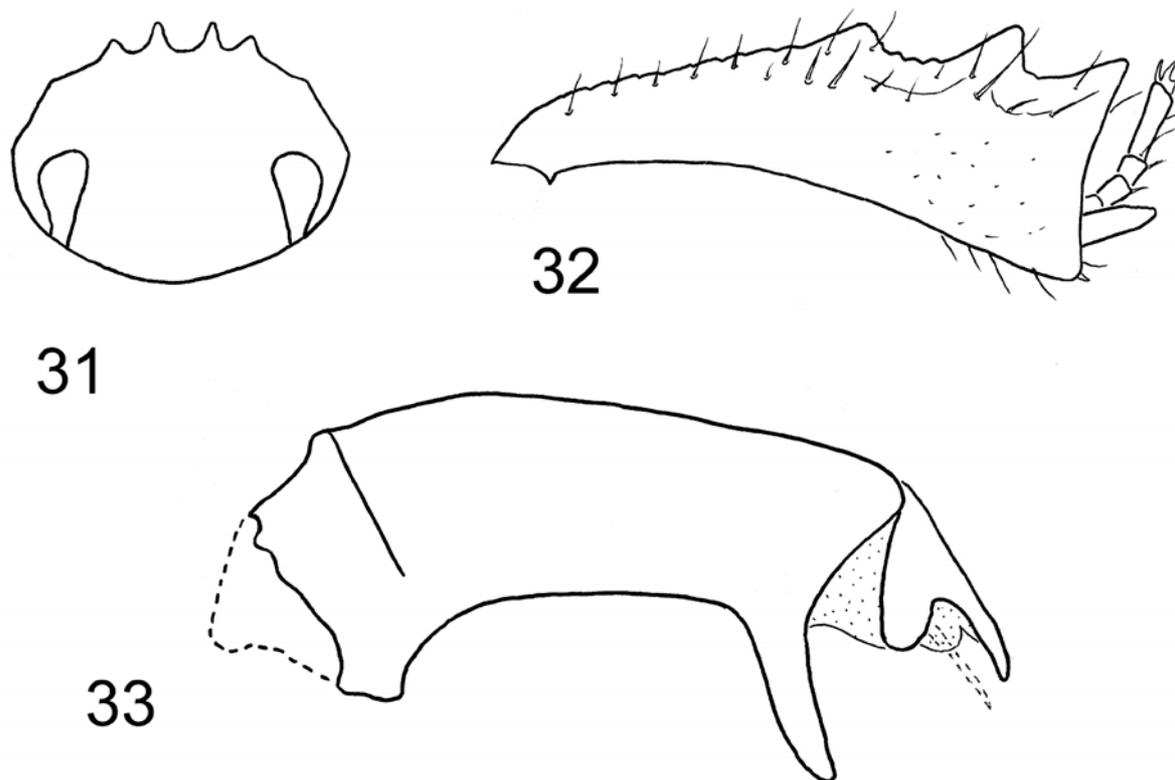
Types. HOLOTYPE MALE — DOMINICAN REPUBLIC: Puerto Plata, Rico El Murazo, north slope near; summit, 19-41N, 70-57W/910 m. 28 Nov 1992; J. Rawlins, R. Davidson; M. Klinger, S. Thompson; mesic deciduous forest [CMNNH]. PARATYPE: 1 MALE — same data as holotype [WIBF].

Etymology. The name is derived from the Greek *platy*, meaning broad or flat, and *cnemis*, the tibia, referring to the proleg of this species

Canthochilum xericum Philips & Ivie, new species

Figs. 31–33, 40, 43

Diagnosis. The elytron evenly rounded laterally, without a trace of a carina or angulate margin between seventh and eighth striae is one characteristic for this species. Additionally, the head surface is distinctly shagreened on the anterior half, with the remaining surface mainly smooth (except for fine punctures), a condition that is unique among known members of the genus.



