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NEW CAVERNICOLOUS *PROPTOMAPHAGINUS* FROM
HISPANIOLA AND MEXICO (COLEOPTERA:
LEIODIDAE: CHOLEVINAE)

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ABSTRACT

Two new species of the genus *Proptomaphagus* are described: *P. hispaniolensis*, collected at an ultraviolet light trap in a bat-guano cave in the Dominican Republic and at other cave and forest sites on the Caribbean island of Hispaniola; and *P. reddelli* from a cave in Oaxaca, Mexico. The species are not cave-specialized. The evolution of the 6 known species in the genus is diagrammed and discussed.

RESUMEN

Se describen 2 especies nuevas del genero *Proptomaphagus*: *P. hispaniolensis*, colectada en una trampa de luz ultravioleta cerca de una cueva con murciélagos y guano en la Republica Dominicana y en otros sitios en cuevas y en selvas en la isla caribe de Hispanola; y *P. reddelli* de una cueva en Oaxaca, Mexico. Las especies no son especializadas para cuevas. La evolución de las 6 especies conocidas en el género se discute y se representa por diagrama.

Proptomaphagus Szymczakowski contains 3 species from Puerto Rico

and Cuba, and one in Mexico. This genus has not been found in Jamaica despite extensive searching (Peck 1977). This paper describes 2 new species; one from the Dominican Republic and Haiti on the Caribbean island of Hispaniola, and another from Mexico. All these species are probably scavengers in deep soils or litter of forests or in caves, and none are cave-specialized in structure.

Proptomaphagus shares with its sister group, the diverse genus *Ptomaphagus* Portevin of the Indo-Malayan region, the derived characters of a narrow mesothoracic epimeron, and a comb of equal spines on the outer face of the fore-tibia. These characters occur in no other New World members of the tribe Ptomaphagini. *Proptomaphagus* is considered to be derived from a group that originated in the New World tropics and spread to the Old World tropics of Asia (Szymczakowski 1969, Peck 1981) perhaps in the Cretaceous. The group survives in the New World only as relicts in soil and litter (and caves which are environmentally similar) in Mexico and some of the Greater Antillean islands.

Proptomaphagus hispaniolensis PECK NEW SPECIES
(Fig. 1-4)

DESCRIPTION: The species matches the detailed description of *P. apodemus* Szymczakowski (1969) of Cuba except in the following characters:

