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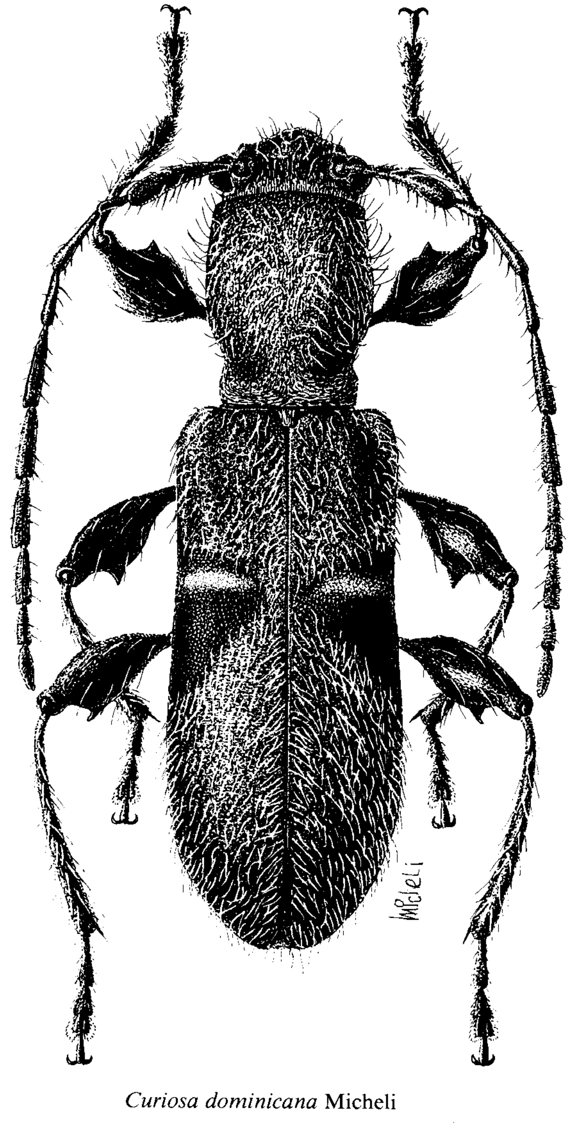

Curiosa dominicana Micheli

***World List* abbreviation: Coleopts Bull.**

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SYNONYMY IN WEST INDIAN *ECYRUS* LECONTE (CERAMBYCIDAE: LAMIINAE: POGONOCHERINI)

MICHAEL A. IVIE[1] AND JOHN A. CHEMSAK[2]

ABSTRACT

The genus *Ecyrus* LeConte is represented in the West Indies by a single known species, *E. hirtipes* Gahan. *Ecyrus insularis* Fisher, *E. hoffmanni* Fisher, *E. nanus* Fisher and *E. flavus* Fisher are reduced to synonymy. A redescription of the species with discussion of the variation, range, and nomenclatural history is provided.

The genus *Ecyrus* LeConte occurs from northeastern North America to Guatemala and in the West Indies. The Mexican species were revised and characterized by Chemsak and Linsley (1975*a*:281) and the U.S. species by Linsley (1935:88). The present note deals with the remainder of the genus, the West Indian fauna. Chemsak and Linsley (1975*b*:163) list five validated names from the West Indies, all described from uniques or small series. Examination of the types of the Fisher species, a photographic slide of the type of *E. hirtipes* Gahan, and 220 additional specimens from the Bahamas, Cuba, Puerto Rico, and the Virgin Islands have allowed a reassessment of the taxonomic status of these names. We conclude that a single variable species occurs throughout the area.

Ecyrus hirtipes Gahan

Ecyrus hirtipes Gahan 1895:127, pl. 2, fig. 6. Linsley 1930:86, 89. Linsley 1935: 88, 89. Breuning 1975:39, 44. Villiers 1980*a*:88. Villiers 1980*b*:466. Villiers 1980*c*:561.

Ecyrus insularis Fisher 1932:76. Linsley 1935:89, 90. Cazier and Lacey 1952: 48. de Zayas 1975:207, fig. 27a. **New Synonymy.**

Ecyrus hoffmanni Fisher 1932:78. Linsley 1935:89, 90. **New Synonymy.**

Ecyrus nanus Fisher 1932:79, 80. Linsley 1935:89. Wolcott 1936:261. Wolcott 1950:341. **New Synonymy.**

Ecyrus flavus Fisher 1932:80. Linsley 1935:89. Wolcott 1936:261. Wolcott 1950:341. **New Synonymy.**

Male. Form robust, from 2.2 to 3.0 times as long as broad, integument dark to light reddish-brown, pubescence variegated, white, brown, and golden-brown.

Head coarsely to sparsely punctate, clothed with whitish to golden-brown, prostrate pubescence; scattered long erect setae along the lateral edges of the frons, on the genae below the eyes, and along the clypeal margin; midline narrowly glabrous from level of bottom of lower lobe of eyes to back of vertex, wider between antennal tubercules; vertex covered with prostrate pubescence, with a longitudinal glabrous ridge on each side of midline. Antennae with prostrate pubescence of variable color and density, with long white cilia beneath.

Pronotum about as wide as long to slightly wider than long, with a sharply defined

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transverse groove at both anterior and posterior margins, and a wider, less abrupt transverse furrow between each of these grooves and disk; disk with a median, longitudinal glabrous line, with an acute tubercle at each side of middle; pubescence from tubercles medially golden-brown, forming a pair of uneven spots reaching from anterior groove to posterior furrow, sometimes extending laterad of tubercles, margined narrowly medially and broadly laterally with white; sides with many to no asperites. Thoracic sterna with dense appressed white pubescence, and with or without scattered long erect setae. Legs with mottled patches of white appressed pubescence and few to many long setae.

Elytra with second interstrial carina tuberculate behind level of scutellum, tubercle bearing a tuft of hairs, the end of this carina also bearing a tuft in unrubbed specimens, and often with a third tuft midway between these two; fourth interstrial carina with a small tuft of hairs at each end in fresh specimens; color pattern variable with age and condition of the specimens, but generally with a white transverse basal band, followed at the level of the elytral tubercules by a band of brown, with a golden-brown spot behind each tubercule, an arcuate brown line extends from below the humeri, posterio-medially to the first interstrial carina. Behind this line is another white band, produced forward on either side of the suture, which extends to the apex, broken by brown spots at hair tufts, golden-brown lines in the interstrial carinae and suture, and scattered large deep strial punctures.

Abdomen covered with dense, appressed, whitish to golden pubescence, with scattered to moderately dense, long, erect setae laterally.

Female. Differs from the male in a tendency to have more long setae on the legs and underside and by having the last abdominal segment as long as the previous three together.

Length. 6–13 mm.

Diagnosis. This species differs from all others in the genus by the sharply defined glabrous grooves at the apical and basal margins of the pronotum and the acute discal tubercules. The arcuate brown line on the elytra is the most constant color character and can be seen even in rubbed specimens.

Type localities. Of *hirtipes,* Balthazar, on the Windward side of Grenada (BMNH); *insularis,* Baragua, Cuba (NMNH); *hoffmanni,* Hinche, Haiti (NMNH); *nanus,* Boqueron, Puerto Rico (AMNH); *flavus,* Mayaguez, Puerto Rico (AMNH).

Known distribution. Bahamas (South Bimini), Cuba, Hispaniola, Puerto Rico, St. Thomas, St. John, Guadeloupe, Dominica, Martinique, Grenada.

Material studied (in addition to types).

BAHAMA ISLANDS: 200-South Bimini, JUL and AUG 1951, C. & P. Vaurie (AMNH, NMNH, EME, CAS, OSU, MAIC).

CUBA: 1-Pinar del Rio Vinales, 200 m, JUL 1966, F. Gregor (EME). 3-Central Jaronú, Camaguey Prov. (1–08 MAY 1926, 1–20 JUN 1926, 1–19 AUG 1926) B. T. Barreto [paratypes] (NMNH, MCZ). 2-Baraqua 22 MAY 1928, at light, L. C. Socramuzza (MCZ, NMNH). 1-St. Clara, '95, R. Combs (NMNH).

PUERTO RICO: 1-Guanica, SEP 1940, D. DeLeon, ex *Elaphrium simarouba* [=*Bursera simbaruba* (L.) Sarg.] (EME). 1-Mayaguez, OCT 1947, S. Rovira (EME). 1-Guianica forest, JUL 1969, H. & A. Howden (HAHC). 1-Mayaguez [Paratype] (NMNH). 1-Mayaguez, 18 MAR 1942, J. A. Ramos (NMNH).

ST. THOMAS: 1-Est. Lillinedahl, 08 AUG 1980, at light, (MAIC). 3-Frenchmans Bay Estate, 750 ft (1 each 01 MAY 1978, 31 OCT 1978, and 17 NOV 1978) M. A. Ivie (MAIC). 1-Frenchmans Bay, 2 mi. E. Charlotte Amalie 16 JUL 1979, C. W. O'Brien (JMC).

ST. JOHN: 1-Lameshur Ranger Station, FEB 1959, C. F. Adams (NMNH). 1-Lameshur Bay, 17 JUL 1979, R. Matlin (VIER). 1-Calbash Boom, 18 OCT 1980, at light, W. B. Muchmore (MAIC).

Notes. The variable nature of this species makes the naming of several forms from isolated specimens understandable. The large series taken by C. & P. Vaurie on South Bimini provided the first opportunity to study the considerable variation within a population. Very little geographic correlation was noted in the limited material from other areas, but the tendency seemed to be for the number of asperites on the pronotum, the long erect setae on the legs and underside, and the amount of punctation on the frons to increase to the East and South, while the occurence of the medial tuft on the second interstrial carinae decreases to the East and South. Rubbed or greasy specimens can appear quite distinct in color from fresh specimens but can be recognized as belonging to this species by the characters given in the diagnosis above.

Most of the specimens appear to have been collected at light, with only 1 host record, *Bursera simbaruba* from Puerto Rico.

Wolcott's (1950:341) statement that Linsley (1935) placed *E. flavus* and *E. nanus* in the genus *Callipogonis* is in error; both species were treated in *Ecyrus* in that and all other pertinent papers by Linsley.

ACKNOWLEDGMENTS

This study was carried out in part in conjunction with a National Science Foundation sponsored study of North American Cerambycidae (Grant DEB-8015523). The authorities of the following institutions and individuals are gratefully acknowledged for the loan of specimens: American Museum of Natural History (AMNH), New York; British Museum of Natural History (BMNH), London; California Academy of Sciences (CAS), San Francisco; Essig Museum of Entomology (EME), Berkeley; Museum of Comparative Zoology (MCZ), Cambridge; National Museum of Natural History (NMNH), Washington; Ohio State University (OSU), Columbus; Virgin Island Ecological Research Station (VIER), St. John; Virgin Island National Park, St. Thomas; J. Micheli (JMC), Ponce, Puerto Rico; and H. Howden (HAHC), Ottawa, Ontario. Material indicated MAIC is in the collection of the senior author.

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BOOK REVIEW

The Bark and Ambrosia Beetles of North and Central America (Coleoptera: Scolytidae), a Taxonomic Monograph. By Stephen L. Wood. 1982. Great Basin Naturalist Memoirs 6: 1–1,359. Cloth. Price $60.00 (prepaid) or $62.00 (purchase order).

The publication of this manual marks the culmination of the past 30 years of the author's work on the Scolytidae and provides the first truly adequate monograph of the North and Central American species of that family.

The book begins with a lengthy introductory section which includes detailed up-to-date summaries of our knowledge of the biology, biogeography, classification, economic importance, and methods of study of the Scolytidae. Here one can find clear, concise discussions of such important subjects as host selection and specificity, dispersal, pheromones, introduced species, phylogeny, and economic losses.

The systematic section is based on studies of more than 187,000 specimens and provides keys, descriptions, summaries of biology and distribution, and illustrations for 1,433 species. Primary type specimens for virtually all of these species were examined. Most of the illustrations were borrowed from previous works, but it is apparent to me that they were chosen for their high quality.

After actual use of this volume for several months, I have found it impressively free of errors other than a few "typos" (e.g. "Xyloborini" for Xyleborini on certain page headings, and "Old Westway" for Old Westbury, L.I.) that could be expected to occur in the most meticulously edited works of this length.

I think this monograph will remain the prime identification aid and information source on North and Central American Scolytidae for many years to come, and should be regarded as an indispensable part of the working library of all entomologists dealing with bark and ambrosia beetles in this hemisphere.

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The Coleopterists Bulletin, 37(3):203–207. 1983.

DESCRIPTION OF THE LARVA OF *UVARUS GRANARIUS* (AUBÉ) (COLEOPTERA: DYTISCIDAE) WITH A KEY TO THE NEARCTIC HYDROPORINAE LARVAE

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ABSTRACT

The larva of the predaceous diving beetle *Uvarus granarius* (Aubé) is described, and the bionomics of that species and of *Liodessus affinis* (Say) are discussed. In addition, a key to the known genera of Hydroporinae larvae in North America is presented, and generic distinctions in the larvae are briefly discussed.

Bidessine water beetles are common members of many aquatic habitats, especially marsh habitats; however, the larvae of only three North American species have been described (Perkins 1980), and relatively little information is available on the bionomics of the species. Perkins (1980) reviewed the world status of bidessine larvae and described the larva and pupa of *Neoclypeodytes cinctellus* (LeConte) from reared material. Watts (1970) briefly described the larva of *Liodessus affinis* (Say) from reared material, and Needham and Williamson (1907) described *Uvarus lacustris* (Say) from material associated but not reared. There is some doubt as to the identity of the larva which Needham and Williamson described because the material was not reared and both *Liodessus flavicollis* (Say) and *Liodessus affinis* also were present in the pond which they studied. Their description does not give much structural detail, and that which is given is closer to *L. affinis* than to the *Uvarus* described below. These observed differences could be species level differences, but this will remain in doubt until the larva of *U. lacustris* is actually reared.

In this paper the larva of *Uvarus granarius* (Aubé) reared from material collected in Back Bay, Virginia is described and compared to the larva of *Liodessus affinis* collected from the same locality. In addition, the bionomics of the two species are discussed, and a key to the known genera of North American Hydroporinae larvae is presented.

Uvarus granarius (Aubé)

Last instar larva. Length (including cerci) 3.2 mm; greatest width (at third abdominal segment) 0.55 mm. Color of dorsal sclerites light brown except for pale patches posteriorly on thoracic segments and anterior, median, and lateral light patches on the head. Abdominal sclerites separated by light membranous areas. Ventral surface white except for head, legs, and abdominal segments 7 and 8 which are light brown.

Head (Fig. 1) with anterior region prolonged to form a nasale; nasale length 0.26 mm, total head length 0.46 mm; occiput with a transverse groove extending laterally to below the middle of the head, the anterior margin of the groove heavily sclerotized to form a low ridge. Eye with individual ocelli close,

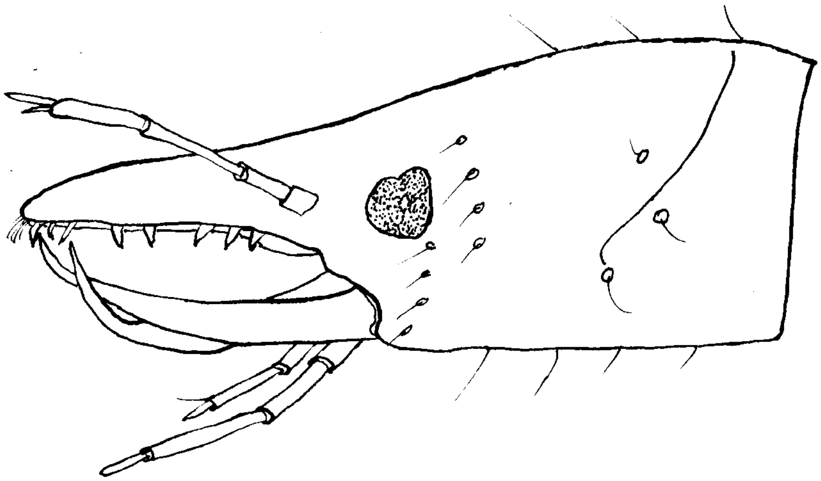

Fig. 1. Head of *Uvarus granarius*, lateral view.

partially fused. Nasale in dorsal view lacking a notch or lateral indentation. Nasale in lateral view with 5 subequal denticles at lateral margin posterior to tip of mandible, with several long flat setae anterior to tip of mandible and many peg-like setae at the anterior margin.

Antennal socket enlarged, raised, appearing as a short broad segment. Antenna cylindrical, 4 segmented; segment 1 short, 2 and 3 subequal, 4 short and bifid. Segments 2 and 3 with setae.

Mandible slender, curving inward and upward apically. Maxillary palpus slender, segment 1 short, 2 and 3 long and subequal, 4 short. Labial palpus slender, 2 segmented, elongate; segment 2 with a middorsal indentation which bears a long seta.

Pronotum almost as wide posteriorly as length, narrowing anteriorly. Mesonotum and metanotum wider than long, with numerous hairs on posterior margin and laterally. Legs 5 segmented; coxa long, subequal to femur; tarsi subequal in length to tibia, combined length of tarsus and tibia (for front and middle legs) subequal to length of femur, hind tarsus and tibia each four-fifths the length of femur. Each tarsus with 2 slender claws; mesotarsal claws twice the length of protarsal and metatarsal claws.

Abdominal segments 1–6 with a dorsal sclerite but no ventral sclerite. Segments 7 and 8 (Fig. 2) completely sclerotized, ring-like; dorsal portion of segment 8 produced into a siphon which is equal in length to ventral length of segment. Cerci short, basal section slightly longer than siphon, with 2 ventromedian, 1 lateral postmedian, and three apical hairs; apical section of cercus slender, 1⅓ length of basal section, with one terminal hair. Abdominal segments 1–8 with many hairs on the sclerotized portion, 1–7 with hairs most abundant at posterior and lateral margins.

COMPARATIVE CHARACTERS

Uvarus granarius and *Liodessus affinus* are similar in general morphology. However, the siphon of *L. affinus* is not more than ¾ as long as the ventral

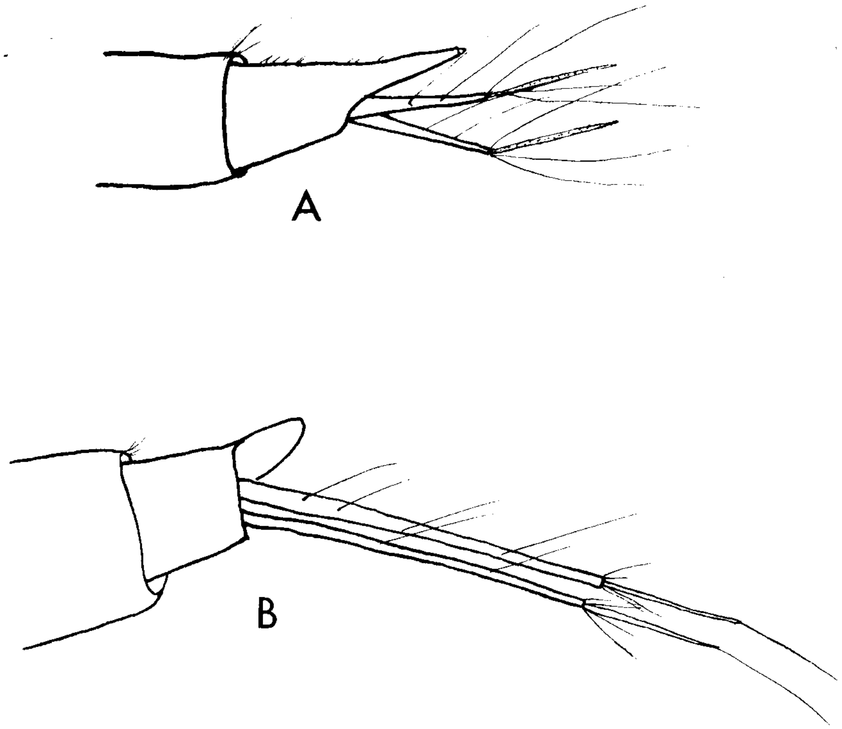

Fig. 2. Seventh and eighth abdominal segments of A) *Uvarus granarius*, lateral view and B) *Liodessus affinis*, lateral view.

length of the 8th abdominal segment, whereas in *U. granarius* it is equal in length to the 8th segment; and the basal section of the cercus of *L. affinus* is at least 3 times as long as the ventral length of the 8th segment, whereas in *U. granarius* it is not more than 1.5 times as long.

A comparison was made between *L. affinis* larvae and Perkin's (1980) description of *Neoclypeodytes cinctellus*; however no morphological differences could be found. Minor differences in color patterns of the head were not considered adequate for generic separation.

BIONOMICS

The larvae and adults of *Uvarus granarius* were collected at the marshy margins of canals flowing into Back Bay in Virginia Beach, Virginia. The salinity of the water was low (less than 0.5 ppt), and the larvae were most frequently found among the stems and blades of submerged grasses. Other aquatic beetles with which the adult and immature stages of *U. granarius* were associated included larvae and adults of *Liodessus affinis, Desmopachria grana* (LeConte), *Celina angustata* Aubé, *Hydrovatus pustulatus compressus* Sharp, *Hydrocanthus iricolor* Say, and *Suphisellus bicolor punctipennis* Sharp. In addition, adults of *Liodessus flavicollis* and *Bidessonotus inconspicuus* (LeConte) were present.

Liodessus affinis larvae were also collected in flooded *Spartina patens* (Ait)

M. meadows on Smith Island, a barrier island located near the mouth of Chesapeake Bay. These larvae were also found clinging to the submerged stems of the grass. Salinity at the time of collection was 10 ppt, but the salinity of these flooded meadows fluctuates from 0 to 33 ppt because of rainfall and washover by storm driven waters from the ocean and bay. Adult *L. affinis* have been found in water with a salinity of 20 ppt; however, larvae have not been found at salinities greater than 10 ppt.

In the laboratory, *U. granarius* fed on bivalve crustaceans, primarily small ostracods; they occasionally attempted to feed on copepods, but they were never observed successfully capturing a copepod. In the normal feeding process on ostracods, the nasale was smashed down on the dorsal surface of the prey. The tips of the mandibles were then inserted between the ventral edges of the valves and the mandibles were closed. This pinned the prey between the nasale and the mandibles, and since the mandibles are crossed at the tip this forces the valves open. The body contents are then scooped out by the other mouthparts. This entire process can take as little as 2 or 3 seconds.

Potential breeding sites were examined at weekly intervals beginning in late March, but third instar *Uvarus granarius* and *Liodessus affinis* larvae were not found until mid June. Earlier instars were not found, indicating either that development was very rapid or that the smaller instars were overlooked. Reduced numbers of larvae were present until late August.

GENERIC DISTINCTIONS IN THE HYDROPORINAE

Studies on the hydroporine larvae have been limited, and only 32 of the approximately 320 species of North American Hydroporinae have been positively associated with the adult form. Some of the generic distinctions based on the adult forms have not held up for the larval forms so far described. Watts (1970) indicated that no generic distinction between *Hygrotus* and *Hydroporus* based on the larvae then described was possible, and this is still true today. The genus *Oreodytes* poses problems in separation from *Deronectes*, and the characters which we use to separate North American *Deronectes* from *Hydroporus* do not work for European species.

Some of these problems may be due to the relatively small number of associated larvae. In addition, the genus *Hydroporus* is a large and complex group, and it may be that generic limits are incompletely or improperly established at the present time.

The following key does not include the genera *Bidessonotus*, *Anodocheilus*, *Neobidessus*, *Falloporus*, and *Brachyvatus*, which have not had larvae associated with adults. In addition, the generic pairs *Hygrotus* and *Hydroporus*, *Deronectes* and *Oreodytes*, and *Liodessus* and *Neoclypeodytes* are incompletely separated.

KEY TO THE KNOWN LARVAE OF NORTH AMERICAN (NORTH OF MEXICO) GENERA OF HYDROPORINAE LARVAE

1. Head with a frontal projection (nasale); body lacking lateral fringes of swimming hairs .... Hydroporinae . . . 2

1′. Head without a frontal projection; body with or without swimming hairs .... not Hydroporinae (not included in this key)

2(1). Frontal projection spatulate and paddle-like at tip, with two long lateral projections arising from base .... *Derovatellus*

2′. Frontal projection more evenly rounded, not expanded at tip, without long lateral projections although short lateral branches may be present 3

3(2′). Ocelli absent; body with a light brown tint, transparent; subterranean .... *Haideoporus*

3′. Not with the above combination of characters; not subterranean 4

4(3′). Ventral abdominal segments 2–8 with a sclerotized plate which may be fused to the tergite on segments 5–8; ocelli all separate, distinct 5

4′. Ventral abdominal segments 2–6 without a sclerotized plate; ocelli usually fused or with only one ocellus free 6

5(4). Pleural suture extending through segment 6 (but very faint on segment 6); front and middle tarsal claws less than ⅔ length of tarsus .... *Desmopachria*

5′. Pleural suture extending through segment 4; front and middle tarsal claws ⅔ length of tarsus .... *Hydrovatus*

6(4′). Frontal projection of nasale with a notch or short lateral branches on each side (very poorly defined in *Laccornis*) 7

6′. Frontal projection of nasale without a notch or projections 10

7(6). Frontal projection with a short lateral branch on each side .... *Pachydrus*

7′. Frontal projection with a notch on each side 8

8(7′). Cerci with only primary hairs, 6 or 9 in number 9

8′. Cerci with additional secondary hairs .... *Oreodytes* and *Deronectes*

9(8). Cerci on eighth abdominal segment long, as long as the eighth segment or longer .... *Hydroporus* and *Hygrotus*

9′. Cerci on eighth abdominal segment short, one-fourth as long as the eighth segment .... *Laccornis*

10(6′). Cerci with only primary hairs 11

10′. Cerci with secondary hairs .... *Oreodytes*

11(10). Head broadly sagittate; maxillary palpus four segmented; last abdominal segment with a recurved (lateral view) extension of the tracheal trunks beyond the apex of the segment .... *Celina*

11′. Head pyriform, not broadly sagittate; maxillary palpus three segmented; lateral tracheal trunks not extended beyond apex of last abdominal segment 12

12(11′). Larva greatly widened at middle .... *Oreodytes*

12′. Larva not greatly widened at middle 13

13(12′). Basal segment of cerci shorter than last abdominal segment including siphon; siphon equal in length or longer than the base of eighth segment .... *Uvarus*

13′. Basal segment of cercus longer than last abdominal segment including siphon; siphon shorter than base of segment .... *Neoclypeodytes* and *Liodessus*

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The Coleopterists Bulletin, 37(3):208–211. 1983.

NEOPHAENOGNATHA, A NEW GENUS FOR THE NEOTROPICAL SPECIES OF *PHAENOGNATHA* HOPE (SCARABAEIDAE: ACLOPINAE) WITH THE DESCRIPTION OF *N. CAPELLA* N. SP. AND DESIGNATION OF LECTOTYPES

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Abstract

Neophaenognatha n. gen. is proposed for three Neotropical species, *jenseni* Heller, *richteri* Ohaus, and *minor* Bruch, formerly placed in *Phaenognatha* Hope, now considered to be exclusively Australian. *N. capella* n. sp. is described from Argentina, and lectotypes are designated for *N. jenseni*, *N. richteri*, and *N. minor*.

The Aclopinae is a compact group of scarabs most closely related to the Hybosorinae, Ochodaeinae, and the "Loxsticti" (Euchirinae, Cetoniinae, Dynastinae, and Rutelinae) (Iablokoff-Khnzorian 1977). The group is characterised by broad, concave, plate-like mandibles which are visible from above on either side of the prominent labrum. Few female specimens of *Phaenognatha* Hope and *Neophaenognatha* n. gen. are known; they have reduced hind wings and hind tarsi, inflated abdomens, and clypeal horn absent, which indicate that they live most of their lives below ground, coming only to the surface for a short time to mate.

Three genera have been described: the Neotropical *Aclopus* Erichson (6 spp.), *Xenaclopus* Arrow from Borneo (1 sp.), and *Phaenognatha* from Australia and South America. Eleven species have been described in *Phaenognatha*—*aequistriata* Arrow, *angusta* Arrow, *arrowi* Allsopp, *erichsoni* Hope, *jenae* Allsopp, *pusilla* Arrow, *scutellata* Arrow, and *tristis* Arrow from northern Australia (Allsopp 1981), and *jenseni* Heller, *minor* Bruch, and *richteri* Ohaus from South America. The inclusion of *jenseni* in a genus other than *Phaenognatha* was first proposed by C. Felsche (Leipzig) who, in a letter to Heller (Heller 1907), proposed the genus *Pseudopachypus* for *jenseni*. However Heller (1907) preferred to refrain, at least temporarily, from erecting a new genus and placed *jenseni* with the Australian *erichsoni* in *Phaenognatha*. Both Ohaus (1909) and Bruch (1910) followed this single genus concept, describing *richteri* and *minor*, respectively, in *Phaenognatha*. Arrow (1909) knew only *jenseni* and, although he retained it in *Phaenognatha*, remarked "this is not very similar superficially [to *erichsoni*]" and "a genus might well have been made for it [*jenseni*]." After comparing the Australian species of *Phaenognatha* with the Neotropical species I consider the latter sufficiently distinct to warrant a separate genus for which I propose the name *Neophaenognatha*. I have rejected Felsche's proposal of naming it *Pseudopachypus* as this name alludes to an incorrect relationship with *Pachypus* Latreille (Pachypodinae).

Neophaenognatha Allsopp, **new genus**

Description. Male: Labrum tapering to rounded apex, base with long dense setae, apex relatively bare. Mandibles roughly semicircular but anterolateral margin slightly indented. Clypeus with prominent slightly-bifurcate horn or strongly raised transverse ridge terminating in a pair of short horns; dense setae at base of and posterior to horn or ridge. Frons with rising posterior and midline, with long erect setae. Ventral surface of head with long setae, stouter on labium. Pronotum with shallow anterior excavation making anterior margin almost vertical; excavation with long, dense setae arising from punctures; long setae on lateral margins of pronotum, remainder glabrous; shallow lateral fovea on each side. Scutellum V-shaped; shallow posterior depression; long setae near base, remainder relatively bare. Elytra tapering towards apex, with at most a single stria near lateral margins, elsewhere with shallow punctures and scattered setae; apices individually rounded, not contiguous; long setae on lateral margins and around apices, shorter setae scattered on disc. Claws normal. Head, pronotum and scutellum brown, elytra tawny sometimes with smoky black patches or edging.

Type species. Phaenognatha jenseni Heller 1907 by present designation.

Etymology. The prefix *Neo* alludes to its close relationship with *Phaenognatha* and to its Neotropical distribution.

The genus is distinguished from other genera in the subfamily by the following key:

1. Clypeus of males without horn or ridge; pronotum normally rounded 2
1′. Clypeus of males with distinct horn or strongly raised transverse ridge; pronotum with anterior excavation 3
2. Inner claw of foreleg simple; fore tibiae 2-dentate; antennal club normal; Neotropical .... *Aclopus* Erichson
2′. Inner claw of foreleg deeply cleft; fore tibiae 3-dentate; antennal club massive; Borneo .... *Xenaclopus* Arrow
3. Elytra with distinct punctuate striae, glabrous; unicolored; Australia .... *Phaenognatha* Hope
3′. Elytra with at most a single distinct stria, scattered setae on disc; bicolored; Neotropical .... *Neophaenognatha* n. gen.

Neophaenognatha jenseni (Heller), **new combination**

Phaenognatha jenseni Heller, 1907, p. 55.

Type material. Lectotype (here designated): Male with the following labels: (i) 'LECTOTYPE,' on pink label; (ii) 'Typus,' on red label; (iii) '11, 1907,' on green label; (iv) 'LECTOTYPE, Phaenognatha jenseni Heller selected P. Allsopp 1982'; (v) 'Neophaenognatha jenseni (Heller) det. P. G. Allsopp, 1982.' Maxillae and labium dissected out and attached to card. Staatliches Museum für Tierkunde, Dresden, DDR.

Heller (1907) gives the type locality as Estacion Santa Rosa, Provincia Mendoza, Argentina. Although there are further specimens in the Dresden collection with this label data none have been designated as paralectotypes as Heller (1907) gives no indication of the exact number of specimens he saw.

Neophaenognatha richteri (Ohaus), **new combination**

Phaenognatha richteri Ohaus, 1909, p. 447.

Type material. Lectotype (here designated): Male with the following labels: (i) 'LECTOTYPE,' on pink label; (ii) 'Rep. Argentina, Prov. San Luis, H.

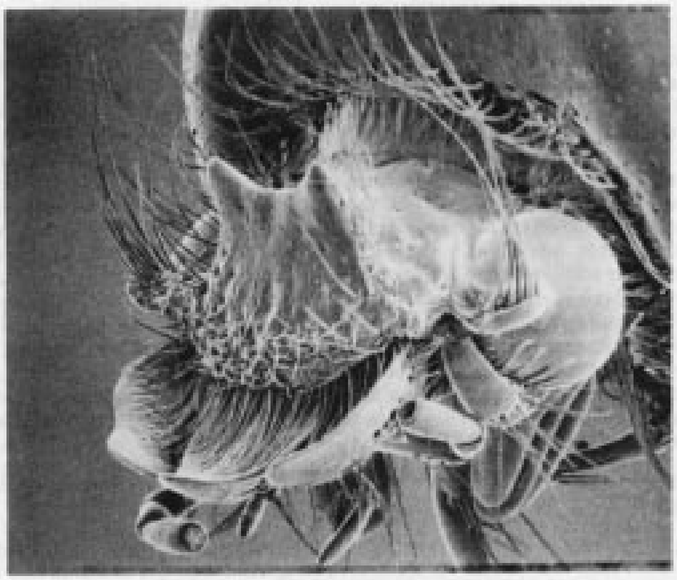

Fig. 1. *Neophaenognatha capella*, head.

Richter'; (iii) 'Typus,' on light blue label; (iv) 'Det. F. Ohaus 1909. Phaenognatha Richteri Ohs. Type. 1896'; (v) '302,' on circular orange label; (vi) 'LECTOTYPE. Phaenognatha richteri Ohaus selected P. Allsopp 1982'; (vii) 'Neophaenognatha richteri (Ohaus) det. P. G. Allsopp 1982.' Museo de La Plata, La Plata, Argentina.

Ohaus (1909) saw a number of specimens (einer Anzahl von Stucken) but I have seen no others with sufficient label data to warrant designation as paralectotypes.

Neophaenognatha minor (Bruch), **new combination**

Phaenognatha minor Bruch, 1910, p. 72.