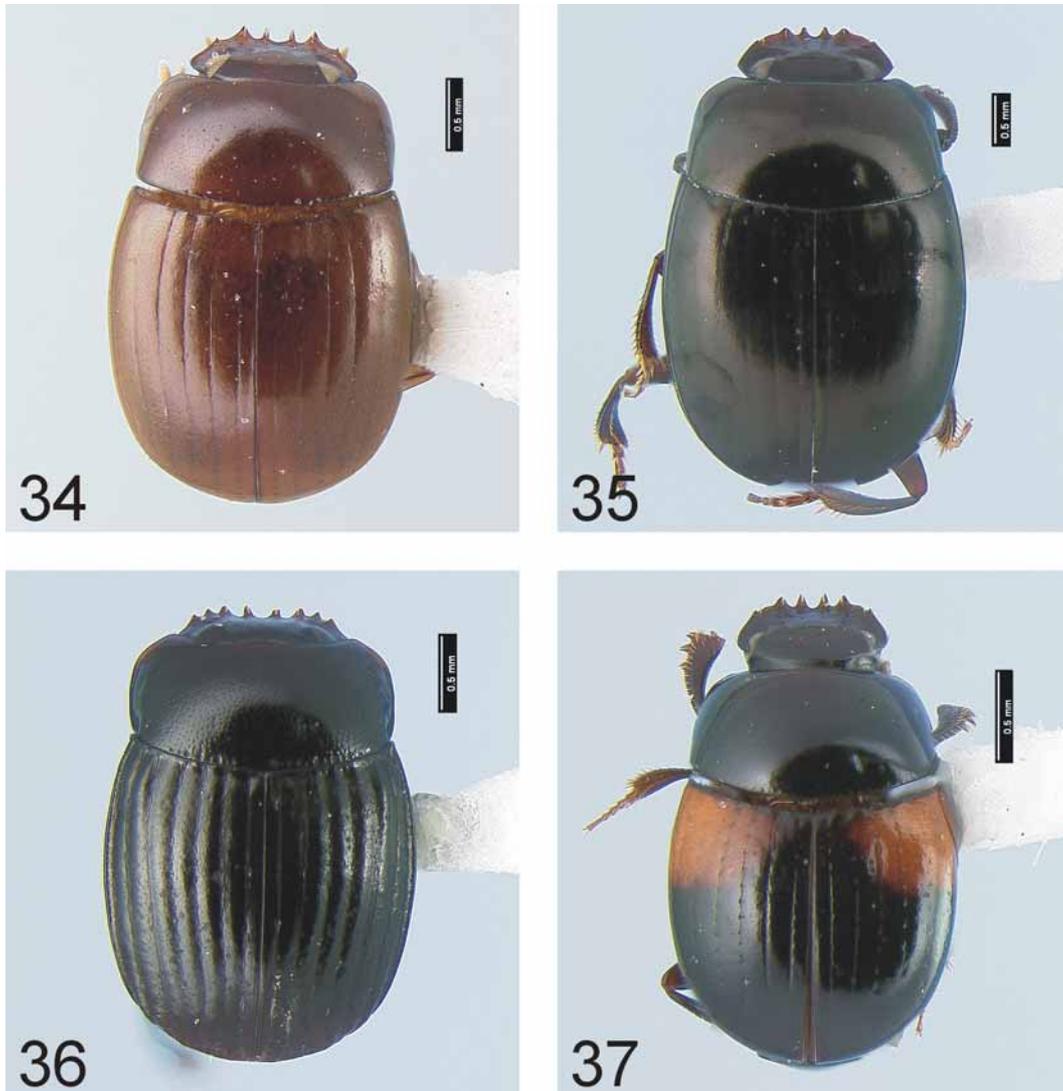
FIGURES 31–33. *Canthochilum xericum*. 31. Head, dorsal view; 32. Protibia, dorsal view; 33. Male genitalia, lateral view.