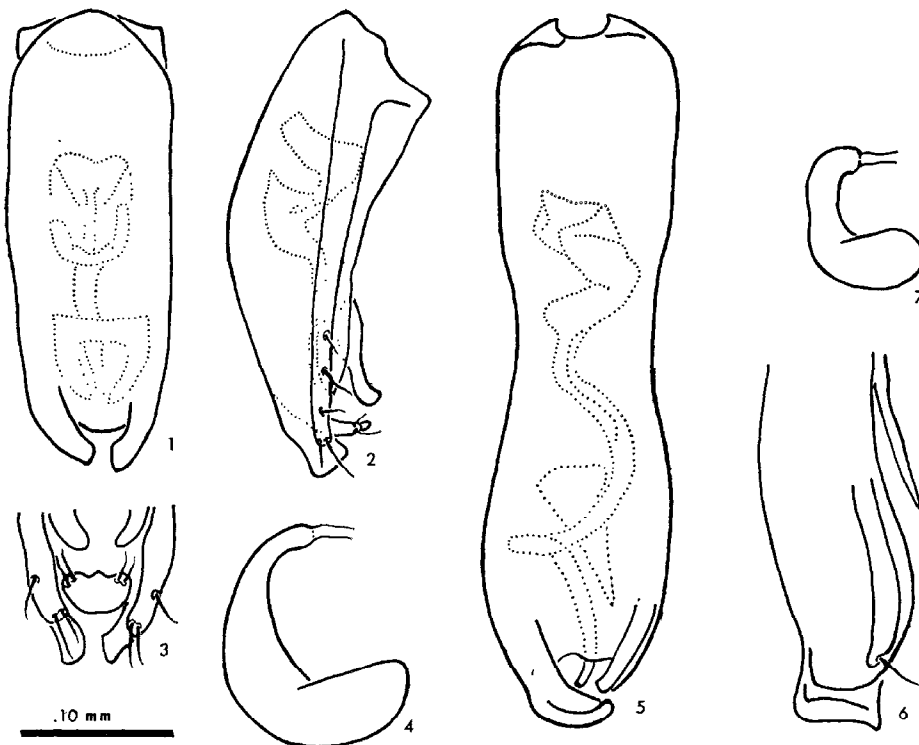


Fig. 1-7. Genital structures of *Proptomaphagus*. Fig. 1-4. *P. hispaniolensis*. 1) Dorsal view of aedeagus. 2) Right lateral view of aedeagus. 3) Ventral view of aedeagus tip. 4) Spermatheca. Fig. 5-7. *P. reddelli*. 5) Dorsal view of aedeagus. 6) Right lateral view of aedeagus tip. 7) Spermatheca. All to the same scale.

Length 1.75-2.13 mm. Width: 0.80-0.90 mm. Eyes large, width to head margin 3.5 times distance from anterior eye margin to antennal insertion. Antennae not noticeably thin or elongated; reaching base of pronotum when laid back. Elytra finely striolate, apices truncate in both sexes and slightly concave. Flight wings fully developed and functional. Mesosternal carina low and uniformly rounded. Legs normal, not noticeably elongate. Aedeagus (Fig. 1) uniformly stout and thick, narrowing to apex, with prominent subequal lateral lobes at tip; apex (Fig. 2) downturned, with 2 lateral swellings, each bearing 2 setae (Fig. 3); ventral blade of tegmen collar-shaped, with median opening; internal sac (flagellum) long, thin, twisted; parameres (Fig. 2, 3) shorter than aedeagus, fused to aedeagus, bearing 2 setae at tip, and 3 others widely spaced before tip. Spermatheca (Fig. 4) gently curved and progressively swollen to anterior end.

DIAGNOSIS: The characters of the aedeagus distinguish the species from all other known *Proptomaphagus*. The species is most similar to *P. puertoricensis* Peck but is distinguished from this species by a more reflexed and trilobed median lobe of the aedeagal tip.

HOLOTYPE MALE: Dominican Republic. La Romana Province, in cave at mouth of Rio Chavon, 8-V-78, R. E. Woodruff and G. B. Fairchild, at blacklight near bat guano (in Florida State Collection of Arthropods, FSCA). *Paratypes*: with same data; in FSCA (16), Canadian National Collection (4), Museum of Comparative Zoology (4), and author's collection (6).

OTHER TENTATIVELY ASSIGNED MATERIAL: DOMINICAN REPUBLIC. Constanza, 3-4000 ft., VIII-1938, P. J. Darlington, 1 female (in MCZ). HAITI. Dept. du Sud. Grotte Counoubois, 1 mi. SSW Camp Perrin, 290 m, 2-XI-79, J. R. Holsinger, J. H. Stock, et al., 1 ♂, 2 ♀ (in author's collection). Grotte "Ca-August", between Cayes and Jacmel, 15-XI-79, J. Notenboom and L. Botosaneanu, 4 ♀ (in Museum of Zoology, University of Amsterdam).

ETYMOLOGY. The name refers to the island of Hispaniola, where the species occurs.

BIOLOGICAL OBSERVATIONS: The large eyes and fully functional flight wings indicate that the species is not cave restricted, (i.e., it is a troglophile). The available material indicates that the species is widely distributed on Hispaniola (the cave locations are at nearly opposite ends of the island on the south coast) and is also in montane forests. This is the same distributional-habitat eurytypy as for *P. puertoricensis* (Peck 1970). The Haitian locality of Grotte Counoubois is a large cave, and is one of several described by Dunn, Schmidt and Taylor (1959). I know of no published summary of caves in the Dominican Republic.

The method of collecting the large type series (R. E. Woodruff, pers. comm.) is noteworthy and should be attempted in other tropical guano caves. A small 6 volt battery-operated blacklight was run over a white enamel pan in the cave, near a large pile of bat guano. The beetles, as well as flies of various families, flew into the light and fell into the pan. Many insects in cave guano piles are attracted to lights. I have collected flies of many families from guano piles in caves in Jamaica with carbide, gasoline, and electric light sources (Peck 1975).