Type material. Lectotype (here designated): Male with the following labels: (i) 'LECTOTYPE,' on pink label; (ii) 'Rep. Argentina, (one word illegible), H. Richter'; (iii) 'Typus,' on light blue label; (iv) 'Phaenognatha minor Bruch, tipo, 2374'; (v) '301,' on circular orange label; (vi) 'LECTOTYPE, Phaenognatha minor Bruch selected P. Allsopp, 1982'; (vii) 'Neophaenognatha minor (Bruch) det. P. Allsopp 1982.' Right antenna, mandible, maxilla and the labium dissected out and attached to one card and aedeagus dissected out and attached to a second card. Museo de La Plata, La Plata, Argentina.

Bruch (1910) gives the type locality as Rio Negro.

Neophaenognatha capella Allsopp, **new species**
(Fig. 1)

Type material. Holotype: Male. ARGENTINA, Prov. Catamarca, Frias, 9 February 1952, Ross & Michelbacher colln. California Academy of Sciences, San Francisco. Paratype: Male. Same data as holotype. H. & A. Howden Collection, Ottawa, Ontario, Canada.

Description. Male. Length 4.7–5.5 mm. Head, pronotum, and scutellum brown, elytra tawny with smoky-black posteriorly-pointed triangle on anterior third and lateral edges, apices and posterior half of sutural line brown-black, setae white around junction of pronotum and elytra, remainder yellow. Apex of labrum inclined upwards. Clypeus with strongly raised transverse ridge terminating in pair of short, slightly outwardly-pointing horns (Fig. 1); anterior clypeus with short setae arising from large punctures, becoming smoother on ridge; many long setae laterally on ridge, few posterior to ridge. Central portion of frons smooth, glabrous; setae on lateral edges and canthus of eye. Venter of head with dense setae anteriorly, finer and shorter posteriorly. Antennae with long setae on scape and pedicel. Anterior excavation of pronotum with setae only on anterior edge, posterior edge with a biarcuate median prominence; disc of pronotum with scattered shallow punctures; anterior angles slightly obtuse but rounded apex, posterior angles rounded; posterior margin relatively straight, protruding slightly to posterior in middle; all edges distinctly margined. Elytra with faint stria between humerus and lateral margin; setae of disc longer near suture than towards lateral margins. Fore coxae with line of setae on anterior face near ventral edge, scattered finer setae elsewhere; fore tibia 3-dentate, teeth evenly spaced, longitudinal line of setae near middle of anterior face; fore tarsi with long setae at joints. Mid and hind coxae with longitudinal lines of fine setae near middle of anterior face and on dorsal edge, posterior face with dense setae; mid and hind tibiae with rows of spines at ⅔ length and at apex, scattered setae elsewhere; mid and hind tarsi with long setae at joints, hind tarsi also with scattered setae elsewhere. Abdomen covered with long fine setae, longer and denser on rugose pygidium, tuft of long setae either side of apex of pygidium. Aedeagus with parameres symmetrical, triangular with apices rounded, width across base half length.

Remarks. This species is readily distinguished by the shape of the clypeal armament. In *N. jenseni, N. richteri,* and *N. minor* the clypeus has a transverse carina which rapidly narrows to form a single parallel-sided horn with, at the most, a slight bifurcation.

Etymology. Latin feminine noun, *capella,* meaning she-goat, referring to the two horns on the clypeal ridge.

ACKNOWLEDGMENTS

I thank Prof. Henry F. Howden, Dr. Luis de Santis, and the Director, Staatliches Museum für Tierkunde, Dresden, for the loan of material and Henry Howden for supplying Fig. 1.

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The Coleopterists Bulletin, 37(3):212–216. 1983.

OCHTHEBIUS (*ASIOBATES*) *OTAVALENSIS*, A NEW SPECIES OF WATER BEETLE FROM THE ECUADORIAN ANDES (COLEOPTERA: HYDRAENIDAE)[1]

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ABSTRACT

Ochthebius (*Asiobates*) *otavalensis* Anderson, new species, is described from a small pool habitat in Otavalo, Imbaburra Province, in the interandean valley of northern Ecuador, at an elevation of 2,490 meters. *O. otavalensis* is the first member of the subgenus *Asiobates* Stephens to be reported from South America, and is the third *Ochthebius* species to be described for this continent. Illustrations of the aedeagus and adult habitus of *O. otavalensis* are presented. Illustrations of the aedeagus and head-pronotum of *O. similis* Sharp, the nearest relative of the new species, are redrawn from Perkins (1981) and included for comparison. *O. otavalensis* is interpolated into revised couplets for Perkins' key to the Western Hemisphere *Ochthebius* (1981, pp. 298–305).

Members of the genus *Ochthebius* are small (ca. 2 mm), oval, somewhat flattened ornately sculptured aquatic beetles usually found in the sand or mud at the margins of lentic habitats such as lakes, ponds, and pools (Perkins 1981). They do not swim well and can be found moving about slowly on or in the substrate or walking on the underside of the surface film of water.

Perkins (1981) recently revised the family Hydraenidae for the Western Hemisphere and recognized 53 species of *Ochthebius*. Of these, only *O. attritus* and *O. lineatus* were known from South America (eastern Brazil and northern Colombia, respectively); he also mentioned an undescribed species of the *biincisus* Group from Colombia, known only from a single female specimen. He treated 16 species in the subgenus *Asiobates* which are recorded from North and Central America.

Ochthebius (*Asiobates*) *otavalensis* Anderson, **new species**
(Figs. 1–4, 6)

Type locality. ECUADOR: Imbaburra Province; Otavalo; elevation 2,490 meters.

Type specimens. Holotype male, allotype, and 14 paratypes (4 ♂♂, 10 ♀♀) are deposited in the U.S. National Museum of Natural History, Washington, D.C. (USNM type no. 100579). Additional paratypes are deposited in the following collections: Museo Ecuatoriano de Ciencias Naturales, Quito (1 ♀); Museum of Comparative Zoology, Cambridge, Massachusetts (1 ♀); and California Academy of Sciences, San Francisco (1 ♂, 1 ♀). I collected all specimens at the type locality on the afternoon of July 27, 1979.

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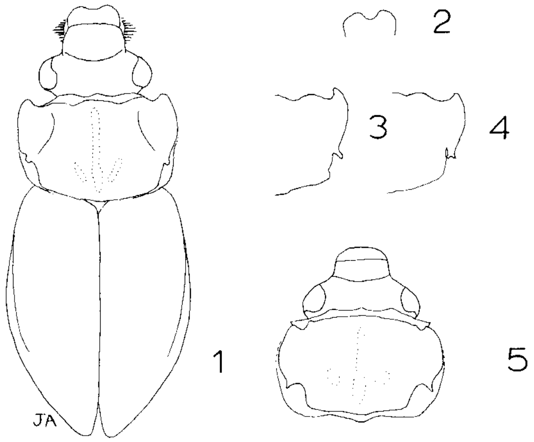
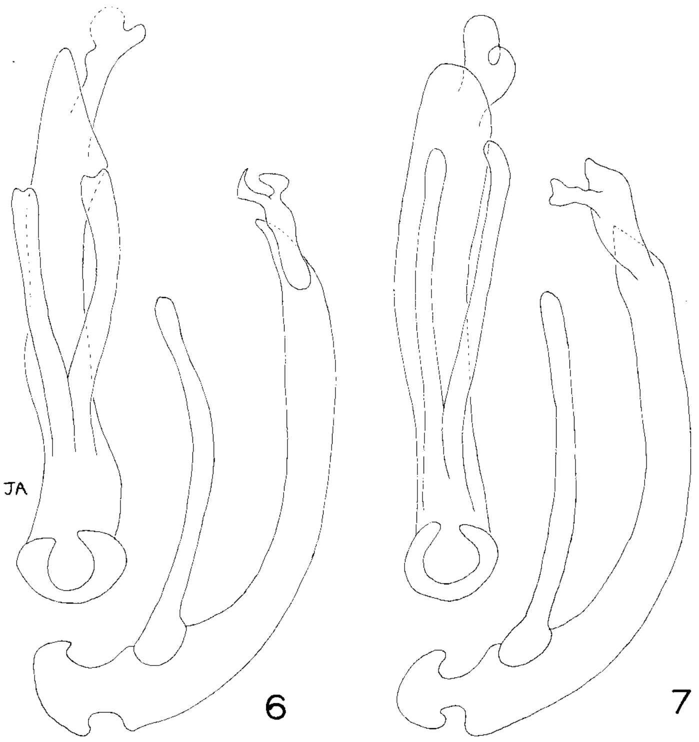
[1] Contribution no. 7 from the Maryland Center for Systematic Entomology.



Figs. 1–4. *Ochthebius otavalensis:* 1, holotype male, dorsal habitus; 2, allotype female, labrum; 3 and 4, pronotal variation, dorsal aspect, allotype female (3), paratype male (4). Fig. 5. *O. similis*, holotype female, head and pronotum, dorsal aspect (redrawn from Perkins 1981).

Diagnosis. O. otavalensis is a member of the *similis* Subgroup of the *discretus* Group of the subgenus *Asiobates*: Sclerotized portion of the pronotum transverse, with the sides gradually rounded from anterior angles to midline or slightly beyond, then excavated behind the midline of the lateral margin; parameres divergent from their base (subgenus *Asiobates* Stephens). Aedeagus with process on the terminal piece (*discretus* Group). Pronotum without anterior foveae (*similis* Subgroup). The only other member of the *similis* Subgroup is *O.* (*A.*) *similis* Sharp; *O. otavalensis* is separated from it most reliably by the shape of the aedeagus (Figs. 6 and 7). Additionally, *O. otavalensis* is generally darker in color, has the anterior angles of the pronotum more produced, has the posterior foveae more elongate, narrower, and less markedly impressed, and has a more arcuate frontoclypeal suture (Figs. 1 and 5).

Description. Holotype: Ovate, moderately convex. Size: 2.04 mm long, maximum width 1.04 mm. Color: Brown, shining, dorsal surface of head and central area of pronotal disc piceus, with a faint brassy reflex. Head: Length .46 mm; width .56 mm; frons finely, sparsely punctate; interocular foveae medium, deep, width of each equal to half the distance between them; interocular tuberculi large, indistinct except under very diffuse light; basomedial foveae small, indistinct. Frontoclypeal suture evenly arcuate. Clypeus length .47 times width, with fine setae and microreticulation. Labroclypeal suture straight. Labrum length .46 times width. Median emargination moderately developed. Mandibles with a row of prominent spines along the lateral edge. Maxillary palpus with palpomere 3 moderately wide; palpomere 4 .41 times length of 3. Mentum moderately expanded apically, trapezoidal, width equal length, shining, with scattered punctures. Genae shining, somewhat swollen. Postgenae microrugose. Thorax: Pronotum length at midline .52 mm; maximum width (near anterior $^{1}/_{5}$) .78 mm. Anterior hyaline border wide in front of disc, becoming wider just before the lateral fossulae, tapering toward the anterior angles. Lateral hyaline border origin at anterior of pronotum, extending backward narrowly along pronotal margin. Anterior margin of pronotum rounded medially, bisinuate, broadly excavate in front of lateral depressions; anterior angles acute, produced. Lateral depressions inflated, very broad, sparsely finely punctate; margins arcuate. Posterior half



Figs. 6–7. Aedeagi of *Ochthebius,* dorsal aspect (left) and lateral aspect (right): 6, *O. otavalensis,* holotype; 7, *O. similis* (redrawn from Perkins 1981).

strongly excavate, with a moderately large tooth lateral to the excavation; pronotum constricted behind lateral margins. Lateral fossulae deeply impressed; inner margins abrupt, posterior extreme tapering into hyaline border. Pronotal disc slightly convex, sparsely punctate, punctures separated by .5–2 times puncture diameter; surface between punctures glabrous; median groove slightly deep channel, more or less parallel sided. Anterior foveae absent, this region moderately depressed. Posterior foveae shallowly impressed, obliquely elongate and narrow. Posterolateral angles with shallow impressions. Prosternum with median carina ended at coxal cavities; coxae continuous. Metasternum with a large median glabrous area. Elytra: Length 1.30 mm; maximum width (near posterior $^{3}/_{5}$) 1.04 mm. Disc moderately flat, shiny, with 5 rows of punctures between suture and humeri. Humeri strongly angulate, obtuse. Sides convex, declivity origin near posterior $^{1}/_{3}$; intervals well-defined, strongly rounded, subcostate, width slightly greater than puncture diameter; surface smooth and shiny; punctures nearly tangent, becoming slightly further spaced posterolaterally; each puncture bearing a seta. Explanate margin very slightly developed. Abdomen: Basal five sterna with hydrofuge pubescence. Apical two segments smooth, apical thirds and sides of each with fine pubescence. Legs: Moderately long; ratio of hind leg length to length of abdomen 2.2:1.0. Protarsomeres 1–3 with suction setae. Aedeagus: Fig. 6 (6 examined).

Allotype. Differs from the holotype in the following respects: Size: Length 2.26 mm, maximum width .96 mm. Color: Darker, piceous, brassy reflex on head and pronotum more pronounced. Lateral tooth of pronotum larger, more prominent, attenuate (Fig. 3). Median emargination of labrum well-developed (Fig. 2). Suction setae on protarsomeres

1–3 absent. Row of spines on lateral edge of mandibles replaced by long erect setae (somewhat curled distally or stuck together at their apices in dried specimens).

Variation. Size: Length 1.76–2.26 mm; width .86–1.04 mm; females generally slightly larger than males. Color: Ranges from nearly testaceous with a very faint brassy reflex to piceous with a pronounced brassy reflex. The most common form in the type series is somewhat intermediate between the two extremes, as in the holotype. These differences in color are probably related to the age of the specimen, the palest individuals being recently emerged tenerals and the darkest ones being older, more fully sclerotized individuals. Females normally have the median emargination of the labrum much more developed than males (Fig. 2). There is some variation in pronotal outline, but this does not appear to be strictly related to sex; the extremes are illustrated in Figs. 1, 3, and 4, but intermediates are found. The area normally occupied by the anterior foveae in many *Ochthebius* species is more depressed in some specimens than in others. In one female specimen it almost appears as if a faint fovea is present, but the depression lacks the well-defined declivity found in true anterior foveae.

Comments. The function of the row of stiff spines along the acute lateral margin of the mandibles of the male and their long setae homologues in the female is unknown. Since these structures are strongly sexually dimorphic, it is possible that they play some role in courtship behavior. Or, although this is entirely speculative, these prominent spines may function as "horns" in the sense described by Eberhard (1980). Such structures, found in many beetle species and in many forms, are developed mainly in the males of the species and are wielded in intraspecific battles over contested critical resources such as females and oviposition sites. Horns have been found on the head, pronotum, prosternum, or mandibles (or in combination) of a great variety of species. Most often, these structures are employed as levers to pry an opponent from the substrate in order to push him away more easily (Eberhard 1980). Observations to determine the actual function of mandibular spines in *Ochthebius* would be very interesting.

I found no mention of these spines in Perkins' (1981) monograph. However, I briefly examined the males of 26 species of *Ochthebius* in the USNM collection in order to see if the character appears in other members of the genus. Only one species of *Ochthebius sensu stricto, O. attritus,* was found to have the spines, and they were only moderately developed in some of the individuals examined. On the other hand, 6 of the 10 species of *Asiobates* examined, including *O. similis,* had the spines developed to a greater or lesser extent. The size and number of the spines present in *O. otavalensis* lay at the upper end of the size-number spectrum. A more thorough analysis of the distribution of these structures in *Ochthebius* is needed. Cursory examination of most other Western Hemisphere Hydraenid genera suggests that the character is confined to members of *Ochthebius.*

Natural history. The type series of *O. otavalensis* was taken from the muddy margin of a small pool (1.5 m across, 1.7 m deep) at the base of a permanent madicolous seepage on the face of a vertical earthen bank approximately seven meters from the edge of a medium sized creek. The local indigenous people, the Otavalos, have used this pool as a source of drinking water for many generations. The general area in which the pool is located consists primarily of cultivated fields, small stands of *Eucalyptus* trees, thickets of shrubs, and grassy areas. The vegetation surrounding the habitat is a comparatively lush mixture of grasses, low leafy herbs, and mosses which partially shades the pool for a good portion of the day.

Of the twenty specimens taken, three (2 ♂♂, 1 ♀) were apparently fresh tenerals, ten (4 ♂♂, 6 ♀♀) were intermediately sclerotized, and seven (all females) evidently were more or less fully sclerotized. As the specimens were collected in late July, this suggests that pupation probably occurs in late June and early July. Unfortunately, I found no immatures.

Distribution. At present known only from the type locality.

Etymology. The specific epithet *otavalensis* refers to the type locality and also honors the local Quechua-speaking people, the Otavalos.

Couplets from Perkins' key to the Western Hemisphere *Ochthebius* (1981, see p. 304) are revised to include the new species:

15(10). Pronotum with posterior foveae; Arizona, Mexico, Ecuador (*similis* Subgroup) 15a
15′. Pronotum without posterior foveae; Pacific Coast States of the United States, transcontinental border near U.S.A.-Canada border (*cribicollis* Subgroup)[2] 16
15a(15). Aedeagus as in Fig. 7. Posterior foveae rounded and deeply impressed; median groove of pronotal disc narrow, moderately deep channel; anterior pronotal angles not strongly produced. Color testaceous to brown. Arizona and Mexico ...... *O. similis* Sharp
15a′. Aedeagus as in Fig. 6. Posterior foveae obliquely elongate, narrow, and moderately impressed; median groove of pronotal disc wide, slightly deep channel; anterior pronotal angles strongly produced, acute. Color brown to piceous, with a brassy reflex on the head and pronotum. Ecuador .... *O. otavalensis* Anderson

ACKNOWLEDGMENTS

I thank Paul Spangler, Scott Shaw, Doug Miller, and Charles Mitter for reading the manuscript and offering useful criticism. I also thank Jim Winfield of North Carolina, former Peace Corps Volunteer in Ecuador, for his companionship on several collecting excursions, including the one that resulted in the capture of *O. otavalensis.* My special gratitude and admiration are extended to Paul Spangler for his continual support and encouragement, as well as his extremely productive enthusiasm for water beetles. The specimens of *O. otavalensis* were collected as part of the cooperative Smithsonian-Peace Corps-Ecuador aquatic insect survey project (1975–1979).

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[2] 15′ unchanged from Perkins (1981).

The Coleopterists Bulletin, 37(3):217–231. 1983.

PSELAPHIDAE OF BUTTE COUNTY, CALIFORNIA (COLEOPTERA)[1]

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ABSTRACT

Sampling for Pselaphidae in Butte County, California, concentrated on the fauna of the foothills and mountains of the Sierra Nevada. Twenty-nine species were discovered. Thirteen species are here described, and records for the remainder are presented. New species are: *Sonoma yahiorum, Oropus grigaricki, O. schusteri, Tetrascapha krysiae, Oropodes ishii, Actium hazeltinei, Hylotychus plumas, H. confusus, Pselaptrichus marshi, P. magaliae, P. cornus, P. auctumnus,* and *Batrisodes oro.*

California possesses the most thoroughly sampled pselaphid fauna of the New World. A. A. Grigarick, R. O. Schuster, and G. A. Marsh have revised almost all of the pselaphid genera of the Pacific Coast states in numerous recent papers. However, these revisions were based on collections primarily taken from the counties bordering the coast, while the inland mountain ranges, the Sierra Nevada and the Cascade Mountains, have been less thoroughly sampled. Over a period of three years, I had the opportunity to intensively sample the litter fauna of many parts of Butte County, an area heretofore lacking any published records of the family. Twenty-nine species in fifteen genera are listed here, with thirteen of these being described as new. The species in this paper represent only part of the total pselaphid fauna of this region, since my efforts were primarily directed toward sampling the leaf litter fauna of the foothills and mountains. Certain species that should be present, such as *Tyrus corticinus* (Casey) and several *Reichenbachia,* were not collected because their habitats were not extensively sampled.

Butte County possesses a diverse array of habitats. The county extends from the extensively agriculturalized Sacramento Valley floor to the mountains of the Sierra Nevada and Cascades, with elevations ranging from 150 to over 7,000 feet. The Sierra Nevada are dissected by several large rivers and streams, with the four forks of the Feather River being the best known and largest. These streams create extensive riverine and some wetland habitats on the valley floor. The northern higher elevations consist primarily of mud flows and other volcanics and form the southern rim of the Cascade Plateau (Mt. Lassen is twenty miles to the north). The bulk of the highlands is the northern extension of the Sierra Nevada, which consists mainly of metamorphics such as serpentine and slates which are progressively intermixed with granites to the southeast. Due to extremely irregular terrain, only two major highways traverse this region, and travel in the mountainous portion of the county is often restricted to dirt roads of variable quality.

Pselaphid collecting anywhere is best when moisture levels are high. In the

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[1] Scientific Contribution Number 1158 from the New Hampshire Agricultural Experiment Station.

Mediterranean climate of California, this essentially restricts leaf litter collections at the lower elevations to the period from November to May when winter and spring rains keep moisture levels high. The season in the mountains is similar, but may be prolonged at higher elevations due to additional moisture from melting snow. Productive collecting at all elevations ceases by the end of July, even though litter may remain moist at the margins of streams. The mud flow region to the north dries out very quickly and is generally a poor collecting area due to thin soil. However, the deep canyons of the Sierra Nevada possess many springs and small streams which maintain high humidity near their margins, and create the best collecting sites for many species.

Species diagnoses are arranged so that the first paragraph contains the distinguishing characteristics of the species, the second the features of the male, and the third the features of the female. At least one specimen of each new species was dissected and mounted on a slide, except in *Batrisodes* and *Hylotychus.* Holotypes were selected from slide-mounted specimens when possible. Specimens were prepared for examination by clearing in 5% KOH, placed briefly in 5% acetic acid, and then mounted in Hoyers medium. Drawings were made from slide-mounts, and measurements are in millimeters. All collections were made by the author. The holotypes are to be deposited at the University of California, Davis. I thank Dr. John M. Kingsolver, U.S. Dept. of Agriculture at the U.S. National Museum for loaning the types of two *Oropus* species, and Robert O. Schuster of the University of California, Davis, for the loan of some *Oropus* paratypes. Drs. John F. Burger and R. Marcel Reeves of the University of New Hampshire reviewed the manuscript.

Sonoma yahiorum Chandler, **new species**
(Fig. 2)

Length 1.40. Head with eyes possessing about 20 facets, frontal fovea extending posteriorly to point even with eye center, vertexal foveae slightly closer to each other than to eyes; mandibular rami lacking teeth. Pronotum with median basal fovea faint, disc lacking any foveae or sulci. Elytra with a sutural and basal fovea, one free discal fovea centered in basal half. Brachypterous. Tergites I–III and sternites II–IV with basal depression between foveae obscured by dense thick setae, both setae and foveae lacking on tergite IV and sternite V.

Male lacking any modifications of trochanters or tibiae. Genitalia relatively simple.

Female unknown.

Male holotype. Little Chico Creek, Butte County, California. Head 0.18 long, 0.27 wide across eyes; pronotum 0.29 long; elytra 0.33 long.

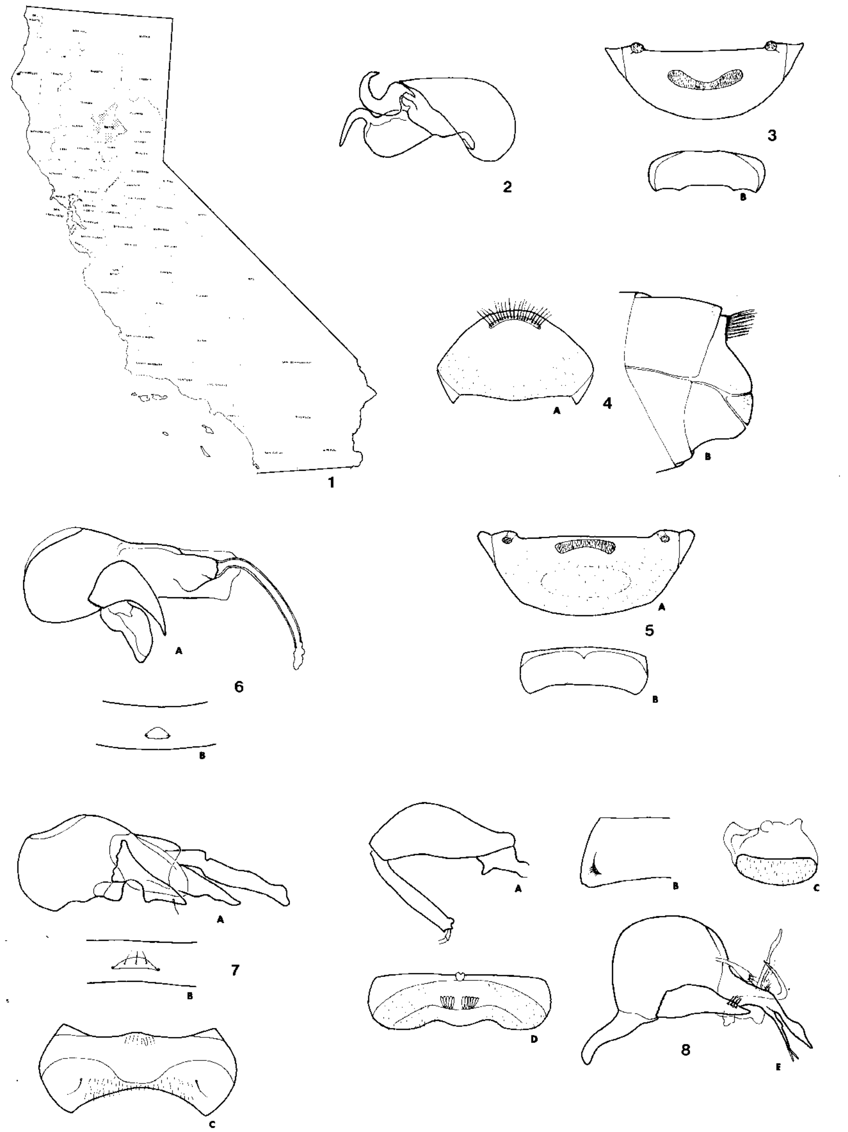
Specimens examined, 2. HOLOTYPE male: *California:* Butte Co.: Little Chico Creek, 1,300′, I-17-1978, sift rotten live oak. PARATYPE: one male, same data as type. Named for the Yahi Indians which lived in northern Butte County.

Biology. This species was collected by sifting rotten live oak in a very moist ravine traversing an otherwise xeric habitat during the wettest period of the year.

Discussion. This species runs in the key of Marsh and Schuster (1962) to *isabellae* (LeConte), from which it differs by the smaller eyes, the fewer elytral foveae, and the mandibular rami lacking teeth.

Megarafonus parvus Schuster and Marsh

California: Butte Co.: Mud Creek, near Cohasset, V-30-1979, sift litter along stream; 7 mi E Chico, Butte Creek Canyon, 400′, XII-23-1978, sift rotten



Figs. 1–8. 1, Location of Butte County in California; 2, *Sonoma yahiorum* n. sp., ventral view aedeagus; 3, *Oropus grigaricki* n. sp., male (a, dorsal view fourth tergite; b, ventral view sixth sternite); 4, *O. schusteri* n. sp., male (a, dorsal view fourth tergite; b, lateral view apex abdomen); 5, *O. acriculus* Schuster and Grigarick, male (a, dorsal view fourth tergite; b, ventral view sixth sternite); 6, *Tetrascapha krysiae* n. sp., male (a, left lateral view aedeagus; b, ventral view median portion third sternite); 7, *Oropodes ishii* n. sp., male (a, left lateral view aedeagus; b, ventral view median portion third sternite; c, ventral view sixth sternite); 8, *Actium hazeltinei* n. sp., male (a, lateral view mesothoracic leg; b, lateral portion third sternite; c, ventral view seventh sternite; d, ventral view sixth sternite; e, left lateral view aedeagus).

Digger pine; Little Chico Creek, 1,300′, I-17-1979, sift rotten live oak; Ponderosa Way, 4 mi NW Forest Ranch, V-27-1978, sift rotten wood; 2 mi SW Nimshew, I-19-1979, sift rotten wood; near Paradise, Honey Run Road, XII-22-1978, sift rotten Digger pine; 3 mi NE Jonesville, Humboldt Summit, 6,600′, V-11-1981, sift rotten wood. This species has always been associated with well rotted wood.

Mayetia skeeteri Royce and Kistner

California: Butte Co.: 3 mi NE Chico, Bidwell Park, II-7/IV-30-1981, berlese sod in clay soil. About forty pounds (wet weight) of soil would yield 10–15 specimens during February and March, with fewer numbers being taken in April.

Oropus grigaricki Chandler, **new species**

(Fig. 3)

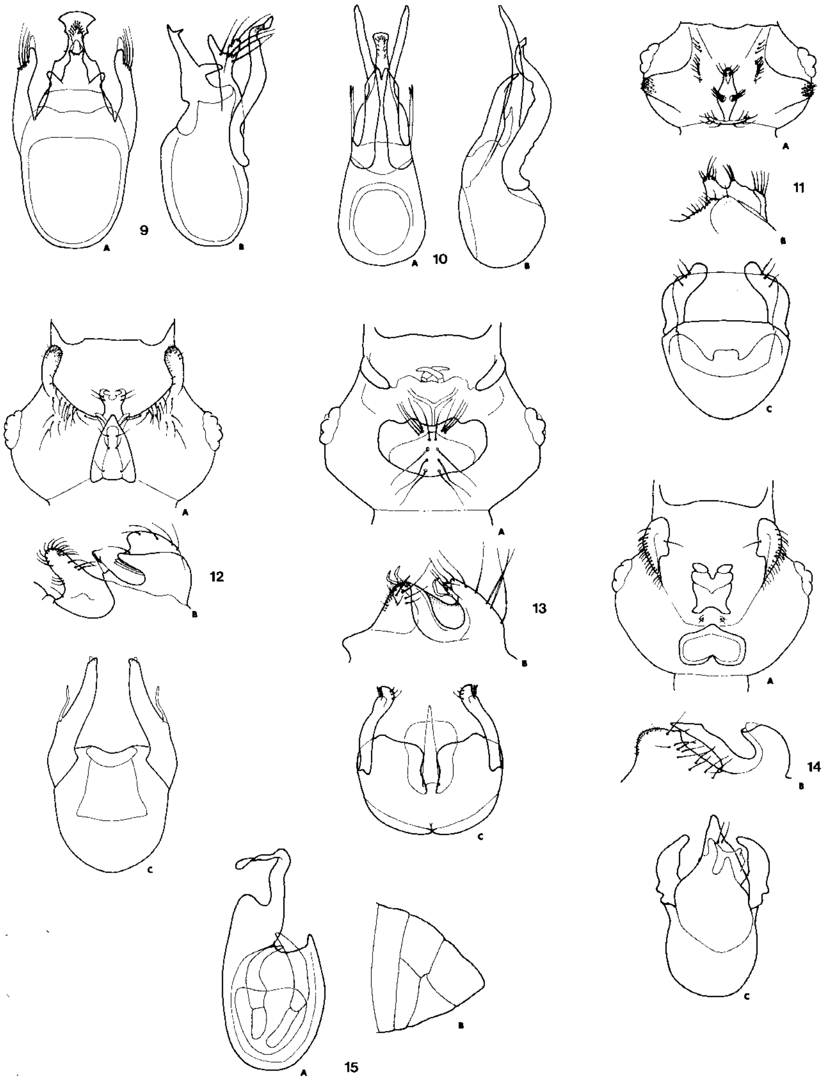
Length 2.08–2.44. Pronotum with large baso-lateral tooth. Elytra with four basal foveae and a subhumeral fovea, first discal stria distinct through first two-thirds of elytra, not approaching sutural stria at apex. Second tergite two-thirds the length of tergite I.

Male with eyes possessing about 40 facets; tergite IV with basal transverse sulcus curving anteriorly at apices, microsetigerous area widest at apices, constricted or absent at middle; sternite IV medianly with 6–8 long setae, sternite V with 5–15 median pits in transverse row, row interrupted at center, apical margin of sternite VI varying from bisinuate to almost straight.

Females with eyes possessing about 17 facets; tergite IV smoothly flattened or convex, lacking sulcus.

Male holotype. 5 mi NE Forest Ranch, Butte County, California. Length 2.35. Head 0.40 long, 0.49 wide across eyes; pronotum 0.50 long; elytra 0.75 long; tergite IV with microsetigerous area complete through sulcus; sternite IV with 8 long setae, sternite V with 9 pits in transverse row.

Specimens examined, 105. HOLOTYPE male: *California:* Butte Co.: 5 mi NE Forest Ranch, I-3-1980, D. S. Chandler, sift tanbark oak and maple litter. PARATYPES: 1 male, eutopotypical; 15 males, 14 females, same data except, XI-28-1979, sift rotten wood and litter along stream; 7 males, 5 females, same data except, I-25-1980, sift rotten wood; 2 males, same data except, VI-19-1980, sift leaf litter along stream; 4 males, 3 mi NE Forest Ranch, VII-13-1978, sift rotten wood and dogwood duff; 2 males, 3 females, same data except, VII-28-1978, sift litter along stream; 1 female, same data except, XI-4-1979, sift forest litter; 2 males, 4 females, same data except, XI-15-1979, sift litter along stream; 3 males, 1 female, 3 mi E Forest Ranch, VI-20-1980, sift leaf litter along stream; 3 males, 2 females, 1 mi E Forest Ranch, VII-12-1978, sift forest litter; 1 male, 1 female, 6 mi N Forest Ranch, Ponderosa Way, V-30-1979, sift litter along stream; 1 female, 4 mi N Forest Ranch, Ponderosa Way, V-29-1979, sift rotten wood; 2 males, 3 females, Lake Madrone, near Berry Creek, II-2-1978, sift leaf litter; 1 male, 3 mi N Lomo, Big Chico Creek, VI-9-1979, sift litter around spring; 1 male, Mountain House, V-2-1981, sift litter around spring; 1 male, same data except, V-7-1981; 1 male, 1 female, same data except, V-14-1981; 1 male, same data except, V-28-1981, sift rotten wood; 1 male, 2 mi SW Stirling City, 2,900′, V-28-1981, sift maple litter. Placer Co.: 3 males, 6 females, Grove of Sequoias, 20 mi E Foresthill, VI-17-1978, sift Rhododendron litter and rotten wood. Tehama Co.: 5 males, Highway 32, Deer Creek, 3,600′, V-3-1981, sift Douglas fir litter around spring; 2 males, 2 mi



Figs. 9–15. 9, *Hylotychus plumas* n. sp. and 10, *H. confusus* n. sp., aedeagi (a, dorsal view; b, lateral view); 11, *Pselaptrichus marshi* n. sp.; 12, *P. magaliae* n. sp.; 13, *P. cornus* n. sp., and 14, *P. auctumnus* n. sp. (a, ventral view gular region; b, lateral view gular region; c, ventral view aedeagus); 15, *Batrisodes oro* n. sp. (a, ventral view aedeagus; b, left lateral view female abdomen apex).