Description (male). Body oblong, black, legs and anterior edge of clypeus dark reddish-brown (Fig. 43); anterior portion of dorsal surface of head with fine punctures separated by 6 to 9X their diameter, surface shagreened anteriorly, extending slightly further posteriorly mesally, vertex with more distinct punctate separated by 4–5X their diameters, surface shining; clypeus with 4 teeth, mesal teeth acute, tips blunt, lateral teeth relatively very small, obtusely pointed, 2 additional projections near clypeal-genal suture barely apparent (Fig. 31); dorsal ocular area large, eyes separated by a distance equal to 3.5 to 4X their transverse width (Fig. 31); elytral striae distinct, with fine punctures along length; elytral intervals very slightly convex, very fine scattered punctures visible under high magnification, surface finely shagreened; elytra evenly rounded laterally, without trace of lateral carina or angulate margin between seventh and eighth striae, punctures of eighth stria coarse continuous to level of metacoxa, then becoming obsolete; protibiae with 3 teeth, distal end nearly truncate with very slight bending obliquely forward beginning at distal tooth (Fig. 32); protibial spur blunt, reaching third tarsomere; metatibia slightly curved; mesosternal suture anteriorly obtusely angled; pygidium entirely margined, strongly convex, surface finely punctured and smooth; aedeagus with basal piece apex with an elongate approximately parallel sided process, parameres small and bifurcate (Fig. 33). Length: 3.1 – 3.5 mm, measured along midline from anterior margin of pronotum to tip of elytra.

Female. Differs from the male in having the protibial spur narrower and acute.

Types. HOLOTYPE MALE, ALLOTYPE FEMALE — DOM.REP.: Pedernales; 4 km W Oviedo, 10m; arid thorn forest; 28.XI – 4.XII.91; intercept trap; Masner & Peck, 91-344 [CMNC]. PARATYPES. 4 MALE, 8 FEMALE — same data as holotype [CMNC, MNHD, TKPC, WIBF].

Etymology. This species is found in arid thorn forest and the other species are known from moist forest, thus the name “*xericum*” indicates the habitat preference for this particular species.



FIGURES 34–37. Dorsal habiti. 34. *Canthochilum brodzinskyorum*; 35. *Canthochilum magnum*; 36. *Canthochilum matthewsi*; 37. *Canthochilum mimicum*.

Notes. This species was initially hidden among a series of another species that was superficially similar. The labels indicating it was from desert region, as opposed to the rest of the group being from wet areas, was the first indication that something unique was represented. Discovery of this species indicates that more exploration is needed in dry areas.

Key to the species of *Canthochilum* of Hispaniola

This key does not include an undescribed species reported by Matthews (1969) from the La Hotte region of southwestern Haiti, known only from a partial specimen. That species has a lateral elytral carina, coarse discal striae, shagreened and flattened elytra, and a unique aedeagus (see Matthews 1969, fig. 8).

1. Elytra evenly rounded laterally (Fig. 43), without trace of lateral carina or angulate margin between seventh and eighth striae and just above elytral epipleura2
- 1'. Elytra with a lateral carina or relatively abruptly angulate margin (Figs 44, 45) between seventh and eighth striae and just above elytral epipleura4
2. Elytra bicolored, yellow-orange along anterior margin from humerus to second interstria, body length < 3 mm (Fig. 37) *C. mimicum*
- 2'. Elytra piceous, body length > 3.5 mm3
3. Head surface distinctly shagreened on anterior half and extending posteriorly at middle, remaining surface smooth and distinctly punctate (Fig. 40) *C. xericum*
- 3'. Head surface smooth and lacking shagreening with very fine small scattered punctures (Fig. 34)
..... *C. brodzinskyorum*
4. Clypeal margin with four teeth and an angulation at each clypeo-genal margin..... 5
- 4'. Clypeal margin with six teeth and an angulation at each clypeo-genal margin.....7
5. Eyes separated by a distance equal to 6 times their transverse width, total body length > 6 mm (but as small as 5 mm rarely) (Fig. 38) *C. nebulonemi*
- 5'. Eyes separated by a distance equal to 3–4 times their transverse width, total body length < 5.5 mm6
6. Body black to dark brownish or reddish black, legs dark brownish grey, body length 3.0 – 4.2 mm (Fig. 41) *C. darlingtoni*
- 6'. Body deep purplish black, legs and anterior edge of clypeus reddish brown, body length 4.0 – 5.5 mm (Fig. 35) *C. magnum*
7. Elytral intervals between striae convex apically, apical portion transversely carinate or subcarinate at apex in rear view (Figs. 36, 46)..... *C. matthewsi*
- 7'. Elytral intervals between striae flat apically, apical portion lacking distinct transverse ridge at apex in rear view (Fig. 47)..... 8
8. Metatibia, slightly, gradually widened in apical 1/2 (Fig. 39) *C. ciboney*
- 8'. Metatibia parallel-sided in basal 2/3, suddenly, distinctly widened in apical 1/3 (Fig. 35) .. *C. platycnemis*