Proptomaphagus reddelli PECK NEW SPECIES
(Fig. 5-7)

DESCRIPTION: The species matches the description of *P. microps* Peck (1973) of Mexico except in the following characters: Length 1.75-1.95 mm. Width 0.73-0.78 mm. Eyes reduced to cluster of about 20 facets, width to head margin 0.7 times distance from anterior eye margin to antennal insertion. Antennae not noticeably thin or elongate, reaching to base of pronotum when laid back. Elytra truncate at apex, sutural angles rounded in both sexes. Flight wings fully developed (presumed to be functional). Mesosternal carina low and rounded. Aedeagus (Fig. 5) tubular, elongate; constricted at middle; lateral lobes at tip unequal, left lobe higher and folded over right lobe (Fig. 6); ventral blade of tegmen thin and elongate; flagellum of internal sac very long, thin, curved; genital orifice shifted to aedeagal dorsal surface; parameres (Fig. 6) thin, fused to aedeagus, setae visible only at tip. Spermatheca (Fig. 7) curved, progressively swollen to anterior end.

DIAGNOSIS: The species is distinguished from *P. microps* by the aedeagus, which is more constricted in the middle, and which has a higher left apical lobe enclosing the genital orifice.

HOLOTYPE MALE: MEXICO. Oaxaca, Cueva de la Finca, 10 km SW Acatlan, 31-XII-76, J. Reddell, D. McKenzie, and A. Grubbs (in Canadian National Collection). *Paratypes*: One ♂ and 2 ♀ with same data in author's collection and one female in Texas Memorial Museum, Austin.

ETYMOLOGY: The species is named for Mr. James Reddell in recognition of his explorations and other efforts in elucidating the cave fauna of Mexico.

DISCUSSION: The species is judged to be normally an occupant of deep forest litter but one which can also establish populations in caves. This species, as well as *P. microps*, and *Proptomaphagus chapmani* Peck of Borneo, all have the unusual combination of very reduced eyes but functional flight wings. Most litter-dwelling beetles are observed to experience wing reduction and loss of flight ability before eye reduction.

Proptomaphagus microps Peck, 1973

The species is known from only 2 caves in the Mexican State of San Luis Potosi. A new cave record follows: MEXICO. San Luis Potosi, Xilitla Plateau, Gruta de los Muertos, 28-III-80, Dale Pate, 1 ♂ (in author's collection).

Proptomaphagus apodemus Szymczakowski, 1969

The species is reported only from 15 caves (usually with bat guano) distributed throughout Cuba in the provinces of Oriente, Las Villas, Camaguey, La Habana, Matanzas, and one cave in Pinar del Rio (Decou 1973). A new cave record follows: CUBA. Pinar del Rio, Cueva Perfecto, 26-XI-81, P. Beron, 4 ♂, 3 ♀ (in collection of National Museum of Bulgaria, Sofia, and of author).

EVOLUTION AND BIOGEOGRAPHY

An analysis of this monophyletic group has been performed by standard Hennigian cladistic methods. The hypotheses of character transformation series (Table 1) were made by out-group comparison with known characters

TABLE 1. HYPOTHESES FOR CHARACTER TRANSFORMATIONS IN *Proptomophagus*. CHARACTER STATES IN PREVIOUSLY DESCRIBED SPECIES HAVE BEEN CONFIRMED BY REEXAMINATION OF MATERIAL. SIMPLE FIGURE NUMBERS REFER TO ILLUSTRATIONS IN THIS PAPER, OR WHEN PRECEDED BY D-73, P-70, P-73, OR S-69 TO FIGURES IN DECOU 1973, PECK 1970, PECK 1973, OR SZYMCAKOWSKI 1969, RESPECTIVELY. THE ABOVE HYPOTHESES SHOULD BE TESTED AS MORE SPECIMENS OF KNOWN AND NEW SPECIES BECOME AVAILABLE.

No. Character	Plesiomorphic State	Apomorphic State
1. genital orifice	ventral (Fig. 1-3; D-73, Fig. 1-3)	dorsal, seemingly cutting right side of aedeagus (Fig. 5)
2. aedeagal ventral blade (tegmen)	awl shaped (P-73, Fig. 14)	collar shaped (D-73, Fig. 3)
3. median lobe of aedeagal tip	posteriorly projecting (Fig. 5; P-73, Fig. 15)	strongly downcurved (Fig. 2; S-69, Fig. 9)
4. median lobe of aedeagal tip	without setae (Fig. 5, 6; P-73, Fig. 14, 15)	with setae (Fig. 2, 3; S-69, Fig. 8, 9; D-73, Fig. 1)
5. aedeagus shaft	unconstricted in middle (P-73, Fig. 14)	constricted in middle (Fig. 5)
6. setae on parameres	clustered at tip (Fig. 6; P-73; Fig. 15)	at tip and along apical 1/4 of shaft (Fig. 2)
7. lateral lobes of aedeagal tip	broad at base (Fig. 1; P-70, Fig. 4)	constricted at base (P-70, Fig. 2)
8. median lobe of aedeagal tip	reflexed, simple (P-70, Fig. 6)	more reflexed, trilobed (Fig. 2)
9. eyes	large	reduced (can occur convergently)