NE Mineral, VI-14-1980, sift leaf litter along stream; 1 male, 4 mi NE Mineral, VI-14-1980, sift grass and alder litter; 2 males, Digger Creek, 3 mi E Manton, XII-27-1977, sift forest litter; 1 female, 3 mi E Manton, XII-6-1977, sift manzanita and oak litter. Named for Albert A. Grigarick, a co-worker in the Pselaphidae.

Biology. Grigaricki has been collected in various leaf litters and rotten woods, but all have been within and above the ponderosa pine belt.

Discussion. Originally I believed this species to be *montanus* Casey, but when examining the type of that species I found it to be quite different. *Montanus* is different from all of the 18 species of *Oropus* in my collection by the first discal stria being sharply defined through its length and joining the sutural stria at the apical fourth of the elytra. *Grigaricki* runs to *interruptus* Casey in the key of Schuster and Grigarick (1960), but is readily separated by the strongly developed sulcus and medianly constricted microsetigerous area of the male tergite IV. The apical margin of male sternite VI is almost straight in a dissected specimen from Tehama County, but is clearly bisinuate in the other dissected specimens.

Oropus schusteri Chandler, **new species**

(Fig. 4)

Length 1.52–1.68. Pronotum with lateral antebasal tooth small but distinct. Elytra with four basal foveae and a subhumeral fovea. First tergite exactly twice as long as tergite II.

Males with eyes possessing about 17 facets; apex of tergite III normally rounded, not projecting medianly, tergite IV with basal transverse, crescentic projection bearing simple setae at apex, only simple setae at preapex of tergite IV; sternite IV lacking long median setae.

Females with eyes possessing about 7 facets; tergite IV smoothly convex, lacking tubercle.

Male holotype. 6 mi N Forest Ranch, Butte County, California. Length 1.60. Head 0.24 long, 0.35 wide across eyes; pronotum 0.36 long; elytra 0.50 long; aedeagus 0.08 wide; projection of tergite IV 0.09 wide.

Specimens examined, 39. HOLOTYPE male: *California:* Butte Co.: 6 mi N Forest Ranch, Ponderosa Way, V-30-1979, D. S. Chandler, sift litter along stream. PARATYPES: 2 males, 2 females, eutopotypical; 5 females, Ponderosa Way, 4 mi NW Forest Ranch V-17-1978, sift litter along stream; 1 female, Little Chico Creek, 1,300′, I-17-1979, sift forest litter; 1 female, Mud Creek, near Cohasset, V-30-1979, sift litter along stream; 1 male, 2 females, West Branch Feather River, 1,600′, IV-13-1981, sift laurel and toyon litter. Tehama Co.: 2 males, Highway 32, Deer Creek, 3,600′, V-3-1981, sift Douglas fir and oak litter; 1 male, same data except, Douglas fir litter; 1 male, same data except, sift litter along stream; 2 males, 3 mi E Manton, Digger Creek, XII-20-1977, sift Douglas fir litter; 1 male, same data except, XII-27-1977, sift forest litter; 1 male, 1 female, 3 mi E Manton, XII-6-1977, sift manzanita and oak litter; 1 male, same locality, I-25-1978, sift rotten pine and fir; 2 males, 1 female, Dog Island Park, Red Bluff, XI-28-1977, sift oak litter; 1 female, same data except, I-24-1978; 1 male, same data except, VI-12-1977; 1 male, 4 mi NE Dales, XII-6-1977, sift buckeye litter; 1 male, 1 female, 2 mi NE Dales, II-13-1971, berlese manzanita duff; 1 female, 2 mi SW Dales, XII-7-1977, sift buckeye litter; 1 female, same locality, III-26-1978, sift oak and grape litter; 2 males, 2 females, North Fork Battle Creek, 1 mi N Manton, XII-20-1977, sift oak and maple litter. This species is named for Robert O. Schuster, a friend and co-worker in the Pselaphidae.

Biology. This species has been collected from 400 to 2,500 feet elevation in the northern Sierra Nevada and the southern Cascade Mountains. It has been collected from diverse leaf litters and rotten woods, but is generally in deciduous leaf litter at or below the lower margin of the Ponderosa pine belt. It has never been common at a particular site.

Discussion. This species is very close to *acumenis* Schuster and Grigarick and *cavicauda* Casey in the size and form of sternite IV of the male. *Schusteri* differs from these species by lacking spatulate setae at either the apex of the tergal tubercle (*acumenis*) or near the apex of tergite IV (*cavicauda*). This may be the new species mentioned in the footnote to the key to species in Schuster and Grigarick (1960), since in specimens on points the male third sternite does appear to be somewhat prolonged medianly over the tubercle of the fourth tergite. However, specimens on slides lack even the suggestion of a median prolongation and the apical margin is evenly rounded.

Oropus acriculus Schuster and Grigarick
(Fig. 5)

California: Butte Co.: Mountain House, V-14-1981, V-28-1981, sift rotten wood, sift litter around spring; 2 mi N Merrimac, 4,500′, V-7-1981, sift litter along stream. Five specimens in very moist litter. A dissected male has only 5 glandular setae at the apex of sternite III, and 9 long setae at the base of sternite IV.

Tetrascapha krysiae Chandler, **new species**
(Fig. 6)

Length 1.84–2.08. Head with eyes possessing about 40 facets, vertexal foveae equidistant from each other and eye margins, lacking occipital carinae; antennae with antennomere V slightly longer and wider than IV or VI. Pronotum with faint median longitudinal sulcus, sulcus most distinct just before median antebasal fovea; base with two longitudinal carinae on each side, carinae equidistant between median fovea and lateral margins, carinae weak, poorly visible using stereoscope but distinct on slide-mounted specimens; baso-lateral margins smoothly wrinkled. Elytra with two basal foveae.

Males with third sternite bearing a medial transverse lamina curving anteriorly to a feebly rounded apex.

Females lacking medial lamina of third sternite.

Male holotype. 2 mi E Jonesville, Butte County, California. Length 2.05. Head 0.42 long, 0.44 wide across eyes; pronotum 0.39 long; elytra 0.70 long.

Specimens examined, 36. HOLOTYPE male: *California:* Butte Co.: 2 mi E Jonesville, Scotts John Creek, 6,600′, V-11-1981, D. S. Chandler, sift alder and grass litter. PARATYPES: 5 males, 14 females, eutopotypical; 4 males, 2 females, same data except, V-25-1981, sift alder litter; 2 males, 5 females, Jonesville, V-11-1981, sift litter along stream; 1 male, 2 mi N Merrimac, 4,500′, V-7-1981, sift litter along stream; 1 male, 2 mi SW Stirling City, 2,900′, V-11-1981, sift leaf litter along stream. Tehama Co.: 1 male, Highway 32, Deer Creek 3,600′, V-3-1981, sift litter around spring. The name is derived from the Polish familiar shortening of the first name of my wife, Christine.

Biology. Most common by springs or very wet areas shortly after the snow has melted.

Discussion. Different from the other two members of the genus by possessing two basal elytral foveae, the pronotum with indistinct basal longitudinal carinae, and the form of the male genitalia. Closest to *dentata* Park and Wagner by possessing the feeble basal longitudinal carinae on the pronotum and the male fifth sternite lacking long tufts of setae.

Oropodes ishii Chandler, **new species**
(Fig. 7)

Length 1.80–2.08. Head with each eye possessing about 17 facets. Pronotum with shallow but distinct median longitudinal sulcus extending from apex to transverse antebasal sulcus, transverse antebasal sulcus strongly arcuate and feeble from median to lateral foveae. Elytra with three basal and a subhumeral fovea.

Males with sternites II–V slightly flattened medially, sternite III with median anteriorly curved lamina rounded at apex, sternite VI with setate area greatly constricted at middle; profemora obtusely protruding at middle of mesal margin; mesotibiae with thick spine at apex; metatibiae with thick spur at apex.

Females lacking the above characteristics of the males; tergite V possessing a slight medial apical depression which is bordered on each side by a small projection.

Male holotype. 5 mi NE Forest Ranch, Butte County, California. Length 1.85. Head 0.35 long, 0.34 wide across eyes; pronotum 0.35 long; elytra 0.50 long.

Specimens examined, 12. HOLOTYPE male: *California:* Butte Co.: 5 mi NE Forest Ranch, I-3-1980, D. S. Chandler, sift tanbark oak and maple litter. PARATYPES: 1 male, 2 females, eutopotypical; 1 male, 1 female, same data except, I-25-1980, sift rotten wood; 1 female, same data except, XI-28-1979, sift litter along stream; 1 male, Griffin Gulch, 3 mi NW Concow Reservoir, 2,000′, IV-2-1981, sift tanbark oak litter; 1 female, Mountain House, V-28-1981, sift litter around spring; 1 male, West Branch Feather River, 1,600′, IV-13-1981, sift oak and grape litter; 1 female, Chico, Bidwell Park, III-30-1981, berlese grass sod. Tehama Co.: 1 male, Highway 32, Deer Creek, 3,600′, V-3-1981, sift Douglas fir litter. This species is named for Ishi, last member of the Yahi Indians.

Biology. Uncommonly collected in a variety of habitats, but it is the only species found in tanbark oak litter.

Discussion. Using the key of Grigarick and Schuster (1976), the males will run to *arcaps* Grigarick and Schuster. *Ishii* may be separated by the more rounded apical projection of the third sternite, the deeply constricted setate area of sternite VI, and the form of the genitalia. The females run to *nuclere* Grigarick and Schuster, and may be separated only by their separate distributions.

Actium hazeltinei Chandler, **new species**
(Fig. 8)

Length 1.39–1.50. Head with antennomere X asymmetrical, thickest anteriorly. Elytra with two basal foveae. Tergite I with two basal longitudinal carinae, following tergites lacking these carinae.

Males with eyes possessing about 40 facets; lateral margins of sternite II smooth, sternite III with small setate tubercle near apical margin on each side; sternite VI medially with deep circular impression, impression shallowly extending anteriorly over sternite IV–V, sternites II–III flattened medially, sternite VI with transverse row of flattened setae across medial impression, row interrupted at center; penial plate with irregular anterior margin; mesotrochanters with large thick spine, mesofemora swollen, lacking any longitudinal carinae, shallowly sinuate on posterior margin, mesotibiae with small apical tubercle; metatrochanters with posterior margin rounded.

Females with eyes possessing about 17 facets; sternite VI with shallow medial impression near basal margin, other sternites convex, lacking lateral tubercles of sternite III: lacking spine on mesotrochanters, mesofemora not swollen.

Male holotype. 2 mi E Jonesville, Butte County, California. Length 1.46. Head 0.30 long, 0.28 wide across eyes; pronotum 0.33 long; elytra 0.43 long; tergite I with basal carinae 0.05 long, separated by 0.08; sternite VI with medial row of 11 flattened setae; penial plate with setate area 0.16 wide, 0.05 long.

Specimens examined, 62. HOLOTYPE male: *California:* Butte Co.: 2 mi E Jonesville, Scotts John Creek, 6,000′, V-25-1981, D. S. Chandler, sift alder litter. PARATYPES: 5 males, 6 females, eutopotypical; 14 males, 18 females, same data except, V-11-1981, sift alder and grass litter; 4 males, 3 females, 4 mi SE Jonesville, Willow Creek, 6,100′, V-25-1981, sift willow and grass litter; 1 male, 1 female, Mountain House, V-7-1981, sift litter along spring; 1 male, same data except, V-14-1981; 1 male, same data except, V-29-1981; 2 males, 1 female, 2 mi N Merrimac, 4,500′, V-7-1981, sift litter along stream; 2 males, 2 females, same data except, V-11-1981. Named for William E. Hazeltine, manager of Butte County Mosquito Abatement District.

Biology. The majority of the specimens were found shortly after the snow melted at all the localities except Mountain House. The Mountain House location is a very wet spring area which approaches the appearance of a bog.

Discussion. This species is a member of the *barri*-group (Grigarick and Schuster 1971) by the two basal elytral foveae and the row of flattened setae on sternite VI of the male. Closest to *micropthalmum* Park and Wagner by the males with only sternite III bearing lateral tubercles, the mesotrochanters bearing a spine, and only tergite I with basal carinae. *Hazeltinei* is separated from this species by the spine of the mesotrochanters being long and distinct, sternite V lacking a median clump of flattened setae at the apex, the setate area of the penial plate being more transverse, and the eyes being larger.

Actium calcaris Grigarick and Schuster

California: Butte Co.: 5 mi NE Forest Ranch, VI-19-1980, sift leaf litter along stream; 3 mi NE Forest Ranch, VII-13-1978, sift rotten wood and dogwood duff; Ponderosa Way, 4 mi NW Forest Ranch, V-17-1978, sift litter along stream; Lake Madrone, near Berry Creek, V-9-1978, sift forest litter. Most commonly collected in mixed leaf litter along streams.

Actium wawonaensis Grigarick and Schuster

California: Butte Co.: 2 mi N Merrimac, 4,500′, V-7-1981, sift litter along stream. Three specimens.

Pilactium summersi Grigarick and Schuster

California: Butte Co.: Lake Madrone, near Berry Creek, V-9-1978, sift forest litter. One specimen.

Reichenbachia albionica (Motschulsky)

California: Butte Co.: 5 mi W Chico, XII-10-1978, XII-31-1978, sift boxelder litter in slough. Quite abundant near the water margin in a slough.

Reichenbachia binodifer Casey

California: Butte Co.: 5 mi W Chico, XII-31-1978, sift boxelder litter in slough; 2 mi N Merrimac, 4,500′, V-7-1981, sift grass and rotten wood by spring. Uncommon.

Reichenbachia fusticornis Casey

California: Butte Co.: 3 mi N Lomo, Big Chico Creek, VI-9-1979, sift litter around spring. Uncommon and appearing to be associated with bunch grass litter.

Hesperotychus nanus Schuster and Marsh

California: Butte Co.: Little Chico Creek, 1,300′, I-17-1979, sift forest litter. One specimen.

Hylotychus remipennis Grigarick and Schuster

California: Butte Co.: 3 mi N Lomo, Big Chico Creek, 3,400′, sift litter around spring. Two specimens.

Hylotychus plumas Chandler, **new species**

(Fig. 9)

Length 1.50–1.68.

Male protibiae possessing a small apical tubercle; mesotrochanters lacking macrosetae, mesotibiae possessing a small apical tubercle; sternite V transversely impressed in median third through entire length; aedeagus with dorsal lobe acutely pointed at apex, with two preapical ventrally projecting tubercles, two larger ventrally projecting tubercles near base, ventral lobe somewhat divergent at apex, with feeble preapical lateral tubercles; parameres forked and with group of setae at apex, parameres about as long as dorsal lobe and shorter than ventral lobe.

Females with metatibiae lacking an apical tubercle; sternite V simply convex.

Male holotype. 2 mi N Merrimac, Butte County, California. Length 1.64. Head 0.38 long; pronotum 0.34 long; elytra 0.62 long; aedeagus 0.38 long, 0.19 wide.

Specimens examined, 20. HOLOTYPE male: *California:* Butte Co.: 2 mi N Merrimac, 4,500′, V-7-1981, D. S. Chandler, sift litter along stream. PARATYPES: 3 males, 2 females, eutopotypical; 1 male, 1 female, same data except, V-11-1981; 2 males, 4 females, Merrimac, V-7-1981, sift litter along stream; 1 male, Mountain House, V-28-1981, sift litter around spring; 1 male, 1 female, Lake Madrone, near Berry Creek, II-2-1978, sift forest litter; 1 male, 1 female, 2 mi SW Stirling City, 2,900′, V-28-1981, sift maple litter. Tehama Co.: 1 male, 4 mi W Mineral, VI-14-1980, sift leaf litter along stream. The name is derived from the Spanish name for the Feather River, Rio de las Plumas.

Biology. Found in very wet litter near streams.

Discussion. Since both the protibiae and mesotibiae possess weak apical tubercles, this species may be closest to *remipennis* Grigarick and Schuster, but the form of the genitalia is quite different from that species. The aedeagus is similar in general proportions of the parts to several species in the genus, but is not close to any particular one.

Hylotychus confusus Chandler, **new species**

(Fig. 10)

Length 1.68–1.80.

Male with eyes possessing about 25 facets; metasternum with faint median longitudinal impression, lacking any tubercle; protrochanters with cylindrical tubercle on posterior margin, protibiae with distinct preapical angulation on mesal margin; mesotibiae with small tubercle at apex; metatrochanter with ventrally directed peg on posterior margin, metatibiae lacking apical tubercle; aedeagus with dorsal lobe split at apex, ventral lobe slightly widened at apex, dorsal lobe shortest; parameres longer than ventral lobe, with two large preapical setae.

Female lacking tubercles of tibiae and trochanters; eyes with about 12 facets.

Male holotype. 3 mi NE Forest Ranch, Butte County, California. Length 1.80. Head 0.34 long, 0.30 wide across eyes; pronotum 0.58 long, elytra 0.58 long; aedeagus 0.53 long, 0.16 wide across base of parameres.

Specimens examined, 2. HOLOTYPE male: *California:* Butte Co.: 3 mi NE Forest Ranch, XI-4-1979, D. S. Chandler, sift forest litter. PARATYPE: 1 female, eutopotypical. The name is derived from the problem in the generic placement of this species.

Biology. Collected two weeks after the heavy rains began in northern California.

Discussion. This species blends the characteristics of two genera, *Lucifotychus* Park and Wagner and *Hylotychus* Grigarick and Schuster. In referring to the key to the two genera (Grigarick and Schuster 1962*a*), this species possesses tuberculate trochanters, but lacks a metasternal tubercle and medially tumid female tergites. This will place *confusus* best in *Hylotychus* (two characters out of three). These genera probably should be combined, as the more recently described species in these groups have also blurred the distinctions between the two genera. As it stands now, *confusus* is distinct in both genera by possessing the armed pro- and metatrochanters, and the genitalia with comparatively long parameres.

Valda frontalis Casey

California: Butte Co.: Feather Falls, V-16-1971, under pine bark. One specimen.

Pselaptrichus (*Pselaptrichus*) *marshi* Chandler, **new species**

(Fig. 11)

Length 1.36–1.44. Pubescence long, decumbent. Head with tempora evenly rounded to neck, cervico-occipital carina weak, barely attaining a point even with the vertexal foveae, fourth maxillary palpus twice as long as wide. Pronotum slightly longer than wide, feebly sinuate at lateral margins before base. Elytra with subhumeral fovea.

Males with eyes possessing about 40 facets, antennomeres VII and VIII as wide as those preceding; gular region with median longitudinal carina, setate basal transverse ridge, and lateral flanges, median carina with one anterior and two median setate elevations, lateral flanges just posterior to eyes; protibiae with large truncate projection extending over deep excavation; aedeagus broad and comparatively simple, parameres each with three preapical setae.

Females with eyes possessing about 5 facets; head venter smooth, lacking flanges and projections; protibiae slender, lacking excavation.

Male holotype. Mountain House, Butte County, California. Length 1.43. Head 0.34 long, 0.31 wide across eyes; pronotum 0.31 long; elytra 0.52 long; metatibial spine 0.02 long.

Specimens examined, 38. HOLOTYPE male: *California:* Butte Co.: Mountain House, V-28-1981, D. S. Chandler, sift litter around spring. PARATYPES: 4 males, 7 females, eutopotypical; 5 females, same data except, V-7-1981; 8 males, 2 females, same data except, V-14-1981, 4 males, 4 females, same data except, V-2-1981; 1 female, Brush Creek, V-7-1981, sift forest litter; 1 female, Merrimac, V-7-1981, sift litter along stream. This species is named for Gordon A. Marsh, an earlier contributor to the Pselaphidae.

Biology. Specimens were uncommon, but found most frequently in very wet litter around a spring.

Discussion. Not similar to any described species due to the combination of the head venter possessing a median longitudinal carina, and the lateral flanges being present and protruding laterally behind the eyes. It runs poorly to *frigidus* Schuster and Marsh in their key (1956). The narrow median longitudinal carina sets it off from that species, while the lateral flanges will distinguish it from *carinatus* Marsh and Schuster.

Pselaptrichus (*Pselaptrichus*) *magaliae* Chandler, **new species**
(Fig. 12)

Length 1.68–1.80. Pubescence long and dense, recumbent; temporal margins almost straight from eyes to neck, cervico-occipital carina strong, extending to point slightly anterior to line between vertexal foveae; fourth maxillary palpus twice as long as wide. Pronotum slightly longer than wide, prebasal margins straight. Elytra with subhumeral fovea.

Males with eyes possessing about 11 facets, antennomeres VII and VIII as wide as those preceding; gular area complex, possessing two median longitudinal projections, anterior projection apically split and setate, ventrolateral flanges large and projecting anteriorly, originating well anterior to eyes; protibiae with deep excavation, long pointed projection over the incision. Aedeagus relatively simple, with single long seta on median lateral margin of each paramere.

Females with eyes possessing about 5 facets; lacking modifications of head venter and protibiae.

Male holotype. 2 mi N Hurleton, Butte County, California. Length 1.80. Head 0.40 long, 0.36 wide across eyes; pronotum 0.40 long; elytra 0.62 long; metatibial spine 0.05 long.

Specimens examined, 42. HOLOTYPE male: *California:* Butte Co.: 2 mi N Hurleton, Stringtown Road, IV-2-1978, D. S. Chandler, sift leaf litter. PARATYPES: 1 male, eutopotypical; 3 males, 3 females, same data except, III-19-1978, sift maple, oak and madrone litter; 1 male, 2 females, same data except, III-25-1978, sift madrone and pine litter; 1 female, same data except, sift oak and madrone litter; 2 males, 1 female, Ponderosa Way, 4 mi NW Forest Ranch, V-17-1978, sift forest litter; 1 female, same data except, V-27-1978; 6 males, 5 females, 2 mi E Magalia Reservoir, 1,800′, IV-7-1981, sift laurel and oak along stream; 5 males, 5 females, West Branch Feather River, 1,600′, IV-13-1981, sift laurel and toyon litter; 2 males, 1 female, same data except, sift oak and grape litter. Tehama Co.: 1 male, 1 female, 2 mi NE Dales, II-13-1971, berlese manzanita duff. Named for Magalia, a local town with an interesting history.

Biology. Collected in a variety of leaf litters which are in moist areas along streams at or below the lower margin of the Ponderosa pine belt.

Discussion. This species is closest to several species from the Sierra Nevada, but not perceptibly closest to any one in particular. In lateral view the gular projection is quite distinctive, and, when coupled with the small eyes, it is readily separated from *oculatus* Marsh and Schuster and *levinei* Schuster and Marsh, to which it runs in the most recent key (Schuster and Marsh 1956).

Pselaptrichus (*Pselaptrichus*) *cornus* Chandler, **new species**
(Fig. 13)

Length 1.72–1.90. Pubescence long and suberect; head with temporal margins gradually rounded to cervix, cervico-occipital carina feeble, barely extending to point even with vertexal foveae, fourth maxillary palpus three times as long as wide. Pronotum slightly longer than wide, prebasal margins essentially straight. Elytra with subhumeral fovea.

Males with eyes possessing about 6 facets, antennomeres VII and VIII as wide as those preceding; gular area complex, with median basal projection flattened and bisinuate at apex, a thin median lamina extends from this projection to a median transverse ridge bearing two large flattened setae at the center, the lateral flanges extend ventrally just anterior to the eyes; protibial incision shallow, short tubercle extending over this incision; aedeagus quite broad.

Females with eyes possessing about 6 facets; lacking modifications of head and protibiae.

Male holotype. Mountain House, Butte County, California. Length 1.90. Head 0.43 long, 0.41 wide across eyes; pronotum 0.43 long; elytra 0.64 long; metatibial spine 0.05 long.

Specimens examined, 45. HOLOTYPE male: *California:* Butte Co.: Mountain House, V-28-1981, D. S. Chandler, sift litter around spring. PARATYPES: 5 males, 4 females, eutopotypical; 1 male, 1 female, same data except, V-14-1981, sift rotten wood; 1 male, same data except, sift litter around spring; 2 males, 2 females, same data except, V-7-1981; 1 male, 1 female, same data except, V-2-1981; 1 male, 1 female, 3 mi NE Forest Ranch, VII-13-1978, sift rotten wood and dogwood duff; 1 male, 1 female, same data except, VII-28-1978, sift litter along stream; 4 males, 3 females, same data except, XI-15-1979, sift litter along stream; 3 males, 4 females, 3 mi E Forest Ranch VI-20-1980, sift leaf litter along stream; 3 males, 1 female, 5 mi NE Forest Ranch, VI-19-1980, sift rotten wood; 1 male, 1 female, same data except, XI-28-1979, sift litter along stream; 1 male, 1 female, 2 mi SW Stirling City, 2,900′, V-28-1981, sift maple litter. Named for the dogwood (*Cornus*) in whose litter this species may be found.

Biology. Collected most often in leaf litter in the Ponderosa pine belt.

Discussion. This species is closest to *chandleri* Schuster and Marsh by the small eyes, the flattened basal projection and the two thickened medial setae of the gular region, and the general form of the aedeagus. *Cornus* differs by the anterior margin of the gular projection being bisinuate, the two longitudinal rows of four setae present medially, and the phallobase being simply rounded in ventral view. This species runs to *incognitus* Schuster and Marsh in their key, but is easily separated in lateral view by the median lamina extending from the apex of the basal tubercle to the apex of the median ridge.

Pselaptrichus (*Pselaptrichus*) *auctumnus* Chandler, **new species**

(Fig. 14)

Length 1.84–1.89. Pubescence long and recumbent; head with temporal margins evenly curved to cervix; cervico-occipital carina short, barely attaining dorsal plane of vertex; fourth maxillary palpus slightly more than twice as long as wide. Pronotum slightly longer than wide, lateral margins straight from base to middle. Elytra with subhumeral fovea.

Males with eyes possessing about 7 facets; antennomeres VII and VIII as wide as those preceding, venter complex, with median basal tubercle flattened and projecting anteriorly, with central median tubercle projecting anteriorly and split at the apex, lateral flange long and directed ventrally just anterior to the eyes; protibiae with preapical tubercle weak, incision shallow; aedeagus with penis projecting beyond parameres, penis irregular at apex.

Females with eyes possessing about 5 facets; lacking modifications of head venter and the protibiae.

Male holotype. 3 mi NE Forest Ranch, Butte County, California. Length 1.89. Head 0.46 long, 0.37 wide across eyes; pronotum 0.40 long; elytra 0.61 long; metatibial spine 0.04 long.

Specimens examined, 6. HOLOTYPE male: *California:* Butte Co.: 3 mi NE Forest Ranch, XI-4-1979, D. S. Chandler, sift forest litter. PARATYPES: 3

males, 2 females, eutopotypical. The species is named for its collection late in the fall.

Biology. Collected in forest litter about two weeks after the winter rains began in northern California.

Discussion. Closest to *frigidus* Schuster and Marsh and *proprius* Schuster and Marsh by the basal gular tubercle being about one-third head width, the presence of a well-developed median tubercle, and small eyes. Separated from both of these species by the lack of setae on the basal tubercle, the central median tubercle being very prominent and with flattened apices, and the form of the genitalia.

Batrisodes (*Empinodes*) *cicatricosis* (Casey)

California: Butte Co.: 3 mi N Lomo, Big Chico Creek, 3,400′, VI-9-1979, sift litter along spring; 5 mi NE Forest Ranch, I-25-1980, sift rotting wood. This species is usually associated with rotting wood or is under the bark of dead trees.

Batrisodes (*Empinodes*) *denticauda* (Casey)

California: Butte Co.: 4 mi NW Forest Ranch, Ponderosa Way, V-27-1978, sift rotten wood; 5 mi NE Forest Ranch, I-25-1980, sift rotten wood. Most commonly recorded from rotten wood and under the bark of dead trees.

Batrisodes (*Empinodes*) *zephyrinus* (Casey)

California: Butte Co.: 3 mi NE Forest Ranch, VII-13-1978, sift rotten wood and dogwood duff; same data except, VII-28-1978, sift litter along stream; same data except, XI-15-1979; 5 mi NE Forest Ranch, I-3-1980, sift rotten wood; same data except, XI-28-1979, same data except, VI-19-1980, sift leaf litter along stream; 3 mi N Lomo, Big Chico Creek, VI-9-1979, 3,400′, sift litter around spring. Found in rotting wood and leaf litter.

Batrisodes (*Empinodes*) *oro* Chandler, **new species**

(Fig. 15)

Length 2.32–2.60. Head with eyes reniform; lacking lateral carinae behind eyes, forked frontal sulcus ending at vertexal foveae; pronotal disc smooth, lacking median sulcus; discal stria of elytra very short, barely extending through first third of elytra.

Males with eyes possessing about 20 facets, antennomeres II and III same length and width; protrochanters angulate; ventral mesofemoral spine short, close to trochanter apex, mesotrochanters slightly tuberculate; mesotibiae with thin spine near middle on ventral margin, inner margin of apex with small tubercle; tergite V evenly convex, sternite VI with deep transverse excavation occupying the entire length and three-quarters the width.

Females with eyes possessing about 15 facets, with antennomere III as long as but slightly narrower than II; sternite VI convex, moderately protruding toward the apical margin; tergite V obtusely angulate and distinctly protruding in lateral view.

Male holotype. Mountain House, Butte County, California. Length 2.50. Head 0.56 long, 0.46 wide across eyes; pronotum 0.46 long; elytra 0.70 long; mesofemoral spine 0.02 long, 0.06 from base of femur, apical spur of metatibia 0.12 long.

Specimens examined, 27. HOLOTYPE male: *California:* Butte Co.: Mountain House, V-7-1981, D. S. Chandler, sift leaf litter around spring. PARATYPES: 2 males, 1 female, eutopotypical; 3 males, 4 females, same data except, V-2-1981; 1 male, 3 females, same data except, V-14-1981; 3 males, 5 females, same data except, V-28-1981; 3 females, Merrimac, V-7-1981, sift litter along stream; 1 male, Brush Creek, V-7-1981, sift forest litter. The specific name is the Spanish word for gold, since this species is found in the northern portion of the Mother Lode.

Biology. Collected in moist leaf litter near water.

Discussion. This species runs to *opacus* Grigarick and Schuster in their key (Grigarick and Schuster 1962*b*), and is probably closest to that species by the head lacking lateral carinae, the mesofemoral spine being near the base, and the aedeagus possessing an apical flange directed to the left. It is separated by smaller eyes, the much larger aedeagal flange, the internal teeth each being about the same size, and the female pygidium obtusely protruding apically.

Mipseltyrus levini Chandler

California: Butte Co.: 2 mi N Hurleton, Stringtown Road, III-25 and III-19-1978, sift madrone and pine litter, sift maple, oak and madrone litter, sift pine and madrone litter, and sift litter along stream; 2 mi W Paradise, Honey Run Road, 900′, XII-22-1978, sift grape and maple litter; 9 mi NE Chico, Big Chico Creek, I-28-1980, sift oak litter. Collected in various types of leaf litter at and below the lower margin of the Ponderosa pine belt.

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BODY SIZE, DISPERSAL ABILITY, AND RANGE SIZE IN NORTH AMERICAN SPECIES OF *BRACHINUS* (COLEOPTERA: CARABIDAE)

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ABSTRACT

A prediction of positive correlations between body size, dispersal ability, and geographic range size is tested for North American species of the genus *Brachinus*. Species with low dispersal ability (flightless species) have significantly smaller geographic ranges than do species with high dispersal ability (species capable of flight). Among species capable of flight, there is no significant correlation of any measure of geographic range with maximum or minimum body size. Geographic range variables show significant positive correlations with intraspecific variability in size. Two alternative hypotheses for the correlation of geographic range and body size variability are proposed: 1) Polyphagous feeding by the parasitic larvae of *Brachinus* species leads to intraspecific size variation, colonizing ability, and wide geographic range; 2) Variation between sites in hosts available or in climate leads to increased intraspecific body size variability in widespread *Brachinus* species.

Among insects, increased body size within certain taxa has been demonstrated to be positively correlated with flight performance and capacity for dispersal (Dingle and Arora 1973; Dingle *et al.* 1980; Derr *et al.* 1981). Larger size may enhance dispersal ability by enhancing resistance to starvation, or by providing a larger energy store thus making long periods of uninterrupted flight possible (Dingle *et al.* 1980). In addition, the cost per unit weight of flight is an inverse function of body weight; flight costs are relatively higher for smaller organisms (Blem 1980; Hainsworth 1981). Whether the correlations of flight performance, dispersal ability, and body size are wide spread among the Insecta has not been demonstrated. Among other groups of organisms, Reaka (1980) showed that large size probably enhances dispersal ability in stomatopod crustaceans, and that greater dispersal ability is associated with greater geographic range size. With increased dispersal ability, more distant sites may be colonized, and a larger contiguous geographic range may be occupied with little chance of isolation between populations. Among Coleoptera, flightless species often have restricted geographic ranges (Crowson 1981). Geographic range size may therefore be a convenient index of dispersal ability.

Within the genus *Brachinus* (Coleoptera: Carabidae) adult body size varies greatly, both between and within species (Erwin 1970). The purpose of this paper is to determine whether there is a positive correlation of body size and dispersal ability among species of *Brachinus*. Employing methods analogous to those used by Reaka (1980), I will: 1) establish that increased dispersal ability (flight ability) leads to increased geographic range; and 2) test the hypothesis that larger body size is associated with increased geographic range, and presumably increased dispersal ability.

NATURAL HISTORY OF *BRACHINUS*

Adult *Brachinus* are small- to medium-sized ground beetles that are common along the edges of ponds, lakes, and streams in the New World. Adults feed on dead animals, or prey upon frail invertebrates (e.g., teneral adult Diptera) (my unpublished data). Adults are long lived (Wautier and Viala 1969) and are probably the overwintering stage (Erwin 1970). Flying adults of many species are commonly collected at lights at night (Erwin 1970), and this behavior appears to be related to a dispersal phase (T. Erwin, pers. comm.).