New records of *Canthochilum*

Canthochilum ciboney Matthews, 1969

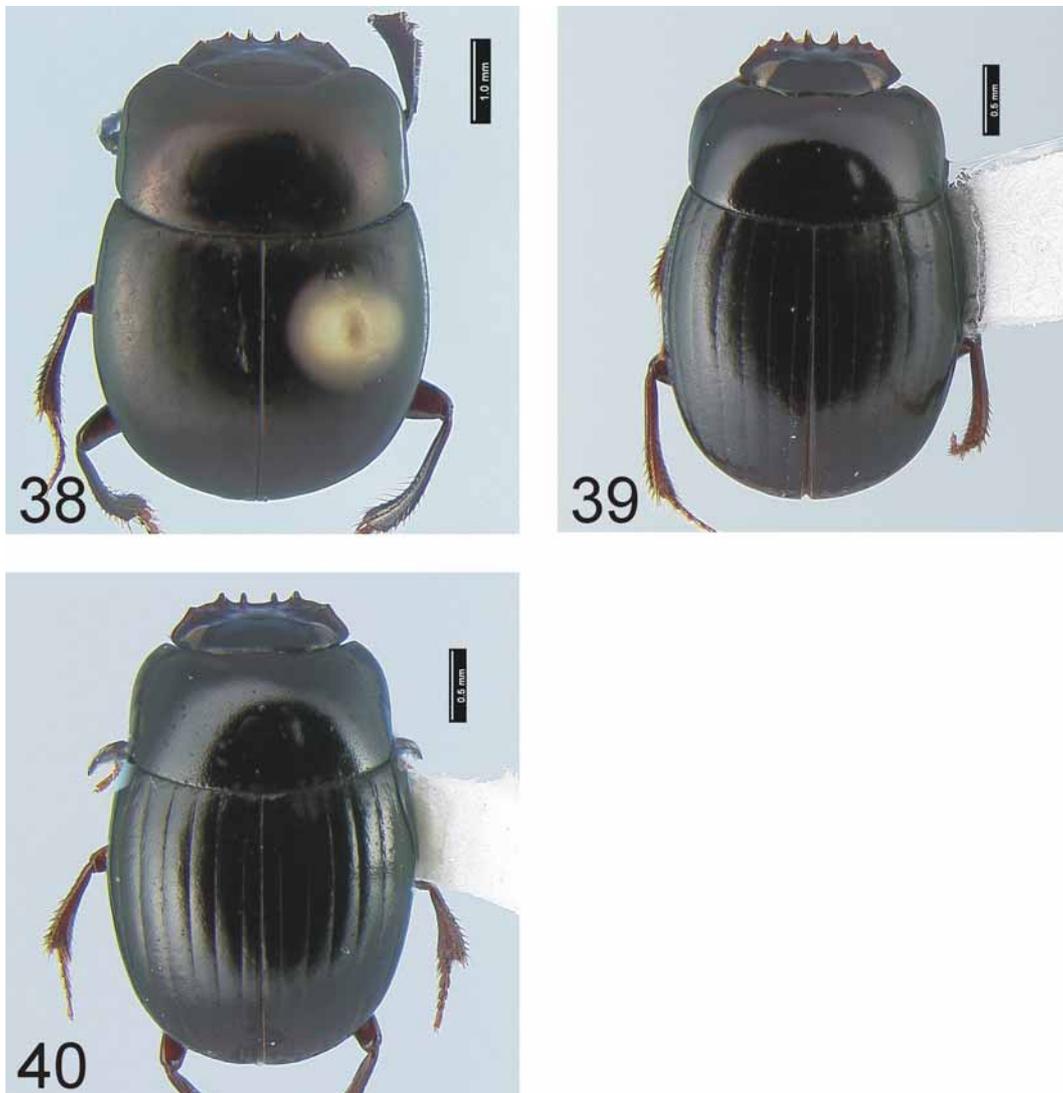
Figs. 39, 47

A single male was reported from Mt. Trou d'Eau, Haiti (18°42.1'N 72°03.1'W) by Matthews (1969). This locality is just north of the Enriquillo Depression, near the Dominican border. We have seen additional specimens from the Sierra de Baoruco in the southwest Dominican Republic. Specific records include: DOMINICAN REPUBLIC: 3 — Prov. Pedernales, 26 km N. Cabo Rojo, 825m, 21 AUG 1992–09 SEP 1992, D. S. Sikes & P. Ward, flight intercept trap (WIBF); 3 — Prov. Pedernales, 24 km N. Cabo Rojo, 610m, 20 AUG–09 SEP 1988, M. A. Ivie, T. K. Philips & K. A. Johnson, flight intercept trap (WIBF); 7 — Prov. Barahona, nr. Filipinas, Larimar Mine, 20–26 JUNE 1992, R. E. Woodruff & P. E. Skelly (PESC); 3 – Pedernales Prov. Sierra Baoruco, 31 km N. Cabo Rojo, 2500', XII-29-1986, Doyen & Santiago/ broad leaf mesophyll association/ ex flight trap (UCBC). 1 — Prov. Pedernales, 24 km N. Cabo Rojo, 665m, 22 JULY–09 AUG 1999, M. A. Ivie, K. A. Guerrero, R. S. Miller & M. Branham (WIBF).

Canthochilum darlingtoni Matthews, 1969

Fig. 41

