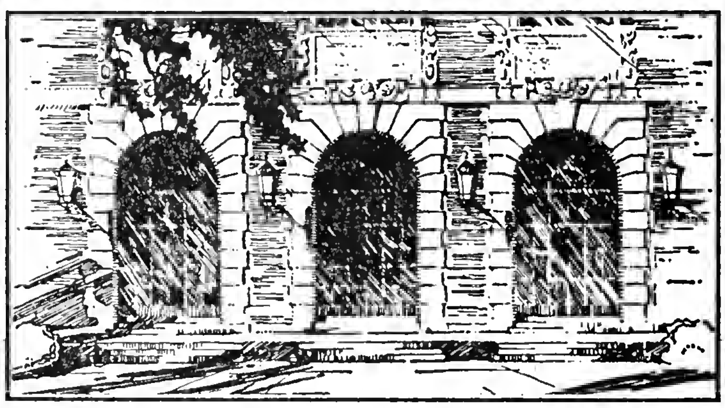

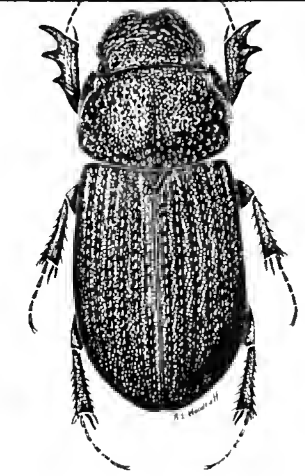

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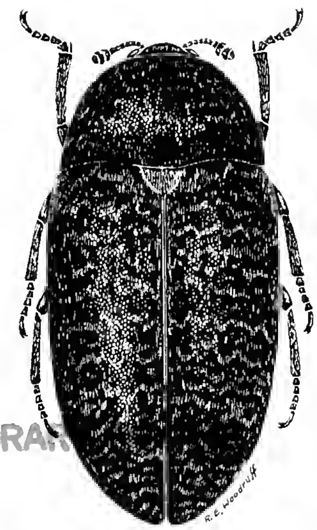


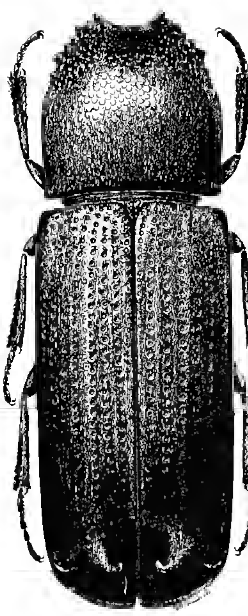
AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES

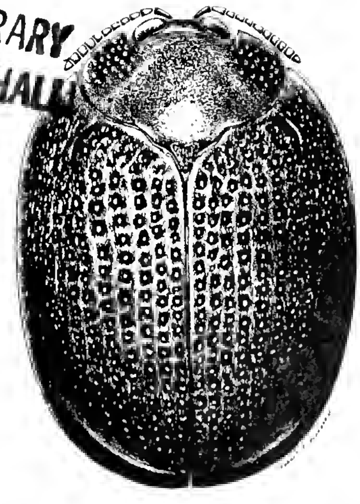
VOLUME 28, NUMBER 1 MARCH, 1974

COCCINELLIDAE: N. A. Chilocorini
by R. D. Gordon 1-6
CURCULIONIDAE: C. A. *Pandeletius (Exmenetypus)*
by A. T. Howden 7-16
CONONOTIDAE vs ANTHICIDAE: New interpretation of old observations
by M. Abdullah 17-25
PROCEDURE: Outline Drawings
by I. Moore 26
LAMPYRIDAE: Behavior of Nova Scotian Firefly, *Photuris fairchildi*
by L. Buschman 27-31
CHAULIOGNATHIDAE: Zoogeography of 2 Neotropical Siblings
by G. W. Miskimen 35-39
SCARABAEIDAE: Crab spiders preying on
by D. T. Jennings 41-43
COCCINELLIDAE: New Mexican *Cephaloscymnus*
by R. D. Gordon 45-48
BUPRESTIDAE: New *Dicerca* & notes
by Frank M. Beer 49-50
TREASURER'S REPORT 51-52
COLEOPTERISTS NEWSLETTER
Ed. by C. W. O'Brien 32-34, 39-40, 43-44, 48, 50

Edited By: Robert E. Woodruff

Mailing date for this issue: May 3, 1974





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The following exceptions are noted: 1) All geographical names are to be spelled out, 2) use words, not symbols, for male and female, 3) use numerals throughout, except to begin a sentence, 4) entomology, -ical, -ist, etc. are to be abbreviated Ent. in literature citations.

Specimen label data should be listed in the following manner: MEXICO: State of Veracruz, Fortin de las Flores, 10-VIII-70, I. B. Jones, under bark of **Pinus moctezumae,** 7000ft. [USNM] (2). The number in parentheses indicates the number of specimens. Geographical names are listed in order with largest units first, with states,

Continued inside back cover

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NOTES ON NORTH AMERICAN SPECIES OF CHILOCORINI (COLEOPTERA: COCCINELLIDAE) WITH DESCRIPTIONS OF TWO NEW SPECIES OF *EXOCHOMUS* FROM MEXICO

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Abstract

Brumus blumi Nunenmacher is transferred to *Brumoides; Exochomus mormonicus* Casey is treated as a synonym of *E. aethiops* (Bland); and *Exochomus townsendi* Casey is recorded for the first time from the United States. *Exochomus decemnotatus* and *E. minutus* are described as new.

Examination of specimens of Chilocorini in the Canadian National Collection [CNC] precipitated a further study of the black forms related to or resembling *Exochomus aethiops* (Bland). Casey (1908) described *Exochomus mormonicus* from Utah and *E. townsendi* from Chihuahua, Mexico, comparing them with the previously described *E. aethiops. E. mormonicus* was later treated as a subspecies or aberration of *aethiops* by Leng (1920) and

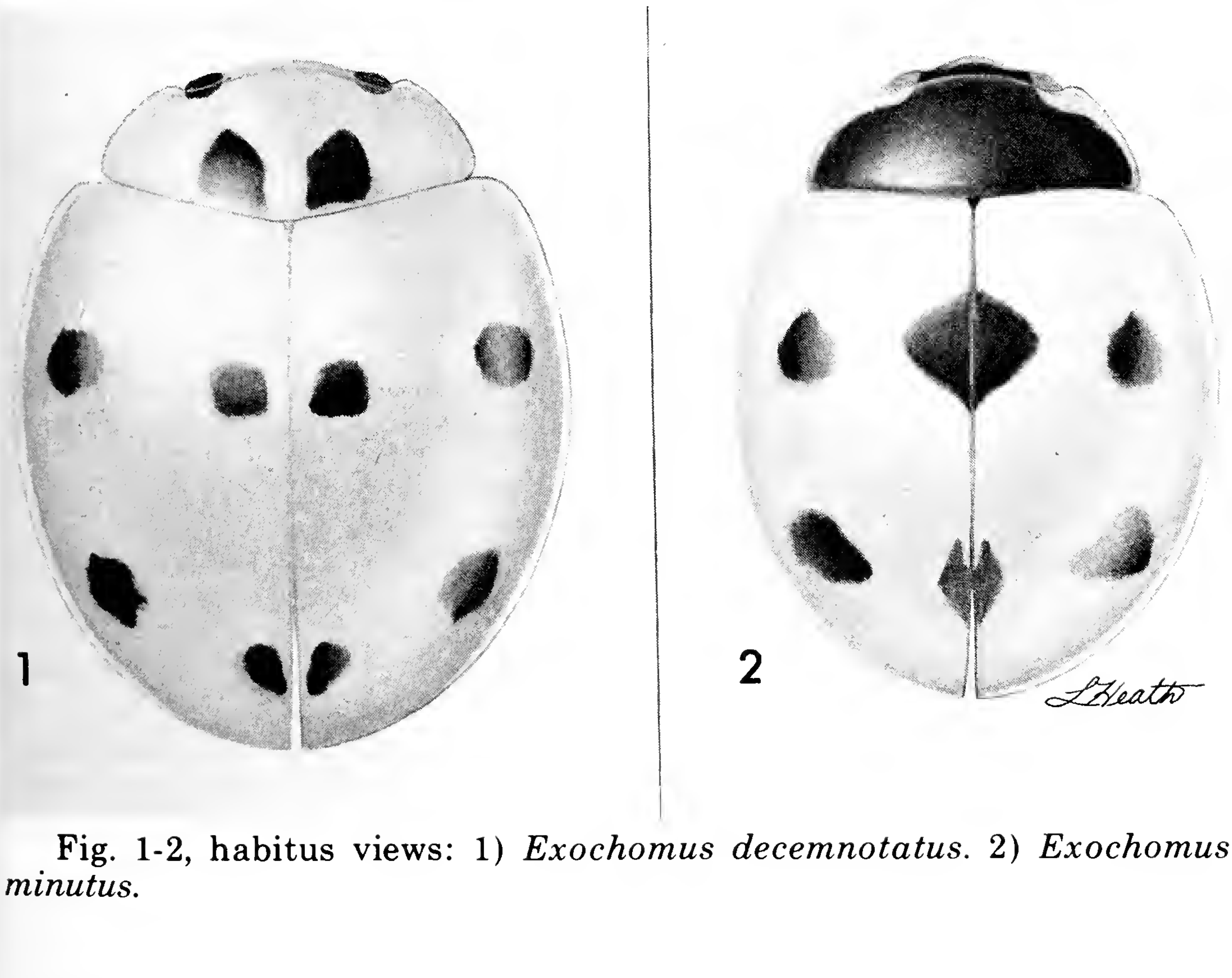

Fig. 1-2, habitus views: 1) *Exochomus decemnotatus.* 2) *Exochomus minutus.*

[1]Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

Korschefsky (1931). My examination of genitalia plus the available information on geographic distribution indicates that *mormonicus* is a junior synonym of *aethiops* and cannot be maintained even as a subspecies (see synonymy below). The Mexican *E. townsendi* has not previously been reported from the U. S., but several specimens from Colorado labeled "*aethiops*" proved to be *townsendi* (see synonymy below). Nunenmacher (1934) described *Brumus blumi* from California and compared it with *aethiops* and *mormonicus*. My dissection of a paratype of *Brumus blumi* shows it to be a member of the genus *Brumoides* Chapin (1956). Nunenmacher (1934), following Korschefsky (1934), considered *aethiops* and *mormonicus* to belong in *Brumus*, but Chapin (1965) correctly included them in *Exochomus* (see synonymy below). Two new species of *Exochomus* were among the CNC specimens and are described below.

Thanks are due Miss Linda Heath for preparing the illustrations presented herein.

Exochomus aethiops (Bland)
Fig. 3, 4, 5

Coccinella aethiops Bland, 1864:72.
Exochomus marginipennis var. *aethiops*: Crotch, 1872-1873:377.
Exochomus aethiops: Casey, 1899:109.
Exochomus (Brumus) aethiops: Leng, 1908:41; Leng, 1920:217.
Brumus aethiops: Korschefsky, 1931:265; Hatch, 1961:163.
Exochomus (Exochomus) aethiops: Chapin, 1965:249.
Exochomus mormonicus Casey, 1908:411. **NEW SYNONYM.**
Exochomus (Brumus) aethiops a. *mormonicus*: Leng, 1920:217.
Brumus aethiops ab. *mormonicus*: Korschefsky, 1931:265.
Exochomus (Exochomus) mormonicus: Chapin, 1965:249.

This species occurs from western Kansas and Nebraska to the Pacific Coast and from Wyoming, Idaho, and southeastern Oregon south to Durango and Nuevo Leon, Mexico. The solid black dorsal surface immediately distinguishes *aethiops* from all related species except *E. townsendi* and *Brumoides blumi* (see comments under those species).

There are 4 type specimens of *mormonicus* in the Casey collection [USNM], all labeled "Marysvale, Ut., Aug., Wickham", and bearing USNM type no. 35556. The first of these is here designated lectotype, the other 3 paralectotypes, labels are attached.

Exochomus townsendi Casey
Fig. 6, 7, 8

Exochomus townsendi Casey, 1908:411; Korschefsky, 1931:264; Blackwelder, 1945:451.

E. townsendi was described from 2 males from Colonia Garcia, Chihuahua, Mexico, collected by Townsend. The first of these 2 specimens in the Casey Collection [USNM], bearing the type number 35557, is here designated as lectotype and the second specimen as paralectotype, labels are attached.

No specimens other than the type series have been seen from Mexico. Eight specimens of this species from Colorado have been examined. The following localities are apparently the first recorded subsequent to the original description: COLORADO: Gunnison Co., near Gunnison; Estes Park; Garland; Buena

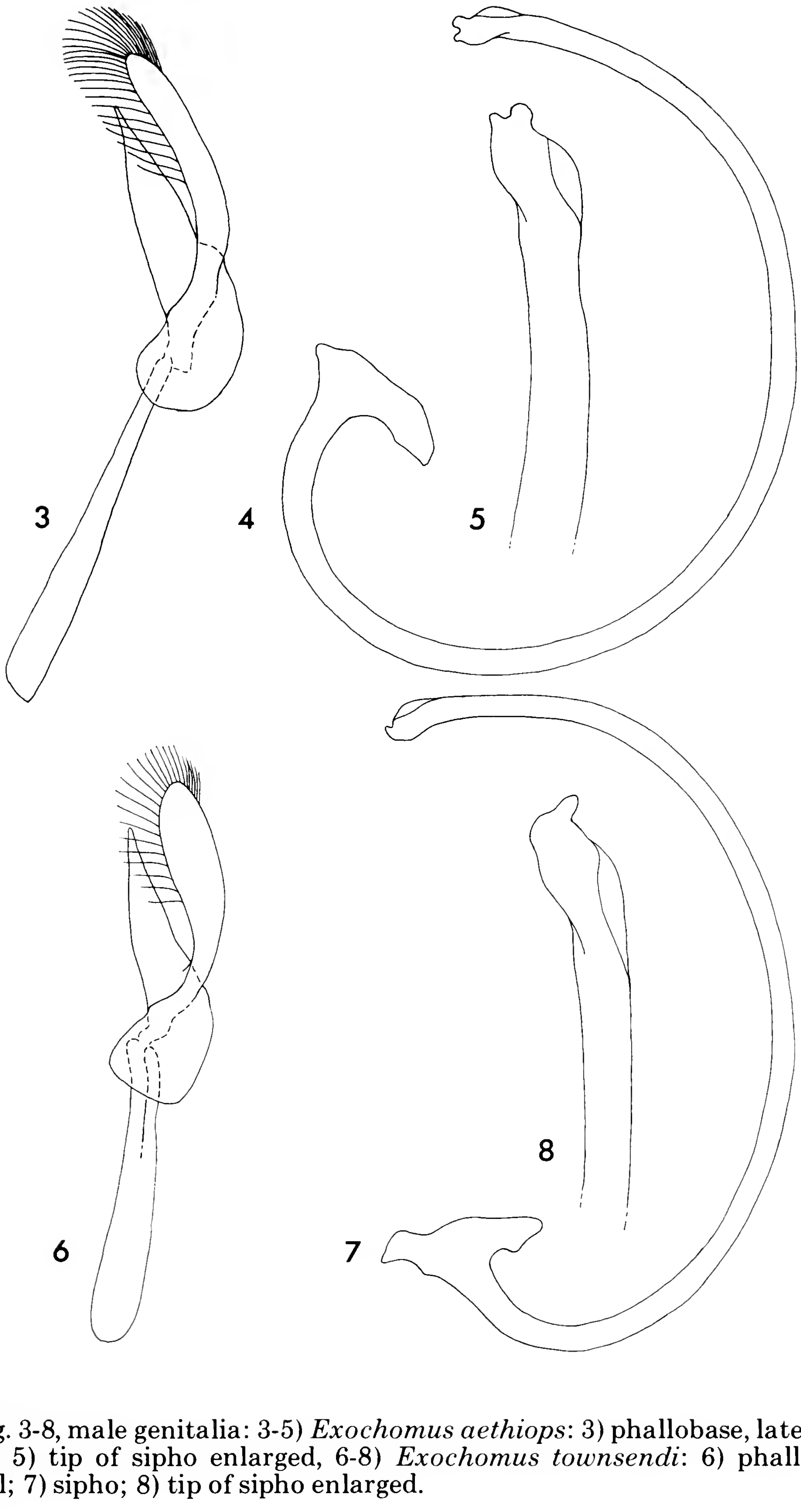

Fig. 3-8, male genitalia: 3-5) *Exochomus aethiops*: 3) phallobase, lateral; 4) sipho; 5) tip of sipho enlarged, 6-8) *Exochomus townsendi*: 6) phallobase, lateral; 7) sipho; 8) tip of sipho enlarged.

Vista. The species probably occurs in Arizona and New Mexico but the records of this have probably been obscured by the mixing of *townsendi* specimens with series of the more abundant *aethiops* in collections.

At first glance *aethiops* and *townsendi* are extremely similar. *E. townsendi* has the lateral margin of the elytron less than half as strongly explanate as *aethiops* and in dorsal view the sides of the pronotum and elytron appear almost continuous in *townsendi,* definitely discontinuous in *aethiops*. The lateral margin of the elytron is also sinuate medially in *townsendi,* straight in *aethiops*. The form of *townsendi* is somewhat elongate, the form of *aethiops* is round. The male genitalia of *townsendi* have the parameres broader and the basal lobe relatively shorter and broader than the corresponding structures in *aethiops* (Fig. 3, 4, 5, 6, 7, 8).

Brumoides blumi (Nunenmacher), **n. comb.**
Fig. 9

Brumus blumi Nunenmacher, 1934:114; Blackwelder, 1945:48.

Brumus blumi must now be placed in *Brumoides* Chapin because of the 8-segmented antennae. *Brumoides* is a North American genus. *Brumus* has 10-segmented antennae and is an Old World genus. Chapin (1965) did not examine specimens of *blumi* while preparing his excellent paper on chilocorine

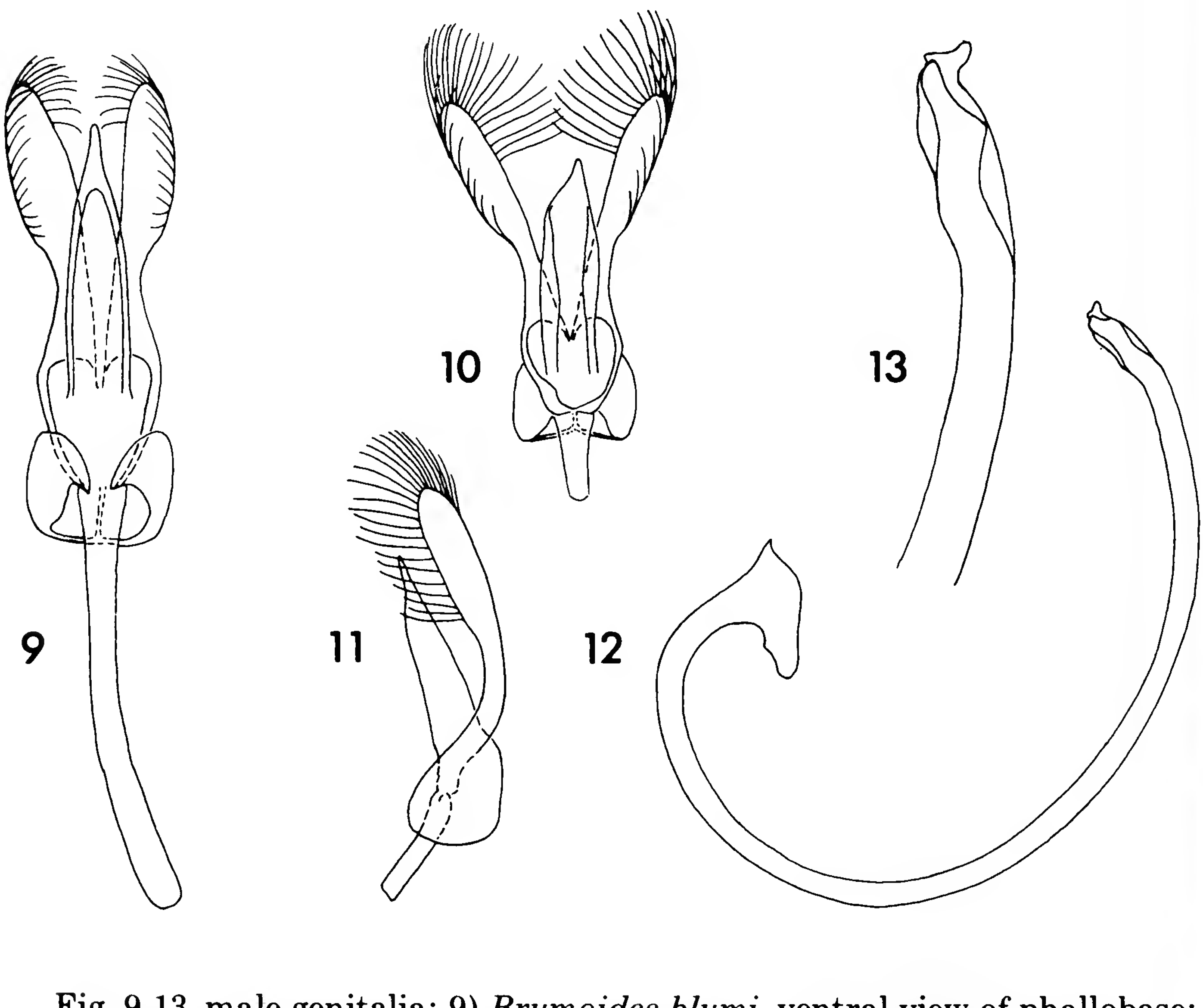

Fig. 9-13, male genitalia: 9) *Brumoides blumi,* ventral view of phallobase; 10-12) *Exochomus minutus*: fig. 10, phallobase, ventral view; 11) phallobase, lateral view; 12) sipho; 13) tip of sipho enlarged.

genera, thus he did not indicate to what genus *blumi* belonged. A paratype of *blumi* in the USNM collection was available for study.

B. blumi resembles *E. townsendi* in external appearance but has simple tarsal claws. The claws in species of *Exochomus* have a basal tooth or angulation. The male genitalia have the basal lobe symmetrical (Fig. 9) while it is asymmetrical in species of *Exochomus.*

All specimens of *blumi* examined have been from CALIFORNIA, Contra Costa and Alameda counties. I am not aware of it having been recorded from anywhere other than California.

Exochomus (Exochomus) decemnotatus Gordon, **new species**

Fig. 1

Holotype: length 2.83 mm, greatest width 2.35 mm. Form rounded, slightly elongate, lateral margin of elytron feebly but distinctly explanate, discontinuous with pronotal margin in dorsal view. Color mostly reddish yellow; pronotum with an irregularly oval, black spot at base at each side of midline; elytron with 4 black spots arranged in 2 transverse rows, first row just anterior to middle, second row on apical one-third, marginal bead with narrow piceous band (Fig. 1); pro-, meso- and metasterna and median area of first 2 abdominal sterna black. Head distinctly alutaceus with fine punctures separated by 3 to 5 times their diameter. Pronotum and elytron feebly alutaceus, shining, with very fine punctures separated by 2 to 6 times their diameter. Epipleuron strongly descending externally with distinct, yellowish-white pubescence medially. Postcoxal line on first abdominal sternum complete, extending beyond middle of sternum. Apical margin of fifth sternum rounded, not emarginate. **Holotype:** Female [CNC], MEXICO: 5 mi. W. Durango, Durango, 11-VI-1964, H. F. Howden.

The only species of *Exochomus* previously known from Mexico or Central America with a color pattern even remotely resembling that of *decemnotatus* is *marginipennis* LeConte. The pale pronotum and elytra with the delicate, sharply defined, black spots will separate *decemnotatus* from *marginipennis.* In addition, specimens of *marginipennis* are nearly always larger than the type of *decemnotatus.* The smallest specimen of *marginipennis* observed was 2.80 mm in length.

Exochomus (Exochomus) minutus Gordon, **new species**

Fig. 2, 10, 11, 12, 13

Holotype: length 2.37 mm, greatest width 2.05. Form rounded, slightly elongate, lateral margin of elytron feebly but distinctly explanate, discontinuous with pronotal margin in dorsal view. Head black except anterior clypeal margin narrowly piceous and labrum yellow; pronotum black except antero-lateral angles broadly yellow; elytron yellow with 4 black spots, first spot anterior to middle and outside of discal area, second spot on suture anterior to middle, third spot at middle of posterior one-third, fourth spot small, elongate, on suture in apical third (Fig. 2); ventral surface black except hypopleuron, epipleuron and lateral margin of abdominal sterna yellow, apices of tibiae and tarsi reddish brown. Head and pronotum finely alutaceus, head more strongly so, punctures fine, separated by 1 to 3 times their diameter on head, 2 to 6 times their diameter on pronotum. Elytron shining, feebly alutaceus, punctures nearly invisible, separated by 2 to 6 times their diameter. Epipleuron strongly descending externally. Postcoxal line on first abdominal sternum complete, extending beyond middle of sternum. Apical margin of fifth sternum feebly emarginate medially. Genitalia with basal lobe shorter than paramere, asymmetrical, apex bluntly pointed; paramere narrowed above base, abruptly widened before middle (Fig. 10, 11); sipho strongly curved, slightly thickened in apical third, orifice lateral (Fig. 12, 13).

Holotype: male [CNC], Mexico: Oaxaca, 8000′, km. 611-648, Rte 190, 30-VII-1962, H. E. Milliron.

Paratype: 1 male [USNM], Mexico: Oaxaca, Mitla, 6000′, 28-VII-1962, H. E. Milliron.

This little species resembles some of the forms of *E. marginipennis* LeC. in color pattern. It is much smaller in size and the male genitalia are different. The dorsal color pattern of *minutus* actually resembles that of *Zagreus ritchiei* (Sicard) from Jamaica, except *ritchiei* has a small, black spot at the apex of the elytron.

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THE *PANDELETEIUS* SUBGENUS *EXMENETYPUS* VOSS IN CENTRAL AMERICA (COLEOPTERA:CURCULIONIDAE, TANYMECINI)

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ABSTRACT

The *Pandeleteius* subgenus *Exmenetypus* Voss is defined and revised for Central America. Included are *hieroglyphicus* Champion from Costa Rica, *opalescens* (Faust) from Panama, and *championi* n. sp. from Guatemala.

The subgenus *Exmenetypus* was erected by Voss in 1954 for *Pandeleteius hieroglyphicus* Champion, and, until now, this has remained the only species assigned to the subgenus. While working on a revision of *Pandeleteius* of Venezuela and Colombia, I discovered that the type series of *Pandeleteius hieroglyphicus* Champion contains not 1 but 3 closely related species. Of these, the 2 specimens from Costa Rica are *hieroglyphicus,* the 7 specimens from Panama are *opalescens* (Faust), and the 3 specimens from Guatemala are a new species, which I am calling *championi.* Most of these specimens bear the notation "var." or "var. worn" on the identification label, so Champion must have had reservations about their status even though this is not mentioned in his description.

SUBGENUS **Exmenetypus** VOSS

Pandeleteius subgenus *Exmenetypus* Voss, 1954:227, 231. Howden, 1966:176.

Type-species. Pandeleteius hieroglyphicus Champion, by monotypy.

Pandeleteius opalescens (Faust) and *championi,* new species, are now added to the subgenus. Six additional new species will be added from Venezuela and Colombia in my review of the *Pandeleteius* of those countries. *Pandeleteius erubescens* Champion and *boops* Champion, which Voss said probably belong to *Exmenetypus,* were removed from *Pandeleteius* to the genus *Airosimus* Howden (1966:176).

The subgenus is characterized as follows: Beak short; shorter from anterior edge of eyes than distance between eyes at their anterior edge; interantennal line closer to base than to apex. Beak apicad of glabrous interantennal line abruptly elevated, the elevated portion clothed with scales smaller, smoother and shinier than on the rest of the beak; epistoma carinate. Eyes prominent. Ocular vibrissae absent or vestigial. Pronotum produced anteriorly over head. Fore coxae very close, separated by no more than the greatest width of the scape in the male. Fore femur abruptly swollen, with or without granules on inner surface. Prosternum and fore coxae without long hairs. Anterior portion of ventrites 3, 4, and 5 slightly depressed in some species. Specimens often iridescent pale yellow.

Secondary characteristics include the following: Scrobe obliquely angled, tapered at its termination at or near ventral surface. Pronotum with basal and apical constrictions complete, sides rounded between constrictions, widest over fore coxae. Scutellum squamose. Middle and hind coxae glabrous. Hind corbel with a rudimentary semi-enclosing carina present in some species. Caudal edge of ventrites 2, 3, and 4 may be abruptly perpendicular.

The subgenus occurs in Central America, Colombia, and Venezuela at elevations below 3000 feet. It is not known from the remainder of South America.

The metallic lustre is intraspecifically variable and may apply to the entire dorsum of the beetle. In this subgenus the spermatheca is so uniform as to be of little use for interspecific diagnosis, but the aedeagus is excellent. The beak has many important characters also.

Key to Central American *Exmenetypus*

1. Setae of alternate intervals of elytra more numerous and conspicuous. Ventrite 5 of female grossly tumid. Tucurrique, Costa Rica .... *hieroglyphicus* Champ.

1′. Setae of all intervals small, evenly distributed. Ventrite 5 of female scarcely convex 2

2. Aedeagus with a median carina dorsally, its apex truncate. Hind tibia of male hollowed on inner surface. Panama and Coastal Cordillera of Venezuela .... *opalescens* (Faust)

2′. Aedeagus unmodified dorsally, its apex elongate, pointed. Hind tibia of male at most slightly flattened. Guatemala .... *championi* n.sp.

Pandeleteius (Exmenetypus) hieroglyphicus Champion
(Fig. 1, 3, 9, 10, 12)

Pandeleteius hieroglyphicus Champion, 1911:190. Voss, 1954:227, 231; Howden, 1966:176. Lectotype, here designated, female, "Tucurrique, Costa Rica", "Coll. Schild & Burgdorf", "TYPE" on red paper, handwritten label "*Pandeleteius hieroglyphicus* Ch. type", and my lectotype label [USNM].

Diagnosis: Ventrite 5 of female tumid (Fig. 12). Setae of alternate intervals of elytra very conspicuous, almost perpendicular at their bases, their apices strongly bent over and not touching surface, separated by 1 to 3 scales; setae of intervals 2, 4, and 6 sparse until apical third where they are separated by 3 to 5 scales.

Description: Males unknown. Females length 3.8, 3.9 mm, width 1.4 mm. Color and pattern as described and illustrated by Champion except no "opalescent whitish" scales. Very densely squamose.

Beak (Fig. 3) as described, 1.5 times wider between anterior edge of eyes than long; 0.83 times as wide at interantennal line as head between eyes. Epistoma occupying approximately three-fifths of anterior edge of beak, its apex reaching two-thirds to interantennal line. Antennal club slender, tapered at each end, 0.76 times as long as scape.

Prothorax (Fig. 1) 1.04 times longer than wide. Apical and basal constrictions equal on sides, apex considerably produced apically (illustrations in Champion misleading), at median line basal constriction at about basal fifth, apical constriction at about apical third. Disc of pronotum with median line finely impressed; a vague transverse depression on either side of disc.

Champion's description of elytra very misleading and his illustration showing apex too short. Elytra (Fig. 1) 2.8 times longer than prothorax; across humeri approximately 1.3 times wider than thorax. Sides parallel for basal seventh thence gradually divergent to just beyond middle, thence gently convergent to apex; the apical terminus of intervals 4 to 6 produced and conspicuous in dorsal view. Base slightly arcuately emarginate between striae 5. Intervals 2, 3, and 4 conjointly raised in a weak convexity on basal seventh. Intervals 3 and 5 slightly elevated and wider on median third where they are up to 6 scales wide. Intervals otherwise equal, narrow and very feebly convex on base and towards sides, flat on apical third. Strial punctures very fine, deepest behind basal swelling. Setae of intervals 1, 3, and 5 (Fig. 9) very conspicuous, almost perpendicular at their bases, their apices strongly bent over and not touching surface, separated by 1 to 3 scales. Setae of intervals 2, 4, and 6 absent or sparse, small and recumbent until apical third where they are separated by 3 to 5 scales and formed as neighboring setae. Scales of elytra (Fig. 10), especially towards apex, posteriorly imbricate and margined.

Fore femur 1.6 to 1.9 times wider than hind femur, without teeth or other modification on inner edge. Fore tibia with 6 or 7 moderate, acute, evenly distributed teeth on inner edge. Hind tibia flattened, without scales on inner surface distally. Hind corbel of lectotype with a brief, very faint carina occupying approximately one-third of the distal width; carina more obsolete in paralectotype. Fore coxae separated by distance approximately equal to greatest width of scape. Ventrites 3 and 4 considerably elevated medially, slightly rounded to their posterior margins which are abruptly perpendicular medially to within 0.1 of sides; anteriorly gradually deflected to preceding segment, the area with scattered scales on segment 3, none on segment 4. Ventrite 5 (Fig. 12) with central two-thirds occupied by a gross tumidity highest apically; up to 3 scales on tumidity, otherwise clothed with only fine setae; as wide across base as long in lectotype, 1.75 times wider than long in paralectotype.

Type Material: Paralectotype, here designated, female, first 2 labels as lectotype, then "U.S. Nat. Mus. 1911-150", "Cotype" circled in yellow, "♀", "B.C.A., Col., IV.pt.3. *Pandeleteius hieroglyphicus* Ch.", "Sp. figured" and my paralectotype label [BMNH].

Champion designated the 2 females from Costa Rica as "the types". He apparently considered the United States National Museum specimen "the type" in view of the label which I believe to be in his handwriting. Also in a statement in his introduction, p.vi, that he was indebted to the U. S. National Museum because they allowed him to keep cotypes, he apparently considered the specimen returned to them as the more important one.

The lectotype is missing the tarsus from the right hind leg, the tarsal claw from the left middle leg, and the left foreleg is broken off beyond the trochanter and mounted on the point with the beetle. The paralectotype is in nearly perfect condition, missing no parts.

Discussion: The species is known to date from only the 2 female specimens. The number of setae per interval on the disc of the elytra before the declivity on the paralectotype is as follows: interval 1: 16, 12; int. 2: 4, 5; int. 3: 17, 21; int. 4: 4, 6; int. 5: 14, 10 (partial count). Within the subgenus the grossly tumid ventrite 5 is unique, although other extreme modifications of the abdomen occur in Venezuelan *Exmenetypus*. The characteristics of the elytral setae and larger size are the only other certain differences noted between

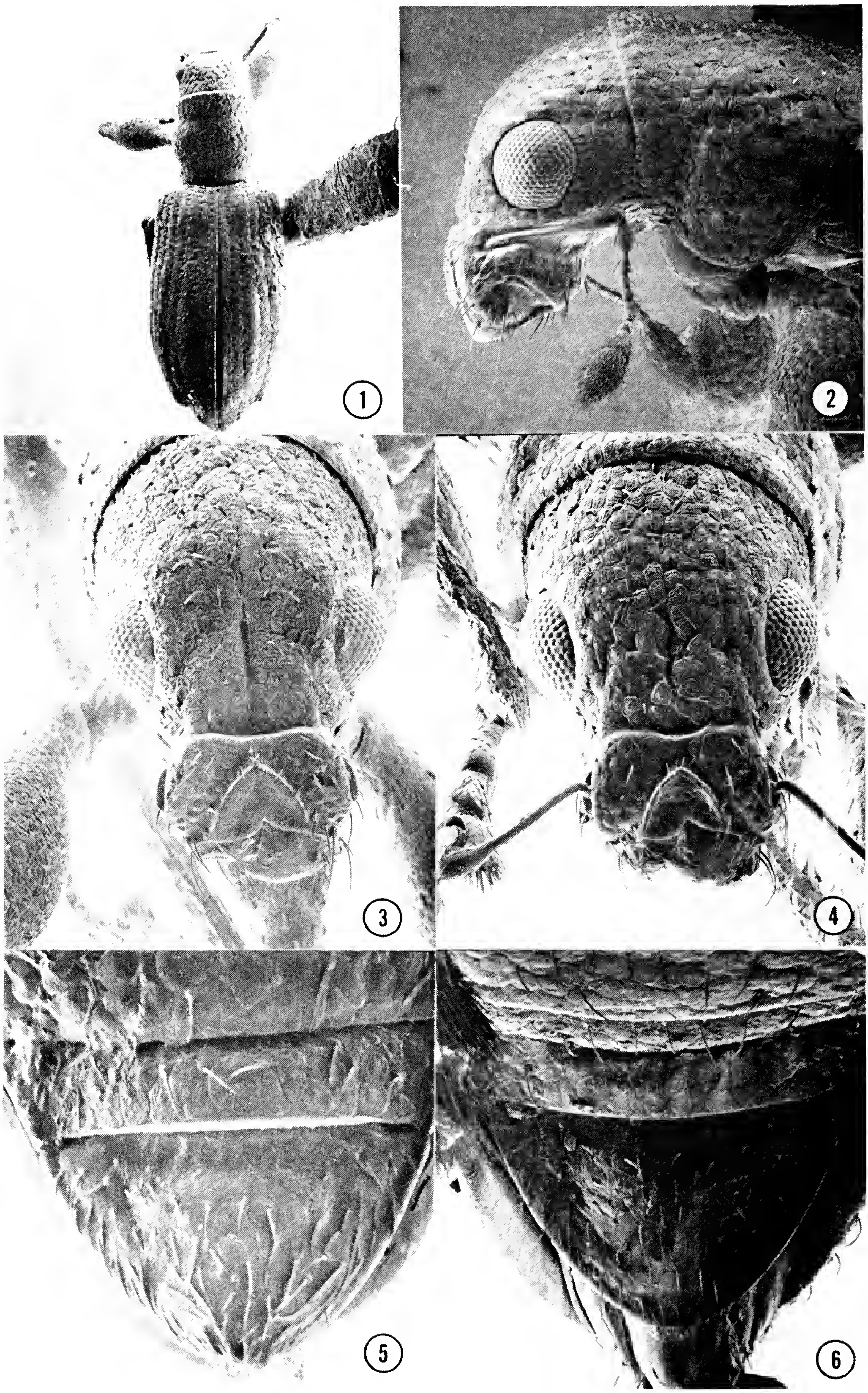

Fig. 1-6. *Pandeleteius (Exmenetypus)* spp.: 1) *hieroglyphicus,* paralectotype, dorsal view; 2) *opalescens,* Barro Colorado, profile head and beak; 3) *hieroglyphicus,* paralectotype, anterior view head and beak; 4) *championi,* allotype, anterior view of head and beak; 5) *championi,* allotype, ventrite 5; 6) *opalescens,* female, Barro Colorado, ventrite 5.

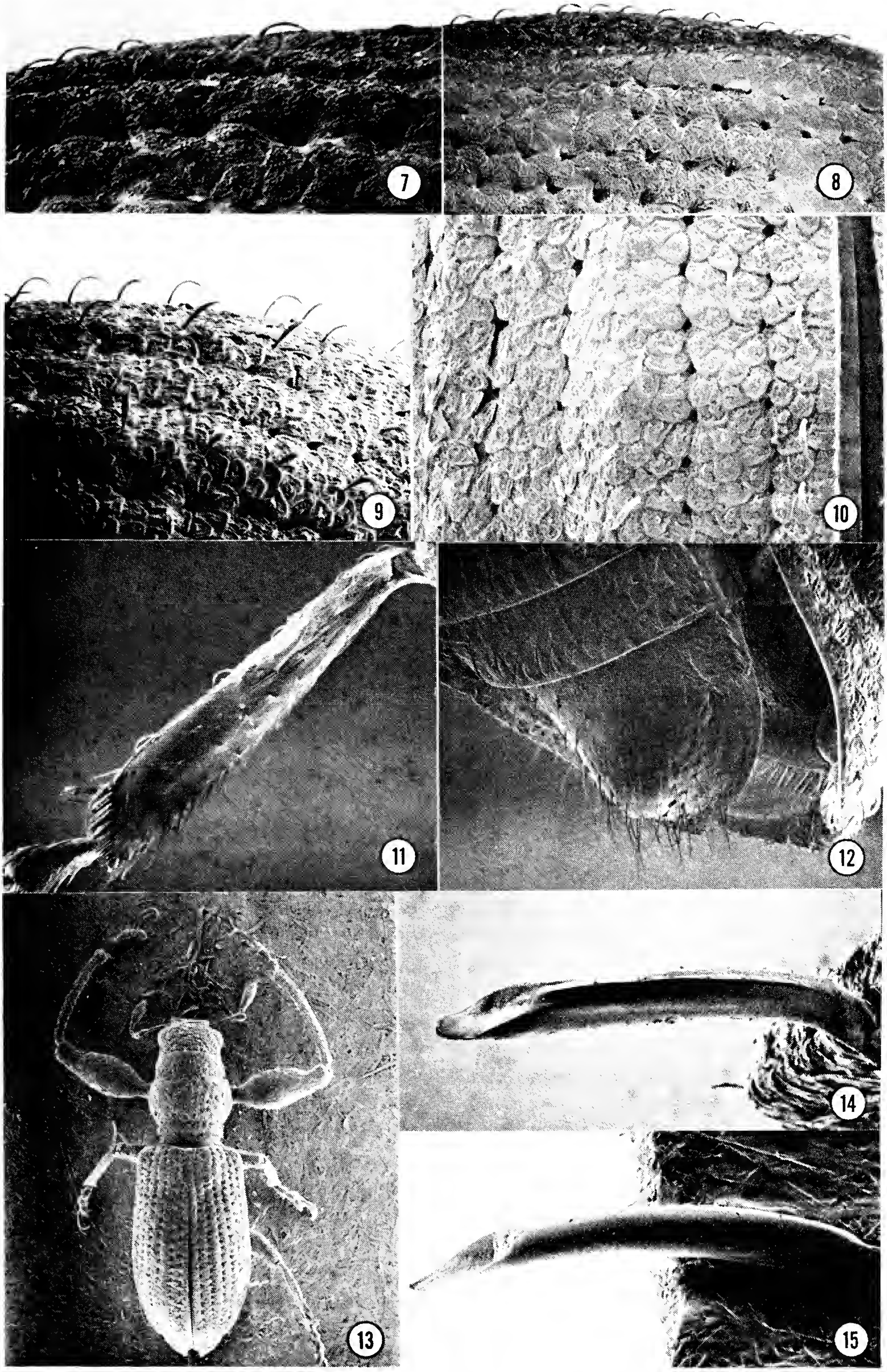

Fig. 7-15. *Pandeleteius (Exmenetypus)* spp.: 7) *championi*, allotype, vestiture near middle of elytra at suture in profile; 8) *opalescens*, female, Barro Colorado, vestiture near middle of elytra at suture in profile; 9) *hieroglyphicus*, paralectotype, vestiture near middle of elytra at suture in profile; 10) *hieroglyphicus*, paralectotype, vestiture near middle of elytra at suture in dorsal view; 11) *opalescens*, male, Duaca, inner surface of hind tibia; 12) *hieroglyphicus*, paralectotype, ventrite 5; 13) *championi*, type, dorsal view; 14) *opalescens*, Duaca, aedeagus in three-quarters profile; 15) *championi*, type, aedeagus in three-quarters profile.

hieroglyphicus and the related Central American species. Males may or may not have the hind tibia concave. The width of the elytral intervals and the number of teeth on the fore tibia may prove to be significant.

Voss (1954:231) listed *hieroglyphicus* from Peru based on a specimen in the Dresden museum. However, this needs verification since in the material I borrowed from Dresden there is no such specimen.

Pandeleteius (Exmenetypus) championi Howden, **new species**
(Fig. 4, 5, 7, 13, 15)

Diagnosis: Form of *opalescens*. Elytral setae very small and inconspicuous, scarcely arched, evenly distributed on all intervals. Inner surface of hind tibia of male without scales, with numerous setae, not at all hollowed, only slightly flattened. Aedeagus with apex simply attenuate, dorsal surface not sculptured. Ventrite 5 of female almost flat.

Description: Holotype, male (Fig. 13), length 3.0 mm, width 1.2 mm. A slightly teneral specimen glued flat on a rectangular card, left hind leg glued to card separately, abdomen and aedeagus glued on point beneath beetle. Pale yellowish white marked with tan in a pattern similar to that of *hieroglyphicus* but reduced. Tan scales especially not always contiguous, but this partly due to teneral condition.

Beak widest at apex where it is as wide as head between eyes, narrowest at interantennal line where it is 1.1 times narrower than head between eyes. Beak 1.6 times shorter from anterior edge of eye than distance between eyes at their anterior edge. Interantennal line at basal fifth, biarcuate. Epistoma occupying approximately 0.5 of anterior edge of beak, its apex reaching 0.75 to interantennal line. Median line marked by an elongate interocular pit. Antennal club 0.75 times as long as scape.

Prothorax 1.04 times wider than long. Apical constriction at apical fourth, basal constriction at basal ninth along median line. No transverse or median impressions.

Elytra 2.4 times longer than prothorax, 1.1 times wider across humeri than across prothorax. Sides parallel for basal fifth, very slightly divergent to just beyond middle, thence rounded to apex, the apical terminus of intervals 4 to 6 scarcely entering outline. Intervals 3 and 4 conjointly obsoletely swollen on basal fifth. Intervals 1 and 2 narrow basally, width of 1 scale, rapidly becoming as wide as 2 scales; interval 2 before declivity as wide as 3 scales; interval 3 basally as wide as 3 scales, then widening to 4 scales; remaining intervals even, as wide as 2 to 3 scales; no intervals convex. In profile elytra slightly elevated from base to about middle; declivity at apical fifth oblique, its summit broadly rounded. Elytral setae (Fig. 7) very small and inconspicuous, recumbent, scarcely arched, approximately as long as 1 scale, evenly distributed on all intervals.

Separation of fore coxae not visible in type because of mount. Fore femur 1.7 times wider than hind femur. Left fore tibia with 6, right with 4 teeth on inner edge. Inner surface of hind tibia without scales, with numerous setae, not at all hollowed, only slightly flattened. Ventrite 4 only with posterior margin perpendicularly elevated, elevated by height of 1 scale. Ventrite 5 twice as wide across base as long, apex broadly rounded; moderately, evenly convex; as long as ventrite 2.

Aedeagus (Fig. 15) as long as first 4.25 ventrites, dorsal surface without sculpture or modification at 54X; apex simple, elongate, pointed.

Allotype, female, length 3.0 mm, width 1.2 mm. Specimen missing right middle leg beyond trochanter, left elytron dislodged and its humerus broken off; most scales present. Differs from type in the following respects: Head and beak (Fig. 4) extremely robust and possibly not typical of females. Beak 1.1 times wider between eyes than across widest part of apex, scarcely narrower at interantennal line. Surface of beak convex, "inflated" between interantennal line and frons; interocular pit shallow, squamose. Club 0.65 times as long as scape. Elytra 2.8 times longer than prothorax. Apical terminus of intervals 4 to 6 rounded, more evident in dorsal outline, apex slightly attenuate. Summit of declivity more abruptly rounded, situated at apical eleventh, declivity slightly concave. Fore coxae separated by approximately four-fifths the width of antennal club. Left fore tibia with 7, right with 4 teeth on inner edge. Ventrite 5 (Fig. 5) at base 1.6 times wider than long; obsoletely, evenly convex.

Type series: Holotype, male, GUATEMALA, Zapote, vibr. wanting, B.C.A., Col. IV pt. 3 *Pandeleteius hieroglyphicus* Ch. var. [BMNH]. Allotype, female, same data as type [BMNH]. Paratypes: 1 female, same data as type [USNM].

Discussion: The female paratype has the same measurements as the allotype and is very much like it but is missing most of its dorsal scales. The beak of the paratype resembles that of the type except that the median line is glabrous and finely impressed to the interantennal line. Ventrite 5 is twice as wide as long.

This is the northernmost species of *Exmenetypus* and the simplest. Males may be separated by the simple aedeagus (dorsum not sculptured and apex simply pointed) and the scarcely modified hind tibia. Females may be separated from *hieroglyphicus* (the nearest species geographically) by the very inconspicuous, evenly distributed elytral setae and nearly flat ventrite 5. Females are very similar to those of *opalescens* but the setae are much less arched.

Pandeleteius (Exmenetypus) opalescens (Faust)
(Fig. 2, 6, 8, 11, 14)

Menetypus opalescens Faust, 1892:2. Lectotype, here designated, male, with the following labels: "♂ Caracas Simon", "opalescens Faust", a 2 × 3 mm piece of gold paper, "Coll. J. Faust Ankauf 1900" on green paper, "TYPE" on red paper and my lectotype label [Dresden].

Diagnosis: Aedeagus with a dorsal median carina its full length; apex truncate. Hind tibia of male spatulate. Elytral setae unserial and equally distributed on all intervals; most setae curved in a high arch with their apices touching the surface.

Description: Males length 2.8 to 3.1 mm, width 1.1 mm; females length 3.0 to 3.4 mm, width 1.2 to 1.3 mm. Color opalescent or luminous yellowish with faint markings, or off-white with tan markings, or dark metallic browns. Markings as depicted for *hieroglyphicus* by Champion (Tab. 8, fig. 2) or reduced to disconnected spots. Scales of beak apicad of interantennal line opalescent or bright submetallic blue or green.

Beak (Fig. 2) in both sexes approximately 1.6 times shorter from anterior edge of eye than distance between eyes at their anterior edge. Beak narrowest at interantennal line where in males it is 1.1 times narrower than head between eyes, in females 1.1 to 1.3 times narrower. Interantennal line at approximately basal fifth of beak, straight or slightly biarcuate, broadly glabrous, perpendicular or oblique. Epistoma occupying 0.5 to 0.66 of anterior edge of beak, its apex reaching 0.75 to interantennal line; posterior margin of epistoma marked by a strong carina, apex rounded or obtusely angled. Median line impressed from interantennal line to behind eyes. Frons with a pair of short, arcuate, transverse depressions between posterior half of eyes. Scape slightly bent ventrad and caudad just before its thickened apex. Antennal club averages 0.8 times as long as scape. Eye nearly hemispherical.

Prothorax usually as long as wide, longer in 3 specimens by up to 1.08 times. Median line unmarked; no transverse impressions.

Elytra of males 2.4 to 2.5 times longer than prothorax, elytra of females 2.4 to 2.7 times longer than prothorax. Elytra across humeri in both sexes usually 1.2 times wider than prothorax, ranging from 1.1 to 1.3 in both sexes, sides of elytra slightly divergent from base to about middle, thence very gradually rounded to apex; apical terminus of intervals 4 to 7 scarcely evident in dorsal outline in male, more evident in female. Intervals 1 and 2 narrow, basally width of 1 scale, gradually becoming as wide as 2 scales. Interval 3 distinctly wider and sometimes higher medially in both sexes. In profile elytra elevated from base to middle thence descending, broadly rounded to apex; summit of declivity ill-defined in male, slightly more evident in female. Setae (Fig. 8) mostly completely arched, slender, more conspicuous than in *championi,* approximately evenly distributed on the intervals, uniserial; each seta as long as 1 to 1.5 scales.

Fore coxae separated by distance less than or equal to greatest width of scape in male, equal to or wider than greatest width of scape in female. Fore femur of male 1.5 to 1.9 times wider than hind femur; fore femur of female 1.5 to 2.0 times wider than hind femur. Inner surface of fore femur on distal half often with granules. Inner edge of fore tibia with 3 to 6 (usually 4 or 5) teeth. Hind tibia of male (Fig. 11) with distal half of inner surface modified as follows: without scales, with a few long hairs, smooth and shiny, flattened, widened, obliquely hollowed before apex. Inner surface of middle tibia of male similarly modified but to a lesser extent. Middle and hind tibia of female modified to a lesser extent than in male, never widened, but glabrous and flattened.

Ventrite 5 of male slightly, evenly convex; apex truncate; with flattened margin narrow, complete; slightly longer than ventrite 2. Aedeagus (Fig. 14) with a dorsal median carina extending from orifice almost to base; apex flattened, truncate; four-fifths as long as abdomen.

Ventrite 5 of female (Fig. 6) similar to that of male but shorter than ventrite 2, apex narrowly to broadly truncate.

Type Material: Faust described *opalescens* from 2 males from Caracas. The lectotype is in good condition, missing only tarsal segments 2, 3, and 4 on the right hind leg; the aedeagus is mounted on a point glued to the same point on which the beetle is mounted. The paralectotype, here designated, is in the Museum National d'Histoire Naturelle, Paris, and bears the following labels: "Caracas", "Museum Paris, Venezuela, E. Simon 1897", "J. Faust, det. 1897", "Type" in handwriting as well as a mechanically printed label, and my paralectotype label.

Distribution: Elevations usually between 500 and 3000 feet in the Coastal Cordillera of Venezuela and in Panama. Total number of specimens examined: 16. PANAMA: Canal Zone: 1 female, Barro Colorado, V-29, Darlington [MCZ]; Chiriqui: 1 male, 3 females, Bugaba, Champion (cotypes of *hieroglyphicus,* "var. worn" (1)) [BMNH, USNM]; 1 male, 2 females, Volcan de Chiriqui, below 4000 feet (1), 25-4000 feet (2), Champion (cotypes of *hieroglyphicus)* [BMNH, Howden]. VENEZUELA: Aragua: 3 females, San Sebastian, 17-VIII-65, J. & B. Bechyné [UCV]; Distrito Federal?: 2 males, "Caracas" lectotype [Dresden], paralectotype, [Paris]; Lara: 1 male, 1 female, Duaca, 14-II-65, J. Bechyné [UCV]. COUNTRY UNKNOWN: 1 female, "Columb. Moritz" (this label refers to Colombia or Venezuela (Horn and Kahle, 1936:182) and personal experience [Berlin].

Discussion: The more metallic or opalescent scales tend to be less sculptured than the nonmetallic white, brown, etc., scales. In the lectotype the majority of scales are decidedly opalescent which would account for Faust's comment that the scales of the beak are the same as those apicad of the interantennal line. The description is accurate enough though not very detailed. The scales of the apex of the beak often reflect brilliant blue or green. One specimen from Volcan de Chiriqui has the arcuate frontal depressions obsolete and the eyes much larger and flatter than in the rest of the series. Two instances of additional elytral setae were observed, both in females on interval 3. The inner surface of the fore femur is distinctly granulate in most specimens including the lectotype; no granules are visible at 54X in 1 male and 1 female from Bugaba, 1 male from Chiriqui, and 1 male from Duaca.

The carinate, truncate aedeagus and spatulate hind tibia are the major distinguishing characteristics of *opalescens* males. The characters of the elytral setae (evenly distributed and usually completely arched) are also specifically distinctive. Females may be separated from *hieroglyphicus* by their flatter ventrite 5 and smaller size, but are difficult to separate from *championi* except geographically.

The northern limit of *opalescens* is apparently the Panama-Costa Rica border. In the forthcoming paper, several other species of *Pandeleteius* (s.s.) will be shown to have similar ranges in Central America and northern South America.

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MY CONCEPT OF THE BEETLE FAMILY CONONOTIDAE CROWSON = ANTHICIDAE (COLEOPTERA)—A NEW INTERPRETATION OF THE OLD OBSERVATIONS

MOHAMMAD ABDULLAH[1,2,3]

ABSTRACT*

Earlier authorities placed the heteromerous beetle genera *Lagrioida* Fairm. & Germ., *Cononotus* LeConte, and *Agnathus* Germar in Pythidae, Salpingidae, Lagriidae, Melandryidae, and Cononotidae and interpreted their similarities to Anthicidae as a result of convergence. They are undoubted anthicids, and Cononotidae Crowson (1953) is a junior synonym of Anthicidae Latreille (1825) (**syn. n.**). *Lagrioida* (as well as the other 2 genera) have the metacoxae widely separated (as in Anthicinae) and differ from all Eurygeniinae in this character as well as in having the first 2 visible abdominal sternites connate (unlike other subfamilies) and is therefore removed from Eurygeniinae, and placed in a **new subfamily, Lagrioidinae Abdullah**—a derivative group more or less intermediate between Eurygeniinae and Anthicinae. The known primitive and derivative characters are given along with a key to the world subfamilies of Anthicidae, and tribes (Lagrioidini, Agnathini, and Cononotini), genera and species of Lagrioidinae. A catalogue of Lagrioidinae (Anthicidae) is also given. I urge that a restriction or ban on descriptions of new species, proposed by several authorities, should be extended to the descriptions of new families in Coleoptera and other groups.

INTRODUCTION

I had earlier treated the cicindelid beetles in a subfamily of Carabidae (Abdullah, 1969) following others but have later given them a distinct family (Cicindelidae) status (Abdullah, in press) before Mandl's (1971) work was published and on my own assessment. On the other hand, in this work I shall be suppressing a family of Heteromera (Cucujoidea) and shall give my reasons for doing so. My concept of Heteromera is presented in earlier papers (Abdullah, 1964, 1969, in press, and Abdullah & Abdullah, 1966). The group Heteromera is monophyletic, distinguished primarily by the evolution of the heteromeroid aedeagus in the male which is an important phylogenetic character. To determine whether a certain cucujoid beetle is a member of Clavicornia or Heteromera check the aedeagus. If it is of the heteromeroid type (evolved from the cucujoid type by the loss of the ventral part of the ring-piece of the tegmen, leaving the lateral lobes or parameres attached to a dorsal basal-piece—analogous to the trilobe type of tegmen of the Dascilloidea, etc., but with the tegmen dorsal and median lobe ventral in orientation) or derivable from it (such as the tegmen lateral or even ventral as in

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*For a German translation of the abstract, see last page.

the Anthicidae, Monommidae, Zopheridae, etc.) then it is Heteromera. The Heteromera have evolved certain other characters: heteromeroid tarsi, trochanters, etc., but they do not all develop at the same time and are subject to secondary modifications (Abdullah, in press). It is possible to find a primitive group of Heteromera where the aedeagus is heteromeroid, and other features are still clavicorn. A phenetic classification based on "totality of their structure" (Crowson, 1967:106) will lead to false or unscientific conclusions.

A well-known example is the fossil bird, *Archaeopteryx*. Mayr (1963:596) wrote, "*Archaeopteryx,* the 'missing link' between reptiles and birds, is a typical pseudosuchian reptile in nearly all of its characters, but in its feathers it is like a modern bird." There are more reptilian (ancestral) characters: 1) teeth, 2) free tail vertebrae (20), 3) ribs simple, without processus uncinati, 4) brain simple, with small cerebellum, 5) metacarpals free, 6) metatarsals free, 7) ilia and ischia separated. While the avian (derivative) characters are even less: 1) feathers, 2) furcula, 3) pelvis with backward pubes, 4) large eyes (Heberer, 1957). Those taxonomists who classify organisms on the "totality of their structure" (Crowson, 1967:106) will regard this primitive bird a member of Reptilia, while a phylogenetic systematist will not. Furthermore, "One of the oldest known amphibians, the stegocephalian *Ichthyostega* from the upper Devonian of Greenland, has as many (or more) fish characters as amphibian characters (Heberer, 1957:874; Jarvik, 1955)" (Mayr, 1963:596).

Systematic Position of Cononotidae

Crowson (1953:41,52) proposed the family name Cononotidae in the Heteromera, for the following 3 genera of Cucujoidea: *Cononotus* LeConte, 1851 from U.S.A., *Agnathus* Germar, 1825 from central Europe, and possibly *Lagrioida* Fairmaire & Germar, 1860 from Tasmania, New Zealand, and Chile. This brought them together for the first time within a family. Earlier authorities included *Cononotus* and *Lagrioida* in Pythidae or Melandryidae; for instance, *Cononotus* in the Pythidae by Hatch (1965), and in the Salpingidae by Arnett (1968), etc. Kaszab (1969) recently incorrectly treated *Agnathus* in Lagriidae, although he is correct when he writes, "Die Körperform erinnert an Anthiciden." Crowson (1953:52) also stated "The affinities of the family [Cononotidae] seem to be to Salpingidae and Mycteridae on one hand and to the Anthicid group on the other." On the one hand he is right and on the other wrong. The observations of the older authorities are correct but their interpretations are incorrect because when they place these genera in Lagriidae (or any other family) they interpret the similarities of the 3 genera to that group due to true (phylogenetic) relationships while attributing their similarities with Anthicidae to convergence. This is an error of judgment, or lack of theoretical ability to deduce phylogenetic relationship from the observed data, common among many practicing taxonomists which I want to emphasize. Crowson (1969:453) is critical of all "systematic workers" (not only D. G. Kissinger) who are capable of recognising 'specific', 'generic' and 'tribal' characters within a family as a result of their intensive study of a family (which among modern coleopterists includes almost everyone except Crowson) and who "When describing a series of taxa of the same rank, they try to refer every time to the same characters in the same order and with the same forms of words, and to provide strictly comparable illustrations for each of the taxa" . . . "Their systems are always presented as something complete, coherent and closed; they do not draw attention to deficiencies in human knowledge, make predictions or suggest problems for future research." Unfortunately, those who think their system and mind is open rather than closed do not always make the best use of it, their practice is not always consistent with their theory, their judgment of those who differ from them at times reflects ignorance or deep-rooted prejudice of one kind or another rather than science.

Lagrioida species are typical anthicid beetles (although Champion, 1890 placed them in Melandryidae) but have the first 2 visible sternites connate which is a derivative feature for Anthicidae (sensu lato). The genus was placed in a separate tribe (Lagrioidini) in the subfamily Eurygeniinae of the Anthicidae (Abdullah & Abdullah, 1968). But now I give it subfamily status, since, unlike Eurygeniinae, the metacoxae are widely separated as in Anthicinae. The larva of the American *Pergetus campanulatus* of the tribe Eurygeniini is known, that of *Lagrioida* is not expected to be completely similar since the 2 genera (now placed in different subfamilies) were still placed in different tribes earlier. My studies of Heteromera have revealed that Anthicidae could have evolved from Pyrochroidae, Pyrochroidae from Pythidae, and Meloidae from Anthicidae (Abdullah, 1969). I do not think that Oedemeridae and Anthicidae could have evolved from each other, and no modern authority on Oedemeridae has reached this conclusion. However, Crowson (1967:135) wrote, " . . . the genus *Lagrioida* (s. temperate regions) appears to link the present family [Oedemeridae] with Cononotidae and Anthicidae." 'Predictions' and 'hypotheses' that 'appear' and 'disappear,' to workers such as this, should not be taken seriously unless they are based on sound judgment of scientific observations.