Brachinus larvae appear to be obligate ectoparasitoids of pupae of aquatic beetles (Erwin 1967, 1970). The first instar larva locates the host pupa, and each larva consumes only one host pupa. Some species of *Brachinus* are polyphagous in host choice, and variation in host size appears to be responsible for intraspecific variation in adult body size (Erwin 1967).

DATA AND METHODS

The data used are from Erwin (1970, 1973). Three major classes of data were extracted from these works: 1) Body size data. For each species of *Brachinus* from North and Central America, the maximum and minimum body lengths of adults were used as indicators of body size. Erwin (1970) reported that body proportions are constant despite intraspecific variation in size. Body size variation within a species was estimated using the difference between maximum and minimum sizes. Erwin (1970) did not report mean or median sizes. 2) Data on wing condition and flight ability. Erwin (1970, 1973) lists 8 species that are either apterous or brachypterous, and that have never been recorded in flight. Flight has been observed in most of the remaining 54 species, and it is likely that all species with fully developed wings can fly. 3) Geographic range data. The distances in km north to south (NS) and west to east (WE), and the greatest distance spanned in any direction were determined from range maps. The NS and WE distances were used to compute a diagonal distance: $(NS^2 + WE^2)^{1/2}$; this computation provides a comparable measure for asymmetrical ranges (Reaka 1980). North and Central America were divided into 5° × 5° quadrats (Reaka 1980). The number of quadrats in which each species occurred was counted. I constructed a convex polygon (Jenrich and Turner 1969) from the range map of each species. The land area enclosed in each of these polygons was measured planimetrically. In order to obtain an estimate of the latitudinal and longitudinal positions of each range, I used the northern, southern, eastern, and western limits of each range (measured in degrees latitude or longitude), and computed the following:

$$\text{latitudinal center} = (1/2)(\text{N limit} - \text{S limit}) + \text{S limit}$$

$$\text{longitudinal center} = (1/2)(\text{W limit} - \text{E limit}) + \text{E limit.}$$

For a few species, Erwin (1970) indicated that certain records far away from the majority of records for that species were probably erroneous. In all cases I omitted such records. For some species Erwin (1970) reported state-only records (i.e., no specific locality). In six cases in which these records affected one or more of the measures of range size, I created a point record corresponding to the minimum range extension necessary to produce such a state record.

The method for testing for a relationship between body size, dispersal ability, and range size involves two parts. First, it must be shown that increased dispersal ability leads to increased range size. I used a Wilcoxon two-sample

Table 1. Differences in body size, range size, and range center of brachypterous/apterous vs. normal-winged *Brachinus* species from North and Middle America. Median (n), and range; $P < 0.05$, Wilcoxon two-sample test. For body size and range center variables a two-tailed test was used; for range size variables a one-tailed test was used.

Variable	Brachypterous/ Apterous species	Normal-winged species	Test
Maximum size (mm)	8.9 (7) 8.0–15.0	10.4 (54) 7.3–18.5	N.S.
Minimum size (mm)	7.0 (7) 5.7–10.0	7.5 (54) 4.8–16.4	N.S.
Size variation (mm)	2.7 (7) 1.0–6.1	2.8 (54) 0.0–5.8	N.S.
NS range (km)	840 (7) 420–2,030	1,750 (51) 280–4,270	$P < 0.03$
WE range (km)	1,540 (7) 280–3,250	2,240 (51) 210–4,480	N.S.
Diagonal (km)	1,596 (7) 495–3,866	2,661 (51) 396–5,808	$P < 0.04$
Maximum span (km)	1,610 (7) 490–3,290	2,380 (51) 420–4,620	$P < 0.03$
Quadrats	5 (7) 2–17	7 (54) 1–45	N.S.
Area (10^6 km^2)	0.637 (6) 0.147–4.018	0.956 (50) 0.049–11.515	N.S.
Latitudinal center (°)	37 (7) 30–42	31 (53) 16–45	$P < 0.04$
Longitudinal center (°)	90 (7) 79–111	95 (53) 70–121	N.S.

test to compare the range size variables of flightless (apterous and brachypterous) species to those of species with normal wings. Any species known from only one locality, or for which no precise locality was given, was excluded (1 apterous and 3 normal-winged species). My null hypothesis was that flightless species have ranges no smaller than those of species that can fly. The alternative hypothesis was that flightless species have smaller ranges than species capable of flight. I also tested for any relationship of wing condition to body size and geographic position of the range.

The second part of the test for a relationship of size and dispersal ability consists of using those geographic range variables that are good indicators of dispersal ability (i.e., those variables for which the median among flightless species is significantly less than the median among species capable of flight). If increased body size leads to increased dispersal ability, increased body size should also be associated with increases in those geographic range variables that are indicators of dispersal ability. Therefore, a positive correlation of body size and geographic range size is predicted. I tested this hypothesis using Spearman rank correlations of body size variables to geographic range variables. I considered only those species that had normal wings, and were recorded at more than one locality.

RESULTS

Range Size and Flight

Three of the six range size variables proved to be good indicators of dispersal ability (Table 1). The test that I am using is a conservative one. For all species tested, there are significant correlations of latitudinal position with: number of quadrats occupied ($r_s = 0.452$, $P < 0.001$); NS range ($r_s = 0.277$, $P < 0.05$); and area ($r_s = 0.499$, $P < 0.0005$). Because flightless species show a small but significant tendency to have more northerly distributions (Table 1), and since geographic ranges tend to be larger in the north, there may be a tendency to underestimate the median range size of species capable of flight.

Table 2. Correlations of body size and range size variables for winged North and Central American *Brachinus*. Spearman's rank correlation. Values are r_s; $P < 0.05$. Range size variables marked with an "*" were found to be good indicators of dispersal ability (see Table 1).

	Maximum size (mm)	Minimum size (mm)	Size variation (mm)
*NS range (km) n = 51	0.038 N.S.	−0.146 N.S.	0.335 $P < 0.02$
WE range (km) n = 51	0.140 N.S.	−0.089 N.S.	0.323 $P < 0.03$
*Diagonal (km) n = 51	0.096 N.S.	−0.155 N.S.	0.375 $P < 0.007$
*Maximum span (km) n = 51	0.057 N.S.	−0.165 N.S.	0.325 $P < 0.02$
Quadrats n = 54	0.089 N.S.	−0.217 N.S.	0.429 $P < 0.002$
Area (10^6 km^2) n = 50	0.084 N.S.	−0.132 N.S.	0.368 $P < 0.009$
*Latitudinal center (°) n = 53	0.104 N.S.	0.047 N.S.	0.114 N.S.
Longitudinal center (°) n = 53	−0.138 N.S.	−0.076 N.S.	−0.184 N.S.

Correlations of Range Size and Body Size

None of the range size variables that are good indicators of dispersal ability is significantly correlated with maximum size or minimum body size (Table 2). Intraspecific size variability is, however, significantly correlated with all of the range size variables including the three variables that were indicative of dispersal ability (Table 2). Even though some range size variables increase with increasing latitude, there is no significant relationship between latitudinal position and any of the body size variables (Table 2). Thus, the relationships of size variability to certain range size variables cannot be explained by a mutual correlation with latitudinal position.

Because the land area of the continent declines toward the equator, and because only normal-winged species have latitudinal centers south of 25°, there is a potential bias in including species with latitudinal centers south of 25° in the analysis. One might expect that the ranges of these more southern species might be smaller than those of more northern species. An analysis involving only those species with latitudinal centers north of 25°N latitude produced results very similar to those of the previous analysis. The same range size variables were found to be good indicators of dispersal ability. All of the variables that were good indicators of dispersal ability showed significant positive correlations with body size variability, and showed no significant correlations with maximum or minimum body size.

Discussion

The above results provide evidence that increased body size is not related to increased dispersal ability in *Brachinus*. Range size variables that are sensitive to dispersal ability show no relationship to maximum or minimum body size. The only body size variable that appears to be related to range size and dispersal ability is body size variability.

The main reason for postulating a relationship between body size and dispersal ability was that such a relationship had been demonstrated in other insects (Dingle and Arora 1973; Dingle *et al.* 1980). Dingle *et al.* (1980) suggested that increased flight performance associated with increased body size was the mechanism producing enhanced dispersal. It is not at all clear why increased size variability should be related to flight ability *per se,* and so it seems that the relationship of size variability and range size/dispersal ability in *Brachinus* has some other basis.

Reaka (1980) distinguished two aspects of dispersal ability: 1) actual vagility, or the ability to move faster, farther, or for longer periods, will lead to some advantage in dispersal. 2) Colonization ability, which depends on the individual's ability to feed, escape predation, endure the physical environment, and ultimately reproduce at a new site. Colonizing ability might be enhanced by broad environmental tolerance, polyphagous feeding, or high potential reproductive output (Lewontin 1965). Because body size in adult *Brachinus* seems to be determined by the size of the host that was parasitized by the larva (Erwin 1967), species in which adult body size is highly variable may be polyphagous in host choice. Polyphagy may be an advantage in colonization because a polyphagous species is more likely to find a suitable host at a new site. At many sites, polyphagous species will be more variable in size than species restricted to one or a few hosts. This hypothesis therefore predicts a positive correlation between average intrapopulation variability in size and geographic range size.

Another hypothesis for the observed relationship is that greater range size, which may be a result of behavioral or physiological traits that enhance colonization ability, leads to size variability. Temperature variation (e.g., along a north–south gradient) can lead to size variation in arthropods (Strong and Darborn 1980; Vannote and Sweeny 1980). Different hosts spread over a wide geographic range may also lead to increased body size variation. If this hypothesis is correct, widespread species should show no more intrapopulation variation in size than do narrowly distributed species, because the cause of increased variation in size is variation between sites. These two hypotheses, one that polyphagy leads to both size variability and colonizing ability, the other that variation between sites in wide spread species leads to increased size variation, make opposite predictions concerning the relationship of average intrapopulation variability in size and range size. Unfortunately, the data necessary to distinguish between these hypotheses are not available.

There are several possible explanations for the lack of correlation of body size and range size. One explanation is that flight performance (e.g., maximum flight duration) is not enhanced by increased body size. Another explanation might be that although larger *Brachinus* may have an advantage in flight performance, smaller beetles may be better able to take advantage of wind currents, and so compensate for lower flight performance. Finally, even if increased body size leads to increased flight performance, simple flight performance may not limit range size in those species capable of flight. The two hypotheses proposed above to explain the correlation of body size variation and range size are based upon the premise that behavioral, physiological, or ecological traits limit dispersal ability and range size. Erwin (1970) hypothesized that ranges of *Brachinus* in North America were more restricted by climate than by barriers to dispersal. Host relationships may be another ecological variable that limits range size.

Possible Biases

At least one species of *Brachinus* has been recorded from almost all of the 5° × 5° quadrats south of 55° N latitude (Erwin 1970). Only in southern Mexico and Central America does collecting seem to have been less extensive. Because the results of the analyses are the same when only the northern subgroup of species is examined, it does not seem likely that differential sampling led to any bias. Certain species are known from only a very few specimens (total range 1 to 3,810, median = 108). The median number of specimens per species did not differ for flightless and normal-winged species (Wilcoxon two-sample test, $P > 0.05$). It therefore appears that differences in ease of collection of flightless vs. normal-winged species did not lead to any bias. Body sizes of flightless species vary from 5.7 to 15.0 mm. Body sizes of winged species vary from 4.8 to 18.5 mm. Only one species of winged *Brachinus* falls outside the range of body sizes found among flightless species.

Testing the hypotheses for the relationship of body size variability and range size will require data on the average intrapopulation variability of *Brachinus* species. These data might be obtained from museum specimens, but it would be more useful to obtain current data on both body size variation in adult *Brachinus* and host records for the populations studied. Such ecological studies could determine whether host relationships are the prime factor influencing colonization ability. Studies of flight performance of *Brachinus* of different sizes would be the most direct way to test for a relationship of flight performance and size.

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NOTICE

Beetles and Coleopterists in New Zealand. The New Zealand beetle fauna has long been known to be exceptionally interesting, many of the more unusual taxa having been discussed by Crowson in his book on the natural classification of the families of Coleoptera. Recently the apparently endemic family Chaetosomatidae was recorded from Madagascar, but we still have several endemic subfamilies (e.g., Lenacinae of Rhizophagidae, Euderiinae of Bostrichidae).

The main collections of New Zealand beetles are included in the New Zealand Arthropod Collection (NZAC) (address below), and the National Museum, Wellington. Anybody contemplating a revision of a group which includes New Zealand species should write to these two institutions for material. Both have extensive, but poorly sorted, collections of immature stages, as well as very extensive and reasonably well sorted collections of adults, from New Zealand. NZAC has extensive collections from southwest Pacific islands (Cook Is., Niue, Tonga, Fiji, New Caledonia, Samoa).

I have responsibility for beetles except Phytophaga (Chrysomeloidea and Curculionoidea), which are at present in charge of Dr. G. (Willy) Kuschel. When he retires next July, these groups will become the responsibility of Dr. Robin C. Craw. Mr. R. G. Ordish is the Curator of Entomology at the National Museum.

Late last year, a new series of systematic publications, *Fauna of New Zealand,* was launched. Two numbers on Coleoptera have been published: 2 Osoriinae (Staphylinidae) by H. Pauline McColl (with a key to subfamilies by myself and the principal author), and 3 Anthribidae by B. A. Holloway. Prices are $8.50 and $10.00 respectively, plus $1.50 per volume overseas postage, obtainable from Science Information Division, DSIR, P.O. Box 9741, Wellington, New Zealand.

In press in the Fauna series, due for publication this year, is 6 Hydraenidae by R. G. Ordish. Volumes in preparation include Nemonychidae and other primitive weevils, and an annotated key to families. Various other families are being studied by specialists, with a view to writing Fauna volumes.

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BEETLES ASSOCIATED WITH THE HARVESTER ANTS, *POGONOMYRMEX MONTANUS, P. SUBNITIDUS* AND *P. RUGOSUS* (HYMENOPTERA: FORMICIDAE)

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ABSTRACT

A list is presented of the beetles found in or near the nests of three Californian species of *Pogonomyrmex* harvester ants: *P. montanus, P. subnitidus,* and *P. rugosus.* The following families and genera of beetles were collected: Carabidae—*Amara, Notiophilus*; Coccinellidae—*Scymnus*; Elateridae—*Cardiophorus*; Histeridae—*Hetaerius, Onthophilus*; Leiodidae—*Echinocoleus, Ptomaphagus*; Melyridae—*Endasytes, Trichochrous*; Scarabaeidae—*Cremastocheilus, Paracotalpa*; Tenebrionidae—*Alaudes, Anepsius, Blapstinus, Conibius, Metoponium, Notibius.*

The tenebrionids were first in numbers of species, the histerids were second, the scarabaeids third. The other families were represented by few species. Only histerids were associated with all three ant species. Approximately equal numbers of families and species of beetles were associated with each of the three ant species, although the family and species compositions were quite different. The faunas associated with *P. montanus* and *P. rugosus* have very little in common, whereas each clearly overlaps with the fauna of altitudinally intermediate *P. subnitidus.*

This report is based on nest excavations of three closely related harvester ant species (MacKay 1981) that occur in southern California, U.S.A. The population of *Pogonomyrmex montanus* was located in a yellow pine community between Fawnskin and Big Pine Flat at 2,100 m elevation in the San Bernardino Mountains, San Bernadino Co. The study area of *P. subnitidus* was in chaparral near the Vista Grande Ranger Station at 1,500 m in the San Jacinto Mountains, Riverside Co. The population of *P. rugosus* was located in a coastal scrub community at Box Springs at 300 m near Riverside, Riverside Co.

The nest excavation process is detailed by MacKay (1981). Briefly, the nests were excavated in ten centimeter levels. The contents, including ants, guests and dirt, were placed in plastic containers, the animals separated later. All beetles were preserved in 70% ethanol except those individuals used in behavioral studies (MacKay in prep.). Eighty *P. montanus,* 26 *P. subnitidus,* and 20 *P. rugosus* nests were excavated. Beetles on the surfaces of the nests were captured in glass jars used to sample the forager ant population (MacKay 1981).

RESULTS AND DISCUSSION

(Table 1)

Carabidae. Numerous carabids are known or suspected to occur in ant nests (Erwin 1979a, 1979b). The specimen of *Amara* collected in the *P. rugosus* nest may have been feeding on stored seeds (cf. van Huizen 1977); *Amara* spp. also are found in the detritus of the nests of *Formica subnitens* and often are attacked

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Table 1. List of the beetles associated with *Pogonomyrmex montanus* (m), *P. subnitidus* (s), and *P. rugosus* (r).

Collection number	Host	Date	Determination and deposition	Level in nest—cm	No. of individuals
CARABIDAE					
Amara (*Celia*) sp.					
3649	r	1-II-80	Andrews	50	1
Notiophilus semiopacus					
2790	r	8-IV-79	Cooper	20	—
COCCINELLIDAE					
Scymnus fenderi					
4433	s	29-VII-80	Andrews	10	1
ELATERIDAE					
Cardiophorus tenebrosus					
1936	m	18-IV-78	Andrews	—	1
HISTERIDAE					
Hetaerius hirsutus					
2885	m	13-VI-79	Cooper	Surface	—
2895	m	14-VI-79	Cooper	Surface	—
3125	m	19-VII-79	Cooper	Surface	—
3195	m	29-VII-79	Cooper	Surface	—
Hetaerius sp. #1					
3343	m	16-VIII-79	Cooper	Surface	—
Hetaerius sp. #2					
4382	s	18-VII-80	Cooper	Surface	—
4437	s	29-VII-80	Cooper	70	—
4514	s	8-VIII-80	Cooper	Surface	—
4635	s	5-IX-80	Cooper	160–180	—
Onthophilus lecontei					
2770	s	5-XI-78	Andrews	80	1
Onthophilus sp.					
3635	r	7-XII-79	Cooper	200	—
LEIODIDAE					
Echinocoleus setiger					
1860	m	17-X-77	Andrews	—	5
2262	m	12-VII-78	Andrews	—	3
2731	m	30-IX-78	Andrews	50	4
2732	m	30-IX-78	Andrews	—	1
3392	s	29-VIII-79	Andrews	10	1
3395	s	29-VIII-79	Andrews	40	1
3398	s	29-VIII-79	Andrews	100	1
3401	s	29-VIII-79	Andrews	120	1
3402	s	29-VIII-79	Andrews	130	2
3506	s	6-X-79	Andrews	Surface	1
3512	s	7-X-79	Andrews	70	1
3520	s	7-X-79	Andrews	150	1
3537	s	7-X-79	Andrews	220	1
3598	s	3-XI-79	Andrews	160	3
4200	s	15-V-80	Peck	80	1
4201	s	15-V-80	Peck	110	1

Table 1. Continued.

Collection number	Host	Date	Determination and deposition	Level in nest—cm	No. of individ-uals
4204	s	15-V-80	Peck	170	1
4206	s	15-V-80	Peck	180	1
4219	s	22-V-80	Peck	130	1
4221	s	22-V-80	Peck	140	1
4223	s	22-V-80	Peck	150	2
4226	s	12-VI-80	Andrews	60	1
4311	s	30-VI-80	Peck	80	1
4319	s	30-VI-80	Peck	130–140	2
4321	s	30-VI-80	Peck	150–160	1
4343	s	8-VII-80	Peck	190–200	2
4344	s	8-VII-80	Peck	200	1
4365	s	13-VII-80	Peck	220	1
4391	s	19-VII-80	Peck	160	2
4393	s	19-VII-80	Peck	180	1
4405	s	22-VII-80	Peck	70	2
4407	s	22-VII-80	Peck	90	4
4409	s	22-VII-80	Peck	100	2
4412	s	22-VII-80	Peck	120–150	2
4413	s	22-VII-80	Peck	160–180	3
4414	s	22-VII-80	Peck	190–200	2
4416	s	22-VII-80	Peck	210	1
4417	s	22-VII-80	Peck	220	1
4441	s	29-VII-80	Peck	240	1
4443	s	29-VII-80	Peck	260	1
4497	s	8-VIII-80	Peck	140	1
4500	s	8-VIII-80	Peck	190	1
4504	s	8-VIII-80	Peck	230	1
4507	s	8-VIII-80	Peck	240	1
4526	s	13-VIII-80	Peck	60	1
4529	s	13-VIII-80	—	190–200	3
4531	s	13-VIII-80	Peck	230	6
—	s	14-VIII-80	—	180	1
4557	m	19-VIII-80	Peck	30	1
4559	m	19-VIII-80	Peck	50	1
4561	m	19-VIII-80	Peck	80	2
4585	s	24-VIII-80	Peck	10	1
4593	s	24-VIII-80	Peck	150–160	2
4599	s	24-VIII-80	Peck	190–200	8
4600	s	24-VIII-80	Peck	210–220	2
4603	s	24-VIII-80	Peck	230	2
—	s	24-VIII-80	—	240	1
—	s	24-VIII-80	—	250	4
—	s	24-VIII-80	—	280	3
—	s	5-IX-80	—	10	1
4628	s	5-IX-80	Peck	40–60	1
Ptomaphagus californicus					
3304	m	12-VIII-79	Andrews	30	1
MELYRIDAE					
Eudasytes sp.					
2901	m	15-VI-79	Andrews	20	1
2902	m	15-VI-79	Andrews	30	1

Table 1. Continued.

Collection number	Host	Date	Determination and deposition	Level in nest—cm	No. of individuals
Trichochrous sp.					
2793	r	20-IV-79	Andrews	10	1
2794	r	20-IV-79	Andrews	50	1
SCARABAEIDAE					
Cremastocheilus angularis					
2623	m	30-VIII-78	Andrews	40	1
Cremastocheilus westwoodi					
3592	s	3-XI-79	Andrews	30	1
4458	s	6-VIII-80	Alpert	10	1
4464	s	—	Alpert	50	1
4494	s	8-VIII-80	Alpert	50	1
4517	s	12-VIII-80	Alpert	40	1
4532	s	14-VIII-80	Alpert	30	2
4588	s	24-VIII-80	Alpert	40	1
—	s	5-IX-80	Alpert	20	1
Paracotalpa ursina					
2768	s	5-XI-78	Andrews	40	1
TENEBRIONIDAE					
Alaudes alternata					
2870	r	11-VI-79	Cooper	Surface	—
Alaudes sp. (*singularis*?)					
4305	s	26-VI-80	Cooper	Surface	—
Anepsius delicatulus					
4303	s	26-VI-80	Andrews	Surface	1
4304	s	26-VI-80	Andrews	Surface	1
Blapstinus spp.					
2832	r	26-V-79	Andrews	10	2
2988	r	2-VII-79	Andrews	10	1
4247	s	7-VII-80	Andrews	Surface	1
4274	s	13-VII-80	Andrews	Surface	1
4290	s	20-VII-80	Andrews	Surface	1
Conibius parallelus					
2938	r	20-VI-79	Andrews	20	1
3632	r	6-XII-79	Andrews	50	2
3161	r	26-VII-79	Andrews	Surface	2
Metoponium sp.					
3278	r	6-VIII-79	Andrews	10	1
Notibius puberulus					
3631	r	6-XII-79	Andrews	10	1
3388	r	24-VIII-79	Andrews	Surface	1
3444	r	11-IX-79	Andrews	Surface	1
3493	r	2-X-79	Andrews	Surface	2
4258	r	10-VI-80	Andrews	Surface	1
4282	r	17-VI-80	Andrews	Surface	1
4341	r	3-VII-80	Andrews	Surface	1
4363	r	11-VII-80	Andrews	Surface	2
4370	r	15-VII-80	Andrews	Surface	1

by the ants (Ayre 1958), and an adult female was collected in a nest of *F. obscuripes* (Weber 1935). The specimen of *Notiophilus* from a *P. rugosus* nest apparently is the first record of the genus from an ant nest; it may have been feeding on collembolans (cf. Ernsting and Jansen 1978), which I have found in nests of *P. rugosus.*

Coccinellidae. Coccinella divaricata occurs in nests of *Formica* spp., *Platynaspis luteorubra* may be associated with *Lasius niger* (Hodek 1973), and several species of the tribe Hyperaspini are associated with ants (Chapin 1966). *Scymnus* is a large genus (Gordon 1976) which preys on aphids (Wheeler and Jubb 1979), and it apparently has not been reported from ant nests. My specimen was collected in a *P. subnitidus* nest, but this ant does not tend aphids nor do aphids occur in the nests.

Elateridae. The occurrence of one specimen of *Cardiophorus* with *P. montanus* was probably accidental.

Histeridae. These beetles are often found with ants (Borgmeier 1948), and species of *Hetaerius* and *Onthophilus* inhabited the nests of the three *Pogonomyrmex* species.

Members of the genus *Hetaerius* are specialized ant guests which prey on immature ants (Martin 1922; Mann 1924; Donisthorpe 1927; Gösswald 1934; Edwards 1949) and are found in the nests of the ants of several species (Wheeler and Wheeler 1973). Most of my specimens were collected on the surfaces of the nests of *P. montanus* and *P. subnitidus.*

Onthophilus is a small genus and is virtually unknown biologically (Helava 1978). The structure of the mouthparts suggests that they are general predators of fly larvae or other small arthropods (Helava 1978). *Onthophilus lecontei* has been captured in gopher burrows and in a *Vespula pensylvanica* nest (Helava 1978). Specimens of this genus were found in the nests of two of the harvester ant species.

Leiodidae. The genus *Echinocoleus* contains three species distributed in the southwestern United States and probably northern Mexico (Peck 1976). They have been collected in the nests of harvester ants of the genera *Pogonomyrmex* and *Aphaenogaster* (=*Novomessor*). I collected *E. setiger* in the nests of *P. montanus* and *P. subnitidus*, and it previously has been collected in the nests of *Aphaenogaster albisetosus* (Peck 1976). *Echinocoleus setiger* is either a synoekete or a symphile. The beetles lick host secretions and clean the body surfaces of the ants (MacKay and MacKay in prep.). *Echinocoleus sonorensis* occurs in nests of *P. rugosus* in Arizona (Peck 1976), but I found none in the 20 *P. rugosus* nests excavated in southern California.

Ptomaphagus californicus is common in the San Bernardino Mountains in nests of the ant *Formica haemorrhoidalis* (MacKay 1980). Other *Ptomaphagus* spp. also are found in ants' nests (MacKay 1980). MacKay (in prep.) will present further information on the collection of *P. californicus* in the nests of *Pogonomyrmex montanus.*

Melyridae. The presence of *Eudasytes* and *Trichochrous* in the nests of *P. montanus* and *P. rugosus*, respectively, was probably accidental.

Scarabaeidae. Several specimens of *Cremastocheilus* spp. and one of *Paracotalpa* sp. were collected in the nests of *P. montanus* and *P. subnitidus.*

The exact nature of the association of *Cremastocheilus* with ants is not clear, although they prey on the brood and possibly on adult ants (Cazier and Mortenson 1965). Many species have trichomes at the anterior and posterior corners of the thorax or on the ventral surface of the body (Kloft *et al.* 1979) that may or may not (Alpert and Ritcher 1975) attract ants. Several species have been collected in the nests of *Pogonomyrmex* spp. (Cazier and Mortenson 1965; Lavigne 1966, 1969). *Pogonomyrmex barbatus, P. occidentalis,* and *P. rugosus* are hosts for *C. hirsutus, C. saucius, C. quadricollis,* and *C. excavatus* from Wyoming south to Mexico City (Alpert pers. comm.). *Cremastocheilus angularis* may normally be associated with the ant *Veromessor andrei* (Alpert pers. comm.), although *V. andrei* does not occur near the habitat of *P. montanus* but does occur at lower elevations in the *P. rugosus* habitat. *Cremastocheilus westwoodi* has not been reported since Horn stated in 1879 that it was common in or near ants' nests in Owen's Valley (Alpert pers. comm.). Its normal host may be a *Veromessor* sp. (*andrei* or *pergandei*?), although I found no *Veromessor* sp. in the *P. subnitidus* study area. *Veromessor pergandei* occurs at lower elevations in the desert surrounding the San Jacinto Mountains. I specifically looked for pupal cases of *C. westwoodi* in the nests of *P. subnitidus* and found none, supporting the hypothesis that *P. subnitidus* is not the normal host.

One of the specimens of *Cremastocheilus* collected in *P. subnitidus* nests actually may represent an undescribed species or a form intermediate between *C. westwoodi* and *C. schaumi* (Alpert pers. comm.); it is deposited in the collection of the University of California at Riverside.

Tenebrionidae. Representatives of six genera were collected near or in the nests of *P. rugosus* and *P. subnitidus,* but not in nests of *P. montanus.*

The records of *Anepsius, Alaudes,* and *Metoponium* might be incidental. North American *Blapstinus* spp. occur in the nests of the ants *Solenopsis xyloni* and *P. occidentalis* and may feed on larvae and dead ants (Lavigne 1966, 1969; Summerlin 1978). Aside from the association of *Conibius parallelus* with *P. rugosus,* have taken specimens of *C. uniformis* from nests of *Solenopsis xyloni* (27 mi NE Quartzsite, Yuma Co., AZ, 11-IV-80, #3775, in Andrews' collection) and *Formica* sp. (Cochise Stronghold, Cochise Co., AZ, 24-IV-80, #4064, in Andrews' collection). *Notibius puberulus,* commonly collected at the surface of *P. rugosus* nests, is known as a guest of the ant *Veromessor pergandei* (Wheeler and Wheeler 1973) which also occurs in the study area.

CONCLUSIONS

Table 2 compares the numbers of species of beetles of each family associated with the three harvester ant species. The Tenebrionidae were the most speciose, followed by the Histeridae and Scarabaeidae. Approximately equal numbers of beetle families and species were associated with each of the three ant species.

However, the composition of the beetle faunas associated with each ant species in the study area is quite different and seems to correlate well with elevation. Only histerids were found with all three ant species, with one genus represented at higher elevations and a second at lower elevations. The faunas associated with *P. montanus* and *P. rugosus* have very little in common, whereas each clearly overlaps with the faunas of altitudinally intermediate *P. subnitidus.* Some beetle species, notably *Echinocoleus setiger,* were found in nests of two of the harvester ant species; others, notably *Hetaerius* spp., appear to be more specialized, either as to elevation and general habitat or as to ant species.

At the higher elevations, in nests of *P. montanus* and *P. subnitidus,* the most commonly found beetle associate was the leiodid *E. setiger,* followed by *Hetaerius* spp. and *Cremastochilus* spp. At the lower elevations, in nests of *P. rugosus* and (again) *P. subnitidus,* the most prevalent beetle associates were various tenebrionids.

Table 2. Comparison of the number of species of each of the beetle families associated with three species of *Pogonomyrmex* harvester ants in southern California.

	Ant species			
Beetle family	*P. montanus*	*P. subnitidus*	*P. rugosus*	Total no. species
Carabidae			2	2
Coccinellidae		1		1
Elateridae	1			1
Histeridae	2	2	1	5
Leiodidae	2	1		2
Melyridae	1		1	2
Scarabaeidae	1	2		3
Tenebrionidae		3	5	7
Total number of families	5	5	4	8
Total number of species	7	9	9	23

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LITERATURE NOTICE

The Baron Maximilien de Chaudoir (1816–1881): A symposium to honor the memory of a great coleopterist during the centennial of his death. This is a collection of the 12 papers from the Coleopterists Bulletin 36(3 and 4) reprinted under a single cover. It is available from The Coleopterists Society, % Department of Entomology, NHB-169, Smithsonian Institution, Washington, DC 20560, U.S.A. Price: $15.00 postpaid.

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THE DISTRIBUTION AND ECOLOGY OF *COILODES CASTANEA* (COLEOPTERA: SCARABAEIDAE: HYBOSORINAE)

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Abstract

The hybosorine scarab, *Coilodes castanea* Westwood, is diurnally active during early and mid-wet season in low to mid-elevation moist forest within a geographic range from Costa Rica to Ecuador. On Barro Colorado Island, Panama, this species is a member of a large feeding guild of scarabs found at dung, carrion, rotting fruit, and fungi. Although competitively inferior in most aspects when at these food sources, *C. castanea* is successful due to early arrival and a diffuse distribution.

On Barro Colorado Island, Panama, the arthropod community associated with carrion, dung, rotting fruit, and fungi is composed primarily of Coleoptera (Young 1978). Most species and individuals associated with these food sources are members of the Scarabaeinae (Scarabaeidae), and their taxonomy, distribution, and habits in Panama were recently reviewed (Howden and Young 1981). One species of Hybosorinae (Scarabaeidae), however, was particularly common at these and other food sources and warrants special attention at this time.

Geographic Distribution

The subfamily Hybosorinae is primarily of Old World distribution, with approximately 110 species in 20 genera (Arrow 1912). Thirty species in nine genera occur in Mexico and Central and South America (Blackwelder 1944). The biology of members of the New World Hybosorinae is relatively unknown, with information on the one species occurring in the southeastern United States restricted to light traps (Woodruff 1973).

The hybosorine genus *Coilodes* presently contains ten species, eight of which are restricted to areas south of Panama or to the West Indies. One unnamed species was described by Bates from Guatemala in 1887. The remaining species, *Coilodes castanea* Westwood, is listed in Blackwelder (1944) as occurring in Nicaragua, Costa Rica, and Colombia. Table 1 lists collection localities for this species, based on pin label data obtained from several museums and private collections. These data indicate that *Coilodes castanea* has a broad geographic distribution throughout the northern neotropics. It is restricted to moist forest areas occurring from sea level to at least 1,760 meters in elevation.