Matthews (1969) described this species from Sánchez, on the north coast of the Dominican Republic, and Pico Quita Espuela, highest peak in the Cordillera Septentrional, in Prov. Duarte. We have seen additional specimens from the Cordillera Central and Parque Nacional Los Haitises. Specific records include: DOMINICAN REPUBLIC: 1 — Prov. La Vega, nr. Buena Vista, Hotel LaMontafta (19°12.1'N 70°35.1'W), 610m, 04–10APR 1992, M. A. Ivie, carrion trap (WIBF); 3 — ibid, 9–12 APR 1992, dung baited pitfal (WIBF); 4 — Prov. LaVega, 12 km NE Jarabacoa, 550m, 01–07 SEP 1988, M. A. Ivie, T. K. Philips & K. A. Johnson (WIBF); 8 — Prov. Hato Mayor, W. of Sabana de la Mar, Parque Nacional Los Haitises, bosque humido, 01–16 APR 1992, M. A. Ivie, D. S. Sikes & W. Lanier, dung baited pitfall trap (WIBF); 2 — ibid, flight intercept trap (WIBF); 4 — ibid, 16 APR 1992, pitfall trap (WIBF); 2 — ibid, flight intercept trap (WIBF); 2 — ibid, 01 July 1992, M. A. & R. O. Ivie (WIBF); 1 — Prov. Hato Mayor, Parque Nacional Los Haitises, 19°51'N 69°29.1'W, 0 m, 16 July 1993, litter in buttresses, D. Sikes (WIBF); 1 — La Vega Prov., 10 km NE Jarabacoa, Hotel Montana, forest, 18.VII–4.VIII.95, 550 m, FIT, S + J Peck, 95-30 (TKPC).