and character states in other genera of Proptomaphagini. The analysis suggests a cladogram of the evolution of the genus as in Figure 8. It indicates that the Mexican species form a group distinct from those of the Antilles, and that within the Antillian species the 2 species of Cuba are a sister group to those of Puerto Rico and Hispaniola. The Mexican species possess more plesiomorphies, and thus may be most like the generic ancestor. The synapomorphies of the Antillian species indicate their monophyly, and that they are not descendants from multiple Antillian occupation by separate Mexican ancestors. The separation of the Mexican and Antillean stocks would probably have been in the early Tertiary according to the evolutionary and biogeographic models of Rosen (1975, 1978).

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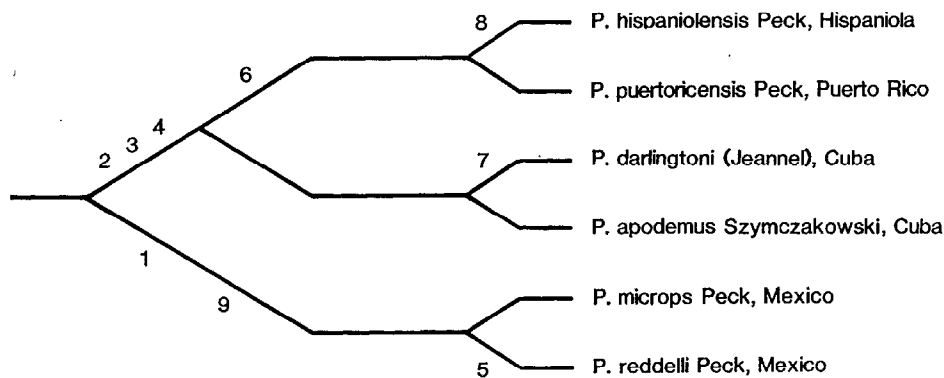


Fig. 8. Phylogenetic hypothesis of evolution in *Proptomaphagus*. Numbers refer to characters in Table 1. Only development or appearance of apotypic character states is shown. No synapomorphy has been found for the pair of Cuban species (*P. darlingtoni* is known only from the holotype). Thus, the species pair from Hispaniola and Puerto Rico could possibly be a sister group of either of the Cuban species.

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GROWTH PATTERN ALTERATIONS IN FALL
ARMYWORM, *SPODOPTERA FRUGIPERDA*¹, LARVAE
AFTER PARASITIZATION BY *APANTELES*
*MARGINIVENTRIS*², *CAMPOLETIS GRIOTTI*³, *CHELONUS*
*INSULARIS*², AND *EIPHOSOMA VITTICOLE*³

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ABSTRACT

Parasitization of fall armyworm, *Spodoptera frugiperda* (J. E. Smith), larvae by *Apanteles marginiventris* (Cresson), *Campoletis griotti* (Blanchard), *Chelonus insularis* Cresson, and *Eiphosoma vitticole* Cresson reduced maximum larval weights by 97, 96, 70, and 62%, respectively compared to 6th instar nonparasitized larvae. Parasitized larvae produced significantly less frass and had smaller head capsule widths. Parasitization increased the duration of the instar during which the parasite destroyed its host. *Apanteles marginiventris* and *C. griotti* destroyed host larvae in the 4th instar and larvae parasitized by *E. vitticole* died in the 5th instar. Eggs parasitized by *C. insularis* were destroyed as larvae in the 4th (41%) and 5th (59%) instars. Larvae parasitized by *A. marginiventris* gained the least amount of weight, produced the least amount of frass, had the shortest life expectancy, did not live past the 4th instar, and had the smallest head capsule widths.

RESUMEN

El parasitismo de las larvas de *Spodoptera frugiperda* (J. E. Smith) por

¹Lepidoptera: Noctuidae.

²Hymenoptera: Braconidae.

³Hymenoptera: Ichneumonidae.