With the earlier transfer of *Lagrioida* to Anthicidae (in the subfamily Lagrioidinae) the Cononotidae of Crowson (1953) is now left with 2 genera: *Cononotus* and *Agnathus*. I have decided to place them together within a family on the basis of Crowson's (1953:52) statement . . . "The two genera seem to agree in all essential points of adult structure." I had earlier attached more importance to the character of the middle coxal cavity (following Crowson, 1953) as to whether it is **open** by reaching the epimera or **closed** by the sterna when I recognized Cononotidae of Crowson as a family distinct from Anthicidae (Abdullah, 1964 & 1969); otherwise they are similar. In fact, *Lagrioida,* which was placed by Crowson (1953:52) in his Cononotidae, has open mesocoxal cavities while the other 2 genera have them closed according to Crowson (which is not true!). Does Crowson believe it is phylogenetically feasible to have the 2 conditions within the same family? I have not checked the middle coxal cavities in all the genera of Anthicidae and will not be surprised if some genera of Anthicidae and will not be surprised if some genera have them apparently closed or nearly so, secondarily. Under the circumstances, I am prepared to accept the opening or near closure of the middle coxal cavities a polyphyletic and variable character. *Cononotus* and *Agnathus* are also transferred to the Anthicidae (s.l.) and Cononotidae becomes a junior synonym of Anthicidae (Latreille, 1825).

Characters of Lagrioidinae Abdullah, new subfamily

Within the Anthicidae, *Cononotus* and *Agnathus* cannot be placed in any of the earlier recognized subfamilies. They differ from Pedilinae and

Steropinae in having internally closed front coxal cavities (Crowson, 1953:40, couplet 13), although Arnett (1968:714) stated, "Procoxal cavities open behind"—probably meaning only visibly open in *Cononotus*; from Pedilinae, Steropinae, Macratriinae, Copobaeninae and Eurygeniinae in having widely separated metacoxae (Arnett, 1968:716 and Hatch, 1965:84, including my own observations on *Agnathus decoratus*); from Steropinae and Anthicinae in having a wide or broad neck; from Pedilinae, Steropinae, Macratriinae, and some Anthicinae in having the parameres or lateral lobes of the tegmen fused throughout (Crowson, 1953:42, Fig. 143); and from Macratriinae in having the internal keel of hind coxa reduced to a narrow-based apophysis (Crowson, 1953:46, Fig. 152). I therefore place these genera in the new subfamily Lagrioidinae, with the first 2 visible abdominal sternites connate as a distinguishing feature.

In my opinion the following are the **primitive characters** of the Lagrioidinae: neck wide (as in Pedilinae, Copobaeninae, Eurygeniinae, and ancestral families Pyrochroidae and Pythidae, etc.); mes-episterna meeting or nearly so in front of mesosternum (as in most anthicids except *Macratria* and *Loubacantus*); and internal keel of hind coxa reduced to a narrow-based apophysis (as in all known anthicids except *Macratria*).

The following are the **derivative distinguishing characters** of Lagrioidinae: apical segment of maxillary palp securiform (as in *Loubacantus* etc.); meso-coxal cavities nearly open; hind coxae widely separated by a broad process of the first visible abdominal sternite (as in Anthicinae); aedeagus with the lateral lobes or parameres fused throughout (as in Eurygeniinae or Copobaeninae etc.); and first 2 visible abdominal sternites connate (unlike any other known subfamilies). The subfamily Lagrioidinae is in certain respects intermediate between Eurygeniinae and Anthicinae, and is a derivative group on the whole.

Tribes of Lagrioidinae

Within the Lagrioidinae, it is possible to distinguish 3 tribes: 1) Lagrioidini for the winged *Lagrioida,* now removed from the Eurygeniinae, with the penultimate segment of the tarsi furnished with a long lobe on each side, these lobes only united at the base (Champion, 1890:122); 2) Cononotini for *Cononotus,* a derivative wingless group, adapted for dry life; and 3) Agnathini for *Agnathus,* a primitive winged group, adapted for life under bark. In the last 2 tribes the penultimate segments of the tarsi are not evidently bilobed. All the tribes have the first 2 visible abdominal sternites connate (unlike any other subfamily) and metacoxae widely separated (as in Anthicinae and unlike Eurygeniinae). When I noticed that *Lagrioida* is also reported to have the hind coxae widely separated as in Anthicinae (Champion, 1890:121), then I immediately recognized that the 3 genera belong to the same subfamily and cannot be placed in Eurygeniinae or any other known subfamily.

After this work was completed, Dr. Heinz Freude showed me 4 specimens of *Agnathus decoratus,* and we checked the middle coxal cavities. They are *definitely open* (as in other Anthicidae), although the meso- and meta-sterna come close together and the mes-epimera reach the meso-coxal cavities. Not only his interpretations but Crowson's observations are sometimes incorrect. The meso-coxal cavities are clearly open in other subfamilies and nearly open in Lagrioidinae but they are not closed. Within the Anthicidae, the connation of abdominal sternites forms a derivative monophyletic group (Lagrioidinae), although this character also has evolved polyphyletically elsewhere in the order Coleoptera.

Ban on New Families in Coleoptera

Crowson (1970:296) predicts that "The description of new species will inevitably form a continually decreasing proportion of the activity of systematists", and I hope that this will also apply to the description of new families in Coleoptera. If Oldroyd (1966:260) knew the practice of some authorities in my group, surely he would have made the plea for a ban on new families as well as new species: "It should be emphasised that the suggested ban would be on the description and naming on new species only. No one would be thereby prevented from studying species as much as he liked, making keys to them, studying their biology, life histories, early stages. Work done on clearing up known species, bringing them together into a synopsis, is infinitely more valuable than publishing the names of another dozen new species".

A KEY TO THE WORLD SUBFAMILIES OF ANTHICIDAE
(Abdullah, 1969)

1.	Hind coxae contiguous and not separated by a distance more than the length of coxa	2
1′.	Hind coxae widely separated by a distance more than the length of coxa	6
2(1).	Neck narrow (width much less than half of head across tempora)	3
2′.	Neck wide (width more than half that of head across tempora)	4
3(2).	Front coxal cavity open visibly and internally; internal keel of hind coxa reduced to a narrow-based apophysis	Steropinae
3′.	Front coxal cavity internally closed; internal keel of hind coxa long and simple	Macratriinae
4(2′).	Front coxal cavity open visibly and internally; aedeagus with the lateral lobes separate at apex	Pedilinae
4′.	Front coxal cavity internally closed; aedeagus with the lateral lobes fused throughout	5
5(4′).	Pronotum rufous and not apically flanged; tarsal claws basally toothed or simple; ovipositor with 2-segmented coxites	Copobaeninae
5′.	Pronotum not rufous and apically flanged, if not flanged then galea palp-like; ovipositor usually without completely 2-segmented coxites	Eurygeniinae
6(1′).	Neck wide; middle coxal cavities nearly open; first 2 visible abdominal sternites connate	Lagrioidinae **Subfam. nov.**
6′.	Neck narrow; middle coxal cavities clearly open; all abdominal sternites free	Anthicinae

A key to the world tribes, genera, and species of Lagrioidinae
(Van Dyke, 1939 for *Cononotus*; offered tentatively)

1. Winged, penultimate tarsi almost simple (Europe) .... Agnathini; *Agnathus* Germar; *A. decoratus* (Germar)

1′. Winged, penultimate tarsi bilobed (New Zealand, Chili, Tasmania) .... Lagrioidini; *Lagrioida* Fairm. et Germ.
  a) *L. australis* Champion (Tasmania; antennae short)
  b) *L. brouni* Pascoe (New Zealand; antennae long, punctures coarse)
  c) *L. obscurella* Fairm. & Germ. (Chili; antennae long)

1″. Wingless, penultimate tarsi almost simple (U.S.A.)............Cononotini; *Cononotus* LeConte 2

2. Punctures on elytra fine, dense, and irregular; 2.75-4.25 mm 3

2′. Punctures on elytra coarse and in regular rows.. 5

3(2). Pubescence fine, sparse, not hiding surface sculpture below; pronotum as wide in front as long 4

3′. Pubescence dense, more or less hiding surface sculpture below; pronotum narrower in front than long; elytra elongate, elliptical, nearly 2.5 times as long as broad; 4 mm (S. Arizona) .... *C. bryanti* Van Dyke

4(3). Head finely, sparsely punctate; antennal segments VII-X transverse; pronotum widest one-fourth distance from apex; elytra elliptical, twice as long as broad, somewhat dull and with punctures moderately coarse and close in front and very fine behind; 2.75-3.25 mm (S. California) ....*C. sericans* LeConte

4′. Head coarsely, densely punctate; antennal segments all as long as, or longer than broad; pronotum broadest close to apex; elytra elongate elliptical, over twice as long as broad, somewhat shining and with punctures fine and sparse in front and very minute behind; 4.25 mm (Idaho) ....*C. lanchesteri* Van Dyke

5(2′). Pubescence fine, sparse, not covering surface sculpture below............ 6

5′. Pubescence dense; elytra elliptical, striae not impressed; 3 mm (Owen's Valley, California) .... *C. macer* Horn

6(5). Dark; elytral striae clearly impressed, elytra slightly broader anteriorly; 2.5-3 mm (Los Angeles, California)... *C. substriatus* Van Dyke

6′. Testaceous, coloured; elytral striae not clearly impressed, elytra elliptical; 1.75-2 mm (Santa Clara & Alameda counties, California)... *C. punctatus* LeConte

World Catalogue of Lagrioidinae

Fam. Anthicidae Latreille, 1825
Cononotidae Crowson, 1953, Ent. Mon. Mag. 89:52
(New Synonymy)

Lagrioidinae Abdullah

Lagrioidini Abdullah & Abdullah, 1968, Ent. Mon. Mag. 104:73.
Batobiini (Lacconotinae-Pythidae), partim, Blair, 1928, Col. Cat. 99:29.
Melandryidae (partim), Champion, 1890, Ent. Mon. Mag. (2)1:121; 1895, Trans. Ent. Soc. London:238.
Lagriidae (partim) auctorum.
Pythidae (partim) auctorum.
Salpingidae (partim) auctorum.
Cononotidae auctorum.

Tribe Lagrioidini

Genus *Lagrioida* Fairm. & Germ., 1860

Lagrioida Fairm. et Germ., 1860, Col. Chili:3; 1863, Ann. Soc. Ent. France (4)III:234; Champion, 1890, Ent. Mon. Mag. (2)1:121; 1916, Ent. Mon. Mag. (3)II:102; Seidlitz, 1917, Mon.:89(1153); Crowson, 1953, Ent. Mon. Mag. 89:52; Abdullah & Abdullah, 1968, Ent. Mon. Mag. 104:73 (in Anthicidae, tribe Lagrioidini).
L. australis Champion, 1895, Trans. Ent. Soc. London:238. **Tasmania.**
L. brouni Pascoe, 1876, Ann. Mag. Nat. Hist. (4) XVIII:58. **New Zealand.**
L. obscurella Fairm. & Germ., 1860, Col. Chili:4; 1863, Ann. Soc. Ent. France (4) III:235. **Chili.**
L. rufula Fairm. & Germ., 1860, Col. Chili:4; 1863, Ann. Soc. Ent. France (4)III:235; Champion, 1895, Trans. Ent. Soc. London:238 (synonymy). **Chili.**

Tribe Cononotini

Cononotini LeConte, 1862, Class. Col. N. America I:254; LeConte & Horn, 1883, Class. Col. N. America II:403; Seidlitz, 1917, Mon.:87(1151).
Cononotinae Blair, 1928, Col. Cat. 99:28.
Cononotidae Crowson, 1953, Ent. Mon. Mag. 89:52 (41 key).

Genus *Cononotus* LeConte, 1851

Cononotus LeConte, 1851, Ann. Lyc. New York 5:137; Lacordaire, 1859, Gen. Col. 5:434; Horn, 1868, Trans. Amer. Ent. Soc. 2:136; Blair, 1928, Col. Cat. 99:28; Crowson, 1953, Ent. Mon. Mag. 89:52.
C. bryanti Van Dyke, 1939, Pan-Pac. Ent. 15:18. **Arizona.**
C. lanchesteri Van Dyke, 1939, Pan-Pac. Ent. 15:19; Hatch, 1965, Beetles Pac. Northwest 4:87. **Idaho, Utah.**
C. macer Horn, 1868, Trans. Amer. Ent. Soc. 2:136; Seidlitz, 1917, Mon.:87(1151); Van Dyke, 1939, Pan-Pac. Ent. 15:20. **California.**
C. punctatus LeConte, 1851, Ann. Lyc. New York 5:138; Seidlitz, 1917, Mon.:87(1151). Van Dyke, 1939, Pan-Pac. Ent. 15:20. **California.**

C. sericans LeConte, 1851, Ann. Lyc. New York 5:137; 1857, Ent. Report:51, Pl. 2, Fig. 3; Lacordaire, Gen. Col. Atlas:Pl. 57, Fig. 2; Seidlitz, 1917, Mon.:87(1151). Van Dyke, 1939, Pan-Pac. Ent. 15:20. **California.**

C. substriatus Van Dyke, 1928, Bull. Brooklyn Ent. Soc. 23:258; Van Dyke, 1939, Pan-Pac. Ent. 15:20 (? *striatus*). **California.**

Tribe Agnathini

Genus *Agnathus* Germar, 1825

Agnathus Germar, 1825, Fn. Ins. Eur., Fasc. 12:Pl. 4; Crowson, 1953, Ent. Mon. Mag. 89:52; Kaszab, 1969 *in* Freude, Harde, & Lohse, Die Käf. Mitteleur. 8:215.

Notoxus (partim), Germar, 1818, Magaz. d. Entom. III:232 ("Megerle v. Mühlfed hat einen diesem entweder sehr ähnlichen, oder vielleicht gar denselben Käfer *Agnathus ornatus* genannt" for *Notoxus decoratus* Germar, but I have not yet found Mühlfed's [or Mühlfeld's] publication!)

A. decoratus (Germar) 1818, Magaz. d. Entom. III:229 (in *Notoxus*); 1825, Fn. Ins. Eur., Fasc. 12: Pl. 4 (in *Agnathus*); Kaszab, 1969, *in* Freude, Harde, & Lohse, Die Käf. Mitteleur. 8:215. **Europe.**

Zusammenfassung

Frühere Autoren stellten die heteromeren Käfergattungen *Lagrioida* Fairm. et Germ., *Cononotus* LeConte und *Agnathus* Germar zu den Pythidae, Salpingidae, Lagriidae, Melandryidae und Cononotidae und interpretierten ihre Ähnlichkeiten mit den Anthicidae mehr als Resultat konvergenter Entwicklung als das phylogenetischer Verwandtschaft, was der Autor als falsch erkannt hat. Sie sind zweifellos Anthiciden und Cononotidae Crowson 1953 ist ein jüngeres Synonym für Anthicidae Latreille 1825 (**syn.n.**). Bei den *Lagrioida* (wie auch den anderen beiden Gattungen) sind die Metacoxae weit voneinander getrennt (wie bei den Anthicinae) und sie unterscheiden sich in diesem Merkmal wie auch durch die (abweichend von den anderen Unterfamilien) verwachsenen ersten beiden sichtbaren Abdominalsternite von allen Eurygeniinae. Sie werden deshalb aus den Eurygeniinae herausgenommen und in eine **neue Unterfamilie** Lagrioidinae Abdullah gestellt—eine abgeleitete Gruppe, die mehr oder weniger zwischen den Eurygeniinae und Anthicinae steht. Zusammen mit den bekannten ursprünglichen und abgeleiteten Merkmalen wird ein Schlüssel zu den Unterfamilien der Anthicidae der Welt, den Tribus (Lagrioidini, Agnathini und Cononotini), Gattungen und Arten der Lagrioidinae vorgelegt. Auch ein Katalog der Lagrioidinae (Anthicidae) wird aufgestellt. Abschliessend drängt der Autor darauf, dass die von einigen Autoritäten vorgeschlagenen Einschränkungen oder Verbote in der Beschreibung neuer Arten auch auf die Beschreibung neuer Familien bei Käfern und anderen Gruppen ausgedehnt werden sollte.

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A METHOD FOR PRODUCING ACCURATELY PROPORTIONED OUTLINE DRAWINGS OF INSECTS

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Outline drawings can be one of the most useful aids to identification of insects whether they be in manuals or in generic revisions. Some people have a natural ability to draw accurately proportional outlines. Most of us lack this facility.

A number of devices are used to overcome the natural inability to get good outlines by freehand. One of these is the effective but tedious use of quadrilled paper in conjunction with a ruled ocular in the microscope. Very good results can be achieved with this method, but it is time consuming. The drawbacks to the camera-lucida are apparent to anyone who has used one. The use of the drawing tube microscope attachment is limited to slide mounts for satisfactory results.

The following technique has proved to be reasonably fast and accurate with both large and small specimens. It requires a Polaroid Automatic 350 Land camera with the necessary attachments and adaptors for an ordinary dissecting microscope. The advantage of the Polaroid camera is that the first picture is developed in a matter of seconds. If additional photos are required, the specimen may at once be repositioned or the light adjusted if necessary for a sharper, better defined picture. My photographic technique is so poor that I have yet to produce a photograph suitable for reproduction in itself, but I can get a good outline of the insect after 1 or 2 attempts. The photo is enlarged to the appropriate size, and an outline drawing in pencil is made on tracing paper. Then, using a tracing table, an ultimate outline drawing, again is made in pencil on quality drawing paper from the first tracing. The last step is inking the drawing.

Throughout this process, the correct proportion of the various parts of the insect are maintained. Details can be filled in if so desired by those who have the artistic ability to do so.

FLASH BEHAVIOR OF A NOVA SCOTIAN FIREFLY, *PHOTURIS FAIRCHILDI* BARBER, DURING COURTSHIP AND AGGRESSIVE MIMICRY (COLEOPTERA, LAMPYRIDAE)[1]

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Abstract

Photuris fairchildi Barber was the only *Photuris* firefly found in Nova Scotia and was common in most moist habitats. Males usually produced single flashes, but in some localities they produced 3- and 4-pulsed flash patterns; flash patterns of individual males varied from 1 to 6 flashes but the pause (time from end of one flash pattern to the beginning of the next) was relatively constant (2.4 to 2.6 sec). Females answered male flash patterns at delays of about 1.5 sec. As the male approached the female, the number of flashes in each male flash pattern and in each female response increased and the flashing of both soon became continuous. The entire dialogue lasted 10-20 sec. Females also answered flashes of other fireflies: *Pyractomena linearis* Leconte, *Pyractomena borealis* (Randall) and *Photinus ardens* LeConte and ate those attracted (aggressive mimicry). Aggressive mimic responses were single flashes and *Photuris* males apparently avoided their predatory females by landing only for responses that include a series of flashes.

Introduction

Barber (1951) believed that flash behavior of *Photuris* fireflies was species specific and described a number of new species, including *Photuris fairchildi,* largely on this basis. Subsequently, flash signals were found to function in courtship (pair formation) and they reproductively isolated different firefly species (Lloyd 1966). Most North American fireflies use flash-answer communication in courtship (Lloyd 1971). However, the flash communication utilized by *Photuris* fireflies in courtship is still largely a mystery. Courtship flashing in *Photuris divisa* LeConte involved flash-answer signals (Buschman 1972). Females of many other *Photuris* species utilize flash-answer signals to attract males of other firefly species and prey on those attracted (aggressive mimicry, Lloyd 1965; 1973). Courtship flashing has not yet been reported in these fireflies. In this paper I describe the flash behavior of *Photuris fairchildi* during courtship and during aggressive mimicry.

These observations were made during the summers of 1968 and 1969 in the vicinity of Bridgewater, Lunenburg Co., Nova Scotia. *Photuris* fireflies were also noted in Kings, Halifax and Colchester counties. They were common in moist habitats such as marshes and spruce forests. Adults were observed from mid June to late July.

[1]University of Florida Journal Series No. 4935.

Taxonomic Considerations

Initial observations suggested that there might be several species of *Photuris* fireflies in Nova Scotia. Several flash patterns were observed in different localities and among individuals within these populations. The flash patterns included 1 to 6 flashes and were repeated about every 2.5 sec. However, the following observations indicated that there was only 1 species, *Photuris fairchildi*: 1) I found no correlation between flash pattern and kind of habitat or geographic distribution. 2) The flashing repertoire of individual fireflies often included most of the flash patterns observed at that location. The following is a list of the number of pulses per flash pattern observed in individual fireflies: 1 only; 1 and 2; 1, 2 and 3; 1, 2 and 4; 2 and 3; 3 only; 3 and 4; 4 only; 4 and 5; 6 only (this list was compiled from several localities). In addition the number of flashes often increased as the male approached an answering female or flashlight (described below). 3) Analysis of flash patterns revealed that the pause (time from the end of one flash pattern to the beginning of the next) was fairly constant (see Table I). For example: when the duration (time between first and last flash of a flash pattern) of 3-pulsed flash patterns (0.82 sec) is subtracted from the interval (time from first flash of one flash pattern to the first flash of the next) following 3-pulsed flash patterns (3.3 sec) the remainder or pause (2.48 sec) is about equal to the pause or interval between single pulsed flash patterns (2.38 sec). Comparison (by analysis of variance and Scheffe's test) of the intervals following similar flash patterns by different individual fireflies revealed no significant difference (= .05). 4) The flash exchange between male and female leading to copulation was observed for single and 4-pulsing fireflies. I observed no differences in the dialogue beyond the initial difference in flash pattern (described below).

Photuris fairchildi was described from specimens and observations sent from Baddeck, Nova Scotia, by Graham Fairchild (Barber 1951). My observations agree with those of Fairchild (Barber 1951): "they were caught over marshy ground" and "they fly rapidly and emit two medium flashes separated by an interval about twice as long as one flash, *but . . . the flashing* [*was*] *not very regular*" (emphasis mine). I did not find any populations in which double flashes predominated; however, the variability I observed would suggest that such populations probably occur.

The behavior of 2 fireflies was unusual but I lacked sufficient data to determine if they were *Photuris fairchildi*. In Bridgewater and near Middle Musquodoboit I observed single males producing 6-pulsed flash patterns in demes where single pulsed flash patterns were common. This was atypical because all other 4- or 5-pulsed flash patterns were observed in predominantly triple pulsing populations.

Courtship Flashing

The flash exchange between male and female leading to copulation was observed on 2 occasions. First, in a locality in which most males were producing single flashes, a flying male flashing at 3.0 and 2.8 sec intervals received a response flash from the vegetation about 10 ft away. The response was a single flash at a delay of about 1.5 sec. The male turned, flew in the direction of the response and flashed again. He received a similar response. The next male flash pattern had 2 flashes, the second being dimmer than the first. The male landed about a foot from the female and produced a 3-pulsed, then a 4-pulsed flash pattern as he moved toward the female. At the same time the number of flashes in the female response increased each time. The number of flashes produced by each increased until they were both flashing at the same time and I could no longer detect a response interval; the flashing was nearly continuous. They met under a leaf and stopped flashing. When I turned the leaf over, they fell to the ground in copulation, male dorsal to the female. A second male nearby began flashing and climbing around during this exchange in a manner similar to the first male. Later in the same vicinity another male and female exchanged flashes as described above except, that after the male landed and approached, the female response decreased and she began moving about; they did not meet. The second observation of flash exchange leading to copulation was in a location where most males were flashing 3 or 4 pulsed flash patterns. A male producing 4 pulses received a response flash from the vegetation 2 ft below him. The next male flash pattern was a long series of flashes. The female began flashing during this series of flashes and both were flashing continuously when the male landed about 0.5 inch from the female and mounted her. The whole sequence took less than 10 sec. On another occasion in this location, flash exchanges were observed between 2 flying fireflies. Again the number of flashes each produced increased as they approached each other. They flew to a tree and landed. I was unable to collect this pair to confirm mating or sexes.

Male *Photuris* fireflies were observed to approach random, repeated or answering flashlight flashes and both male and female *Photuris* flashes. Sometimes they would land and climb onto an answering flashlight, but more often they would approach, hover several feet away and repeat the flash pattern several times before flying away. As males approached a source of

Table I: Characteristics of male *Photuris fairchildi* flash patterns. Measurements were obtained by following individual fireflies and verbally recording their flashes with a tape recorder. The duration (time between first and last flash of a flash pattern) and the interval (time from first flash of one flash pattern to the first flash of the next) were later measured from the tape playback using a stopwatch. These measurements were then grouped according to the number of flashes in the first flash pattern. The pause (time from the end of 1 flash pattern to the beginning of the next) was obtained by subtracting the duration from the respective interval. Thirteen of 29 fireflies produced more than 1 kind of flash pattern.

Flash no. per flash pattern	interval (sec)	no. of measurements	duration	no. of measurements	pause (sec)
1	2.38*	148			2.38
2	2.97*	34	.57*	3	2.40
3	3.30*	74	.82*	54	2.48
4	3.55	25	.95*	21	2.60

*significantly different α = .05 (analysis of variance and Scheffe's test) flashes the number of flashes per flash pattern often increased: in single-flashing demes they became 2 pulsed, in triple-flashing demes they became 4 or 5 pulsed. One evening I succeeded in attracting a number of males to a flashlight which I held in the grass. When I removed the flashlight the flashing of these males attracted several other flying males. Both males and females produced repeated single flashes when handled and in other contexts.

Aggressive Mimicry

Females of *Photuris fairchildi* are aggressive mimics; they answer the flash signals of males of other species of fireflies mimicking their female signals and preying on those they attract. This behavior has been observed in other species of *Photuris* (Lloyd 1965; 1973). Several times I found *Photuris* females holding or standing near chewed-up males of *Pyractomena linearis* and *Pyractomena borealis*. The female responses of these 2 species are single flashes at response intervals of about 1.5 and 1 sec respectively. *Photuris* females commonly answered flashlight signals with single flashes (rarely more than 1) and at response intervals varying from 0.8 to over 4 sec but usually 1 to 1.5 sec. One evening I received several flash responses (at about 1 to 1.5 sec delays) from a *Photuris* female perched on a roadside plant. I left for a short time. When I returned I noted some erratic flashes from this plant. On investigation I found the female holding a newly captured male *Pyractomena borealis*. On another occasion I noted flash exchanges in the grass. A female answered the male with single flashes at short delays (1 to 1.5 sec) while he crawled toward her. When the flashing stopped I investigated and found a *Photuris* female holding a male *Pyractomena linearis*. Another evening a male *Photinus ardens* was flying over a grassy meadow producing a slow triple flash pattern. He received a response flash from the grass about 2 sec after his last flash and then landed. I turned on my flashlight expecting to collect a female *Photinus ardens* but found a *Photuris* female instead.

Sometimes *Photuris* females answered *Photuris* male flashes with single flashes but did not increase the number of flashes in succeeding responses. The male would hover, repeat his flash signal several times, then fly away. These females may have been aggressive females. The *Photuris* males apparently will not land unless the female response changes to a series of flashes.

Discussion

Courtship flash communication among *Photuris* fireflies has rarely been observed and remains a mystery in most species. Williams (1917) and Hess (1920) were convinced that flash communication was involved in courtship of *Photuris* fireflies, but they could not detect flash-answer communication as they did in other American fireflies. Flash-answer communication was later observed in *Photuris divisa* LeConte (Buschman 1972). In this species the female answered the male flash pattern with 1-6 pulses at a response interval of about 1.5 sec. Male *Photuris* fireflies of as many as 15 species (including *Photuris fairchildi*) can be attracted to answering flashlight signals (J. E. Lloyd, personal communication). In *Photuris fairchildi* the courtship flashing appeared to begin with flash-answer signals but then shifted to continuous flashing. Continuous flashing during courtship was also observed in other *Photuris* species by Hess (1920) and Barber (1951). Hess stated that "both continued to flash actively," and Barber stated that there was a "quickened repetition of the male's signals as he approached [the female] in a long oblique descent." The communicative parameters of these courtship exchanges are still not understood but flash-answer signals appear to be involved.

An understanding of courtship communication in *Photuris* fireflies is complicated by the fact that females of many species (e.g., *Photuris versicolor* and *Photuris fairchildi*) are aggressive mimics. Aggressive mimicry raises several questions about the flash behavior of these fireflies. Do aggressive mimics use their own courtship signals to attract prey? Do they prey on their own males as well as the males of other species? My observations indicate that in *Photuris fairchildi* the flash signals differ in the 2 situations. During aggressive mimicry the *Photuris* female answers males with single flashes usually at response intervals of 1 to 1.5 sec. During courtship the first female response may also be a single flash at a response interval of 1 to 1.5 sec but the number of flashes in her response increases as the dialogue proceeds until she appears to be flashing continuously. *Photuris* males will approach many kinds of flashes, but they apparently are less likely to land if the responses remain single flashes. They apparently can avoid predatory females by landing only for responses including a series of flashes. I have not observed *Photuris* females preying on males of their own species except in captivity, although J. E. Lloyd found a female *Photuris* eating a male *Photuris* in a site in northern Michigan where presumably only 1 species (*Photuris fairchildi*?, JEL det.) occurs (personal communication).

Acknowledgments

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THE
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MINUTES OF ANNUAL MEETING

The sixth annual meeting of the Coleopterists Society was held November 28, 1973, at the Statler Hilton Hotel in Dallas. President George Ball welcomed members and reminded them that the society was reconstituted in Dallas 6 years ago through the efforts of Lee Herman and Tommy Allen. Copies of the agenda were distributed. That numbering system is followed in the minutes.

1. Lois O'Brien was appointed secretary pro-tem.

2. The minutes of the 1972 meeting were accepted as published in the Newsletter No. 8, January 1973.

3. Business arising from the minutes.

3.1 **Publications Committee** (Arnett, Woodruff, O'Brien). Charles O'Brien reported on the possibility of purchasing the stock of the first 24 volumes of the Coleopterists Bulletin. Volumes 1-3 are out of print. Volumes 4-20 are held in part by a private individual and part by Catholic University. Volumes 21-24 are held by Purdue University until such time as they recoup their expenses by selling back issues. At that time they are to be turned over to the Society. These interests will sell the volumes to the society for $2,000, but we would receive only 8 complete sets of 4-24 and 37 complete sets of 5-24. In addition to the cost of purchase, some place of storage would be needed. Bob Woodruff would permit an aluminum storage shed to be erected in his yard at the Society's expense, but it would not be air-conditioned, which is almost a necessity with the humidity in Florida. Volumes 1-3 (240 p.) could be reprinted at a cost of $1,440 to us and stored or we could authorize someone such as Xerox University Microfilms to make volumes 1-3 available, at a 15% royalty to the Society. O'Brien moved that the executive committee be empowered to approach and authorize a reprint specialist to arrange for their type of publication of the earlier sets. Herman seconded. Harley Brown amended to read that the executive seek the best source to make reprints available on demand. Howden seconded. Motion carried to amend. Motion carried as amended.

3.2 **Field Trip Committee** (Burke, Gibson, Murray). Horace Burke reported that 26 people will leave Thursday for Welder Wildlife Refuge, Sinton, Texas staying until Monday. They were to meet after this meeting to form car pools and plan travel routes.

3.3 **Constitutional Changes.** The ballots for the changes proposed last year for the length of term of office were accidentally omitted from the ballot for officers. They will be sent separately soon.

4. Business arising from the Executive meeting, November 26, 1973. (Wenzel, Burke, Erwin, Lawrence, Ball).

4.1 The **Finance ad hoc committee** (Erwin, Spilman, Spangler, Kingsolver) proposed to the executive committee that the excess funds of the society be used as follows: that one year's reserve be kept (for this year $5,000, half in savings, half checking) and that anything over this be used to increase the size of the bulletin. Hopefully this year the bulletin would have an additional $1,000 to spend. The executive committee approved. The members present approved.

4.2 Spilman had asked the executive committee to approve the selection of honorary or distinguished members. The executive recommends no additional classes of membership. Henry Howden suggested for executive consideration the possibility of including a class of emeritus members.

4.3 Woodruff had suggested organizing a trip to Mexico of one month duration, with the society buying a bus which could be stored in Gainesville between trips. The executive thought this too complicated and recommended that members use the Newsletter to organize group trips.

Howden reported that a group is leaving Ottawa for the Amazon February 22 to March 3 at a cost per person of $500. Contact him for further details.

4.4 Woodruff had suggested that the 1974 meeting perhaps be held in summer. The executive recommended it continue to be held with the annual meeting of the E.S.A. as people might have difficulty getting funds for more than one trip. Valentine moved that the Coleopterists Society meet with the E.S.A. for 1974. Murray seconded. Motion passed. Ball suggested that perhaps in 1976 we might meet with the International Congress of Entomology in Washington rather than the E.S.A. in Hawaii.

4.5 Lois O'Brien had requested that the executive consider nominating 3 members to the councils of the Association for Systematic Collections. Three amateurs were nominated as it was thought that this might be the only way for amateurs to be represented. Two refused. The third's nomination is being held in abeyance as the council was filled. President Ball recommended that each year someone be nominated to these councils.

4.6 J. Howard Frank proposed that the Society prepare a color code for Coleopterists and use it in our publications. The executive approved but asked him to explain. He reported that the standard reference codes (Ridgway's, which the ornithologists use, Munsell Color Chart, the U. S. Bureau of Stds. Chart, 1928, and Seguy Color Standards) are out of print or very expensive. Several people reported that Scott's Color Key, used for stamp collecting, was inexpensive ($6 to $8), but good, but warned that the $.50 versions of the same chart varied from card to card. Frank proposed that a paint company be approached and asked to print color chips of the colors we might use. [Ed. note: In later discussion he used the analogy of trying to write a scientific paper with a very imprecise knowledge of the English language and no dictionary.] The executive committee will ask the next executive to take it under advisement and report in the Newsletter.

5. Reports of officers.

5.1 President Ball. It was a quiet year with a brilliantly responsive executive committee which was used only sparingly. The issues considered were constitutional amendments, incorporation of the Newsletter into the Bulletin, length of time for delinquent members to pay dues, and the items reported from the executive meeting. Ad-hoc committees established were those reported upon here, the publications committee, field trip committee, finance committee, an organization committee for the Boulder meetings (Erwin and Ball) and a scientific program committee-Dallas meeting (Lawrence).

A notable event was the First International Congress of Systematic and Evolutionary Biology, at Boulder, Colorado, August, 1973. It was first class and one of the best Congresses I ever attended with excellent planning, papers, discussion groups, informal meetings, and field trips.

It had been suggested by members present at the annual meeting in Montreal that the Coleopterists Society organize a discussion group, with the view to getting together the coleopterists at the meeting. It was hoped that a lot of people would be present from overseas, and we could have a general exchange of views. Terry Erwin and George Ball organized a Coleopterists gathering, on behalf of the Coleopterists Society. They also organized a discussion group for carabid specialists.

At the Coleopterists Gathering, mis-termed a business meeting of the Coleopterists Society, about 30 people were present. Items presented or discussed were: membership list of the Society, presented by Erwin; preliminary report on plans for the Field Trip to the Welder Refuge, by Bob Murray; aspects of the North American Beetle Fauna Project; Quaternary beetle fossils, by Alan Ashworth; coleopterous larvae and classification, by Dave Kavanaugh and Henri Goulet; information storage and retrieval systems for data on Coleoptera, by Erwin; report on the ASC meetings by Lois O'Brien, and a request that the Society nominate members for standing councils of ASC.

The carabid specialists meeting was attended by 22 people, most of whom worked on other groups, but were made honorary ad hoc carabid specialists. Invitations were sent to many European workers, but none attended. The meeting began with a rambling, disjointed account of the history of study of carabids, as a background for consideration of the present-day state of the art. Then, there was a show and tell session, at which members explained what they were doing. Time was spent on discussion of higher classification, with special reference to the question of what to do with the tiger beetles—in or out of the Carabidae. This led to a more general discussion of higher classification, its methods and aims. Ashworth again reported on some of his work with fossil carabids.

Although the objective to meet with coleopterists from outside the North American continent was not fully realized (actually, a few were there: Dr. Wittmer from Basle, Switzerland), the sessions explored a number of facets of coleopterology, and were thoroughly enjoyable. In fact, the Chairman had a most difficult task of persuading the members at the gatherings that they had had enough when the hour grew late, and that they should consider adjournment. One member of the organizing committee from the University of Colorado who attended our sessions rated them very highly.

In addition to attending the formal meetings, the coleopterists present availed themselves of the opportunity to collect in the nearby mountains, etc.

Archives—In a letter dated April 24, 1973, Paul Spangler informed the president that the Coleopterists Society Archives have been transferred to the Smithsonian Archives. Material for deposit can be sent to Paul, for transmittal.

The Bulletin—This is our most significant contribution to the furtherance of beetle study, and it flourished during the past year, under the able editorship of Bob Woodruff.

The Newsletter—Continued to be informative and thus of value to the members. Its contents can be improved only if you, individually, contribute to it. Thanks to the O'Briens.

Conclusion—The Executive Committee was as active as was required, and progress that the Society made is directly attributable to their efforts. The membership was peculiarly quiet. No more than a handful of letters were received by the president, and no angry ones, protesting the activities, or lack of them. Remember, it is your Society. The Executive is elected to run it, but only as your representative. You should advise your representatives of your desires.

5.2 Secretary Gordon. Terry Erwin reported for him that the secretary listed about 50 members who had not paid dues since 1971, or before. Fifteen of these members paid up. Thirty to 35 were dropped. There are 47 new members and 3 new institutions subscribing to the Bulletin.

(Cont. p. 39)

ZOOGEOGRAPHY OF TWO NEOTROPICAL SIBLING SPECIES OF CHAULIOGNATHIDAE WITH A REDESCRIPTION OF THE SPECIES

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Abstract

Two sibling species of *Chauliognathus* range from southern Mexico through Central America to northwestern South America as far south as Bolivia and eastward into Venezuela. A zone of species overlap occurs at the Cordillera de Talamanca in Costa Rica. A model is presented describing origin and dispersion of the species in light of current concepts of plate tectonics. The species are redescribed and compared with other members of the genus.

Introduction

Neotropical Chauliognathidae are rather poorly known, although Central American forms have been studied by Gorham (1881, 1885), Champion (1914), and Miskimen (1966). During my studies of the group, a number of museum collections, plus field collecting, provided sufficient specimens to reveal some interesting relationships between 2 widespread species of southern Mexico, Central America, and the northwestern region of South America.

The first of these species, *Chauliognathus pallidus* Waterhouse (1878), is distributed from southern Mexico south of the Mexican Plateau to Costa Rica, while the second species, *C. cinguliventris* Erichson (1847), is relatively abundant from Costa Rica southward along the Andean Mountain system to Bolivia and eastward into the Cordillera de Merida and llanos of Venezuela. The 2 species were not distinguished by Gorham (1881, 1885) nor by Champion (1914) although each listed *C. pallidus* as ranging from Mexico southward into Panama. *C. cinguliventris* has previously been described as from Peru by the original author and by Blackwelder (1945), the latter listing *pallidus* from Colombia as well as its actual range.

The 2 species represent very closely related siblings that differ superficially only in the presence of postero-lateral brownish-black or black maculae on the fifth abdominal tergite that may in some specimens be expanded to form a continuous band encompassing both sternite and tergite. Aedeagi are identical, except for a small but consistent conformational difference of the right paramere (Fig. 1 and 2).

Origins and Zoogeography

C. pallidus and *cinguliventris* are clearly more closely related than virtually any other pair of New World Chauliognathidae as evidenced by aedeagal similarity in a group where genitalic characters are highly diagnostic. Differentiation of the 2 species appears to have been a relatively recent occurrence.

The following model, describing possible origin and subsequent distribution of the species, is based primarily upon historical geological factors plus closeness of species affinities. Relationships between members of *Chauliognathus* elsewhere suggest that ancestral forms arose as forest-adapted carnivores on the primeval Gondwanaland continent. At some time after South America separated from the continent, an element or elements of the Neotropical fauna evolved adult phytophagous habits. The Cretaceous period appears to be the most logical time for this event, since angiosperm radiation was rapid at that time. The known upper Cretaceous land bridge between North and South America apparently permitted northward dispersal of members of the genus as evidenced by known *Chauliognathus* species from Colorado Florissant deposits that are regarded as upper Oligocene or Miocene (Scudder 1876, Wickham 1909). Further species exchange between North and South America was effectively prevented from late Eocene to late Miocene or early Pliocene by the Bolivar geosyncline, a 60 to 100 mile wide seaway, formed during initial stages of the Andean orogeny, that separated the Darien of Panama from continental South America (Olsson 1932, Nygren 1950).

West of the Bolivar trough, the San Blas region of Panama is believed to have been a relatively stable island throughout much of the Cenozoic Era. It was periodically connected with land elements of the Isthmian Panama-Costa Rica-southern Nicaraguan marine portal zone. North of the latter portal, paleontological evidence suggests a more or less continuous land mass leading to North America proper (Whitmore and Stewart 1965). Finally, in late Miocene and early Pliocene, the marine portals were closed uniting North and South America and remain so today. In addition, and important to development of the proposed speciation-distribution model, the Cordillera de Talamanca, located in Costa Rica and northwestern Panama, was uplifted at the same time.

Considering present distribution and historical water barriers and drier habitat preferences of *C. pallidus,* it seems likely that a population of that species became isolated during uplift of the Cordillera de Talamanca. Sufficient divergence occurred to produce the distinct species, *cinguliventris,* that was first able to dominate the wetter uplands of the Cordillera and then was able to traverse the lowland Panamanian rainforest because of moist habitat adaptation and was able to extend its range into South America via the Andes Mountains. Northward distribution apparently has not been possible due to drier general habitat situations and to niche occupation by *pallidus,* which, in turn, has not been able to cross the lowland rainforest barrier of eastern Panama and the west coastal region of Colombia.

A zone of species overlap exists in the Meseta Central-Cordillera de Talamanca region of Costa Rica where *cinguliventris* is more common than *pallidus.* No intermediate forms, suggesting possible hybridization, are known from this area despite extensive collecting. It seems possible that the sternal maculae may serve as a visual clue for species discrimination in nature.

Both *pallidus* and *cinguliventris* may be found in a variety of forested and ruderal habitats. Using the Holdridge (1947) system of plant formation and life zone classification; *pallidus* ranges in a wide variety of tropical to subtropical to lower montane dry and moist forest habitats at altitudes from near sea level to 2000 m, while *cinguliventris* is consistently found in somewhat wetter situations including wet and rainforests. Increasing environmental disturbance, particularly by paved roads, appears to be contributing to range extension and abundance of both species due to more available host plants along roadsides. Adults congregate primarily on host plants of the family Compositae (*Baccharis* and *Eupatorium* spp. are common hosts) and Ammiaceae. Both species may be regularly taken at light in small numbers. The species are apparently univoltine and appear near the end and after the primary rainy season from October or November until as late as April or May, depending upon altitude. Temporal distribution patterns in mountainous regions generally follow those described for another related species, *Chauliognathus proteus* Gorham (Miskimen 1972).

Species Redescription and Diagnosis

Chauliognathus pallidus Waterhouse

Chauliognathus pallidus Waterhouse 1878:330. Type: Mexico.
Chauliognathus oedemeroides Gorham 1881:73. Type: Mexico.
Chauliognathus fuscescens Gorham 1881:73. Type: Mexico.

Yellowish; antennae and palpi brownish-black; elytral bases with a narrow brownish-black band of varying width beginning centrally and extending to the lateral and sutural margins; distal third of femora, tibiae, and tarsi brownish-black. Length: males 12-15 mm, females 14-18 mm (head extended).

Head and pronotum semiopaque with a very short coarse vestiture; pronotum quadrate in males, slightly transverse in females, anterior angles rounded, lateral edges shallowly reflexed; elytra parallel, semiopaque, slightly rugose with short inclined hairs.

Aedeagus: penis slender, apex produced somewhat forming rounded triangulate tip, genital opening partially covered by a flap with a membranous suture extending to base of penis; right paramere flattened, in profile narrower

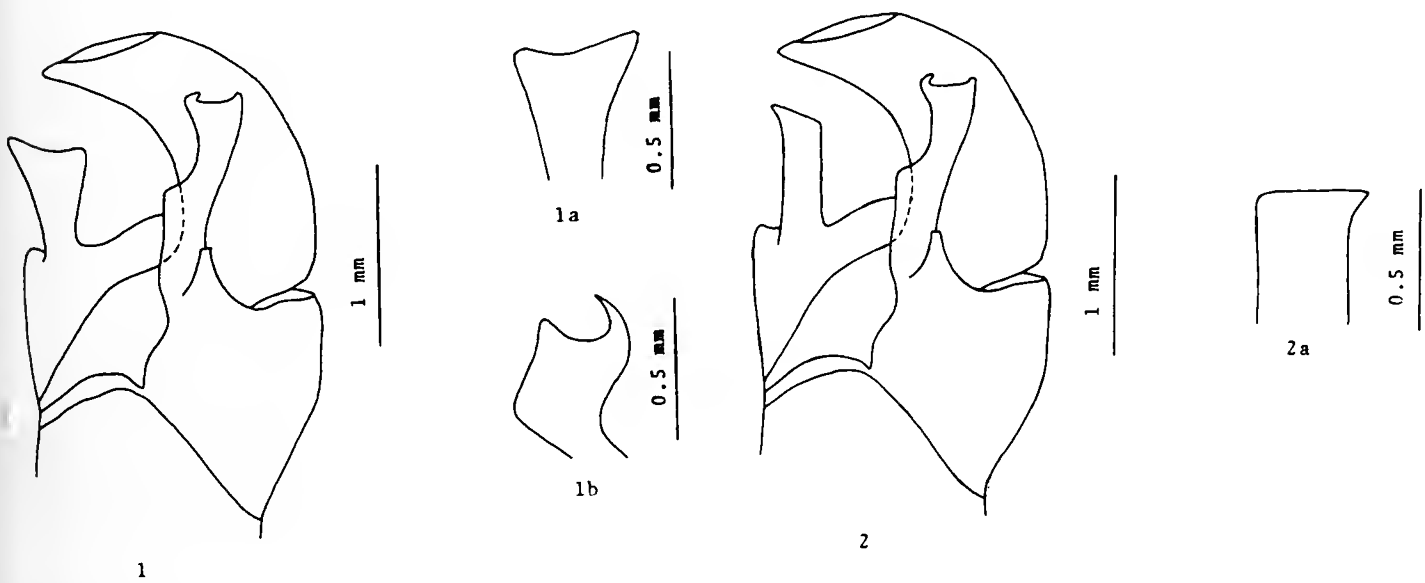

Fig. 1. *Chauliognathus pallidus* Waterhouse: 1) left dorso-lateral aspect of aedeagus; 1a) profile of right paramere tip; 1b) caudo-ventral aspect of left paramere tip.

Fig. 2. *Chauliognathus cinguliventris* (Erichson): 2) left dorso-lateral aspect of aedeagus; 2a) profile of right paramere tip.

at base expanding to notched tip; left paramere flattened, bent, and expanded apically forming truncate tip armed with a curved hook at one end and a tooth at the other (Fig. 1, 1a, and 1b).

Variation in the right paramere tip of the aedeagus and lack of maculae on the fifth abdominal segments distinguish *pallidus* from its southern sibling *cinguliventris*. *Chauliognathus sulphureus,* a similar appearing species is a distinct sulfur yellow, has less prominent eyes, and coarse erect pronotal hairs as well as substantial aedeagal differences. The synonyms described by Gorham describe minor color differences within the limits of the redescription given above. Climatically induced color variation in *Chauliognathus* is discussed by Miskimen (1972).

Chauliognathus cinguliventris (Erichson)

Callianthia cinguliventris Erichson. 1847:83. Type: Peru.

Yellowish; antennae and palpi brownish-black; elytral bases with a brownish-black band of varying width beginning centrally and extending to lateral and sutural margins; distal third of femora, tibiae, and tarsi brownish-yellow; fifth abdominal tergite with postero-lateral brownish-black to black maculae that may in some specimens be expanded to form a continuous belt encompassing both tergite and sternite. Length: males 12-15 mm, females 14-18 mm (head extended).

Head and pronotum semiopaque with very short coarse vestiture; pronotum quadrate in males, slightly transverse in females, anterior angles rounded, lateral edges shallowly reflexed; elytra parallel, semiopaque, slightly rugose with short inclined hairs.

Aedeagus: penis slender, apex produced somewhat forming rounded triangulate tip, genital opening partially covered by a flap with membranous suture extending to base of penis; right paramere flattened, tip truncate with small angular tooth extending dorsad; left paramere flattened, bent, and expanded apically forming truncate tip armed with a curved hook at one end and a tooth at the other (Fig. 2, 2a).

Conformation of the right paramere tip of the aedeagus and markings on the fifth abdominal segment differentiate *cinguliventris* from the northern sibling *pallidus*. The only other species with which *cinguliventris* can be confused, *Chauliognathus sulphureus* Waterhouse, can be distinguished on the same basis cited above for *pallidus*.

Forms with the entire fifth abdominal segment black-banded are the only deviation known from the much more common type with simple postero-lateral tergal markings. Banded forms are known only from Peru where the more common type is also found. I feel that the banded type may be the consequence of environmental conditions (cool, high humidity) inducing expression of this characteristic in a manner similar to that described by me (1972) for *Chauliognathus proteus* Gorham in Colombia.

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Coleopterists Newsletter, *(Cont. from p. 34)*

5.3 Treasurer Erwin submitted the appended report, which was audited by Don Anderson and Ginter Ekis. He hopes finances will allow an increase in the Bulletin this year by $250 per issue. The question was raised about the payment to the Inkblot Co. The treasurer explained that Woodruff's children put the Bulletins into envelopes and arranged the zip codes for mailing and handle preparing, billing, and mailing separates, much less expensively than at the printers. These expenses are expected to be nearer $200 this year as Mrs. Woodruff is paid for secretarial work and taking the Bulletins to the post office. With this explanation, Terry moved the report be accepted. Harley Brown seconded. The vote was carried.

5.4 Newsletter Editor O'Brien reported that he had an overwhelmingly favorable response to including the Newsletter with the Bulletin. His one correspondent approved fully! Material should be received a month and a half before the issue is to appear; e.g., by April 15th for the June Newsletter. This allows 2 weeks for editing and transmittal to Gainesville, and one month in the printer's hands. Again, please send notes of new techniques, discoveries, or travels, etc. It was asked whether we had a tax-exempt status to allow us to apply for reduced mailing fees yet. Erwin reported that he and Gordon are still filling out forms.

6. Reports from committees.

6.1 Nomination and elections committee (Dybas, Whitehead, Hardy). Alan Hardy announced our new president is John Lawrence; Vice President, Paul Ritcher; Secretary, Bob Gordon; and Treasurer, Terry Erwin. New council members are Milton Campbell, John Chemsak, and Lee Herman.

6.2 Catalogue Committee (Kingsolver). John Kingsolver reported that the catalogue is proceeding well. New cards have been printed, and the present hold-up is an MTST typist. Kingsolver, Spangler, Spilman, and White are an in-house editorial committee. There are 53 other participants.

Anobiidae, Cupedidae, Micromalthidae, Platypodinae are ready for tape; Heteroceridae are on tape and the printout is here for examination.

Cards are near completion for three subfamilies of Scarabaeidae (Dynastinae, Rutelinae, and Geotrupinae), Rhipiphoridae, Lyctidae, Bostrichidae, Ptinidae, and Cucujidae.

Participants are needed for Elmidae, Lycidae, Erotylidae, Lathridiidae, Stylopidae, and possibly Endomychidae and Colydiidae.

Four programs are done: data input, edit, update, and search. They will not require more proofing. Four need to be done: they are: sequencing in catalog order, hierarchy of higher categories, bibliography, and catalog page format.

Kingsolver would like comments from coleopterists on whether the catalogue should be arranged phylogenetically (species alphabetically) or alphabetically within tribes. It was originally planned to be in phylogenetic order through subgenus, then alphabetically, with each family in a separate fascicle, printed when cards were received from contributors. However, if it is done alphabetically, the first fascicle can be ready July 1974. If it is done phylogenetically, it will take 4 months longer. If it is done alphabetically, it is planned to have a phylogenetic index in the front. The Diptera catalog is done partially alphabetically, partially phylogenetically.

A show of hands indicated 6 in favor of each system with most of the group abstaining to consider the problem. Discussion indicated fears that curators would arrange their collections alphabetically, thus complicating study of collections by a specialist, because not only would neighboring genera be separated, but in old collections one would have to remember each generic change and look up each of these genera as well. Members were charged with considering each possibility and writing to Kingsolver.

6.3 Liaison: Coleopterists Society-North American Beetle Fauna Project. (Ball) The board of directors met in early April in Tallahassee and attended to many details of organization. They decided to publish the journal "American Beetles" and to start with the northeastern volume. Blackwelder has taken over most of the work on the Checklist, with the red form to be completed in early 1974. Volume 1, Fauna of the Northeast, is to come out in 2 parts. At least the first part is scheduled for 1974, authored jointly by Bradley, Downie and collaborators. There is still the problem of illustrations. The project is solvent, thanks to benefactor David Rockefeller.

7. President Ball expressed thanks to the members for cooperating so fully with him during the year and installed John Lawrence as our new president.

8. Lawrence appointed Howden, Ekis, and Allen as the nominating committee for next year.

9. Kingsolver and Spangler were appointed auditors.

10. Other business.

Ed Becker announced that Canada is setting up a foundation (CANACOLL) to promote short term research services for the Canadian collection. The foundation will be able to hire people for a short time to do curatorial work on the Canadian National Collection. They are attempting to get tax exempt status in the United States. See the June issue of the Bulletin E.S.A. for further information.

Howden praised the presidential efforts to preserve the society, especially last night. The members approved setting aside a meeting room for the Society at the convention again next year.

The business meeting was adjourned for a scientific session with talks by Lawrence on "Major lineages in the evolution of Coleoptera", and Tom Hlavac on "The adaptive history of beetles: questions, speculations".

Respectfully submitted, Lois O'Brien, Secretary Pro-Tem

CRAB SPIDERS (ARANEAE: THOMISIDAE) PREYING ON SCARAB BEETLES (COLEOPTERA: SCARABAEIDAE)

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Abstract

Xysticus apachecus Gertsch crab spiders were collected feeding on adult *Diplotaxis* sp., *D. parvicollis* Fall, and *Phyllophaga (Listrochelus) falsa* (LeConte) scarab beetles on young *Pinus ponderosa* Laws. trees in Arizona. New records of prey, spider-habitat associations, and predators of scarab beetles are established by these collections.

Spiders are predators, the prey consisting chiefly of live invertebrates, especially insects. Some spiders spin webs or snares of silk for capturing food, while others rely on stealth and surprise. Crab spiders of the family Thomisidae are among the latter. They actively search plant surfaces, litter, and debris for prey, or they ambush insects from hiding places such as in flowers, or on foliage of trees and shrubs. Typical crab spiders of the subfamily Misumeninae have stout, robust front legs for seizing prey. Captured insects, including bumblebees and wasps much larger than the spiders, are quickly subdued with a powerful venom.

Crab spiders may ambush a variety of insects resident or visiting the habitats occupied by the spiders. Detailed studies are lacking concerning possible food habits or preferences of crab spiders. Most prey records are for flower-inhabiting crab spiders (Gertsch, 1939), while prey records of tree- and shrub-inhabiting species consist mainly of lepidopterous defoliators (Loughton, Derry, and West, 1963; Morris, 1972; Renault and Miller, 1972). There are few previous records of crab spiders preying on beetles. This paper reports collections of crab spiders found feeding on scarab beetles associated with ponderosa pine seedlings in Arizona. The spiders with beetle prey are deposited in the American Museum of Natural History, New York.

On 14 July 1971, 2 female *Xysticus apachecus* Gertsch crab spiders were collected on *Pinus ponderosa* Laws. foliage with scarab beetle prey. The collecting locality is ca. 5 miles southwest of the Chevelon Ranger Station in sec. 34, T13N, R13E, Chevelon Ranger District, Sitgreaves National Forest, Coconino County, Arizona; elevation ca. 7,300 feet. The pine trees are part of a naturally regenerated ponderosa pine stand that became established following an intensive and devastating forest fire, the Dudley Burn, that swept through the area in June 1956. One spider had captured a male *Diplotaxis* sp. in a 7.6 ft. tree. Because the head of the scarab beetle was missing at the time of collection, specific identification was not possible. On a nearby

[1]Forest Service, U.S. Department of Agriculture, with central headquarters maintained at Fort Collins in cooperation with Colorado State University; author is located at Albuquerque in cooperation with the University of New Mexico.

pine, 9.3 ft. in height, another *X. apachecus* was feeding on a male *Phyllophaga (Listrochelus) falsa* (LeConte). Both spiders were on foliage in the upper crowns of the trees, near the apices of lateral branches. Crab spiders were seen with out-stretched front legs in such foliage on numerous other occasions, presumably waiting for insects.

A third example of a crab spider feeding on a scarab beetle was observed on 19 July 1971 when Herbert Allen Pase, III, collected a female *X. apachecus* feeding on a female *Diplotaxis parvicollis* Fall. This collection was made in the same general locality as the other 2 collections, but in sec. 23, T13N, R13E of the Dudley Burn, ca. 2.5 miles southwest of the Chevelon Ranger Station, elevation 7,200 feet. The spider with beetle prey was on a ponderosa pine seedling, height ca. 3 ft. All 3 observations are new prey records for *X. apachecus.*

The distribution of *X. apachecus* includes Utah, Arizona, Colorado, New Mexico, Texas, and California (Gertsch, 1939, 1953; Schick, 1965). Previous records of this crab spider on *Pinus ponderosa* foliage are lacking. Distributions of the scarab beetles include Mexico, New Mexico, Colorado, Utah, California, and Arizona for *P. falsa* (Butler and Werner, 1961) and Colorado, New Mexico, Arizona, and Mexico for *D. parvicollis* (Vaurie, 1960).

Although spiders are not included among the natural enemies of scarab beetles given by Ritcher (1958), Davis (1919) reported 3 species of spiders preying on scarabs, including the crab spider *Xysticus gulosus* Keys. feeding on *Phyllophaga futilis* (LeC.). Exline and Hatch (1934) observed *Odontaeus* [now *Bolboceras*] *obesus* LeC. and *Diplotaxis brevicollis* LeC. in webs of the black widow, *Latrodectus mactans* (Fabr.).

The species of scarabs captured by crab spiders may be of economic importance in areas where survival of natural and planted ponderosa pine seedlings is critical. Adults of *P. falsa* have been taken in Arizona several times on ponderosa pine in July and August (Butler and Werner, 1961). Saylor (1940) reported that larvae of these beetles did extensive damage to pine seedlings at Flagstaff, Arizona, by cutting off the tree roots. Chapin (1934) described *Listrochelus langeri* (a synonym of *P. falsa*), and stated that it injures foliage of *Pinus ponderosa*.

It is not known whether the adults of *Diplotaxis* sp. and *D. parvicollis* feed directly on ponderosa pine foliage or merely visit pine trees in the vicinity of other food sources. General information regarding the feeding habits of *Diplotaxis* indicates that the adults probably feed on pine foliage, while larvae feed on the roots or rootlets of pine seedlings. Vaurie (1960) included *Pinus* among the habitats where she collected adult *Diplotaxis,* and Arnett (1963) reported that adults of *Diplotaxis* are nocturnal and feed mostly on conifers, with pines being the preferred food. Larvae of *Diplotaxis* fed on the roots of coniferous seedlings under experimental conditions, but they destroyed less than 20% of the pine seedlings used in the experiments (Craighead, 1950).

The extent and frequency of crab spider predation on scarab beetles are not known. Carcasses of scarab beetles were frequently seen near the tips of branches in the upper crowns of young pines on the Dudley Burn. *Xysticus apachecus* is an ambushing crab spider that does not move rapidly over the foliage in search of prey. The positioning of these spiders at the apices of upper crown branches is probably advantageous for capturing flying insects, including these scarabs, that alight on these extremities. No doubt these spiders prey on other insects besides scarab beetles.

ACKNOWLEDGMENTS

I am indebted to Dr. Milton W. Sanderson, Illinois Natural History Survey, Urbana, Illinois, for determination of the *Phyllophaga* and to Mrs. Patricia Vaurie, American Museum of Natural History, New York, for *Diplotaxis* determinations. Thanks are due Dr. Willis J. Gertsch, Curator Emeritus of Arachnids, American Museum of Natural History, New York, now at Portal, Arizona, for confirming spider determinations.

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Coleopterists Newsletter, *(Cont. from p. 40)*

MASTER OF ARTS IN MUSEUM SCIENCE

A master's degree program in Museum Science has been approved by Texas Tech University and awaits final approval at the State Coordinating Board level in January. Applications are now being accepted for this program which should begin in the fall semester of 1974. The program is designed to train students for a wide variety of positions within museums and related organizations. Students can opt for emphasis in art, historical restoration, history, anthropology, or some area of biology or geology. For further information write to Museum Science Program, The Museum, Texas Tech University, Lubbock, Texas 79409.

COLEOPTERISTS SOCIETY FIELD TRIP TO WELDER WILDLIFE REFUGE AND VICINITY

(November 29—December 3, 1973)

Following a successful Entomological Society of America meeting in Dallas, 26 coleopterists left Thursday morning, November 29, and drove to the Welder Wildlife Refuge near Sinton, Texas for a 3-day field trip. After several stops en route we arrived at the Refuge late in the evening and settled into the dorm rooms and efficiency apartments provided by the Rob and Bessie Welder Foundation. Due to the late hour of our arrival and the cool weather Thursday night, most members of the group chose to relax in front of a roaring fire and talk about beetles, vowing to make the big collecting push the following day. A few people decided to try their luck that night, but mostly the beetles refused to cooperate.

The next morning we were then treated to a tour of the headquarters, laboratories, and museum of the Welder Foundation by Drs. Clarence Cottam and Eric Bolen. At approximately 10 o'clock that morning most of the group left the Refuge to collect at Goose Island State Park on the coast. The collecting there would probably not qualify as being great but a few good beetles were taken. Regardless of the quality and quantity of beetles brought home, the beautiful weather which we were so fortunate to experience at Goose Island made the outing an enjoyable one. On the return trip to Welder that afternoon, several groups stopped at various localities along the way to sample the beetle fauna. Friday night was warmer than the previous night and more people were out in the brush of the Refuge after beetles with blacklights and various other methods.

Saturday one group drove to Lake Corpus Christi State Park to collect, while the remaining coleopterists worked on the Refuge or visited other localities in the area. Everyone was back at the Refuge by 7 p.m. Saturday with a big appetite ready to partake of a catered barbeque held in the rotunda at the Foundation headquarters.

Due to the gasoline shortage many service stations in the area were closed Sunday so we concentrated our collecting efforts on the Refuge that day. A few, however, decided to forsake the beetles long enough to drive over to nearby Aransas Wildlife Refuge in hopes of spotting a whooping crane or two. We did not get a glimpse of these magnificent birds but other bird life was abundant and the trip was well worth the effort. Light-collecting was more successful on the Refuge Sunday night as the weather warmed up appreciably.

Monday morning everyone was up early preparing to leave for home. By mid-morning we had cleaned the living quarters, packed up, loaded and departed the Refuge.