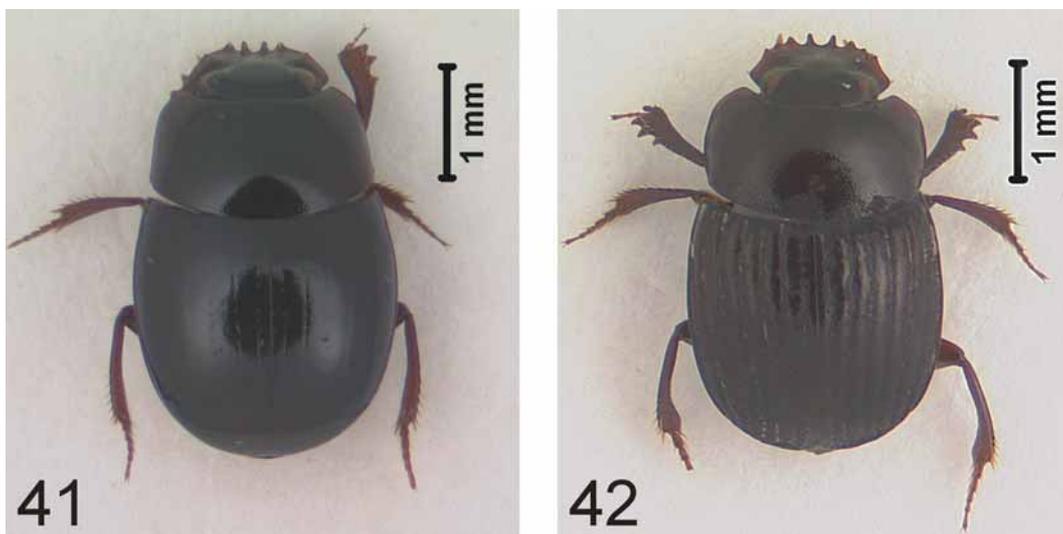


FIGURES 38–40. Dorsal habiti. 38. *Canthochilum nebulonemi*; 39. *Canthochilum ciboney*; 40. *Canthochilum xericum*.

Discussion

Canthochilum is an endemic West Indian genus of ball-rolling canthonine (Matthews 1965), with species found only on Cuba, Hispaniola, Puerto Rico, and some of the remaining islands of the larger Puerto Rican Bank. Although the species on each of these islands undoubtedly belong to the genus *Canthochilum*, many differ a great deal in size and other morphological features (Matthews 1965, personal observations) and which has once resulted in the creation of new generic names for some species (Vulcano & Pereira 1966).

Most species of *Canthochilum* appear to be nocturnal, as evidenced by the relatively large dorsal lobe of the eye. Species with relatively small eyes are probably diurnal or perhaps crepuscular. All species with bright colors have small eyes and are diurnally active. It is notable that this genus and *Canthonella* contain sympatric species with similar red, orange or yellow colored patches on or near the base of the elytra. The function of this color pattern remains unclear although one could hypothesize it may act as a warning to potential predators.