Seasonal Distribution

Tables 1 and 2 indicate a range of collection dates from May to September. The biological significance of this period, however, may be obscured by its

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Table 1. Collection data for *Coilodes castanea.*

Country	Province	Locality	Elevation (m)	Date	Collection*
Costa Rica	Cartago	Reventazon	—	—	USNM
Costa Rica	Cartago	Turrialba	600	19 May 1979	HFH
Costa Rica	Heredia	Puerto Viejo	—	Jun. 1979	MCZ
Costa Rica	Limon	Estrella	—	Apr. 1924	USNM
Costa Rica	Puntarenas	Monteverde	1,400	28 May 1979	HFH
Costa Rica	Puntarenas	Monteverde	1,500	23 May 1979	HFH
Costa Rica	Puntarenas	San Carlos	—	—	USNM
Costa Rica	San Jose	San Jose	1,150	—	USNM
Costa Rica	San Jose	San Jose	1,161	1902	CNC
Panama	Chiriqui	Santa Clara	1,300	31 May 1977	HFH
Panama	Chiriqui	Santa Clara	1,300	25 May 1980	EGR
Panama	Chiriqui	Santa Clara	1,300	5 Jul. 1976	EGR
Panama	Chiriqui	Cerro Punta	1,760	5 Jun. 1977	HFH
Panama	Chiriqui	El Hato del Volcan	1,350	27 Jun. 1976	EGR
Panama	Cocle	El Valle	—	14 Jun. 1967	HFH
Panama	Panama	Vaca Monte	—	15 Jun. 1972	EGR
Panama	Panama	Cerro Campana	900	30 Jul. 1970	HFH
Panama	Panama	Cerro Campana	850	27 May 1974	OPY
Panama	Panama	Cerro Campana	850	3 Jun. 1972	USNM
Panama	Panama	Cerro Campana	800	30 May 1970	HFH
Panama	Canal Zone	Ancon	—	27 Jul. 1971	HFH
Panama	Canal Zone	Cabima	—	29 May 1911	USNM
Panama	Canal Zone	Cano Saddle	—	13 May 1923	USNM
Panama	Canal Zone	Corozal	—	22 May 1937	USNM
Panama	Canal Zone	Fort Kobbe	—	8, 24 Jun. 1976	EGR
Panama	Canal Zone	Frijoles	—	2 May 1972	USNM
Panama	Canal Zone	Gatun	—	13 Jul. 1975	BCR

Table 1. Continued

Country	Province	Locality	Elevation (m)	Date	Collection*
Colombia	Magdalena	Cincinnati	1,050	11 Jun. 1920	CNC
Colombia	Magdalena	Sevilla	—	1928	MCZ
Colombia	Magdalena	Rio Frio	—	1928	MCZ
Colombia	Magdalena	Aracataca	—	1928	MCZ
Colombia	N. de Sant.	Chinacota	1,000	10 May 1974	HFH
Colombia	La Guajira	Sierra N. de S. M.	900	22 Jun. 1928	MCZ
Ecuador	Napo	Limoncocha	250	18 Jun. 1976	HFH
Ecuador	Napo	Limoncocha	250	21 Jul. 1976	HFH
Ecuador	Tungurahua	Rio Negro	1,500	13 Jul. 1976	HFH
Venezuela	Barinas	Barinas	230	22 May 1968	HFH
Venezuela	Tachira	San Cristobal	1,000	19 May 1974	HFH
Venezuela	Merida	Merida	—	—	CAS

* See acknowledgements for explanation of symbols.

Table 2. *Coilodes castanea* specimens from B.C.I.

Date	No. specimens	Collection*
4 May 1975	4	OPY
16 May 1975	7	OPY
18 May 1975	2	OPY
22 May 1975	4	OPY
23 May 1975	1	OPY
— May 1929	12	MCZ, CNC
— May 1937	4	USNM
5 Jun. 1974	14	OPY
14 Jun. 1961	5	MCZ
23 Jun. 1967	2	CNC
27 Jun. 1967, 74	13	CNC, USNM
30 Jun. 1976	1	EGR
— Jun. 1950	1	MCZ
20 Jul. 1969	4	MCZ
— Jul. 1969	13	MCZ
— Aug. 1969	32	MCZ
15 Sep. 1974	7	OPY
16 Sep. 1974	4	OPY
18 Sep. 1974	3	OPY

* See acknowledgments for explanation of symbols.

historical correlation with the summer recess period of north temperate academic institutions and the concurrent increased activity in the tropics of investigators from such institutions. This potential bias can be minimized by considering just one locality over several complete seasonal cycles.

On Barro Colorado Island (BCI), Panama, I was able to obtain data on *Coilodes castanea* during a 15 month period of 1974–75 (Young 1978). During those two years, *C. castanea* first appeared in baited pitfall traps on 4 May and was last collected on 18 September, with maximum numbers at the start of the rainy season—mid- to late May, followed by a steady decline in abundance to zero in July–August. BCI usually has a mini-dry season sometime in July–August (Smythe 1975), which may account for depressed *Coilodes* populations at that time. A second smaller peak in population density occurred in August–September, at the start of the late wet season rains, but was of very short duration.

This pattern of peak early-wet season abundance, minimal levels during mid-wet season, and a secondary peak of abundance in the late wet season is typical of nocturnal Coleoptera populations on BCI (Smythe 1975). Diurnal sampling of Coleoptera in the leaf litter demonstrates the same pattern of occurrence (Willis 1976). Some of the coprophagous Scarabaeinae on BCI (two-thirds of the diurnal species) also possess this seasonal pattern (Young 1981).

DIEL ACTIVITY

Coilodes castanea on BCI is active only during the day. This was established by 24 hour observation cycles of naturally occurring food sources and two-hour bait-trapping intervals throughout numerous 24 hour periods. Within the daylight period of 0600–1800 hrs, this species is most active during the period of 0900–1500 hrs, and in fact is one of the few scarab species active at typical food sources at mid-day. This pattern of activity remains stable throughout the wet season, in contrast to several scarabaeines at the same food sources which shift their activity periods seasonally (Howden and Young 1981).

FEEDING NICHE WIDTH

Information from museum specimen labels, personal observations from Panama, and correspondence with other investigators have been combined in Table 3 to give an indication of the variety of food sources on which *C. castanea* has been observed. Compared with other scarabs known to occur on dung, carrion, and rotting fruit and/or fungi, this species has a very broad feeding niche. Considering just the 36 most abundant species of scarabaeines on BCI, 11 are restricted to dung, 3 to carrion, 13 to carrion and dung, none to rotting fruit/fungi, one to dung and fungi, and the remaining 8 species occur at all three food types (Young 1981). Of the 57 species of scarabaeines known to occur on BCI, and which occur on some of the listed food sources, only *Onthophagus sharpi* Har. has been recorded from a similar variety of food sources, though not on invertebrate carrion (Howden and Young 1981). The other Hybosorinae on BCI occurring at some of these foods, *Anaides longeciliata* Balth., appears only on a few kinds of vertebrate dung and carrion (Young 1978).

Perhaps the most interesting aspect of this diversity of food choice in *C. castanea* is the inclusion of invertebrate carrion. There are very few references in the literature to the consumption of dead invertebrates by insects, although several scarabaeines have been recorded at insect carrion (Seastedt *et al.* 1981). Due to relatively low population densities and a diverse diet, however, it is not likely that this species consumes a significant proportion of the available invertebrate carrion.

COMPETITIVE INTERACTIONS

When *Coilodes castanea* occurs at dung on BCI, as many as 22 diurnal species of scarabaeines may also be competing for that food. At carrion, 15 species may be competing and at rotting fruit/fungi, 3 species may be competing with *C. castanea* (Young 1978). Although this species is obviously successful in the presence of such competition, it appears to be at a competitive disadvantage.

Considering just the scarabs that occur at dung, carrion, and/or rotting fruit/fungi, food is removed from the site by three basic techniques (Young 1978). Individuals in genera such as *Canthon* and *Phanaeus* remove food by an overland route, rolling or butting the material to a distant place for subsequent burial and consumption or egg-laying. Non-overland removal as seen in *Onthophagus* or *Eurysternus* involves the burial of material below the food source with subsequent utilization. A third technique of food removal is the consumption of food *in situ,* without prior burial or overland transport.

In situ consumption of food is a technique which allows for a rapid attainment of energy sources with a minimum expenditure of energy. In the scarab feeding guilds under consideration, however, this technique is only efficient when scarabaeines are not present. *C. castanea* is not able to protect food from competitors attempting to remove it by burial or by overland transport. Since most food sources are relatively small and competition for them is intense, *C. castanea* obtains very little food when other scarabs are present, usually being

Table 3. Occurrence of *Coilodes castanea* at potential food sources.

Food		Source of data*
Carrion—Vertebrate	Old carcass of Three-toed Sloth	OPY
	Actively decaying carcasses of: Porcupine	HS
	Sloth	JFL, OPY
	Howler Monkey	OPY
	Roof Rats	OPY
	Rotting fish carcass	USNM
—Invertebrate	Eating dead ants on log	OPY
	Feeding on inside & outside of dead earthworm	EGR
Dung	Coati	OPY
	Howler Monkey	OPY
	Human	HFH, SBP, NEW
	Tapir	OPY
Rotting fruit and/or fungi	In *Gustavia* sp. fruit on ground	OPY
	On fallen *Entada* sp. pods covered with white fungi	OPY
	Over-ripe fallen fruit	EGR
	Fruit fly traps	JZ
	Forest fruit traps	SBP
	Fermented Palm fruits	HS
Miscellaneous	Forest leaf litter	EOW
	Berlese separation of forest leaf litter	JFL, SBP
	Siftings from broken termite nest	SBP

* See acknowledgments for explanation of symbols.

forcefully removed from a food site by more aggressive competitors. This hybosorine is a successful species on BCI because it usually arrives first at a food source and can feed for several minutes before other species arrive (N. Woodley, O. P. Young; pers. obs.).

The early arrival of *C. castanea* at food sources is probably due to its distribution pattern within the BCI forest. Usually no more than two or three individuals of this species will occur at any one food site, whereas perhaps 20–50 individuals of each of several scarabaeine species may co-occur. The hybosorine species usually appears at almost every food site, whereas less than 50% of the food sites will contain individuals of any one species of scarabaeine. This pattern of occurrence suggests a relatively uniform distribution within the forest with low densities in any one area. Factors contributing to this pattern may include the small size of *C. castanea* (4.5–5.5 mm), its relatively weak flying capabilities as compared to other similarly-sized scarabaeines, and a demonstrated inability to detect food odors at distances comparable with other competitors (Young, unpubl. ms.). The possibility also exists that the primary feeding niche for *Coilodes castanea* has yet to be discovered.

ACKNOWLEDGMENTS

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LARVAL DESCRIPTION OF *CALYBE* (*EGA*) *SALLEI* (CHEVROLAT) WITH A PRELIMINARY ASSESSMENT OF LACHNOPHORINE AFFINITIES (CARABIDAE: LACHNOPHORINI)

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Abstract

The larva of *Calybe* (*Ega*) *sallei* (Chevrolat) shares derived character states with the Odacanthini, Pentagonicini, and Lebiini, supporting removal of *Calybe* Laporte from the Pterostichini *s.l.* Characters of the female internal reproductive tract are illustrated. Species of *Calybe, Lachnophorus* Dejean, *Anchonoderus* Reiche, *Euphorticus* Horn, and *Eucaerus* LeConte share a number of derived character states of spermathecal configuration. These synapomorphies are discussed in relation to the data provided by the larva of *C. sallei.*

The Lachnophori was first proposed by LeConte (1853) to comprise the genera *Ega* Laporte (=*Calybe* Laporte) and *Lachnophorus* Dejean. Since that time, many classificatory schemes have been proposed for these genera and their allies. Much of the confusion as to the placement and status of the lachnophorine genera has been caused by the exclusive reliance on adult external characters in the classificatory attempts. The purpose of this paper is twofold. The larval stage of *Calybe* (*Ega*) *sallei* is described. The derived character states possessed by the larval stage provide new data bearing on the taxonomic placement of *Calybe.* Secondly, the female internal reproductive tract of *Calybe* and other lachnophorines is illustrated. Derived character states of the female internal tract corroborate data obtained from the larval stage, and provide clues to the natural affinities of the lachnophorine genera.

Materials and Methods

Larval characters were observed using whole specimens, and in one dissected specimen cleared in cold 10% KOH. The microcrochets of the larval uropod can only be observed under 100–200×, and were recorded from a dissection cleared and mounted in Canada balsam.

Dissection and observation of the female internal reproductive tract is facilitated by the use of a chlorazol black stain. The abdomen of specimens to be dissected are first soaked in warm 10% KOH for 10 to 30 minutes, or in cold KOH overnight. Once the extraneous fat is removed, the apical three abdominal segments and attached gut, defensive glands, and reproductive tract are placed in a suspension of chlorazol black in cellosolve. Chlorazol black stains cuticular membrane a cyanotic blue which remains dark blue in glycerine. Using this stain, even the most delicate structures associated with the spermatheca can be observed. The dissection can be retained with the specimen in a genitalia vial.

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Larval Description

L3 larvae. Head width .60–.65 mm, prothoracic width .75–.80 mm, length 5.1–5.6 mm (3 specimens).

Coloration: Head testaceous with quadrate smoky field on frons; prothorax testaceous with central smoky field, meso- and metathoracic nota darker, all with brassy lustre; abdominal tergites I–IV and VI–VII testaceous with a smoky cast; abdominal tergites V, VIII, and IX darker with metallic lustre; urogomphi reddish brown bearing dark setae, apical quarter of apical segments pale with pale setae.

Head: Mandible with smooth blade, well developed retinaculum, penicillus and external seta (Fig. 5). Maxilla with four segmented palp, second segment 2.5 × length basal segment, third segment same length basal, apical segment shortest; outer lobe of two segments, apical segment subequal to basal; inner lobe absent, inner margin of stipes setose (Fig. 3). Labium medially bisetose (Fig. 4); palps two segmented, apical segment swollen basally and medially constricted, nipple-like. Antenna with third segment bearing apically expanded sensory peg; third segment as long as basal, apical segment subequal to second (Fig. 2). Nasale biconcave with median projection; three setae located on each side above mandibular insertion. Ocular field composed of six stemmata (Fig. 6) set in a piceous [pigmented] ocular field.

Thorax: Prothorax moderately robust, longer than either of next two segments, setae arranged around notal margin and in three transverse rows (Fig. 1); pleura lightly pigmented except for coxal articulation. Mesothorax and metathorax with setae on notal margins and in one transverse row: pleural plates more darkly pigmented than on prothorax; mesothorax bearing annular spiracle. Legs slender, bearing prominent spinose setae plus more numerous slender setae (Fig. 7); anterior claw stouter and 1.3 × length trailing claw on prothoracic leg, posterior claw stouter and 1.1 × to 1.3 × length anterior claw on meso- and metathoracic legs.

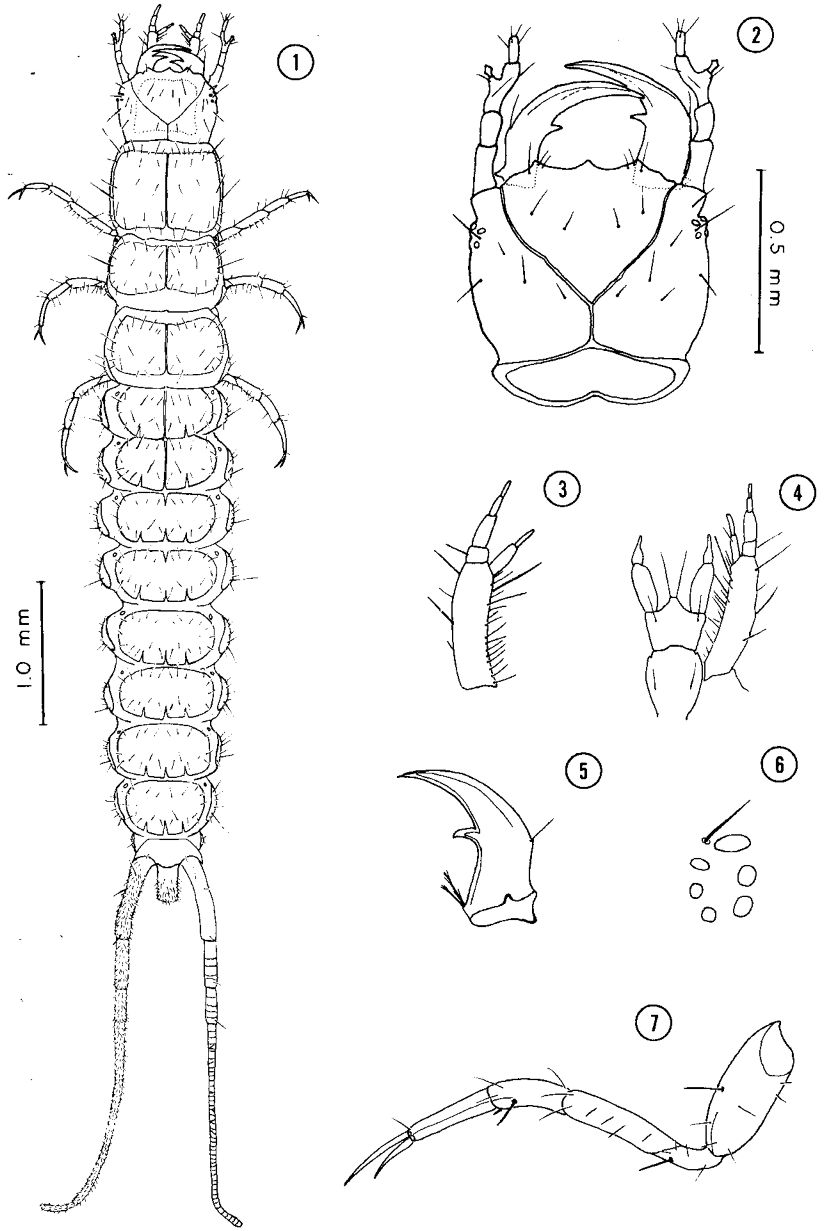
Abdomen: Segments I–VII with transverse oval tergite bearing two rows of fixed setae; dark rimmed annular spiracles; two ovoid pleurites, the dorsal with five to seven setae, ventral with five to six setae; seven sternal sclerites bearing setae, comprised of one large transverse oval sclerite followed by four smaller quadrate sclerites arranged linearly across each segment, two small sclerites anteriad of large transverse sclerite on segments II–VII each bearing a small seta; segment VIII with rounded oval tergite, more convex than those of more anterior segments, spiracle, pleurites and sternal sclerites as in segments II–VII; segment IX bearing articulated four segmented urogomphi and cylindrical X segment or uropod (Fig. 1); urogomphal segments bearing longer fixed setae as well as numerous shorter finer setae, each segment secondarily segmented by irregular annular rings; uropod sclerotized at base, pale distally with numerous fine setae; row of 7 to 8 microcrochets in apical folds of uropod (visible only at 100–200×).

L2 larva. Head width .50 mm, prothoracic width .55 mm, length nasale to cauda 3.7 mm (1 specimen).

Material. 1 L2 larva, 4 L3 larvae; one L3 larva reared through pupal to adult stage.

Locality. Texas: Gonzales Co., farm pond ⅓ mile south of interstate highway 10, Luling exit, 18 April 1981, J. K. Liebherr collector.

Biology. The larvae of *Calybe sallei* were taken with 24 adults on the shore of an 80 acre farm pond. The soil is predominantly clay mixed with sand. Associated carabids include species of *Omophron, Clivina, Dyschirius, Bembidion,* and *Tachys.* The larvae and adults were flushed out from under algal mats and small sticks by splashing. The larvae live under the debris, not in the clay soil itself. They are quite agile, waving their urogomphi as they run, producing a resemblance to the bicolored antennae of the adult *Calybe.* The variegated tergite coloration combined with the relatively wide intersegmental membranes disrupts the outline of the larva. Other collections of *Calybe sallei* adults were made, and in many cases the adults were running with foraging



Figs. 1–7. L3 larva of *Calybe* (*Ega*) *sallei* (Chevrolat): 1, Dorsal view of larva, left urogomphus shows secondary setae, right urogomphus shows secondary annular rings; 2, Dorsal view of head capsule, maxillae and labium omitted; 3, Stipes of left maxilla, dorsal view; 4, Labium and left maxilla, ventral view; 5, Right mandible, dorsal view; 6, Lateral view of stemmatal field of right side of head, cephalic direction to the right; 7, Right metathoracic leg, cephalic view.

ants. The disruptive coloration and quick movements of the larvae suggest that they too could be mimicking ants.

LARVAL CHARACTERISTICS AND AFFINITIES OF *CALYBE* (*EGA*) LAPORTE

The discovery of the larva of *C. sallei* brings new information to bear on the taxonomic placement of *Calybe* and allied genera. Previous classifications of lachnophorine genera have been of two principal types; inclusion of the lachnophorine lineage in the Pterostichini, or recognition of the lachnophorine genera at the tribal level. Larval characteristics do not support the first alternative. The presence of articulated and segmented urogomphi argues strongly for removal of *Calybe* from the Pterostichini. Pterostichine larvae possess unarticulated, unsegmented urogomphi (Thompson 1979a), the primitive states in Carabidae for these characters. Articulated urogomphi are present in other lineages within the Carabidae, including the Nebriini, Notiophilini, Opisthiini, Chlaeniini, and Lebiini (Thompson 1979b). Given the accepted carabid classification, it is likely that this character is subject to extensive homoplasy. Segmented urogomphi have been observed only in *Calybe* and various lebiine genera such as *Lebia* (Jeannel 1942), *Plochionus, Philophuga,* and *Tecnophilus* (Larson 1969). Restriction to a limited portion of the Carabidae indicates that it is a relatively conservative character, more likely to indicate natural affinities.

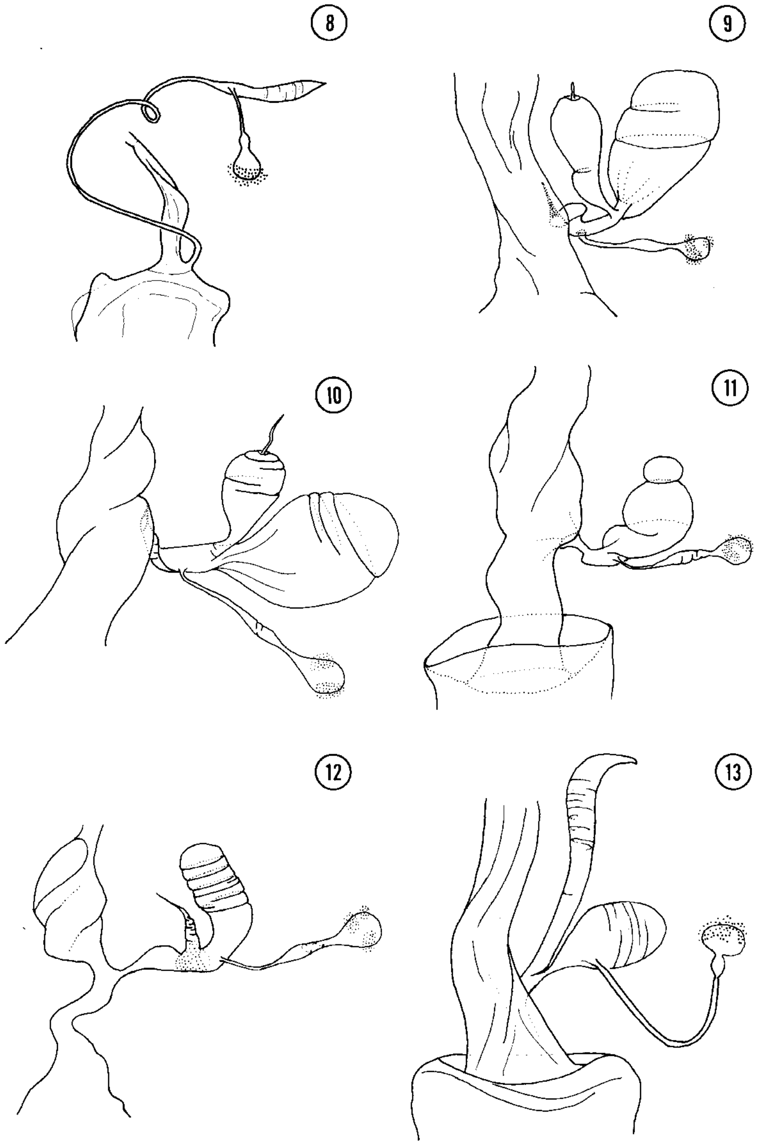
The inner margin of the maxilla of *Calybe* bears only fine setae. The maxillar inner lobe characteristic of pterostichine larvae is absent. Many other tribes of Carabidae lack the inner lobe, including the Perigonini (Grassé and Jeannel 1941), Odacanthini (Jeannel 1942, Thompson 1979b), Pentagonicini (Moore 1965), and Lebiini (Jeannel 1942, Larson 1969, Erwin 1975). Presence of the inner lobe is considered the primitive state, as the inner lobe is present in the Gyrinidae and Haliplidae (Boving and Craighead 1930), and the carabid tribes Cychrini, Carabini, Elaphrini, some Nebriini, and Opisthiini (Thompson 1979b).

A fourth derived character state present in *Calybe* larvae is the unequal ungues. In the second and third instar larvae observed, the anterior claw is stouter and longer on the prothoracic legs, whereas the posterior claw is stouter and longer on the mesothoracic and metathoracic legs. Other genera possessing unequal ungues include *Harpalus* (Chu 1945), *Lebia* (Jeannel 1942), and *Perigona* (Grassé and Jeannel 1941). The homology of these states remains in doubt as none possess the unequal ungues formula of *Calybe.* This character is best considered an autapomorphy of *Calybe* until further comparative studies are made.

FEMALE REPRODUCTIVE TRACT AND ANCHONODERINE AFFINITIES

The possession of shared derived character states in larvae of *Calybe* and the Pentagonicini, Odacanthini, and Lebiini provides grounds for exclusion of *Calybe* from the Pterostichini *s.l.* The configuration of the female internal reproductive tract corroborates the conclusions based on larval characters.

Within the Pterostichini, the base plan for the spermatheca is much like that of *Agonum sexpunctatum* (L.) (Fig. 8). The spermathecal duct enters the common oviduct near its junction with the bursa copulatrix. In *Pterostichus* and *Agonum* species the spermathecal duct may be greatly lengthened, lying coiled under the rectum. The spermathecal gland may join the spermathecal duct near the base of the spermatheca (Fig. 8), or enter the duct somewhat



Figs. 8–13. Spermatheca and spermathecal gland for female genitalia, dorsal view. Bursa copulatrix at bottom of view; spermathecal duct enters median oviduct; spermathecal gland is membranous but overlain with cuticulin ducts shown as stippling. 8, *Agonum sexpunctatum*; 9, *Calybe* (*Ega*) *sallei*; 10, *Euphorticus pubescens*; 11, *Lachnophorus elegantulus*; 12, *Anchonoderus* sp., MEX: Nuevo Leon, 17.5 mi W. Linares, 25 May 1981, J. T. Doyen and J. K. Liebherr collectors; 13, *Eucaerus* sp., PANAMA: Canal Zone, Barro Colorado Isl., Harvard 11, 8 May 1975, T. L. Erwin and J. F. Lawrence collectors (ADP 38653).

distant from the spermatheca. A tubelike spermatheca is reported in the Carabini, Harpalini, and Pterostichini (Iuga 1966); Cicindelini (Freitag 1979); and Nebriini (Kavanaugh pers. comm.), and would appear to be the primitive state for this structure.

The spermatheca of *Calybe* (*Ega*) *sallei* differs from the primitive condition in a number of ways (Fig. 9). The spermathecal duct enters the common oviduct distant from the bursa copulatrix. The duct is not flexible as seen in *Agonum*, but is more heavily sclerotized, and anchored to the oviduct by a triangular, thickened area of cuticle cephalad of the duct opening. The spermathecal gland enters this sclerotized duct. The spermatheca is a bipartite structure, composed of a more tubular body with an apical filament, and a larger more globose body. This condition is almost identical to that observed in *Euphorticus pubescens* (Dejean) (Fig. 10). In *E. pubescens*, the spermathecal duct enters the common oviduct distant from the bursa copulatrix, and the sclerite at the opening of the spermathecal duct onto the oviduct, the bipartite spermatheca and the apical filament on the tubular reservoir are all present. These character states are derived, compared to the configuration observed in *Agonum* and *Pterostichus*.

Females of *Lachnophorus elegantulus* Dejean possess a single bodied spermatheca (Fig. 11), however the globose spermathecal shape, short heavily sclerotized spermathecal duct and duct opening situated distant from the bursa are derived character states shared with *Calybe* and *Euphorticus*. *Anchonoderus* sp. females possess a bipartite spermatheca, but the tubular body is represented by only a tapering filament (Fig. 12). The spermathecal gland duct enters the spermatheca more distally than in *Calybe*, *Euphorticus*, or *Lachnophorus*, but the general configuration is similar.

Eucaerus has previously been considered a member of the Lebiini, however it has recently been excluded from that tribe (Ball pers. comm.) The female tract of *Eucaerus* sp. is very similar to that of *Anchonoderus*. The spermathecal duct enters the common oviduct somewhat distant from the bursa, the spermatheca is a bipartite structure and the spermathecal gland duct enters near the base of the distal spermathecal reservoir (Fig. 13). These derived character states shared with the lachnophorine genera imply a close phylogenetic relationship among these taxa.

SUMMARY

Derived character states present in the larva of *Calybe* (*Ega*) *sallei* support removal of this genus from the Pterostichini *s.l.* The possession of segmented, articulated urogomphi and the absence of a maxillary inner lobe are characteristics shared with various taxa within the Lebiini, indicating that *Calybe* may be a basal derivative of lebiine stock.

The configuration of the female reproductive tract corroborates the larval data. Species of *Calybe*, *Euphorticus*, and *Anchonoderus* share a number of derived character states not seen in the Pterostichini. *Lachnophorus* species have a similar spermathecal configuration, but lack several of the synapomorphies uniting *Calybe*, *Euphorticus*, and *Anchonoderus*. The species of *Eucaerus* investigated has a spermatheca very similar to that of *Anchonoderus*, implying a close phylogenetic relationship between the lachnophorine genera and *Eucaerus*.

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The Coleopterists Bulletin, 37(3):261–266. 1983.

CURIOSA DOMINICANA, A NEW GENUS AND SPECIES OF CURIINI (COLEOPTERA: CERAMBYCIDAE) FROM DOMINICAN REPUBLIC

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ABSTRACT

A new cerambycid beetle, *Curiosa dominicana,* new genus and species (Curiini), from Dominican Republic is described and illustrated, generic characters are discussed, and a key to the genera in the tribe is presented. The new genus is distinguished from others in the tribe by having 10-segmented antennae and finely-faceted eyes.

Among cerambycids from Dominican Republic (West Indies) given to the author by Charles W. O'Brien was an unusual specimen which was initially mistaken for a member of the Anaglyptini or the Tillomorphini. On closer examination it was found to belong in Curiini, but it presents characters so unusual for this tribe that it appears to represent a new genus.

Unfortunately, only a single specimen (female) is available for description. However, since the taxon presents such unique characters, descriptions for the new genus and species are presented at this time.

Curiosa Micheli, **new genus** (tribe Curiini)

General form. Small, moderately narrow, subcylindrical. *Head* oblique; front short, almost flat; epistoma short, its anterior margin straight; antennal tubercles low, separated at base. Eyes small, strongly convex, entire, feebly emarginate, finely-faceted. Palpi moderately short, subequal, with apical segments subtriangular. Antennae 10-segmented, moderately long, slender, ciliate, with segments 5–10 expanded on external edge (with antennae directed backward); scape longer than any of the following segments, gradually enlarged from base, slightly arcuate; 2nd segment much longer than broad; 3rd distinctly longer than 4th and shorter than 5th; remaining segments shorter than 5th. *Pronotum* longer than broad, convex anteriorly, constricted basally, without tubercles. Scutellum small, subquadrate. *Elytra* uneven basally, convex beyond basal ⅓, subparallel-sided, with apices separately rounded and unarmed. *Prosternum* strongly declivous in front of coxae; process moderately narrow between coxae, expanded behind; coxal cavities narrowly open behind. *Mesosternum* inflated in front of process and coxae, strongly depressed anteriorly; process broader than prosternal; coxal cavities closed externally. Metathoracic episterna narrow, feebly attenuated posteriorly. *Legs* moderately long; femora pedunculo-clavate, each with a small tooth ventrally on clavate portion; metafemora not reaching elytral apices in female; tibiae slender, posterior ones feebly arcuate, feebly compressed apically and subequal in length to metafemora; basal metatarsal segment elongate, slightly longer than following 2 segments together. *Abdomen* with basal sternite a little longer than following 2 together.

Type-species. Curiosa dominicana, new species.

Etymology. Latin, *curiosus,* meaning curious, in the sense of unusual; also, curi-, showing tribal affinities. Gender: feminine.

Distribution. Known only from Dominican Republic.

This genus differs from the rest of the known genera in the tribe by having 10-segmented antennae and finely-faceted eyes.

Discussion. In comparison with members of some tribes of the subfamily Cerambycinae with finely-faceted eyes, the ommatidia in *Curiosa* are similar in size to those of *Tilloclytus* Bates (Anaglyptini), but not as fine as in *Neoclytus* Thomson (Clytini) or *Acyphoderes* Serville (Rhinotragini).

The new genus also appears to be unique in the tribe in having the scape longer than any other antennal segment and the metatibiae subequal in length to the metafemora; however, these characters may apply only to females since other members of this tribe usually exhibit some degree of sexual dimorphism in the antennae and legs.

Curiosa fits into the tribal definition as given by Linsley (1963) except for the lack of annulation on the antennal segments and possession of finely-faceted eyes. The first of these differences does not seem significant but the latter does, but alone it does not seem sufficient to exclude the genus from the tribe.

In the key that follows, *Plectromerus* Haldeman and *Pentomacrus* White are not separated from each other since at present they are not clearly differentiated. Cazier and Lacey (1952) commented on this problem. The 2 genera, however, share the characters presently used to separate them from *Curius* Newman.

KEY TO THE GENERA OF CURIINI

1. Antennae 10-segmented; eyes finely-faceted .... *Curiosa,* new genus
1′. Antennae 11-segmented; eyes coarsely-faceted 2
2. Third antennal segment longest; femora gradually enlarged from the base; basal abdominal sternite as long as following 2 together .... *Curius* Newman
2′. Third antennal segment shorter than, or subequal to some other segment; femora pedunculo-clavate; basal abdominal sternite as long as following 3 together . *Plectromerus* Haldeman and *Pentomacrus* White

Curiosa dominicana Micheli, **new species**
(Figures 1–3)

Holotype female: Length 5.7 mm; greatest width 1.6 mm at apical ⅓ of elytra.

General appearance. Small, moderately narrow; integument dark reddish-brown, becoming feebly lighter in color on antennae, portions of underside, palpi and legs; moderately sparsely clothed with long and short, recumbent and suberect whitish hairs on head, pronotum and elytra; each elytron ornamented at basal ⅓ with a small, transverse, yellowish spot, which is placed within a large, subtriangular, blackish, glabrous area.