The collecting success on this trip will not be fully known until everyone has an opportunity to closely examine his material and make determinations. Undoubtedly, material collected on this trip will appear in revisions and other papers on beetles for years to come. It is obvious to all who participated, however, that aside from the insects collected, the exchange of ideas, general talk about beetles, and the great fellowship which prevailed made the trip a success.

The fine facilities provided by the Rob and Bessie Welder Wildlife Foundation, the beautiful surroundings, and the warm hospitality of Dr. Cottam and his staff were greatly appreciated by all who attended.

Participants in the field trip included: James Ashe, George and Kathleen Ball, Horace Burke, Wayne Clark, Ginter Ekis, Terry Erwin, David Foster, J. Howard Frank, Grant Gaumer, Bill Gibson, Ruth Lynn Hooper, John

(Cont. p. 48)

TWO NEW SPECIES OF *CEPHALOSCYMNUS* CROTCH FROM MEXICO WITH NOTES ON OTHER SPECIES (COLEOPTERA:COCCINELLIDAE)

ROBERT D. GORDON

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ABSTRACT

Two new species of *Cephaloscymnus, mexicanus* and *minutus,* are described, and additional distribution data are listed for some previously described species.

The genus *Cephaloscymnus* in North America was treated by Gordon (1970). The purpose of the present paper is to present additional information on distribution and genitalia of previously described species and to describe 2 new species. Material discussed herein is in the Canadian National Collection [CNC] and the U. S. National Museum [USNM].

Cephaloscymnus zimmermanni zimmermanni Crotch
Fig. 1

A single specimen of this subspecies from Arkansas has been examined. This represents an extension of the known range (Gordon, 1970: 67), and it is interesting that this specimen is typical of the nominate subspecies and does not represent an intergrade between *zimmermanni,* s. str., and *z. australis* Gordon.

Figure 1 is an enlarged view of the siphonal apex of the male genitalia of *zimmermanni,* s. str.

Cephaloscymnus mexicanus Gordon, **new species**
Fig. 2-6

Holotype male: length 2.60 mm, greatest width 1.52 mm. Form elongate, dorso-ventrally flattened, widest at middle of elytra. Color reddish-brown dorsally except clypeal area of head and lateral border of pronotum paler yellowish-brown, elytron with faint greenish-bronze sheen; ventral surface black except hypopleuron and epipleuron reddish-brown, mouthparts, legs, lateral border of third and fourth sterna and entire apical sternum yellow. Head and pronotum densely, coarsely punctured, punctures separated by less than their diameter, becoming denser on explanate border of pronotum; punctures on elytron not dense, separated by at least their diameter. Pubescence grayish-white, short on head, tightly appressed, long on pronotum and head, semi-erect. Genitalia with basal lobe longer than paramere, parallel-sided with rounded apex in ventral view, curved in lateral view, with dorsal

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[1]Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

keel; paramere slender, nearly straight, narrowed toward apex (Fig. 2, 3); sipho as in Fig. 4, 5.

Female: similar to male except spermathecal capsule curved, apex bluntly rounded (Fig. 6).

Variation: length 2.48 to 2.60 mm, width 1.45 to 1.52 mm.

Holotype: male [CNC], MEXICO, 30 mi. W. Durango, Dgo., 8000′, 4-V-1961, Howden & Martin.

Paratypes: total 2 [CNC and USNM], MEXICO: 7500′, nr. Jame, 33 mi. S. E. Saltillo, Coahuila, 25-VII-1963, H. F. Howden; 3 mi. E. El Salto, Durango, 21-VI-1964, H. F. Howden.

Another specimen of *Cephaloscymnus* in the CNC from Jacala, Hidalgo, Mexico, is probably this species, but it is a female that doesn't match the type series exactly.

The male genitalia of *mexicanus* are of the type found in *C. z. australis,* but the basal lobe is relatively longer, more slender and not as abruptly curved in *mexicanus. C. z. australis* also differs from *mexicanus* in having the pronotal punctures extremely dense, usually contiguous, and the pronotum entirely red, not paler laterally.

The holotype has the head indented medially, obviously a result of damage, and 1 middle leg and 1 hind leg are missing. The specimen was teneral when collected and so was more susceptible to damage.

Cephaloscymnus occidentalis Horn
Fig. 7

This is the first Mexican record for this species. Two specimens in the CNC bearing the following data are this species: "Nr. San Jose Beach, 40 mi. SW. Cd. Obregon, Sonora, Mex., 16-23.V.1961, Howden & Martin, at light"; "Rio Yaqui, 12 mi. W. Cd. Obregon, Sonora, Mex., 15-V-1961, Howden & Martin". Figure 7 is an enlarged view of the siphonal apex of the male genitalia.

Cephaloscymnus laevis Gordon
Fig. 8, 9

This species was described (Gordon 1970) from a single male from Nogales, Arizona, in the California Academy of Sciences collection. There are 2 examples of *laevis,* a male and female, in the CNC, both labeled "10 mi NE. Jacala, Hidalgo, Mex., VIII.1-3.1960, Howden. This is not only the first Mexican record of the species but also represents a great extension of the known range.

Figure 8 is an enlarged view of the siphonal apex of the male genitalia. Figure 9 is the female spermathecal capsule, not previously illustrated.

Cephaloscymnus gnomus Gordon, **new species**
Fig. 10

Holotype female: length 1.70 mm, greatest width 1.00 mm. Form elongate, somewhat convex, widest at middle of elytra. Color black except antero-lateral angle of pronotum and apical third of elytron obscurely reddish-brown, legs and mouthparts yellow or yellowish-brown. Punctures on head and pronotum dense, coarse, separated by their diameter or less, becoming somewhat contiguous along lateral margin of pronotum; punctures

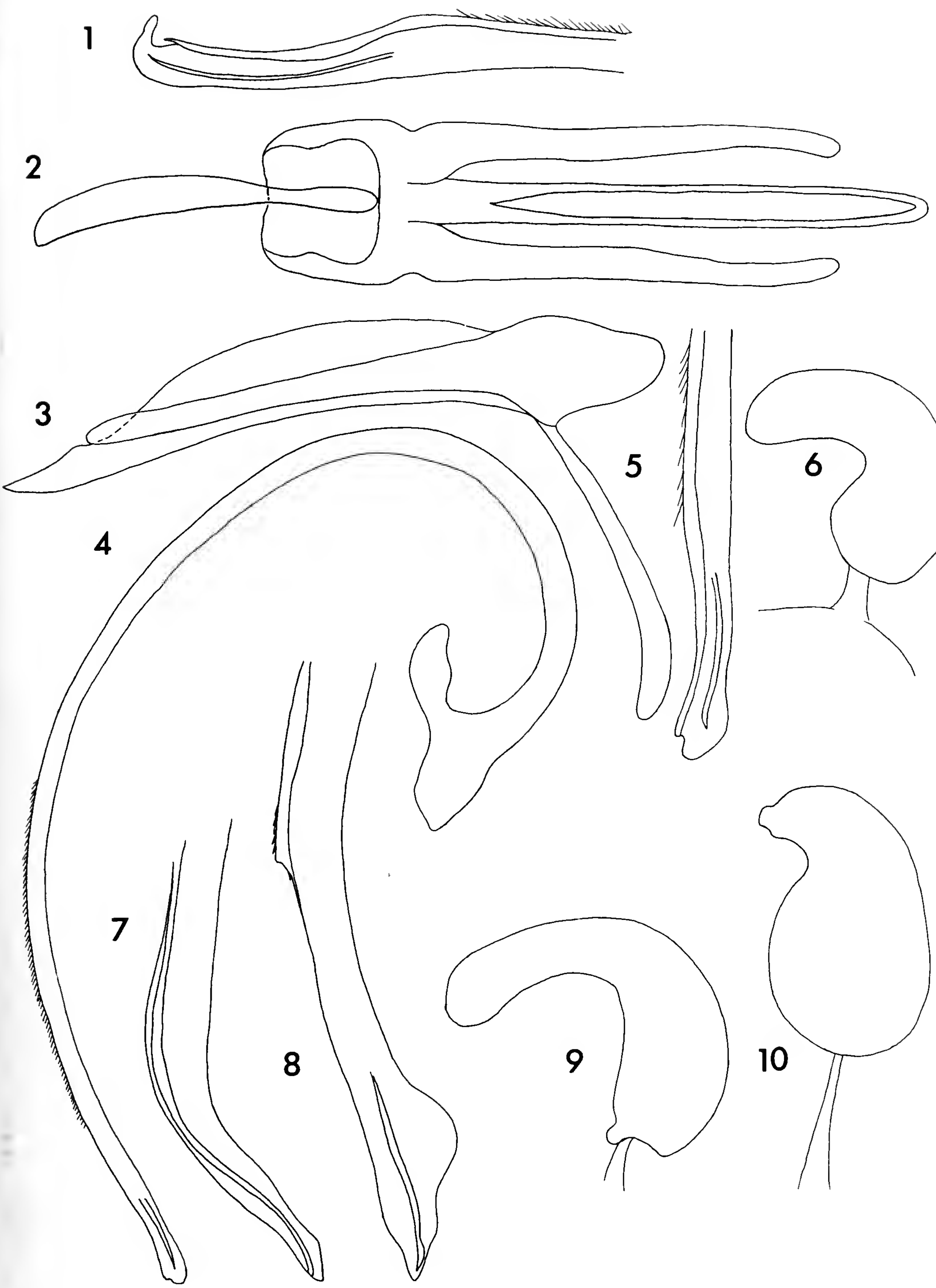

Fig. 1-10. Genitalia of *Cephaloscymnus* spp.: 1) siphonal apex, *C. zimmermanni zimmermanni;* 2 and 3) ventral and lateral aspects of phallobase, *C. mexicanus;* 4 and 5) entire sipho and siphonal apex, *C. mexicanus;* 6) spermathecal capsule, *C. mexicanus;* 7) siphonal apex, *C. occidentalis;* 8) siphonal apex, *C. laevis;* 9) spermathecal capsule, *C. laevis;* 10) spermathecal capsule, *C. gnomus.*

on elytron dense, coarse, subequal in size to pronotal punctures, separated by their diameter or less. Pubescence grayish-white, short and tightly appressed on head, long and semi-erect on pronotum and elytron. Genitalia with spermathecal capsule feebly curved before apex, apex bluntly pointed (Fig. 10).

Male: not known.

Holotype: female [CNC], Mexico: El Salto de Agua, San Luis Potosi, 28-30-VII-1960, H. Howden.

The extremely small size, nearly all black dorsal surface and coarse, dense punctures on the elytron distinguish *gnomus* from any previously described species. *C. occidentalis* approaches *gnomus* most closely in size but has the elytral punctures much less dense on the elytron than on the pronotum as do all other presently known species of *Cephaloscymnus* except *gnomus*. The shape of the spermathecal capsule is also completely different from those previously figured (Gordon 1970:68).

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Coleopterists Newsletter, *(Cont. from p. 44)*

Lawrence, George Marshall, Bob and Maria Murray, Charles and Lois O'Brien, Manuel Pescador, Edgar and Mary Riek, Elbert Sleeper, Billy D. Stallings, Barry and Buena Valentine, and Janice White.—*Horace R. Burke, William W. Gibson, Robert R. Murray.*

THE FOURTH OF JULY, OR WHAT'S IN A DATE? A PLEA

The important date of the American calendar is considered by one segment of the American populace to fall on 4 July and by another segment to occur on July 4. Subscribing to the first system is the American military and to the second, various institutions of the Federal Government and at least some State governments. Under the first system the date is abbreviated to 4.7.1974 or 04/07/74 or 4-7-'74 or 4 VII '74 or other variations and, under the second, to 7.4.1974 or 07/04/74 or 7-4-'74 or VII 4, '74 or other variations. This can, understandably, lead to confusion by adherents of the one system of notation when faced with the other.

Both systems are deeply entrenched. The first is used, to my knowledge, almost universally outside the U.S. No standardization can be expected for general use.

Coleopterists are concerned when it comes to recording and citing collection data. Editorial policy of the Coleopterists Bulletin wisely requires that the month be written in Roman numerals for collection data and, arbitrarily but in accordance with the more widespread international system, that the whole be written in the order day-month-year, i.e. in units of increasing magnitude. But anyone working with museum specimens is likely to have had to decide which numeral indicates the day and which the month in data labels

(Cont. p. 50)

NEW BUPRESTIDAE (COLEOPTERA)

FRANK M. BEER
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ABSTRACT

A new subspecies of buprestid beetle, *Dicerca horni nelsoni,* is described from Inyo County California, as is the plesiallotype female of *Trachykele fattigi* Knull from Stone Mountain, Georgia.

Dicerca horni nelsoni Beer, NEW SUBSPECIES

Similar to typical subspecies *horni* except as to color, being a brilliant coppery above and below, both surfaces suffused with green, especially behind scutellum, along elytral suture and humeral areas, both surfaces clothed with long, fine, erect white hairs. Head with front more flattened, pronotum with sides more parallel in basal half rather than with slight flare, intervals of elytral disk having somewhat more scattered raised smooth areas which possess a bluish to purplish cast; elytral apices tend to be vaguely emarginate rather than entire or truncate. Under surface slightly more shining, coarsely and serially punctate; tarsi and apical margin of abdomen with purplish cast. Male genitalia identical with subspecies *horni.* Male length 18.8 mm, width 6.5 mm; female length 18.0 mm, width 6.8 mm. Smallest specimen, a male, length 14.9 mm, width 5.3 mm; largest specimen, a female, length 21.9 mm, width 8.0 mm.

Holotype male: CALIFORNIA: Inyo County, Cottonwood Creek, east flank of the Sierra-Nevada Range, 7-VII-65, F. M. Beer [California Academy Sciences]; allotype female, Inyo County, Lone Pine, 14-VI-37, A. P. Yerrington [CAS]. **Paratypes (13):** CALIFORNIA: Inyo County, as follows: 3 males, 3 females, same data as holotype, [F. M. Beer col.]; 3 females, Lone Pine, 6-V-60, F. D. Parker [G. H. Nelson Col.]; 1 female, Lone Pine, 20-VI-37, K. L. Maehler [CAS]; 1 male, Lone Pine, 20-VI-37, W. C. Reeves [G. H. Nelson col.]; 1 female, Lone Pine, 26-V-37, A. P. Yerrington [G. H. Nelson col.]; 1 male, Blackrock, VI-63, Mannott [CAS]; 1 paratype, Lassen County, Doyle, 31-V-40, A. T. McClay [G. H. Nelson col.].

The middle tibial spine of the male is shorter and more blunt than in the nominate species, while the terminal margin of the last visible segment of the female is vaguely bisinuate in 7 specimens, broadly rounded in the remaining 3. In subspecies *horni* of 20 females examined (the number in the writers collection), 15 have the terminal margin rounded, 2 have it emarginate, 2 have a vague median projection without being bisinuate, and 1 has a broad emargination with central short obtuse spine.

I take pleasure in naming this form in honor of Dr. Gayle Nelson, Chairman, Department of Anatomy, Kansas City College of Osteopathic Medicine, who has done so much to clarify poorly known species and who has brought much organization of the species within the family.

Trachykele fattigi Knull, 1954
Ohio Jour. Science, LIV: 294-296

This species was described from a unique male taken at Stone Mountain, Georgia, in 1951 by Lucian Harris. While visiting Georgia in 1966, I cut 7 specimens (3 males, 4 females) from a decadent juniper (*Juniperus virginiana* L.).

Description of female: Differs from the male as follows: larger, more robust; irregular velvety black depressions larger, more numerous; last visible sternite broadly rounded at apex, smooth areas each side on first 4 abdominal segments lacking, but small depression adjacent to their position, present. Length 17.4 mm, width 6.3 mm.

Plesiallotype: GEORGIA: Stone Mountain, 26-X-66, F. M. Beer. A male and female are deposited in the G. H. Nelson collection, the plesiallotype and remaining topotypes in the writer's collection.

Two specimens have a very faint tint of red on the pronotum and basal region of the elytra similar to that found in *T. blondeli* of the Pacific Northwest. Males vary in length from 14.1-15.1 mm, width 5.0-5.6 mm; the females from 17.2-18.0 mm, width 6.3-6.8 mm.

Coleopterists Newsletter, *(Cont. from p. 48)*

where 'Arabic' numerals were used throughout. Four examples (from the National Museum of Natural History) before me at this time bear the following 'dates': '1.3.8', '14.4', '3.82', '8.2'!

Coleopterists, individualists all, are unlikely to change to recording their collection data in a day-month-year system if they have been writing it as month-day-year ever since they collected their first beetle, nor is this necessary. But please, if you value your collections, make it easier for others to use them by making it plain which is the day and which the month and print the month in *obvious* Roman numerals (II or ii *not* 11) or spell it out in letters. Lincoln's Birthday anniversary could be 12 II 1974 or 12 Feb. 1974 or II-12-1974 or Feb. 12, 1974 according to preference or inclination.

An article, *Standards for Entomological Labels,* by B. R. Stuckenberg and M. E. Irwin, which appeared in the Sept. 1973 number of Bull. Entomol. Soc. Am. vol. 19, pp. 164-168, is well worth reading.—J. Howard Frank, P. O. Box 520, Vero Beach, Florida 32960.

TREASURER'S REPORT: 1972, 1973, BUDGET FOR 1974

Financial Statement 1972

Assets:	
Transfer of account from Florida (Jim Lloyd) to Washington (Terry Erwin) plus accumulated checks forwarded from Woodruff, Lloyd, and Purdue—opened account at Riggs National, D.C.	$ 3,216.61
Income:	
Page charges, separates, postage on separates charged to authors after 5 March 1972	921.81
Membership dues, institutional subscriptions; plus page charges, separates, etc. before 5 March 1972	4,645.14
Balance of credits:	$ 8,783.56
Disbursements:	
Printer's cost for Bulletin production	$ 2,919.60
Printer's other services (addressograph, etc.)	30.05
Inkblot Co. services (stuffing envelopes, etc.)	111.20
Newsletter production and mailing	104.84
Administration supplies (postage, rubber stamps, envelopes, billing forms, etc.)	328.03
Editor's office postage kitty	50.00
Riggs Bank service charge (checks)	11.92
Transfer to Jacques from Abdullah for directory	2.00
Balance of Debits:	$ 3,557.64
Income over disbursements, 1972	$ 5,225.92

Preliminary Financial Statement 1973 (thru Nov. 15, 1973)

Assets:	
Balance from 1972	$ 5,225.92
Income:	
Page charges, separates, postage on separates charged to authors after 1 January 1973	1,148.68
Membership dues, institutional subscriptions	5,464.65
Balance of credits:	$11,839.25

(Treasurer's Report, *continued*)

Disbursements:	
Printer's cost for Bulletin production	$ 4,276.83
Printer's other services (addressograph, etc.)	54.07
Inkblot Co. services (stuffing envelopes, etc.)	81.35
Newsletter printing	51.50
Newsletter postage	53.88
Administration supplies (postage, envelopes, billing forms, ballots, etc.)	242.70
Editor's office postage kitty	125.00
2nd class mailing permit	50.00
Faxon refund (Poland quit)	10.00
Tax on envelopes	1.00
Balance of debits:	$ 4,946.33

PROPOSED 1974 BUDGET

Income:	
Page charges	$ 1200.00
Membership dues, institutional subscriptions	4,500.00
Total	$ 5,700.00
Expenses:	
Bulletin costs	$ 4,500.00
Printer's other services (addressograph, etc.)	60.00
Postage, envelopes, forms, etc.	300.00
Bulletin stuffing and mailing expenses	200.00
Editor's postage, 2nd class mailing	175.00
Total	$ 5,235.00
Income Over Expenses	$ 465.00

. . . Respectfully submitted by Terry L. Erwin, Treasurer (1973;. Audited by Donald M. Anderson and Ginter Ekis.

(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

NOTICES

Notices to appear on this page are a free service to members and subscribers. Such copy will be limited to the back page, the older notices being moved up and replaced with the newest ones at the bottom. The editor reserves the right to reword such notices for brevity, consistency, and clarity.

SCARABAEIDAE: Studying myrmecophilous and termitophilous Aphodiinae. Request loan of New World material especially. Will sort from general scarab collections or from light trap samples. Robert E. Woodruff, Fla. Dept. Agr., P. O. Box 1269, Gainesville, FL 32601.

CERAMBYCIDAE: Preparing checklist of species in Tennessee. Request data from any Tennessee specimens. Hoyt L. Jamerson, Dept. Biology, Memphis State Univ., Memphis, TN 38152.

SCARABAEIDAE: ***Dynastes hercules*** and related species wanted. Interested in variation in size and color, as well as distribution (locality data). Will buy or exchange. Bill Reid, 994 Irene Ct., No. Valley Stream, NY 11580.

LUCANIDAE: Buy or exchange all species. Offer Buprestidae, Carabidae, Cerambycidae, and Scarabaeidae. Antonio Alaimo, Via dei Platani 52, 00172 Roma, Italy.

CERAMBYCIDAE, LUCANIDAE, & SCARABAEIDAE: Will purchase or exchange. R. H. McPeak, 10370 Limetree Lane, Spring Valley, CA 92077.

FREE PUBLICATION: If you are not now receiving "Progress Reports", the newsletter of the North American Beetle Fauna Project, send your name, address, and interest in beetles statement to: Dr. R. H. Arnett, NABF Project, Dept. Biol., Siena College, Loudonville, NY 12211.

FOR SALE: Used insect boxes of various types and sizes and unit pinning trays for Cornell drawers and Calif. Acad. drawers. Write for specifics to R. E. Woodruff, 3517 N.W. 10th Ave., Gainesville, FL 32601.

GRANT INFORMATION: Funding Sources Clearinghouse, Inc. 760 Market Street, Suite 1000, San Francisco, California 94102.

COLYDIIDAE: Building up worldwide collection. I want to buy or exchange other Coleoptera. Also interested in immature stages and publications on this family. Horst D. Matern, 5000 Koeln 41, Lotharstr. 34, Western Germany.

SCARABAEIDAE: Looking for all material of Coprinae, literature and specimens, also in exchange and purchase. Klaus-Ulrich Geis, Gyrhofstr. 6, D 5 Koln 41, Western Germany.

PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

WANTED: American Geographical Society maps of Mexico: Baja California-Norte, Baja California-Sur, and Sonora. W. H. Clark, 705 Smith Street, Vale, Oregon 97918.

EXCHANGE: I am interested in trading Colorado beetles for Meloidae and/or Scarabaeidae. I prefer Meloidae. D. Hartman, P. O. Box 444, Frederick, Colorado 80530.

FOR SALE: Comparative anatomy of the male genital tube in Coleoptera. Classic Sharp & Muir monograph on genitalia & six related papers. An essential work for all serious students of Coleoptera. 304 pp., 43 pls., bound. $10.00. Entomological Society of America, 4603 Calvert Road, Box AJ, College Park, Maryland 20740.

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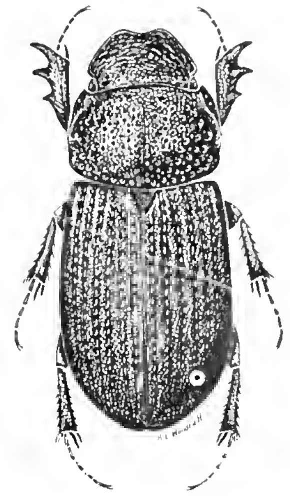
THE COLEOPTERISTS BULLETIN



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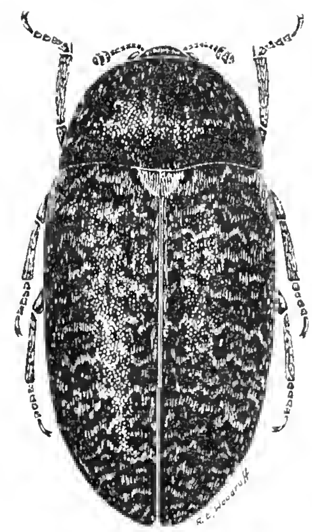
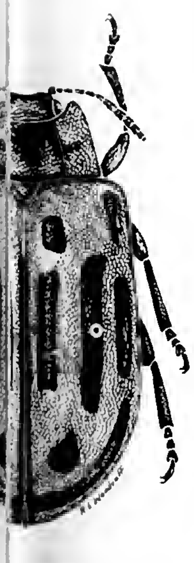
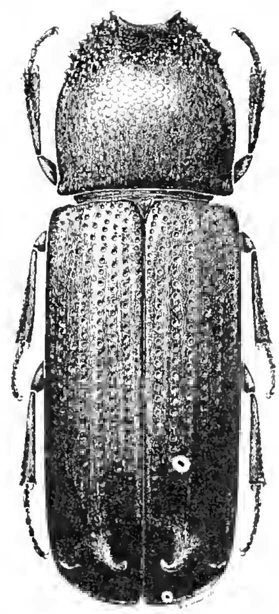


DYTISCIDAE: Stridulatory organs
by D. J. Larson & G. Pritchard 53-63
CHRYSOMELIDAE: N.A. *Orthaltica*
by G. Scherer 65-72
BUPRESTIDAE: *Agrilus* new to U.S.
by H. A. Hespenheide 73-75
STAPHYLINIDAE: Lispininae genera
by I. Moore & E. F. Legner 77-84
TECHNIQUES: Gender points
by P. D. Perkins 84
PSEPHENIDAE: Life history
by C. M. Murvosh & B. W. Miller 85-92
MELANDRYIDAE, MYCETOPHAGIDAE & TETRATOMIDAE
by M. Abdullah 93-100
TECHNIQUE: Inexpensive unit trays
by C. E. White & D. S. White 101-102
CARABIDAE: C. A. *Platynus*
by D. R. Whitehead 103-104
NOTICE OF CONSTITUTIONAL AMENDMENTS 64
BOOK REVIEWS & LITERATURE NOTICES 75, 76, 92, 100





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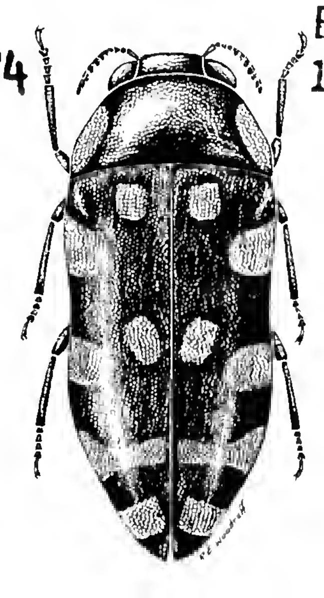

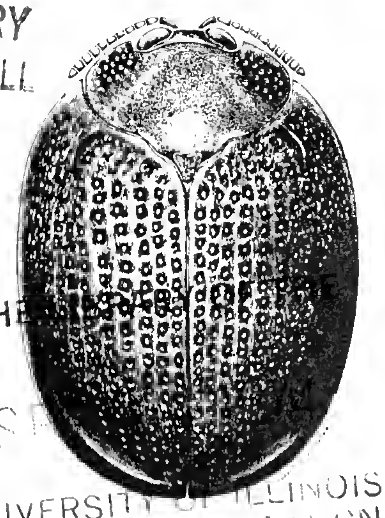

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ORGANS OF POSSIBLE STRIDULATORY FUNCTION IN WATER-BEETLES (COLEOPTERA: DYTISCIDAE)

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Calgary, Alberta, Canada

ABSTRACT

Organs of possible stridulatory function are described from the genera *Laccophilus, Agabus, Carrhydrus, Colymbetes, Cybister,* and *Hydaticus*. Five major types of organs are recognized on the basis of the portions of the body on which they are found: file on submentum, plectrum on labial palpus; file on metacoxa, plectrum on metafemur; file on abdominal sterna, plectrum on metafemur; file on metafemur, plectrum on abdominal sterna; and file on protarsal article 2, plectrum on protibia. With a few exceptions these organs are restricted to, or best developed on, males.

INTRODUCTION

During the course of a taxonomic study of the Dytiscidae, Larson noted several examples of modifications of opposing body parts in which a roughened area or file on one matched with a projection on the other. Further search revealed that such structures were widespread in the family and that in each case one part could be moved over the other in a very precise manner. We wish to draw attention to this variety of interesting structures and to suggest a function for them. More than 200 species of Dytiscidae, representing nearly all the North American genera, have been examined, and we describe the major types of structure found. No attempt has been made to elucidate intraspecific variation, important as such variation may be.

Some of these structures have been described before as will be noted below, and some have been called "stridulatory organs" (e.g., Balfour-Browne 1940), although no behavioral observations are available. Almost all sounds that have been heard from dytiscid beetles have occurred when the animals were out of water and generally under some stress. Under these circumstances, attention has been focused on the wings as the means by which sound is produced (von Reeker 1891; Arrow 1924; Marcu 1936). However, we believe that such sounds could be produced simply by whirring the wings beneath the elytra. In particular, it seems unnecessary to invoke a stridulatory function for the 'costal file' as was done by von Reeker (1891), and more recently by Freitag and Lee (1972) to account for buzzing sounds made by cicindelid beetles. Indeed, all Adephaga that we examined had very similar costal architecture. We intend, therefore, to describe only those structures in the Dytiscidae that fit the conventional form of a specialized frictional stridulatory organ.

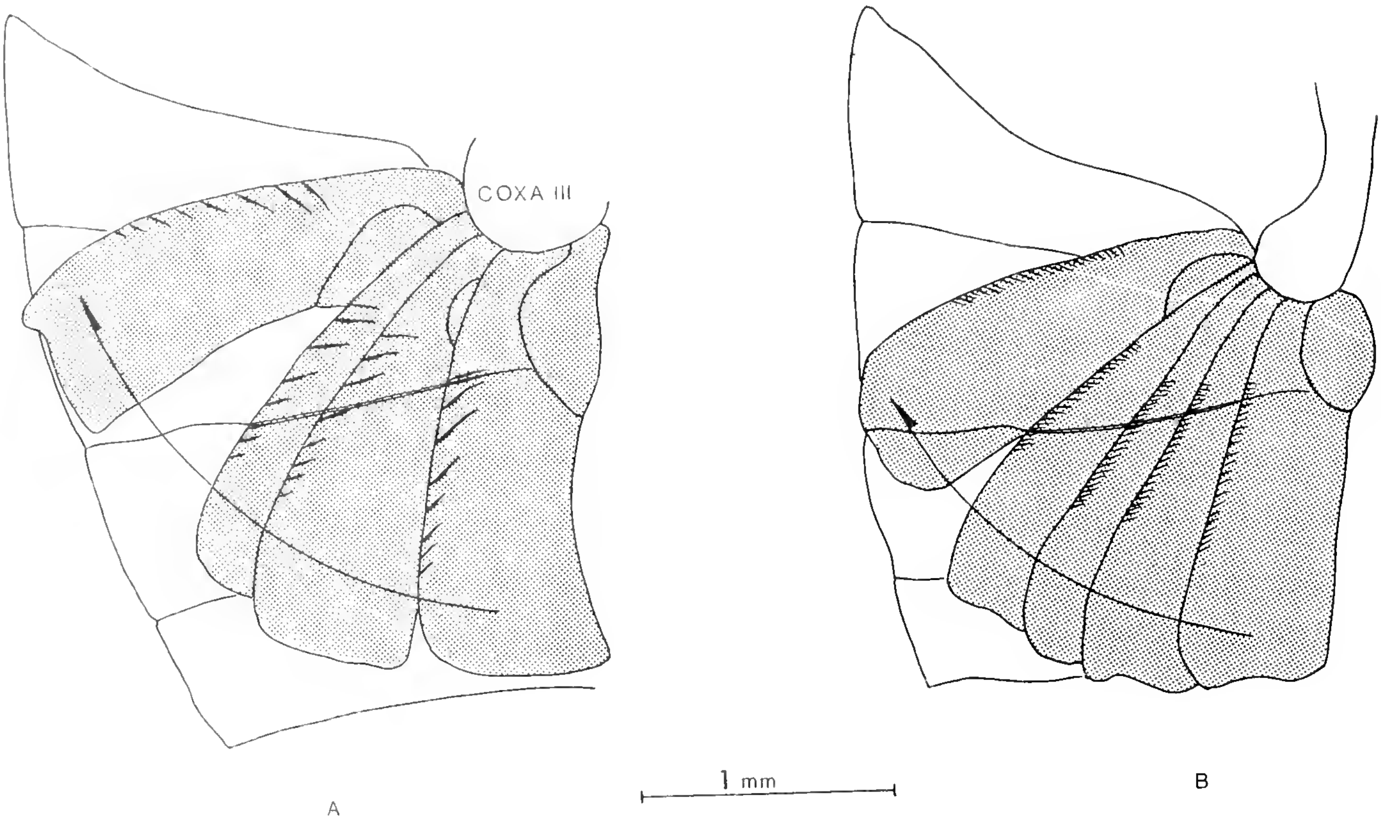

Fig. 1. Movement of metafemur over sternal plectrum in (a) *Agabus aeruginosus* and (b) *A. falli,* showing alignment of femoral grooves with the sternal plectrum.

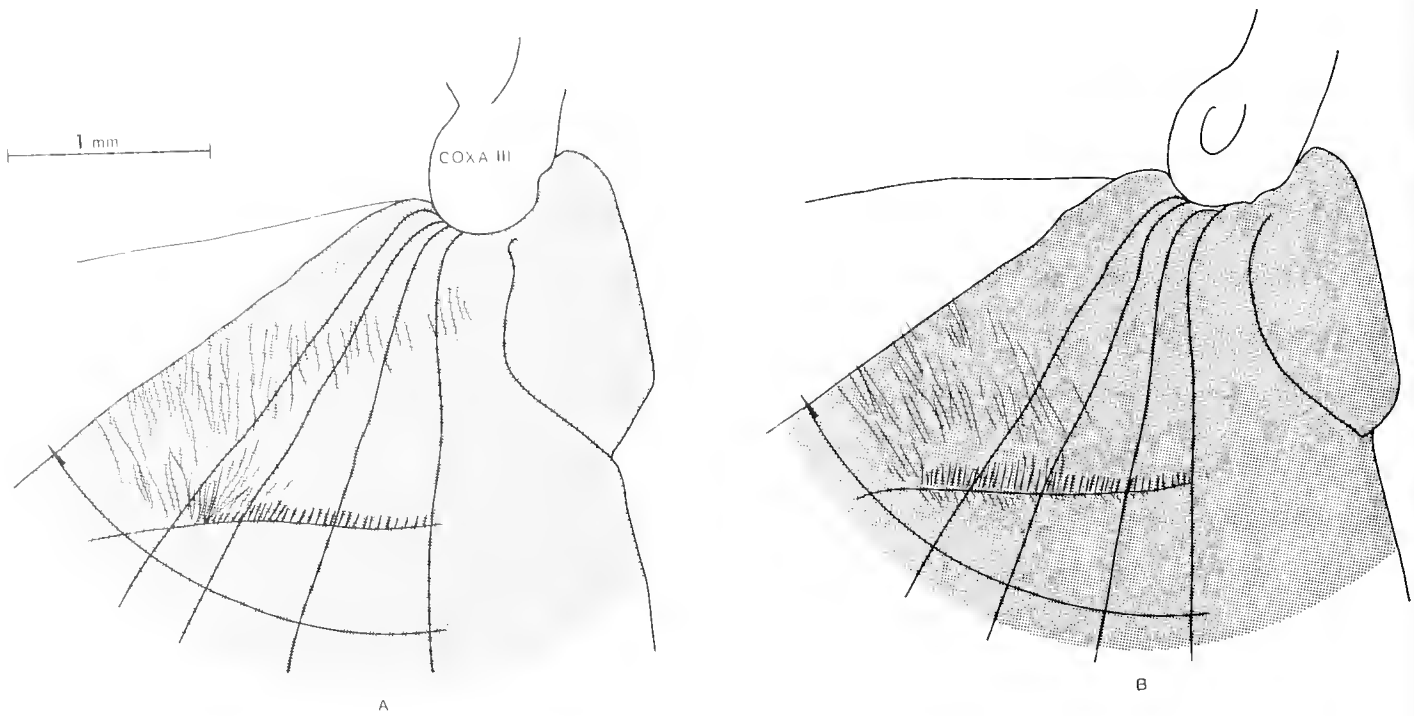

Fig. 2. Movement of metafemur over sternal file in *Colymbetes sculptilis*: (a) male; (b) female. See text for further information.

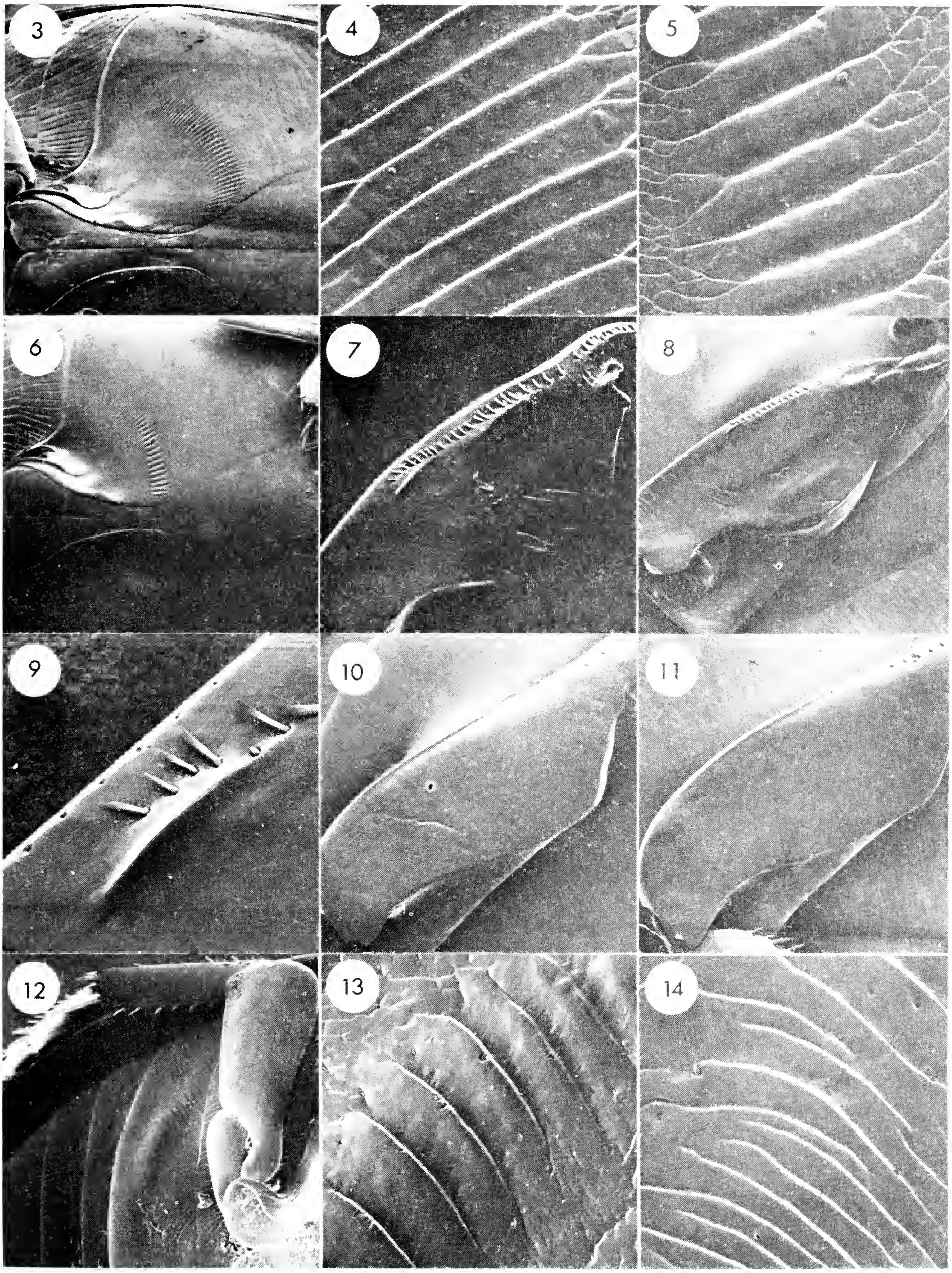

Fig. 3. *Laccophilus maculosus decipiens*: coxal file; x 22.
Fig. 4. *L. m. decipiens*: ibid; x 225.
Fig. 5. *L. fasciatus*: ibid; x 225.
Fig. 6. *L. fasciatus*: ibid; x 22.
Fig. 7. *L. maculosus decipiens*: dorsal view of metafemur showing femoral plectrum; x 40.
Fig. 8. *L. fasciatus*: ibid; x 40.
Fig. 9. *L. maculosus decipiens*: ibid; x 187.
Fig. 10. *Agabus semipunctatus*: dorsal surface of metafemur with anterior ridge; x 37.
Fig. 11. *A. velox*: ibid; x 37.
Fig. 12. *A. semipunctatus*: file of abdominal sternum 2; x 20.
Fig. 13. *A. semipunctatus*: ibid; x 187.
Fig. 14. *A. velox*: ibid; x 187.

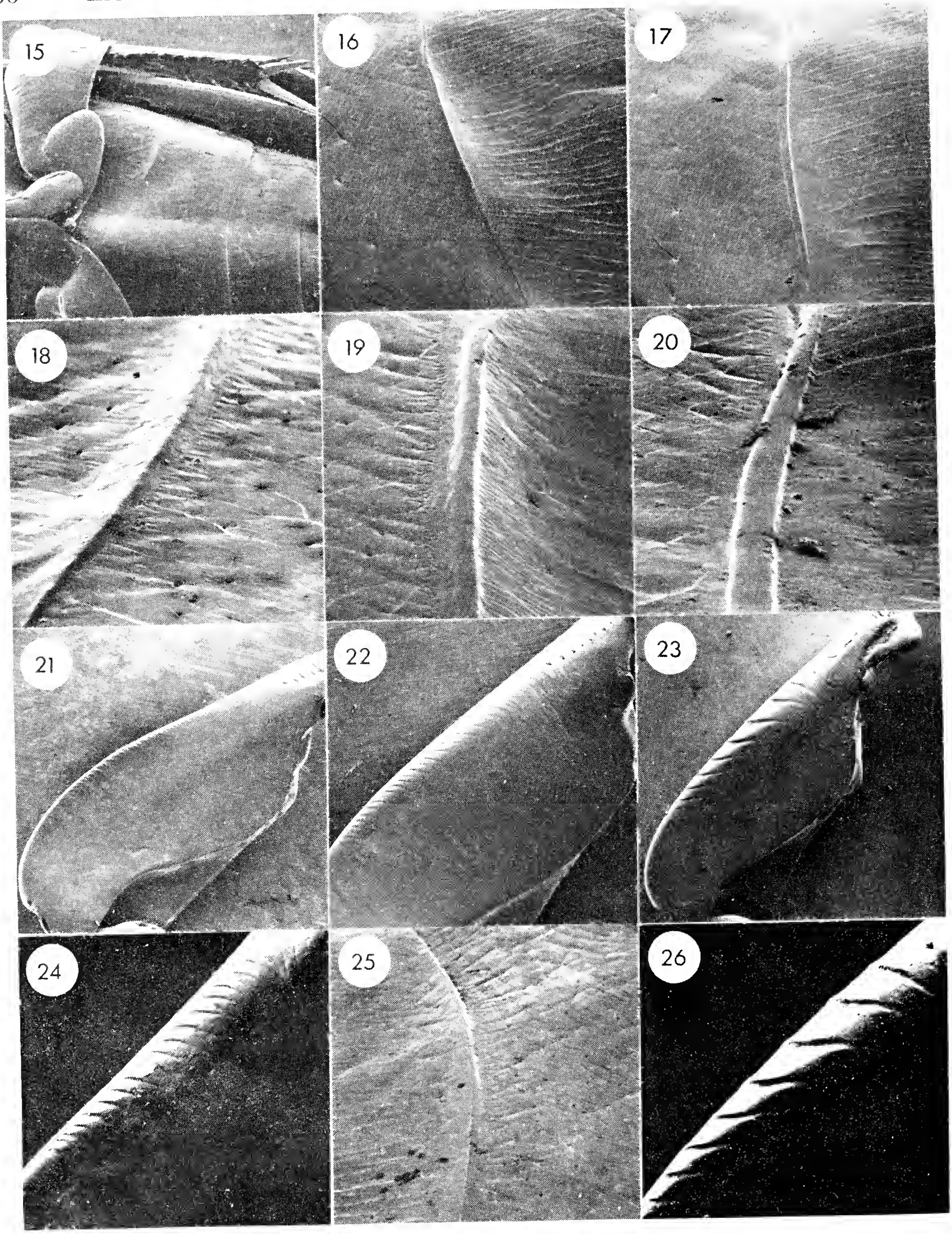

Fig. 15. *A. pisobius*: plectrum on suture between abdominal sterna 2 and 3; x 20.
Fig. 16. *A. punctatus*: ibid; x 37.
Fig. 17. *A. aeruginosus*: ibid; x 37.
Fig. 18. *A. pisobius*: ibid; x 205.
Fig. 19. *A. punctatus*: ibid; x 180.
Fig. 20. *A. aeruginosus*: ibid; x 200.
Fig. 21. *A. pisobius*: dorsal view of metafemur with anterior file; x 37.
Fig. 22. *A. punctatus*: ibid; x 37.
Fig. 23. *A. aeruginosus*: ibid; x 27.
Fig. 24. *A. falli*: ibid; x 55.
Fig. 25. *A. disintegratus*: plectrum on suture between abdominal sterna 2 and 3; x 75.
Fig. 26. *A. aeruginosus*: dorsal view of metafemur; x 55.

Genus *Loccophilus* Leach

Zimmerman (1970) recorded 27 North American species of this genus, and 12 possess a file on each metacoxal plate. Certain Palaearctic species also bear similar organs. There is intraspecific variation in the number and coarseness of lines in the file. The file is absent or less developed on females.

1. *Laccophilus maculosus decipiens* LeConte. The organ is present on the male only. The file (Fig. 3,4) consists of 35 to 45 lines (Zimmerman 1970), each about 140μ long. A well developed ridge of about 140μ long is present anteriomedially on the dorsal surface of the metafemur (Fig. 7,9). The ridge is positioned so that it passes directly over the file as the leg swings in an arc across the metacoxa.

2. *Laccophilus fasciatus* Aubé. The coxal file (Fig. 5,6), present on the male only, consists of 20 to 30 lines (Zimmerman 1970), each about 100μ long. Compared with *L. maculosus*, the entire file is located closer to the base of the metacoxa and the lines are shorter, broader, and deeper. The dorsal face of the metafemur possesses a short ridge (Fig. 8) of about the same length as the width of the file.

Genus *Hydrovatus* Motschulsky

Young (1963) noted a ridge bearing cross-striations on the anterior border of the meta-coxa of 2 Palaearctic species, *H. cuspidatus* Kunze and *H. clypealis* Sharp. A similar structure has not been found on any New World species, although we have not examined specimens of *Hydrovatus*. Young suggested that the structure forms part of a stridulatory organ but did not give a description of how the organ might operate.

Genus *Agabus* Leach

Organs of the file-and-ridge type occur on only a few species of this large genus. Two types of organ have been observed: 1) the file occurs on the mediolateral portion of visible abdominal sternum 3, and a ridge is present on the anterior margin of the metafemur; 2) a ridge occurs along the mediolateral portions of the suture between visible abdominal sterna 2 and 3, and the anterior margin of the metafemur is cross-striated to produce a file. Interspecific differences in these structures involve the width and sharpness of the ridge and the coarseness of the file.

1. *Agabus semipunctatus* Kirby. The male possesses a very strongly developed file on the mediolateral area of visible abdominal sternum 3 (Fig. 12, 13). The lines are deep and the intervening ridges slope gradually posteriorly and internally, but abruptly externally and anteriorly. The anterior dorsal margin of the metafemur is delimited by a longitudinal submarginal groove (Fig. 10). The file is arranged in a more or less concentric arc around the base of the leg. A similar organ occurs on the Palaearctic species *affinis* Paykull and *unguicularis* Thoms. (Guignot 1933).

2. *Agabus velox* Leech. This species is closely related to *A. semipunctatus* Kirby, and the males possess an organ of basically the same type. However, the sternal file (Fig. 14) is more irregular without the lines so strongly raised or showing a definite orientation. Also, the groove on the metafemur (Fig. 11) is not so well defined.

3. *Agabus falli* A. Zimmerman. Although this species is apparently closely related to *A. semipunctatus* Kirby, the file-and-ridge organ consists of the reverse type; that is the file (Fig. 24) occurs on the anterior dorsal surface of the metafemur and the ridge is formed from the elevation of the suture between visible abdominal sterna 2 and 3. Only the male possesses such an organ. The file is moderately coarse and more or less unspecialized in that the lines run rougly at right angles to the leading edge of the femur (Fig. 1b), and parallel to each other throughout much of the length of the organ.

4. *Agabus pisobius* Leech. The organ, which consists of a sharp abdominal ridge (Fig. 15, 18) and a fine femoral file (Fig. 21), is equally developed on both sexes.

5. *Agabus punctatus* Melsheimer. The organ is found on the male only. The sternal ridge (Fig. 16, 19) is fairly broad and somewhat rounded medially. The femoral file (Fig. 22) is about as coarse as that of *A. falli*. However, there is a greater tendency for the lines on the distal half of the femur to run obliquely in from the margin rather than be oriented at right angles to the margin.

6. *Agabus aeruginosus* Aubé. The organ possessed by the male is similar to that of *A. punctatus*, to which *A. aeruginosus* is closely related. The ridge (Fig. 17, 20) is broad with a low profile, and the file (Fig. 23, 26) is extremely coarse. The lines of the file are almost at right angles to the leading margin of the femur basally, but become oblique distally so that as the leg swings forward over the ridge, the lines maintain their longitudinal axis at right angles to the longitudinal axis of the ridge (Fig. 1a).

7. *Agabus disintegratus* Crotch. The sternal ridge (Fig. 25) is sharp and curved so that its anterior face is concave, and the femoral file (Fig. 27, 28) is extremely fine, formed from numerous short transverse lines. This development occurs only in the male. *Agabus taeniolatus* Harris, a closely related species, possesses a similar organ on the male (Fig. 29).

Genus *Carrhydrus* Fall

Carrhydrus crassipes Fall, the only species of this endemic North American genus, possesses a peculiar organ formed by the labial palpi and the submentum (Fig. 30, 31). The penultimate article of each palpus is triangular in shape, with a sharp ventral and 2 lateral ridges. The anterior margin of the submentum is raised laterally and bears a series of coarse longitudinal ridges. When the palpus is bent backwards and swung laterally, the median portion of the ventral ridge passes over the striae on the submentum. These structures are present and equally developed on both sexes. Fall (1922) described the peculiar structure of the labial palpus but did not suggest a function for it.

Genus *Colymbetes* Clairville

The relevant structures in this genus consist of a sternal file and a ridge on the anteror margin of the metafemur. The file occurs on the mediolateral portion of the hind margin of visible sternum 2 (Fig. 32, 33, 34, 35). The area comprising the file is slightly raised and coarsely longitudinally striate. On most specimens, the striae are longitudinally arranged medially, but become oblique laterally in a manner which maintains their longitudinal axis at right angles to the arc transversed by the femur (Fig. 2a). The file is present on both sexes of all species that we examined. However, on females of at least *C. sculptilis* Harris, the file is not so strongly raised as on the male. In addition, the striae on the female are slightly shorter and weaker, and the orientation of the ridges is roughly longitudinal throughout the length of the file and does not shift to a more oblique position laterally in correlation with the changing angle of incidence of the femur (Fig. 2b). Between species, the file varies in coarseness and in number of ridges from the few large coarse ridges of *C. fuscus* L. to the more numerous fine ridges of *C. sculptilis*. A ridge is formed by the sharp anterior margin of the metafemur which is limited dorsally by a shallow submarginal longitudinal groove similar to that shown by *Agabus semipunctatus*.

These structures were known to Gahan (1900) who queried the stridulatory function assigned to the system by previous authors, on the basis that specimens of *Colymbetes* had not been heard to stridulate. Balfour-Browne (1950) illustrated the sternal file of the species *fuscus* L. and *striatus* L.

Genus *Cybister* Curtis

Crotch (1873) first described the organ possessed by this genus. The organ, present only on males, consists of a series of short coarse grooves on the inner basal margin of the metacoxa (Fig. 36) and a corresponding ridge on the dorsal basal surface of the metatibia (Fig. 37). The number of grooves in the file varies between species. The file and ridge of *C. fimbriolatus* Say are illustrated in this paper.

Genus *Hydaticus* Leach

An unusual organ is present on the front legs of the males (Fig. 38, 39) of all North American species, and at least several Palaearctic species. The coarsely pitted dorsal surface of the second tarsal article (Fig. 31, 42) could act as a file across which can be moved a row of stout spines situated on the external margin of the protibia (Fig. 40). During the forward motion of the tibia, the movable spines bend backwards and upwards; however, during the backstroke, the spines are held perpendicularly by a ridge which passes across the anterior basal margin of the spine row. Although the pitted sculpture of the protarsus has been described for some European species (Rye 1859, *in* Balfour-Browne 1950), a function has not been postulated for it.

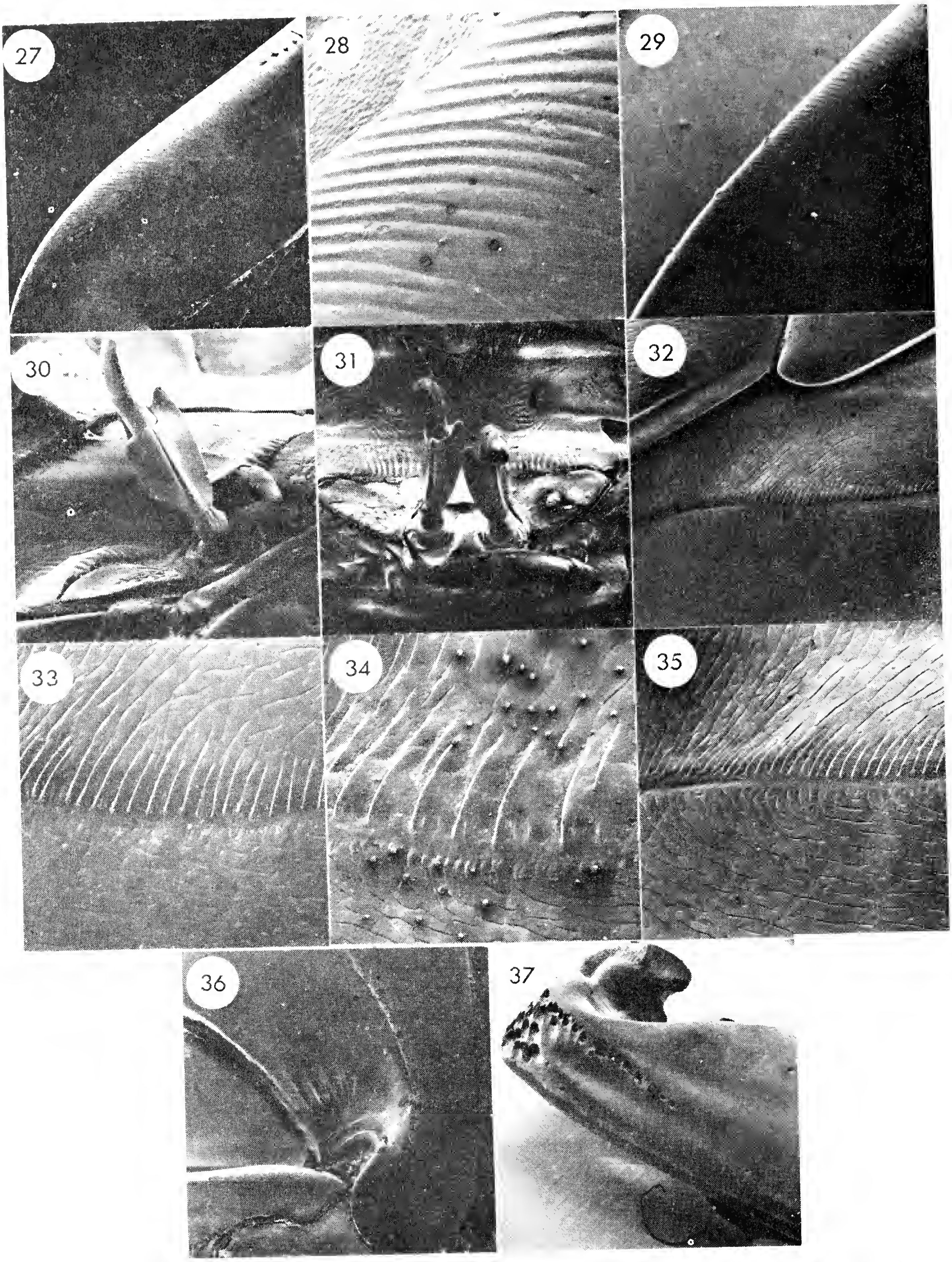

Fig. 27. *A. disintegratus*: ibid; x 37.
Fig. 28. *A. disintegratus*: ibid; x 375.
Fig. 29. *A. taeniolatus*: ibid; x 55.
Fig. 30. *Carrhydrus crassipes*: ventral surface of head, lateral view of labial palpus and submentum; x 26.
Fig. 31. *C. crassipes*: ventral surface of head, anterior view; x 23.
Fig. 32. *Colymbetes sculptilis*: file of abdominal sternum 2; x 20.
Fig. 33. *C. exaratus*: ibid; x 42.
Fig. 34. *C. fuscus*: ibid; x 42.
Fig. 35. *C. sculptilis*: ibid; x 42.
Fig. 36. *Cybister fimbriolatus*: metacoxal file; x 9.
Fig. 37. *C. fimbriolatus*: base of metafemur, dorsal view; x 220.

Discussion

The structures described here possess the morphological requirements of stridulatory organs of the type termed "frictional mechanisms" by Haskell (1961). Some, such as those of *Laccophilus maculosus decipiens* or *Agabus disintegratus* possess a file of a fineness comparable with acknowledged sound-producing mechanisms in other groups such as the Orthoptera. Others, which are clearly of the same morphological type as the above (e.g., *Cybister* or *Agabus aeruginosus*), are much coarser but nevertheless compare with published drawings of certain frictional stridulatory organs in both Orthoptera and Hemiptera (Haskell 1961). Also, in those organs with a coarse sculpture, the orientation between the ridge and the lines on the file, as the parts move across each other, is much more precisely matched than in species with fine sculpture (Fig. 1).

With the exceptions of *Agabus pisobius,* all species of *Colymbetes* examined, and *Carrhydrus crassipes,* well-developed structures of this type are present on the males only. They probably function primarily in courtship.

The described structures fall into 5 groups, based on the position on the body: 1). File on submentum, ridge on labial palpus (*Carrhydrus*). 2). File on coxa, ridge on metafemur (*Laccophilus, Hydrovatus, Cy-*

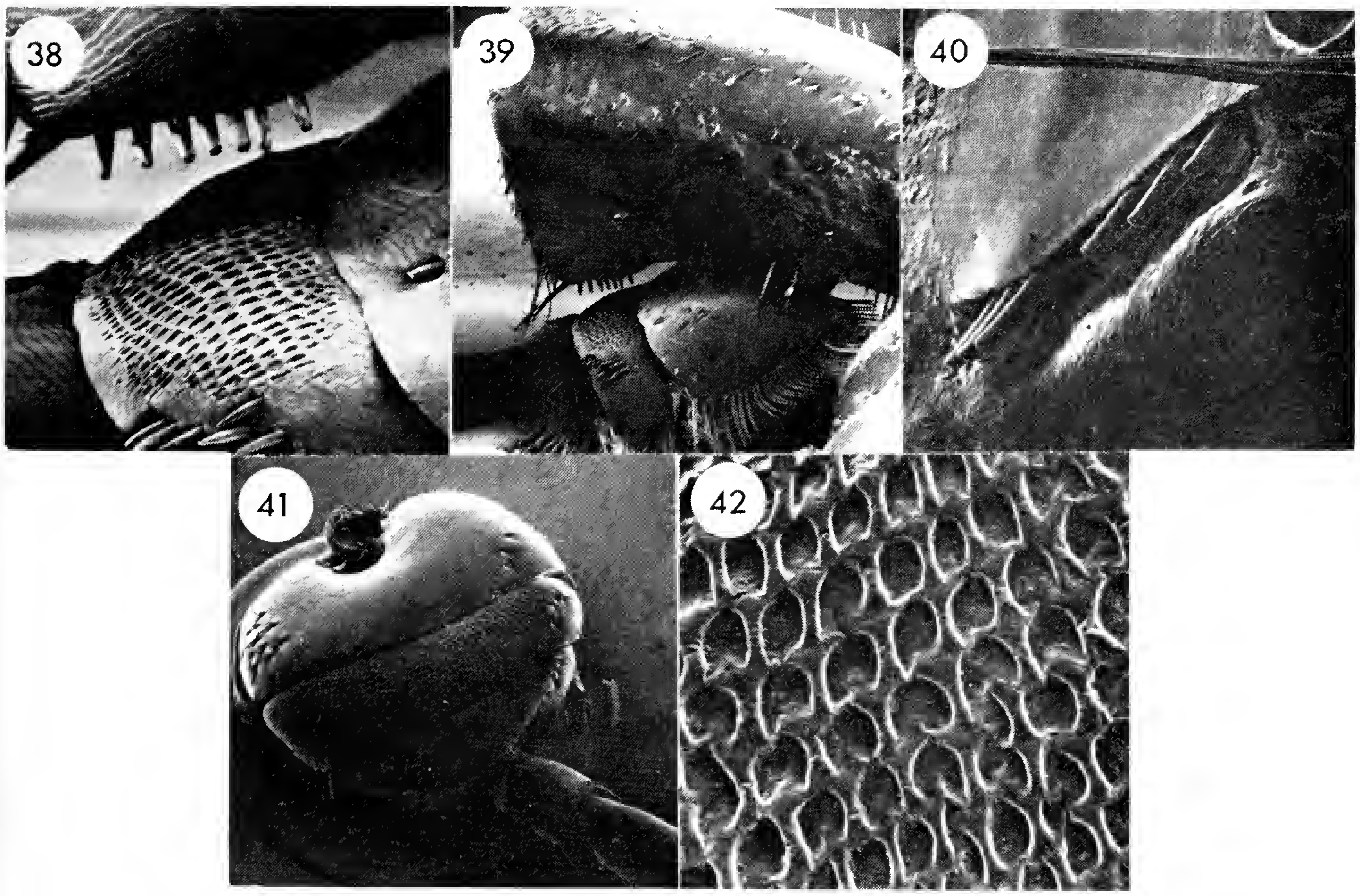

Fig. 38. *Hydaticus modestus*: left front leg, posterior view of protibial spines and tarsal articles 1 to 3; x 75.
Fig. 39. *Hydaticus modestus*: ibid; x 20.
Fig. 40. *Hydaticus modestus*: protibial spines; x 110.
Fig. 41. *Hydaticus modestus*: left protarsus, dorsal view; x 20.
Fig. 42. *Hydaticus modestus*: protarsal article 2, dorsal view; x 200.

bister). 3). File on abdomen, ridge on metafemur (some *Agabus*, *Colymbetes*). 4. Ridge on abdomen, file on metafemur (some *Agabus*). 5). File on protarsal article 2, spines on protibia (*Hydaticus*).