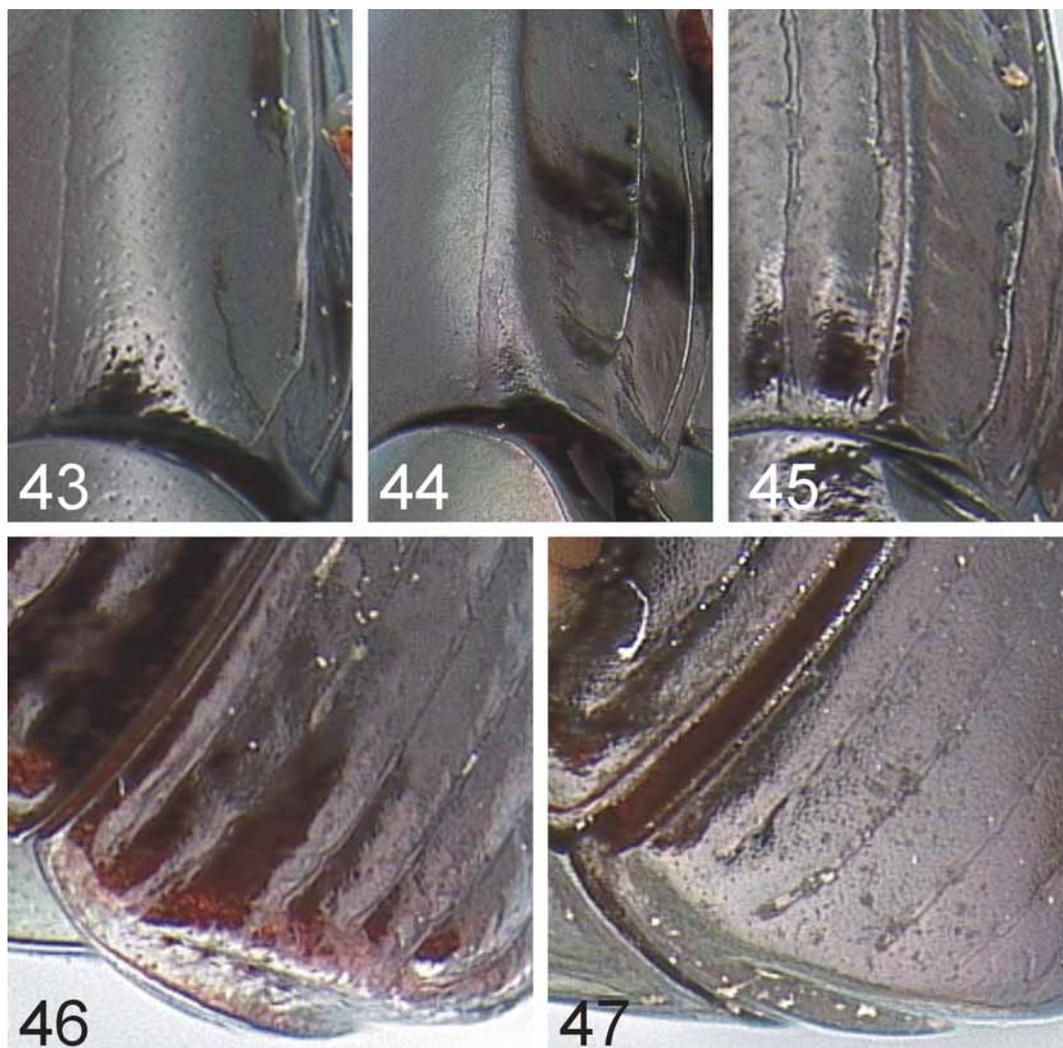
FIGURES 41–42. Dorsal habiti. 41. *Canthochilum darlingtoni*; 42. *Canthochilum platynemesis*.

Food specialization is unknown, but merits further investigation. The majority of specimens on Hispaniola and the Virgin Islands were taken in flight intercept traps rather than in the traditional dung-baited traps normally used for scarabaeines, in spite of the fact that dung traps were utilized in the same areas. Matthews failed to obtain any specimens on Hispaniola with human-dung and carrion-baited traps (Matthews 1966), and dung and carrion baiting on several collecting trips by Ivie, Sikes, Peck, and their associates were, at best, weakly successful.