Head. Front about 1½ times broader than long, feebly convex, shallowly foveate on each side, with a feeble, narrow, median groove extending from about anterior ¼ to beyond vertex; antennal tubercles widely separated at base. Surface feebly shining, alutaceous in part; front shallowly, irregularly, moderately finely punctate and finely rugose; vertex and posteriorly shagreened and sparsely, very inconspicuously punctate; mandibles coarsely rugose-punctate on external face; ventral surface moderately shining, with transverse rugae. Eyes (Fig. 2) ovate, transverse, narrowing posteriorly, feebly emarginate on upper margin. Pubescence short, fine, recumbent, moderately sparse on vertex and posteriorly, elsewhere long, coarse, suberect and very sparse. Antennae reaching to about apical ¼ of elytra; scape about 4 times longer than broad and about 1¼ times as long as the distance between antennal sockets, slightly longer than next 2 segments together; 2nd segment twice as long as broad, 3rd about 1⅓ times length of 4th, 5th about 1⅛ times length of 3rd, 6th to 9th becoming progressively slightly shorter, 7th subequal in length to 3rd, 10th slightly longer than 9th. All segments feebly shining, alutaceous; punctures

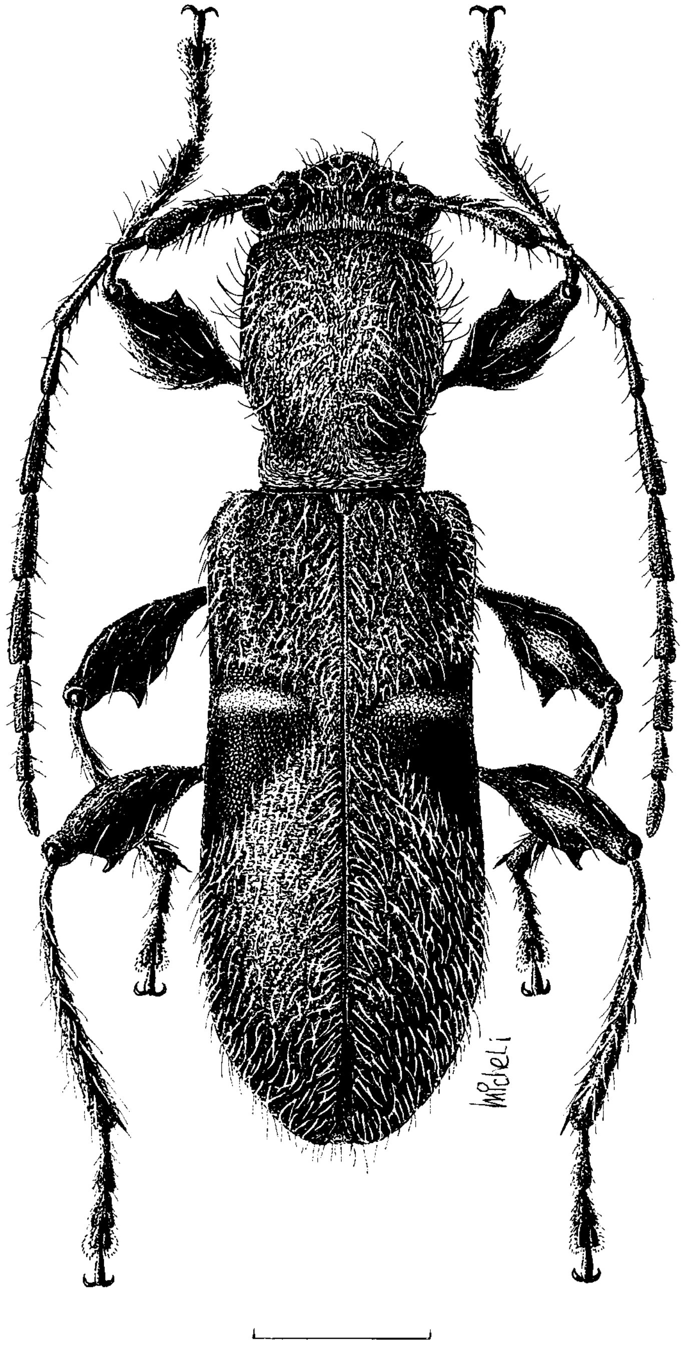
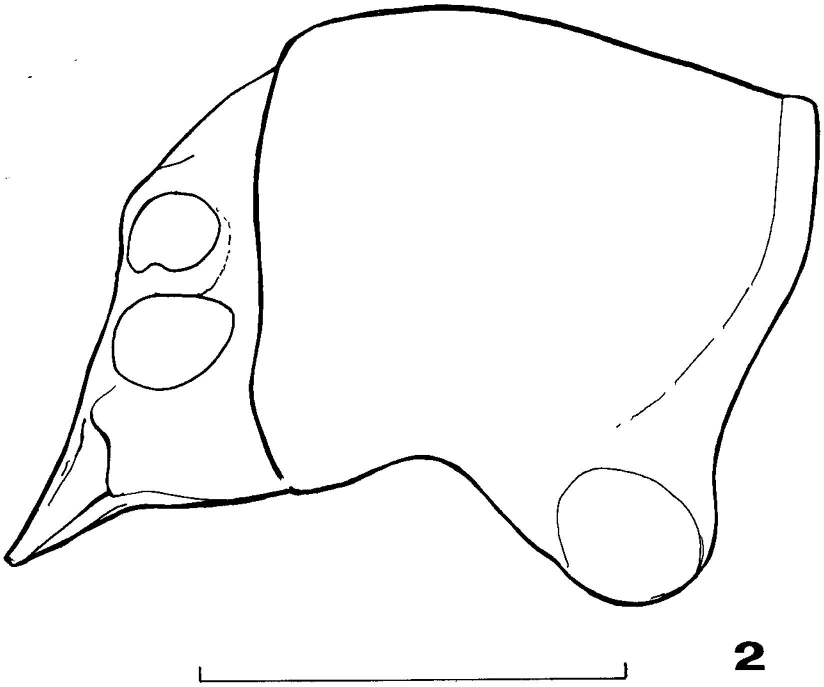


Fig. 1. *Curiosa dominicana*, n. sp., dorsal habitus. (Scale line = 1 mm).



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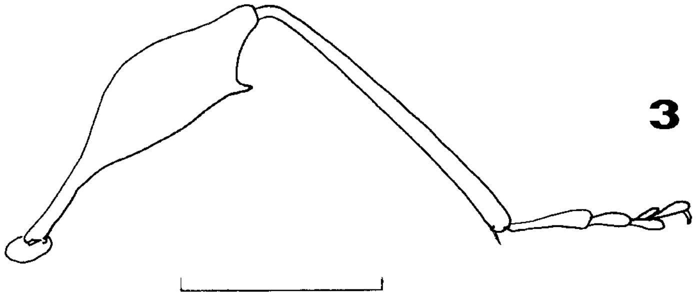

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Figs. 2, 3. *Curiosa dominicana*, n. sp. 2) lateral aspect of head and pronotum; 3) lateral aspect of posterior leg. (Scale lines = 1 mm).

fine on basal segments becoming finer on distal ones; pubescence sparse on basal segments becoming denser on distal ones and consisting of short, fine, recumbent, inconspicuous hairs with long, coarse, suberect ciliae intermixed.

Prothorax strongly arched in lateral view (Fig. 2). *Pronotum*: One and ⅓ times longer than broad, widest at middle, a little narrower at base than at apex. Lateral outline broadly arcuately expanded from anterolateral angle to middle, thence broadly rounded to basal ⅕ where it is strongly constricted, thereafter sinuate to basal margin. Basal margin straight; anterior margin broadly arcuately produced. Surface subopaque, finely granulose-rugose dorsally, becoming very finely granulose on sides; punctation sparse, very fine. Pubescence consisting of long, suberect hairs which are sparse on disk, very sparse on sides, and short, fine, recumbent hairs which are moderately densely distributed along base. Scutellum subtruncate at apex; moderately densely clothed with long, recumbent hairs.

Elytra. Two and ½ times longer than subbasal width; 2⅝ times longer, and about 1⅓ times broader basally than pronotum at middle. Disk unevenly depressed from base to basal ⅓, each elytron tumid centrobasally; posterior two-thirds strongly convex. Humeral angles not prominent. Outline of sides slightly convergent from posthumeral region to basal ⅓, thence slightly divergent to about apical ⅓, thereafter broadly, evenly rounded to apices, which are separately and moderately narrowly rounded. Epipleural margin moderately sinuate. Each elytron ornamented at basal ⅓ with a small, transverse, yellowish spot which is placed within a large, subtriangular, blackish area, the anterior margin of which is obliquely, arcuately expanded forward, the posterior margin extending obliquely from subsutural basal ⅓ to about lateroapical ⅓. Surface deeply, moderately coarsely, closely and occasionally confluently punctate basally in front of subtriangular areas, punctures becoming finer toward sides, but coarse along margins; humeri impunctate; subtriangular areas finely alveolate; regions extending from posterior margins of subtriangular areas to apices finely rugose with sparse, inconspicuous punctures. Pubescence moderately sparse, becoming very sparse around humeral angles and sides anteriorly, and consisting of moderately long, recumbent hairs with a few longer, suberect hairs intermixed; subtriangular areas and yellowish spots glabrous.

Prosternum. Anterior margin narrowly, feebly emarginate at middle; prosternal process between coxae about ⅓ as broad as width of coxal cavity. Surface along anterior margin shining, with transverse rugae and a few fine punctures; remaining portion subopaque, shagreened, very finely, very sparsely punctate; process sulcate between raised margins of coxal cavities. Pubescence consisting of a few scattered hairs.

Mesosternum. Surface shining, very sparsely and very finely punctate; very sparsely clothed with a few short hairs, except outer portion of mesepisternum which is moderately densely clothed.

Metasternum. Surface shining, very sparsely and very finely punctate; very sparsely clothed with a few short and long hairs, becoming moderately densely clothed about posterolateral angles.

Legs. Anterior legs with femora longer than tibiae; ventral femoral tooth small, acute, feebly compressed basally; tibiae moderately sinuate. Intermediate legs with femora and tibiae subequal in length; femoral ventral tooth acute, broad at base, strongly compressed; tibiae feebly sinuate. Posterior legs (Fig. 3) with femoral ventral tooth acute, obliquely directed backward, compressed, smaller and narrower than same on mesofemora; femora barely reaching 5th abdominal sternite in female; tibiae slender, feebly arcuate, feebly compressed apically, subequal in length to femora. Surface on all legs moderately strongly shining, finely wrinkled in part, very finely and sparsely punctate. Pubescence on femora and tibiae consisting of sparse, short, fine, recumbent hairs with longer, coarser, suberect hairs intermixed.

Abdomen. Surface shining, very sparsely, very finely punctate and clothed with a few short and long hairs; 5th sternite broadly, evenly rounded at apex.

Type-data. Holotype female: DOMINICAN REPUBLIC: La Vega, 20 km. SE. Constanza, May 26, 1978, C. W. & L. B. O'Brien & Marshall. Deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Etymology: dominicana, in reference to its known distribution.

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NEW COMBINATIONS, SYNONYMY AND DISTRIBUTION RECORDS FOR NEOTROPICAL PENTODONTINI AND ORYCTINI (COLEOPTERA: SCARABAEIDAE: DYNASTINAE)

Brett C. Ratcliffe[1] and Roger-Paul Dechambre[2]

Abstract

The following changes and new distribution records are made: PENTODONTINI: *Endroedianibe* Chalumeau is placed in junior synonymy with *Indieraligus* Dechambre; *Ligyrus gyas* (Er.) is listed for Costa Rica and Panama; *Ligyrus maimon* (Er.) is recorded from Chile for the first time; *Bothynus horridus* Endrödi is recorded as new to the Brazilian states of Pará and Rondônia; *Hylobothynus arnaudi* Dechambre is recorded as new from Surinam. ORYCTINI: *Strategus waldenfelsi* Endrödi is transferred to *Gibboryctes* Endrödi; *Gibboryctes porioni* Dechambre is placed in junior synonymy with *G. waldenfelsi; G. waldenfelsi* is recorded for the first time from Panama, Brazil, and Peru; *Strategus gracilis* Endrödi and *Strategus thomasi* Endrödi are placed in junior synonymy with *Strategus talpa* (Fabr.); *Heterogomphus niger* Endrödi is placed in junior synonymy with *Oryctes tarandus* (Oliv.); *Heterogomphus bicuspis* Endrödi is listed as new to Colombia; *Heterogomphus arrowi* Prell is listed as new to Bolivia and distinguished from *H. dilaticollis* Burm.

During the past several years a number of new taxa of Dynastinae have been described which we feel are synonymical with existing taxa. We have also accumulated a small number of new distributional records in the Pentodontini and Oryctini. In this paper we clarify some of these taxonomic "loose ends" by proposing several new synonyms and two new combinations. Dechambre examined the type of *Heterogomphus niger* Endrödi, and Ratcliffe examined the types of the three Endrödi species of *Strategus* and *Endroedianibe bozzolai* Chalumeau. We also list the new distributional records we have found.

Pentodontini

Indieraligus bozzolai (Chalumeau), **new combination**

Endroedianibe bozzolai Chalumeau (1981), **new generic synonymy.**

Chalumeau (1981) described *Endroedianibe* based on a male from the Dominican Republic and a female from Haiti. He distinguished *Endroedianibe* from *Neobothynus, Hiekeianus,* and *Hispanioryctes.* He further indicated (personal communication to Ratcliffe, 1982) that he had been unable to see types of Dechambre's monotypic *Indieraligus* (from Puerto Rico) before returning page proofs of *Endroedianibe* but was of the opinion that the two genera were distinct based on their respective descriptions. We believe, based upon examination of the allotype of *Endroedianibe bozzolai* and type material of *In-*

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dieraligus, that the two taxa are congeneric. The differences between *Endroedianibe bozzolai* and *Indieraligus michelii* at the generic level (degree of sculpturing of head and pronotum, length of pygidial setae, form of parameres) are not as substantial as the similarities between them (color, size; form of clypeus, mandibles, and front; form of pronotum, elytra, and apex of posterior tibiae; and especially presence of long, dense setae on posterior tibiae). In view of these important shared characters, we place *Endroedianibe* into junior synonymy with *Indieraligus.*

Ligyrus gyas (Er.)

This species is known from Mexico to Argentina (Endrödi 1969). Heretofore there has been no published record of this species actually occurring in Costa Rica and Panama; these are here provided: COSTA RICA: Prov. Heredia, Pto. Viejo Sarapiqui, Finca La Selva, 1980, J. H. Beach (1 male). PANAMA: Canal Zone, Madden Dam, VI-25-1976, at light, E. G. Riley, (1 male, 3 females).

Ligyrus maimon (Er).

Ligyrus maimon is known from Colombia, Ecuador, Peru, and Brazil. The following is a new country record: CHILE: Arica, X-11-1952, L. Peña (5 males, 4 females).

Bothynus horridus Endrödi

This species was described from SE Brazil, Paraguay, and Argentina. The following represent new state records for BRAZIL: Pará: Belem, X-9-1960 and III-1959, J. Hidasi (2 males). Rondônia: Vilhena, II-20-1961, J. & S. Bechyne (1 male).

Hylobothynus arnaudi Dechambre

This species was described from French Guiana. The following is a new country record: SURINAM: Nassau-gebergte, 22-VII-1972, G. F. Mees (1 female).

ORYCTINI

Gibboryctes waldenfelsi (Endrödi), **new combination**

Strategus waldenfelsi Endrödi (1977).
Gibboryctes porioni Dechambre (1981), **new synonymy.**

Endrödi (1974) established the genus *Gibboryctes* to accommodate a distinctive species (*G. szelenyii* Endrödi, female) from Paraguay. The genus was unique in having the following combination of characters: anterior tibia with four lateral teeth, head very short and widely triangular with acuminate clypeus, and mandibles conspicuously projecting laterally from near the apex of the clypeus. Endrödi (1978) described a second *Gibboryctes* (*acuminatus*) based on two females from Argentina and Bolivia.

Dechambre (1981) added a third highly distinctive species (*porioni*) to the genus based on males and females from French Guiana and Guyana. Although he expressed some concern in placing the new species in *Gibboryctes,* the specimens fit in all the essential features characterizing the genus. Ratcliffe

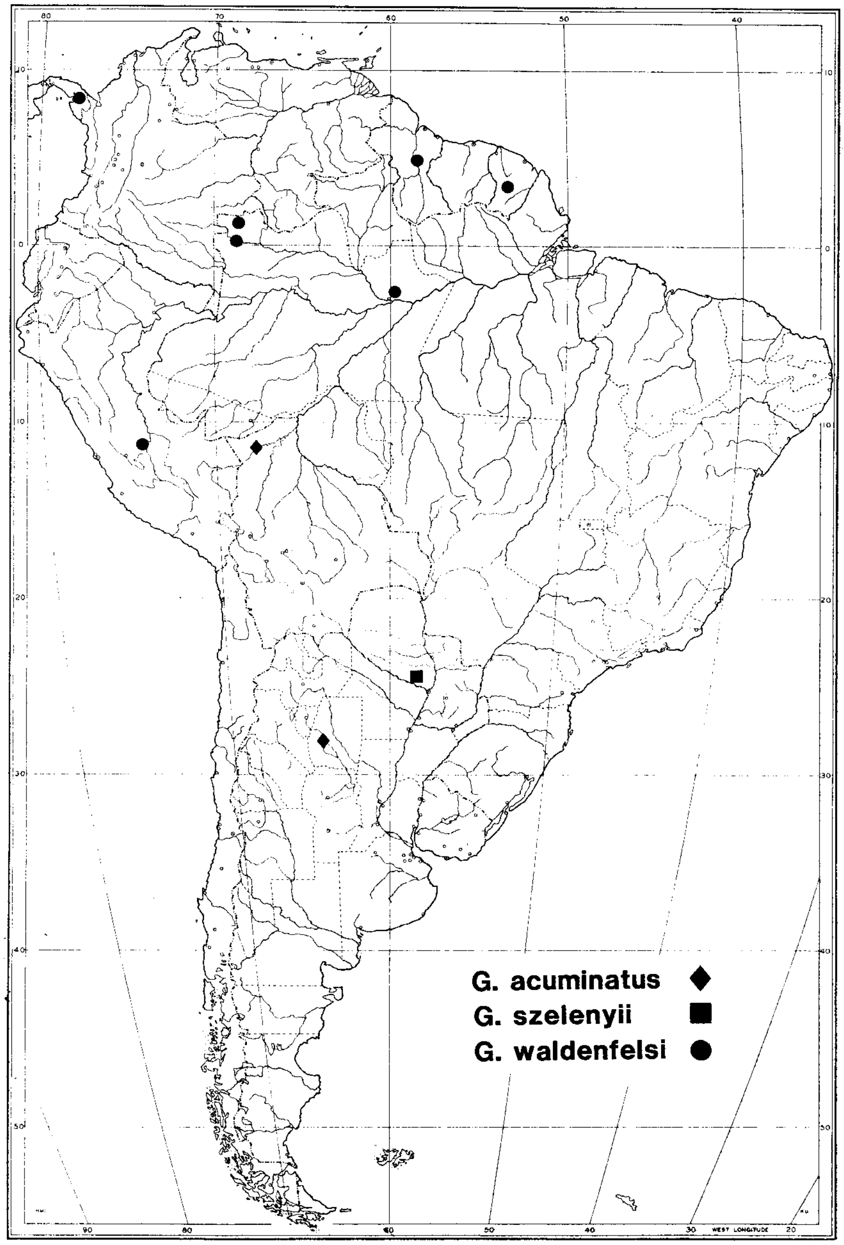

Fig. 1. Distribution map for the genus *Gibboryctes*.

independently reached the same conclusion with conspecific specimens in his possession and was, in fact, on the verge of describing them when Dechambre's paper was published.

Examination of the holotype of *S. waldenfelsi* demonstrated to us that it was not a *Strategus* but a *Gibboryctes*; it was also identical with *G. porioni* Dechambre. Endrödi, unfortunately, did not illustrate his *S. waldenfelsi* except for the parameres. Had he done so, the creation of a new synonym would not have occurred because *waldenfelsi/porioni* stands out as being very different from *Strategus* in spite of its pronotal armature. Consequently, Endrödi's *waldenfelsi* is transferred to the genus *Gibboryctes* and has priority over Dechambre's *porioni.*

In addition, the following new country records are provided for *Gibboryctes waldenfelsi*: PANAMA: Darién, house of R. Hinds, VII-1-1979, R. Hinds (1 male). PERU: Jauja Dist. [Junin Prov.], Satipo, II-1945 (1 male). BRAZIL: Amazonas, Reserva Ducke, 26 km NE Manaus, II-28-1977, B. C. Ratcliffe, (1 female); Amazonas, Taracuá, Rio Uaupés, 0°15'N, 68°34'W, 1967 (1 male); Amazonas, Mauá, V-10-1963 (1 male).

Figure 1 shows the distribution for the genus *Gibboryctes.*

Oryctes tarandus (Oliv.)

Heterogomphus niger Endrödi 1976, **new synonym.**

Endrödi (1976) described *H. niger* based on a male and a female specimen. The female was lacking data and the label on the male specimen ("*sp. Am. bor.*") indicated that it might be from South America. Study of the type specimen revealed that it is the typical form of *Oryctes tarandus* (Oliv.) which occurs on the island of Mauritius off the east coast of Madagascar. We believe this illustrates once again the danger of identifying or describing new taxa with undue emphasis on presumed locality as opposed to actual morphology of the specimens at hand.

Heterogomphus bicuspis Endrödi

The unique male holotype is known from Bolivia. The following represents a new country record: COLOMBIA: Cali, 1,000 m, V-1975, L. Denhez (5 males, 1 female).

Heterogomphus arrowi Prell

The unique male type was recorded from Peru. The following are new records: BOLIVIA: Santa Rita, Prov. Ibañez, Dept. Santa Cruz, 500 m, X-1969, F. Steinbach (1 male); Cristal Mayu, XI-1970, H. Dott (1 male); Coroico, 1700 m, XII-1981, G. Lachaume (1 female).

The distinctive characters separating *H. arrowi* Prell and *H. dilaticollis* Burmeister (regarded as questionable by Endrödi (1976) at the specific level considering the unique type specimen) are, in fact, substantial enough to consider these two species as valid. In *H. arrowi*, the body shape is more slender, the sides of the pronotum are shagreened (instead of wrinkled), the eye canthi are broad, nearly quadrangular (slender and obliquely acute in *H. dilaticollis*), and the parameres are less slender, more sinuate, and with the apex more rounded.

Strategus talpa (Fabr.)

Strategus gracilis Endrödi, 1976, **new synonym.**
Strategus thomasi Endrödi, 1976, **new synonym.**

Endrödi (1976) described *S. gracilis* based on a male from Mexico and a female from St. Croix in the Virgin Islands. Based on Ratcliffe's (1976) revision and zoogeographical analysis of the genus, Ratcliffe (1982) suggested that Endrödi's description of a new *Strategus* based on a male and female from such disparate localities was improbable. He further indicated that the female allotype from St. Croix was probably *S. talpa* (Fabr.) which occurs there.

Endrödi did not differentiate *S. talpa* from similar species in his description, and his separation of *S. gracilis* and *S. talpa* (in the key only) was based largely on geography and not morphology. The hand-written label "*Mexico*" of the holotype is undoubtedly erroneous (at least insofar as this specimen did not come from an established population in Mexico).

From examination of the holotype of *S. gracilis* Endrödi, we conclude that it is conspecific with *S. talpa* (Fabr.).

Endrödi (1976) described *S. thomasi* based on a male from St. Thomas in the Virgin Islands and a female (see below) from Haiti. In the key and in the description Endrödi stated that *S. thomasi* was very similar to *S. talpa* (which also occurs on St. Thomas). These two species key out in the same couplet in Endrödi's key, and a brief footnote attempts to separate them from one another by differences in pronotal punctation and form of the parameres. In *Strategus,* the punctures of the pronotum are variable both in size and density within a single species, and this is usually a function of overall body size. Parameres are not generally so variable in dynastines. It was found, however, that the illustration of the parameres of *S. thomasi* (Endrödi 1976) does not fully agree with those in the holotype: the illustration shows a distinct subapical tooth whereas this is not present in the holotype. The parameres, in fact, are the same as those in *S. talpa.* Moreover, we find that the holotype agrees in all respects with the expression of characters seen in *S. talpa.* The holotype of *S. thomasi* is conspecific with *S. talpa.*

Strategus talpa does not occur in Haiti or anywhere on the island of Hispaniola. We believe the female allotype of *S. thomasi* is probably *S. aenobarbus* (Fabr.), which does occur in Haiti. It remains difficult to associate males and females from separate localities together into a single taxon given the current knowledge of our taxonomy, i.e., females in some groups lack distinctive or unique characters. The females of *S. talpa* (Fabr.), *S. aenobarbus* (Fabr.), and *S. ajax* (Oliv.) constitute just such a group which cannot be reliably separated.

ACKNOWLEDGMENTS

We thank Sëbo Endrödi and Z. Kaszab (both Termeszettudomanyi Muzeum Allattara, Budapest) and Fortuné Chalumeau (Institut de Recherches Entomologiques de la Caraïbe, Guadeloupe) for loans of the type material discussed in this paper.

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SCIENTIFIC NOTE

DYBASINA, A NEW NAME FOR *TERMITOPTERYX* DYBAS (COLEOPTERA: PTILIIDAE)

The genus *Termitopteryx* was erected by Dybas (1955) for *T. productus*, a new species of termitophilous feather-wing beetle from Ilha Grande, Estado do Rio, Brazil. This generic name, however, is a junior homonym; it was previously used by Verhoeff (1940) for a genus of myriapod. Therefore, in recognition of the valuable contributions the late Henry S. Dybas made to the study of the Ptiliidae, and with appreciation for the courtesies he extended to me during my visits to the Field Museum of Natural History, Chicago, I propose to replace *Termitopteryx* Dybas with *Dybasina* Lundgren, **new name.** The only described species becomes *Dybasina producta* (Dybas), **new combination.**

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The Coleopterists Bulletin, 37(3):273–282. 1983.

THE GENUS *PACHYONYX* SCHÖNHERR (COLEOPTERA: CURCULIONIDAE: CRYPTORHYNCHINAE) IN SOUTH AFRICA: GALL-INCITING WEEVILS ON WILD LEGUMES

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ABSTRACT

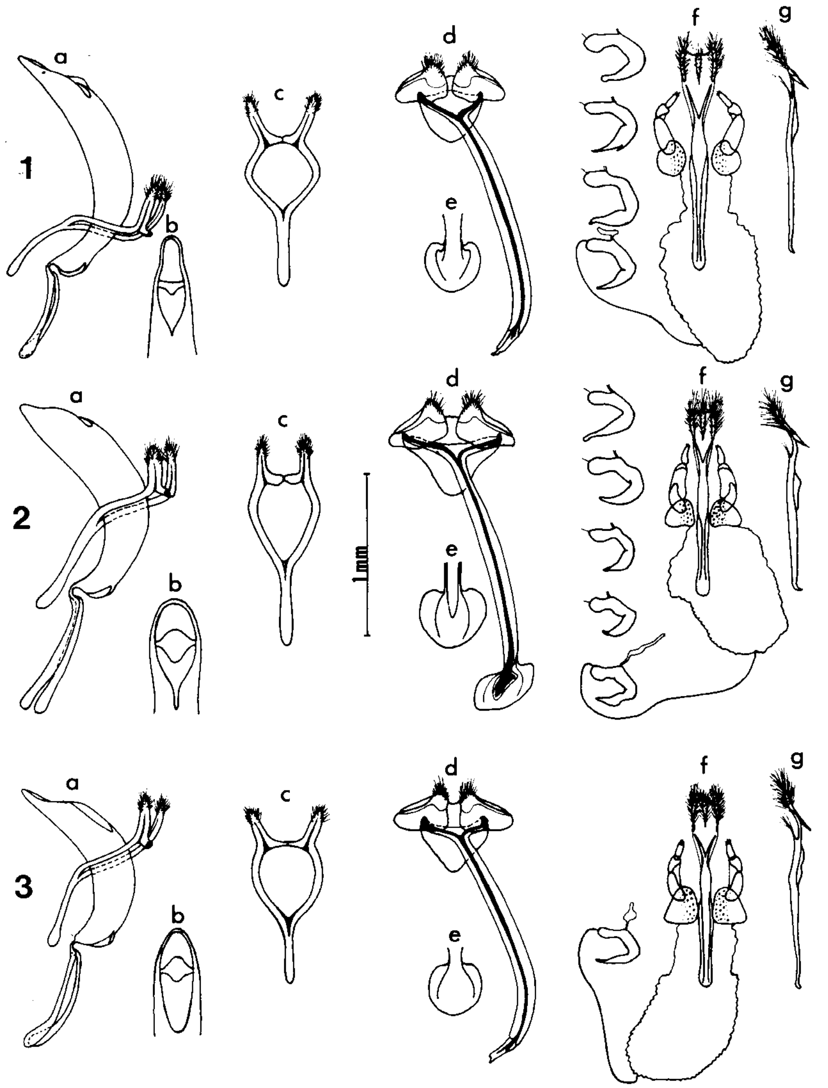
Three species of *Pachyonyx* have been recorded from South Africa. All are gall-incitants on wild legumes. A short diagnosis, with illustrations of genitalia of each species, is given. An account of the biology of *P. niveus* Marshall, bred from *Acacia*, is given and the larva, pupa and adult are illustrated.

The genus *Pachyonyx* was proposed by Schönherr (1837) for *affaber* Boheman, described from the Cape of Good Hope. Hustache (1936a) listed 17 species, and subsequently new species have been described by Hustache (1936b; 1937), Paulian (1942), Bose (1946) and Hoffman (1962). Paulian (1942) also provided a key to the African species. The genus currently includes 23 species distributed in the Afrotropical and Oriental regions; seven occur in the Orient, 15 in Africa and one on Madagascar. Three species, *P. affaber*, *P. niveus* Marshall and *P. triangularis* Marshall have been recorded from South Africa. *Pachyonyx obscurus* Paulian, described from a single specimen collected in Mozambique, may also extend southwards into South Africa.

Very little information other than the original descriptions and the key to the African species is available on members of the genus. The only published report on the biology of any of the species is that by Heller (1907) in which he described the larva and life-cycle of the Indian species *P. quadridens* Chevrolat, and in which he recorded the host plant on which the larvae feed. According to this report, *P. quadridens* incites galls in the fleshy petioles of the "flame-of-the-forest" (*Butea frondosa*: Leguminosae). An unpublished record of a *Pachyonyx* species (nr *tibestiensis* Hoffman), reared from *Acacia nilotica* stem galls in Nigeria, has recently come to light (R. T. Thompson, *in litt.*).

Genus *Pachyonyx* Schönherr, 1837

Diagnosis: In South Africa the genus is characterized by two dorsal, longitudinal ridges running subparallel to the midline from the anterior margin halfway down the pronotum. Each ridge bears two adjacent tufts of long erect



Figs. 1–3. External genitalia of South African *Pachyonyx* species: Fig. 1: *P. affaber* Boheman; Fig. 2: *P. niveus* Marshall; Fig. 3: *P. triangularis* Marshall (a—aedeagus, lateral view; b—apex of median lobe, dorsal view; c—tegmen, anterior view; d—sternites VIII and IX of male, ventral view; e—apex of apodeme of sternite IX of male; f—ovipositor, ventral view, with variation of spermathecae; g—sternite VIII of female, lateral view).

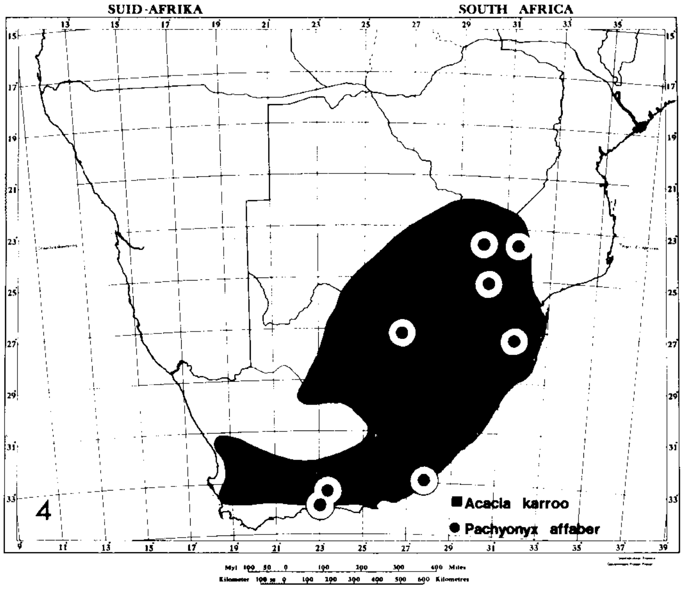


Fig. 4. Distribution of *Pachyonyx affaber* and its host, *Acacia karroo* (in black), in South Africa.

setae. The groove into which the rostrum is retracted, lies entirely in the prosternum and does not reach the mesocoxae. It stretches past the procoxae and is posteriorly closed off by a pouch-like extension of the prosternum.

Hustache (1924:429–430) provided a detailed description of the genus.

Pachyonyx affaber Boheman, 1837:248

Diagnosis: This species (6.5–8.8 mm long), described originally from the Cape, is widely distributed in South Africa (see Fig. 4). It is characterized by conspicuous fascicules of setae and deep foveae on the elytra. The posterior half of the elytral disc is generally covered with short, flat, pale setae, while the anterior half is sparsely pubescent to glabrous. The elytral pubescence may vary markedly. In some individuals the whole elytral surface is covered and the tufts are prominent and erect, in others the pubescence is sparse and the tufts small and short. The latter condition probably occurs in rubbed specimens, but specimens were examined where this appears to be the natural condition. Some specimens are also covered with fine silvery setae. Variation does not, however, appear to be linked to geographical distribution.

Pachyonyx niveus Marshall, 1906:951

Diagnosis: This species (7.8–8.8 mm long), was described from specimens collected in the Orange Free State (S.A.) and southwestern Zimbabwe. It has since been recorded in other parts of South Africa and Namibia (see Fig. 6). It is characterized by dense scaling of flat, silky-white setae and tufts of short, broad setae on the elytra. The arrangement of the tufts is in the same pattern

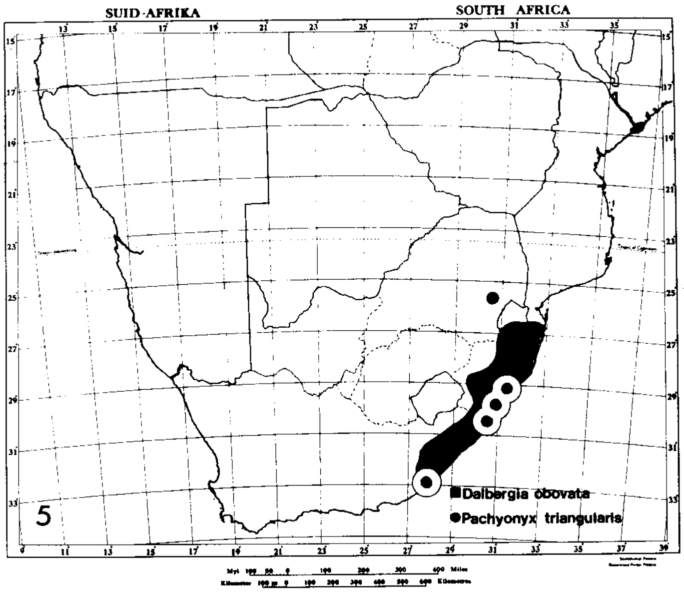


Fig. 5. Distribution of *Pachyonyx triangularis* and its host, *Dalbergia obovata* (in black), in South Africa.

as in *P. affaber*. The pubescence and colouration differ only slightly between the specimens throughout the distribution range.