Some of these groups are undoubtedly natural, with the stridulatory structures homologous in the species included in the group. For example, the organ possessed by the species of *Hydaticus* is very similar throughout the genus, probably having a common origin. On the other hand, taxonomically distant species have developed similar forms of organs. Certain species of the genera *Laccophilus* and *Cybister* possess a coxal file and a corresponding femoral ridge, although differences in the position and structure of these organs tend to confirm that the 2 genera are not closely related. Similarly the presence of a sternal file and femoral ridge on a few species of *Agabus* and on the species of *Colymbetes* seems to be attributable to convergence.

Only a few species of *Agabus*, all of which appear to be closely related, possess sternal files; have a different form of organ but still use essentially the same body parts. Among the North American species, the sternal ridge femoral file type of organ is found in 4 groups: 1) *falli* group; 2) *punctatus* - *aeruginosus* group; 3) *disintegratus* group; 4) *pisobius* group. While these species represent a single section of the large genus *Agabus*, it is doubtful that these organs were all inherited from a single ancestral stock; *A. pisobius* is very similar to *A. punctulatus* Aubé, *oblongulus* Fall, and *colymbus* Leech, but none of the latter possess possible stridulatory organs. While the latter 3 species are allopatric, the range of *pisobius* overlaps the distribution of both *punctulatus* and *oblongulus* and a stridulatory organ could provide an isolating mechanism. Two of the 3 species of the *disintegratus* group, namely *A. disintegratus* Crotch and *A. taeniolatus* Harris, possess possible stridulatory organs, while the third species, *A. lineellus* LeConte, lacks an organ. Both species of the *punctatus* group, *punctatus* Melsheimer and *aeruginosus* Aubé, have metafemoral files and sternal ridges. *Agabus falli* appears to be closely related to *A. semipunctatus* on the basis of habitus and male sexual and secondary sexual characters, yet it has an organ of a different type.

If the function of these organs is sound production then these observations support the views of Alexander, Moore, & Woodruff (1963): "The rudimentary nature of acoustical behavior in beetles—coupled with the great number and variety of species and systems involved—makes this kind of behavior in these particular animals an appropriate subject for the study of evolutionary direction in the early elaboration of communicative systems."

Acknowledgments

We are grateful to Mr. Bob Fitch, Department of Civil Engineering, University of Calgary, who was helpful in operation of the scanning electron microscope; to Dr. J. B. Cragg whose critical reading of the text improved it immeasurably; and to Mr. H. B. Leech, California Academy of Sciences, for providing specimens of hard-to-obtain species of *Agabus* as well as reprints of early work. The work is supported in part by grants from the National Research Council of Canada and the University of Calgary Grants Committee.

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NOTICE OF PROPOSED AMENDMENTS TO THE CONSTITUTION

a) By-Law I. Section 6: Now reads: "A member whose dues have not been paid within a reasonable period of time as determined by the Executive Committee will forfeit the privileges of *membership. Such members may be reinstated upon payment of current dues."* Proposed change: ". . . .membership. Such members may be reinstated upon payment of dues owed during the period of delinquency plus the current dues." The reason is obvious. If the returning member does not pay the delinquent dues, he has then received the Bulletin free for at least a year.

b) Article II. Now reads: "Object: The objective of the Society shall be to promote the study of Coleoptera." Proposed change: *Object and Operation:* The object of the Society shall be the advancement of the science of Coleopterology in all its aspects of theory, principles, methodology, and practice, for both living and fossil beetles, with emphasis on areas of common interest to all coleopterists regardless of individual specialization. With this object in mind, the Society shall be organized and operated exclusively for scientific and educational purposes." This amendment and the next are necessary for our tax exempt status.

c) By-Law V. *Termination of the Society.* Now reads: "If, for any reason, the Coleopterists Society is terminated, the assets of the Society will be *turned over to the Entomological Society of America."* Proposed change: ". . . .distributed to the 1) Society of Systematic Zoology, or 2) Entomological Society of America. However, if neither of the named recipients is then in existence, or if neither is then a qualified distributee, or if neither is willing or able to accept the distribution, then the assets of this organization shall be distributed to a fund, foundation, or corporation organized and operated exclusively for the purposes specified in section 501 (c) (3) of the Internal Revenue Code."

d) By-Law II. Section 1. Now reads: "The officers and council of the Society shall serve as the Executive Committee. The immediate Past-President of the Society shall sit for one term as an *ex-officio* member of the Executive, and shall be entitled to vote." Proposed change: "The officers, the council, and the editor of the Coleopterists Bulletin, shall serve as the Executive Committee. The immediate Past-President of the Society shall sit for one term as an *ex-officio* member of the Executive, and shall be entitled to vote." Until now there has been little contact between the Executive Committee and the Editor of the Bulletin. If the Editor is considered a full voting member of the Executive, he will be in a better position to present publication matters to the officers and council and to get increased feedback from them. Since the journal and its editor are not mentioned elsewhere in the Constitution, the following By-Law might also be added.

e) "By-Law VII. *Journal.* The journal of the Society shall be called the "Coleopterists Bulletin" and shall be conducted by an Editor, who shall be appointed by the President, with the approval of a majority of the Executive Committee."

REVIEW OF NORTH AMERICAN SPECIES OF *ORTHALTICA* WITH NEW GENERIC SYNONYMY (COLEOPTERA: CHRYSOMELIDAE: ALTICINAE)

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ABSTRACT

Livolia Jacoby, 1903, and *Leptotrichaltica* Heikertinger, 1925, are synonymized with *Orthaltica* Crotch, 1873. A key to Nearctic species is given.

While in the United States (N.S.F. Senior Foreign Scientist Fellowship), I became acquainted with the genus *Orthaltica* and recognized that the species are the Nearctic representatives of the genus *Livolia* whose distribution is the Ryu-Kyu-Islands, Asia, Micronesia, New Guinea, Australia, and Africa. After further study, it also became apparent that *Leptotrichaltica* is a synonym of *Orthaltica* and that *Leptotrichaltica rhois* (B. E. White) is a synonym of *L. recticollis* (LeConte).

Upon my return to the Frey Museum, I was able to critically compare *Orthaltica, Livolia,* and *Leptotrichaltica,* and concluded that they are definitely congeneric. The main point in support of this proposal that all 3 genera are congeneric is that they all lack an extensor apodeme (Organ of Maulik). Previous observations regarding this structure in my revision of *Livolia* (1971) were incorrect. The oil of cloves which I used to prepare the specimens (as well as cold KOH) usually produces what appears to be an extensor apodeme. Since that time I have found that it is necessary to cook the insect in a 10% solution of KOH in order to see the extensor apodeme. Also, I could find no external morphological characters, new or classical, with which to separate the genera.

The male genitalia of all North American *Orthaltica* and *Leptotrichaltica* have an asymmetrical aedeagus, while the species of *Livolia* thus far examined have a symmetrical aedeagus. This is the best evidence that *Leptotrichaltica* is congeneric with *Orthaltica* as this character is rare in the Alticinae (Fig. 1a-d). The only other example I know is the genus *Chalaenosoma* in southern India. The aedeagus might prove to be important at the subgeneric level, but it is probably best not to speculate on subgeneric criteria until the entire genus is better known.

Genus *Orthaltica* Crotch

Orthaltica Crotch, 1873:69 (type-species: *Crioceris copalina* Fabricius; N. America; Horn, 1889:236, 247; Blatchley, 1910:1206, 1215; Heikertinger, 1924-25 (1925):65; Arnett, 1963:914, 938.

Leptotrix Horn, 1889:236, 249 (type-species: *L. recticollis*; N. America) (*nec* Menge, 1868: Araneae) see *Leptotrichaltica*.

Livolia Jacoby, 1903:15 (type-species: *L. sulcicollis* Jac.; Africa; Scherer, 1961:268; 1969:10, 19, 118, 242; 1971:1-37. **New Synonym.**
Leptotrichaltica Heikertinger, 1924-25 (1925):68 for *Leptotrix* Horn. **New Synonym.**
Micrepitrix Laboissiére, 1933:205 (type-species: *M. coomani* Lab.; Tonkin; Gressitt, 1955:35 (Alticinae); Gressitt & Kimoto, 1963:404, 575; Samuelson, 1965:219; Scherer, 1969:10, 19, 98; 1971:10 (as synon.)
Serraticollis B. E. White, 1942:17 (type-species: *S. rhois* White; Calif.; Arnett, 1963:938 (as synon.)

Shape compact, elongate-oval; length of body 1.0 to 2.8mm; color usually brownish but sometimes nearly black; elytral vestiture somewhat dense, but varies.

The features which best characterize this genus are: each elytron with 9 more or less regular rows of punctures (the lateral and sutural rows not counted); punctation of scutellar field of elytra tends to be somewhat irregular and may show variation within the same species; lateral margin of pronotum usually toothed; antebasal impression of pronotum not interrupted laterally by longitudinal furrows, but instead, bending posteriorly and joining hind angles; pronotum strongly punctate; punctation of head moderate to strong, however, certain species groups distributed in Asia and Africa with as few as 4 setigerous punctures across frons; anterior coxal cavities closed; anterior and middle coxae widely separated; hind femora slightly swollen but small when compared to other Alticinae; extensor apodeme (organ of Maulik) not present.

Type of genus: *Orthaltica copalina* (Fabricius)

Key to the Nearctic Species of Orthaltica

1. Sides of pronotum not serrate .... *melina* Horn
1′. Sides of pronotum serrate 2
2(1′). Punctation of elytral disc irregular; length 2.5-2.8mm .... *copalina* (Fabricius)
2′. Punctation of elytral disc serial; length 1.7-2.5mm 3
3(2′). Length 1.8-2.5mm; sexual dimorphism strongly evident: middle femora constricted at base, stronger in male than in female (Fig. 2b); pronotum of male longer and more produced at apex than in female (Fig. 3) .... *recticollis* (LeConte)
3′. Length 1.70-1.73mm; sexual dimorphism weakly evident: middle femora not constricted in either sex; pronotum of both sexes subequal .... *parkeri* (B. E. White)

Nearctic Species

Orthaltica copalina (Fabricius)

Crioceris copalina Fabricius, 1801:466; Olivier, 1808:720, Pl. 5, Fig. 92.
Orthaltica copalina Crotch, 1873:69; Horn, 1889:248; Blatchley, 1910:1215.
Haltica forticornis Illiger, 1807:111 (Pennsylvania; Berlin ?)

DESCRIPTION: Length 2.5 to 2.8mm; color piceus (rarely reddish brown); head usually strongly punctate (Fig. 4b) although some specimens show finer punctation; frontal tubercles strongly convex; antennal sockets approximate; antennae long, more than two-thirds length of elytra (longer in males); punctation of pronotum as coarse as on elytra and head, punctation less dense in front of antebasal depression; punctation of anterior elytral disc (scutellar field) confused, humeral calli very convex, basal calli raised; aedeagus, Fig. 1a.

DISTRIBUTION: Alabama, Florida, Illinois, Indiana, Iowa, Maryland, Massachusetts, Missouri, New York, North Carolina, Pennsylvania, South Dakota; Canada (Ad and Lenox Co., Ontario)

NEW DISTRIBUTION RECORDS: ILLINOIS: 2 without further data (Mus.Frey); MARYLAND: 1 Bladensburg, Ja.13/16, Ducket (Mus.Frey); MASSACHUSETTS: 13 ex. Lawrence (Mus.Frey); MISSOURI: 2 Fern Glenn, Franklin Co., G. W. Bock (Mus.Frey); NEW YORK: 3 Ithaca, June 23, 1925 (Mus.Frey); 1 White Lake July 12, 1897, J. L. Labriskic (Mus.Frey); 2 Pearl River, K. P. Jansson (Mus.Frey); NORTH CAROLINA: 1 Black mts. V.1927, (Mus.Frey); PENNSYLVANIA: 2 Wilmerding (Mus.Frey); 2 without further data (Mus.-Frey); 8 Bethlehem (Mus.Frey); 1 Philadelphia (Mus.Frey); Steelton, Dauphin Co.; Stoverdale; Heckton Mills; Harrisburg (all coll. Balsbaugh); SOUTH DAKOTA: Lincoln Co., Newton Hills State Park on *Rhus glabra*; Canton; Union Co., Union Co. State Park on *Rhus glabra*.-CANADA: Ontario, Ad and Lennox Co., J. F. Brimley (South Dakota State Univ.).

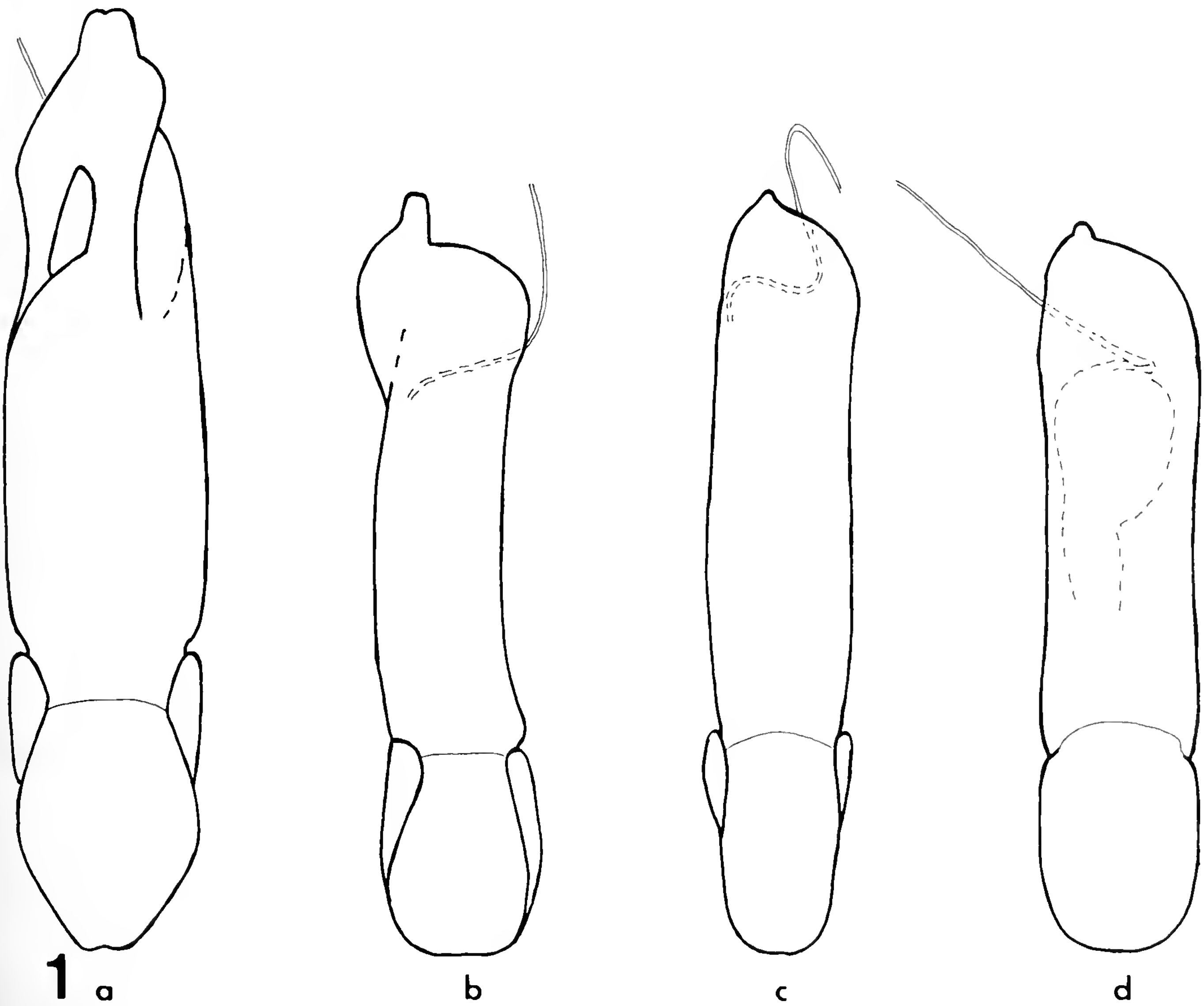

Fig. 1: Aedeagus of a) *Orthaltica copalina*, b) *O. melina*, c) *O. recticollis*, d) *O. parkeri* (90 X).

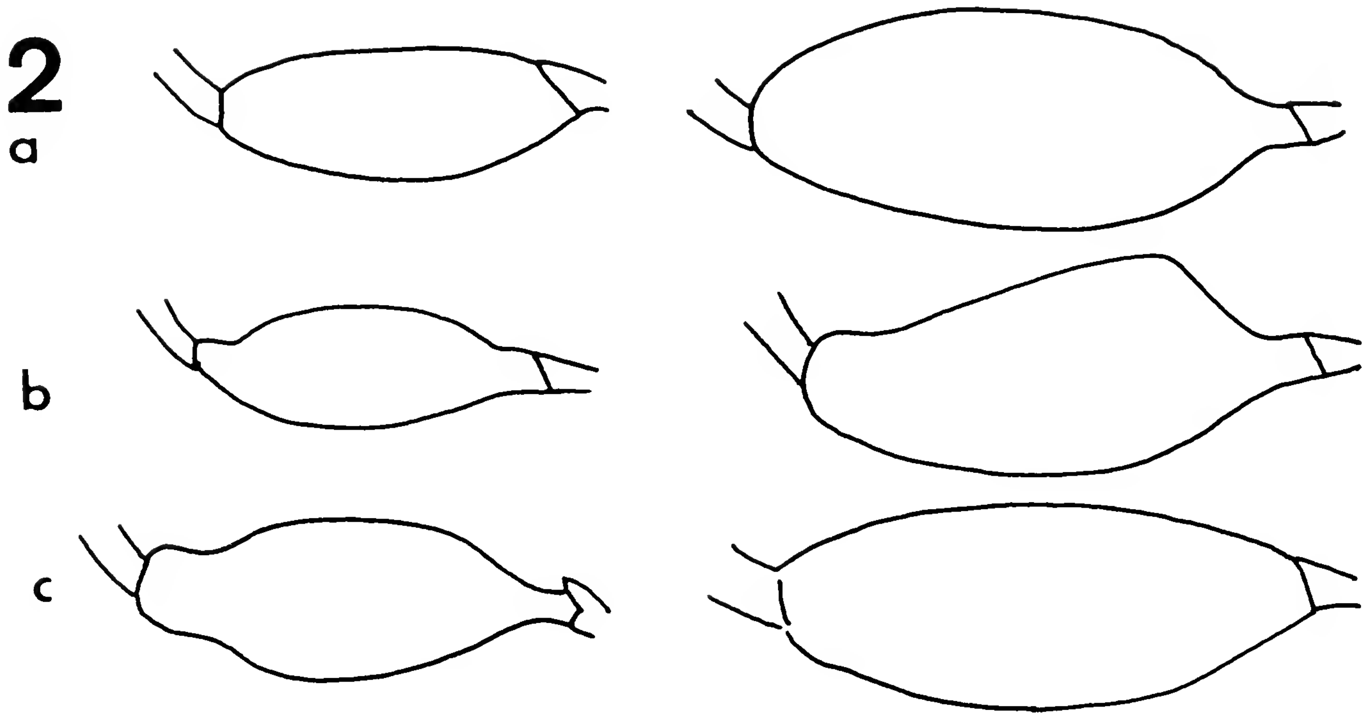

Fig. 2: a) front femora, b) middle femora, c) hind femora of left *Orthaltica parkeri,* right *O. recticollis* (60 X).

Orthaltica melina Horn

Orthaltica melina G. Horn, 1889:249 (Kansas, Texas; Acad. Nat. Sci. Pa.); Blatchley, 1910: 1215, 1216 (Indiana).

DESCRIPTION: Length 2.0 to 2.2mm; yellowish to reddish brown; elytra occasionally with translucent, seemingly dark spots; antennal sockets nearly approximate (Fig. 4a); punctation between eyes slight and scattered; punctation on anterior elytral disk not confused; aedeagus as in Fig. 1b.

DISTRIBUTION: Alabama, Indiana, Kansas, Pennsylvania, South Dakota, Texas.

NEW DISTRIBUTION RECORDS: PENNSYLVANIA: Bucks Co., 2 mi. E. Mechanicsville on *Rhus radicans* L., E. U. Balsbaugh, Jr.; SOUTH DAKOTA: 38, Union Co. State Park on *Rhus glabra,* 11-VIII-71, G. Scherer, (Mus.Frey); 12, Lincoln Co., Newton Hills State Park on *Rhus glabra,* 7-VII-71, G. Scherer (Mus.Frey); loc. cit. E. U. Balsbaugh, Jr., TEXAS: 1 female, Dallas (Mus.Frey).

Orthaltica recticollis (LeConte) **New Combination**

Haltica recticollis LeConte, 1862 (1861):358 (California—Mus. Comp. Zool. Cambridge, Mass.).

Orthaltica recticornis (LeConte), Crotch, 1873:70.

Leptotrix recticollis G. Horn, 1889:250, Pl. 6, Fig. 11 (California and Oregon).

Leptotrichaltica recticollis Heikertinger, 1924-25 (1925):68.

Serraticollis rhois B. E. White, 1942:18, Fig. 1, 2, 4 (California, Riverside Co., Beaumont on flowers of *Rhus* sp.-Cal. Acad. Sci., San Francisco) **New Synonym**

O. recticornis appears to be a misspelling by Crotch (1873) for *recticollis*. This is not cited again, even by Horn (1889) when he erected the genus *Leptotrix* for *recticollis*. In his description of *Haltica recticollis,* LeConte stated: "The western representative of our *H. forticornis* Ill. (?*copalina* Fabr.), though very different from that species."

Description: Length 1.8 to 2.4mm; color of head and pronotum reddish, elytra yellowish to piceus brown, slightly brownish and clouded along the suture, darker than pronotum; punctation of elytral disc entirely regular; antennae moderately long, nearly one-half elytral length; head with scattered punctation between eyes, vertex alutaceous; frontal tubercles not prominent, shiny, seemingly polished; antennal sockets widely separate (Fig. 4c); sexual dimorphism evident, pronotum of male longer and more produced in front than in female (Fig. 3); femora constricted at base, constriction more pronounced in male than in female (Fig. 2); aedeagus Fig. 1c.

New distribution records: California: Trinity Co., V.1.17, F. W. Nunenmacher, coll. 1 female (Mus.Frey), 1 ex. SDSU coll., (Mus.Frey in exchange from Field Mus., Chicago, Nunenmacher coll.); California without further data 2 males, 2 females (Mus.Frey).

3

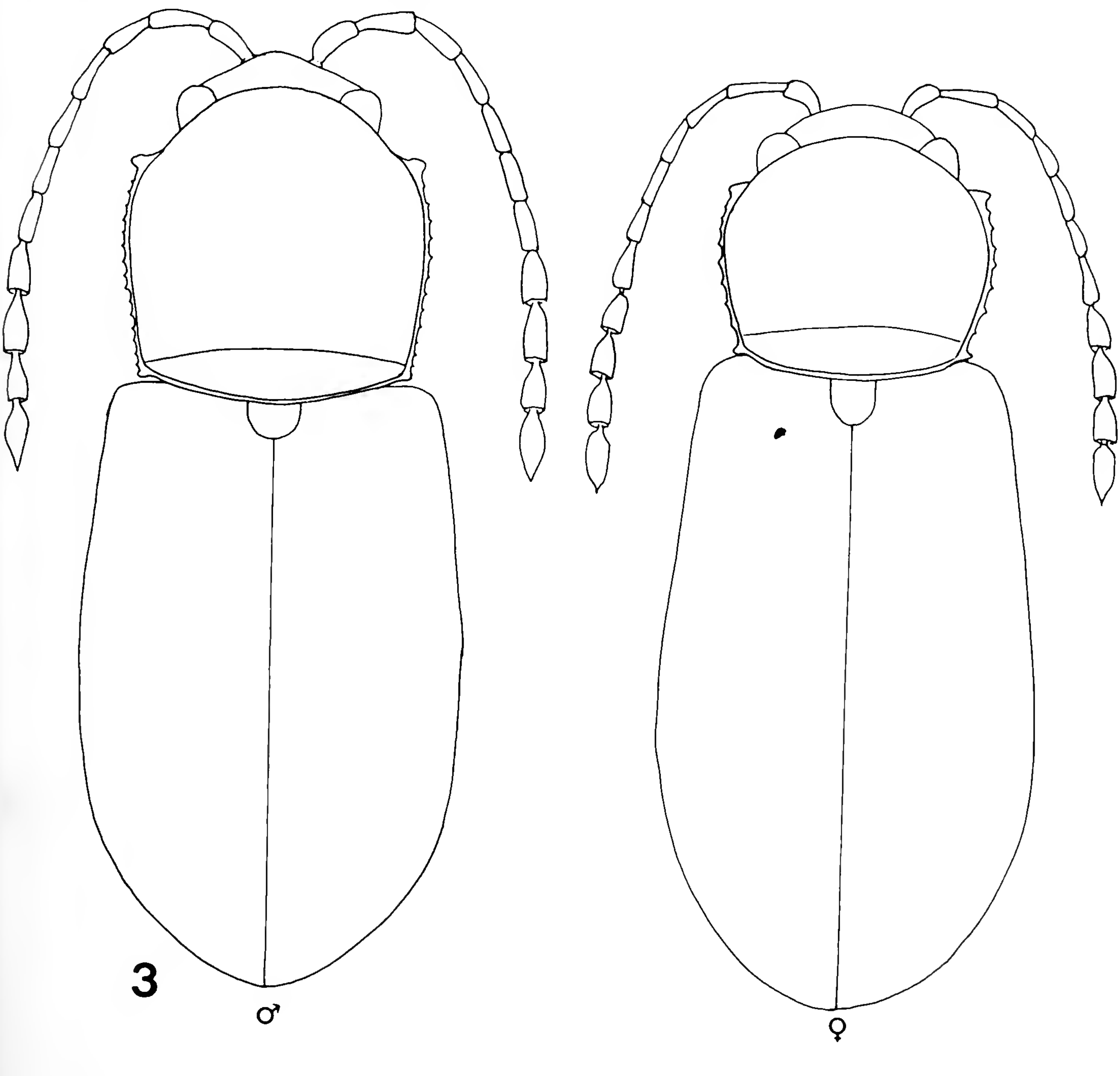

Fig. 3: *Orthaltica recticollis* male and female (40 X).

Orthaltica parkeri (B. E. White) **New Combination**

Serraticollis parkeri B. E. White, 1942:20, Fig. 3 (Arizona: Globe, on *Rhus*–Calif. Acad. Sci., San Francisco).

DESCRIPTION: Length 1.70 to 1.73mm; middle femora not constricted at base in either sex (Fig. 2); sexual dimorphism less evident, pronotum of male and female subequal; aedeagus Fig. 1d. There is no apparent difference in the coloration between *parkeri* and *recticollis*. When compared with the males of *parkeri*, the males of *recticollis* show a stronger punctation of the elytra and pronotum as well as somewhat more convexity of the elytral intervals. The head in both species is similar; vertex shagreened, shiny and somewhat polished between the eyes with scattered punctures; the area between the oblique frontal tubercles forms a pit-like depression; the diameter of the eyes compared to the interocular distance is proportionally the same with regard to the size of the specimen. The only other noticeable difference are in the femora. In *O. recticollis* the male femora (Fig. 2), especially the middle femora, are swollen and display a noticeable stalk-like constriction near the base. The degree of "swelling" of the middle femora shows variation in different specimens. Even though the female femora are less enlarged, they also show a somewhat stalk-like constriction at the base. The femora of male *parkeri*, even though less enlarged, still display the stalk-like character in the middle and hind femora. The enlarged middle and hind femora in *recticollis* are similar in shape to the femora of *vestita* (Baly) from Australia.

Even though the pronota of the males of *recticollis* and *parkeri* have an oblong appearance, measurement shows the length and width of both species to be subequal (Fig. 5); the pronotum of the female of *recticollis* is shorter than broad; I had no female specimens of *parkeri* to examine (*parkeri* males: 0.55 × 0.55mm; 0.55 × 0.57mm; *recticollis* males: 0.75 × 0.75mm; 0.65 × 0.67mm; *rhois* males: 0.77 × 0.81mm; 0.85 × 0.83mm; *recticollis* females: 0.68 × 0.58mm; 0.65 × 0.58mm; 0.75 × 0.70mm; *rhois* females: 0.65 × 0.56mm; 0.63 × 0.53mm).

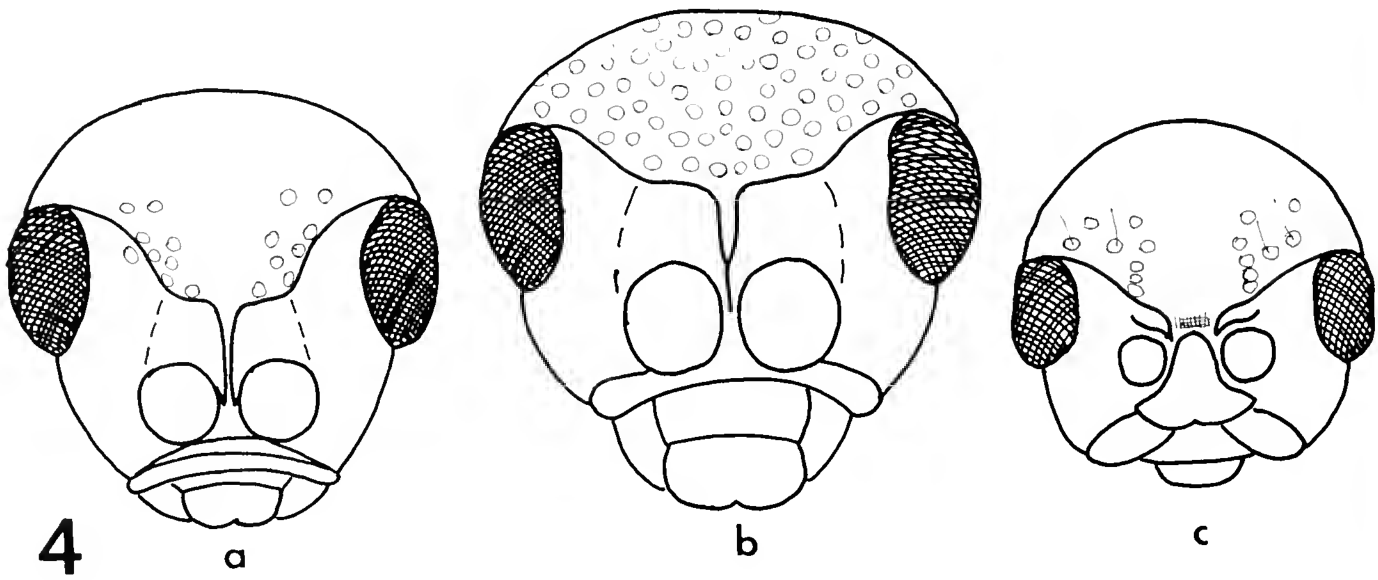

Fig. 4: Head of *Orthaltica melina* a) *O. copalina*, b) *O. recticollis*, c) (55 X).

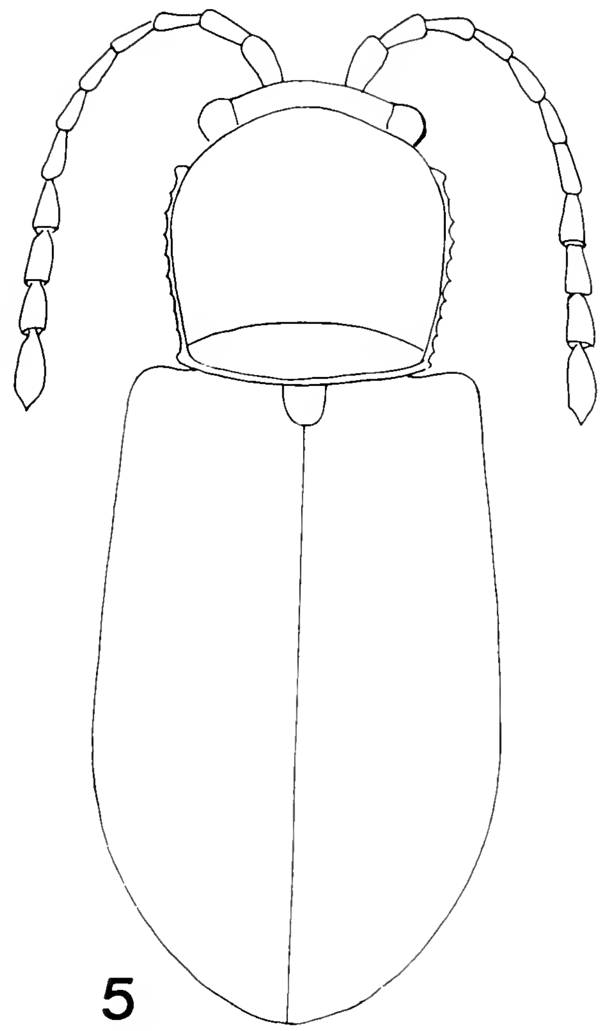

Fig. 5: *Orthaltica parkeri* male (40 X).

The aedeagus of both species is very similar. In *parkeri* it is somewhat more pointed, apically, although examination of a longer series may show this to be individual variation.

There is a size difference between the 2 species. *O. parkeri* is shorter (*parkeri* 1.70 and 1.73mm; *recticollis* male 2.30, 2.20, 2.10, and 1.80mm; females 2.10, 2.00, 2.40, 1.95 and, 2.00mm).

Parkeri may prove to be a small form or a subspecies of *recticollis*. As mentioned above, longer series of specimens should be examined.

Supplement

In G. A. Samuelson's paper, "Alticinae of New Guinea I. *Micrepitrix*" (1965), 3 new species are described, 1 of which is *M. serraticollis*. At the time I wrote my paper, "The genus *Livolia* Jacoby and its disputed position in the system" (1971), I did not know of Samuelson's paper and used the name *serraticollis* in the description of a new *Livolia*. A new name is given here for the species which I named as *Livolia serraticollis*.

Orthaltica impressiceps **nom. nov.** et **comb. nov.**

Livolia serraticollis Scherer, 1971:12, 27, Pl. II Fig. 15, Pl. IV Fig. 15 (Burma: Tenasserim–BMNH)

Zusammenfassung

Während meines Aufenthaltes in den U.S.A. wurde ich mit der Gattung *Orthaltica* konfrontiert und erkannte, dass es sich hier nur um die nearktischen Vertreter eines Genus handelt, das seine Verbreitung über die Ryu-Kyu-Inseln, Asien, Mikronesien, Neu Guinea, Australien und Afrika hat. Bei intensiverer Beschäftigung mit dieser Gruppe erwies sich die Gattung *Leptotrichaltica* als synonym zu *Orthaltica,* die Art *Leptotrichaltica rhois* als synonym zu *Leptotrichaltica recticollis.* Die Stellung in der Unterfamilie Alticinae wird bewiesen. Die Verbreitung dieser Gattung ist eine typisch tertiäre. Die nearktischen Arten zeigen mit ihrem asymmetrischen Aedoeagus subgenerische Eigenschaften. In einem speziellen systematischen Teil wird sämtliche Literatur für die Gattung *Orthaltica* zitiert, es folgt eine Gattungsdiagnose. Ein Bestimmungsschlüssel führt zu den nearktischen Arten. Literatur und Verbreitung der nearktischen Arten ist angeführt, die Futterpflanzen zitiert. In einem Anhang bekommt das Homonym *O. serraticollis* Scherer einen neuen Namen *impressiceps.*

Acknowledgements

I would like to thank H. B. Leech (California Academy of Sciences) for the loan of specimens; Dr. P. J. Spangler (United States National Museum) for literature not immediately accessible to me; Dr. E. U. Balsbaugh, Jr. (South Dakota State University) for collaboration; and T. N. Seeno (California Department of Food and Agriculture) for reading and critiquing the manuscript.

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AN *AGRILUS* NEW TO THE UNITED STATES (COLEOPTERA, BUPRESTIDAE)

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ABSTRACT

The Mexican *Agrilus aurilatera* Waterhouse is redescribed, a lectotype designated, and reported from Arizona for the first time.

Examination of *Agrilus* specimens in the collections of David S. Verity and E. Giesbert revealed the first records of the Mexican *Agrilus aurilatera* Waterhouse from Arizona and the United States. The insect is very similar to the male of *A. walsinghami* Crotch (see Fisher, 1928), and the following diagnosis will enumerate the differences from that species to facilitate identification. The genitalia are figured (Fig. 1).

Agrilus aurilatera Waterhouse, 1889,
Biol. Cent.-Am., Coleoptera III, 1:120.

Form of male *Agrilus walsinghami,* aeneus throughout, some specimens with a bluish tinge, except for the portions of the elytra lateral to the medial costa, which are more or less strongly golden or cupreous; 11.1-13.0 mm long, 2.9-3.2 mm wide.

Head with the front wide, the margins of the eyes parallel, a relatively shallow oval depression and a narrow polished groove from the depression to the occiput; surface coarsely, densely punctate and conspicuously clothed with long white hairs which meet along the midline; antennae extending to about the middle of the pronotum, serrate from the fourth joint, the outer joints wider than long.

Pronotum as in *A. walsinghami* except that the medial depression is slightly shallower, prehumeral prominence oblique to the marginal carina rather than parallel, the marginal and submarginal carinae distinctly marked and separate for virtually their entire length.

Elytra similar in shape to those of *A. walsinghami* except that elytral apex is more gently rounded and less sharply angulate; disc with broad deep basal depression and 3 faint, relatively parallel costae, 1 along the sutural margin strongest and extending to apex, 1 at the middle faintest and extending two-thirds to four-fifths the length of the elytron, and another between these 2, intermediate in strength and about two-thirds the length of the elytron, all 3 much less strongly marked than in *A. walsinghami*; surface more finely and uniformly imbricate-punctate than in *A. walsinghami,* uniformly clothed with short inconspicuous hairs which are somewhat denser between the medial and sutural costae.

Abdomen beneath more finely punctate than in *A. walsinghami,* all the segments pubescent over their entire area; basal segments less strongly marked, uniformly and densely pubescent; the pubescence slightly denser in large oval spots along the anterior vertical margins; prosternum somewhat more densely pubescent than in *A. walsinghami.*

Sexes similar, the female larger.

SPECIMENS EXAMINED: Arizona: Cochise Co., Fort Huachuca, on *Baccharis,* 23-VII-69, A. E. Lewis [D. S. Verity Coll.]; Miller Canyon, 8-VII-1973, E. Giesbert [E. Giesbert Coll.]. México: Michoacan, Pta. Garnica, 9270′, 8-VII-69, L. A. Kelton [CNCI]; Durango, 6 mi E Durango, 24-VI-64, H. F. Howden [CNCI]; Chihuahua, Pinos Altos, Buchan-Hepburn, Lectotype [BMNH]; Guanajuato, Guanajuato, Sallé [BMNH], Dugés (2) [BMNH]; Distrito Federal, Temascaltepec, 1931, G. B. Hinton [BMNH]; without definite locality—"Saunders.74.18" [BMNH], "Mexico, Salle Coll. 649" [BMNH].

Three specimens in the British Museum possess syntype labels. The Saunders specimen bears an additional label "Agrilus aurilatea, (Type) Waterh." but is not cited in the original description and cannot be considered type material. The specimen from Chihuahua has been designated the type arbitrarily, and the Guanajuato specimen collected by Salle is considered a paratype.

Agrilus aurilatera keys to *A. concinnus* Horn in Fisher's key to North American *Agrilus,* despite its close similarity to *A. walsinghami,* because *aurilatera* lacks the pubescent spots found on the elytra of the latter species. Besides the difference in geographic range from *concinnus* and the overall difference in color, *aurilatera* lacks the conspicuous pubescence on the pronotum of *concinnus,* and possesses the faint costae on the elytra. In addition to the lack of pubescent spots on the elytra, *aurilatera* lacks the strong sexual dimorphism of *walsinghami,* has much less prominent elytral costae and lacks the well-defined pubescent spots on the basal and vertical parts of the abdominal segments.

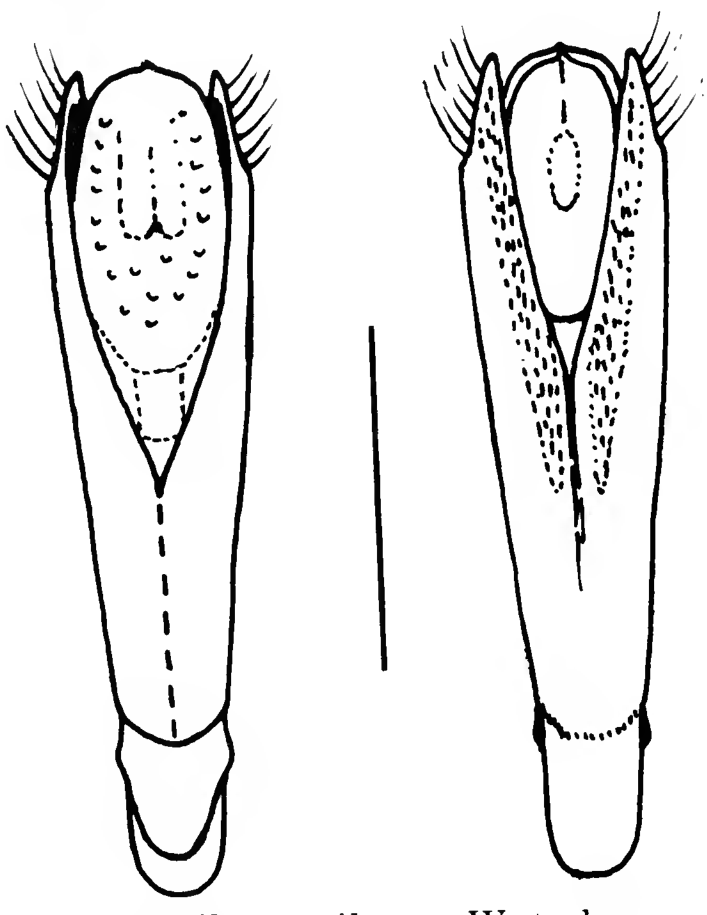

Fig. 1. Genitalia of *Agrilus aurilatera* Waterhouse, dorsal (left) and ventral (right) views. Line indicates 1 mm.

Correspondence with David Verity, who contacted the collector (Dr. A. E. Lewis), pinpoints *Baccharis sarothroides* as the plant on which the Arizona *aurilatera* was collected. Specimens of *A. walsinghami* in my collection were collected by George N. Walters on rabbit brush (*Chrysothamnus* sp.) on the Paradise Road, near Portal, Cochise Co., Arizona.

I would like to thank David Verity and Edmund Giesbert for loan of their specimens, the Canadian National Collection [CNCI] for loan of additional material, the British Museum (Natural History) [BMNH] for help during visits, and the University of Connecticut Research Foundation for funds under grant 35-451 to examine the type of *aurilatera*.

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BOOK REVIEW

The biology of *Tribolium*; with special emphasis on genetic aspects. Vol. I by A. Sokoloff. 1972. Oxford University Press, Ely House, London, W. I. England, and 200 Madison Ave., N. Y., N. Y. 10016. 300 p. $41.00.

This volume contains a review of the known information on a single genus of Tenebrionidae. Chapter titles indicate the scope: 1) Introduction; 2) Taxonomic position and evolutionary trends; 3) Morphology; 4) Internal anatomy and histology; 5) Electron microscopy; 6) Chromosomes in *Tribolium* and *Dermestes*; 7) Developmental and post-embryonic studies; 8) Teratological abnormalities; 9) Index. Volume 2 is to deal with geographic distribution and ecological aspects and Volume 3 primarily with genetic aspects, including irradiation. The Appendix is to include " . . . descriptions of equipment and techniques useful in handling beetles."

Although this is primarily a literature review, Dr. Sokoloff intersperses some personal data, some of which appeared in the ***Tribolium* Information Bulletin.** It is extremely useful to have such extensive and scattered information summarized in one place. However, the $41.00 price tag makes it out of reach for the average coleopterist, especially if there are 2 more volumes with the same price.

—R. E. Woodruff

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THE GENERA OF THE LISPININAE OF AMERICA NORTH OF MEXICO (COLEOPTERA:STAPHYLINIDAE)

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ABSTRACT

A key is given to the genera of the subfamily Lispininae of America north of Mexico. A full generic description, distributional notes, and a habitus illustration of a member of each of the following genera is presented: *Thoracophorus* Motschulsky, *Clavilispinus* Bernhauer, *Renardia* Motschulsky, *Eleusis* Laporte, *Nacaeus* Bernhauer and *Lispinus* Erichson.

The genera of very few of the North American Staphylinidae have been adequately described and illustrated. The treatment which follows should for the first time make identification of genera of the subfamily Lispininae easy.

Because of their small anterior coxae and often depressed form, members of this subfamily have usually been associated with the Piestinae. Blackwelder (1942) united them with the Osoriinae because of their unmargined abdomens. Moore (1964), considering the above characters partly adaptive (in some cases modification useful in a subcortical habitat), removed these genera to a subfamily by themselves, Lispininae.

The Lispininae may be briefly characterized as follows (Moore 1964): antennae 11-segmented, inserted at front margin of head near eyes; second abdominal segment absent; abdomen without paratergites; anterior coxae small, globose or peg shaped, usually not longer than wide.

Like the Osoriinae and Piestinae this is a large tropical subfamily, only a few of whose members are found in temperate regions. Most species are found under the bark of dead trees.

KEY TO THE GENERA OF THE LISPININAE OF AMERICA NORTH OF MEXICO

1. Tarsi 3-segmented .... *Thoracophorus* Motschulsky
1′. Tarsi 5-segmented 2

2(1′). Anterior coxae contiguous 3
2′. Anterior coxae separated by a spatulate process of the prosternum 5

3(2). Pronotum half as wide at base as apex 4
3′. Pronotum little narrowed at base .... *Clavilispinus* Bernhauer

4(3). Head with 2 longitudinal frontal impressions; pronotum with 2 apical denticles .... *Renardia* Motschulsky
4′. Head without frontal impressions; pronotum without apical denticles .... *Eleusis* Laporte

5(2′). Abdominal sternites without diagonal strigae .... *Nacaeus* Blackwelder
5′. Abdominal sternites with diagonal strigae which are sometimes not completely separate from the large punctures .... *Lispinus* Erichson

Clavilispinus Bernhauer

Form. Small, subcylindrical. Integuments rather densely, not coarsely, sculptured.

Head. Head quadrate, with or without a neck. Eyes moderate, not prominent. Antennae somewhat incrassate; their fossae located in front of eyes under a distinct ridge. Mandibles stout at base, short, with apex pointed and slightly hooked. Labrum transverse, apex evenly, not deeply emarginate, with few long setae and numerous ciliae. Maxillary palpi 4-segmented; first segment short; second longer than wide; third short, transverse; fourth almost as wide as third, twice as long as wide, slightly narrowed to rounded apex. Inner lobe of maxilla narrow, strongly hooked at apex, densely ciliate within. Outer lobe broad at apex which is densely ciliate. Labial palpi 3-segmented; first segment about as long as wide; second very short, transverse, as wide as first; third narrower than second, longer than wide. Ligula small, transverse, with a slender chitinous rod on each side extending well beyond apex. Gular sutures united. Infraorbital carina wanting.

Thorax. Pronotum quadrate. Prosternum large, its process very short and blunt. Lateral prosternal sutures distinct. Hypomera delimited by a sharp edge. Trochantin rectangular. Prosternal epimera not delimited by a carina, represented by a long, slender, pointed extension of hypomera. Mesosternum short, its process acute, extending halfway between coxae. Metasternum long, its process extending halfway between coxae to meet mesosternal process. Elytra quadrate, epipleura delimited by a carina. Scutellum prominent. Anterior coxae small, peg-shaped, contiguous. Middle coxae round, narrowly separated. Posterior coxae triangular. Tibiae without spines. Tarsi 5-segmented; first 2 segments very short; next 2 a little longer; fifth longer than first 4 together.

Abdomen. Abdomen cylindrical. First 5 visible segments without paratergites, not impressed or constricted. First visible segment not keeled between the coxae.

Distribution. Besides the 5 species known from the United States, 17 other species have been described from the tropics of both hemispheres. The species are found under bark of dead trees.

Notes. Hatch (1957) used the name *Paralispinus* Bernhauer for this genus, however that name is preoccupied by *Paralispinus* Eichelbaum and must give way to *Clavilispinus*.

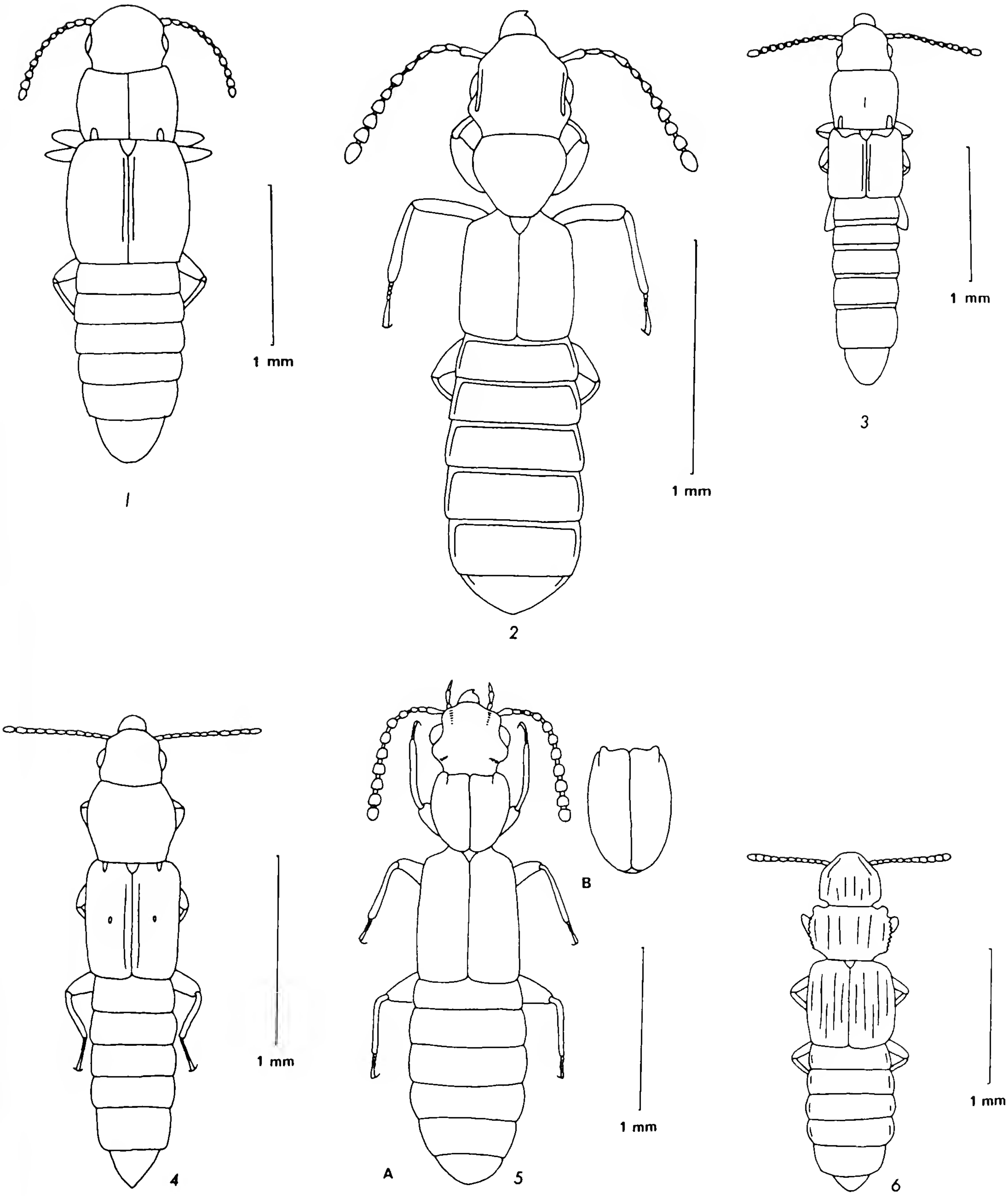

Fig. 1. *Clavilispinus californicus* (LeConte). Fig. 2. *Eleusis pallida* LeConte. Fig. 3. *Lispinus aequipunctatus* LeConte. Fig. 4. *Nacaeus tenellus* (LeConte). Fig. 5. A, *Renardia nigrella* (LeConte), female. Fig. 5. B, *Renardia nigrella* (LeConte), pronotum of male. Fig. 6. *Thoracophorus fletcheri* Wendler.

Eleusis Laporte

Form. Elongate, parallel, very depressed. Integuments shining, very feebly sculptured.

Head. Head quadrate, without frontal impressions, with a longitudinal carina over each eye, narrowed behind to form a broad neck. Eyes moderate, somewhat convex. Antennae slightly incrassate, penultimate segments transverse; their fossae located in front of eyes under a very slight prominence. Mandibles stout at base, hooked at tip, with 2 small central teeth internally. Labrum transverse, apex broadly emarginate and furnished with 4 large setae and numerous small ciliae each side. Maxillary palpi 4-segmented; first segment short; second short, broad at apex; third stout, about twice as long as wide; fourth narrower and a little shorter than third. Inner lobe of maxilla narrow, pointed, hooked at apex. Outer lobe wide and densely setose at apex. Labial palpi 3-segmented; first segment longer than wide; second a little narrower, transverse; third a little narrower, slightly longer than wide. Ligula with apex tri-lobed, the outer lobes largest. Gular sutures united for most of their length, widely diverging at base. Infraorbital carina wanting. With a longitudinal sulcus on the under side behind each eye.

Thorax. Pronotum not longer than wide, narrowed at base, with 2 large punctures each side at apex. Prosternum elongate, its process hardly pointed. Lateral prosternal suture distinct. Hypomera not delimited by a suture. Trochantin prominent, elongate, directed diagonally toward anterior angle of thorax. Prosternal epimeron not delimited by suture. Mesosternum short, its process short and acute. Metasternum long, its process short and acute. Elytra quadrate. Epipleura not delimited by carina. Scutellum prominent. Coxae contiguous; anterior small, peg-shaped; middle rounded; posterior transverse and somewhat triangular. Tibiae without spines except at apices. Tarsi 5-segmented; first 4 short and equal, last longer than first 4 together.

Abdomen. Paratergites lacking. First visible sternite not keeled between coxae.

Distribution. This large, tropical genus is represented in the United States by only 2 known species. Through 1966, about 187 species had been described from the tropics in all parts of the world. A very few species have been recorded from the temperate zones. The species are found under the bark of trees.

Lispinus Erichson

Form. Small, linear, subcylindrical. Integuments not coarsely sculptured.

Head. Head not narrowed behind to form a neck. Eyes moderate, not very prominent. Antennae somewhat incrassate, their fossae located in front of eyes under distinct ridge. Mandibles stout at base, abruptly narrowed near apex and thence sharply hooked to pointed apex. Labrum with apex evenly, arcuately emarginate and setose. Maxillary palpi 4-segmented; first segment small; second a little longer than wide, widest at apex; third very short, transverse, as wide as apex of second, fourth as wide as third, about 3 times as wide as long, hardly narrowed to rounded apex. Maxilla with inner lobe narrow, outer lobe wide at apex, which is densely ciliate. Labial palpi 3-segmented, first 2 segments short, third twice as long as wide. Ligula transverse, its apex with a pair of short, chitinous rods. Gular suture divergent behind. Infraorbital carina lacking.

Thorax. Pronotum quadrate. Prosternum large, its process spatulate, extending between coxae. Lateral prosternal suture faint. Hypomera delimited by a carina. Trochantin small, subrectangular. Epimera not delimited by a suture. Mesosternum short, its process narrow, pointed, extending about halfway between coxae. Metasternum large, its process pointed, extending between coxae to meet mesosternal process. Elytra quadrate, with sutural stria, epipleura delimited by carina. Scutellum large. Anterior coxae small, globose, separated. Middle coxae round, narrowly separated. Posterior coxae transverse, somewhat triangular. Tibiae without spines except at apex. Tarsi 5-segmented, the first 4 segments short, fifth as long as first 4 together.

Abdomen. Abdomen cylindrical, without paratergites. First visible segment with small keel between coxae.

Distribution. A very large number of species have been described in this genus from all parts of the tropics. It is possible that many of these will be found to belong to *Nacaeus*, as defined in this work. A few species are known from temperate regions. The species are usually found under bark of dead trees.

Notes. The single Nearctic species placed in this genus has the salient character of diagonal strigae on the underside of the abdomen somewhat obscured by large elongate punctures.

Nacaeus Blackwelder

Form. Small, linear, subcylindrical. Integuments not coarsely sculptured.

Head. Head not narrowed behind to form a neck; with 2 faint longitudinal frontal impressions. Eyes not very prominent. Antennae somewhat incrassate; their fossae located in front of eyes under distinct ridge which is tumid above each insertion. Mandibles stout at base, nearly parallel-sided to near apex where they are abruptly narrowed and thence sharply hooked to pointed apex. Labrum with apex broadly emarginate and setose. Maxillary palpi 4-segmented; first segment small; second and third each about as wide as long; fourth nearly as wide as and twice as long as 2 preceding together. Inner lobe of maxilla narrow, outer lobe broad at apex. Labial palpi 3-segmented, first 2 segments short, third a little narrower and about as long as first 2 together. Ligula transverse, broadly emarginate at apex. Gular sutures divergent behind. Infraorbital carina lacking.

Thorax. Pronotum quadrate. Prosternum large, its process narrow, pointed, extending well between coxae. Lateral prosternal sutures faint. Trochantin short and very narrow. Epimera not delimited by suture. Mesosternum short, its process narrow, pointed, extending halfway between coxae. Metasternum large, its process pointed, meeting mesosternal process between coxae. Elytra quadrate, impressed at base, with sutural stria, epipleura delimited by carina. Scutellum large. Anterior coxae small, globose, narrowly separated. Middle coxae small, round, narrowly separated. Posterior coxae transverse and somewhat triangular. Tibiae without spines. Tarsi 5-segmented, first 4 segments very short, last longer than others together.

Abdomen. Abdomen cylindrical, without paratergites. First visible segment with small keel between coxae.

Distribution. Several tropical species from both the Old and New Worlds are placed in this genus.

Notes. This genus is distinguished from *Lispinus* largely on the basis of the lack of diagonal strigae on the abdomen. A large number of species at present placed in *Lispinus* will probably be found to belong here. Arnett (1961) used the name *Pseudolispinodes* for this genus and treated it as a subgenus of *Lispinus*. It possibly might best be considered a subgenus of *Lispinus*, but the name *Nacaeus* must apply in any case.

Renardia Motschulsky

Form. Elongate, parallel, very depressed, integuments shining, alutaceous.

Head. Head quadrate, with 2 longitudinal frontal impressions, narrowed behind to form broad neck. Eyes moderate, somewhat prominent. Antennae slightly incrassate, penultimate segments transverse; their fossae located in front of eyes under distinct prominences. Mandibles stout at base, short, only slightly arcuate, each with a minute tooth near apex. Labrum transverse; anterior margin deeply, evenly emarginate and furnished with 5 long setae on each side. Maxillary palpi 4 segmented; first 2 segments short; third longer than wide; fourth about half as wide as third and a little shorter. Inner lobe of maxillae narrow, pointed, hooked at apex. Outer lobe wide at apex, which is densely ciliate. Labial palpi 3-segmented; first segment stout, widest at apex, second very short, transverse; third narrower than second, about twice as long as wide, slightly narrowed to rounded apex. Ligula broad, membranous, with 2 short central processes. Gular sutures very approximate at middle, widely diverging before and behind. Infraorbital carina wanting. Without a sulcus on the under side behind eye.

Thorax. Pronotum longer than wide, narrowed at base, with a tubercle on each side of anterior margin; longer in male than female. Prosternum much elongated, its process short and acute, not separating coxae. Lateral prosternal suture distinct. Hypomera not delimited by suture. Trochantin wide, very long, directed diagonally toward anterior angle of thorax. Prosternal epimeron not delimited by suture. Mesosternum short, its process short and acute. Metasternum very long, its process short and acute. Elytra elongate, epipleura not delimited by carina. Scutellum prominent. Coxae contiguous; anterior small, peg-shaped; middle longer, rounded; posterior transverse and somewhat triangular. Tibiae without spines. Tarsi 5-segmented, first 4 segments short, last longer than first 4 together.

Abdomen. Paratergites lacking. First visible sternite not keeled between coxae.

Distribution. Only 4 species have been described in this genus, 1 from the United States, 1 from Mexico, and 2 from Guatemala. They are found under the bark of trees.

Notes. Members of this genus closely resemble species of *Eleusis*, from which they differ in the frontal impressions, stronger antennal tubercles, the tubercles at the anterior margin of the pronotum, coarser sculpture and other details. This genus has long been called *Eumalus*. Hammond (1970) called attention to the fact that the type of *Renardia* is the same as *Eumalus nigrella* (LeConte) and that the name *Renardia* has precedence.

Thoracophorus Motschulsky

Form. Small, subcylindrical. Integuments coarsely sculptured, rough; foreparts longitudinally costate.

Head. Head orbicular, abruptly narrowed behind to form a distinct neck; anterior margin limited by carina which extends back on each side above and behind eyes; upper surface longitudinally costate. Eyes small, not visible from above. Antennae somewhat increassate, penultimate segments transverse; their fossae located under anterior carina in front of eyes. Mandibles stout, almost parallel from base to near apex, thence abruptly constricted and tapered to a hooked, pointed apex. Labrum transverse, apex emarginate in deep, even arc, and supplied with several long setae. Maxillary palpi 4-segmented; first segment short, second longer, curved, widest at apex; third short, transverse, as wide as apex of second; fourth as wide at base as third, twice as long as wide, a little narrowed to rounded apex. Outer lobe of maxilla slender, with 2 small curved teeth at tip below which are a few closely placed ciliae in a row. Inner lobe broad, densely ciliate at apex. Labial palpi 3-segmented; first and third segment each about twice as long as wide; second transverse; segments of equal width. Ligula broad, slightly produced in middle. Gular sutures widely divergent posteriorly. Infraorbital carina wanting.

Thorax. Pronotum quadrate, longitudinally costate. Prosternum large, its process hardly pointed. Lateral prosternal sutures faint. Hypomera delimited by carina. Trochantin rectangular, not easily distinguished from prosternum. Prosternal epimera not delimited by suture. Mesosternum short, its process narrow, pointed, produced more than halfway between coxae. Metasternum long, its process short, pointed, meeting mesosternal process between coxae. Elytra quadrate, longitudinally costate, epipleura delimited by carina. Scutellum visible. Anterior coxae small, peg-shaped, contiguous. Middle coxae round, narrowly separated. Posterior coxae transverse, somewhat triangular. Tibiae without spines. Tarsi 3-segmented, first 2 segments very small, last several times as long as first 2 together.