Of the nine named species on Hispaniola, seven have been taken with flight intercept traps and the largest numbers of specimens for four species were collected that way. Four have been taken in carrion baited pitfalls and four in dung traps (with two species taken both ways), for only two species has dung produced the most specimens. One specimen was also taken by Berlese funnel. One species has no associated collecting data. Thus, it seems likely that something other than mammalian dung may be utilized by at least some species, as was suggested by Matthews on Puerto Rico (1965, 1966)

Most, if not all, species appear to be limited to a particular understory habitat type that ranges from cloud, wet, or moist forests to xeric thorn bush and palm forests (*e.g.* Matthews 1966). Species distributions corresponding with a particular range in altitude have been well documented for Puerto Rican taxa (Matthews 1965) and populations have been found from near sea level to as high as 1,825 meters on Hispaniola. Due to the restriction of many species to forests and other endangered habitats, efforts should continue to be made to

document the species found on these islands. Moreover, given the documented usefulness of scarabaeines in assessing diversity and ecosystem health (Spector 2006), these species may be ideal candidates helping to make decisions on habitat protection and restoration in the Greater Antilles.



FIGURES 43–45. Elytral lateral angles (and part of pronotal base). 43. Evenly rounded (*Canthochilum xericum*); 44. Trace of angulate edge (*Canthochilum nebulonemi*); 45. Distinct angulate margin (*Canthochilum matthewsi*). **FIGURES 46–47.** Elytral apices. 46. Rounded intervals and transversely carinate or subcarinate (*Canthochilum matthewsi*); 47. Flat intervals and lacking distinct transverse ridge (*Canthochilum ciboney*).

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Literature cited

- Chapin, E.A. (1934) A new genus and species of dung-inhabiting Scarabaeidae from Puerto Rico, with notes on the Coprinae of the Greater Antilles (Coleoptera). *Proceedings of the Biological Society of Washington*, 47, 99–102.
- Ivie, M.A. & Philips, T.K. (1990) New species of *Canthonella* Chapin from Hispaniola (Coleoptera: Scarabaeidae: Scarabaeinae). *Journal of the New York Entomological Society*, 98, 429–433.
- Ivie, M.A. & Philips, T.K. (2008) Three new species of *Canthonella* Chapin from Hispaniola, with new records and nomenclatural changes for West Indian dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae). *Zootaxa*, 1701, 1–14.
- Matthews, E.G. (1965) The taxonomy, geographical distribution and feeding habits of the canthonines of Puerto Rico (Coleoptera: Scarabaeidae). *Transactions of the American Entomological Society*, 91, 431–465.
- Matthews, E.G. (1966) A taxonomic and zoogeographic survey of the Scarabaeinae of the Antilles (Coleoptera: Scarabaeidae). *Memoirs of the American Entomological Society*, 21, 1–134.
- Matthews, E.G. (1969) New data on Antillean scarabaeine beetles, and two new species from Hispaniola. *Psyche*, 76, 114–125.
- Smith, M.L., Hedges, S.B., Buck, W., Hemphill, A., Inchaustegui, S., Ivie, M.A., Martina, D., Maunder, M., Ortega, J.F. (2006) Caribbean Islands. In Mittermeier, R. A., Gil, P. R., Hoffman, M., Pilgrim, J., Brooks, T., Mittermeier, C. G., Lamoreux, J. & da Fonseca, G. A. B. (Eds.). *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. Conservation International. [2005], pp. 112–118.
- Spector, S. (2006) Scarabaeine dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae): An invertebrate focal taxon for biodiversity research and conservation (pp. 71–83). In: M.L. Jameson and B.C. Ratcliffe (editors), *Scarabaeoidea in the 21st Century: A Festschrift Honoring Henry F. Howden*. *Coleopterists Society Monograph*, 5, 1–219.
- Vulcano, M.A. & Pereira F.S. (1966) Canthonini das Antilhas (Col., Scarabaeidae). *Arquivos de Zoologia*, 14, 115–154.
- de Zayas, F. & Matthews, E.G. (1966) Revisión de los cantoninos de Cuba (Coleoptera, Scarabaeidae) con la descripción de seis nuevas especies. *Poeyana* (Series A), 14, 1–24.