Pachyonyx triangularis Marshall, 1906:952

Diagnosis: This, the smallest of the South African species (5.8–6.5 mm long), was described from Natal and seems to be confined to the low-lying, subtropical area along the east coast of the subcontinent (see Fig. 5). It can be distinguished from the other two species by the absence of tubercles and fascicules on the elytra as well as by the characteristic triangular patches of pubescence around the scutellum and sides of the elytra. It also has a more sloping and attenuated body form. Old specimens have usually lost the characteristic pubescence.

THE EXTERNAL GENITALIA

The external genitalia of the males and females of each species were studied. The general structure of the genitalia of each of the sexes was found to be rather similar in all species. Only certain characters were found to differ sufficiently between the species, and are constant enough within each species, to make them useful for distinguishing between species.

The aedeagi (Figs. 1–3a) of the three species are similar in overall shape, and the length, width and curvature of the median lobe vary as much infraspecifically as between species. The shape of the apodemes is also subject to infraspecific variation. The aedeagi of *P. affaber* and *P. niveus* are approximately the same size but that of *P. triangularis* is smaller.

The apex and ostium of the median lobe (Figs. 1–3b), however, do offer

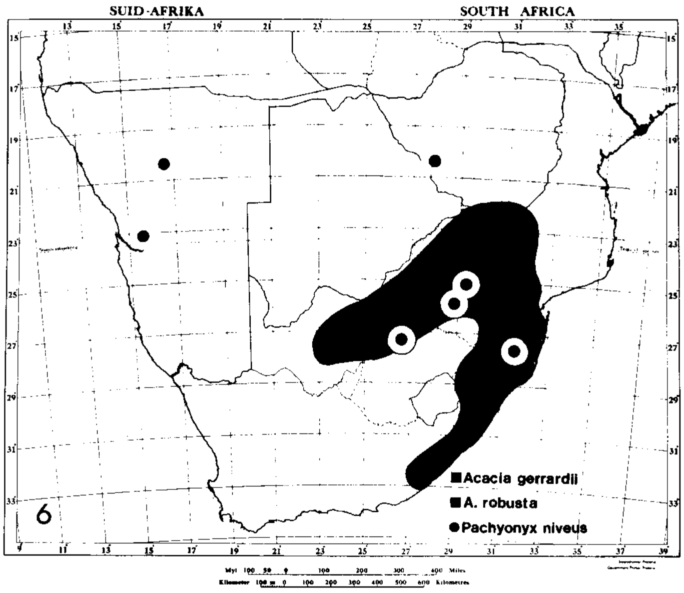


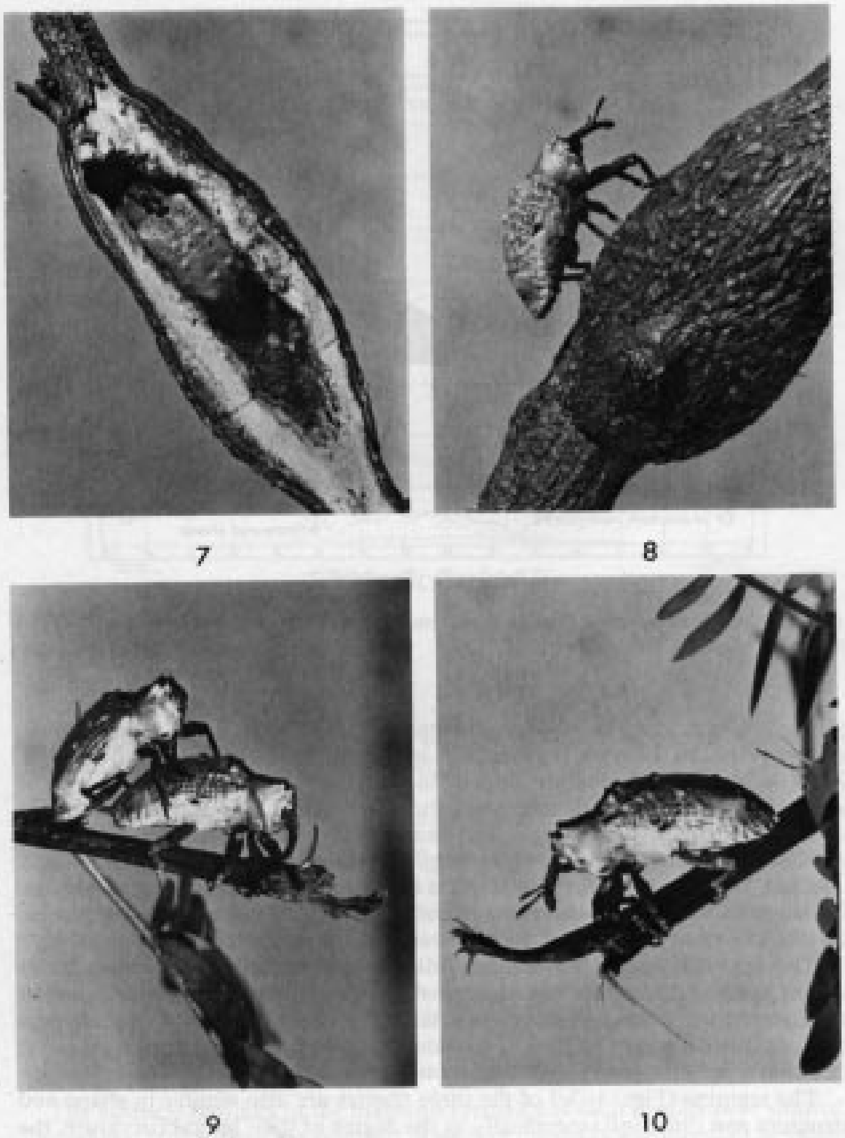
Fig. 6. Distribution of *Pachyonyx niveus* and its hosts, *Acacia robusta* and *A. gerrardii* (in black) in South Africa.

characters which can be used to distinguish between the three species. In *P. affaber* (Fig. 1b) the apex is elongated and attenuated while in *P. niveus* (Fig. 2b) it is blunt and broadly rounded. In *P. triangularis* (Fig. 3b) the apex is approximately intermediate between the other two. The distal margin of the ostium is also fairly characteristic in each species. In *P. triangularis* (Fig. 3b), it is deep but smoothly rounded, in *P. affaber* (Fig. 1b), it is shallow and faintly notched, while in *P. niveus* (Fig. 2b) it is extended into a deep, narrow incision. Infraspecific variation in these two characters is only slight, and in combination they can be used to separate the species on genitalic characters.

The internal sac of the median lobe does not possess any conspicuous sclerotized structures. There are, however, areas on its apex and sides which are covered with minute hooks. As it is difficult to evert the internal sac and because it is necessary to stain it in order to investigate these hooks properly, this character is impracticable for identification purposes.

The tegmina (Figs. 1–3c) of the three species are also similar in shape and structure and differ infraspecifically in the degree of their lateral curvature, the length and shape of the apodeme and in the position and angle of the bristled parameres.

Sternites VIII and IX of the male (Figs. 1–3d) are similar in all three species. Sternite VIII consists of two connected, hollowed hemisternites with setae at the apices. These hemisternites differ slightly in size between individuals of all species, but are not sufficiently different to distinguish between them. Sternite IX consists of a basal plate of fairly characteristic shape in each species and a longitudinal asymmetrical apodeme (spiculum gastrale) with a broadened apex curved inwards (Figs. 1–3e). The apodeme, as well as the apex and its tortion,



Figs. 7–10. Adult *Pachyonyx niveus* specimens (size *c.* 8 mm): Fig. 7: Overwintering adult with dark frass pellet in the bottom of the cavity as well as partially completed emergence hole (top left). Fig. 8: Freshly emerged adult on gall. Fig. 9: Male and female *in copula* on the host plant *Acacia robusta*. Fig. 10: Adult on twig of *Acacia robusta* with feeding damage on apical bud.

are extremely variable infraspecifically, but the form of the basal plate is, although subject to some variation, constant enough to enable the separation of the species.

The genitalia (Figs. 1–3f) and sternite VIII of the female (Figs. 1–3g) are almost identical in the three species examined and provide no characters useful to distinguish between them. The hemisternites are only partially sclerotized, the amount thereof varying individually. No bursal sclerites are discernible. The spermathecae exhibit a remarkable amount of variation in *P. affaber* and *P. niveus* (only one female of *P. triangularis* was available for study) between individuals of different localities and, in the case of *P. niveus,* even between individuals of the same population. The shape of the spermathecal gland tends to be long in *P. niveus* and flatter in *P. affaber* and *P. triangularis,* but intermediates occur within the species.

BIOLOGY

Pachyonyx affaber

Pachyonyx affaber has been reared from stem galls of *Acacia karroo* (Leguminosae) from the vicinity of East London (Cape Province). The distribution of *P. affaber* was superimposed on that of the recorded host (Fig. 4) to obtain an idea of whether there is an obligatory association between the weevil and its host, and from the information available it appears as if *P. affaber* may be restricted to its host. However, *A. karroo* is the most widespread Acacia species in South Africa and occurs in most parts of the country (Ross 1975).

Pachyonyx triangularis

This species has been reared from galls on the twigs of *Dalbergia obovata* (Leguminosae) and, with the exception of one record (Fig. 5), occurs within the distribution range of the host plant. Whether the exception reflects on the known distribution of the host plant or implies that this species is associated with several host plants, is not known.

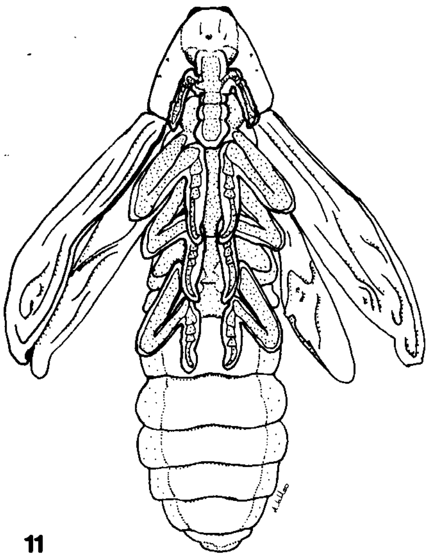
Pachyonyx niveus

Pachyonyx niveus appears to be rather catholic in its choice of food plant as specimens have been reared from galls on *Acacia robusta* and *A. gerrardii.* Furthermore, it has been collected in areas which fall outside the distribution ranges of both of the above species (Fig. 6), implying that it occurs on other hosts as well. The distribution of the *Acacia* species is based on Ross (1975).

The following report on the biology and life-cycle of *P. niveus* is based on a study of a population, the members of which were found to incite galls on young stems of *A. robusta.* The study site is situated on a farm 40 km NW of Pretoria.

Adults emerge from the monothalamous galls in spring (September–October), and mating and oviposition take place soon afterwards (Figs. 7–10). Females lay eggs singly in a prepared slit in the bark of thin stems (c. 6 mm diameter) less than 30 cm above the ground. Eggs may be laid at regular intervals of 50–75 mm on the same stem (usually the previous season's growth) resulting in a number of contiguous galls. Adults feed on the young *Acacia* buds which causes some damage, and extreme cases result in twig die-back (Fig. 10).

Gall growth, which at least doubles the thickness of the stem, is completed after approximately two months, and larvae mature two months later. Pupation



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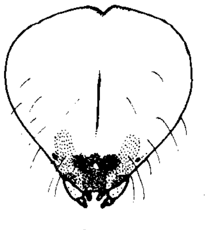

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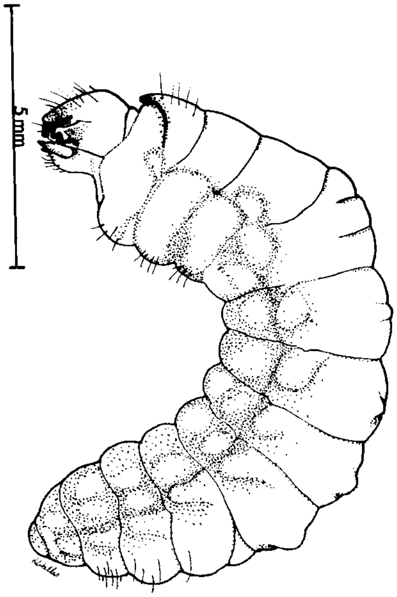

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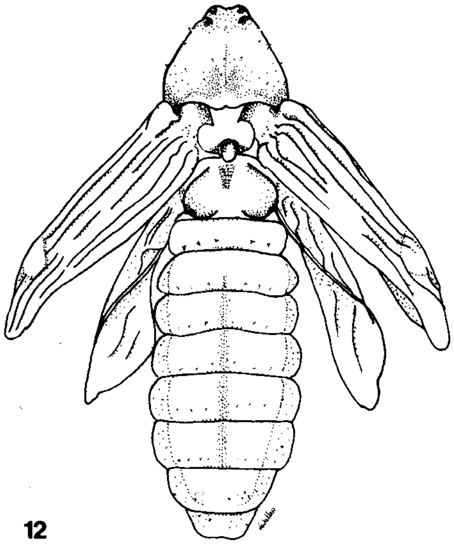

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Figs. 11–14. Immature stages of *Pachyonyx niveus*: Fig. 11: Pupa, ventral view; Fig. 12: Pupa, dorsal view; Fig. 13: Final instar larva, lateral view; Fig. 14: Head capsule of final instar larva, anterior view.

occurs in February–March, with the pupal stage (Figs. 11 & 12) lasting approximately one month. After eclosion, adults remain in the galls until the following spring, and the cycle is then repeated.

The galls are hollowed out by the larvae (Fig. 13 & 14) which leave only a thin shell (Fig. 7). Before pupation all frass and faeces are tamped into wads (Fig. 7) at the top and bottom of the gall cavity. An emergence hole is chewed to just below the bark by the final instar larva. The emerging adult completes this hole by chewing through the remaining layer of bark.

Galls were found to be particularly abundant in an area which had been burned in a veld fire a few years previously. The fire had killed all above-ground growth, and the resultant regrowth from the roots left a dense thicket of thin stems. In surrounding areas galls were sparsely distributed (although the host plant is common) and all others were on young stems low down. No retarding of overall growth as a result of gall formation was noticed, and tissue regeneration eventually fills the galls again after emergence of the adult. Although the adults are fully winged, they do not fly readily, and populations appear to be very localized.

Some specimens of *P. niveus* were found to be parasitized by an unidentified ichneumonid wasp, the adults of which emerged shortly before the first weevils. However, percentage of parasitized specimens was low.

DISCUSSION

Weevil association with galls, either as incitants or inquilines, is widespread in the family (for references see Felt 1940; Mani 1964; Gates & Burke 1972) but relatively few detailed studies have been undertaken.

A small number of other cryptorhynchine species are known to be inquilinous in, or incitant of, galls (H. R. Burke *in litt.*) but this has probably occurred independently in the various groups, whereas in *Pachyonyx* there appears to be some phylogenetic significance in the gall-inciting habit, as all species of which the biology is known, are gall-incitants on related plants.

ACKNOWLEDGMENTS

We are grateful to the following persons for assistance: Professor Horace R. Burke (Texas A&M University) for information on weevils associated with galls; Mr. R. T. Thompson (British Museum, Natural History) for confirming the identity of *P. niveus* and for providing unpublished information on the biology of a further species; and Louise Walles for illustrating the immature stages.

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BOOK REVIEW

Renaud Paulian and Jacques Baraud, 1982. Faune des Coléoptères de France, II. Lucanoidea et Scarabaeoidea. Editions Lechevalier S.A.R.L., 19, rue Augereau, 19 Paris. 16 plates, 185 figures, 477 pages. Price 525 F. Fr. Available from bookstores in Paris or from the Librairie du Museum, 36 rue Geoffroy Saint Hilaire, 75005 Paris.

This book is a major revision of Paulian's 1941 volume 38 of the Faune de France and its subsequent reprint. In the present work 275 species are keyed, briefly diagnosed, and the habits and range are given for each. All taxa are well illustrated and there are many excellent habitus drawings. A few of the illustrations appeared in the 1941 volume, but most figures are new as are the 16 plates. There is a brief section on terminology and a more detailed discussion of habits and larval characters under each of the 22 family and subfamily headings. At least one larva belonging to each of the higher taxa is illustrated. Thus, the information available in the book includes a broad and up-to-date synthesis of the information on the Lucanoidea and Scarabaeoidea of France. The book is well printed, essentially error free in the sections I have checked and represents a welcome addition to the literature available on the French fauna.

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REVISION OF *PHAEDROPUS* SCHOENHERR WITH NOTES ON THE MALE GENITALIA OF ENTIMINI (COLEOPTERA: CURCULIONIDAE: LEPTOPIINAE)

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ABSTRACT

The Neotropical genus *Phaedropus* is revised, and two new species are described: *Phaedropus inopinatus* (type-locality, Bolivia, Santa Cruz) and *Phaedropus suturellus* (type-locality, Brazil, Mato Grosso do Sul, Água Clara). Keys and illustrations of habitus and male genitalia of the five known species are provided. Study of the male genitalia of *Phaedropus* disclosed a long flagellum inside the internal sac of median lobe. A brief study carried out on the male genitalia of the other four genera included in Entimini revealed that the flagellum is a feature unique of *Phaedropus*. In the genera *Cydianerus* Schoenherr, *Entimus* Germar, *Polydius* Schoenherr, and *Rhigus* Germar, the internal sac is provided with sclerites but lacks the flagellum.

Dr. Evôneo Berti Filho, from Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, asked me to identify some weevils collected on cultivated *Eucalyptus saligna* Sm. in Mato Grosso do Sul, Brazil. Among this material was found an undescribed species of the conspicuous entimid genus *Phaedropus* Schoenherr. Up to now the genus was known from three described species: *P. candidus* (F.), *P. togatus* Boheman, and *P. albobrunneus* Bovie. The first two are very common and well represented in entomological collections; the third, so far as I am aware, is known only from the holotype. Through Dr. Donald R. Whitehead, Systematic Entomology Laboratory, U.S.D.A., % National Museum of Natural History, Washington, D.C., I had the opportunity to examine the type-specimen of *P. albobrunneus* and to study another specimen, from Santa Cruz, Bolivia, which proved to belong to a second undescribed species. In preparing this paper, I found an interesting character in the male genitalia, the presence of a flagellum in the internal sac of median lobe, never before reported for the genus *Phaedropus* or for the tribe Entimini. Thus, I thought it worthwhile to revise the genus and provide some notes on the internal sac of the male genitalia in Entimini.

The material studied belongs to the Museu de Zoologia, Universidade de São Paulo (MZSP); United States Museum of Natural History (USNM); and the Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo (ESALQ).

BIOLOGICAL DATA FOR *PHAEDROPUS*

No published information is available on the biology and host plants of *Phaedropus* species.

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The three adults of *P. suturellus*, n. sp., were collected on the leaves of *Eucalyptus saligna* Sm., in Água Clara, Mato Grosso do Sul, Brazil, by Dr. Evôneo Berti Filho. According to him (pers. comm.) the sample was collected in the core of a reforested area. The original vegetation in the region is open savanna (cerrado) but is becoming drastically altered by a progressive program of reforestation with exotic species. Dr. Evôneo had not observed direct feeding on the leaves by the weevils, but he found leaves with small damaged areas. The family Myrtaceae, to which the genus *Eucalyptus* belongs, is represented in neotropics by several genera and numerous species, some of them present in the cerrado of Água Clara (Dr. Evôneo, pers. comm.).

One could raise two hypotheses regarding the relationship between this weevil and *Eucalyptus saligna*: (1) *P. suturellus* develops in some native Myrtaceae, and secondarily could be associated with *Eucalyptus* species. (2) The species develops in a South American plant other than Myrtaceae, but the adults being polyphagous occasionally could feed on *Eucalyptus* species.

The disappearance of natural habitat may represent a selective pressure on the species to colonize new habitats. Singer & Gilbert (1978) reported the shift of a riodinid butterfly from unknown native hosts to *Eucalyptus* during the first 75 years of its planting in Brazil. According to the authors (*l.c.*:7) it may be the increasing "target size" of the new resource as much as the shrinkage of natural habitat which sets the stage for the evolution of new host preference.

Much more information is needed on life history to understand the detailed resource requirements of larvae and adults of *Phaedropus* species.

MALE GENITALIA OF ENTIMINI

The male genitalia of some Entimini were studied by Vaurie (1951). She illustrated only the apical half of the median lobe, and she gave no reference to the sclerites of the internal sac. The presence of a flagellum in the internal sac of *Phaedropus* species led me to study the aedeagus of other entimids. I examined the following species, including at least the type-species (*) of the other four genera: *Cydianerus*: **C. latruncularius* Perty 1830; *C. araneiformis* Dalman 1833. *Entimus*: **E. imperialis* (Forster 1771). *Polydius*: **P. coelestinus* Perty 1830; *P. atrox* Germar 1824. *Rhigus*: **R. tribuloides* Pallas 1781; and R. *nigrosparsus* Perty 1830.

Median lobe. The median lobes of some species were discussed and illustrated by Vaurie (1951), and my observations agree well with hers. In *Cydianerus, Entimus, Polydius* (*P. coelestinus*, Fig. 19), and *Rhigus* the median lobe is non-tubular, more or less flattened, with a membranous dorsal plate. In *Phaedropus* (Figs. 11–18) it is tubular in the basal two-thirds, circular in cross-section, without a membranous dorsal plate. Only in *Rhigus* are the chitinized borders of the anterior region of the median lobe fringed with very long setae.

Phaedropus can be divided in two groups according to the shape of the median lobe: First group, including only *candidus*, with apex flattened, spoon-like, curved upwards (Figs. 11, 12); Second group, including *togatus, inopinatus* and *suturellus*, with apex showing a striking constriction behind the deflexed portion, deflexed portion curved downwards, dorsally with a median, longitudinal, shallow sulcus (Figs. 13–18). In *Phaedropus* the median struts are shorter than the median lobe (*candidus, togatus* and *inopinatus*) or approximately as long as the median lobe (*suturellus*). The male of *albobrunneus* is not known.

Internal sac. Phaedropus has a conspicuous flagellum (Fig. 18, F). The internal sac in the other four genera lacks a flagellum but is provided with U-, V- or Y-shaped sclerites very variable in size and shape among the genera. In the two species of *Cydianerus* examined the sclerites are slightly longer than half the length of the median lobe; in *Polydius* they are about one-third the length of the median lobe; and in *Entimus* and *Rhigus* they are much shorter, about one-fifth the length of the median lobe. The sclerites in *Entimus* are hardly visible due to the dark chitin of the median lobe, and for examination it is better to cut the dorsal membranous plate and pull out the internal sac, or evert it.

Only in *Polydius* appears a structure that can be compared with the flagellum of *Phaedropus.* In *P. colelestinus* (Fig. 20) occurs a short tube (T) provided with two apertures, one apical (AA) and other subbasal (PA), placed dorsally on the posterior enlargement of the tube, and where the ejaculatory duct is connected. The tube is held anteriorly by two lateral struts (LS).

Phaedropus Schoenherr, 1826

Phaedropus Schoenherr 1826:112, 1833:647, 1840:745; Dejean 1836:274 (Cat.); Lacordaire 1863:282; Bovie 1908:3; Schenkling & Marshall 1931:58 (Cat.); Blackwelder 1947:811 (Cat.); Vaurie 1951:150 (key), 161 (key to species).

Head (rostrum included) about as long as prothorax. Rostrum slightly curved, broad, robust, quadrangular in cross section; dilated toward apex; apex emarginate, nearly as wide as head; upper margins feebly elevated; laterally depressed on each side in front of eyes; mentum bare, oval or rhomboidal, surface concave; scrobes deep, narrow, descending obliquely to a point below and in front of the eye. Eyes oval, inferiorly acuminate. Frons flat with small foveole between eyes; frons as wide as or slightly narrower than rostrum at apex. *Antennae* inserted subapically; extending about to middle of prothorax (most species) or almost reaching the base of prothorax (*inopinatus*); scape slightly shorter than funicle, widened at apex; funicle seven-segmented: second segment largest, 1.1 to 2.0 times as long as first; first and third to sixth segments subequal; seventh slightly longer and wider than sixth; club elongate-oval, 2.3 to 2.8 times longer than wide, acuminate, four-segmented, all segments pubescent and separated by distinct sutures. *Prothorax* nearly cylindrical, constricted at apex, varying from transverse to slightly longer than wide; postocular lobes rounded (most species) or acute (*candidus*), very prominent, not covering eyes, fringed with short stiff vibrissae; with discal depressions feebly or well impressed; base bisinuous, approximately one-half humeral width. *Elytra* about one and half times longer than wide, convex, strongly declivous behind; sides progressively narrowing toward apex, abruptly narrowed subapically; apices with outer apical angles forming a tooth; base bisinuous, emarginate, projected and raised over pronotum, especially near scutellum; humeri produced into an acute or obtuse tubercle; ten striae formed by well ordered and separated punctures, each puncture bearing a scale or setiform scale in the middle; punctures larger and deeper on dark spots or transversal bands; punctures sometimes obscured by closely packed scales; interstices flat or convex, sometimes elevated and costate, with a number of more or less developed tubercles and low gibbosities on disc. *Scutellum* triangular, sides curved, survace convex. *Metasternum* with a transverse bare pit placed in median posterior third, just in front of abdominal process; metasternal swelling in front of hind coxae acute and strongly produced. *Abdomen*: second sternite at middle about as long as third and fourth together. *Legs*: front coxae contiguous; middle coxae globular, separated by narrow truncate process, about one-third of coxal diameter; hind coxae transverse, separated by about one-half greatest coxal width. Femora clavate, unarmed. Tibiae mucronate, minutely crenulate on inner side; front tibiae slightly curved at apex, remainder straight; hind tibiae with closed corbel, corbel plate setulose or squamulose; articular area of hind tibiae without scales. Tarsi with first tarsomere triangular, elongate; second about as long as wide; third transverse, rounded, strongly bilobed, deeply divided to near base; fourth curved, nearly as long as second and third united. Claws falciform, simple, free and divergent at base. *Vestiture* dorsally formed by a few erect setiform scales and by flat, oval and elongate-oval, recumbent scales, closely packed and covering completely the underlying integument, or by more loosely arranged scales leaving the integument exposed; dark scales forming longitudinal or transversal bands on head, pronotum and elytra, arranged on a generally white background, resulting in well defined patterns for each species. Ventrally clothed with scales and setiform scales. On abdomen, lighter scales forming small clusters on sides of sternites I to V basally, a large spot on center of sternite I, two on center of sternites II to IV, and a small cluster on tip of sternite V; the two clusters on center of sternites II to IV may be united forming a single, larger spot. *Male genitalia* with median lobe heavily chitinized, curved, tubular for nearly two-thirds of its length; apical third open, with large dorsal orifice; apex constricted and deflexed, differently shaped in the species; borders of dorsal orifice without setae; median struts slender, varying from one-half to about the same length as median lobe; internal sac without sclerites but with a flagellum, about as long as or slightly shorter than median lobe. *Sexual dimorphism*: fifth sternite broadly rounded and with an apical depression in male, narrower and more pointed and without depression in female. Females, on average, larger than males.

Type-species: *Curculio candidus* Fabricius 1775, by monotypy.

Etymology: from the Greek *phaidros*, serene and *ops, opos*, look, appearance. Gender masculine.

Distribution. Members of this genus are distributed in South America, from French Guiana south to Brazil (State of Paraná) and west to Bolivia.

Discussion. *Phaedropus* is promptly distinguished from the other known genera of Entimini by the following diagnostic characters: metasternal swelling in front of hind coxae acute and strongly produced; tibiae minutely crenulate on the inner side; male genitalia with median lobe tubular and with a flagellum inside the internal sac.

The affinities of this genus can be established only after a revision and delimitation of the tribe Entimini.

The inclusion of two new species in the genus *Phaedropus* must bring about a change in the key presented by Vaurie (1951:150) to the genera of the Entimini. In couplet 3 the first two characters for *Phaedropus*, "antennae with second segment of funicle at least twice as long as first; antennae reaching to middle of prothorax only," do not work for *inopinatus* and *suturellus*. The antennae almost reach the base of prothorax in *inopinatus* and the second segment of funicle is only 1.1 times as long as first in *inopinatus* and 1.3 to 1.4 times in *suturellus*. On the other hand, we may add characters of the male genitalia. Couplet 3 of Vaurie's key (*l.c.*) may be modified as follows:

3. Tibiae not crenulate or dentate within; metasternal swelling in front of hind coxae rounded or obtuse; male median lobe not tubular and internal sac with sclerites but without a flagellum .... *Entimus*

3′. Tibiae minutely crenulate within; metasternal swelling in front of hind coxae acute and strongly produced; male median lobe tubular and internal sac without sclerites but with a flagellum .... *Phaedropus*

KEY TO SPECIES OF *PHAEDROPUS* SCHOENHERR 1826

1. Postocular lobes acute (Fig. 2). Pronotum with dark longitudinal stripe in middle third, the sides white (Fig. 1). Each elytron with a single, dark lateral spot, near the apical third (Fig. 2). Metatibial corbel plate with broadly oval scales. Median lobe (Figs. 11, 12). Amazonian region: French Guiana and Brazil (Amazonas, Pará, Maranhão and Amapá) .... *candidus* (Fabricius)

1′. Postocular lobes rounded (Figs. 4, 6, 8, 10). Pronotum without a dark longitudinal stripe in middle third. Elytron not as above. Metatibial corbel plate with narrow, elongate, seta-like scales 2

2(1). Pronotum with white longitudinal stripe in middle third, sides dark 3

2′. Pronotum white on disc 4

3(2). Distal tubercle of elytral interstice III arising in front of dark transverse band (Figs. 3, 4). Basal half of elytra white and yellowish white; apical half with a dark, transverse band, interrupted on suture by lighter scales. Elytral apices with a spot of golden scales. Amazonian Region: "Guyane" .... *albobrunneus* Bovie

3′. Distal tubercle of elytral interstice III arising behind dark transverse band (Figs. 5, 6). Basal half of elytra with two yellowish-brown lateral, longitudinal bands which become confluent with a transverse, continuous band near the apical third. Elytral apices white. Median lobe (Figs. 13, 14). Brazil, Atlantic Forest (Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo and Paraná) .... *togatus* Boheman

4(2′). Pronotum with both erect setae and recumbent scales. Basal two-thirds of elytra entirely white; apical third with a transverse, dark band, interrupted by two longitudinal stripes of white scales on interstices VII (Figs. 7, 8). Median lobe (Figs. 15, 16). Bolívia. .... *inopinatus* n. sp.

4′. Pronotum without erect setae, only recumbent scales present. Basal half of elytra white, except near suture with some short dark maculae bare or with black or ferrugineous scales; apical half with a transverse, continuous, dark band (Figs. 9, 10). Elytral apices with a small spot of dark scales. Median lobe (Figs. 17, 18). Brazil (Mato Grosso do Sul) .... *suturellus* n. sp.

Phaedropus candidus (Fabricius 1775)
(Figs. 1, 2, 11, 12)

Curculio candidus Fabricius 1775:146 (Holotype: Cajenna, University of Kiel, Denmark, not examined); Fabricius 1781:185, 1787:111, 1792:451, 1801:509; Olivier 1791:527; Herbst 1795:480.

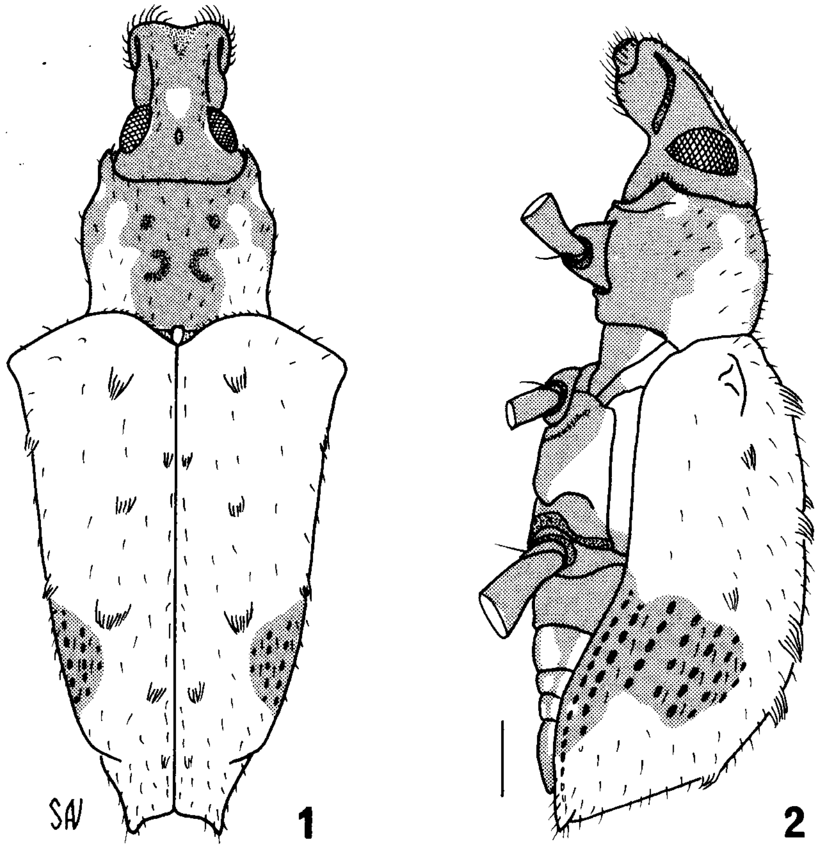
Curculio tomentiger Herbst 1795:319, pl. 85, fig. 4a, b (Holotype: Cayenne, Museum für Naturkunde, Humboldt Universität, DDR, not examined).