Abdomen. Abdomen cylindrical, without paratergites, first 5 visible segments abruptly constricted at base. First visible segment broadly, deeply impressed beneath on each side for reception of coxae; with small keel between coxae.

Distribution. Most of the known 47 species of this genus are from Latin America; however, several species are known from other tropical regions as well as 4 from the United States, 1 from Europe, and 1 from Japan. They are generally found under the bark of decaying trees.

ACKNOWLEDGMENTS

We thank Jacques Helfer and Hugh B. Leech for loan and gift of specimens and for other favors; and Robert E. Orth for useful suggestions.

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GENDER POINTS: A TIMESAVER FOR MICROCOLEOPTERISTS

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The time involved in properly preparing beetles, especially microcoleoptera, for taxonomic study is considerable. In many (most?) genera the male genitalia and/or female spermathecae must be removed by dissection and placed in an appropriate receptacle. The specimen, after being cleaned in a sonic apparatus, must then be affixed to a paper point (which had to be previously prepared and placed on a pin). Following this, the genitalia receptacle, locality label(s), and (in some instances) ecological data label(s) are added. Finally, a sex label must be cut from a sheet of same and affixed to the pin to facilitate retrieval of the specimen once it has been placed in the collection. Multiply this procedure by thousands of specimens, and the time saved by the obviation of a single step in the process becomes considerable.

A step can be eliminated by using a gender point, (i.e., a point upon which the appropriate sex symbol has been printed). Apparently, sex symbols of the appropriate size and printed upon point paper are not commercially available. The symbols must be spaced so that the point can be cut out with a point punch without cutting into adjacent symbols in the same row, or symbols in the next row. Sheets for use in making gender points have been readily made by typing (on a machine with elite type) an 8½″×11″ page with sex symbols, then submitting the page and blank point paper to a printer for reduction and printing. With elite type (symbols are 3mm high and 2mm wide), the symbols should be placed 2 spaces apart (7mm from center to center) in the rows, and the rows 2cm apart. The sheet is then reduced 50%. The resulting symbols can be easily punched out, with ample area for the pin to be inserted between the base of the point and the symbol.

LIFE HISTORY OF THE WESTERN WATER PENNY BEETLE, *PSEPHENUS FALLI* (COLEOPTERA: PSEPHENIDAE)

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ABSTRACT

Psephenus falli, the western water penny beetle, living in the Pacific coast states and Idaho, probably requires 15-18 months to complete its life cycle. Much growth variation exists even among those developing from the same egg mass. Life history is shorter than that postulated for the eastern species, *P. herricki*, but the microdistribution, habitat distribution, and behavior of all life stages seem identical to that species.

INTRODUCTION

Several authors (Matheson 1914, West 1929, Schafer 1950) have produced life history studies of *Psephenus herricki* (DeKay), the water penny beetle living in eastern United States and Canada. Murvosh (1971) incorporated life history data into an autecological study attempting to explain and understand the habitat and geographical distribution. Two new species have been described recently (Brown 1970; Brown and Arrington, 1967), but little biological information has appeared except studies on parasitism (Burks 1968; Brown 1968). Murvosh, Spangler, and Brown (unpublished data) worked out the Nearctic distribution, and Brown and Murvosh (in manuscript) revised the genus and described some new species from Arizona.

Life history information on the western members of this genus is lacking. Ecological studies over the past 8 years have yielded a certain amount of life history data, and the purpose of this paper is to assemble what is known about the far western species, *P. falli* Casey. The study was designed to give a general overview of life history, and no attempt was made to work out certain details such as the exact number and description of instars. Certain areas will be pointed out that require additional study and comparisons made with the eastern species.

Casey described *P. falli* from a unique male from southern California apparently without examining specimens of the previously described *P. haldemani* Horn from Baja California. Two more species, *P. veluticollis* and *P. calaveras*, were described from California and *P. lanei* from Idaho, but these are all the same as *P. falli* (Brown and Murvosh, in manuscript). A potentially unsolvable problem exists in trying to determine if *P. haldemani* and *P. falli* are the same. The description of *P. haldemani* was based on 2 females taken from an unknown type locality in Baja. This locality will probably never be determined and species determinations are made on male specimens. Brown

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and Murvosh (in manuscript) reviewed this problem and based on color difference, size, and some disjunction, think it best to tentatively consider the Baja population separate from that occurring in the U. S. Considering this, the genus distribution map published by Murvosh (1971) is slightly in error. The problem seems solvable only if one species of *Psephenus* occurs in Baja.

Common names for species have not yet been proposed for this group, but some consideration should be given to this since several species are now known and biological data is accumulating. We are using western water penny beetle as a tentative common name for this species.

Acknowledgments

We would like to thank Dr. Harley P. Brown for his assistance on certain aspects of this study and for reading and commenting on the manuscript. The University of Nevada Board of Regents provided a research stipend. Some of the remaining costs incurred in our field research were indirectly sponsored by the Department of Internal Revenue, and we thank them for allowing legitimate deductions in this area.

Methods

Life history data was collected in both the field and laboratory. Collections and observations were made throughout the entire range of the species, but most of the work concentrated in 2 streams in southern California. Deep Creek drains part of the San Bernardino Mountains near Lake Arrowhead and flows north to join the Mojave River 15 miles south of Victorville. Big Rock Creek flows north out of the San Gabriel Mountains, enters and crosses the San Andreas Fault at Valyermo and disappears into an alluvial fan about 15 miles southeast of Palmdale. Drainage in both streams is interior.

The different life stages of this insect were field collected and taken to the laboratory for rearing. Newly laid eggs are easily determined if the ovipositing female is present. Rocks with such eggs were brought to the laboratory to determine hatching time. The growth rate of immatures under laboratory conditions was estimated by sorting field samples of larvae into different (2, 3, 4, 5, 6, 7 mm) size classes. Each size class was put into separate rearing containers and monthly measurements made to calculate the average time required for each group to grow to the next size class.

Water pennies can be maintained in the laboratory in containers as simple as plastic bowls and aquaria, if sufficient light and algae coated rocks are present. Aeration of the water is very desirable but seems unnecessary on a continuous basis. The containers required frequent cleaning of scum and debris and the water exchanged to inhibit a slimy bacterial growth which formed on some rocks. Chlorinated tap water does not appear harmful, but we routinely aerated this water for 30 minutes or allowed it to stand for 24 hours before use.

Stock populations of water pennies were kept in rectangular (30 × 25 × 15cm) plastic wash tubs. Larvae, sorted to various size classes, were put in round (15 × 15cm) plastic half gallon ice cream containers. Two holes, each 5cm square, were cut out of the containers, 2cm above the bottom and nylon screening was glued on. The half gallon rearing containers were put into a 120cm circular plastic swimming pool 20cm deep. The water in the pool was maintained at a level 5cm from the top and oxygenated continuously. The containers were exposed to sunlight (200-1600 foot candles) through a large laboratory window. The tops of the containers were uncovered as there was no evidence of larvae migrating from one container to another.

Field growth rates were estimated by periodically collecting samples of larvae and constructing frequency distributions of size classes plotted against number. This gives an idea of the temporal distribution of the various size classes. Measurements were made in the field with dial calipers and larvae returned to the stream. Other field observations of a less quantitative nature yielded similar data.

It is almost impossible to determine in the field the time required for pupation. Data was obtained by holding mature larvae and prepupae in moist glass vials in the laboratory. Adult life span cannot be properly studied in the field either. Field collected adults and those emerging from pupae were kept in containers with moist rocks and cotton to study longevity.

Life History

The Adult Beetle

Adults are typically found on the lee and sides of wave-splashed rocks in stream riffles. They are very difficult to see when standing motionless at the rock water interface, but they periodically run back and forth along the wet surface and are more easily seen. The habitat, microdistribution, and behavior seem identical to those of *P. herricki* (Murvosh 1971).

Males (3.3-4.3mm) are somewhat smaller than females (3.8-5.1mm); apparently true for all species studied in this genus. Adults are generally present from early May to about the middle of August (Table 1) but not necessarily in all localities. In southern California, for example, they were collected in early May in Big Rock Creek but not seen until June in Deep Creek. An area should be sampled at least 2 years before any conclusions are drawn regarding temporal distribution. Sampling in Big Rock Creek in 1970 suggested that adults emerged in late May and early June and vanished by July. Studies the following year showed that they were present in this stream from early May to mid-August. Populations in Big Rock Creek are not as large as those in Deep Creek and there may not be a continuous adult emergence such as probably occurs all summer in Deep Creek. Gaps in emergences plus low population densities could lead to unwarranted generalizations.

There is not enough data to give a complete picture of adult temporal distribution in Idaho and Oregon. The May to August time distribution occurs in a great enough variety of streams and geographic locations that genetic factors probably exert more control over emergence than extrinsic factors. In most locations, July seems to be the best time to collect adults.

An individual beetle is probably not around very long. Laboratory data suggest that both males and females can live about a week. A new tagging method will give better information in the future as to what actually happens in the field. Females enter the water immediately to lay eggs in the substrate and then die. These females have a characteristic "dirty" appearance and have never been known to leave the stream bed. They probably have a field life span of 1 to 3 days.

Eggs

The lemon yellow eggs of this species are deposited close together in single layers forming a mass of about 500. Several females often oviposit together forming a large mass sometimes containing 2,000 eggs. Eggs are deposited on the undersurfaces of rocks in riffles but particularly those areas of a riffle where wave-splashed rocks project above the water line. One exception to this was seen on the Clearwater River in Idaho where females were ovipositing near the shore in water void of any turbulence.

Eggs of this species have yet to be examined microscopically for differences from *P. herricki*. Superficially at least, all water penny beetle eggs look very much alike and occur in masses about the same size.

They have been found in Big Rock Creek from the first week of May to the second week in August. In Deep Creek, they have been seen from mid-June to mid-August. In northern California in the Trinity River drainage, eggs also have been collected as late as August 14. Egg hatch took 16-17 days in the laboratory in water at 23°C, but this should be studied again since we experienced difficulty getting some eggs to hatch and could not determine the cause. This hatching time is comparable to, but slightly longer than, the 12-15 days reported for *P. herricki* (Schafer 1950; Davis 1965). The newly hatched larva, about 0.75mm long, is whitish or colorless and can't be seen with the naked eye when on a naturally-occurring substrate. Egg hatch seems high (75-90%), but survivorship data beyond this is unknown for any species in this genus. Two unmated, laboratory reared females laid eggs, but these did not hatch, casting doubt that parthenogenesis occurs.

Pupae

The macro- and microdistribution of prepupae (mature larvae) and pupae under rocks along the shorelines of riffles seem identical to that of *P. herricki*. They are often distributed in such a highly contagious manner that they are difficult to sample accurately. We spent little time studying this stage and did not attempt to describe the pupa or the exact time period required for pupation. Physical descriptions of this whole process are needed. Limited data suggest that 2 weeks are required, but our rearing conditions were far from normal. If the pupation process takes about 2 weeks, then pupae should occur in the field from late April to early August. One pupa was found in Deep Creek as late as 12 August. Pupation takes 10-12 days in *P. herricki*, and the temporal distribution is from late May to early September.

The Larva

Some idea of the temporal distribution of larvae is indicated by graphs in Fig. 2. These data, plus others collected in the field, show that several sizes (but not necessarily all) of larvae are present the entire year. Although we did not directly attempt to find the exact number of instars, laboratory data suggest a minimum of 4, and we speculate somewhat in suggesting 6. A comparison of these data with those collected for *P. herricki* indicates a difference in life history to some extent. All sizes of *P. herricki* larvae can be found throughout the year (Murvosh 1971), suggestive of the 2 year life history postulated by West (1929) and Schafer (1950).

Small larvae could not be found in a winter collection at Big Rock Creek suggesting that the last eggs of the previous season had developed to 4-5mm larvae. The size classes present in Deep Creek by mid-August show that most larvae are in the 2-3mm stage. A similar distribution, not shown here, was found the same time the following year. If these represent the last laid eggs, then larvae may grow to this size in about a month or so. The collection from the Trinity River area was biased somewhat toward the larger sizes and does not accurately represent the relative numbers of small larvae. Considering this bias, a minimal growth rate for the entire summer would be 3-4mm. In general, the field data are suggestive of a minimal summer's growth from egg to 3 or 4mm, with the possibility that the fastest growing larvae may do this in much less time.

Laboratory rearing demonstrated that a tremendous amount of variability exists in growth patterns, even among individuals hatching from the same egg mass. The average growth rate for laboratory reared larvae was about 1mm per month. Larvae from a Big Rock Creek egg mass developed to 2.5 and 3.5mm in 3 months, but this was on rocks where the nutrient supply was possibly inadequate.

It seems reasonable, in view of both laboratory and field data, to postulate an egg to egg life history development time of 15 months based on an average field growth rate of 1mm per summer month. A 1mm first instar in May could overwinter as a 5mm larva, if it grows during September, and reach the last instar the following May or June. Pupation, emergence, and oviposition during June and/or July would give a 14-15 month life cycle. The fastest growing larva, after hatching in early June, might overwinter as a 5 or 6mm larva, completing development the following spring with a 1 year life history. Some laboratory larvae grew little more than 0.5mm per month. If this represents genetic growth and not poor nutrition, then some individuals would need 2 full years to complete the life cycle. Pupation occurs under the covering of the exoskeleton of the last instar, and measurements of these skins show the last instar ranges from 6 to 8.5mm. Females are generally larger, although a 4.3mm female emerged from a 6.3mm last instar. Field and laboratory data suggest that larvae reaching maturity in late summer (August) do not complete development, but they overwinter and emerge the following year. Some larvae probably overwinter twice. Eggs laid in August could produce a 2mm overwintering larva which could develop to maturity the following summer and overwinter again. In such cases, a complete life cycle would take 20 months or more.

We feel that a life history of either 1 or 2 years is probably unusual and suggest that 15-18 months is more realistic for California beetles. More data is needed to generalize about Idaho and Oregon beetles. Tremendous growth variability exists in this species and a great deal of variation is to be expected in life history. This makes it impractical to propose a specific narrow time range. There is also a certain amount of opportunism involved. Individuals from eggs laid at the "wrong time" may have to spend 2 winters in the water resulting in a longer development time. More information is needed about 2 specific time periods: how much growth and development actually occur in September and October and the spring months? If the growth rate is faster than we suspect at these times, then the life history is shorter than postulated. We have seen some distributions that are puzzling. We could find no larvae other than matures near pupation sites in early May in Big Rock Creek. This

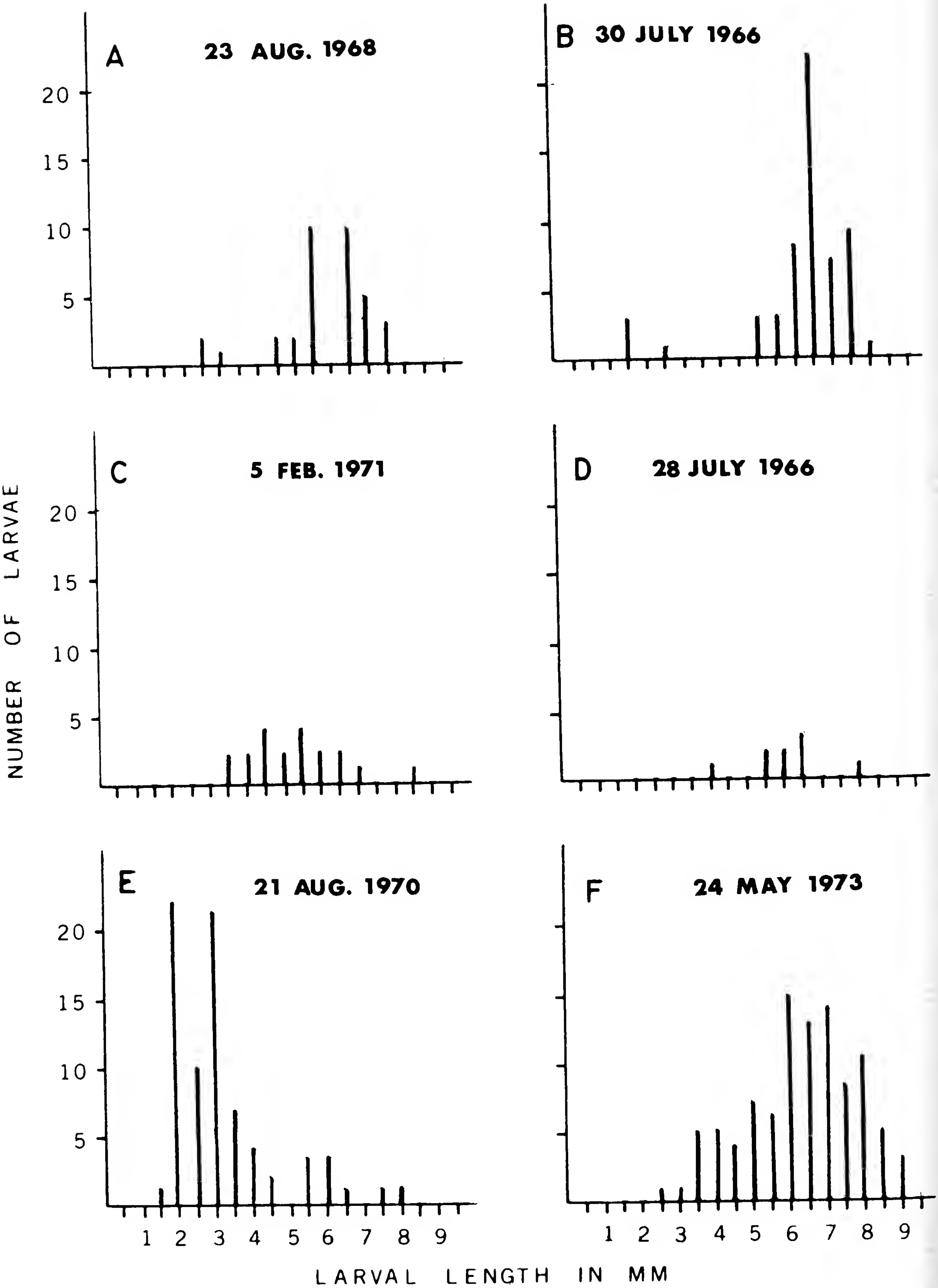

Fig. 1. Temporal distribution of various size classes of *P. falli* larvae. A. Salt Creek, Peanut, California. B. Julietta, Idaho. C. Big Rock Creek, Valyermo, California. D. Clearwater River, Kamiah, Idaho. E. Deep Creek, San Bernardino Mountains, California. F. Deep Creek.

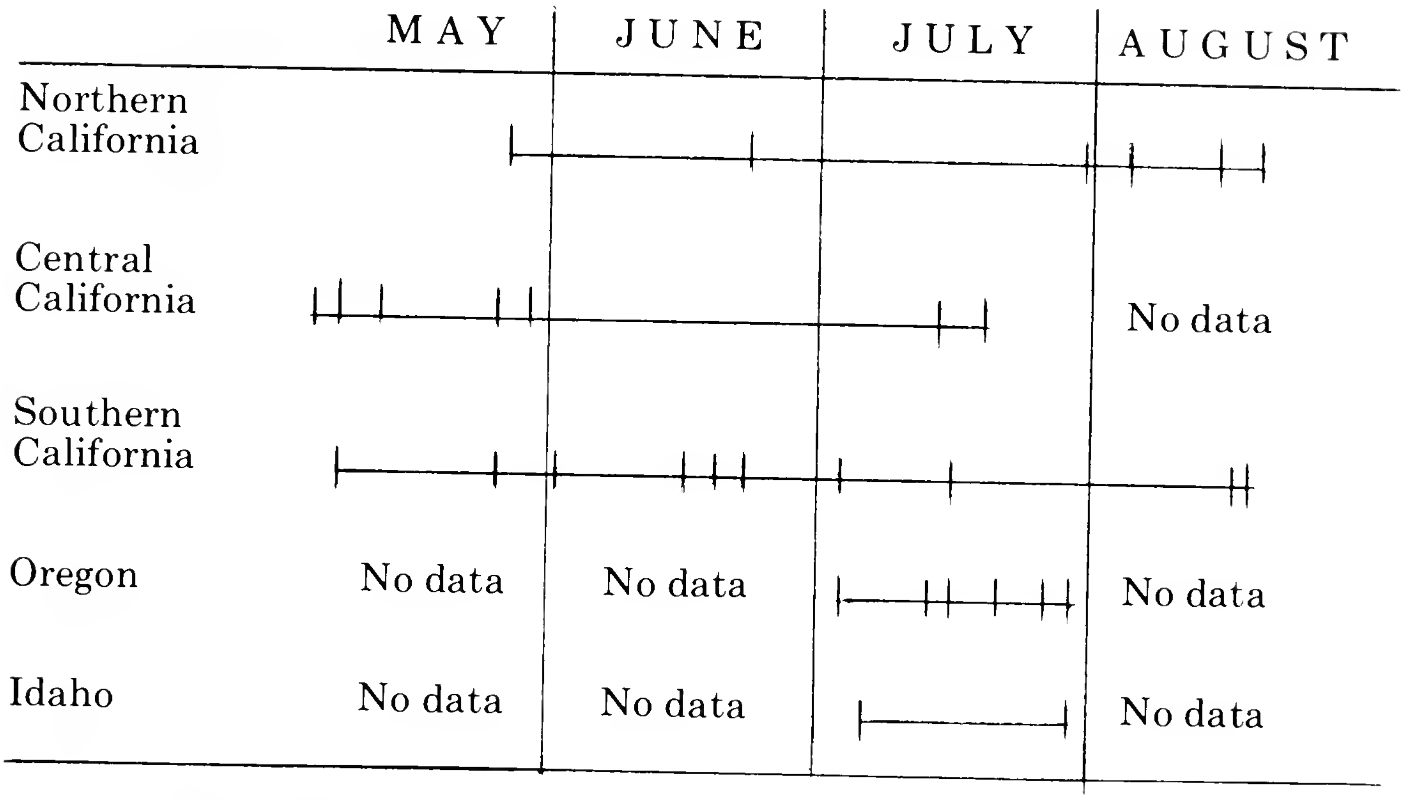

TABLE 1. The temporal distribution of adult *Psephenus falli* in western United States.

is suggestive of a 1 year life span if the sampling error was small. In May, in Deep Creek, a similar distribution was seen except that some 2-3mm larvae were present. A Deep Creek riffle, 300m above this, was full of mature larvae in August. No 1 or 2mm individuals could be found, and those under 5mm were rare, suggesting a very rapid summer growth. The riffle 300m below on this same date was full of small (2-3mm) individuals, and mature larvae were difficult to find. This seems to suggest 2 populations, relatively isolated in the same stream, developing separately. Another unusual temporal distribution was seen in Idaho during July 1966. Adults were common and larvae uncommon along the Clearwater River, but the reverse situation was true 2 days later on the Potlatch River about 80 miles away.

Psephenus falli and *P. herricki* are very much alike except that they occur in 2 different geographic locations. Morphologically they look very much alike except that *P. falli* is smaller. The behavior, habitat distribution, and life history are similar. The major difference is that *P. herricki* seems to require a longer time to complete the life cycle.

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BOOK REVIEWS

The following 2 recent books have been published by W. Junk, Publishers, 13 van Stolkweg, The Hague, Netherlands. Both are monumental treatises on families of beetles, for which the publisher should be commended for producing. Even with the great dedication of the authors in conducting the research, it is often difficult to obtain commitments for printing such specialized books.

Monographie der Familie Platypodidae (Coleoptera) by Karl E. Schedl. 1972. v + 322 p.; 73 fig. 70 Dutch Guilders

Dr. Schedl has devoted over 50 years to the study of this economically important family and owns the World's largest collection of them. This, his greatest contribution, contains everything " . . . which is necessary for an understanding of the complex biological aspects together with a systematic section including determination keys for the sub-families and genera." The text is in German.

Biology of Coccinellidae by Ivo Hodek. 1973. 260 p.; 58 photos; 34 plates. 100 Dutch Guilders.

Three chapters are separately authored: 1) Taxonomy and morphology of adults, by I. Kovar; 2) Morphology and taxonomy of the larvae with keys for their identification, by G. I. Savoiskaya and B. Klausnitzer; 3) Variability and genetic studies, by A. Honek. A pictorial color key to 4th instar larvae and a simple field key (by Klausnitzer and Kovar) is attached in an envelope so that it can be removed for field use. The text is in English.

The volume will undoubtedly lead to greater interest in this family, because of the thoroughness of the coverage here. It is unfortunate that such volumes are so rarely produced, and that often lifetimes are required to do so. The color production is useful, but suffers from some poor registration and a coarser half-tone screening than desirable. All in all, it is a splendid contribution.

—R. E. Woodruff

INTERPRETATIONS OF THE IMAGINAL AND LARVAL CHARACTERS, INCLUDING DISTINCTIONS AMONG MELANDRYIDAE, MYCETOPHAGIDAE, AND TETRATOMIDAE (COLEOPTERA)

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ABSTRACT

After considering the similarities and differences in imaginal and larval characters of the 3 families, they appear to be phylogenetically related and to have evolved in the following phylogenetic sequence: 1. Tetratomidae. 2. Mycetophagidae. 3. Melandryidae.

INTRODUCTION

The heteromerous beetle families Melandryidae Leach (1815) [including Serropalpidae Latreille (1825) but excluding Synchroidae Horn (1883)], Mycetophagidae Leach (1815), and Tetratomidae Mulsant (1856) are badly in need of systematic revision for the world. There are presently only preliminary and isolated studies by Crowson (1955, 1964 and 1966), Hayashi (1971 and 1972) on Japanese larvae, Miyatake (1960) on Japanese Tetratomidae, Viedma (1966 and 1971) on Melandryid larvae, Arnett (1971) on American fauna, and Abdullah (1964) on Baltic amber Heteromera. These 3 families are reviewed here because they seem to be close phylogenetically and have *heteromeroid aedeagi*. It follows that any modern classification that splits them in such different groups as Clavicornia and Heteromera, as was the old practice, is artificial.

Crowson (1966:512) considered the existing family Tetratomidae as resembling the common ancestor of Heteromera, while regarded Diphyllidae LeConte (1861) [=Biphyllidae Sharp (1900)] and Byturidae Thomson (1859) as clavicorn ancestors of Heteromera (Crowson 1967). My view is quite different on this subject (Abdullah 1973a and Abdullah & Abdullah, 1966). I regard Diphyllidae and Byturidae as Heteromera (and not Clavicornia), and as the 2 most primitive families of Heteromera (more than Tetratomidae).

Observations on the similarities and differences among the adults and larvae of these 3 families are presented below.

Similarities in the adult stage

1. The modes of life, *habits*, and foods are rather similar. Melandryids are found under bark, Mycetophagids are fungivorous under bark, and also feed on pine pollen. Tetratomids are also fungivorous.

2. Melandryids are elongate, convex, and slender to somewhat broadened

in *shape*. Mycetophagids are obovate, broad, and depressed. Tetratomids are elongate, convex, slender to somewhat broadened, or broadly oval and rather flattened.

3. *Size* or length in mm: Melandryids, 3-20; Mycetophagids, 1.5-6; and Tetratomids, 3-20.

4. *Coloration*. Melandryids: castaneous, brown or dark, rarely with yellow markings. Mycetophagids: brown to piceous, sometimes with orange or reddish markings. Tetratomids: dark.

5. *Vestiture*. Melandryids: sparse to moderately dense but short and sub-depressed. Mycetophagids: short, moderate, sparse to dense, sub-erect hairs. Tetratomids: usually sparse.

6. *Punctation and head surface*. Melandryids: smooth, punctate or rugose. Mycetophagids: punctate or rugose-punctate. Tetratomids: smooth, punctate.

7. *Head shape*. Melandryids: deflexed, posteriorly constricted or not. Mycetophagids: short, triangular, slightly deflexed. Tetratomids: ? as in Melandryidae.

8. *Type of antenna*. Melandryids: filiform or somewhat thickened or serrate. Mycetophagids: clavate; segments 7-11 enlarged, or with a 2- to 3-segmented club. Tetratomids: clubbed or thickened apically.

9. *Number of segments in antenna*. Melandryids: 11, rarely 10. Mycetophagids: 11. Tetratomids: 11.

10. Antennae *not inserted* under lateral expansions or ridges of frons in all 3.

11. *Apex of mandible*. Melandryids: simple or bifid, acute or blunt. Mycetophagids: blunt, curved. Tetratomids: ? as in Melandryidae.

12. *Apical segment of maxillary palp*. Melandryids: often long and more or less enlarged. Mycetophagids: simple to enlarged. Tetratomids: dilated.

13. *Apical segment of labial palp*. Melandryids: dilated, elongate. Mycetophagids: simple, slender. Tetratomids: ? dilated.

14. *Eyes* are both entire and emarginate in Melandryidae and Mycetophagidae; Tetratomids emarginate.

15. The *neck is wide* in all 3.

16. *Pro-coxal cavities are externally or visibly open* in all 3.

17. Pro-coxal cavities are *internally open* in Mycetophagidae, but both open and internally *closed* condition exists in Melandryidae and Tetratomidae.

18. *Pro-coxae are without substantial concealed lateral expansions* in all 3.

19. Pro-coxae are *not separated* by a flat intercoxal process with lateral extensions behind coxae in all 3.

20. Pro-coxae are *externally not contiguous* in all 3.

21. Pro-coxae are *internally contiguous* in all 3.

22. Pro-thorax is *not Bostrichoid* or Cisid-like in all 3.

23. Pro-thorax has *distinct side borders* in all 3.

24. Pronotum is *not apically flanged* in any.

25. There are *no antenna-receiving grooves on pro-pleura* in all 3.

26. *Trochantins of meso-coxae are exposed* in all 3.

27. *Meso-coxal cavities are open* by reaching of mes-epimera (and not closed by meeting of sterna) in all 3.

28. Meso-coxae are completely *separated* by intercoxal processes of sterna in all 3.

29. *Penultimate segments of tarsi are simple* in all 3 (exceptionally front tarsus may be lobed or pulvilliform in some Melandryids).

30. *Ante-penultimate segments of tarsi are simple* in all 3.

31. *Tarsal claws are simple* in all 3 (except in Osphyinae of Melandryidae where they are strongly toothed or split, a derivative feature!).

32. *All trochanters are heteromeroid* in all 3.

33. *Legs without ctinidia* in all 3 (although, rarely tibiae with numerous transverse ridges bearing spinules are found in Melandryidae).

34. *Blytra are without vein-like ribbings* in all 3.

35. *Apices of elytra are simple and similar in both sexes* in all 3.

36. Blytra are *without distinct pseudopleura* or epipleural fold in all 3.

37. *Metasternum is not spinous* (in the male) in all 3.

38. *Meta-coxae are contiguous* or nearly so in all 3.

39. *Wings have radial cells* in almost all of them.

40. *Anal cells* are present in the wings of Mycetophagidae and Tetratomidae (? but perhaps not in Melandryidae).

41. The *apparent number of anal veins* is 5 in all 3.

42. *Type of furca or met-endosternite.* Melandryidae: Hylecoetoid. Mycetophagidae: Hylecoetoid (? to not so). Tetratomidae: Hylecoctoid (approaching Boridae).

43. *Met-endosternite with long arms* in all 3.

44. *Met-endosternite with the anterior tendons far apart* in all 3.

45. Met-endosternite with the *anterior tendons* arising on the arms in Tetratomidae, but both from the arms or from the body of furca in Melandryidae and Mycetophagidae.

46. Met-endosternite without an *anterior median projection* in front of arms in Mycetophagidae and Tetratomidae, but with or without one in Melandryidae.

47. *Number of visible abdominal sternites* (or sterna) 5 in all 3.

48. *No connate visible abdominal sternites* in all 3.

49. *Orientation of tegmen and median lobe.* Melandryidae: inverted heteromeroid (rarely normal heteromeroid). Mycetophagidae: both conditions. Tetratomidae: inverted heteromeroid, tegmen ventral and median lobe or penis dorsal.

50. *Ovipositor long and tubular* in all 3.

51. Ovipositor with the *coxite 2-segmented* in Melandryidae (Not known in Mycetophagidae and Tetratomidae but expected to be similar).

52. *Abdominal appendages absent* in all 3.

53. *Last abdominal tergite* not produced into a Mordellid-like posteriorly directed *spine* in all 3.

Differences in the adult stage

1. *Eyes* are described to be large and lateral in Mycetophagidae, small in Melandryidae, and variable in Tetratomidae.

2. *Pro-coxae* or front coxae are transverse and *non-projecting* in Mycetophagidae and Tetratomidae, but in Melandryidae they are distinctly *projecting.*

3. *Trochantins of pro-coxae* are *exposed* in Mycetophagidae and Tetratomidae but *not* in Melandryidae.

4. *Mes-episterna* are reported meeting in front of mesosternum in Mycetophagidae but not in Tetratomidae, while both conditions are found in Melandryidae.

5. *Tarsal formula.* Melandryidae: 5-5-4. Mycetophagidae: 4-4-4 or 3-4-4 in male. Tetratomidae: 5-5-4.

6. *Tibial spurs* are *simple* in Mycetophagidae and Tetratomidae but *serrate* in Melandryidae.

7. *Internal keel of meta-coxa* is reduced to a narrow-based apophysis in Mycetophagidae and Tetratomidae. This is also the case in some Melandryidae but in others the keel is long and simple.

8. *Hind-wing has a sub-cubital fleck* in Melandryidae and Mycetophagidae. The fleck may be present or absent in Tetratomidae (? and is perhaps absent in a few Melandryids also).

9. *Mes-endosternite with the arms distinctly branched* are found in some Melandryids. The arms are, however, not branched in Mycetophagidae, Tetratomidae and some Melandryidae.

10. *Met-endosternite with laminae* are found in Mycetophagidae, Tetratomidae and some Melandryidae. Laminae are, however, absent in other Melandryidae.

11. *Tegmen with the parameres* or lateral lobes or gonostyli separate at apex in Mycetophagidae and Tetratomidae but fused apically in Melandryidae.

12. *Median lobe with 1 median strut* in Melandryidae and Tetratomidae but 2 in Mycetophagidae.

Note: It may be possible to use imaginal character number 19 under similarities (*vide supra*) to partially separate some Mycetophagids. Some *exceptions* are expected to be discovered in both the imaginal and larval characters described here, as the 3 families are revised for the world.

Similarities in the larval stage

1. *Habits.* Melandryidae: under bark and within fungi. Mycetophagidae: in fungi, cones of *Pinus*, and in dried flowers of *Opuntia*, etc. Tetratomidae: in fungi.

2. *Shape.* Orthosomatic, rather fusiform in *Penthe* (Tetratomidae).

3. *Body length in mm.* Melandryidae: 3-30. Mycetophagidae: 3-8. Tetratomidae: 4-12.

4. *Coloration* and *vestiture* rather similar in all 3.

5. *Hypostomal margins or rods.* Melandryidae and Tetratomidae: present or absent. Mycetophagidae: present.

6. *Hypopharyngeal sclerome.* Melandryidae and Tetratomidae: present or absent. Mycetophagidae: present.

7. *Number of antennal segments* 3 in all 3.

8. *Mandibles* both *symmetrical* and *asymmetrical* in Melandryidae and Tetratomidae but only asymmetrical in Mycetophagidae.

9. *Mandibular mola* both present and absent in Melandryidae and Tetratomidae, but not absent in any known Mycetophagid.

10. Mola without fine *transverse ridges* in all 3.

11. *Fleshy or setose post-molar appendage and penicillus* absent in all (? except possibly some *Penthe*—Tetratomidae, and *Eustrophinus*—Melandryidae).

12. *Retinaculum* both present and absent in all 3.

13. *Maxillary cardo* not divided and bi-partite in Tetratomidae, but both divided and entire or undivided cardo are found in Melandryidae and Mycetophagidae.

14. *Maxillary mala not toothed* in all 3.

15. Mala with or without *uncus* (non-dentate, spine or hook-like process) in Melandryidae and Tetratomidae, but absent in all Mycetophagids.

16. *Ligula* present in all 3.

17. *Gula not distinct from submentum*, the 2 being united or fused in all 3 (? distinct in some *Penthe*).

18. Number of *leg segments* and claws normal in all 3.

19. *Prothorax* not appreciably wider than other thoracic segments in all 3.

20. *Abdominal segments* 10 in all 3 (? may be 9 in some Mycetophagidae).

21. *Ninth abdominal sternite without asperities* in all 3.

22. Ninth sternite not composed of *a series of small plates* in any.

23. Ninth sternite not *broad, flat, plate-like* in shape in all 3.

24. *Urogomphi* present in Tetratomidae, but both present and absent in Melandryidae and Mycetophagidae.

25. *Urogomphi simple* and un-branched in Melandryidae and Mycetophagidae, but in some Tetratomidae urogomphi may be slightly complex.

26. Urogomphi both widely and narrowly *separated at base* in all 3.

27. *Tenth sternite* produced or not produced into 1 or 2 *pseudopods* in Melandryidae and Tetratomidae, but never distinctly produced in Mycetophagidae.

28. *Spiracles not cribriform* in any of them.

29. Spiracles not provided with a *series of small peripheral tubes* in any known species in all 3.

Differences in the larval stage

1. *Coronal suture.* Melandryidae: present or absent. Mycetophagidae: present. Tetratomidae: present.

2. *Frontal suture.* Melandryidae: lyriform or V-shaped. Mycetophagidae and Tetratomidae: lyriform.

3. *Clypeal or epistomal or frontoclypeal suture.* Melandryidae: present or absent. Mycetophagidae and Tetratomidae: absent.

4. *Number of ocelli.* Melandryidae: 6-10. Mycetophagidae: 8-12. Tetratomidae: 10.

5. *Sensory appendix or sensorium or tactile papilla or accessory process of antenna.* Melandryidae: present or absent. Mycetophagidae and Tetratomidae: present.

6. *Third antennal segment* less than half longer than second in Melandryidae and Tetratomidae. In Mycetophagidae various (more or less).

7. *Antennal insertion separated from base of mandible by a visible strip* in Tetratomidae but *not* in Melandryidae and Mycetophagidae.

8. *Mandibular mola asperate* or with tubercles in Mycetophagidae, not asperate in Melandryidae, and both conditions exist in Tetratomidae.

9. *Armament of mola extending ventrally* in Mycetophagidae, not in Melandryidae, and both conditions exist in Tetratomidae.

10. At least 1 mandible with *multi-dentate* or multi-lobed *cutting edge along inner dorsal margin* in Tetratomidae but not in Melandryidae and Mycetophagidae.

11. *Prothorax* longer than meso- and meta-thorax in Melandryidae and Tetratomidae, but both longer and shorter in Mycetophagidae.

12. *Spiracles annular-biforous* in Melandryidae and Tetratomidae. In Mycetophagidae, however, they are variable: with or without an extentional part on margin, annular, circular, guitar-shaped or annular-biforous.

Phylogeny of Melandryidae

According to Crowson (1966) and Viedma (1971) of the 3 subfamilies (Eustrophinae, Melandryinae, and Osphyinae) of Melandryidae, the most primitive is Eustrophinae, and both regard this subfamily as annectant to primitive Tetratomidae [Pisenini: *Pisenus* including *Pseudotriphyllus*, and *Eupisenus* doubtfully including *Integrinus, sensu* Miyatake (1960)].

In searching for the true relationships of Melandryidae, it would be necessary to revise the adults and larvae of world Eustrophinae (primitive subfamily) as well as those of world Pisenini (primitive group of Tetratomidae). The few known characters indicate that the Melandryidae have most probably evolved from Tetratomidae. Future systematic revisions are expected to support this view, as well as to prove or disprove the rather ambiguous suggestions of "affinities" to Scraptiidae, Mordellidae, and Rhipiphoridae in the literature. In all cases, the primitive groups need to be discovered and revised first.

Phylogeny of Mycetophagidae

A modern systematic revision of the family is much needed for the world, and particularly of the primitive groups to discover ancestry and phylogeny. My Baltic amber *Crowsonium* Abdullah (1964) should also be considered in this connection. From the published account of Mycetophagidae in Arnett (1971) it is possible to offer some suggestions. If *Myrmechixenis* is a Mycetophagid, then it would be better placed in a subfamily by itself, as suggested by the externally closed front coxal cavities, and this might prove to be a derivative group. The tarsal formula 5-5-5 in *Lendomus* (Lendomini) placed in Mycetophagidae in Arnett (1971) is thought provoking. It could be better placed elsewhere and may not be a Mycetophagid, or else should be a very primitive representative still possessing the ancestral clavicorn 5-5-5 tarsi. In the last event, other primitive characters are also expected to be present which will further strengthen the view. *Lendomus politus* Casey (1924) from Quebec should be first checked for the heteromeroid aedeagus in the male (to rule out the possibility of being a member of Clavicornia). Rather striking similarities of *Triphyllus*-group to Pisenini (Tetratomidae) have been interpreted as indicators of phylogenetic relationships between Mycetophagidae and Tetratomidae (*vide infra*).

Phylogeny of Tetratomidae

Miyatake (1960) classified the family into 3 tribes which could as well be considered natural subfamilies:

I. Pisenini (1. *Pisenus* including *Pseudotriphyllus*, 2. *Eupisenus*, doubtfully including *Integrinus*).

II. Tetratomini (3. *Tetratoma*, 4. *Abstrulia*, ? 5. *Incolia*).

III. Penthini (6. *Penthe*).

The most primitive tribe is Pisenini, and the most derivative is Penthini. Both Miyatake (1960) and Hayashi (1972) believe that Tetratomidae (particularly Pisenini) are phylogenetically related to Mycetophagidae (especially to the *Triphyllus*-group possibly including *Mycetophagus, Litargus*, and *Litargops*). If the *Triphyllus*-group represents the most primitive Mycetophagidae (which needs to be confirmed) then particular attention should be given to the systematic revision of adults and larvae for the world in order to discover the phylogeny of Tetratomidae and Mycetophagidae. The few characters given by Miyatake (1960) and Hayashi (1971 and 1972) could in fact be interpreted as indicators of true phylogenetic relationship between Tetratomidae and Mycetophagidae. They have not, however, clearly indicated the probable phylogenetic sequence which Crowson (1966:512) seems to suggest as Tetratomidae first (primitive) and Mycetophagidae as a direct offshoot (derivative). Future revisions are expected to throw more light on their phylogeny (*vide* Abdullah 1973a).

Acknowledgments

I wish to thank my fellow-coleopterists for sending reprints or photo-copies of their publications, particularly Drs. R. A. Crowson, N. Hayashi, M. Miyatake, and M. G. Viedma; and to my wife, Abida Abdullah, for her encouragement and assistance.

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LITERATURE NOTICES

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AN INEXPENSIVE METHOD FOR PRODUCING UNIT TRAYS

CHARLES E. WHITE[1] AND DAVID S. WHITE[2]

It was mentioned in the October, 1972 issue of the **Coleopterists Newsletter** that my father[1] produced his own unit trays. His death prevented him from answering the many requests for further details; thus, I am publishing the procedures which he used.

The following method will produce a good quality but inexpensive unit tray. The trays and boxes may be stored and assembled as needed. Materials can be ordered from, and if desired, precut by most local box manufacturers. The boxes are 0.032 white vat-lined chipboard; the cover paper is standard one side glossy; the pinning surface is 1/4 inch balsa wood. The drawers are 1/4 inch basswood or similar material with a bottom of 1/4 inch hard fiberboard.

The dimensions may be altered to suit the collection; those given here were found to be the most workable in housing Coleoptera. The smallest box (Size 1) is used for species where there are only 1 or 2 specimens. Size 4 easily holds a series of the larger species. Size 2 was used about 4 times more than Size 1 or 3 and 10 times more than Size 4. A drawer of the given dimensions will hold 54 of the Size 2 boxes.

Plywood cases can be made to house the unit trays. If the cases have proper seals, there is no need to make tops for the drawers. A sheet of glass, however, may be useful in protecting specimens in the drawer while out of the case.

Procedure (all measurements given in inches): A mandril (1 1/2 × 1 × 2) is needed for the smallest box and 1 (3 1/4 × 1 × 2) for the larger sizes. A screw partially inserted into the mandril makes a useable handle.

1. Score half way through the box at fold lines (Fig. 1).
2. Fold around mandril and form corners with adhesive tape. If using tape which must be wetted, allow to dry thoroughly.
3. With box slightly on mandril, fold broader sides of cover paper around box (glossy side out).
4. Apply paste to folded sides of cover paper. Form on box and allow to dry.
5. Paste and fold remaining sides of cover paper around box. Neatly pinch the inside corners with the mandril.
6. Paste pinning area in place.

[1] Deceased March 22, 1973.

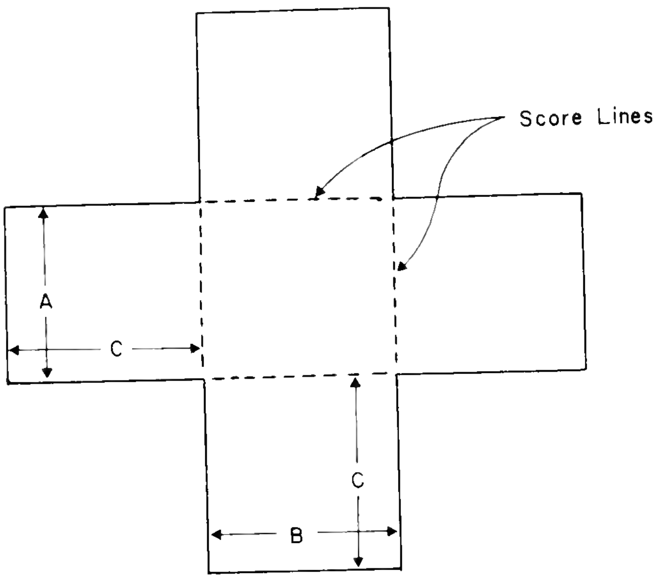
[2] Department of Biology and Water Resources Laboratory, University of Louisville, Louisville, Kentucky 40208.

TABLE I. BOX AND COVER PAPER DIMENSIONS:

Box Size	A	B	C	D	E	F	G	H
1	1 1/2	1 19/32	1 23/32	1 3/4	1 1/2	1 13/32	2 3/4	2
2	1 1/2	3 3/4	1 23/32	3 21/32	1 1/2	1 13/32	4 21/32	2
3	2 15/16	3 3/4	1 23/32	3 21/32	2 15/16	2 27/32	4 21/32	2
4	4 1/4	3 3/4	1 23/32	3 21/32	4 1/4	4 5/32	4 21/32	2

Inside tray dimensions: 20 3/8 × 14 × 1 7/8.

Balsa wood pinning area cut to dimensions A and B.



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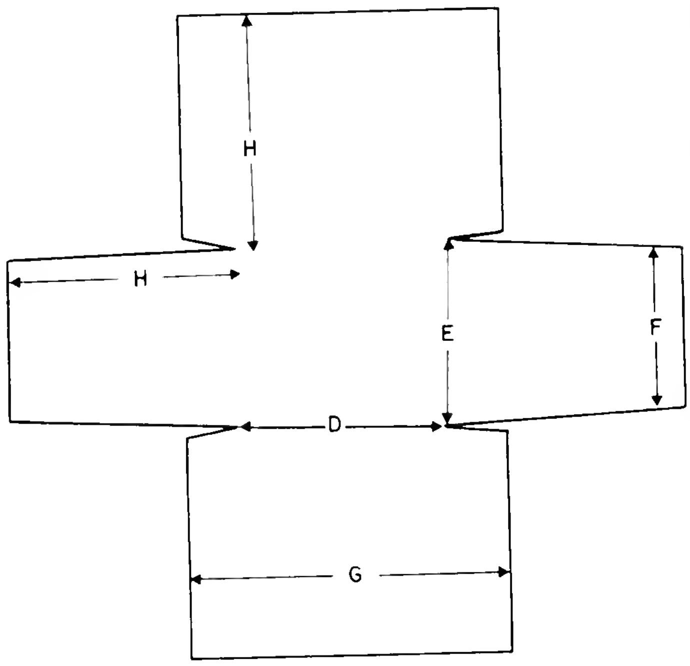

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Fig. 1) Outline of chipboard box; 2) Outline of cover paper (dimensions given in table).

NOTES ON THREE CHAUDOIR SPECIES OF *PLATYNUS* FROM CENTRAL AMERICA (CARABIDAE: PTEROSTICHINI: AGONI)

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ABSTRACT

Type-localities are restricted to GUATEMALA, Sacatepequez: Capetillo for *Platynus crossomerus* (Chaudoir); GUATEMALA, Izabal: Quirigua for *P. guatemalensis* (Chaudoir); and COSTA RICA, Puntarenas: 5-8 km. above Monteverde for *P. melanocnemis* (Chaudoir). *Platynus crossomerus* (Chaudoir 1878) is a junior name for *P. procephalus* (Bates 1878), a new synonymy.

Chaudoir (1878) named 3 species of *Colpodes* MacLeay from Guatemala and Costa Rica based on material in the Putzeys Collection of the Institut Royal des Sciences Naturelles de Belgique (IRSB), Brussels. Whitehead (1973) treated these names as valid species of *Platynus* Bonelli in a paper concerning type material of Mexican species of *Platynus*. A continuation of that study, this note is based on further material in IRSB and in the United States National Museum (USNM): restricted type-localities are designated, 1 of the Chaudoir names is reduced to synonymy, and 1 species is incorporated into my key to Mexican *Platynus* species (1973).

Platynus crossomerus (Chaudoir).

I compared the holotype with material of *P. procephalus* (Bates) in USNM, and found 1 male to be an essentially exact match. I here restrict the type-locality of *P. crossomerus* to GUATEMALA, Sacatepequez: Capetillo. Further, I place the name *Platynus crossomerus* (Chaudoir 1878) into synonymy with *P. procephalus* (Bates 1878), a **New Synonymy.** These specimens represent a violaceous form of *P. procephalus*, and the first alternative of couplet 66 (64′) in Whitehead (1973) should be altered to read "Elytron submetallic *or violaceous* . . .".

Platynus guatemalensis (Chaudoir).

I here restrict the type-locality to GUATEMALA, Izabal: Quirigua, based on a female in USNM that I compared with the holotype. This form will not key beyond couplet 8 (7′) in Whitehead (1973). As it does not closely resemble any known Mexican species keyed through couplet 8, I here emend that couplet as follows:

8(7′). Rufopiceous, unmetallic, unicolorous; tooth of mentum narrow, acute; pronotum with 2 pairs of marginal setae, lateral explanations broad, sides sinuate, hind angles nearly right, basal impressions impunctate; apex of intercoxal process of prosternum not truncate; brachypterous, metepisternum short; elytron with microsculpture isodiametric, basal and epipleural carinae joined in an arc; hind femur with 1 or more dorsoapical setae; last article of hind tarsus ciliate beneath, articles 1-4 clearly bisulcate .... *P. guatemalensis* (Chaudoir)

8′. Combination of characters not as above .... 8A (=couplet 8 in Whitehead 1973).

Platynus guatemalensis is a more robust form than any Mexican species keyed through couplet 8; in pronotal form it resembles only certain undescribed forms from northeastern Mexico, but differs from them by the narrow mental tooth and non-truncate prosternum.

Platynus melanocnemis (Chaudoir).

I recently discovered Putzeys' second specimen in undetermined IRSB material, a male labelled "Costa Rica" (green) but without Chaudoir's determination label; this is a paralectotype. I here restrict the type-locality to Costa Rica, Puntarenas: 5-8 km. above Monteverde, based on a male I collected 19-23-III-73 under stones along a small stream in montane rain forest (USNM). This specimen is smaller than Putzeys' specimens (elytral length about 6.5mm vs. 8.0mm), but otherwise is not distinguishable. Costa Rican specimens have tarsi, tibiae, and extreme apices of femora pale, in sharp contrast to dark basal parts of the legs; and both males have but 1 pair of anal setae.

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(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

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COLYDIIDAE: Building up worldwide collection. I want to buy or exchange other Coleoptera. Also interested in immature stages and publications on this family. Horst D. Matern, 5000 Koeln 41, Lotharstr. 34, Western Germany.

SCARABAEIDAE: Looking for all material of Coprinae, literature and specimens, also in exchange and purchase. Klaus-Ulrich Geis, Gyrhofstr. 6, D 5 Koln 41, Western Germany.

PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

WANTED: American Geographical Society maps of Mexico: Baja California-Norte, Baja California-Sur, and Sonora. W. H. Clark, 705 Smith Street, Vale, Oregon 97918.

EXCHANGE: I am interested in trading Colorado beetles for Meloidae and/or Scarabaeidae. I prefer Meloidae. D. Hartman, P. O. Box 444, Frederick, Colorado 80530.

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CARABUS, CARABIDAE, CERAMBYCIDAE: Will purchase or exchange Albert Sermet, Pres du lac 17.1400, Yverdon, (Suisse) Switzerland.

LUCANIDAE: World revision of most genera; prefer exchange for lucanids or other beetles; will identify loans, will buy if necessary. Hughes E. Bomans, 39 Avenue Charles Verhaegen, 1950 Crainhem, Belgium.

MICROPEPLIDAE: Working toward a world monograph of the entire family. Specimens, praeimaginal stages, distribution and/or ecological records needed from all areas of the World, by loan, or general exchange, correspondence invited. **SILPHIDAE:** Presently revising the genus ***Agyrtes*** for World. Request loan of adults and/or larvae & pupae. Distribution and ecological records welcome. **STAPHYLINIDAE:** Revising the genus ***Bryocharis*** (subfam. Tachyporinae). Request loan of New World and East Asiatic material especially. Petr Nohel, Botany Inst., Czech. Acad. Sci., 25243-Pruhonice nr. Prague, Czechoslovakia.

BUPRESTIDAE: 50 ***Euchroma gigantea*** (av. 6cm) plus general collection, unidentified, in alcohol, from Canal Zone (many scarabs, longhorns, etc.) to trade for any interesting Coleoptera. David Swanson, 502 Beech St. A-4, Savanna, Ill. 61074.

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FOR SALE: Exotic beetles from Malaysia, New Guinea, Africa, Brazil, etc. Send $1.00 for 64 p. catalogue. Prospect Biological, P. O. Box 307, Round Lake, Illinois 60073.

PHILIPPINE BEETLES: Leonard L. Lengyel, c/o Mrs. Manuela R. Ablan, Rizal St., Laoag City, Ilocos Norte, Rep. Philippines.

LITERATURE DESIRED: Donations of reprints, journals, and reference works are solicited to build up library. Wau Ecology Institute, Box 77, Wau, PAPUA, NEW GUINEA.

SCARABAEIDAE: Want to purchase ***Dynastes tityus*** and ***Plusiotus*** from North and Central America or trade for ***Psalidognathus superbus*** and French Scarabaeidae. T. D. Haas, 97 Barnes St., Long Beach, N. Y. 11561.

WANTED: Casey, T. L. 1912. Memoir III, p. 1-386. Henry Dietrich, Dept. Ent., Cornell Univ., Comstock Hall, Ithaca, N. Y. 14850.

BUPRESTIDAE: Buy, exchange, determine Central American Agrilinae for revisionary studies. Henry A. Hespenheide, Dept. Biology, Univ. California, Los Angeles, California 90024.

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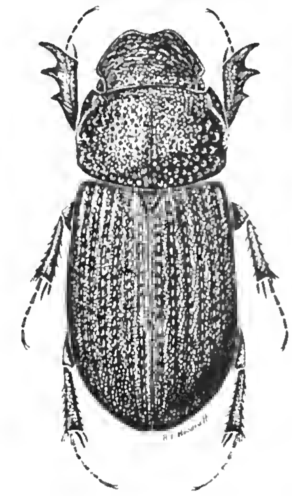
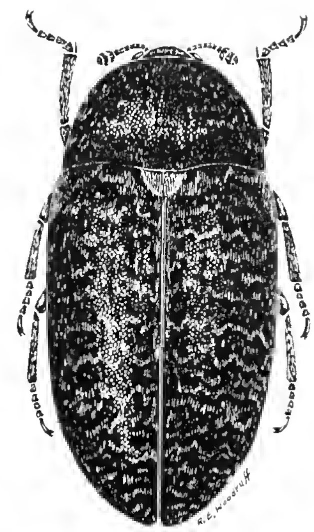


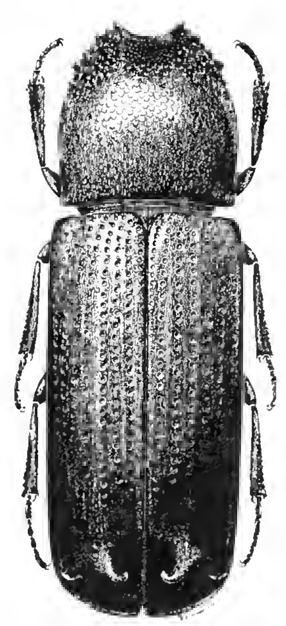
THE COLEOPTERISTS BULLETIN

AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES

VOLUME 28, NUMBER 3 SEPT., 1974

NITIDULIDAE: New palm *Mystrops*
by W. A. Connell 105-107
LANGURIIDAE: Synonymy in *Acropteroxys*
by Patricia Vaurie 108
SCARABAEOIDEA: Colombian Santa Marta
by H. F. Howden & J. M. Campbell 109-114
CARABIDAE: *Pasimachus sublaevis*
by P. S. Miliotis 114
STAPHYLINIDAE: N.A. Osoriinae
by Ian Moore & E. F. Legner 115-119
STAPHYLINIDAE: *Cafius sulcicollis*
by Ian Moore 119
CARABIDAE: *Glanodes* in New Mexico
by G. G. Perrault 120
CERAMBYCIDAE: Virginia notes I.
by R. H. Perry 121-122
CARABIDAE: Neotropical *Glyptolenus*
by D. R. Whitehead 123-132
CURCULIONIDAE: Acamptini
by E. C. Zimmerman 133-142
BUPRESTIDAE: New *Acmaeodera*
by J. N. Knull 143-144
COCCINELLIDAE: New tribe Oryssomini
by R. D. Gordon 145-154
STAPHYLINIDAE: New *Oxyporus* & notes
by J. M. Campbell 155-157
STAPHYLINIDAE: Lectotype designation
by J. M. Campbell 158
TENTYRIDAE: Larvae
by J. T. Doyen 159-165
SCARABAEIDAE: Mating behavior
by Gwenn Bennett 167-168
BOOK REVIEW 166





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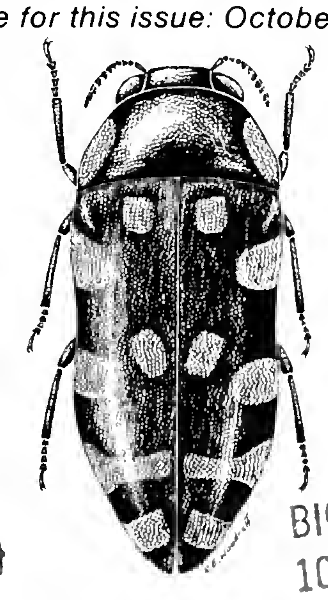

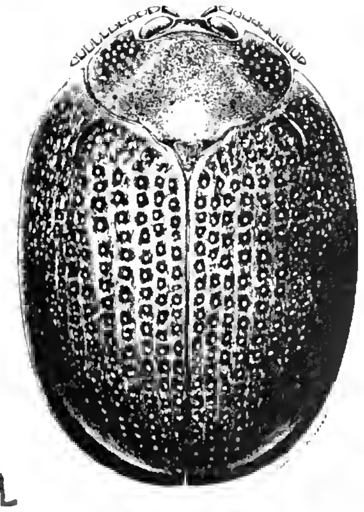

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The following exceptions are noted: 1) All geographical names are to be spelled out, 2) use words, not symbols, for male and female, 3) use numerals throughout, except to begin a sentence, 4) entomology, -ical, -ist, etc. are to be abbreviated Ent. in literature citations.

Specimen label data should be listed in the following manner: MEXICO: State of Veracruz, Fortin de las Flores, 10-VIII-70, I. B. Jones, under bark of **Pinus moctezumae,** 7000ft. [USNM] (2). The number in parentheses indicates the number of specimens. Geographical names are listed in order with largest units first, with states,

Continued inside back cover

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A NEW PALM ASSOCIATED *MYSTROPS* FROM BRAZIL (COLEOPTERA NITIDULIDAE)[1]

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Abstract

Mystrops gilloglyi n. sp. (Nitidulidae), from Pernambuco, Brazil is described and illustrated. This Neotropical genus contains 19 described species, of which 5, including *M. gilloglyi,* are associated with palms.

Mystrops is a small Neotropical genus that is distinguished from most other nitidulids by the presence of conspicuously elongated antennae in the males, extending to the tip of the abdomen in some species. Little published information on the group is almost exclusively taxonomic. A review by Gillogly (1955) is recommended to anyone attempting to identify members of the group. Since then, Gillogly (1972) described an additional species from Costa Rica and Jelinek (1969) described 3 from Bolivia and Paraguay. Host associations have been reported for only 4 species: *M. fryi* Grouvelle, *M. heterocera* Sharp, *M. bondari* Gillogly, and *M. costaricensis* Gillogly. All were collected from male flowers of certain palms. The following brings the number of described species to 19.

Mystrops gilloglyi Connell, New Species (Fig. 1-6)

Oblong-oval, length 2 to 2.25 times greatest width, moderately depressed; testaceous with vaguely defined fuscus areas near elytral suture in some specimens; dorsal surface uniformly punctate, except scutellum less strongly so, and moderately densely clothed with fine pale testaceous pubescence; punctures separated by their own diameters or less and each bearing a short fine pale testaceous hair; alutaceous between punctures.

Head transverse; strongly and broadly depressed on frons between antennal bases. Eyes prominent, finely faceted. Clypeus not evident. Labrum deeply bilobed, indentation reaching almost to base; lobes evenly rounded, heavily bearded. Mandibles dilated in basal 0.66, strongly narrowed at beginning of apical 0.33 which has the appearance of a darkened tusk, a smaller tooth behind this on inner margin concealed by labrum, and an additional one behind this on left mandible of male.

---

[1]Miscellaneous Paper No. 673, approved by the Director, Delaware Agricultural Experiment Station. Publication No. 427, Department of Entomology and Applied Ecology.

Antennae of male reaching from 0.25 to 0.75 length of elytra, setose, but the only long setae are a few on the club. Segment 1 thick, cylindrical, as broad as club and 0.25 longer. Other segments except club narrower, but each enlarged at tip; 2, 3, 6, 7, and 8 about equal in length; 4 and 5 longer, as long as basal segment; 9, 10, and 11 forming club, 9 elongate conical, as long as 10 and 11 combined, 10 and 11 transverse. Female antennae not elongated.

Pronotum nearly twice as wide as long, slightly narrowed toward front; anterior margin nearly straight; front angles rounded, hind angles obtuse but elongated hairs covering them make these angles appear to project rearward; hind margin sinuate at each side near angles.

Scutellum triangular.

Elytra combined width about equal to length; sides evenly arcuate; tips separately rounded; sutural angles obtuse; sutural striae complete, but narrowing strongly near apex.

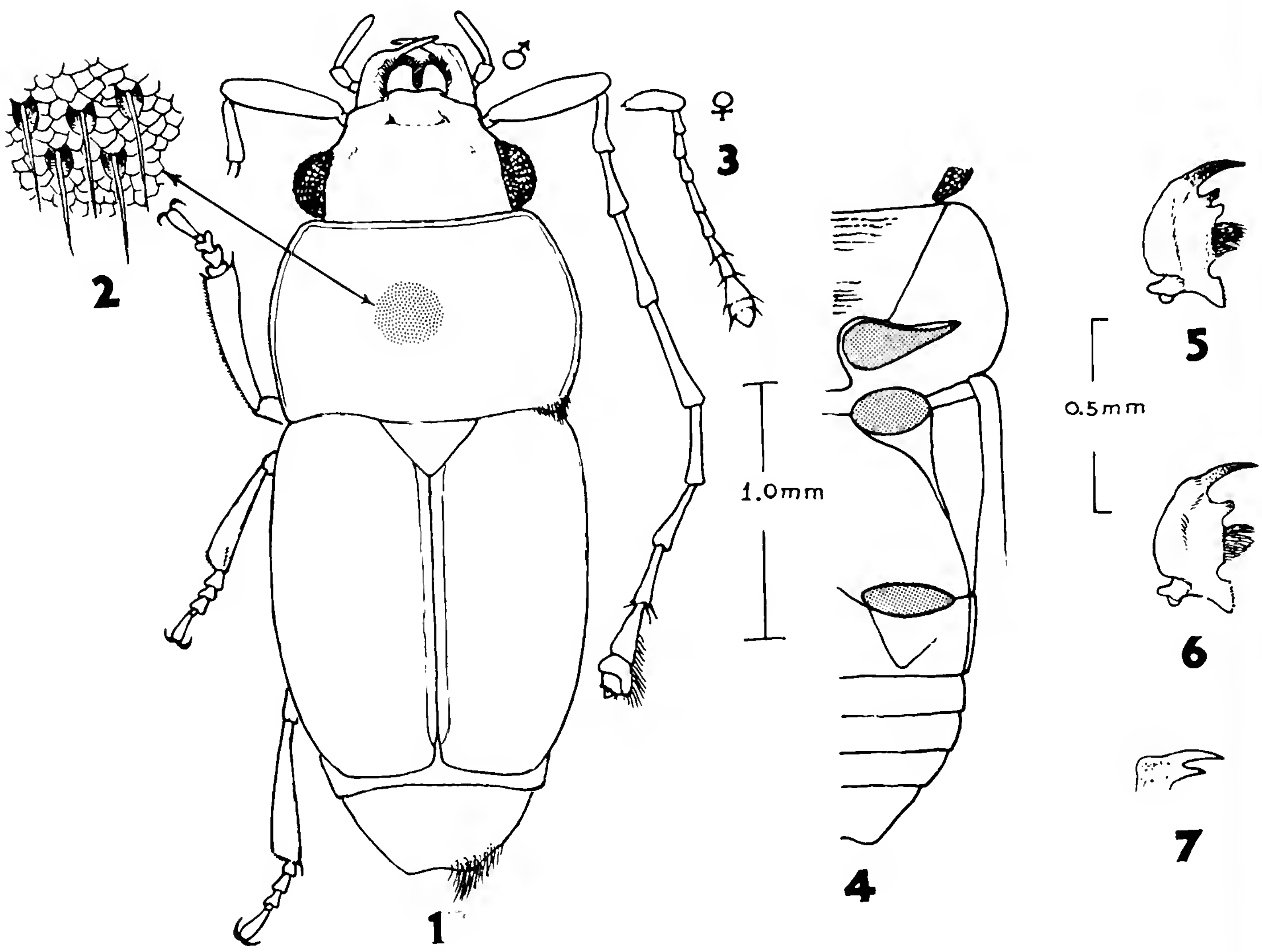

Fig. 1-6: *Mystrops gilloglyi* sp. n. 1) male, legs not shown on right side, antenna omitted on left side; 2) detail of dorsal surface sculpturing; 3) right antenna of allotype; 4) ventral aspect of left side of thorax and abdomen; 5) left mandible of male; 6) left mandible of female.

Fig. 7. Apical portion of left mandible of *Mystrops rotundula* Sharp. (Redrawn from Sharp 1889).

All illustrations by E. P. Catts.

Pygidium similar in both sexes; in basal 0.75 variably flattened to slightly convex medially, often turned upwards at sides, juncture of lateral margin with margin of hypopygidium visible from above and often forming a low rim along both sides; the apical 0.25 deflexed and concave, appearing variably truncate or indented from above, while actually rounded at the tip which can be seen only in a rear end view; a median protuberance of variable size proximad to the perpendicularly deflexed portion; clothed with moderately long hairs which extend beyond lateral and posterior margins; male supplementary segment not evident.

Prosternum nearly smooth except for 6 to 10 transverse wrinkles and sparse, shallow punctures.

Metasternum with axillary space extending from inner margin of coxal cavity to meet the episternal suture at about half the distance to the hind coxa.

Sternite 1 with postcoxal line extending posterio-laterally from inner margin of hind coxal cavity nearly to the hind margin of the sternite and ending there, or, in some specimens, recurving toward the outer part of the hind coxa.

In Gillogly's key this species runs to *M. rotundula* Sharp, which I have not seen, but Sharp's (1889) description is of a smaller species with differently formed mandibles (Fig. 7). Moreover, I do not find an indication of a pygidium shaped as in *M. gilloglyi* in the descriptions of any of the previously known species. This species is named after Lorin R. Gillogly, in recognition of his efforts toward a better understanding of this interesting genus.

Length 2.0 to 3.0mm; width 0.8 to 1.4mm.

Holotype male and allotype in National Museum of Natural History [USNM]. *Type locality*: BRAZIL, Pernambuco. G. P. de Arruda, May 1969, from palm tree. Paratypes, same data [USNM-3], [California Academy of Sciences - 2], [Instituto Biologica, Sao Paulo, Brazil - 2].

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SYNONYMY IN *ACROPTEROXYS GRACILIS* NEWMAN (COLEOPTERA, LANGURIIDAE, LANGURIINAE)

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Acropteroxys gracilis Newman, found in the United States, Mexico, and Central America, was divided into 2 subspecies by Vaurie (1948): nominate *gracilis* (type locality, Mt. Pleasant, Ohio), and *divisa* Horn (type locality, "Colorado and New Mexico"). They were said to differ in the coloration of the pronotum and prosternum (nominate *gracilis,* pronotum red with center third black, entirely or partially; *gracilis divisa,* pronotum red with varying amounts of black transversely or angularly across base, and black marks on prosternum). Examination of additional specimens, chiefly from Mexico, shows that the color is not well correlated with geographical distribution and that *divisa* is merely a color variety of *gracilis* (**New Synonymy**).

Martins and Pereira (1965:158) already expressed doubt as to the validity of *divisa* as a subspecies, but they did not synonymize the name for lack of material. Their 8 specimens of *divisa* were from Mexico (states of Mexico, Puebla, Morelos, Veracruz, and Chiapas). Since my revision (1948) I have examined material from the Mexican states of Durango, Chihuahua, Jalisco, Sinaloa, Colima, Oaxaca, Tabasco, and Veracruz. Although many of these specimens are colored as stated for "*divisa*", some show characters of both "subspecies" (specimens from Jalapa and Orizaba in Veracruz; Monte Alban, Oaxaca; Durango; also Arizona and Brownsville, Texas). In addition, there are other color varieties throughout the range of the species, some with the pronotum entirely red, some with it virtually entirely black.

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VAURIE, P. 1948. A review of the North American Languriidae. Bull. American Mus. Nat. Hist. 92:119-156; fig. 1, 2.

OBSERVATIONS ON SOME SCARABAEOIDEA IN THE COLOMBIAN SIERRA NEVADA DE SANTA MARTA

H. F. Howden and J. M. Campbell

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Abstract

The Scarabaeoidea fauna of the Sierra Nevada de Santa Marta of northern Colombia is briefly considered, particularly in relation to the geological history of the area. The habits of 3 species, *Heterogomphus dilaticollis* Burmeister, *Golofa porteri* Hope, and *Sphenognathus bellicosus* Boileau, are discussed in some detail.

In May, 1973, we spent 11 days on the San Lorenzo ridge of the Sierra Nevada de Santa Marta, Magdalena, Colombia. Our base was the Inderena Experiment Station at 7,000 feet. Collecting was largely limited to areas 6,000-8,500 feet in elevation within walking distance. The rains started approximately 3 weeks before our arrival, and during our stay it rained fairly regularly in the afternoons, with amounts varying from a trace to over 3 inches. Mornings were usually clear with the temperature averaging 70°F. Evenings were clear and cool, approximately 50°F, and often windy.

The area near the Inderena Station was largely either cleared or planted with pines and eucalyptus. One-half mile below the station (6,000-6,500 feet) there were patches of heavy forest; the presence of tree ferns indicated a cloud-forest formation (Fig. 1-2). Above the station (Fig. 3) and at the top of the ridge (8,000-9,000 feet) there were only scattered areas where the partly cut-over forest was accessible. Much of the ridge top was covered with grass, weeds, and scattered plantings of pine.

Since we were generally interested in Coleoptera, we utilized a variety of collecting techniques; i.e., observation, sweeping, beating (both during the day and at night), log and stone turning, sifting, black-light, malaise traps, and dung, carrion and fruit traps. From our experience in similar areas in South and Central America we expected to find a rich fauna, but results were disappointing. The fauna seemed quite depauperate, and in many ways resembled an insular one. We may have been too early in the season, but this would not account for the paucity of species in some groups, such as the Staphylinidae. Possibly the poor fauna may be explained by the historical aspects of the geology of the area.

The major uplift of the Sierra Nevada de Santa Marta to its present elevation of over 18,000 feet occurred in the relatively recent past (geologically speaking), within the last 3 or 4 million years. The range was formed by an uplift of an ancient plate and is not volcanic in origin. At least four-fifths of the surrounding area is quite low, with the Pliocene-Pleistocene base below current sea level. The nearest mountains, the Sierra de Perija, on the Colombian-Venezuelan border, lie to the south and east of the Sierra Nevada de Santa Marta, and since the prevailing trade winds blow from the northeast,

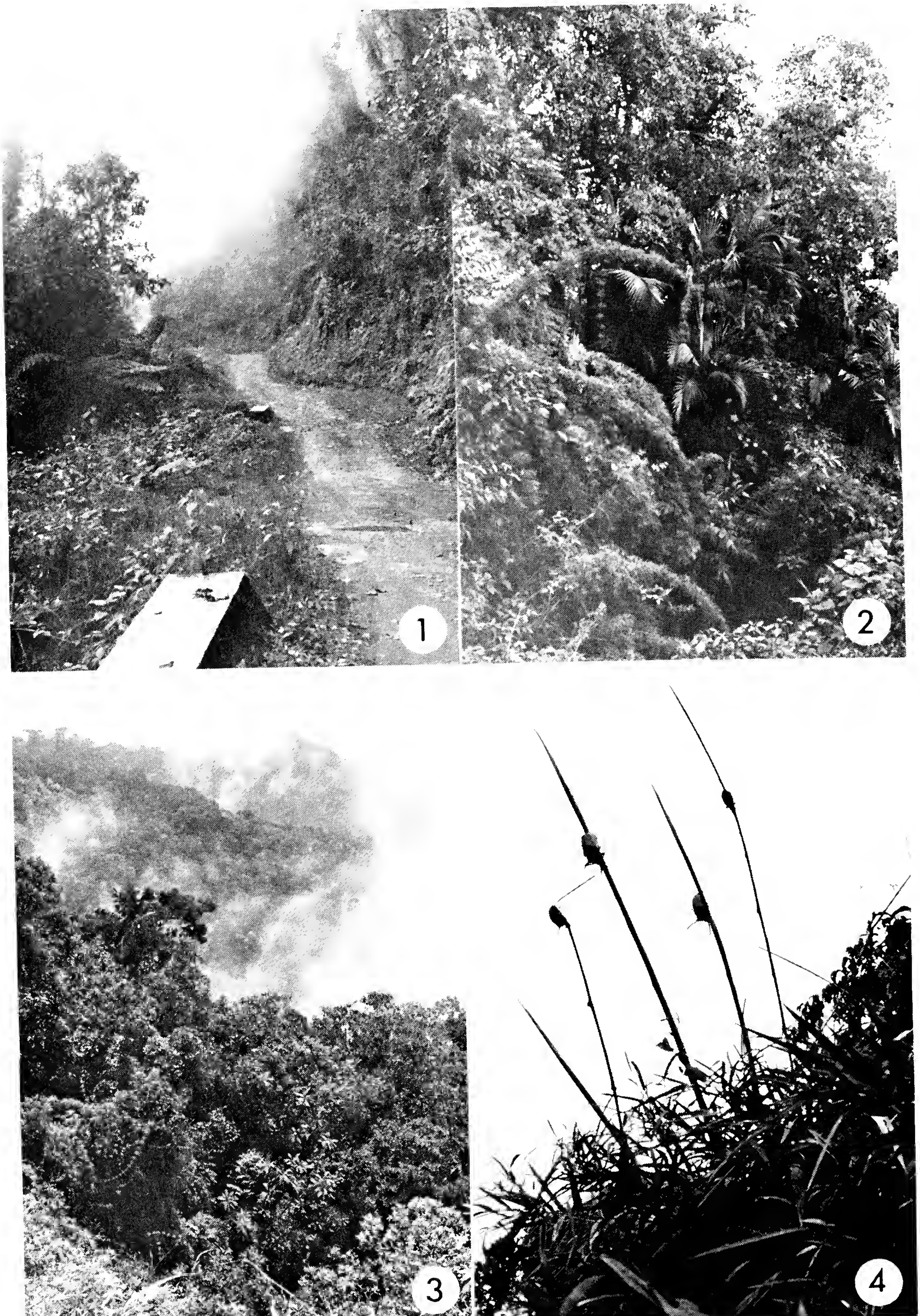

Fig. 1-4: (1-2) Cloud forest formations near Inderena Station, Sierra Nevada de Santa Marta, Colombia, 6,000-6,500 feet. (3) Forest above Inderena Station at 7,500 feet. (4) Males of *Golofa porteri* on growing shoots of bamboo at 8,500 feet.

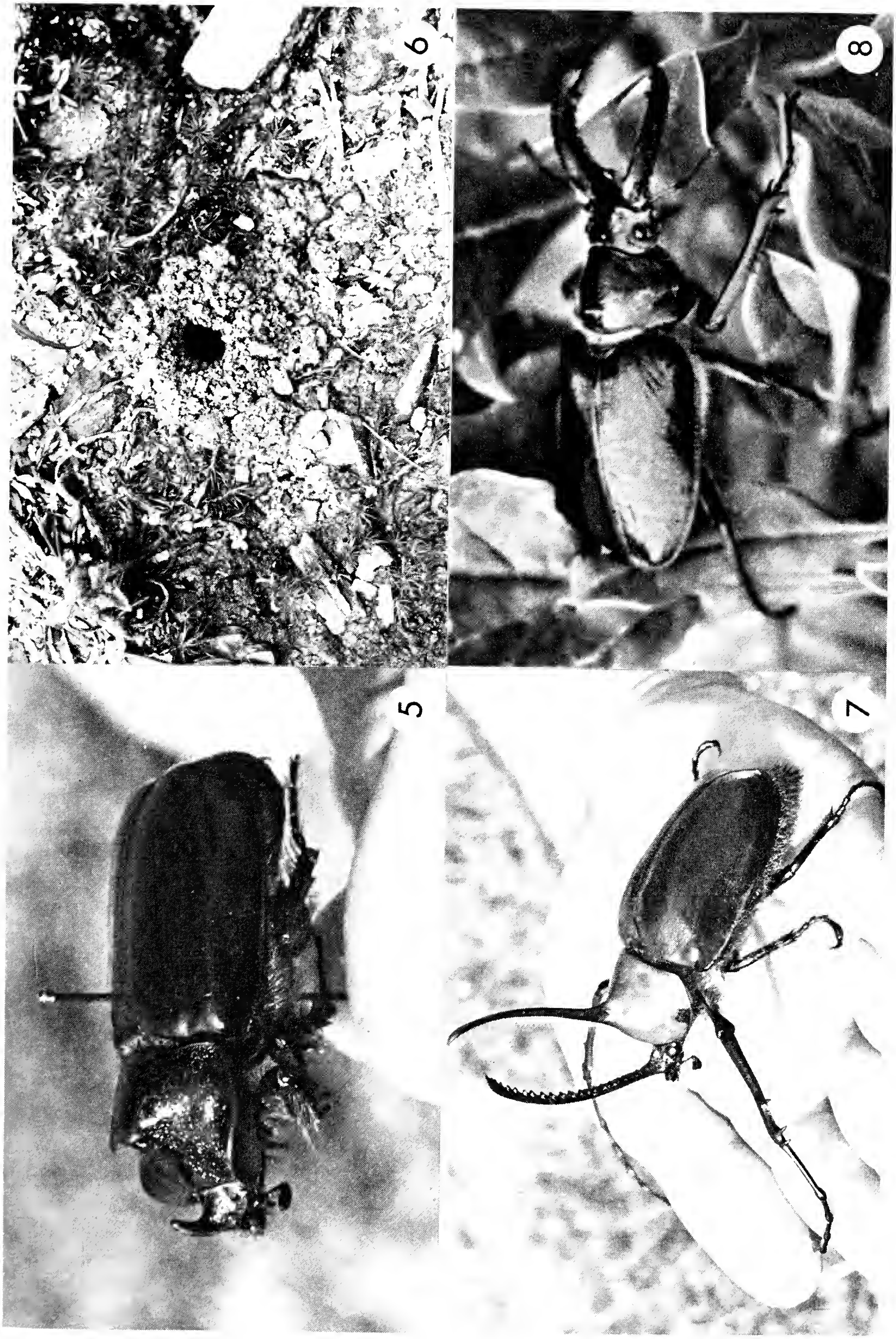

Fig. 5-8: (5) *Heterogomphus dilaticollis* Burmeister, male. (6) "Turreted" burrow of *H. dilaticollis.* (7) *Golofa porteri* Hope, male. (8) *Sphenognathus bellicosus* Boileau, male.

there appears to be little chance of wind transport of small insects from adjacent high areas.

The recent uplift and relative isolation could account for the depauperate fauna in the 6,000 to 8,500 foot levels of the San Lorenzo Ridge. At lower elevations (2,000-5,000 feet) there is a much richer fauna. Endemism is moderate at levels above 3,000 feet, but mainly at the species level, indicative of a relatively short period of isolation. This seems to support the concept of an insular, relatively recently uplifted area as an explanation for the lack of species diversity.

The distribution of the scarab fauna illustrates the general pattern. At 3,500 feet on the road to San Lorenzo near the settlement of Campana, 35 species of Scarabaeidae were taken on dung or at black-lights during an afternoon and evening of collecting. Only 1 species, in the genus *Golofa,* also occurred at 7,000 feet, where 1 specimen was taken at black-light. With this 1 exception the elevational differences were complete, the faunal shift appearing to occur between 5,000 and 6,000 feet. Between 6,000 and 8,500 feet there seemed to be little change, and the following genera of Scarabaeidae were taken: *Eurysternus* (1 species), *Canthidium* (1 species), *Uroxys* (1 species), *Onthophagus* (1 species), *Aphodius* (1 species), *Pseudoserica* ? (1 species), *Macrodactylus* (1 species), *Anomala* (1 species). *Ancognatha* (2 species), *Cyclocephala* (1 species), *Megacerus* (1 species), *Heterogomphus* (2 species), *Dynastes* (1 species), *Golofa* (2 species); and in Lucanidae, *Sphenognathus* (1 species). The first 5 genera listed were taken in dung or carrion traps. The *Pseudoserica* (?) was taken beating and at light between 7,000 and 8,000 feet. The *Anomala* and *Macrodactylus* were diurnal, the *Macrodactylus* being very common at the station flying along grassy banks and resting on moss-covered rocks. *Ancognatha vulgaris* Arrow and a black *Ancognatha* sp., *Cyclocephala, Megacerus jason* Hbst., *Heterogomphus rugicollis* Prell, *Dynastes neptunus* Quen., and a small *Golofa* were collected only at light. The *Megacerus, Heterogomphus,* and *Dynastes* were found at the lights of the Telecom station at 8,000 feet near the top of the ridge; the remaining species were taken at both the Telecom and San Lorenzo Stations. More detailed observations were made on 3 species, 2 Dynastinae and 1 Lucanidae.

While collecting along the San Lorenzo road between 6,000 and 8,500 feet, we found numerous fragments of the moderate-sized dynastid, *Heterogomphus dilaticollis* Burm. (Fig. 5). The fragments usually consisted of the head, pronotum, forelegs, and occasionally one elytron. Often, in the early morning, the forelegs and antennae of the fragments were still moving. In areas where numerous fragments were found, a number of odd "turreted" burrows (Fig. 6) were noted. The burrows were open, about 15 mm in diameter, with the rim 15 to 30 mm above the surrounding ground level. Investigation showed that the burrows were made by *Heterogomphus dilaticollis.* The majority of burrows were along the roadside in the compacted pebbly-clay soil, and 1 burrow was found in the center of the gravel road. The burrows, not including the "turret", were irregularly vertical for approximately 16 to 24 cm, then turned toward the horizontal for 6 to 8 cm. Because of rocks and roots, some burrows were quite sinuous, and in almost all cases the horizontal portion of the burrow terminated under a large rock or root, making excavation difficult. Because of these obstructions, only 15 burrows were fully excavated. Each of these yielded a male *dilaticollis.* The only live female seen was walking across the road, and it was not determined whether females make similar burrows. The males apparently utilize the burrows over a period of days, since burrows we disturbed were subsequently reopened. We also noted a moderate-sized fox-like canid (*Dusicyon*?) attempting to dig out the beetles; and this animal is apparently the major predator, not only of *dilaticollis*, but of other dynastids in the area.

On the San Lorenzo range, from approximately 6,500 feet to the top of the ridge, there were scattered clumps of bamboo or a bamboolike grass. This plant formed very thick clumps, often 20 to 30 feet high and very dense. However, fresh growth was evident in nonleafy stalks that extended above the main clump of vegetation for 2 or 3 feet. On 1 clump of the "bamboo", at 8,500 feet, we found 18 males of *Golofa porteri* Hope (Fig. 7). Each male was on a separate stalk, facing downward, approximately 3 to 5 inches below the growing tip (Fig. 4). The *porteri* were actively feeding on the stalk, and several nearly severed stalks were seen. While contemplating the best method of collecting the specimens, we heard a "clicking, squeaking" noise and after moving around the clump we saw 2 males on a single stalk fighting. One male was considerably larger than the other and was above the smaller specimen facing downward. Each male had its head lowered, so that the long, slender head horn extended directly forward. They grappled with their elongated forelegs, as each attempted to place the head horn under the opponent. At the same time, both males were vigorously sonifying, their abdomens moving up and down. The "battle" was observed for approximately 1 minute, when suddenly the larger male successfully placed his head horn under his opponent and flipped him off the stalk. The victor then resumed feeding, while the vanquished smaller male flew to the base of another stalk. The small male started to ascend the new stalk on which a very large male was facing downward near the terminus. The small male approached to within a foot of the larger one before its presence was observed. The large male extended its forelegs, lowered its frontal horn and sonified vigorously. The small male immediately stopped its upward progress, remained completely still for perhaps 15 seconds, and then flew off to an unoccupied stalk. Subsequent observations were halted by the advent of the afternoon rains. We collected a number of the specimens, but missed others that flew off when we disturbed the clump. Since there were no females in the clump of "bamboo", we can only conclude that the aggressive behaviour noted was in defense of a "feeding territory", and was not related to courtship. We did find a female *porteri* in another clump of "bamboo", 50 yards away, but there was no associated male. *Golofa porteri* seemed to be largely diurnal, flying early in the morning, but a few specimens, particularly females, were taken at the lights of the Telecom Station.

Another largely diurnal species was the lucanid, *Sphenognathus bellicosus* Boileau (Fig. 8). We first found this species along the road below the San Lorenzo Station at 6,500 feet. During the first week we found 5 specimens, either in the road (in several instances upside down) or on roadside vegetation. Several other specimens were seen flying near the top of the tree canopy along the road. We believed the species to be uncommon until we worked 2 narrow saddles along the top of the ridge at 8,500 feet. The length of the saddles was approximately 100 feet, with the ridge abruptly rising to 300 to 500 feet on either end. The sides of the saddles, which barely accommodated the road, fell away steeply for nearly 1,000 feet on either side to relatively heavily forested areas. Along the saddles were a number of woody shrubs with numerous stems forming a clump 8 to 10 feet high. The majority of clumps housed from 1 to 5 male *Sphenognathus* (Fig. 8). There was no indication of any feeding or other activity. Apparently the concentration of specimens was due to a combination of a tendency to fly uphill plus wind patterns which concentrated specimens at the saddles. Thirty-five specimens were found, all males. *Sphenognathus bellicosus* is of particular interest, since it is the only species we collected among the larger, high elevation scarabaeids that is endemic to the Santa Marta range.

Acknowledgements

Our visit to the San Lorenzo Station was made possible through the kindness of Dr. Jaime Ramirez Gomez, Instituto de Desarrollo de los Recursos Naturales Renovables (Inderena) de Santa Marta.

Mr. and Mrs. Terry Johnson, U. S. Peace Corps (with Inderena), helped us in many ways, particularly through their extensive knowledge of the San Lorenzo area. Dr. S. Endrodi, Hungarian Natural History Museum, Budapest, assisted with the identification of the Dynastinae, and Dr. M. O. de Lisle, Paris, France, identified the Lucanidae. Dr. F. K. North, Geology Department, Carleton University, kindly helped us with the geological aspects of the paper.

This work was supported, in part, by an operating grant to H. F. Howden from the National Research Council of Canada.

RANGE EXTENSION FOR *PASIMACHUS SUBLAEVIS* BEAUVOIS (COLEOPTERA, CARABIDAE)

Paul S. Miliotis

R. F. D. 1, Dunstable, Massachusetts

A specimen of *Pasimachus sublaevis* Beauv. was collected in open sand dunes of Monomoy Island, Cape Cod, Massachusetts on 8-X-1973 (det. Ross T. Bell). A search for other specimens in a collection of Coleoptera from Monomoy Island, made by Robert Baird, yielded 4 additional specimens.

This species is apparently unrecorded from Massachusetts. Banninger (1950) recorded the distribution as New York and New Jersey to Florida, west to Illinois and Indiana. No Massachusetts records could be found in the collections of the Museum of Comparative Zoology, Cambridge, Mass. or the National Museum of Natural History, Washington, D. C. (Dr. Terry L. Erwin, personal comm.), the most northerly records being several Long Island, New York specimens in the National Museum.

Specimens are deposited in my own collection and that of Dr. Ross T. Bell, University of Vermont.

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THE GENERA OF THE OSORIINAE OF AMERICA NORTH OF MEXICO (COLEOPTERA: STAPHYLINIDAE)

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ABSTRACT

A generic summary (morphology and distribution) is presented for the following 3 genera of Osoriinae: *Osorius, Neotrochus,* and *Fenderia.*

The subfamily Osoriinae, treated here in the restricted sense suggested by Moore (1964), may be briefly characterized as follows: antennae inserted at side margins of head; first segment of maxillary palpi not more than one-third longer than second; last segment of maxillary palpi not arcuate; abdomen without paratergites; anterior coxae large, elongate, with a transverse or diagonal sulcus on anterior face.

Members of this subfamily are usually cylindrical in form. Many species are found in the sandy margins of streams, but some inhabit rotting wood, and others are found in leaf litter. The subfamily is extensively represented throughout the tropics, but a few species are indigenous to the warmer areas of the United States and other temperate zones.

KEY TO THE GENERA OF OSORIINAE OF AMERICA NORTH OF MEXICO

1. Anterior tibiae much enlarged, strongly spinose .... *Osorius* Latreille
1′. Anterior tibiae not enlarged, not spinose 2

2(1′). Last segment of maxillary palpus not narrower than penultimate; labrum truncate, not dentate .... *Neotrochus* Blackwelder
2′. Last segment of maxillary palpus much narrower than penultimate; labrum rounded, dentate .... *Fenderia* Hatch

Osorius Latreille

Latreille 1829:438; Erichson 1839:30, 1840:753; LeConte 1861:69; LeConte & Horn 1883:102; Blatchley 1910:473; Notman 1925:3; Bradley 1930:67; Arnett 1961:242. Synonym: *Melosoma* Say 1830:49. Type: *braziliensis* Guerin-Meneville. Key: Notman 1925:6.

---

[1]Staff Research Associate and Associate Professor of Biological Control, respectively.

Form: cylindrical, robust; integuments shining.

Head: large, cylindrical. Eyes small, often not interrupting the side margin of the head. Antennae short, incrassate, somewhat geniculate; first segment as long as the next 4 or 5 together; their fossae located well in front of the eyes beneath a distinct ridge. Mandibles very stout, pointed. Labrum transverse, widest at base, apex truncate with the angles rounded. Paraglossae very long, prominent, comb-like, protruding well beyond the apex of the latrum. Maxillary palpi 4-segmented; first segment short; second elongate, curved, widest at apex; third as wide as apex of second, transverse; fourth as wide as third, twice as long as wide, pointed. Inner lobe of maxilla slender, pointed, ciliate; outer lobe broad, truncate with an apical pointed process and a few apical setae. Labial palpi 3-segmented; first segment widest, transverse; second and third of equal width and length, each about twice as long as wide; third narrowed to apex. Ligula rounded, simple. Gular sutures united. Infraorbital carina lacking.

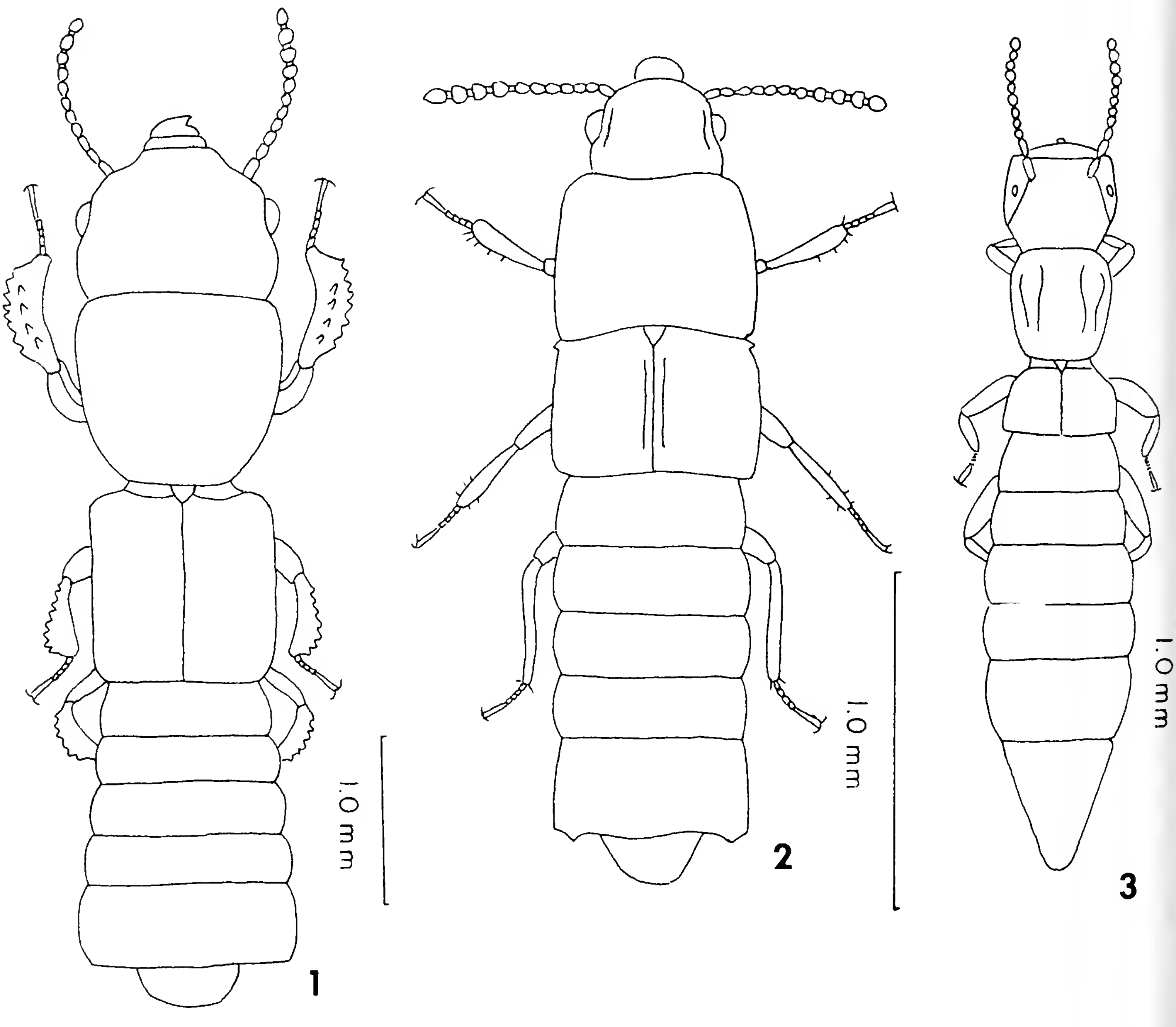

Fig. 1-3. Genera of Osoriinae: 1) *Osorius latipes* Erichson; 2) *Neotrochus* sp.; 3) *Fenderia capizzii* Hatch.

Thorax: cylindrical; pronotum usually widest at apex. Prosternum moderate, medially strongly tumid, its process pointed and extending a short distance between the coxae. Lateral prosternal suture obliterated. Hypomera delimited by a carina. Trochantin small, triangular. Epimera not delimited by a suture. Mesosternum short, its process long, narrow, pointed, carinate, extending about halfway between the coxae. Metasternum elongate, its process very short, pointed. Elytra quadrate, epipleura delimited by a carina. Scutellum large. Anterior coxae very large, rectangular, exserted, with a diagonal sulcus on the anterior face, contiguous. Middle coxae large, exserted, contiguous. Posterior coxae transverse, contiguous. Tibiae greatly expanded, with many large spines and setae. Tarsi 5-segmented; first 4 segments short, with the first a little the longest; fifth longer than the first 5 together.

Abdomen: cylindrical, usually narrowed at base. Segments without paratergites. First visible segment with a small keel between the coxae.

Distribution: 9 species in this tropical genus are reported from the United States, 2 of which range into the northeastern states. Between 200-300 species have been placed in this genus. Except for 2 of our species, 1 from Japan, several from China, and 1 from Australia, the species are known only from the tropics and subtropics.

Neotrochus Blackwelder

Blackwelder 1943:164; Arnett 1961:242. Synonym: *Holotrochus* Chapin 1928:65 (not Erichson 1839). Key: Chapin 1928:65.

Form: subcylindrical; integuments shining, foreparts without pubescence.

Head: not constricted behind to form a neck; a short, longitudinal carina over each eye. Eyes moderate, not very prominent. Antennae somewhat incrassate, first segment as long as the next 3 together, their fossae located well in front of the eyes under a distinct ridge. Mandibles stout, pointed, each with 2 internal teeth. Labrum transverse, the apex truncate, the angles rounded. Maxillary palpi 4-segmented; first segment small; second about as long as wide, widest at apex; third as wide as apex of second, transverse; fourth as wide as third, a little longer than second and third together, pointed. Inner lobe of maxilla narrow, bifid at apex; outer lobe broad, ciliate at apex. Labial palpi 3-segmented, segments of about equal width, first and third segments about 3 times as long as wide; second segment ball-shaped; third pointed. Ligula transverse, a little produced in the center of the apex. Gular sutures united. Infraorbital carina absent.

Thorax: pronotum quadrate, the sides subparallel; the base a little emarginate. Prosternum large, with a prominent pointed tumidity just anterior to its process, which is pointed and extends slightly between the coxae. Lateral prosternal sutures obliterated. Hypomera delimited by a carina. Trochantin large, oval. Epimera not delimited by a suture. Mesosternum short, its process long, narrow, pointed carinate, extending two-thirds of the way between the coxae. Metasternum long, its process pointed, extending one-third of the way between the coxae where it meets the mesosternal process. Elytra quadrate; the humeral angle with a small tooth; the sutural striae subparallel; the epipleura delimited by a carina. Scutellum large. Anterior coxae large, exserted, contiguous, with a diagonal sulcus on the anterior face. Middle coxae large, round, narrowly separated. Posterior coxae transverse and somewhat triangular. Tibiae not much expanded, with a few small setae. Tarsi 5-segmented, the first 4 segments short, the fifth about as long as the first 4 together.

Abdomen: cylindrical, without paratergites; first visible segment with a small keel between the coxae.

Distribution: this is a small tropical genus with a few species extending into temperate areas. They are found under the bark of trees. The above description was taken from a Brazilian species, as we have seen no North American material in this genus.

Fenderia Hatch

Hatch 1957:245; Arnett 1961:242. Type: *capizzii* Hatch.

Form: minute, cylindrical, elongate, integuments shining.

Head: large, orbicular, narrowed behind to form a distinct but broad neck. Antennae with the first 2 segments elongate, the rest round, with the eighth smaller than the seventh; their fossae located well in front of the eyes under a prominent ridge which is well back from the anterior margin of the head. Mandibles very long and slender, arcuate; the apex finely pointed, each with a long, slender, curved tooth internally. Labrum transverse, the apex with seven teeth, the center tooth the longest. Maxillary palpi 4-segmented; first segment short; second longer; third large, bulbous; fourth about as long as second, very slender, aciculate. Labial palpi 3-segmented; first segment large, elongate; second shorter; third very narrow, short. Ligula quadrate with a palpus-like appendage at each outer angle. Gular sutures united behind, divergent in front. Infraorbital carina absent.

Thorax: pronotum narrowed behind, with 2 irregular longitudinal impressions on each side of the disc. Prosternum large, its process short and pointed, hardly going between the coxae. Lateral prosternal suture distinct. Hypomera very broad, delimited by a carina. Trochantin minute or absent. Epimera not delimited by a suture. Mesosternum moderate, its process very long, acute, carinate, extending all the way between the coxae. Metasternum moderate, its process very short, pointed, meeting the mesosternal process. Elytra small; epipleura delimited by a carina, almost as large as disc of elytra. Scutellum small. Anterior coxae exserted, contiguous, with a diagonal sulcus on the anterior face. Middle coxae exserted, separated. Posterior coxae exserted, contiguous. Tibiae without spines. Tarsi 5-segmented; first 4 segments short, last not quite as long as first 4 together.

Abdomen: cylindrical, without paratergites. First segment with a small keel between the coxae. First five segments constricted basally.

Distribution: There is a single known species found in litter under redwood and other coniferous trees in the northwestern United States.

Notes. The very long falcate mandibles are quite remarkable in this group. Their points of articulation are so far apart as to give the head an unusual appearance. In most other regards, this genus is similar to other members of this subfamily.

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CAFIUS SULCICOLLIS LECONTE FROM THE GULF OF CALIFORNIA (COLEOPTERA: STAPHYLINIDAE)

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Moore and Legner, 1973 (Pan-Pac. Ent. 49:279-280) gave speculations on the distribution of several species of *Cafius* in Baja California and reported *C. sulcicollis* LeConte from the Salton Sea. They said "It is unlikely that the species was introduced from the Gulf of California as no member of the genus is known from the northern part of the Gulf." We have recently seen 3 specimens of *C. sulcicollis* from Punta Chueca, (29.00°-112.05°) Sonora, Mexico, light trap on beach, 18-I-1974, Vincent Roth, and 44 specimens from Punta Cuevas, (29.42°-112.35°) Sonora, Mexico, crepuscular flight over intertidal zone, 24-25-IX-1973, Vincent Roth and W. Brown. It is possible that *C. sulcicollis* found its way to the Salton Sea from the Gulf of California.

NEW RECORDS OF *GLANODES* (COLEOPTERA: CARABIDAE: HARPALINI) FROM NEW MEXICO

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During the summer of 1968, I had occasion to collect in the chihuahuan desert which in south New Mexico goes north at the foot of the Sacramento Mountains into Eddy and Chaves counties. That particular year the rainy season began early in the south and at the beginning of July, it was in full force.

On July 5, in the valley of the Rio Peñasco, altitude about 1200m, in muddy grassland with yuccas and little plant cover, about 5 miles east of Hope, on Rd US 82, in Eddy County, specimens of Carabidae were numerous, although species were not: *Opadius cordatus* (LeC.), *Selenophorus* sp., *Discoderus* sp., *Pasimachus californicus* (Chaudoir) and *duplicatus* (LeConte), *Cicindela lemniscata* (LeC.), and 4 males and 5 females of *Harpalus (Glanodes) cohni* Ball (1972).

Ball listed it only from western Texas in a limited range. This record extends the range northward into New Mexico, and seeming to cover the eastern approaches of the Davis and Sacramento mountains or the whole northeastern part of the chihuahuan desert. One of the unidentified females listed by Ball, was collected near Malaga, also in Eddy County, and it possibly belonged to *H. cohni.* However it also could be *H. stephani* Ball (1972) the range of which overlaps that of *H. cohni* in northwestern Texas, and more records are needed to set the boundary of the ranges of the 2 species and establish if they are sympatric or not.

The next day, July 6, near Organ, on the western slope of San Agustin Pass, in the San Andres mountains, altitude about 1000m and 10 miles east of Las Cruces (Dona Ana County) I collected 2 specimens of *Harpalus (Glanodes) obliquus* (Horn), 1 male and 1 female, along with *Discoderus* sp. and *Hyperaspis fimbriolata* (Melsh). This locality is near one for an unidentified female listed by Ball. It establishes the presence of the species in the whole northwestern part of the chihuahuan desert.

The 2 new records put the 3 species: *obliquus, cohni,* and *stephani* in an area surrounding the Alamogordo valley from which no species has yet been recorded. *Obliquus* and *cohni* are separated in the north by the Sacramento and the San Andres mountains, and *stephani,* the range of which includes south east Arizona and northwest Texas, would normally occur in the area south of the Alamogordo valley itself. Thus it would be very interesting to search the valley to determine if *Glanodes* species occur there.

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NOTES ON THE LONG-HORNED BEETLES OF VIRGINIA, PART I

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Abstract

Three specimens of *Stenocorus vittiger* (Randall) have been collected from the southern Appalachian range in Virginia that are markedly different from the normal species. Its possible taxonomic placement is discussed.

In preparation for a paper on the long-horned beetles of Virginia, I found 3 specimens of *Stenocorus vittiger* (Randall) that deserve comment. They vary from the normal and typical species as follows: in females the elytra are entirely yellow except for the sutural line which widens slightly below the median point, a line extending on the apical half of the lateral margin from the half way point to a point just short of the apices (rarely attaining the apices), and the apical tips of the elytra. The male is the same except the lateral line extends basally just short of the shoulders.

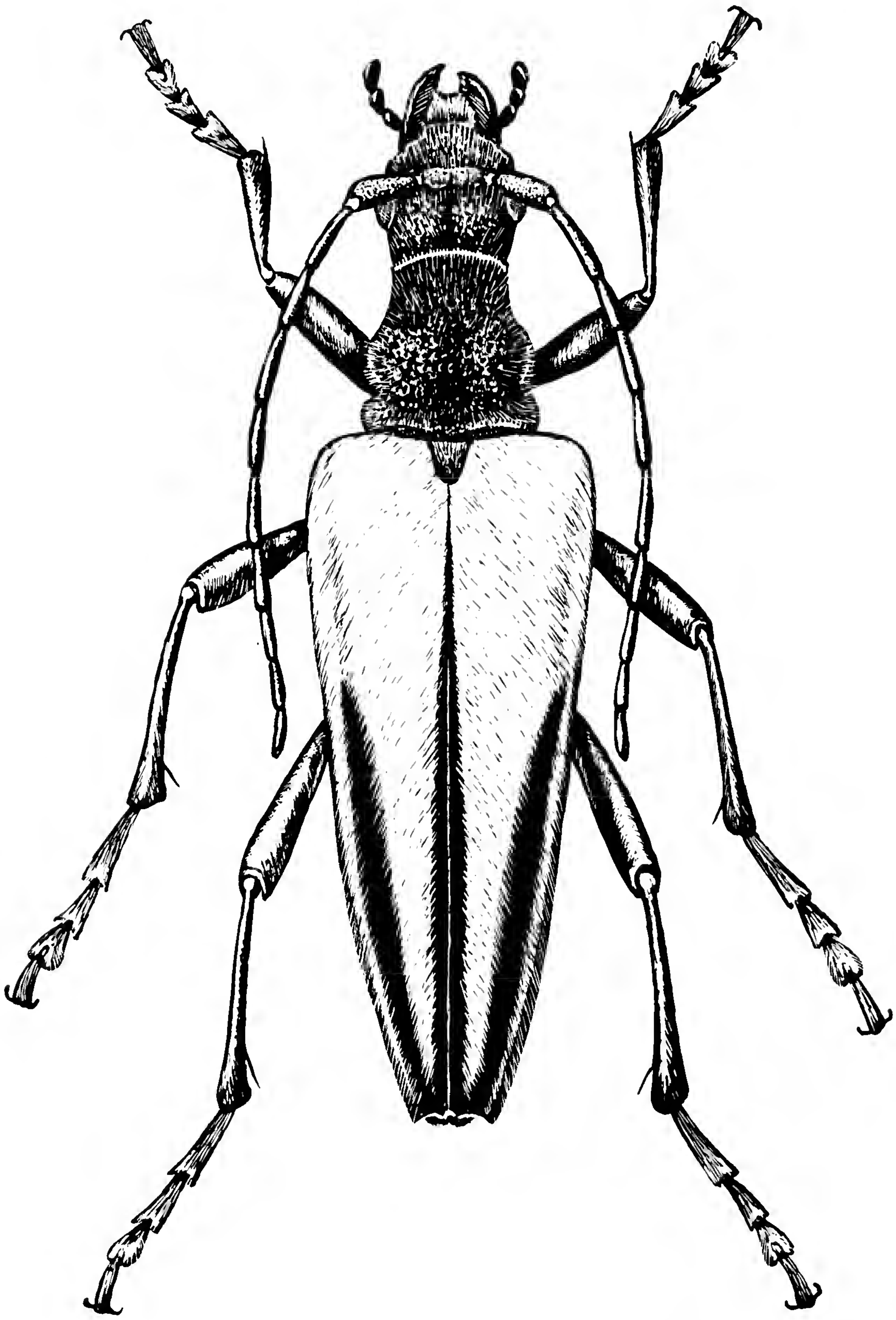
Stenocorus vittiger (Randall) ranges from Minnesota thru the northern midwest to Ohio, Pennsylvania, and New Jersey. These are the southern boundaries of the typical species. Three other specimens are known from Virginia (2) and North Carolina (1), but they were from the lowlands (less than 2000′) and show the normal elytral striping.

The 3 deviant specimens were taken above 4000′ elevation and within 40 miles of each other. No other 'yellow' specimens have been seen by the author so these may represent a local population. Since only 6 specimens have been taken south of Pennsylvania, there may not be much of a population in Virginia with which to breed. The 3 'yellow' specimens seem to be well removed from the rest of the population, both geographically and altitudinally.

Both localities (at which the 'yellow' specimens were taken) are primarily covered with oak. Linsley & Chemsak (1972) do not list a host for this species, although many adult feeding plants are known (Knull 1946). The elytral variation may be explained by different hosts, but since nothing is known of their larval feeding habits, this would only be speculation.

Hopping (1937) and Linsley & Chemsak (1972) mention that the species appears to be quite constant in color, variation being expressed only in the width of the median testaceous vittae. But the width has never been seen to this extreme.

I would like to thank Richard L. Hoffman and Henry Dybas for their learned counsel and my appreciation to Robert W. Surdick for the excellent drawing of the female. The 3 'yellow' specimens are in the author's collection.



Stenocorus vittiger (Randall)

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AN ANNOTATED KEY TO DESCRIBED SPECIES OF THE NEOTROPICAL GENUS *GLYPTOLENUS* (CARABIDAE: PTEROSTICHINI: AGONI)

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Abstract

The Neotropical agonine genus *Glyptolenus* Bates is briefly redefined to include certain species heretofore assigned to *Colpodes* MacLeay. All described species are keyed, and the following data are given for each: major literature citations; type-locality; label data and type-depository; and notes on distribution and relationship. Type-localities are restricted for some species. Lectotypes are designated for all names not borne by clear holotypes. All undescribed species known to me are treated parenthetically in the key and briefly mentioned in the discussion of closely related forms. Of 19 species-group names recognized as valid, 12 are new combinations in *Glyptolenus*. Four other names are treated as synonyms, the following 3 as new synonymies: *G. chalybaeus* Dejean 1831 (=*G. lebioides* Bates 1878); and *G. ruficollis* Chaudoir 1878 (=*G. cayennensis* Chaudoir 1878, =*G. viridinitens* Oberthür 1883).

Bates (1878) described the genus *Glyptolenus* to contain *G. rugicollis,* an agonine with grooved tarsi and tibiae. In 1882 and 1884, he transferred 3 species with these characteristics from *Colpodes* to *Glyptolenus,* and added 2 new species: *G. ater* (Chaudoir), *G. janthinus* (Dejean), *G. latitarsis* Bates, *G. nigrita* (Chaudoir), and *G. transformatus* Bates. Only 1 additional species has since been placed in *Glyptolenus,* the West Indian *G. simplicicollis* Darlington.

During my study of Mexican *Colpodes* type material in London and Paris in 1968, I found Bates' interpretation of the genus to be illusory. Chaudoir (1878) keyed a section of *Colpodes* on the canaliculate structure of the tibia, correctly disregarding presence or absence of longitudinally directed median sulci on the dorsal surfaces of the tarsal articles. This arrangement is reflected in his collection, with species recognized as *Glyptolenus* by Bates interspersed with many other species in which the tarsi are not distinctly sulcate.

This paper extends my treatment of Mexican *Platynus* (1973), in which I characterized *Glyptolenus* as Agoni (*sensu* Lindroth 1966) with anterior tibia externally canaliculate and male genitalia basally melanistic. This diagnosis is sufficient to distinguish *Glyptolenus* from all other Agoni genera of the World.

Glyptolenus is an exclusively New World genus; I plan a detailed revision of the species of Mexico and Central America, but have no plans to revise the South American species. I here treat all names referable to the genus, in essentially the same format as in my *Platynus* paper except that the discussion for each included form is more extended. I have examined type material for each included name, and here designate lectotypes as appropriate. In the key to described species, parenthetic characteristics are given to help distinguish the described forms from all undescribed forms known to me. Types in the Oberthür collection are located by box, column, and row (e.g., 298/1/2).

Acknowledgements

All type material is housed in the following 4 collections, and I heartily thank curators of these collections for permission to study this material. American Museum of Natural History, New York (AMNH), P. Wygodzinsky; British Museum (Natural History), London (BMNH), P. Hammond; Museum of Comparative Zoology, Cambridge (MCZ), J. White; Muséum National d'Histoire Naturelle, Paris (MNHP), A. Bons.

I thank also the following for the privilege of studying collections under their care: J. Nègre, Versailles (JNeg); G. E. Ball, University of Alberta, Edmonton (UASM); T. L. Erwin, United States National Museum of Natural History (USNM); the directors, Institut Royal des Sciences Naturelles, Brussels (IRSB).

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Key to Described Species of *Glyptolenus*

1. Elytral interval 3 at most bisetose, apical seta absent 2
1′. Elytral interval 3 trisetose, apical seta present 7

2(1). Tarsal articles 1-4 sulcate dorsomedially 3
2′. Tarsal articles 1-4 not sulcate dorsomedially; South America .... *G. sulcipennis* (Chaudoir)

3(2). Elytral apex rounded 4
3′. Elytral apex spinose; South America .... *G. spinosus* (Reiche)

4(3). Anterior pronotal seta present 5
4′. Anterior pronotal seta absent 6

5(4). Pronotum not rugose; elytral striae distinctly punctate; (lateral pronotal explanation narrow, impunctate; pronotal front angle weakly produced); Central America .... *G. latitarsis* Bates
5′. Pronotum strongly rugose; lateral pronotal margin angulate at middle; South America .... *G. nigritus* (Chaudoir)

6(4′). Elytral striae impunctate; lateral pronotal explanation developed strongly only at base; West Indies .... *G. simplicicollis* Darlington
6′. Elytral striae distinctly punctate; lateral pronotal explanation strongly developed throughout; (elytral striae strongly punctate); Central America .... *G. transformatus* Bates

7(1′). Elytron piceous or aeneopiceous; pronotum not rugose; anterior pronotal seta present; pronotal hind angle well developed 8
7′. Combination of characters not as above 9

8(7). Apices of elytral intervals concave or striate; elytron piceous or rufopiceous, slightly iridescent; South America .... *G. apicestriatus* (Chaudoir)
8′. Apices of elytral intervals flat to convex; (elytral striae strongly punctate; tarsal articles 1-4 deeply sulcate dorsomedially); South America .... *G. rivalis* (Chaudoir)

9(7′). Pronotum not strongly rugose 10
9′. Pronotum strongly rugose; elytron piceous or rufopiceous; (pronotum with posterior seta, base broad, hind angle denticulate, lateral margin angulate at middle); Central America .... *G. rugicollis* Bates

10(9). Anterior pronotal seta absent 11
10′. Anterior pronotal seta present 13

11(10). Elytron black or piceous; Central America .... *G. ater* (Chaudoir)
11′. Elytron bright blue to blue-black 12

12(11′). Elytron bright blue; elytral microsculpture formed of dense transverse lines; elytral intervals strongly convex; Central and South America .... *G. janthinus* (Dejean)
12′. Elytron blue-black, with or without greenish luster; elytral microsculpture more open, only slightly stretched toward elytral apex; elytral intervals weakly convex .... *G. latelytra* (Darlington)

13(10′). Eye bulging, prominent 14
13′. Eye not bulging, distance between eyes more than half maximum width of head 15

14(13). Elytral microsculpture formed of dense lines; (elytron blue-green to bright blue, not bright green); Central and South America [=*lebioides* Bates] .... *G. chalybaeus* (Dejean)
14′. Elytral microsculpture more open; elytron green or blue-green; pronotum broad to narrow, piceous to rufous; South America [=*cayennensis* Chaudoir, =*viridinitens* Oberthür] .... *G. ruficollis* (Chaudoir)

15(13′). Lateral pronotal margin not or slightly sinuate behind, hind angle rounded or obtuse 16
15′. Lateral pronotal margin distinctly sinuate behind 19

16(15). Pronotal hind angle rounded, posterior seta far forward; (elytron brightly colored, not aeneopiceous) 17
16′. Pronotal hind angle evident, posterior seta near base 18

17(16). Elytron bright blue; South America .... *G. azureipennis* (Chaudoir)
17′. Elytron blue-green; South America .... *G. cyclothorax* (Chaudoir)

18(16′). Elytral microsculpture formed of dense lines; (tarsal articles 1-4 deeply sulcate dorsomedially); South America .... *G. affinis* (Chaudoir)
18′. Elytral microsculpture more open; South America .... *G. aereipennis* (Chaudoir)

19(15′). Lateral pronotal margin strongly sinuate, hind angle nearly right; tarsal articles 1-4 deeply sulcate dorsomedially; eye large; elytron cupreoaeneous; South America .... *G. nitidipennis* (Chaudoir)

19′. Pronotum narrow, lateral margin less sinuate, hind angle obtuse; tarsal articles 1-4 not sulcate dorsomedially; eye flattened; (elytron bright blue, not violaceous) 20

20(19′). Pronotum narrow, nearly as long as wide, base strongly constricted, lateral margin more strongly sinuate; South America [=*purpureovarius* Motschoulsky] .... *G. azureus* (Dejean)

20′. Pronotum more transverse, base less strongly constricted, lateral margin less strongly sinuate; Central America .... *G. purpuripennis* (Chaudoir)

Annotated List of Species

Glyptolenus aereipennis (Chaudoir), **new combination.**

Dyscolus aereipennis Chaudoir 1850:388. Type-locality: "Brazil", restricted by Chaudoir (1859) to Brazil, Rio de Janeiro: Nova Friburgo. Type: lectotype male, here designated, first male (first specimen) in series of 9 specimens labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/1), MNHP.

Colpodes aereipennis: Chaudoir 1859:358; Chaudoir 1878:379; Csiki 1931:747; Blackwelder 1944:37.

Specimens of this South American species key readily to couplet 18; *G. affinis* and various undescribed forms that also key to couplet 18 differ by having extremely dense, fine elytral microsculpture. I have examined 16 additional specimens of *G. aereipennis* from various localities in eastern Brazil, including specimens in MNHP from Nova Friburgo collected after Chaudoir's works were published. Localities are: Brazil, Bahia: Cachimbo. Rio de Janiero: Nova Friburgo; Rio de Janeiro. Santa Catarina: Nova Teutonia. [Not located]: Caraça.

Glyptolenus affinis (Chaudoir), **new combination.**

Colpodes affinis Chaudoir 1878:379; Csiki 1931:747; Blackwelder 1944:37. Type-locality: Venezuela, Distrito Federal: Caracas. Type: holotype male labelled "14 e sect. b." and "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/2), MNHP.

Specimens of this South American species key readily to couplet 18, and differ from the related *G. aereipennis* by having much finer and denser elytral microsculpture. I have examined just 1 additional specimen from "Venezuela", in the Bates collection, MNHP.

I have seen 4 specimens of 1 or perhaps several related undescribed species. These specimens are smaller and differ by having tarsal articles 1-3 not or slightly sulcate dorsomedially. Localities are: Bolivia, Cochabamba: Chapare, Alta Palmar (JNeg) 1; Yungas, Puente Villa (JNeg) 1. Ecuador, Pichincha: Quito (IRSB) 1. Venezuela, Merida: Merida (USNM) 1. The Ecuador specimen has bright blue rather than green elytra. The Venezuela specimen has the head, pronotum, and appendages including the basal antennal articles dark rather than rufous as in the Bolivian specimens. I suspect these 4 specimens are conspecific, but that they represent a species distinct from *G. affinis*.

Glyptolenus apicestriatus (Reiche), **new combination.**

Anchomenus apicestriatus Reiche 1843:75. Type-locality: "Colombia". Type: lectotype male, here designated, labelled "Colombia", "Anchomenus apicestriatus Reiche Rev. ent. 1843", and "Ex Musaeo Chaudoir"; in Chaudoir collection (298/2/3), MNHP.

Colpodes apicestriatus: Chaudoir 1878:381; Csiki 1931:748; Blackwelder 1944:37 (as *apicestriata*).

A second male in the Chaudoir collection, MNHP, is labelled "14 sect. a." and is a paralectotype. I have not seen additional material of this highly distinctive form, the only member of the genus with the apices of the elytral intervals concave or striate. Specimens of this species should key readily. *Glyptolenus apicestriatus* probably is closely related to *G. affinis* and *G. nitidipennis.*

Glyptolenus ater (Chaudoir).

Colpodes ater Chaudoir 1859:358; Chaudoir 1878:380. Type-locality: Mexico, Veracruz: Toxpam. Type: lectotype male, here designated, labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/6), MNHP.

Glyptolenus ater: Bates 1882:99; Csiki 1931:766; Blackwelder 1944:41.

Specimens of this species are readily distinguished as keyed. I have examined 47 specimens of this species from various localities in Mexico, Guatemala, and Panama.

Glyptolenus azureipennis (Chaudoir), **new combination.**

Colpodes azureipennis Chaudoir 1859:355; Chaudoir 1878:377; Csiki 1931:748; Blackwelder 1944:38. Type-locality: Brazil, Rio de Janeiro: Nova Friburgo. Type: lectotype female, here designated, labelled "Bresil Bescke" and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/3), MNHP.

I have seen but 4 specimens of this species, all in MNHP. A paralectotype female (stated to be a male in original description) is labelled "Colombie". Two other specimens are labelled "Oberhalb Muzo Dr. Otto Thieme IV. 1887". A specimen in the Oberthür material placed with *azureipennis* material and labelled "Colombie" and " . . . Mniszech" is conspecific with *G. cyclothorax.* Also, I have labelled a specimen in IRSB previously identified as *G. azureipennis* as *G.* cf. *affinis* because its pronotal hind angles are distinct; this specimen was not, however, compared with type material, and I may not have it keyed properly through couplet 17.

Glyptolenus azureus (Chaudoir), **new combination.**

Colpodes azureus Chaudoir 1859:354; Chaudoir 1878:377; Csiki 1931:748; Blackwelder 1944:38 (as *azurea*). Type-locality: "Colombia", here restricted to Colombia, Cundinamarca: Bogota. Type: lectotype male, here designated, labelled "male" (green), "Anchomenus" (green), "azureus in Colombia" (green), and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/1), MNHP.

Ophryodactylus purpureovarius Motschoulsky 1864:308. Type-locality: Venezuela, Distrito Federal: Caracas. Type: lectotype male, here designated, labelled "Ophriodactylus purpureovarius Motsch." and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/1), MNHP.

Colpodes purpureovarius: Chaudoir 1878:377 (synonymy).

I examined 35 specimens of *G. azureus* from the following localities: BOLIVIA, Cochabamba: Yungas del Palmar. COLOMBIA, Cundinamarca: Bogota; "Tequendauria". VENEZUELA, Distrito Federal: Caracas.

I also examined a specimen from ECUADOR, Loja: Loja (MNHP) in which the front tibiae are not canaliculate though the hind tibiae are: I cannot decide if this specimen is conspecific with *G. azureus,* but it definitely is closely related.

Known distributions of *G. azureus* and *G. purpuripennis* are separated by the entire length of Central America, yet where they occur they seem to be abundant. Though superficial differences are rather slight, the 2 forms probably are reproductive isolates.

Glyptolenus chalybaeus (Dejean), **new combination.**

Anchomenus chalybaeus Dejean 1831:720. Type locality: "Brazil" (also "Guadeloupe"), here restricted to BRAZIL, Rio de Janeiro: Nova Friburgo. Type: lectotype female, here designated, labelled "male" (green), "chalybaeus mihi in Brafilia D. Latreille" (green), "Anchomenus" (green), "Ex Musaeo Chaudoir"; in Chaudoir collection (298/2/1), MNHP.