Curculio tomentosus Olivier 1807:343, pl. 13, fig. 155a, b (Holotype: Cayenne, not located, not examined).

Chlorima candida Dejean 1821:92 (Cat.).

Phaedropus candidus Schoenherr 1826:112; Boheman 1833:648; Dejean 1836:274 (Cat.); Lacordaire 1863:283; Bovie 1908:3; Blackwelder 1947:811 (Cat.); Vaurie 1951:161 (key); Guerin 1953:192.

Length (pronotum + elytra): 7.8–9.4 mm. *Integument* dark brown to black; some scales on head and legs with greenish or cupreous irridescence; overlapping scales on elytra white with pearly sheen. *Head* densely clothed by elongate-oval, recumbent whitish and brownish scales, longer and slender on frons; with two clusters of whitish scales almost surrounding eyes, and in some specimens two clusters in front of median foveole; with a few white or dark brown erect setiform scales sparse on dorsal surface, mainly near upper margin. *Antennae* reddish-brown; second segment of funicle 2.0 times as long as first; club slightly shorter than four preceding segments united, 2.5 times longer than



Figs. 1, 2. *Phaedropus candidus* (F.), male from Oriximiná, Pará: 1, dorsal view; 2, lateral view. (Line = 1 mm).

wide. *Prothorax* 1.2 to 1.3 times wider than long; greatest width just behind anterior constriction; sides rounded, slightly constricted at base. Postocular lobes acute. Pronotum with two lateral, longitudinal bands of rounded or oval overlapping white scales; bands narrowed anteriorly and not reaching front margin; disc of pronotum, in middle third, sparsely covered with elongate, recumbent, whitish setiform scales with cupreous or greenish iridescence, and with numerous, sparse, white or dark brown erect setiform scales; dorsal surface with a few bare, shallow depressions; base of ocular lobe with a small cluster of whitish scales; lateral sides of prothorax covered by elongate, cupreous setiform-scales, and with a few shallow depressions. *Scutellum* triangular, about as long as wide, sparsely covered with whitish setiform scales. *Elytra*: humeri acute, almost completely clothed with rounded or oval overlapping white scales, except for one irregular dark spot on each side at apical third, comprising interstices IV to X; dark spots with black or dark brown integument exposed or sparsely covered by very minute, recumbent, brownish setiform scales; some specimens showing broader scales with cupreous iridescence. Interstices I to X with white or dark brown erect setiform scales irregularly spaced, more numerous on sutural interstice. Interstices I and III raised and convex on transverse dark band. Punctures of elytral striae without conspicuous scales, but each puncture in the dark spot with a dark brown setiform scale inserted anteriorly. *Underside* covered with elongate, whitish and brown setiform scales, with cupreous or greenish iridescence, and with more or less erect setiform scales; a cluster of round, overlapping white scales on apices of mesepisterna, mesepimera, metaepisterna, and sides of metasternum. Metasternum, near median pit, with recumbent and more or less erect, whitish and brown setiform scales. *Legs* clothed with whitish and brown setiform scales and oval whitish scales with cupreous and greenish iridescence; anterior third of each femur with a small, lateral cluster of lighter scales; corbel plate of hind legs covered with broadly oval, overlapping whitish scales. *Aedeagus*: median lobe with apex flattened, spoon-like, curved upwards; median struts shorter than the median lobe length.

Material examined. BRAZIL. *Amazonas*: Manaus (1 ex., MZSP); Maués (5 exs., USNM). *Pará*: Boca do Cuminá-Miri, Oriximiná (3 exs., MZSP); Rio Trombetas, Oriximiná (1 ex., MZSP); Fazenda Taperinha, near Santarém (3 exs., MZSP); Benevides (2 exs., MZSP); Lago Uubim, Igarapé Nhamundá, Faro (1 ex., MZSP). *Maranhão*: Igarapé Gurupi-Una, Aldeia Araçu (2 exs., MZSP). *Amapá*: Serra Lombard, Limão (1 ex., USNM); Serra do Navio (6 exs., MZSP). FRENCH GUIANA. *Cayenne*: Maroni River (3 exs., USNM); St. Jean (1 ex., USNM).

Geographic distribution. P. candidus ranges in the Amazonian Region, occurring in French Guiana (Cayenne), and Brazil, in the states of Amazonas, Pará, Maranhão, and Amapá.

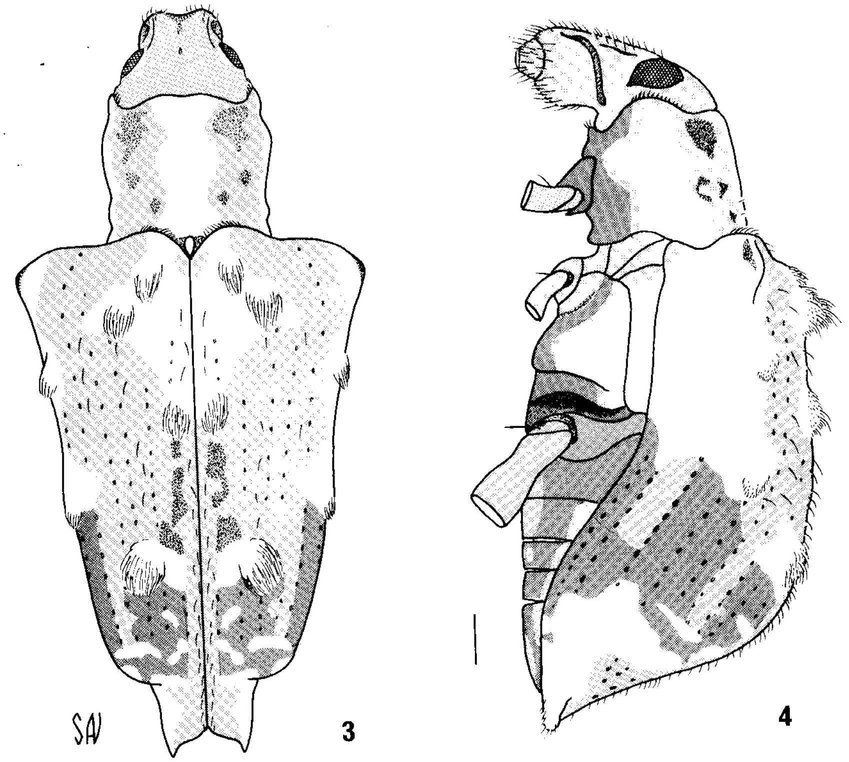
Remarks. P. candidus is the only known species of *Phaedropus* that bears a dark longitudinal stripe in middle third of pronotum, has postocular lobes acute (rounded in other members of the genus), shows the corbel plate of hind leg covered with broadly oval scales instead of setiform scales, and is clothed only with setiform, hair-like scales, in the center of metasternum near the median pit (oval scales present in all other species). The median lobe is very peculiar, with its apex flattened, spoon-like and curved upwards, neither grooved nor bent downwards as in the other species.

This species does not show important color variation except for relative predominance of the cupreous or greenish iridescence of the scales, mainly on head, pronotum, legs, and underside.

Phaedropus albobrunneus Bovie 1907
(Figs. 3, 4)

Phaedropus albobrunneus Bovie 1907:70 (Holotype female: Guyane, USNM, examined); Bovie 1908:2, figs. 4, 4a; Blackwelder, 1947:811; Vaurie 1951: 161 (key).

Length (pronotum + elytra): 12.7 mm. *Integument* black. *Head*: rostrum sparsely clothed with oval, brown scales, and with oval creamy scales scattered on frons and forming a distinct ring around eyes; a few erect, brown setiform scales scattered on dorsal surface, especially on dorso-lateral margins. *Antennae* ferrugineous; second segment of funicle 1.6 times as long as first; club about as long as four preceding segments united; 2.5 times longer than wide. *Prothorax* 1.2 times wider than long, greatest width just behind apical constriction. Postocular lobe rounded. Prothorax clothed with more or less sparse brown scales and with three longitudinal bands of very dense, overlapping white scales; on either side of white bands the brown scales showing a golden sheen. Disc of pronotum with a few lateral, shallow depressions, bare or covered by scales. *Scutellum* 1.3 times longer than wide, covered by minute, white setiform scales. *Elytra* with humeri obtuse and apical teeth blunt. Each elytron with six gibbosities, consisting of tubercles bearing tufts of erect, elongate, setiform scales: first tubercle placed on anterior third of interstice I; second tubercle on interstice II, near scutellum; third tubercle on interstice III, just behind second tubercle; fourth tubercle, the largest, on interstice III, just before elytral declivity; fifth tubercle, the smallest, on interstice VII, just behind humeral inflexion; sixth tubercle on interstice VII, just before the transverse dark band.

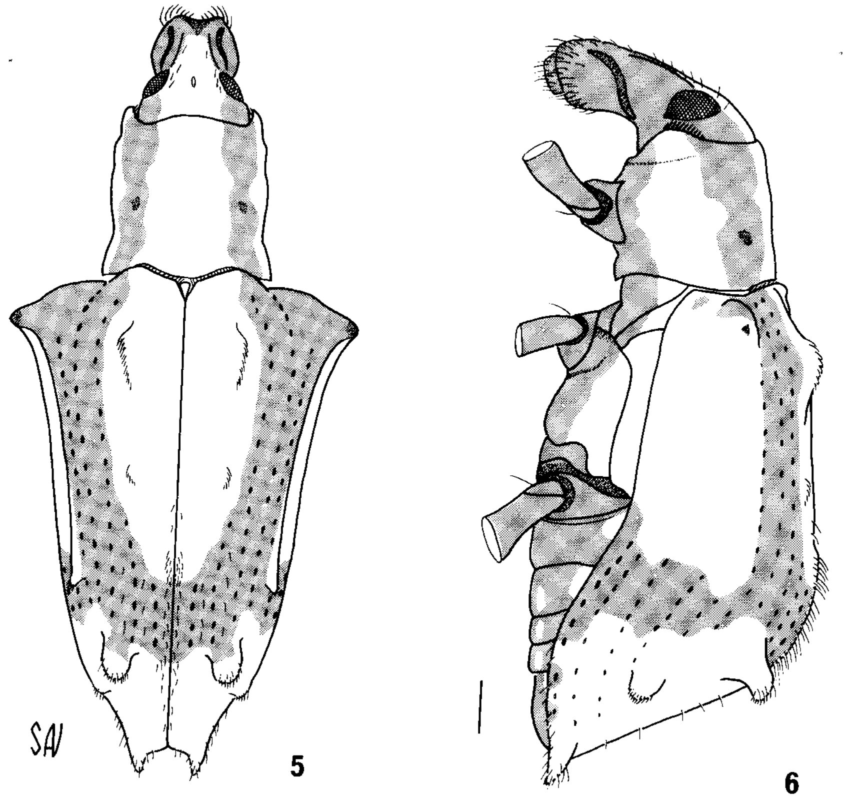


Figs 3, 4. *Phaedropus albobrunneus* Bovie, holotype female: 3, dorsal view; 4, lateral view. (Line = 1 mm).

Basal half of elytra with closely packed white scales on sides (interstices VII to X) and with creamy and a few brown scales on dorsum (interstices I to VI); apical half with an oblique, transverse band of light or dark brown scales, and with an apical, irregular spot of white scales; dark transverse band with two minute spots of white scales near suture, on interstice II; interstices V and IX with light scales with golden sheen forming short, longitudinal stripes; along suture, beteween tubercles of interstices I and posterior tubercles of interstices III, a quadrangular area with very scattered light and dark brown scales, showing the bare black integument; interstice I, behind this area, slightly raised, with light recumbent brown scales; interstice III elevated and convex on the transverse dark band. Erect, dark brown setiform scales on interstices I, III and V, especially abundant on sutural interstice. Punctures of elytral striae, on transverse dark band, with a very minute dark brown setiform scale inserted anteriorly. *Underside* clothed with dark and and light brown scales; a spot of closely packed white scales on apices of mesepimera, on metaepisterna, and sides of metasternum. Metasternum, near median pit, covered with elongate-oval, recumbent whitish scales, and more or less erect, brownish setiform scales. *Legs* with light and dark brown scales and setiform scales; lighter scales forming a small cluster near extremity of femora; corbel plate of hind tibiae covered with setiform scales. Male unknown.

Material examined. Holotype female: Guyane (USNM).

Geographic distribution. P. albobrunneus is known only from the type-locality "Guyane."



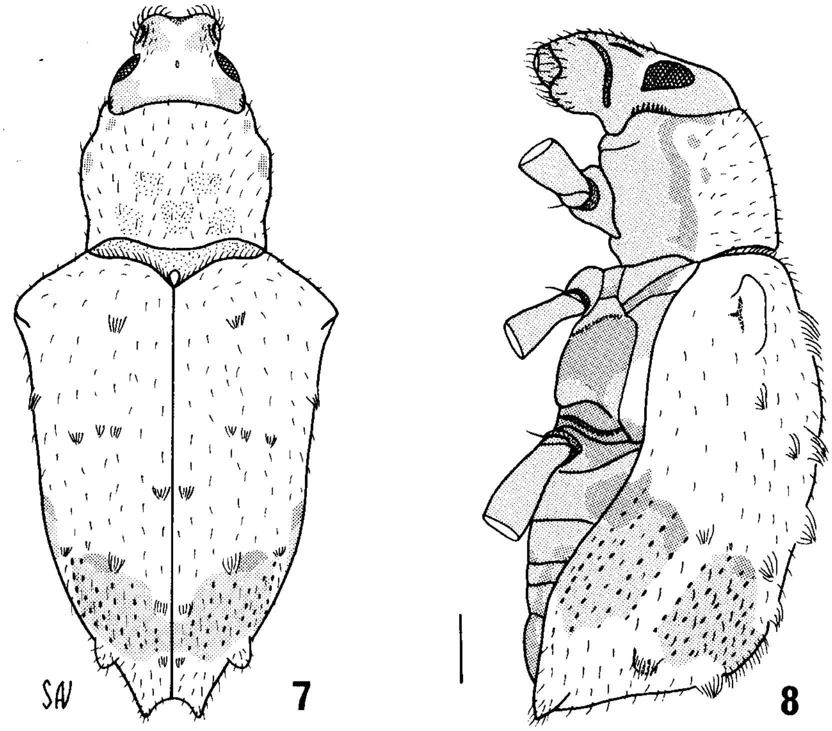
Figs. 5, 6. *Phaedropus togatus* Boheman, male from São Paulo (Ipiranga), São Paulo: 5, dorsal view; 6, lateral view. (Line = 1 mm).

Remarks. In the original description of *albobrunneus,* Bovie (1907:70) reports: "Patrie: Brésil. Un exemplar reçu autrefois du Dr. Plason." The same author (1908:3) in giving the geographic distribution of *Phaedropus* species cites "Brésil" for *albobrunneus.* However, the holotype deposited in USNM, under n° 76405, bears the label "Guyane"; the specimen also bears a hand written label "albobrunneus type" and a printed label "fig. Gen. Ins.," thus indicating this is the specimen figured in *Genera Insectorum.* One could suppose that the type-locality "Brésil" was an error that appeared in the original description and persisted in subsequent papers; *albobrunneus* might well be restricted to northern South America.

This species is easily distinguished by the color pattern as well by the six tubercles on each elytron.

Phaedropus togatus Boheman, 1833
(Figs. 5, 6, 13, 15)

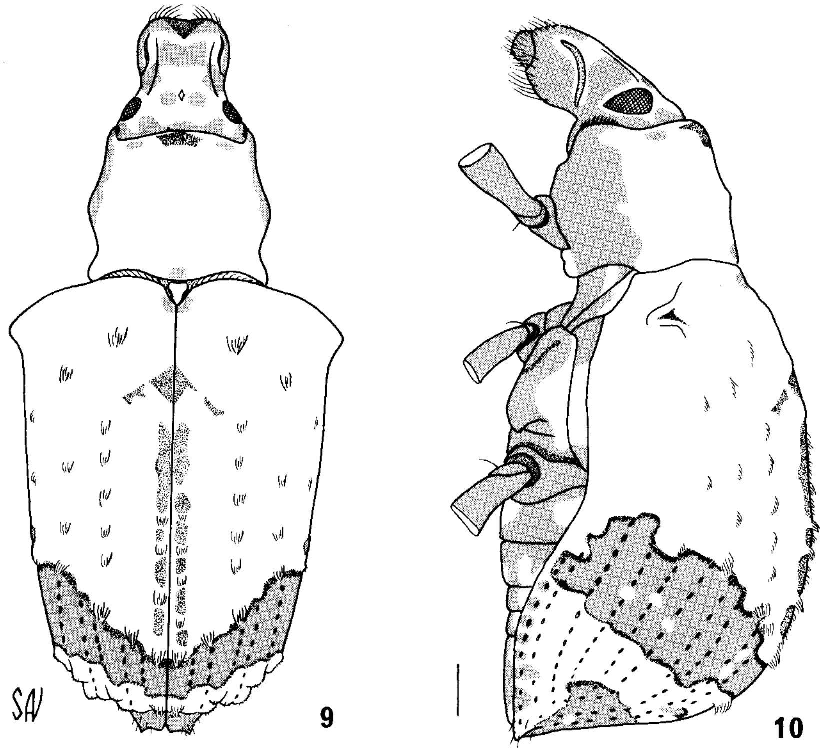
Phaedropus togatus Boheman 1833:647 (Holotype: "Brasilia," not examined); Dejean 1836:274 (Cat.); Lacordaire 1863:283; Bovie 1908:3, Fig. 5; Heyne



Figs. 7, 8. *Phaedropus inopinatus*, n. sp., holotype male: 7, dorsal view; 8, lateral view. (Line = 1 mm).

& Taschenberg 1907:227, pl. 30, Fig. 35; Blackwelder 1947:811 (Cat.); Vaurie 1951 (key); Guerin 1953:191, Fig. 282; Lima 1956:73, Fig. 54(2).
Phaedropus dorsalis Dejean 1836:274 (*nomem nudum*).

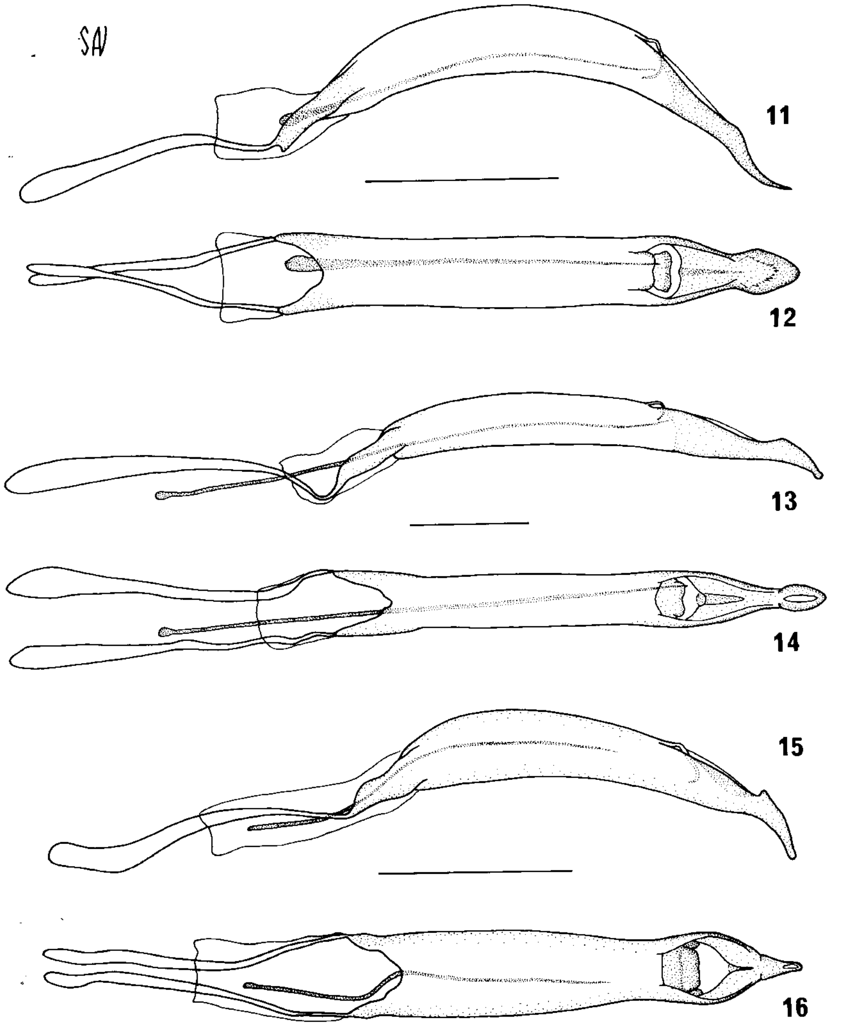
Length (pronotum + elytra): 10.6–14.6 mm. *Integument* dark brown to black; overlapping white scales with pearly sheen; yellowish-brown scales with golden iridescence. *Head*: lateral sides and dorsal anterior half of rostrum densely clothed with elongate, recumbent or inclined yellowish-brown scales; dorsal posterior half of snout and frons covered with elongate-oval, recumbent, overlapping white scales; a few erect white setiform scales scattered especially near dorsal sides. *Antennae* reddish-brown; second segment of funicle 2.0 times as long as first; club slightly shorter or as long as five preceding segments united; 2.3 to 2.6 times longer than wide. *Prothorax* about as long as wide (1.0 to 1.1 times); greatest width slightly before middle; sides sinuate, slightly constricted at base. Postocular lobes rounded. Prothorax densely clothed by yellowish-brown scales, and with three longitudinal bands of very dense, elongate-oval, overlapping white scales: one median, wider, and two lateral. Pronotum with a faint, median, longitudinal impressed line; with rounded, shallow depressions on disc, which are masked by covering scales; a few erect white scales scattered on the median white band. *Scutellum* triangular, 1.3 times longer than wide, covered by white scales similar to those of elytra. *Elytra* with humeri very produced, acute; base strongly elevated and expanded over pronotum; apical teeth very acuminate. Each elytron with three well-developed tubercles and a



Figs. 9, 10. *Phaedropus suturellus*, n. sp., paratype female: 9, dorsal view; 10, lateral view. (Line = 1 mm).

variable number of low gibbosities bearing more or less erect setiform scales: interstice I with a small gibbosity on beginning of elytral declivity; interstice III with an elongate tubercle near base, a second one very small, lacking in some specimens, and a third, the largest one, at beginning of the elytral declivity; interstice VII with a small gibbosity on posterior third and a small but conspicuous tubercle on apical region (see variation below). Elytra densely clothed with elongate-oval, overlapping white scales; basal half with two yellowish-brown, lateral bands, comprising interstices IV to VI, which become confluent with a transverse, irregular, continuous band, near apical third. Interstice I with about 10 to 25 erect, dark-brown setiform scales, arising on gibbosities, tubercles, apex, and basal half; slightly raised near beginning of elytral declivity. Each puncture of elytral striae with an elongate-oval, white or yellowish-brown scale. *Underside* clothed densely with elongate-oval, recumbent yellowish brown scales, and with scattered, erect, white and dark brown setiform scales; a cluster of overlapping white scales on apices of mesepisterna, mesepimera, metaepisterna, and sides of metasternum. Metasternum, near median pit, with elongate-oval, recumbent yellowish-brown scales, and a few scattered, yellowish-brown setiform scales. *Legs* covered by yellowish-brown scales and setiform scales; dorsally with a cluster of white scales near femoral extremity; corbel plate of hind tibiae covered with setiform scales. *Aedeagus*: dorsal aspect of deflexed apical portion elongate-oval; median struts shorter than median lobe length.

Material examined. BRAZIL. *Bahia*: Villa Nova (now Bonfim) (1 ex., MZSP). *Espírito Santo*: Porto Cachoeiro (now Santa Leopoldina) (1 ex., MZSP). *Minas Gerais*: Lambari



Figs. 11–16. Male genitalia. Median lobe of *Phaedropus* spp.: 11, 12, *P. candidus* (F.); 13, 14, *P. togatus* Boheman; 15, 16, *P. inopinatus*, n. sp., holotype; 11, 13 and 15, lateral view; 12, 14 and 16, dorsal view. (Line = 1 mm).

(1 ex., USNM); Varginha (1 ex., MZSP). *Rio de Janeiro*: Barra do Piraí (1 ex., MZSP); Nova Friburgo (2 exs., MZSP); no locality (2 exs., MZSP). *São Paulo*: São Paulo (Cantaeira) (1 ex., MZSP); São Paulo (Ipiranga) (4 exs., MZSP); São Paulo (Jabaquara) (3 exs., MZSP). *Paraná*: Curitiba (1 ex., USNM).

Geographic distribution. P. togatus occurs from southern Bahia south to Paraná and seems to be associated with the Atlantic Forest.

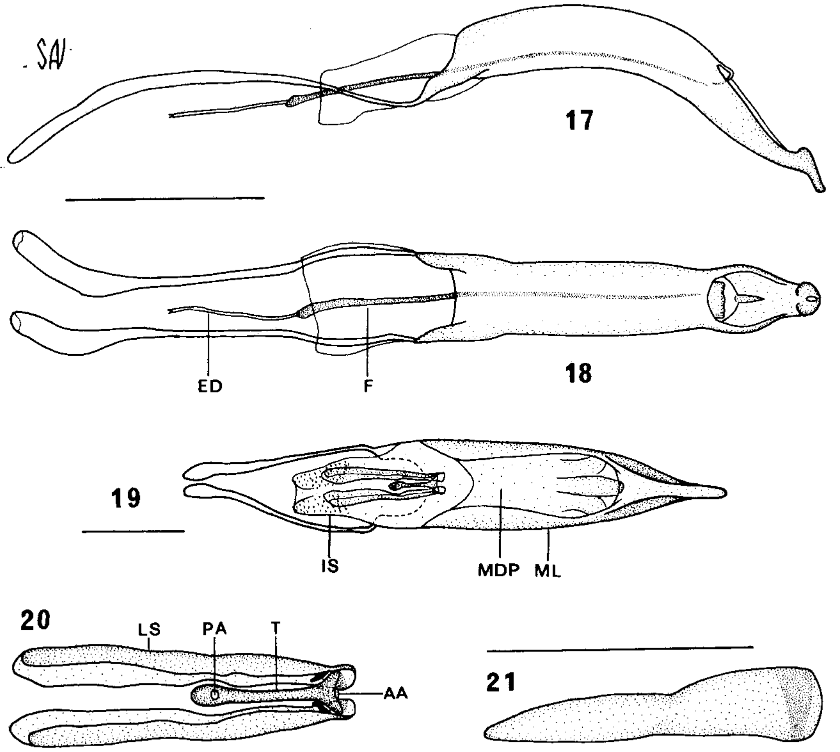
Remarks. Four specimens from State of Rio de Janeiro (two from Nova Friburgo and two without exact locality) exhibit a consistent variation on elytral tuberculation that merit mention. On interstice I, the basal half of elytral declivity is more raised and bears three or four low gibbosities with tufts of erect setiform scales; on interstice III the tubercle at beginning of elytral declivity is much less developed, being at most as large as the apical tubercle on interstice VII. As the color pattern and the aedeagus of the two forms are identical, and no other diferences were noticed, I consider these variations only as intraspecific.

The conspicuous elytral color pattern and the other characters indicated in the key are enough to promptly distinguish this from other species of the genus. The name *togatus* was given in relation to the elytral pattern, which resembles a "toga," an outer garment used by Roman citizens.

Phaedropus inopinatus Vanin, **new species**
(Figs. 7, 8, 15, 16)

Type. Holotype male: BOLIVIA, Santa Cruz, II.1956, G. Pinckert col. (USNM). No paratypes.

Length (pronotum + elytra): 8.6 mm. *Integument* dark brown; creamy, light brown and ferrugineous scales with cupreous iridescence; white scales with pearly sheen. *Head*: rostrum densely covered by recumbent, creamy and light brown scales; frons mainly with white and creamy scales and a few light brown scales; dorsal and lateral surface of head with sparse, erect, light and dark brown setiform scales. *Antennae* reddish-brown; second segment 1.1 times as long as first; club slightly shorter than four preceding segments united; 2.8 times longer than wide. *Prothorax* 1.3 times wider than long, greatest width on apical third; sides rounded. Postocular lobe rounded. Pronotum clothed densely with recumbent white scales, except on five discal depressions where scales are sparse, not imbricate; pronotum with two antero-lateral depressions on each side, with exposed integument and invaded by sparse light brown scales; erect white setiform scales very numerous on disc and on sides. *Scutellum* 1.2 times longer than wide, covered densely with elongate-oval white scales. *Elytra* with humeri obtuse and apical teeth short. Each elytron with 10 small or very small gibbosities bearing tufts of erect white setiform scales: three on interstice I (first placed near middle of interstice, second in front of dark band, third behind dark band), three on interstice III (first near base, second just behind anterior third, third, the most developed, before dark band), two on interstice V (first just behind anterior third, second behind dark band), two very small, on interstice VII (first behind humeral inflexion, second near dark band). Basal two-thirds of elytra, on dorsum and sides, with closely packed, recumbent white scales; only a few creamy or light brown scales respectively in front and below humeri, and near scutellum; apical third with an oblique, irregular transverse band of light and dark brown scales, interrupted by two longitudinal stripes of white scales on interstices VII. Interstices I to X (IX and X except at base) with erect white or dark brown setiform scales, more or less ordered, usually concolorous with background scales. Interstice I very raised between first and third gibbosities, with numerous erect setiform scales. Odd numbered interstices III to IX slightly elevated and convex on apical half. *Underside* clothed with creamy, light and dark brown scales, and a few sparse, more or less inclined whitish setiform scales; two small clusters of closely packed, white scales, on apices of mesepimera and metaepisterna. Metasternum, near median pit, covered with elongate-oval, recumbent scales and more or less inclined, white setiform scales. *Legs* clothed with oval, recumbent light and dark brown scales and with erect, whitish or light brown setiform scales; dorsum of each femur with a preapical cluster of lighter scales; corbel plate of hind tibiae covered with setiform scales. *Aedeagus*: dorsal aspect of deflexed apical portion elongate, narrowly



Figs. 17–21. Male genitalia: 17, 18, median lobe of *Phaedropus suturellus*, n. sp., holotype; 17, lateral view; 18, dorsal view. 19, 21, *Polydius coelestinus* Perty: 19, median lobe, dorsal view; 20, 21, sclerites of the internal sac; 20, dorsal view; 21, lateral view. Explanations of lettering: AA, anterior aperture; ED, ejaculatory duct; F, flagellum; IS, internal sac; LS, lateral strut; MDP, membranous dorsal plate; ML, median lobe; PA, posterior aperture; T, tube. (Line = 1 mm).

triangular-shaped, sides slightly curved inwards, apex rounded; median struts shorter than median lobe.

Etymology. from the Latin *inopinatus*, unexpected.

Geographic distribution. *P. inopinatus* is known only from the type-locality, Santa Cruz, Bolívia.

Remarks. This species resembles *candidus* in the presence of numerous, similar gibbosities on elytra, and presence of erect, sparse setiform scales on pronotum and elytra. It differs by lacking the median longitudinal dark band on pronotum, by the rounded postocular lobe (acute in *candidus*) and by the presence of two dark spots on each elytron (only one in *candidus*). *P. inopinatus* is the only species in the genus with antennae almost reaching the base of prothorax; in the other species the antennae are much shorter, reaching to middle of prothorax only.

Phaedropus suturellus Vanin, **new species**

(Figs. 9, 10, 17, 18)

Types. Holotype male: BRAZIL, *Mato Grosso do Sul*: Água Clara, 8.III.1980, E. Berti Filho col. (MZSP); 2 paratypes females, same locality and data (1 ex. MZSP; 1 ex. ESALQ).

Length (pronotum + elytra): 8.2–12.1 mm. *Integument* black; white scales with faint violet iridescence, and ferruginous scales with bronzy sheen. *Head* and rostrum covered by cluster of oval, dense, recumbent whitish and ferruginous scales, and a few elongate-oval, sparse, erect dark brown scales; eyes almost surrounded by whitish pubescence. *Antennae* reddish-brown; second segment 1.3 to 1.4 times as long as first; club slightly shorter than four preceding segments united, 2.7 times longer than wide. *Prothorax* 1.2 times wider than long; greatest width near the middle, sides rounded; strongly constricted at base. Postocular lobe rounded. Pronotum clothed densely with minute, oval, white recumbent scales, except for a small, median apical denuded area, and a small cluster of ferruginous scales in front of scutellum; sides covered by elongate, ferruginous setiform scales; erect setiform scales absent. Disc of pronotum showing irregular surface, with a variable number of shallow depressions, masked by covering scales. *Scutellum* heart-shaped, about as long as wide, covered with oval, recumbent white setiform scales. *Elytra* with humeri obtuse; apical teeth obsolete, almost concealed by apical vestiture. Each elytron without well-developed tubercles, but with undulated surface, due to numerous low gibbosities bearing tufts of erect setiform scales on interstices I, III, V and VI; the number of gibbosities varies from 3 to 10 on each interstice. Odd numbered interstices I to IX elevated and convex on apical half, especially on the transverse dark band. Basal two thirds of elytra with minute oval, recumbent white scales, except near suture, with some irregular dark maculae, bare or with ferruginous or black scales; apical third with an oblique, transverse band of ferruginous scales; anterior and posterior margins of band bordered with darker scales; apical region with a triangular spot of ferrugineous scales. Each puncture of elytral striae with a conspicuous oval, white scale. *Underside* clothed with recumbent whitish, ferruginous, and dark brown scales; a cluster of white scales on apices of mesepimera, and another one on middle of each metaepisternum and sides of metasternum. Metasternum, near median pit, covered with oval and elongate-oval, recumbent whitish and ferruginous scales. *Legs* covered by ferruginous scales and setiform scales; with two dorsal and two lateral irregular clusters of whitish scales on anterior half of each femur; corbel plate of hind legs covered with setiform scales. *Aedeagus*: dorsal aspect of deflexed apical portion transverse-ovate; median struts approximately as long as median lobe.

Etymology: suturellus, from the Latin *sutura,* seam, *ellus* diminutive suffix, referring to the aligned dark spots on elytral interstice I.

Geographic distribution. P. suturellus is only known from the type-locality, Água Clara, Mato Grosso do Sul, Brazil.

Remarks. P. suturellus is distinguished from the other species of the genus by its broader body, elytra only about 1.3 times longer than wide, color pattern, and by median lobe of aedeagus short with transverse-ovate apex. This is the only species of the genus *Phaedropus* which lacks the setiform scales in middle of metasternum, near the median pit, only oval scales being present.

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CONTENTS

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