Colpodes chalybaeus: Chaudoir 1859:357; Chaudoir 1878:381; Csiki 1931:750; Blackwelder 1944:38 (as *chalybaea*).

Colpodes lebioides Bates 1878:599; Bates 1882:129; Csiki 1931:756; Blackwelder 1944:39. Type-locality: NICARAGUA, Chontales: [locality not specified]. Type: lectotype female, here designated, labelled "Chontales" and "Colpodes lebioides Bates"; in Bates collection (372/4/3), MNHP. **New synonymy.**

This is a widespread, geographically varied species, and is closely related to *G. ruficollis.* Central American specimens tend to be more greenish as in *ruficollis,* but with head and pronotum dark; the *lebioides* specimens tend to have dark femora and stronger bluish or aeneous luster on the head and pronotum, but the lectotype of *chalybaeus* also has dark femora (unlike most other South American specimens). I examined 40 specimens from various localities in Dominica, Guadeloupe, Costa Rica, Panama, and Brazil.

I have also examined 2 specimens from the Mexican states of Chiapas and Veracruz (UASM) which may be conspecific with *G. chalybaeus* but which have bright green elytra. I tentatively regard them as representative of an undescribed species.

Glyptolenus cyclothorax (Chaudoir), **new combination.**

Colpodes cyclothorax Chaudoir 1878:377; Csiki 1931:752; Blackwelder 1944:38. Type-locality: "Colombia". Type: lectotype female, here designated, labelled "13^{e} sect." and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/4), MNHP.

There is 1 additional specimen of *cyclothorax* in the Chaudoir collection labelled "Colombie" and ". . . Mniszech", but it is placed under *azureipennis.* Another specimen in MNHP was not compared with the type but runs without difficulty through my key to *cyclothorax;* it is from PERU: Chanchamayo [Not located]. *Glyptolenus azureipennis* and *G. cyclothorax* are closely related, and they may be conspecific.

Glyptolenus janthinus (Dejean).

Anchomenus janthinus Dejean 1831:721. Type-locality: "Bresil". Type: holotype male labelled "Anchomenus", "janthinus mihi h in Brasilia D. Lacordaire", and "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/8), MNHP.

Colpodes janthinus: Chaudoir 1859:357; Chaudoir 1878:381.

Glyptolenus janthinus: Bates 1882:98; Bates 1884:282; Csiki 1931:766; Blackwelder 1944:41.

This species is distinctive, abundant, and widespread. I examined 18 specimens from various localities in Costa Rica, Panama, and Brazil.

Glyptolenus latelytra (Darlington), **new combination.**

Colpodes latelytra Darlington 1935:199; Blackwelder 1944:39. Type-locality: JAMAICA, Blue Mountains. Type: holotype female labelled "Main Range Blue Mts. 5-7388 ft. Aug. 17-19", "Jamaica 1934 Darlington", and "22011 M.C.Z. Holotype Colpodes latelytra D."; in MCZ.

Darlington originally compared his specimen of *G. latelytra* with 2 specimens of *G. chalybaeus* from GUADELOUPE, Gourbegre (MCZ), but did so inaccurately: in *chalybaeus* the anterior pronotal setae are present (not absent as stated by Darlington); and the type of *latelytra* is a female (cited as a male by Darlington). Specimens of this species should key with no difficulty. I suspect its closest relatives are *G. ater* and *G. janthinus,* but the elytral microsculpture near apex and base is much more open and only slightly transverse. I have seen 1 other specimen, a male from JAMAICA, Green Hills (USNM).

Glyptolenus latitarsis Bates.

Glyptolenus latitarsis Bates 1884:282; Csiki 1931:266; Blackwelder 1944:41. Type-locality: PANAMA, Chiriqui: Boquete. Type: holotype male labelled "TYPE H.T.", "Sp. figured", "Boguete, 3500 ft. Champion", etc.; in BMNH (375/2/4).

One additional specimen (PANAMA, Chiriqui: Volcañ de Chiriqui) is in the Bates collection, MNHP. I tentatively consider as conspecific three further specimens: MEXICO, Chiapas: 3.1 mi. s. Pueblo Nuevo (UASM) 2; 1.5 mi. n. Pueblo Nuevo (UASM) 1. The Mexican specimens differ from the type by having darker appendages and by less narrowed lateral pronotal explanations.

Specimens of *G. latitarsis* should key with no difficulty, but this species, *G. nigritus,* and *G. transformatus* belong to a rather large complex of species most of which are not yet described. I have examined 1 specimen of an undescribed form distinguished from *G. latitarsis* by much wider lateral pronotal explanations and by more strongly developed pronotal front angles: MEXICO, Oaxaca: 16.9 mi. s. Valle Nacional (UASM).

Glyptolenus nigritus (Chaudoir).

Colpodes nigrita Chaudoir 1878:380. Type-locality: "Amerique meridionale". Type: holotype female labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/7), MNHP.

Glyptolenus nigritus: Bates 1882:98; Csiki 1931:766; Blackwelder 1944:41.

This species is close to *G. latitarsis, G. transformatus,* and at least 2 additional undescribed Central American species. I have seen no additional specimens of *G. nigritus,* but have examined 2 specimens of an apparently undescribed South American form which is closely related. These specimens differ from the type of *nigritus* by having a non-rugose pronotal disc and by having broad, punctate lateral pronotal explanations. Localities are: PERU, San Martin: Moyobamba (MNHP) 1; Huallaja, Aguaytia (JNeg) 1.

Glyptolenus nitidipennis (Chaudoir), **new combination.**

Dyscolus nitidipennis Chaudoir 1850:384. Type-locality: "Colombia". Type: lectotype female, here designated, first of 2 females labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/7), MNHP.

Colpodes nitidipennis: Chaudoir 1859:357; Chaudoir 1878:381; Csiki 1931:758; Blackwelder 1944:39.

The only specimens of this form seen by me are the 2 specimens in the Chaudoir collection and 1 in the Bates collection (MNHP), none with specific locality data.

Glyptolenus purpuripennis (Chaudoir), **new combination.**

Colpodes purpuripennis Chaudoir 1878:377; Bates 1882:129; Csiki 1931:761; Blackwelder 1944:40. Type-locality: "Oaxaca", here restricted to MEXICO, Oaxaca: Cerro de Plumas (see Bates 1882). Type: lectotype male, here designated, labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/2), MNHP.

I have examined specimens of this species from various localities in upland parts of the Mexican states of Chiapas, Guerrero, and Oaxaca. It is closely related to *G. azureus,* but distributions of the 2 forms apparently are widely disjunct.

Glyptolenus rivalis (Chaudoir), **new combination.**

Colpodes rivalis Chaudoir 1878:380; Csiki 1931:761; Blackwelder 1944:40. Type-locality: BRAZIL, Rio de Janeiro: Petropolis. Type: lectotype female, here designated, 1 of 2 specimens labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/5), MNHP.

During my visit to London and Paris in 1968, I distinguished 5 forms in a South American complex centered about *G. rivalis;* I do not know how many of these are distinct species, but I have seen some samples in which 2 forms are present. The type of *G. rivalis* has the elytral striae strongly punctate, and tarsal articles 1-3 strongly sulcate dorsomedially; another form has the tarsal articles faintly sulcate, and 3 forms have the striae less strongly punctate. The latter 3 forms differ from one another in density of elytral microsculpture, and in size of posterolateral pronotal impressions.

In addition to the type specimens, I have seen 15 specimens from Brazil with the above specified characters of *G. rivalis*: BRAZIL, Parana: Bocaiuva (UASM) 13. Rio de Janeiro: Nova Friburgo (MNHP) 1. Santa Catarina: Nova Teutonia (JNeg) 1.

Glyptolenus ruficollis (Chaudoir), **new combination.**

Colpodes ruficollis Chaudoir 1878:379; Csiki 1931:762; Blackwelder 1944:40. Type-locality: BRAZIL, Rio de Janeiro: [locality not specified]. Type: lectotype (?female), here designated, labelled "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/3), MNHP.

Colpodes cayennensis Chaudoir 1878:380; Csiki 1931:750; Blackwelder 1944:38. Type-locality: FRENCH GUIANA, Cayenne. Type: holotype male labelled "14e sect. b." and "Ex Musaeo Chaudoir"; in Chaudoir collection (298/1/4), MNHP. **New synonymy.**

Colpodes viridinitens Oberthür 1883:54. Type-locality FRENCH GUIANA, Cayenne. Type: holotype female labelled "Cayenne Dr. Nodier", "Colpodes viridinitens R. Oberthür TYPE Col. novit. I. p. 54"; in Oberthür collection (298/1/3), MNHP. Placed next to type of *ruficollis*. **New synonymy.**

The Chaudoir collection contains only the type specimens of *ruficollis* and *cayennensis,* while the Bates collection contains 2 specimens of *cayennensis* from "Cayenne" and 1 of *ruficollis* without locality data; the *cayennensis* specimens differ from the *ruficollis* specimens by having narrower and more piceous pronota. However, other specimens in the Oberthür collection, all from French Guiana, indicate that the distinction does not hold. The type of *viridinitens* has the form of *ruficollis* but the color of *cayennensis;* 1 specimen from Gourdonville has the form of *cayennensis* but the color of *ruficollis*; and 3 specimens from Passoura and 2 from Roches de Kourou have the form and color of *ruficollis.*

Both Blackwelder and Csiki listed *ruficollis* from Mexico and Guatemala, attributed to Bates (1882:125); the Bates record pertains to *Colpodes ruficornis,* and *G. ruficollis* is not known from Central America. Neither Blackwelder nor Csiki listed *viridinitens,* and I am indebted to G. E. Ball for finding the original description for me.

Glyptolenus ruficollis and *G. chalybaeus* are related, similar, and sympatric in South America where they are distinguished readily by the open microsculpture of *ruficollis.*

Glyptolenus rugicollis Bates.

Glyptolenus rugicollis Bates 1878:595; Bates 1882:98; Csiki 1931:766; Blackwelder 1944:41. Type-locality: NICARAGUA, Chontales: [locality not specified]. Type: holotype female labelled "Chontales" and "Glyptolenus rugicollis Bates"; in Bates collection, MNHP.

Bates (1882) confused at least 2 and probably 3 species under the name *G. rugicollis*; his records from El Tumbador and Las Mercedes, Guatemala, refer to an undescribed form. In true *G. rugicollis* the pronotum has 2 pairs of marginal setae, has the base relatively broad and hind angles denticulate, and has the lateral margins more or less angulate at the middle. I have seen 3 specimens with these characteristics: NICARAGUA, Chontales: [locality not specified] (MNHP) 1, holotype. COSTA RICA, Cartago: Turrialba (USNM) 1. PANAMA, Chiriqui: Volcan de Chiriqui (BMNH) 1.

Glyptolenus simplicicollis Darlington.

Glyptolenus simplicicollis Darlington 1934:97; Blackwelder 1944:41. Type-locality: DOMINICA, Laudet. Type: holotype male labelled "Laudet Dominica, B. W. I. June 9 1911" and "Holotype Glyptolenus simplicicollis Darl."; in AMNH.

The absence of the terminal seta of elytral interval 3 implies that this species is related to *G. latitarsis, G. nigritus,* and *G. transformatus,* but the relationship probably is not close. In form, and in particular in the narrow pronotal explanations, *G. simplicicollis* more nearly resembles the group that includes *G. ater, G. janthinus,* and *G. latelytra.* I have not seen additional material of this species.

Glyptolenus spinosus (Reiche), **new combination.**

Agonum spinosus Reiche 1843:77. Type-locality: "Colombia". Type: lectotype female, here designated, labelled "14 ᵉ sect. b." and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/6), MNHP.

Colpodes spinosus: Chaudoir 1859:360; Chaudoir 1878:378; Csiki 1931:763; Blackwelder 1944:40 (as *spinosa*).

I have seen no additional specimens of this fine species, the only member of the genus with spinose elytral apices.

Glyptolenus sulcipennis (Chaudoir), **new combination.**

Colpodes sulcipennis Chaudoir 1878:377; Csiki 1931:764; Blackwelder 1944:40. Type-locality: COLOMBIA, Cundinamarca: Bogota. Type: holotype female labelled "13ᵉsect." and "Ex Musaeo Chaudoir"; in Chaudoir collection (297/6/5), MNHP.

I have seen no other specimens of this distinctive form.

Glyptolenus transformatus Bates.

Glyptolenus transformatus Bates 1882:99; Csiki 1931:766; Blackwelder 1944:41. Type-locality: GUATEMALA, Quezaltenango: Cerro Zunil. Type: holotype female labelled "TYPE H.T.", "Cerro Zunil 4-5000 ft. Champion", etc.; in BMNH (375/2/3).

I have examined no further material of this species, but have seen 5 specimens of a related but undescribed species from the Mexican states of Jalisco and Oaxaca in the Sierra Madre del Sur (UASM).

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STUDIES OF ACAMPTINI* (COLEOPTERA: CURCULIONIDAE: COSSONINAE)

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ABSTRACT

A review of the literature and history of the classification of the Acamptini is given together with a key to the genera and an annotated list of the species. It is demonstrated that the Acamptini are Cossoninae and not Cryptorhynchinae as considered by some authors. *Pseudacamptus* Champion and *Glyphostethus* Marshall are reduced to synonyms of *Acamptus*. *Glyphostethus cancellatus* Marshall, *Pseudacamptus plurisetosus* Champion, and *Pseudacamptus texanus* Sleeper are transferred to *Acamptus*. *Acamptus cancellatus* Marshall, including the male and female genitalia, is illustrated for the first time, and it is concluded that the species is tropical American and has been introduced accidentally to Samoa and Fiji (recorded from the latter for the first time). A lectotype is selected for *Acamptus rigidus* LeConte. *Paracamptopsis* Hustache is excluded from the Acamptini, and it is noted that *Paracamptus* Casey, *Acamptoides* Champion and *Anchacamptus* Voss are Cryptorhynchinae and not Cossoninae as listed in Coleopterorum Catalogus and some other literature.

In 1921, Sir Guy Marshall described what he considered to be an unusual new genus and species of Samoan cossonine weevil, and he called it *Glyphostethus cancellatus*. It was based upon a single specimen found by Dr. Swale at Apia, Upolu, Western Samoa in 1916. Having not seen the unique holotype, the weevil was long a puzzle to me. When I went to Samoa in 1940, I tried hard to rediscover the species. In spite of extensive and intensive collecting, I found only 1 example, and it was captured near the end of my expedition. My specimen was found beneath the dead bark of *Hibiscus tiliaceus* at about 200 m. above Utulei, near Pago Pago, Tutuila, 24-VIII-1940. While studying my Samoan collection in 1943, I found, much to my great surprise, that *Glyphostethus* is the same as the American *Acamptus*. Later, when I was able to take my specimen to the British Museum to compare it with the holotype of *cancellatus,* I found that the type is a badly abraded specimen. Moreover, there are in the British Museum 2 Fijian specimens, one collected by R. Veitch at Labasa (Lambasa), Vanua Levu, VII-1922, and the other taken by H. S. Evans at Lomaloma, Vanua Levu. Although I made a very large collection of Curculionidae in Fiji in 1938, I did not collect the species in that archipelago. It is noteworthy that the above-mentioned 4 Pacific island specimens were collected singly at widely separated localities, and all of them were found at or near seaports. There appears no doubt that this species has been introduced to the Pacific from America. To strengthen further this conclusion, I can now also report that *cancellatus* is closely similar to the more recently described

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Acamptus verrucosus Voss from Colombia, South America. It is possible that *Acamptus cancellatus* was dispersed into the Pacific during the days of sailing ships, and we may expect to find it established in other localities on tropical Pacific islands. This recalls the discovery that the American *Anchonus duryi* Blatchley has been accidentally established in the Society and Gambier Islands in southeastern Polynesia as reported by me in 1964.

The taxonomic position of *Acamptus* has been the subject of considerable uncertainty. When LeConte described the genus in 1876, he erected the "Group Acampti" to receive it. He placed the Acampti in the "Tribe Cryptorhynchini" between his "Group Ithypori" and his "Group Cryptorhynchi". This was the equivalent of making the Acamptini a tribe of the Cryptorhynchinae. LeConte considered *Acamptus* an unusual weevil, and he characterized the group as follows:

"As *Camptorhinus* differs from the *Cryptorhynchi* by the pectoral groove being confined to the prosternum, though distinctly limited behind, so is the singular insect which constitutes this group similarly separated from the *Ithypori,* by the shorter beak resting upon the front coxae. The body is elongate, as in *Camptorhinus,* and the tibiae are stout, sinuate on the inner side, and strongly hooked at the tip. The other characters are peculiar, the tarsi are not dilated nor spongy beneath, and the club of the antennae is pubescent and sensitive only near the tip. [The latter character does not apply to all species now known.]

"These characters indicate relationships in various directions, such as the *Byrsopides* and *Cossonidae,* but the insect preserves unchanged all the essential characters of the Cryptorhynch type of *Curculionidae.*"

These details were repeated by LeConte and Horn in their 1883 monograph (p. 487-488).

In *Biologia Centrali-Americana* (1909:1), Champion described 3 new genera in this group (*Acamptopsis,* with a 5-segmented antennal funicle; *Pseudacamptus,* with a 6-segmented funicle; *Choerorrhynchus,* with a 7-segmented funicle), and he called the cluster "Group Acamptina" of the subfamily Curculioninae. He gave a key to the 4 genera then recognized. Although he included the group in his last section of the Cryptorhynchinae, he remarked upon its affinity with the Cossoninae, and he said that "they seem to me to be best placed near the Cossonina and Trypetina". In a footnote, Champion called attention to the fact that *Paracamptus* Casey and *Acamptoides* Champion have complete pectoral canals and bilobed third tarsal segments and do not belong to the Acamptini. Champion characterized the Acamptini as follows:

"The 'Acamptina' have the rostrum stout and deflexed, its basal portion received in a deep groove in the prosternum and its apex resting on the narrowly separated anterior coxae; the prothorax projecting over the head anteriorly; the third tarsal joint simple; the funiculus 5-, 6-, or 7-jointed; and the body more or less setose and lutose."

Other characters of fundamental importance that have not previously appeared in literature are the long rectal loop sclerotization and the row of sclerolepidia along each metepisternum which are characteristic of most Cossoninae.

In 1916:519, Blatchley and Leng followed Champion's suggestion, and they included the group as "Tribe Acamptini" of the Cossoninae. In 1920:333, Leng placed the Acamptini as the first tribe of the Cossoninae in his catalog of North American Coleoptera.

1

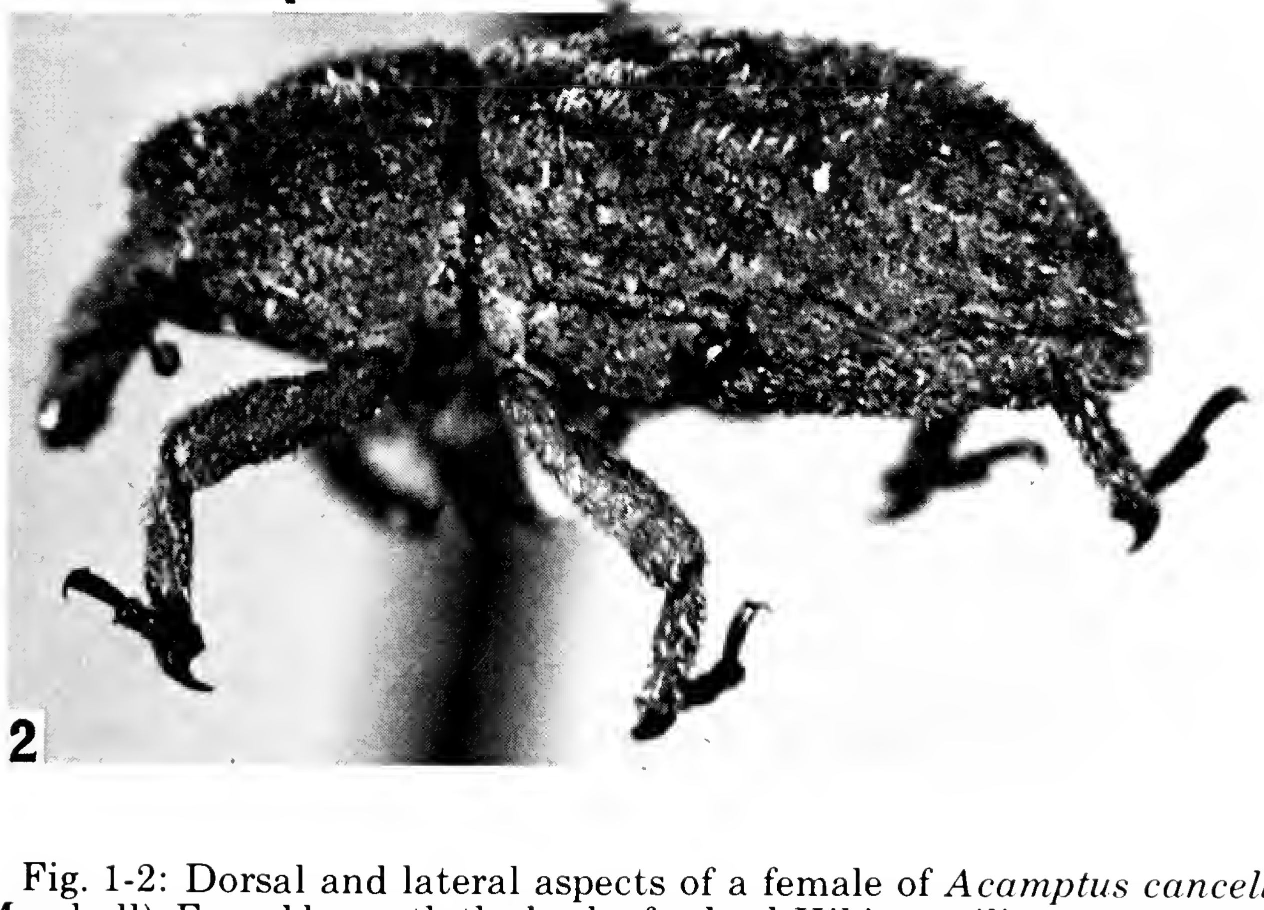

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Fig. 1-2: Dorsal and lateral aspects of a female of *Acamptus cancellatus* (Marshall). Found beneath the bark of a dead *Hibiscus tiliaceus* tree at about 200 m. above Utulei, Tutuila, Samoa 24-VII-1940, E. C. Zimmerman. Length: 3.7 mm, excluding head. The weevil is fully winged.

In 1929*a*:512-514, Hustache described *Paracamptopsis* as a new genus containing 2 species from Mt. Kenya, Africa. He elevated the group to subfamily status and placed it next in front of the Cryptorhynchinae in his report. Hustache was not, however, dealing with African representatives of the Acamptini, because *Paracamptopsis* and *Acamptus* belong to different groups. Inexplicably, in the same paper (1929*a*:466), Hustache described in the Rhyparosominae a new species, *laeviceps,* from Kilimandjaro, which he wrongly assigned to *Microcopes* Faust, whereas it is an ally of his *Paracamptopsis.* In 1953:119, Sir Guy Marshall transferred the species to *Gethen* Marshall.

In 1936, Csiki treated the Acamptini as the first tribe of the Cossoninae in *Coleopterorum Catalogus.* Also in 1936, Hustache, in the Cryptorhynchinae volume of *Coleopterorum Catalogus,* included the group as the first tribe of the Cryptorhynchinae. Hustache said that although the Acamptini had already been reported on in the Cossoninae volume of the *Catalogus,* they were better placed with the Cryptorhynchinae. Hustache evidently overlooked Champion's 1909 comments regarding *Paracamptus* Casey and *Acamptoides* Champion, and he erroneously included those 2 genera in the Acamptini instead of placing them with the Cryptorhynchinae where they belong. Casey originally noted the association of his *Paracamptus* with *Lembodes* in the Cryptorhynchinae.

In 1952, Anderson reported upon his study of the larvae of "several species" of *Acamptus,* and he concluded that they are definitely cossonine. Anderson treated the group as tribe Acamptini of the Cossoninae, and he concluded his studies with the following remarks (1952:288):

"*Acamptus* was originally placed by LeConte (1876, p. 238) in the Cryptorhynchini, near the Ithypori. Champion (1910), after studying genera which he considered clearly related to *Acamptus,* transferred the genus to the Cossoninae. More recently Hustache (1936) and Voss (1947) have referred the genus to the subfamily Cryptorhynchinae, tribe Ithyporini, subtribe Acamptina. Unfortunately close relatives of *Acamptus* are not shown in the larval stage. Therefore conclusions based on larval characters must be considered tentative. However, none of the genera of the true Ithyporini available for study (*Conotrachelus, Aeatus, Chalcodermus* and *Rhyssomatus*) has larvae which have the subtriangular labrum, the mandible with a differentiated, ridged area on the inner surface, nor the anterolateral setae on the epipharynx arranged as in *Acamptus,* all characteristics held in common with one or more genera in the true Cossoninae. The general appearance of the larva of *Acamptus* is typical of the Cossoninae as is its communal biology. The majority of cossonines . . . live in colonies in the host. All stages of a species will be found together, adults living and breeding entirely within the wood as long as the latter furnishes sufficient nutriment. No species of the ithyporine genera known have a similar biology, there being no evidence of community life. In view of these considerations *Acamptus* has been continued in the Cossoninae."

Kissinger, in his work on the genera of Curculionidae of North America (1964:10, 64), placed the Acamptini adjacent to the Ithyporini in the Cryptorhynchinae. He thus repeated the erroneous 1876 opinion of LeConte and Horn. Also, by including *Paracamptus* Casey, Kissinger's "Acamptini" is a mixture containing both Cossoninae and Cryptorhynchinae.

As listed in the Cryptorhynchinae part of *Coleopterorum Catalogus* in

1936, the Acamptini is a compound assemblage of 2 tribes of Cossoninae and a tribe of Cryptorhynchinae. Seven genera are listed by Hustache. Of these, *Acamptoides* Champion and *Paracamptus* Casey belong to the Cryptorhynchinae. *Paracamptopsis* Hustache, although evidently cossonine, does not belong to the Acamptini; it belongs in association with *Gethen* Marshall and *Miopus* Marshall, and the problems associated with those names remain to be elucidated in another report. Thus, from the listing in *Coleopterorum Catalogus,* only *Acamptus* LeConte, *Acamptopsis* Champion, *Choerorrhynchus* Champion, and *Pseudacamptus* Champion belong to the Acamptini. I consider *Pseudacamptus* a synonym of *Acamptus.*

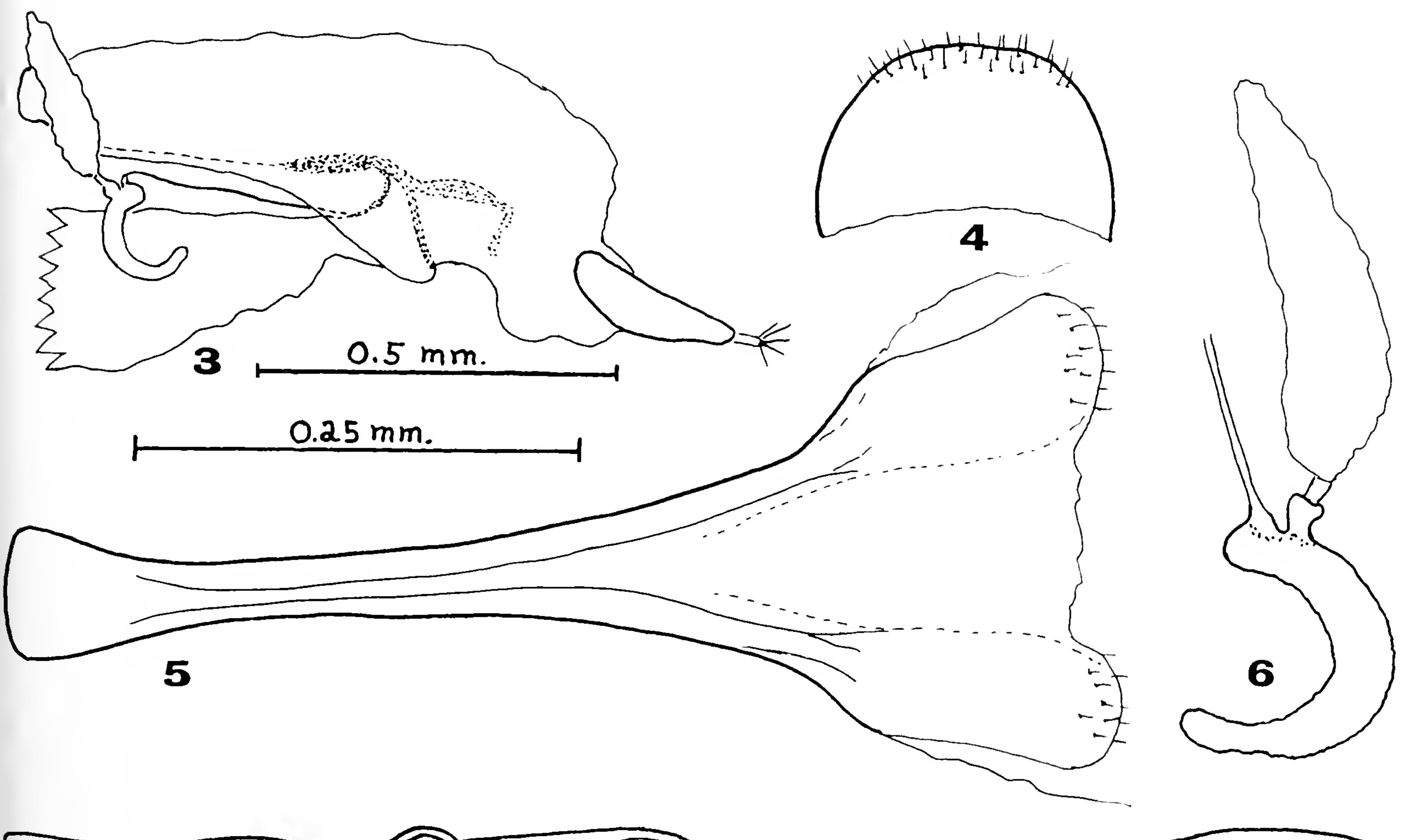

Fig. 3-11: Details of the male and female of *Acamptus cancellatus* (Marshall). **3-6,** female: 3) genitalia, left lateral aspect; 4) eighth tergite, drawn to same scale as 3; 5) sclerotization of eighth sternite; 6) spermatheca, drawn to same scale as 5. **7-11,** details of the male and drawn to the same scale as the bar between Fig. 7 and 8: 7) 8) dorsal and left lateral aspects of aedeagus with tegumen (note the development of the parameres); 9) ventral aspect of tergite 8 with the divided sternite 8 and sternite 9 attached; 10) dorsal aspect of tergite 7 (pygidium); 11) rectal loop.

In 1947, Voss described *Anchacamptus* from Colombia, and he incorrectly assigned it to the Acamptini (which he treated as a subtribe of the Ithyporini of the Cryptorhynchinae). *Anchacamptus* not only does not belong to the Acamptini, it does not belong to the subfamily Cossininae. It belongs to the Cryptorhynchinae in association with such genera as *Acamptoides, Paracamptus,* and *Lembodes*. It has no sclerolepidia along the metepisternal suture as is typical of the Cossoninae. It does have a sclerotized rectal loop and developed male genital parameres, and these characters are shared by various Cossoninae and Cryptorhynchinae.

KEY TO THE GENERA OF ACAMPTINI

1. Antennal funicle only 5-segmented; rostrum stout, its greatest subapical breadth as viewed from above more than one-half as broad as the total length of rostrum to margin of eye as seen from side .... *Acamptopsis* Champion

1′. Antennal funicle 6- or 7-segmented; rostrum more slender, its greatest subapical breadth as seen from above less than one-half the length of rostrum in front of eyes as seen from side 2

2. Basal half of antennal club densely setose; abdominal ventrites 3 and 4 very short, together only about one-third the length of 5 along medial line; antennal funicle 7-segmented in known species .... *Choerorrhynchus* Champion

2′. Basal half of antennal club bare and shiny; abdominal ventrite 3 plus 4 more than one-half as long as 5 along medial line; antennal funicle either 6- or 7-segmented ...... *Acamptus* LeConte

LIST OF THE ACAMPTINI

Genus ACAMPTOPSIS Champion

Acamptopsis Champion, 1902:2. Type-species: *Acamptus encaustus* Champion, by original designation.

Acamptopsis cubanus Champion.
Acamptopsis cubanus Champion, 1909:2.
Cuba (type locality: Cayamas).

Acamptopsis encaustus Champion.
Acamptopsis encaustus Champion, 1909:2, pl. 1, fig. 1*a-c*.
Acamptopsis encanotus, misspelling by Hustache, 1936:5.
Panama (type locality: Volcan de Chiriqui, 3,000 feet).

Genus CHOERORRHYNCHUS Champion

Choerorrhynchus Champion, 1909:3. Type-species: *Choerorrhynchus tenuitarsis* Champion, by monotypy and original designation.

Choerorrhynchus tenuitarsis Champion.
Choerorrhynchus tenuitarsis Champion, 1909:3, pl. 1, fig. 2*a-c*.
Panama (type locality: Volcan de Chiriqui, 3,000 feet).

Genus ACAMPTUS LeConte

Acamptus LeConte, 1876:238. Type-species: *Acamptus rigidus* LeConte, by monotypy. Casey, 1892:445. Blatchley and Leng, 1916:519. Hustache, 1929*b*:177; 1932:77(329).

Pseudacamptus Champion, 1909:3. Type-species: *Pseudacamptus plurisetosus* Champion, by monotypy and original designation. **New synonym.**

Glyphostethus Marshall, 1921:596. Type-species: *Glyphostethus cancellatus* Marshall, by monotypy and original designation. **New synonym.**

Anderson, 1952:286, fig. 19, larva.

Pseudacamptus was separated from *Acamptus* because of the difference in number of funicular segments in the antennae, but in *Acamptus* the number varies from 6 to 7. The number of segments is not of generic value in *Acamptus. Glyphostethus* is a simple synonym. Its author was confused by finding the type-species in a fauna foreign to the tribe, and this could mislead almost any taxonomist.

When I began this study in 1943, I had an invaluable exchange of correspondence with the late L. L. Buchanan (a careful worker and an astute observer) regarding *Acamptus* material in the United States National Museum, and I believe that details from his letter of 1 December 1943 are worthy of inclusion here:

"I have your letter of October 29 concerning the status of *Acamptus rigidus* LeConte and *A. echinus* Casey and their generic placement. Several years ago, in attempting to identify a few *Acamptus* specimens, I encountered a puzzling and contradictory situation, and I believe your inquiries can best be answered by giving you a rough summary of notes I made at that time.

"*A. rigidus* was described from "South Carolina to Texas" and as having a 6-jointed funicle. I have not examined LeConte's type specimen, but our collection contains examples of *Acamptus* from South Carolina and Texas, as well as from all the coastal states between and including Maryland to Texas; also, from the District of Columbia, West Virginia, and Arkansas. All these specimens have a 6-jointed funicle, and there is scarcely any doubt that LeConte was correct as to the antennal structure of *rigidus.* The above-mentioned eastern United States specimens, however, represent several forms, - species or geographical races or perhaps both. I was unable to settle this point satisfactorily.

[I have examined LeConte's material at the Museum of Comparative Zoology at Harvard. It is a mixed series containing specimens with both 6 and 7-segmented antennal funicles. The type (lectotype) of *rigidus* has a 7-segmented antennal funicle, and thus LeConte was incorrect in stating that the number is 6.]

"Casey, therefore, was mistaken (unless the antenna of LeConte's type proves to be not as originally described, a very unlikely thing, for reasons given) in saying (1892, p. 446) that the funicle of *A. rigidus* is 7-jointed; though Casey was correct in describing the funicle of his *A. echinus* as 7-jointed. [As noted above, LeConte was wrong and Casey was right in describing the antennal funicle of *rigidus.*] Later, Casey changed his mind (1895, p. 837) about the type locality of *echinus,* stating that the species probably came from Arizona instead of New York. Here again Casey probably was wrong, as we have at least one specimen, agreeing perfectly with *echinus,* from New York; furthermore, all Arizona specimens at hand have a 6-jointed funicle and represent an undescribed species (unless they belong to Champion's *Pseudacamptus plurisetosus* from Mexico).

"In addition to the New York specimens of *echinus,* the Museum collection contains specimens with 7-jointed funicles from Ontario, Illinois, Nebraska, and Kansas. These are a little smaller than *echinus* specimens and do not agree exactly among themselves, and may represent one or two geographic races of *echinus.* The whole *Acamptus* problem obviously is much more complex than is indicated by the few names and localities recorded in literature.

"As to the number of genera involved, I believe that everything mentioned above (*rigidus, echinus,* etc.) belongs to a single genus, *Acamptus,* the number of funicular segments being, on this conclusion, of less than generic importance.

"Please feel free to use any of this information. There is little likelihood that I will get back to *Acamptus. . . .*"

In 1954, Sleeper described 1 of the forms studied by Buchanan as *Pseudacamptus texanus.* Sleeper borrowed part of the Acamptini from the United States National Museum (including the material referred to in Buchanan's letter quoted above), and it was returned with labels indicating that Sleeper had divided it into 6 "species" of "*Pseudacamptus*", including *texanus* and 5 forms on which there are name labels that appear to be unpublished manuscript species names. Excepting for the Arizona form studied by Buchanan and mentioned by him in the letter quoted just above, it appears that the other segregates on which Sleeper has placed species name labels are forms of his variable *texanus,* and that they do not represent distinct species.

The colonial, geographic, and individual morphological variability of *Acamptus* species is confusing, and it will require much work to provide an adequate taxonomic treatment of the group. That task must be left for a careful taxonomist who may in the future assemble an extensive collection of specimens. I have noted, in the limited studied material, the same reared series contains forms so distinctive that, on first sight, I considered them different species. One must treat this group with utmost caution if one does not wish to encumber the literature with synonymous names.

Acamptus breed in dead wood and under the dead bark of a variety of trees, such as *Carya, Hibiscus, Liquidambar, Persea, Platanus, Salix* etc., in the characteristic manner of the Cossoninae. They have been found to be locally abundant in some areas, although it appears that they are not often taken by collectors. The adults are obscure insects and may easily be mistaken for bits of bark or rotten wood.

Acamptus cancellatus (Marshall), **new combination** (fig. 1-11).

Glyphostethus cancellatus Marshall, 1921:596. 1931:323.

This is a Central or South American species that has been accidentally introduced to Samoa (Tutuila and Upolu) and to Fiji (Vanua Levu) (type locality: Apia, Upolu, Samoa). The holotype (in the British Museum) is so badly abraded that it presents a false impression of the species. As noted above, I found only one specimen of this species (beneath the rotting bark of *Hibiscus tiliaceus*) during my 1940 Samoan expedition.

Acamptus echinus Casey.

Acamptus echinus Casey, 1892:445; 1895:837. Blatchley and Leng, 1916:520.

North America (New York to Ontario, Illinois, Kansas, Nebraska) (type locality: New York State). The status and extent of the distribution of this form remains to be clarified. As noted above in the quotation from the Buchanan letter, Casey seemed unsure of the type locality of *echinus*.

Acamptus interstitialis (Chevrolat).

Cryptorhynchus interstitialis Chevrolat, 1880:253.

Acamptus interstitialis (Chevrolat) Hustache, 1932:77.

Cryptorhynchus orthodoxus Chevrolat, 1880:253. Synonymy by Hustache, 1932:77.

Guadeloupe (type locality "Guadulpia").

Acamptus plurisetosus (Champion), **new combination.**

Pseudacamptus plurisetosus Champion, 1909:3, pl. 3, fig. 2*a-c*.

Mexico (type locality: "Sierra de Durango"). As noted by Champion, the originally unique holotype has much stouter setae than does *Acamptus rigidus,* and the elytral setae are not confined to the alternate intervals as they are on *rigidus* and *echinus,* for example.

Acamptus rigidus LeConte.

Acamptus rigidus LeConte, 1876:239. Champion, 1909:3. Blatchley and Leng, 1916:519. Wickham, 1896:123, pl. 4, fig. 6 (not pl. 5, fig. 5 as cited in Hustache, 1936:5), biology.

Eastern North America (type locality: not cited by LeConte but here designated as South Carolina). The LeConte series is compound and does not have a clearly designated holotype. I hereby designate as lectotype, and, with the assistance of John Lawrence, have so labeled the specimen which carries the principal name label and the locality label "S.C." [South Carolina] in the LeConte collection in the Museum of Comparative Zoology at Harvard University.

Acamptus texanus (Sleeper), **new combination.**

Pseudacamptus texanus Sleeper, 1954:185.

North America (type locality: Colorado County, Texas).

Acamptus verrucosus Voss.

Acamptus verrucosus Voss, 1947:51.

South America, Colombia (type locality: Medellin).

Acknowledgments

I am indebted to John Lawrence for information regarding specimens in the Museum of Comparative Zoology, Harvard University; Rose Ella Warner for the loan of material from the United States National Museum; and Horace Burke for specimens reared by him and from the collection of the Texas A. and M. University, College Station, Texas.

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A NEW SPECIES OF *ACMAEODERA*, WITH NOTES ON OTHER SPECIES OF BUPRESTIDAE (COLEOPTERA)

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ABSTRACT

A new species, *Acmaeodera thoracata*, is described from Texas with notes on *Melanophila piniedulis* Burke and *Mastogenius crenulatus* Knull.

Acmaeodera thoracata Knull, **new species**

Resembling a small *A. tubulus* (Fab.); entire insect on both surfaces and appendages dark brown, nearly black with shining bronzy luster; each elytron with an irregular line of 4 yellow spots starting behind humerus and ending about apical fifth.

Head convex, coarsely punctured, a short white seta arising from each puncture; antennae not extending to middle of pronotum, serrate from the fifth segment, scape stout, second segment wider than third, slightly longer, third segment subequal to fourth, fifth to eleventh transverse, segments finely punctate. Pronotum about twice as wide as long, widest in front of middle, basal margin truncate, anterior margin sinuate, median lobe broad; disc convex, a transverse corrugated stripe at base, a pit in front of scutellar region and a deeper pit at base on either side, a slight median depression behind anterior margin; median area glabrous, punctures in middle well separated, those toward side margins larger and closer, a white seta arising from each puncture. Elytra convex, at base narrower than widest part of pronotum, sides subparallel behind base, expanded about middle, then broadly rounded to rounded apices, finely serrulate at tips, surface with transverse depression at base, umbone glabrous, striately punctured on basal half, punctures separated by less than their own width, oval, interspaces uniserrately finely punctate, apical half striate, punctures contiguous in striae, interspaces finely punctate, a short, white recumbent seta arising from each interspace puncture. Prosternal margin of thorax slightly retracted, truncate, proepisternum with large punctures, abdomen finely punctate, last sternite rounded, glabrous with punctures around edge, each puncture with a short recumbent white seta. Length 4.5 mm; width 1.6 mm.

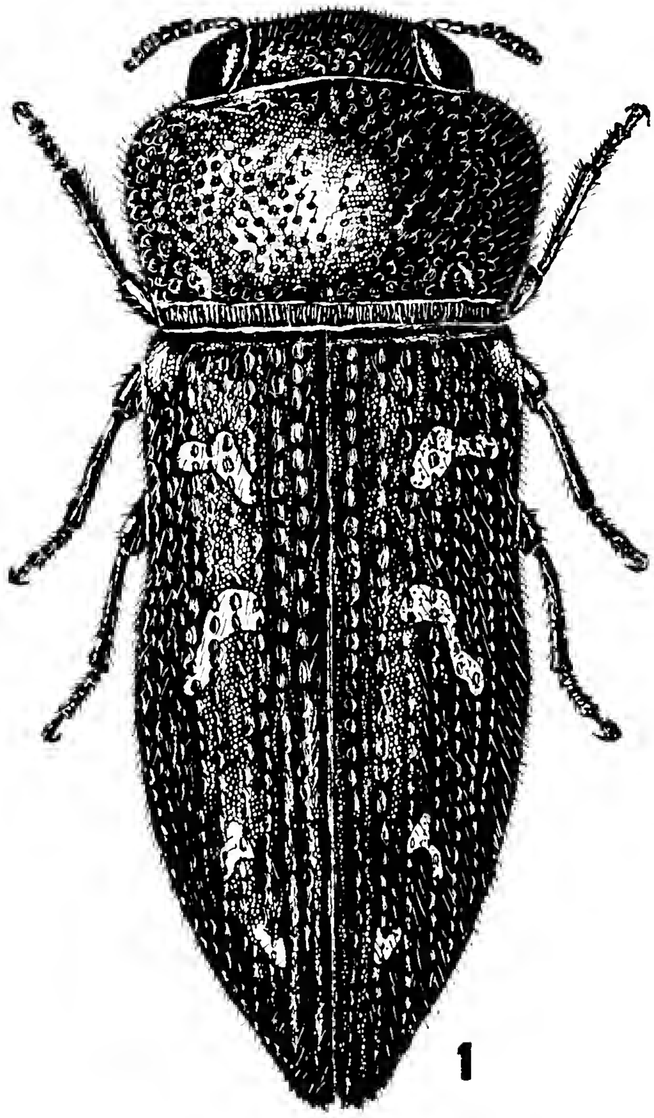
Type: sex undetermined, TEXAS, Starr County, 10-IV-1965, D. J. and J. N. Knull, in collection of author.

At first I thought that this specimen was an abnormal *A. tubulus*, but there are so many ways in which it differs from that species. The body shape and the punctures of the pronotum are different. *A. tubulus* is wider behind middle, surface more densely punctured, side margins of elytra rather coarsely serrate from middle, and the last sternite more punctate.

NOTES

Specimens of *Melanophila piniedulis* Burke were taken on dying pinõn pine (*Pinus edulis* Engelm.) 9-VI-1954, 15-VII-1955, in the Davis Mountains, Texas.

Mastogenius crenulatus Knull (1934, Ohio Jour. Sci. 34(5):333). More specimens of this species are available, and I agree with Hespenheide (1973, Col. Bull. 27(4):185) that it is a valid species. Specimens were taken from dead branches of: sugar maple (*Acer saccharum* Marsh.) 2-VI-1947 in Delaware County, Ohio; oak (*Quercus* sp.), Greene County, Ohio, 25-V-1947, and in numbers from dead branches of willow (*Salix*) on the bank of the Rio Grande River in Hidalgo County, Texas, 30-III-1960. The numbers taken would indicate that willow is also a host plant. Specimens vary in size from 3.2 to 2 mm.



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Acmaeodera thoracata, new species, Length 4.5 mm., width 1.6 mm.

A REVIEW OF THE ORYSSOMINI, A NEW TRIBE OF NEOTROPICAL COCCINELLIDAE (COLEOPTERA)

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ABSTRACT

The genus *Oryssomus* Mulsant is removed from the Cranophorini and established as the type-genus of a **new tribe,** Oryssomini. *Oryssomus lineatus,* n. sp., *Pseudoryssomus,* n. gen., *P. formosus,* n. sp., *P. pumilus,* n. sp., and *P. brevipilosus,* n. sp., are described. *Oryssomus melzeri* Korschefsky is transferred to *Eupalea* Mulsant.

Mulsant (1850) described the genera *Oryssomus* and *Cranophorus,* placing them together in his "branch" Cranophoraires. Chapuis (1876), placed the same 2 genera in his Group VIII, "Cranophorites". Broun (1886) described the genus *Holopsis* (New Zealand), stating that it belonged to the Cranophorites and should be placed between *Oryssomus* and *Cranophorus.* Weise (1895) described the genus *Cassiculus* (New Zealand) for *Cranophorus venustus* Pascoe, stating that it belonged near *Cranophorus.* Casey (1899) erected the tribe Cranophorini for the genera *Nipus* Casey (North America), *Cranophorus* (African), and *Oryssomus* (Neotropical). Bréthes described the genera *Cranoryssus* (Chile, 1923) and *Orynipus* (Chile, 1925), placing them in the Cranophorini. All of the above genera were included in the Cranophorini by Korschefsky (1931) as well as the genus *Cleidostethus* Arrow. Blackwelder (1945) listed the Neotropical genera (*Cranoryssus, Orynipus* and *Oryssomus*) as belonging to the Cranophorini. The genus *Holopsis* Broun was removed from the Coccinellidae and placed in the *Corylophidae* by Matthews (1899) but it was unaccountably included again in the Coccinellidae by Korschefsky (1931). Crowson (1955) again stated that *Holopsis* belonged in the Corylophidae. The genus *Nipus* was removed from the Cranophorini and placed in the Sticholotini by Gordon (1970). The remaining genera are a heterogenous assemblage of mostly unrelated elements which have been placed together only because they have the head concealed by the pronotum. Examination of antennae, mouthparts, and genitalia indicates that *Oryssomus* should be removed from the Cranophorini. The affinities of *Oryssomus* are with the Exoplectrini and Noviini and *Oryssomus* is here considered to form the type-genus of a new tribe, Oryssomini, to be placed near the Exoplectrini. Of the genera still remaining in the Cranophorini, it is likely that only the type-genus, *Cranophorus,* can be retained in that tribe. The remaining genera will probably have to be assigned to other existing tribes or placed in new tribes.

The habitus views presented here were prepared by Miss Kate Conway, the line drawings by Miss Linda Heath.

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Oryssomini Gordon, **new tribe**

Form elongate; lateral margin of elytron and pronotum discontinuous. Dorsal surface pubescent. Pronotum completely covering head, anterior border rounded, not emarginate or truncate (Fig. 1). Head with anterior clypeal margin broadly, feebly emarginate, lateral angle bluntly rounded; antenna 10-segmented, inserted immediately before eye, basal segment greatly enlarged, club large, 3-segmented, inner margin of all club segments strongly produced (Fig. 6); terminal segment of maxillary palpus large, strongly securiform (Fig. 7); mandible with 2 strong apical teeth and 1 large, basal tooth (Fig. 8). Epipleuron flat, not notched for reception of femoral apices. Legs with tibiae simple or angulate externally (Figs. 9, 10); tarsus trimerus; tarsal claw strongly bifid. Abdomen with 5 visible sterna; postcoxal line complete as in *Pullus* or incomplete as in *Scymnus* (Fig. 11, 12); abdominal punctures (at least on first sternum) large, flat-bottomed, shallow (Fig. 11). Male genitalia simple, symmetrical; trabes usually as long as or longer than phallobase (Fig. 16); sipho not strongly curved anterior to base, usually with median loop, apex nearly membranous, unmodified (Fig. 18). Female genitalia: spermatheca stout, bent, ramus present, nodulus well developed, cornu large, accessory gland small; infundibulum absent; bursa a long, simple sac; genital plates triangular, elongate or not, styli present (Fig. 14, 15).

The head with emarginate clypeal margin, large, securiform maxillary palpus and large, robust antenna is of the type possessed by the Exoplectrini. The postcoxal line of the *Pullus* or *Scymnus* type and flattened, unnotched epipleuron are similar to the same structures in the Noviini. The tribe Oryssomini is apparently not closely related to any other group of genera and is provisionally placed near the Exoplectrini in the present classification.

The occurrence of both modified and unmodified tibiae in a group of otherwise similar genera is unusual but a parallel situation exists in the Exoplectrini where *Chnoodes* has simple tibiae and *Exoplectra* has the tibiae angulate externally.

Key to genera of Oryssomini

Tibia slender, unmodified (Fig. 9)..*Oryssomus* Mulsant

Tibia widened, flattened, angulate on external margin near base (Fig. 10) ....*Pseudoryssomus* **new genus**

Oryssomus Mulsant

Oryssomus Mulsant, 1850:939; Crotch, 1874:292; Chapuis, 1876:217-218; Gorham, 1895:210. Casey, 1899:132. Korschefsky, 1931:176. Blackwelder, 1945:446. Type-species, *Oryssomus terminatus* Mulsant, monobasic.

Oryssomini with all tibiae simple, unmodified (Fig. 9). Postcoxal line complete. Female genitalia with genital plate not elongate, somewhat triangular (Fig. 14); spermatheca simple, curved, without nodulus (Fig. 14).

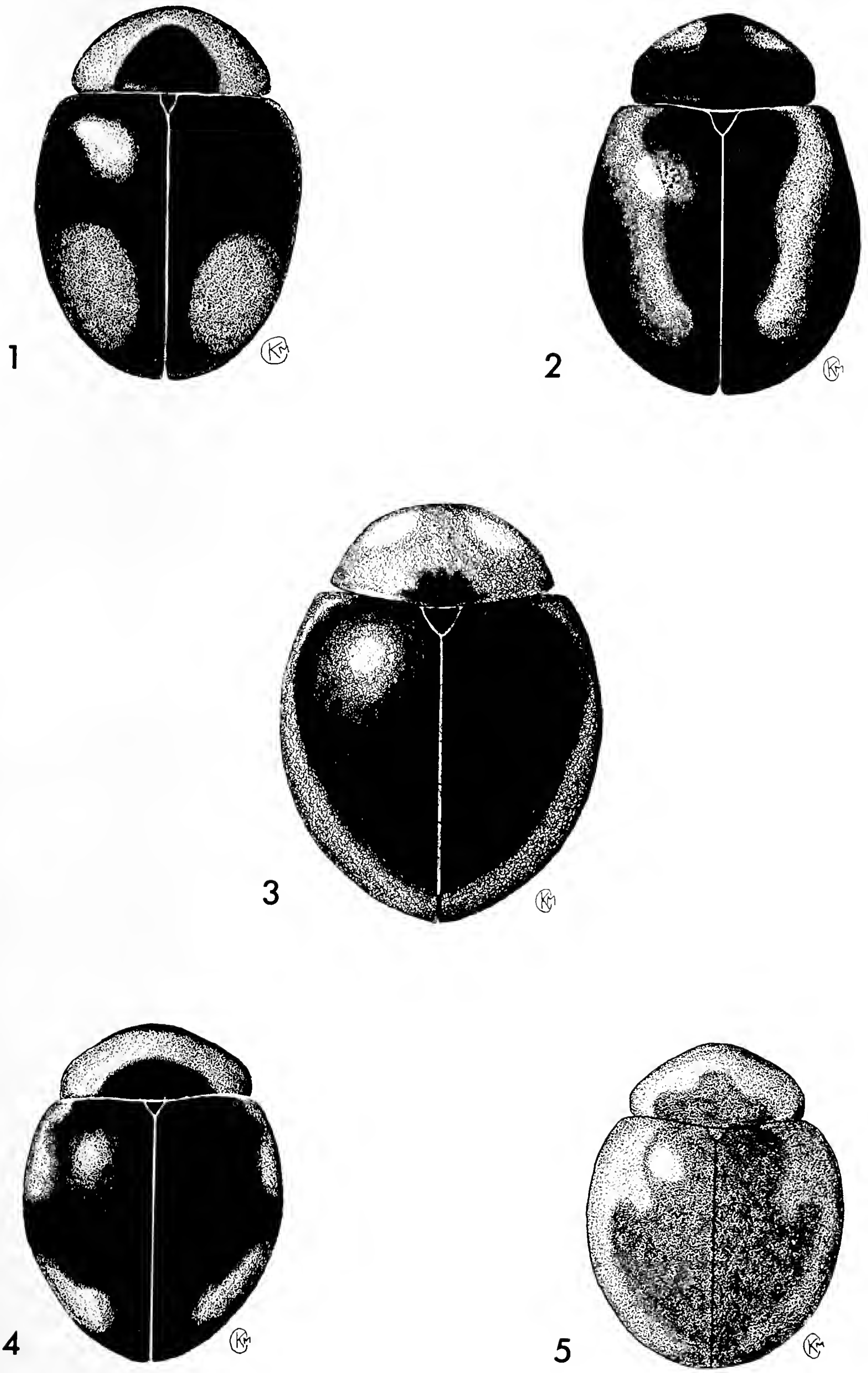

Fig. 1-5; habitus views: 1) *O. subterminatus;* 2) *O. lineatus;* 3) *P. formosus;* 4) *P. pumilus;* 5) *P. brevipilosus.*

Korschefsky (1935) described *Oryssomus melzeri* from Brasil. It is obvious from his figure on page 254 that this cannot be a member of *Oryssomus*. Examination of the Korschefsky collection in the USNM revealed that he had placed his paratype of *melzeri* under the genus *Eupalea* where it belongs. He apparently did not correct his error in the literature, but *O. melzeri* does belong in *Eupalea* and is a junior synonym of *E. suffriani* Mulsant (**New Synonymy**). With *melzeri* removed, there remain 2 described species in *Oryssomus, subterminatus* Mulsant (Colombia and Central America) and *deyrollei* Crotch (Brasil), and a third species is described below. There are 3 specimens of *O. subterminatus* in the Crotch Collection, University Museum, Cambridge, England, the first of these bearing the following labels is here designated lectotype: "Type, subterminatus Reiche/Type [blue paper]/ 836 FCC-1181". The head and abdomen are missing from the specimen. There are 2 specimens representing 2 different species under the name *Oryssomus deyrollei* Crotch in the Crotch Collection. The first of these, bearing the following labels, is here considered to be the holotype: "Type [blue paper]/ Type, Deyrolli, Bras,/831, FCC-1176". The abdomen is missing from the holotype. The second specimen is probably not type material as it does not match Crotch's description at all and is tentatively determined to be *Cranoryssus germaini* (Crotch).

Key to species of *Oryssomus*

1. Pronotum usually with an elongate, median, black spot extending from base nearly to apex; elytron black with large, red spot on apical third (Fig. 1) .... *subterminatus* Mulsant

1′. Dorsal color pattern not as described above 2

2. Elytron black with external margin entirely orange .... *deyrollei* Crotch

2′. Elytron black, with external margin black, humeral area and diagonal stripe red (Fig. 2) .... *lineatus*, n. sp.

Oryssomus lineatus Gordon, **new species**
(Fig. 2, 16-18)

Holotype male: Length 4.32 mm, greatest width 3.00 mm. Form elongate, robust, widest posterior to middle of elytra, outline of pronotum and elytron strongly discontinuous. Ventral surface and head entirely brownish red; pronotum black except apical five-eighths yellow, yellow area nearly divided medially by apical extension of black area (Fig. 2); elytron black except humeral area broadly red, red area extending posteriorly in a broad, diagonal stripe to apical third of elytron (Fig. 2). Pronotum shining; punctures fine, separated by less than to twice their diameter; pubescence grayish white. Elytron shining; pubescence grayish white except reddish brown on black sutural stripe, mostly appressed but with some long, erect hairs. Abdomen densely punctured, becoming more so along lateral margin of all sterna and on apical 3 sterna; postcoxal line complete, evenly rounded, extending slightly beyond middle of first sternum. Genitalia simple; basal lobe equal in length to paramere, tapered from base to pointed apex, apex slightly bent downward in lateral view (Fig. 16, 17); sipho only slightly curved above basal piece, with 1 complete loop anterior to middle, apex almost membranous, unmodified (Fig. 18).

Female: Similar to male in all external aspects.

VARIATION: Length 3.72 to 4.70 mm, greatest width 2.68 to 3.21 mm. The width of the red stripe on the elytron may be slightly wider or narrower than on the holotype.

HOLOTYPE: Male, USNM type no. 72831, from BOLIVIA, Santa Cruz, Oct. 1954, G. Pinckert.

PARATYPES: Total 19, from TRINIDAD, summer 1958, R. R. Bideshi, in USNM and CNC collections.

As indicated in the key, color pattern alone is sufficient to distinguish *lineatus* from *subterminatus* or *deyrollei.* In addition, the male genitalia of *lineatus* are proportionately larger than those of *subterminatus,* and the basal lobe is tapered from base to apex in *lineatus,* almost parallel sided in basal three-fourths in *subterminatus.*

The holotype of *lineatus* is from Bolivia, and all of the paratypes from Trinidad. There is no doubt that the specimen from Bolivia is correctly labeled, and so, while I have no reason to suspect that the Trinidad specimens are incorrectly labeled, the Bolivian specimen has been selected as the holotype.

Pseudoryssomus Gordon, **new genus**

Oryssomini with all tibiae expanded, flattened, angulate on external margin near base (Fig. 10). Postcoxal line complete or incomplete (Fig. 12, 13). Female genitalia with genital plate elongate (Fig. 15); spermatheca simple, curved, with well-developed nodulus (Fig. 15).

The only apparent differences between *Oryssomus* and *Pseudoryssomus* are in the legs and female genitalia as indicated above. The legs are exactly of the type found in the genus *Exoplectra.* It is somewhat unusual in the Coccinellidae to have more than 1 type of postcoxal line in the same genus. *P. formosus* has the postcoxal line definitely incomplete as in *Scymnus* (Fig. 12) and the other 2 species have it complete as in *Pullus* (Fig. 13). I've not been able to detect any differences other than the postcoxal line and so have placed all 3 species in the same genus. Type-species, *Pseudoryssomus formosus,* new species.

Key to species of *Pseudoryssomus*

1. Length more than 4.00 mm.; elytron black with distinct, red lateral border (Fig. 3), postcoxal line incomplete (Fig. 12) .... *formosus,* n. sp.

1′. Length less than 3.75 mm.; color of elytron not as described above. Postcoxal line complete (Fig. 13) 2

2. Pubescence on elytron long with many erect hairs; Panama .... *pumilus,* n. sp.

2′. Pubescence on elytron short, no erect hairs visible; Venezuela .... *brevipilosus,* n. sp.

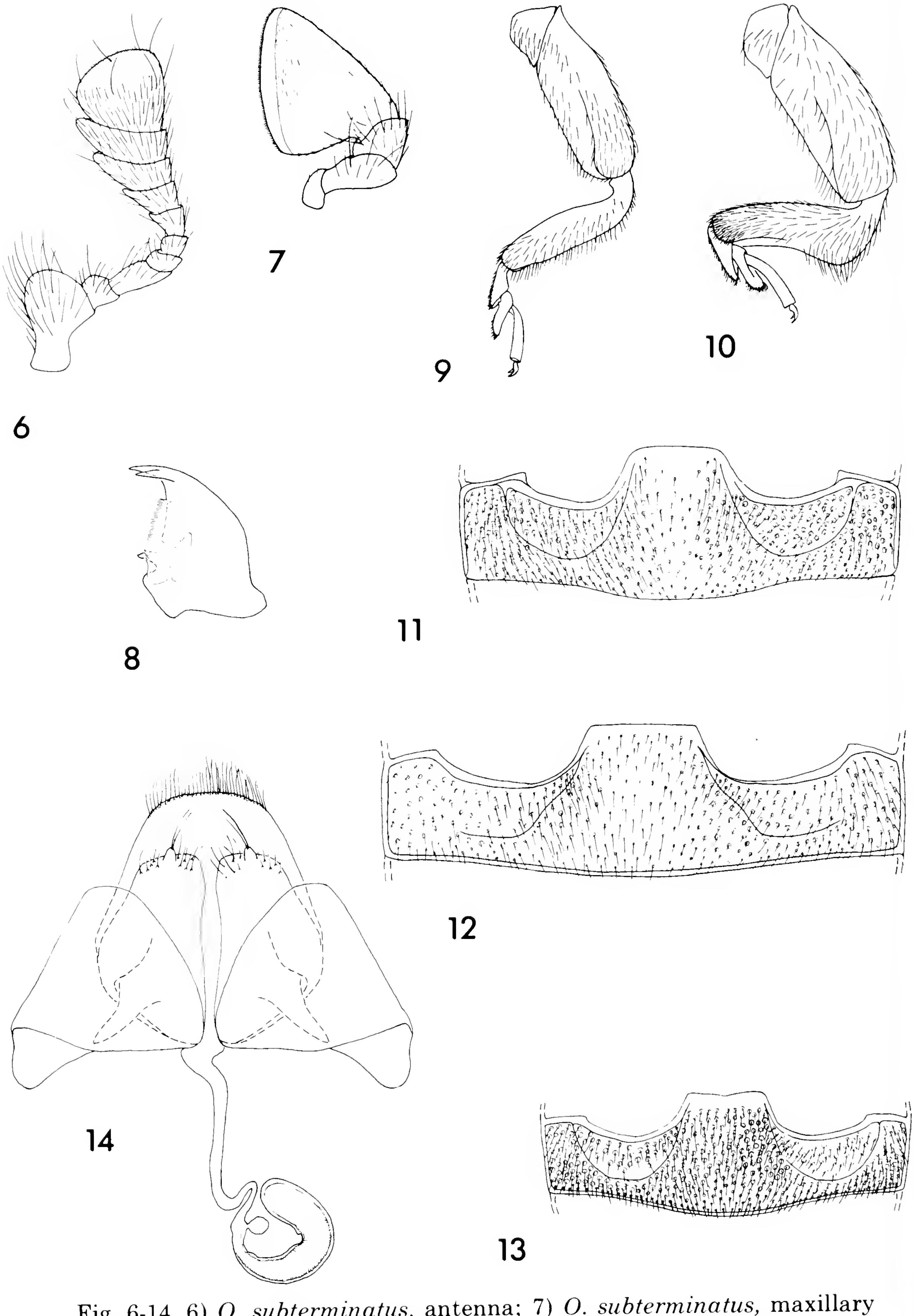

Fig. 6-14. 6) *O. subterminatus,* antenna; 7) *O. subterminatus,* maxillary palp; 8) *O. subterminatus,* mandible; 9) *O. subterminatus,* proleg; 10) *P. formosus,* proleg; 11) *O. subterminatus,* first abdominal sternum; 12) *P. formosus,* first abdominal sternum; 13) *P. brevipilosus,* first abdominal sternum; 14) *O. subterminatus,* female genitalia.

Pseudoryssomus formosus Gordon, **new species**
(Fig. 3, 12, 15, 19-21)

Holotype male: Length 4.66 mm, width 3.77 mm. Form elongate, robust, widest at middle of elytra, outline of pronotum and elytron discontinuous. Ventral surface and head entirely yellowish red; pronotum red except oval, translucent, yellow area on each side of middle at apex, small, irregular black spot at base anterior to scutellum (Fig. 3); elytron black with a broad, red lateral border, lateral border slightly narrowed medially, strongly narrowed at apex, an obscure, narrow, dark-red sutural area on disc (Fig. 3). Pronotum shining, finely, densely punctured, punctures separated by less than to twice their diameter; pubescence a mixture of erect and appressed yellowish-white hairs. Elytron shining, punctures coarser than on pronotum, separated by less than to twice their diameter; pubescence a mixture of appressed, white hairs and erect yellowish-white hairs. Abdomen densely punctured, becoming more so along lateral margin of all sterna and on apical 3 sterna; postcoxal line widely incomplete, as in *Scymnus* (Fig. 12), extending beyond middle of first sternum. Genitalia simple; basal lobe slightly longer than paramere, lateral margin thickened and abruptly widened in apical half, apex bluntly pointed; paramere slightly curved in lateral view, nearly parallel-sided (Fig. 19, 20); sipho with 1 complete loop at middle, apex nearly membranous, unmodified (Fig. 21).

Female: Similar to male in all external aspects; concealed 6th sternum with apical margin slightly sinuate on each side of middle; apex of spermatheca tapered to blunt point (Fig. 15).

VARIATION: Length 4.25 to 5.38 mm, width 3.08 to 4.00 mm. Two of the specimens in the type series are somewhat teneral, the areas that are normally red being yellow.

HOLOTYPE: Male, USNM type no. 72832, from COSTA RICA, Turrialba, 1946, R. Perez A.

PARATYPES: Total 7, in USNM and CNC collections, 4 with same data as holotype; 2 from Costa Rica, Turrialba, 5-VI-1951, O. L. Cartwright; 1 from GUATEMALA, Alta V. Paz, Cacao Trece Aguas, 23-4.

The color pattern, including the shape of the basal black spot on the pronotum, is completely uniform in the type series. There may be a tendency for the median black area of the elytron to extend outward toward the lateral margin, particularly if *formosa* should prove to be widespread in Central America and southern Mexico.

Pseudoryssomus pumilus Gordon, **new species**
(Fig. 4, 22)

Holotype female: Length 3.58 mm, greatest width 2.52 mm. Form elongate, widest at middle of elytra, outline of pronotum and elytron strongly discontinuous. Ventral surface and head entirely brownish yellow; pronotum reddish yellow except anterior border pale yellow, translucent, a large, oval, black spot present on posterior margin anterior to scutellum (Fig. 4); elytron black with 2 large, reddish-yellow, lateral spots narrowly connected along suture (Fig. 4). Pronotum shining, extremely finely, densely punctured, punctures separated by 1 to 2 times their diameter; pubescence mostly appressed with some erect hairs, yellowish white. Elytron shining, punctures fine, coarser

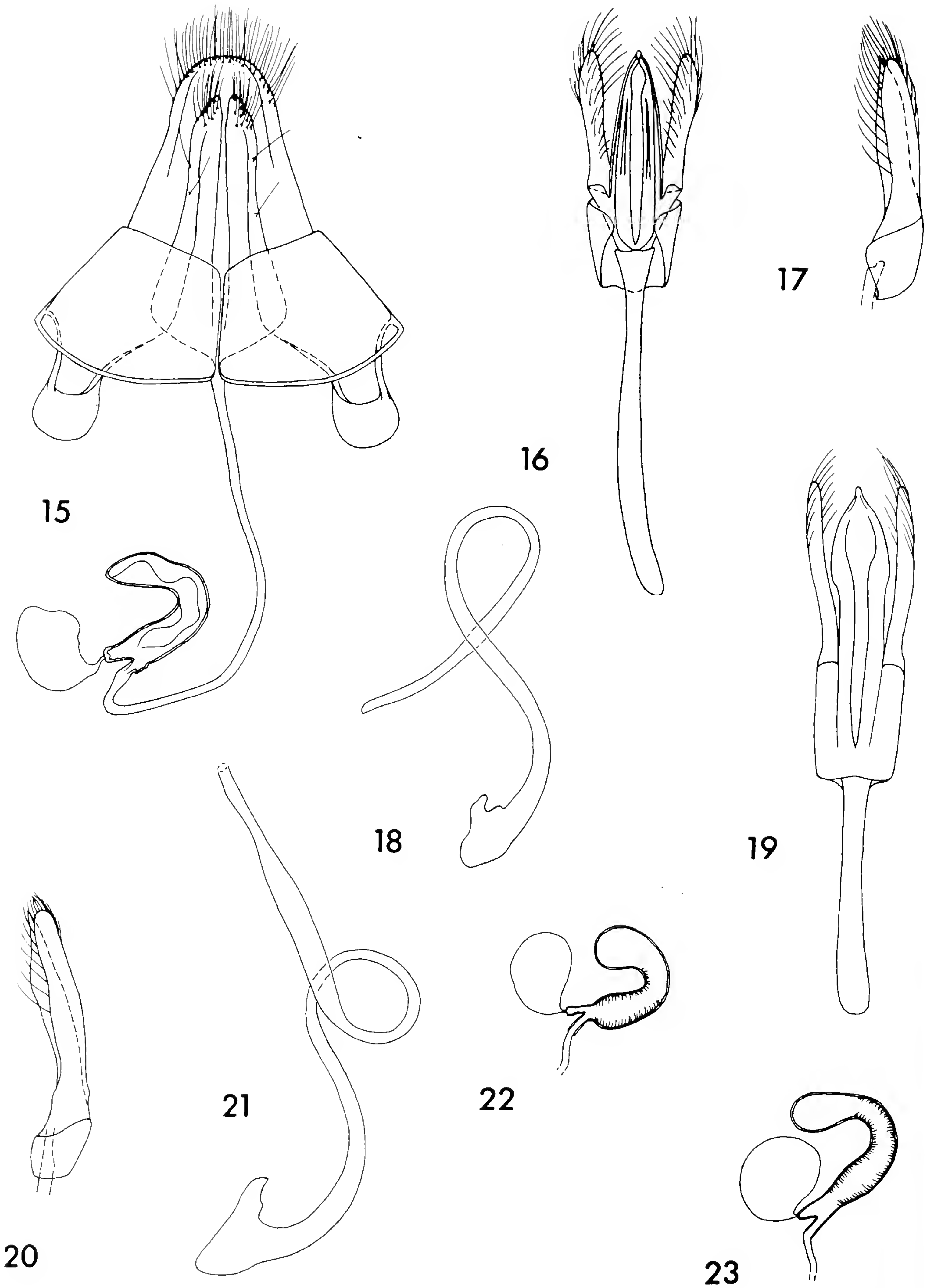

Fig. 15-23, genitalia: 15) *P. formosa,* female genitalia; 16-18) *O. lineatus,* male genitalia; 19-21) *P. formosa,* male genitalia; 22) *P. pumilus,* spermathecal capsule; 23) *P. brevipilosus,* spermathecal capsule.

than on pronotum, separated by less than to twice their diameter; pubescence appressed or semi-erect, yellowish white. Abdomen with punctures fine, sparse at middle of first and second sterna, dense and coarser elsewhere; postcoxal line complete, as in *Pullus,* extending slightly beyond middle of first sternum; 6th sternum entire, rounded on apical margin. Genitalia with apex of spermatheca enlarged, bulbous (Fig. 22).

Male: Not known.

HOLOTYPE: Female, USNM type no. 72833, from PANAMA, Barro Colorado Isl., 1-9-V-1964, W. D. and S. S. Duckworth.

Another female specimen from Barro Colorado in the USNM collection is probably conspecific. It is not regarded as a paratype because it is at variance with the type in the style of pubescence and type of postcoxal line. The small size, rounded 6th sternum, and bulbous spermathecal apex separate *pumilus* from *formosus* which is much larger, has the apical border of the 6th sternum sinuate on each side of the middle and has the spermathecal apex slender and pointed.

Pseudoryssomus brevipilosus Gordon, **new species**
(Fig. 5, 13, 23)

Holotype female: Length 3.45 mm, greatest width 2.60 mm. Form elongate, widest across center of elytra, outline of pronotum and elytra strongly discontinuous. Ventral surface and head brownish red; pronotum red except parabolic basal spot dark brown; elytron with lateral half red, median half dark brown, outer border of brown area irregular, projecting laterally at middle, an elongate sutural area obscurely paler, dark red (Fig. 5). Pronotum shining, finely densely punctured, punctures separated by less than to 3 times their diameter; pubescence extremely short, appressed, yellowish white. Elytron shining, punctures slightly coarser than on pronotum, separated by less than to twice their diameter; pubescence short, a mixture of appressed and semierect hairs. Abdomen densely, evenly punctured, punctures coarser on basal sterna, becoming finer on apical sterna; postcoxal line complete (Fig. 13), extending well beyond middle of first sternum. Genitalia with apex of spermatheca broadly rounded, apical fourth slightly bulbous (Fig. 23).

Male: Not known.

HOLOTYPE: Female, USNM, type no. 72834, from VENEZUELA, Exp. Territ. Amazonas, Mt. Marahuaca, N. Slopes, Benitez Camp, 1-25-V-1950.

The short dorsal pubescence which has no erect hairs will separate *brevipilosus* from *pumilus* which has long pubescence with some distinctly erect hairs. The spermatheca is relatively slender and elongate in *brevipilosus,* short and robust in *pumilus.*

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A NEW SPECIES OF *OXYPORUS* (COLEOPTERA: STAPHYLINIDAE) FROM MEXICO WITH COMMENTS ON *OXYPORUS ELEGANS* LECONTE

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ABSTRACT

A new species, *Oxyporus lawrencei,* is described from the Distrito Federal, Mexico. *Oxyporus elegans* Leconte is considered a valid species, distinct from *O. femoralis* Gravenhorst based on a study of the male genitalia.

A new species of *Oxyporus* from Mexico and a series of specimens of *O. elegans* Leconte were recently submitted to me for study. I would like to thank Dr. John Lawrence and Mr. Jim Neal for the opportunity to examine this material.

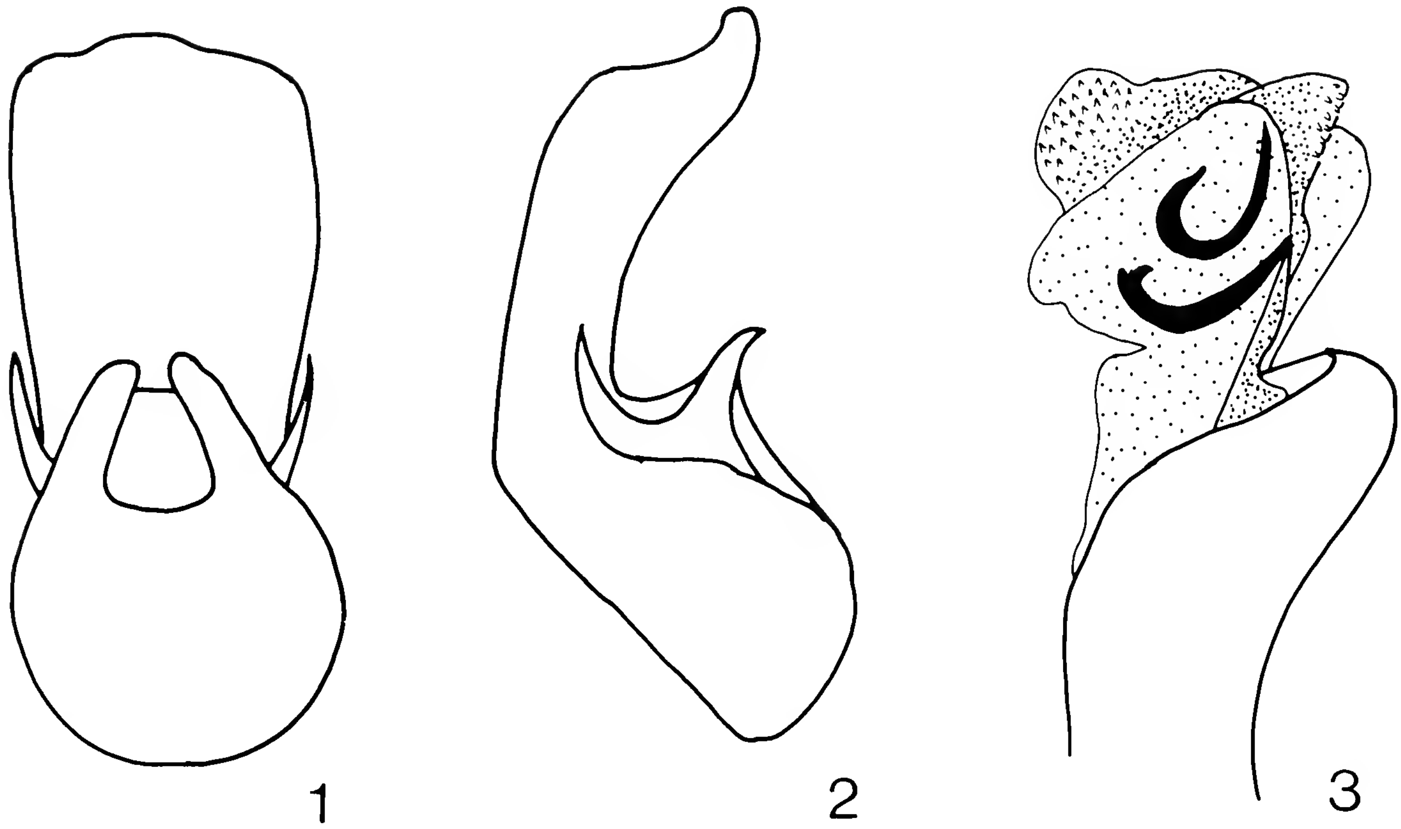
Oxyporus (Oxyporus) lawrencei Campbell, **new species**
(Fig. 1-3)

With the characters of the subgenus *Oxyporus.* Length 6.5-6.6 mm. Orange, with head, prothorax, outer apical angles of elytra, procoxae, and mesepisterna black. Surface of head and pronotum very finely granulate, shining; abdomen more coarsely and distinctly granulate, subopaque.

Male: Head transverse; width of head (including eyes) only slightly greater than width of pronotum; temples rounded, width across temples slightly narrower than maximum distance between outer margins of eyes; length of temples 1.25 times greater than length of eye. Mandibles moderate in size, distinctly shorter than length of head; inner edges finely serrate near bases, evenly curved to acute apices. Labrum narrowly emarginate in middle of anterior margin; impressed along midline. Clypeus with anterior margin slightly concave medially. Frons with a narrow, transverse impression between bases of antennae, with a shallow impression between antennal bases and midline. Pronotum slightly transverse (ratio $l/w = 13/17$); sides rounded, widest at anterior fourth, distinctly narrowed to both base and apex. Ultimate and apical half of penultimate abdominal sternites sparsely covered with long setae; remaining sternites with long setae sparsely placed near posterior margins. Tarsi filiform, lacking fine setae ventrally. Genitalia (Fig. 1, 2) with median lobe broad, apex broadly rounded; parameres each with a very fine, short seta on apex; internal sac (Fig. 3) as illustrated.

Female: Unknown.

Types: Holotype, male, with labels as follows: Eslava, Mex. Aug. 30, 98/ Collection of Frederick Allen Eddy/HOLOTYPE male, Oxyporus lawrencei, J. M. Campbell, 1974. The specimen is deposited in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZ Type No. 32207).



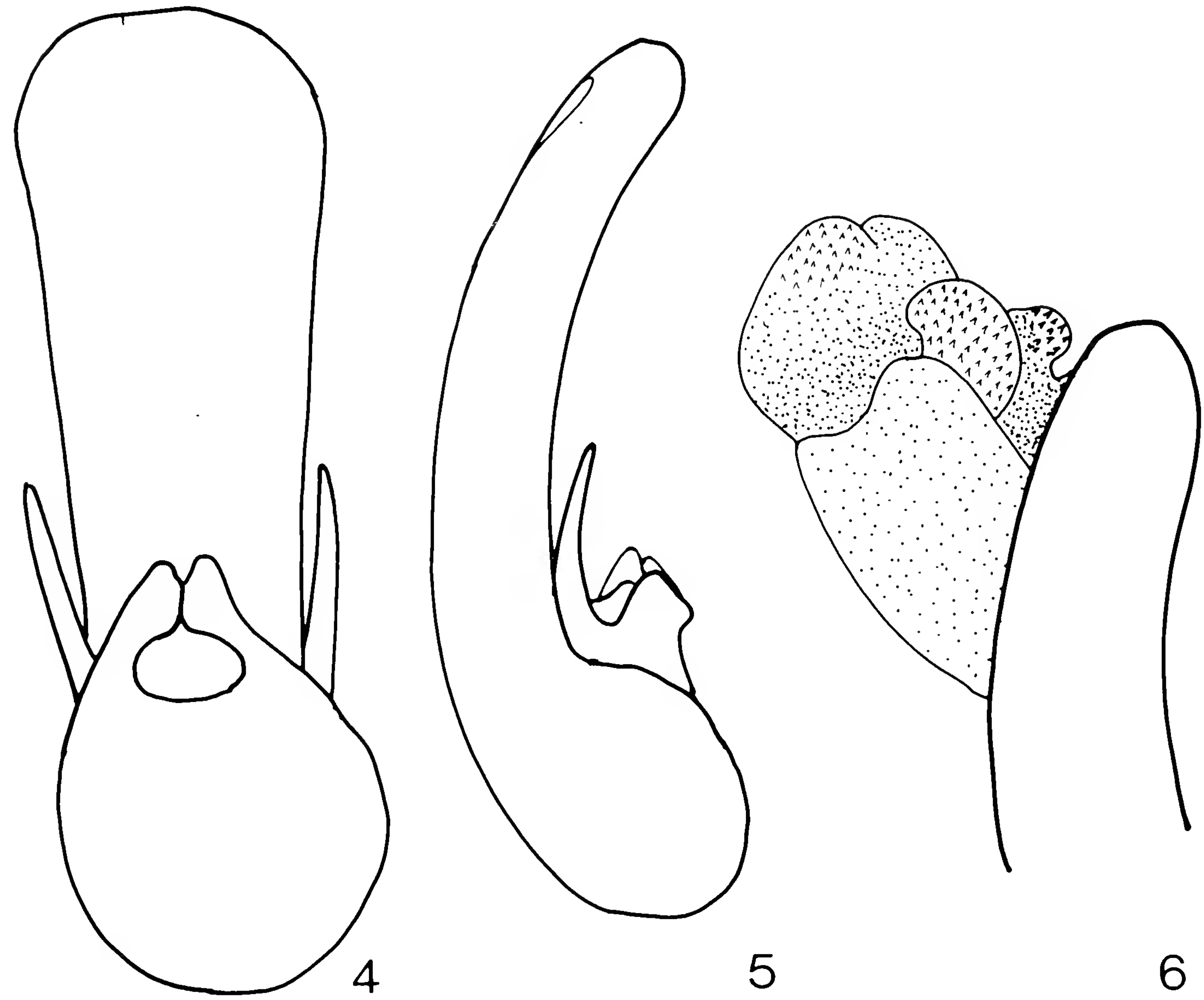


Fig. 1-3: Male genitalia of *Oxyporus lawrencei*; 1) ventral; 2) lateral; and 3) internal sac.

Fig. 4-6: Male genitalia of *Oxyporus elegans*; 4) ventral; 5) lateral; and 6) internal sac.

One male paratype with the same data is deposited in the Canadian National Collection (CNC No. 13337).

Remarks: Eslava, Mexico was not located by Selander and Vaurie (1962), but is specified in the Biologia Centrali-Americana as being in the Distrito Federal at an elevation of 8000 feet.

Oxyporus lawrencei keys to couplet 17 of my key to the New World Oxyporinae (Campbell 1969). This key should be changed as follows to include this new species.

17. Abdomen orange, completely lacking black markings .... *lawrencei* new species
– Abdomen with at least fourth visible segment black 18

18. Abdomen with third, fourth, and anterior half of fifth visible segments black; head and pronotum black or black with irregular red areas; Costa Rica and Panama .... *bierigi* Campbell
– Abdomen with only fourth segment black; head and pronotum pale; Mexico .... *flohri* Sharp

Oxyporus lawrencei may be readily distinguished from all other Mexican *Oxyporus* by its entirely orange abdomen, by the reduced black markings on the elytra, and by the more granulate surface of the body. The male genitalia are similar to those of *mexicanus* Fauvel, but differ in the shape of the internal sac (Fig. 3). This species should be placed between *mexicanus* and *guerreroanus* Bernhauer (see Campbell 1969).

This species is named in honor of Dr. J. F. Lawrence, Museum of Comparative Zoology, Harvard University.

Oxyporus (Oxyporus) elegans Leconte
(Fig. 4-6)

In my revision of *Oxyporus* (1969:243) I remarked that this species was probably a color variety or subspecies of *femoralis* Gravenhorst. I have recently received a series of 22 specimens of this species from Mr. Jim Neal of Stephen F. Austin State University, Nacogdoches, Texas. They were collected from the following localities in eastern Texas: Nacogdoches Co., Stephen F. Austin Experimental Forest; 22-IV-72; Sabine Co., Pineland, 23-X-71. [Canadian National Collection and collection of Mr. Neal].

Further study of this series of specimens, including a study of the male genitalia, indicates that *elegans* is a valid species and is distinct from *femoralis*. In addition to the differences in coloration (see Campbell 1969:242), *elegans* may be distinguished from *femoralis* by the flatter median lobe of the male genitalia, the apex of which is more broadly rounded (Fig. 4, 5), and by the different shape of the internal sac (Fig. 6).

Oxyporus elegans was recorded from the following mushroom hosts by Mr. Neal (personal communication): *Lentinus lepideus* and *Pluteus* sp. Specimens were collected in both the spring (April) and the fall (October) of the year.

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LECTOTYPE DESIGNATION FOR *TACHINOMORPHUS GRANDIS* (SOLSKY) (COLEOPTERA: STAPHYLINIDAE)

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During a recent study of the genus *Tachinomorphus* of North and Central America, I was unable to locate any syntypes of *Tachinomorphus grandis* (Solsky). In the published revision (Campbell 1973), I stated that the types were probably in the collection of the Zoologischeskij Institut, Akademiya Nauk, Leningrad, USSR.

Subsequently Mr. Hans Silfverberg informed me that Solsky's type material for this species was located in the Zoological Museum of Helsinki, Finland. I would like to express my appreciation to Mr. Silfverberg for this information and for making them available for study.

The type series consists of 2 specimens, 1 male and 1 female each with the following labels: Mexico/Solsky/Mus. Zool. H:fors, Spec. typ. No. 2220, Tachinomorphus grandis Sol./Mus. Zool. Helsinki Loan No. CA35. The female bears an additional label: Tachinus grandis mihi male, female Mexique. I hereby designate the male as lectotype and the female as allolectotype of *Coproporus grandis* Solsky (now *Tachinomorphus grandis*). I have added a red type label to each of the specimens confirming this designation and returned them to the Zoological Museum in Helsinki. Solsky (1868) recorded the species from Mexico, ". . . et probablement de l'Etat d'Oaxaca". The occurrence of the species in the state of Oaxaca has been confirmed by subsequent collecting (Campbell 1973).

The lectotype and allolectotype are both representatives of the same species I referred to as *T. grandis* in my revision, thus no change in the usage of the name *grandis* is required.

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LARVAE OF *BOTHROTES PLUMBEUS* AND *LOBOMETOPON FUSIFORME* (COLEOPTERA: TENTYRIIDAE: EPITRAGINI)

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ABSTRACT

Larvae of the tribe Epitragini are characterized by a slender, elongate body, enlarged forelegs and prothoracic sternellum, transversely ridged labrum armed with stout, blunt setae, and the presence of a tuft of stout, blunt setae set in a membranous basal patch on the dorsolateral surface of each mandible. These features are similar to those of known tentyriid larvae, especially members of the tribe Tentyriini.

Characteristics of larval Tentyriidae (=Tentyriinae, Tenebrionidae of authors; see Doyen, 1972) are based on relatively few taxa, mostly from Eurasia and Africa. Among North American species, the only larvae associated with adults include 2 species of Asidini (*Philolitha* and *Stenomorpha*: Brown, 1973) and 2 species of Coniontini (*Coniontis* and *Coelus*: Marcuzzi and Rampazzo, 1960). Keleynikova (1971) described the larva of *Colposphena karelini*[1] (Ménétriés) from Turkmenia. Until now, this has been the only larva ascribed to the tribe Epitragini. The present paper describes larvae of 2 North American members of the Epitragini, *Bothrotes plumbeus* (LeConte) and *Lobometopon fusiforme* Casey.

The Epitragini occur in tropical and warm temperate regions throughout the world, except Australia. Most species are diurnally active fliers, commonly occurring on flowering herbs and shrubs. Pollen and flowers are probably the normal food of adults. Traditionally the Epitragini have been considered distinct from the Tentyriini (Horn 1870; Casey 1907; Freude 1967-68), which includes apterous, geophilous species. Koch (1950; 1955:19; 1960:33) compared apterous South African Epitragini with typical Tentyriini, concluding that the tribes were not distinct. His reasoning was based primarily on the genus *Derosphaerius,* where a gradual transition from fully winged to completely apterous species bridges the morphological gap between the 2 tribes. Apterous species of *Derosphaerius* also show strong development of supraorbital structures, dilation of the intercoxal process of the first visible abdominal sternite, and reduction of the precoxal grooves on the metasternum, characters frequently used to distinguish the Tentyriini from the Epitragini. Conversely, some Madagascan members of the Tentyriini have retained the precoxal grooves, though flightless (Koch, 1960). The evidence presented below indicates a high degree of similarity among larvae of the 2 tribes, supporting Koch's taxonomic conclusions.

Larvae described below were obtained by confining adult beetles in plastic utility boxes containing oviposition medium of mixed sand and oak leaf litter

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[1]Placed in the Tentyriini by Freude (1967).

to a depth of about 5 cm. Further details of rearing were similar to those described by me earlier (1973). Larvae were preserved in Kahle's solution and later transferred to 70% ethyl alcohol. No attempt was made to determine the amount of time spent in the various instars, which probably varies considerably under either natural or laboratory conditions, depending on the availability of food and water. Descriptive terminology follows that of Spilman (1963).

Tribe Epitragini

Body elongate, slender, weakly moniliform (Fig. 1), slightly flattened ventrally; cuticle weakly sclerotized except for frontoclypeal suture, mandibles, hypopharynx and claws; cranium, pronotum and prosternellum with lateral portions densely set with long, fine setae.

Head prognathous (Fig. 2), dorsoventrally flattened, sometimes with 2 pigment spots ("ocelli") at base of each antenna; labrum and clypeus transverse, labrum with transverse, prominently raised ridge bearing row of stout blunt setae and with incomplete row of stout, blunt setae along anterior margin (Fig. 3, 9); mandibles with basal membranous patch on dorsolateral surface set with stout, blunt setae (Fig. 4, 10); right mandible bidentate, left weakly tridentate (Fig. 6, 10), molar surfaces simple, flattened; maxillae with fused mala and stipes, indistinctly 2 segmented cardo; mala with median row of stout spines (Fig. 7); submentum and gula fused; labium with mentum trapezoidal, ligula a short, median protuberance with 2 apical setae near midline (Fig. 6, 12); antennae with second segment about 1.5 times length of first; third segment peglike, with few apical setae (Fig. 3, 13).

Prothorax slightly longer than mesothorax and metathorax (*Bothrotes* and *Lobometopon*) or subequal (*Colposphena*); sternum broad, trapezoidal, lateral margins converging posteriorly; sternellum quadrispherical, enclosing coxal cavities laterally and posteriorly (Fig. 6); epipleura partially enclosing sternellum posteriorly, indistinctly separated from notum and pre-epipleura. Mesothorax and metathorax shorter than prothorax; sternum and sternellum indistinctly separated laterally, delimited by epipleural fold. Mesothoracic spiracles large, elliptical, set on preepipleura, partly concealed by sternum. Metathoracic spiracles small, set on preepipleura. Prothoracic legs enlarged, approximately 1.6 times length and girdth of mesothoracic and metathoracic legs; coxae globular, contiguous mesally, oriented anteroventrally on protruding sternellum (Fig. 2); trochanter conical, about one-half length of femur, sparsely spinose; femur robust, about two-thirds as broad as long, with pectin of stout, blunt setae ventrally, several elongate setae dorsally; tibia about twice as long as wide, with pectin of stout, blunt setae ventrally, slender, elongate setae dorsally; tarsungulis with short, transverse, weakly sclerotized basal segment bearing single stout, blunt seta; distal segment a strongly sclerotized claw (Fig. 5, 14). Mesothoracic and metathoracic legs about two-thirds size of prothoracic legs, more slender and without femoral and tibial setal pectins; tarsunguli simple, claws, without basal, desclerotized segment (Fig. 15).

First abdominal segment subquadrate, about 1.25 times wider than long; second through sixth segments weakly moniliform, widest in anterior quarter; third segment largest, thence gradually decreasing in size posteriorly; seventh and eighth segments subquadrate; each segment with 3 to 5 slender setae on anterolateral one-fifth, 1 to 3 setae in posterolateral one-fifth, small, circular spiracle located just anterad of anterior cluster of setae. Abdominal tergite 9 subconical in dorsal aspect, with numerous slender, posterolaterally directed setae along lateral margins, and 2 irregular arcs of stout bristles dorsolaterally and apically (Fig. 1); sternite 9 about half length of tergite, variably set with setae (Fig. 8, 16). Abdominal segment 10 modified as enlarged pygopodial lobes variably set with stout, sharp bristles and irregularly placed, longer, slender setae (Fig. 8, 16).

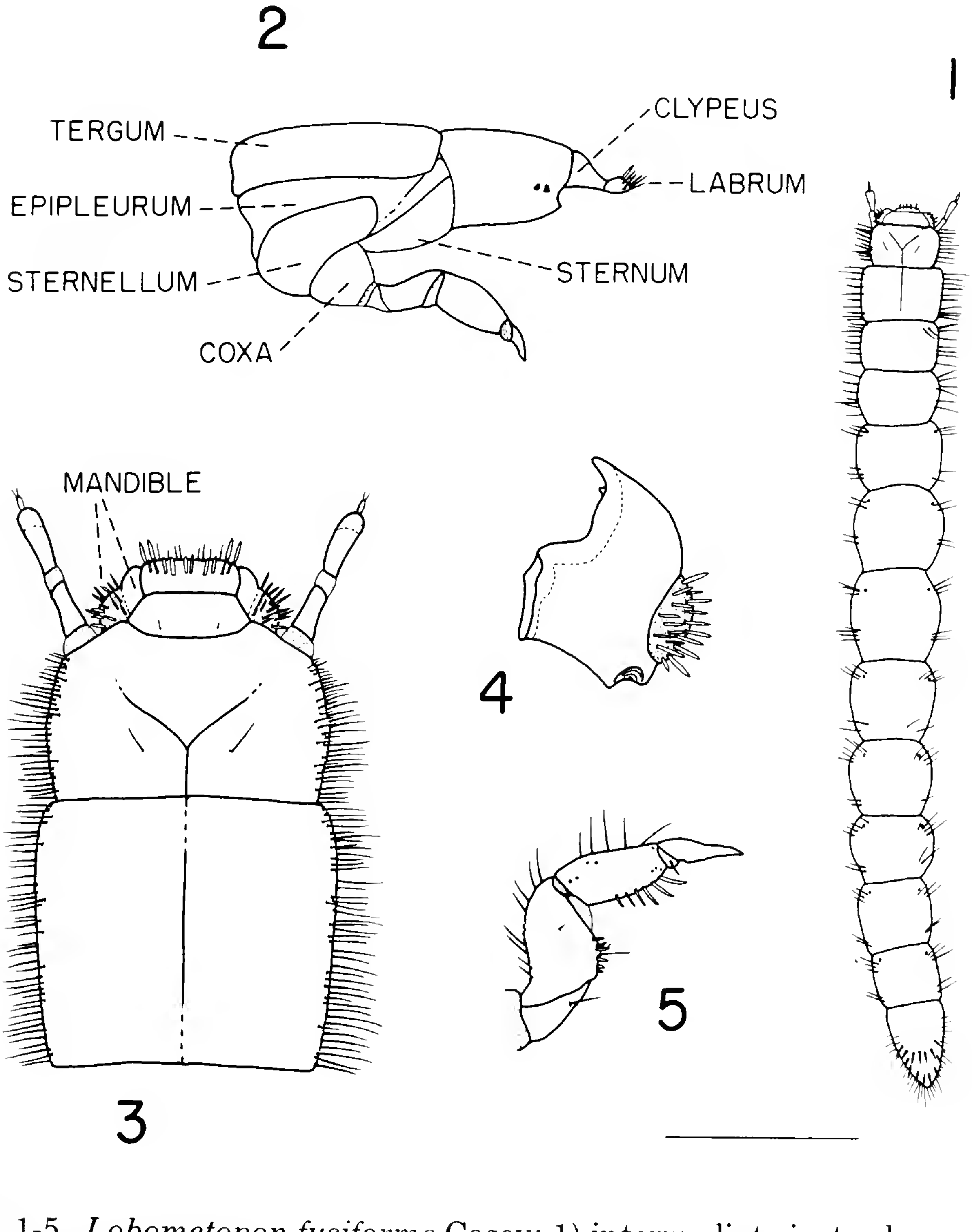

Fig. 1-5. *Lobometopon fusiforme* Casey: 1) intermediate instar larva, dorsal aspect (scale line = 2 mm); 2) diagrammatic relationships of head and pronotum, lateral aspect; mandibles, maxillae, labium omitted; 3) head and pronotum, dorsal aspect (scale line = 0.5 mm); 4) right mandible, dorsal aspect (scale line = 0.25 mm); 5) prothoracic leg (scale line = 0.5 mm).

DISCUSSION. Brown (1973) has provided the most comprehensive descriptions of any larval tentyriids, and also summarized their most important morphological characteristics. These include the basal patches of setae on the mandibles, the greatly enlarged prothoracic sternellum, and the presence of only 2 ligular setae in first instars. Other features, such as the enlarged forelegs, development of urogomphi and enlargement of the pygopodia are inconsistently distributed among tentyriids and tenebrionids, and probably represent convergent adaptations for similar larval habitats.

Known larvae of the Epitragini share a general anatomical similarity with other members of the Tentyriidae. The most reliable diagnostic features appear to be 1) the dorsolateral patch of blunt, stout setae near the base of the

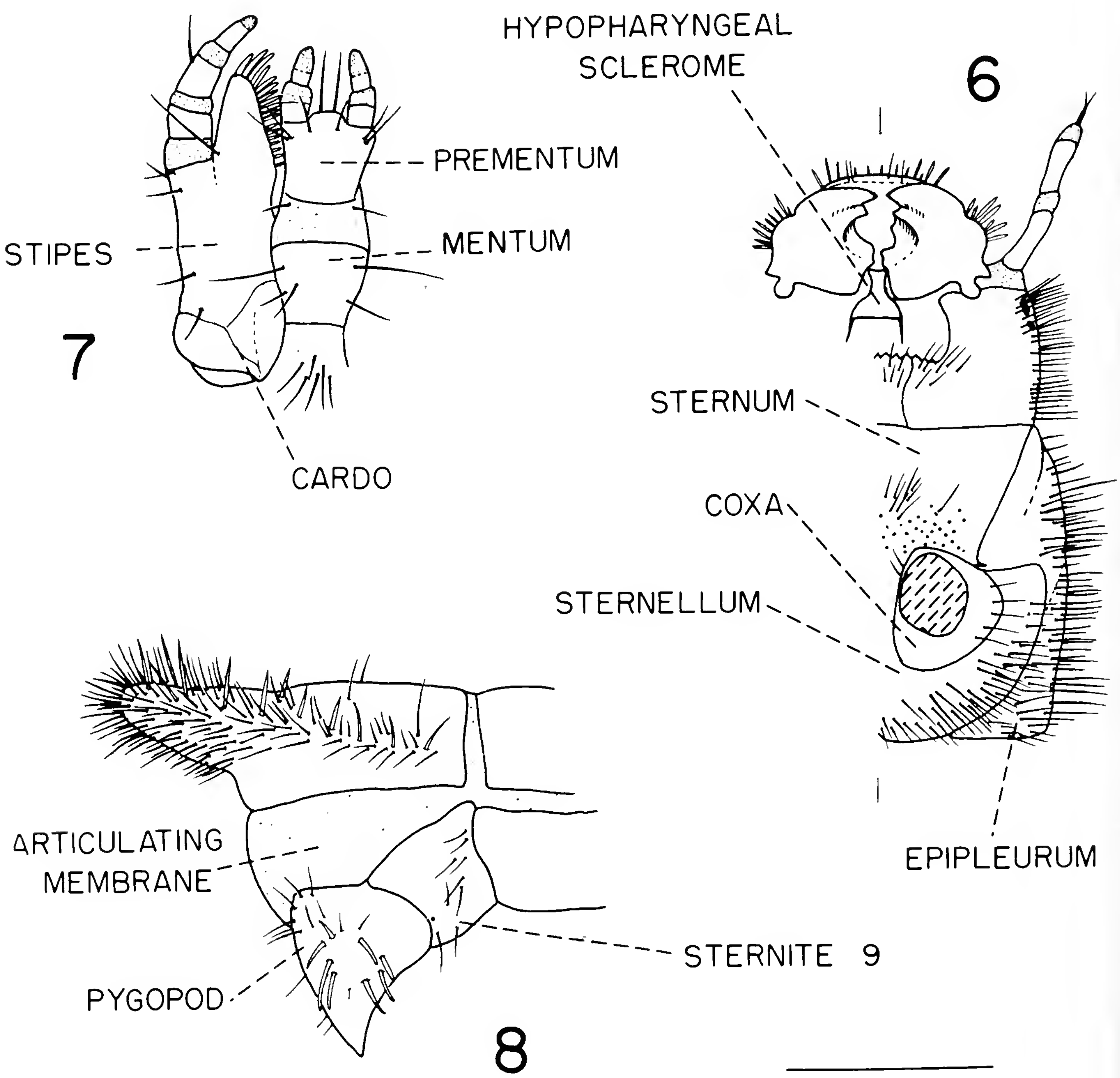

Fig. 6-8. *Lobometopon fusiforme*: 6) ventral aspect of head and prothorax; labium, maxillae, and leg removed (scale line = 0.5 mm); 7) right maxilla and labium, ventral aspect (scale line = 0.25 mm); 8) abdominal segments 9 and 10, lateral aspect (scale line = 0.5 mm).

mandibles (setae ventrolateral, slender and elongate in the Asidini; slender, elongate in the Adesmiini; both stout, blunt and slender, elongate in the Coniontini); 2) the glabrous clypeus and cranium (set with granules in the Asidini; set with short, blunt setae in the Coniontini and Adesmiini). *Bothrotes* and *Lobometopon* are extremely similar to *Colposphena*, except in spination of the epipharynx and details of body setation. It may be expected that other larvae of the Epitragini will conform in most characteristics. Larvae of Epitragini and Tentyriini (as characterized by Keleynikova, 1971) are extremely similar in all major features, supporting Koch's (1955, 1960) placement as subtribes of the Tentyriini.

Lobometopon fusiforme Casey
(Fig. 1-8)

Intermediate instar larva (Fig. 1): Length 8.2-10.6 mm; head capsule width 0.58-0.88 mm. Eleven individuals examined (probably fourth and fifth instars); reared from adults from New Mexico, Hidalgo County, 29 mi. E. Douglas, Cochise County, Arizona, 30-VIII-1971.

Cranium nearly glabrous dorsally, with single slender seta posterolaterad of anterior branches of epicranial suture on each side (Fig. 3); glabrous ventrolaterally, with transverse patch of setae across gula and subgenae just posterad of oral cavity (Fig. 5). Labrum with transverse ridge set with 8-10 stout, blunt setae, and with 2 stout blunt setae on each side of anterior margin, 8-10 slender setae on anteromedial margin (Fig. 2, 3); mandibles with 16-20 stout, blunt setae set in membranous dorsolateral patch near base (Fig. 4). Maxilla with mala bordered medially with single row of stout, weakly curved setae. Ligula with a pair of apical setae, a second pair of subapical setae, and a pair inserted laterally near base of each labial palp (Fig. 7). Prothoracic legs with pectin of 5 or 6 short, stout spines on femur, 6 longer spines on tibia (Fig. 5).

The dense lateral setation of the cranium and thoracic segments is slightly variable in its dorsal and ventral extent. The setation of the abdominal segments and legs varies among individuals, among segments, and sometimes between the right and left sides of a single individual, probably due in part to the loss of setae during burrowing.

Bothrotes plumbeus (LeConte)
(Fig. 9-16)

Intermediate instar larva: Length 3.7-5.5 mm; head capsule width 0.32-0.53 mm. Ten individuals examined (probably second and third instars); reared from adults from New Mexico, Hidalgo County, 2 mi. W. Rodeo, 31-VII-1971.

Cranium glabrous dorsally, glabrous ventrolaterally with irregular patch of slender setae on gula and extreme anteromedial corners of subgenae (Fig. 13). Labrum with transverse ridge set with 8 stout, blunt setae, with a single stout, blunt seta on each side of anterior margin (Fig. 9), and 8-10 slender setae on anteromedial margin; mandibles with 7-10 stout, blunt setae, sometimes with 1 or 2 short, slender setae set in membranous dorsolateral patch (Fig. 10). Maxilla with mala bordered medially by single row of stout, marginal setae, with parallel row of shorter setae slightly laterad of mesal margin. Ligula with

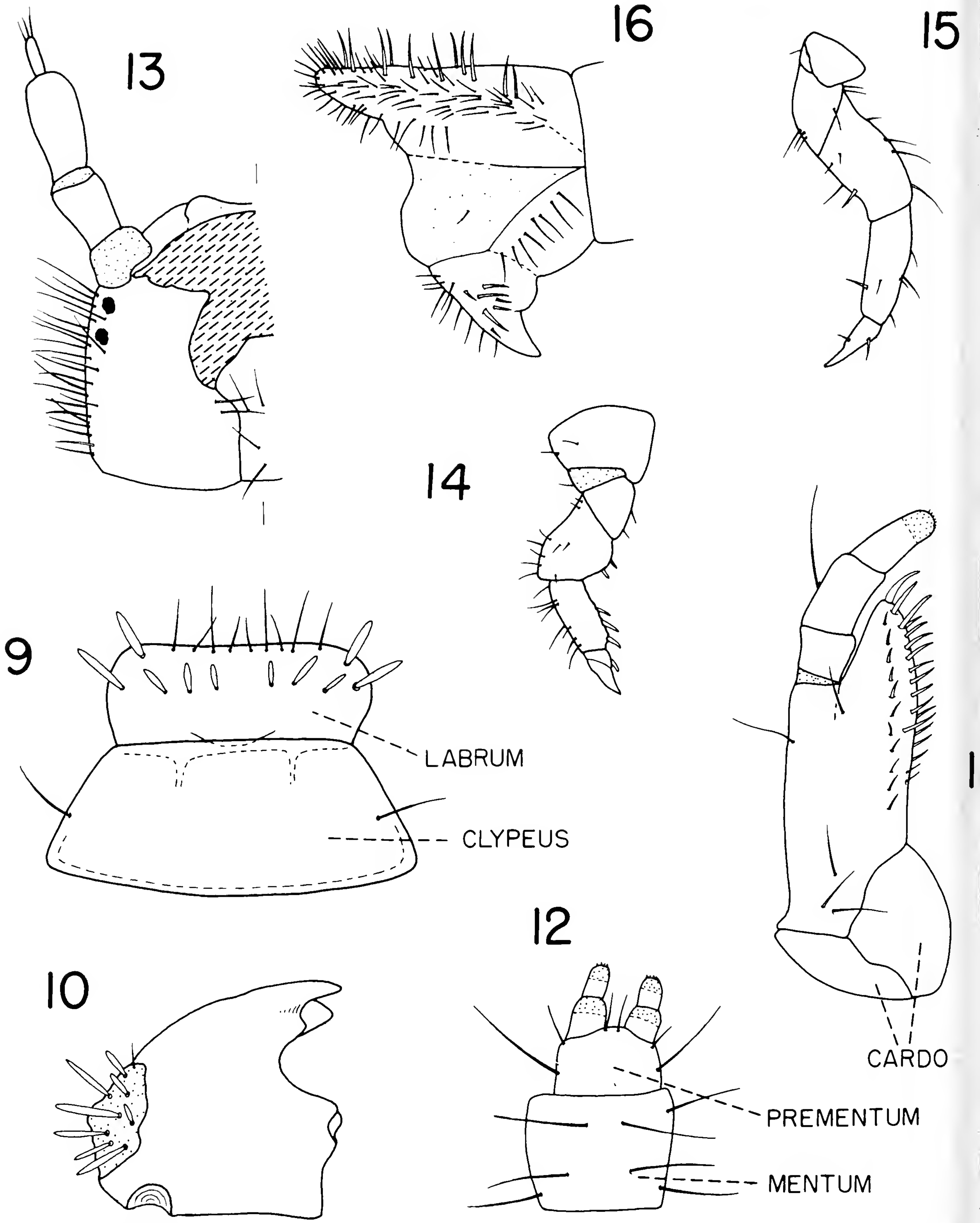

Fig. 9-16. *Bothrotes plumbeus* (LeConte): 9) labrum and clypeus, dorsal aspect (scale line = 0.1 mm); 10) left mandible, dorsal aspect (scale line = 0.1 mm); 11) right maxilla, ventral aspect (scale line = 0.1 mm); 12) labium, ventral aspect (scale line = 0.01 mm). Note that the prementum is retracted beneath the mentum; 13) cranium, ventral aspect (scale line = 0.33 mm); 14) prothoracic leg (scale line = 0.33 mm); 15) mesothoracic leg (scale line = 0.16 mm); 16) abdominal segments 9 and 10, lateral aspect (scale line = 0.33 mm).

a pair of apical setae, single seta on each lateral corner near insertions of palps, and one marginal seta on each side near midpoint (Fig. 11, 12). Prothoracic legs with 2-3 short, blunt spines on ventral margin of femur, 3 longer spines on ventral margin of tibia (Fig. 14, 15).

Variation in setation of the cranium, thorax, and abdomen is similar to that in *Lobometopon*. Differences in setation of the labrum, mandibles, ligula, and legs between *Bothrotes* and *Lobometopon* may be due in part to differences in age of the larvae, since Brown (1973) has shown that setae are commonly added during molts. There is also considerable variation in setation of the ninth abdominal tergite, the ninth sternite, and the pygopodia, in both species. The most consistent differentiating character is probably the setational pattern of the maxillae (a single mesal row of setae in *Lobometopon*; 2 parallel rows in *Bothrotes*).

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BOOK REVIEW

Surtsey, Iceland: The Development of a New Fauna, 1963-1970, Terrestrial Invertebrates, by Carl H. Lindroth, Hugo Andersson, Högni Bödvarsson, and Sigurdur H. Richter. Entomologica Scandinavica, Suppl. 5, 1973. Munksgaard, International Booksellers and Publishers Ltd., 35, Norre Sogade, DK-1370 Copenhagen K, Denmark. 280 p.; 50 fig. Paper 40 Danish Crowns ($5.35).

For those of us interested in zoogeography in the broadest sense, Surtsey, Iceland . . . offers the first carefully documented study of strictly natural island colonization. The study began shortly after the birth of a completely new and unexpected island. As usual, since the time of Linneaus (Linné), the Swedes, Danes, and Icelanders were quick to take up the challenge of documenting the island's changes through time with a sound cooperative and interdisciplinary approach. Now, the first years' data are available on plant and animal colonization and experimental zoogeography.

The book is arranged in 3 parts. Part I, Introduction, develops the history of the study of New Islands, the origin of Surtsey, and summarizes the development of the terrestrial flora on the Island. Part II, Special Part, documents all collection records on Surtsey, other Westman Islands, and the western part of the south coast of Iceland, providing localities, date of capture, general distribution of species, and ecological notes. In some cases, taxonomic notes are also provided where species determination is difficult or nomenclatorial problems exist. Part III, General Part, is the meat of the book, that is, the analysis of the raw data and its associated hypothesis building. Numerous tables and graphs are presented in this part to show frequency, abundance, correlations, etc. Trapping methods, contamination, and chronology of arrivals are discussed, the adjacent areas are examined with regard to their faunae of Diptera, Coleoptera, Collembola, and Acari. The book concludes with detailed discussions of modes and ways of dispersal to Surtsey, colonization, and the general applicability of Surtsey's case to overseas dispersal.

Coleopterists will find that several species of beetles (34 on the Westmans, 89 on Heimaey, and 96 on the Mainland) are discussed in relation to their powers of dispersal.

The book is a "must" for all serious students of entomology, zoogeography, and coleopterology.—T. L. Erwin, Smithsonian Institution, National Museum of Natural History, Washington, D. C. 20560.

MATING BEHAVIOR OF THE ROSECHAFER IN NORTHERN MICHIGAN (COLEOPTERA: SCARABAEIDAE)[1]

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7900 Shady Beach Dr., Whitmore Lake, MI 48189

ABSTRACT

Male and female rosechafers (*Macrodactylus subspinosa syriaca* Fab.) gather in what appear to be mating aggregations. Most individuals stay with the group less than 1 day. During copulation, males scrape pubescence from the females' pronota with their mandibles; mated females can thus be recognized. Unmounted males push against mounted males, and mounted males repel them by thrashing and pushing with their middle and hind legs.

I made a number of observations on the rosechafer, *Macrodactylus subspinosa syriaca* Fabricius, in an old field at the junction of I-75 and Riggsville road in Cheboygan County, Michigan, during July 1973. There were a large number (30) of these beetles on 4 milkweed plants within 4 yards of each other. I subsequently found them on 3 sumac (*Rhus*) bushes across the field and nowhere else in numbers, through there were individual and small clumps of sumac and milkweed elsewhere in the field.

I watched the behavior of incoming beetles at the 4 milkweed plants. As they approached in flight they usually dropped to the ground near the plants. They either crawled to the milkweed or climbed to the tops of nearby grassblades and flew to the milkweed.

Since other milkweed plants did not have large aggregations, food did not seem to be the major attractant. Virgin female *Dendroctonus* beetles are known to produce a scent which attracts both males and females (Chapman, 1969), and pheromones may have been involved in the formation of the aggregations I observed. A female observed at another locality repeatedly crawled to the tops of grasses, raised her wings slightly, and rotated her abdomen. Since the external opening of glands which produce pheromones are usually located between the posterior segments of the abdomen (Chapman, 1969), rotating the abdomen could have been a way of releasing a scent. This female did not attract any beetles during the 2 hours I observed her.

I observed copulation at the I-75 locality. When a pair came into contact, the male quickly mounted and grasped the female between her thorax and abdomen with his forelegs. Just prior to insertion of the aedeagus, males made several quick vibrations. While copulating, females remained still or walked about. Several fed upon the plant.

I noted that copulating females had shiny pronota, and that mounted males had pubescent ones. At first I considered this sexual dimorphism, but finally I observed a newly coupled pair, and the female had pronotal pubescence similar to that of males. During approximately 15 minutes following mounting and coupling, the male scraped the female's pronotum with his

[1]This research was performed as a grants-in-aid project while enrolled in the Biology of Insects course at the University of Michigan Biological Station, Douglas Lake, Pellston, Michigan, during the summer of 1973.

mandibles, leaving a shiny longitudinal line. Ultimately the entire pronotum was smooth and shiny. It is thus possible to distinguish virgin females from mated ones.

Mounted males hold leg pairs 2 and 3 straight out from the body and do not move them unless they touch another beetle; in which case they thrash these legs about and drag them along the female, pushing other males away. I tried unsuccessfully to evoke this response with a twig. I experimentally increased the number of encounters between single males and mating pairs by positioning single males on grass blades alongside pairs. When a male came in contact with a pair, he pushed his head between them. This was done quickly from several angles, and then the male moved away. The mounted male thrashed with his free legs and pushed the second male. These encounters lasted 10 to 30 seconds. The longest, most vigorous encounter involved a mounted, but not yet coupled male. The single male pushed his head between the pair; the mounted male pushed him away repeatedly and quickly coupled with the female. No single male dislodged a mounted male during 22 observations.

Males sometimes encountered other males and responded (as if they were females) by quickly mounting and then crawling off. Often they mounted each other in turn before moving apart. Females rejected males by crawling rapidly or flying away. Females were often mounted a second, and even a third time, by different males. Males often mounted several females in rapid succession.

I marked an elytron of each beetle on the 2 (milkweed and sumac) aggregations with a quick drying pigment (administered with a hypodermic syringe). There was a fast turnover in these groups, with most individuals remaining 1 day or less. Of 28 individuals marked on milkweed at 10 AM, 15 July, only 12 were present (remained) at 5 PM; there were in addition 14 unmarked (newly arrived) beetles. At 5 PM the following day, 22 beetles were present; 16 unmarked, 2 from 5 PM and 4 from 10 AM the previous day. Of 48 individuals marked on sumac at 10 AM 15 July, only 17 were present (remained) at 5 PM; there were in addition 32 unmarked (newly arrived) beetles. At 5 PM the following day 16 beetles were present; 5 unmarked, 6 from 5 PM and 5 from 10 AM the previous day. No beetles moved from 1 aggregation to the other, although 1 beetle from the sumac was later found on a sumac plant 20 yards away. Other observations: 2 pairs were found coupled (again or still?) 8 hours later and 2 other pairs were found (again or still?) 32 hours later; 3 males of mated pairs were coupled with different females 8 hours later and 2 males of mated pairs were coupled with different females 32 hours later; one mated female was coupled with a different male 8 hours later and 3 mated females were coupled with different males 32 hours later.

I thank Dr. David Gates, Director of the Biological Station, for making this research possible, and Dr. James E. Lloyd, of the Biological Station and the University of Florida, for his help during the field work and the preparation of the manuscript.

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(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

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BUPRESTIDAE: 50 ***Euchroma gigantea*** (av. 6cm) plus general collection, unidentified, in alcohol, from Canal Zone (many scarabs, longhorns, etc.) to trade for any interesting Coleoptera. David Swanson, 502 Beech St. A-4, Savanna, Ill. 61074.

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WANTED: Casey, T. L. 1912. Memoir III, p. 1-386. Henry Dietrich, Dept. Ent., Cornell Univ., Comstock Hall, Ithaca, N. Y. 14850.

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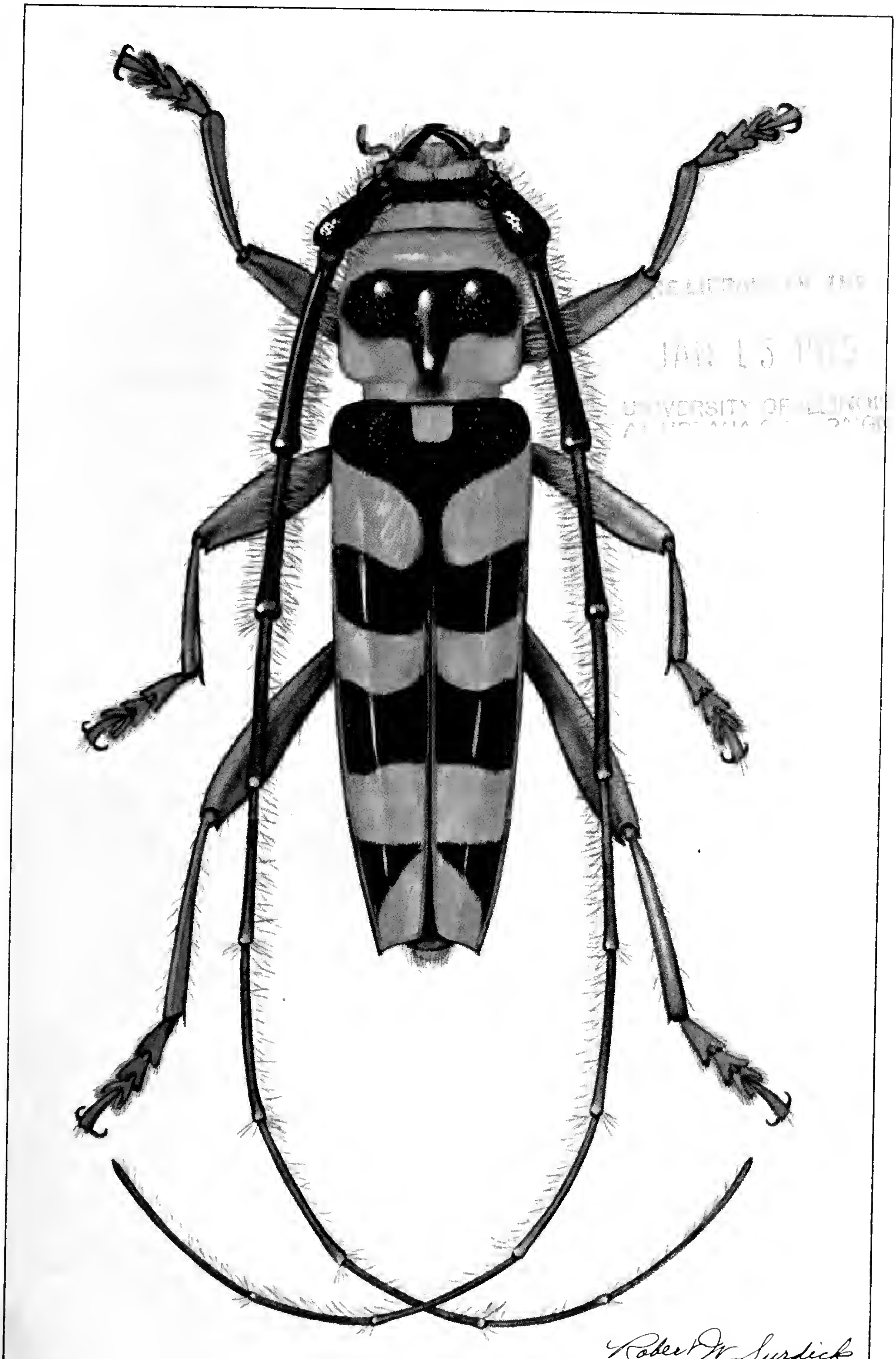
THE COLEOPTERISTS BULLETIN

AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES



Dryobius sexnotatus Linsley, male.

THE COLEOPTERISTS BULLETIN

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Mailing date for this issue: December 31, 1974

VOLUME 28, NO. 4 DECEMBER, 1974

CERAMBYCIDAE: *Dryobius sexnotatus*
by Perry, Surdick, & Anderson 169-176

CARABIDAE: *Asklepia*
by Hans Reichardt 177-179

ILLUSTRATIONS: Proportions
by R. E. Orth & Ian Moore..180

CERAMBYCIDAE: N. & C. American
by J. A. Chemsak & E. G. Linsley....................181-184

CARABIDAE: Larvae I.
by R. G. Thompson & R. T. Allen 185-201

ANOBIIDAE: *Ernobius opicus*
by E. J. Ford, Jr. 201-202

DYTISCIDAE & GYRINIDAE: Southeastern
by G. W. Folkerts & L. A. Donavan..................203-208

PASSALIDAE: Synonymy
by Pedro Reyes-Castillo 208

COCCINELLIDAE: Synonymy & Lectotypes
by R. D. Gordon..209-210

NITIDULIDAE: *Epuraea alternans*
by W. A. Connell 211-213

STAPHYLINIDAE: *Vicelva* synonymy
by Ian Moore 214

CERAMBYCIDAE: Virginia II
by R. H. Perry 215-217

PSEPHENIDAE: *Eubrianax edwardsi*
by W. H. Clark & G. L. Ralston 217-218

CARABIDAE: *Allendia,* new S. A. genus
by G. R. Noonan 219-227

COCCINELLIDAE: West Indies *Psorolyma*
by R. D. Gordon..228-232

CERAMBYCIDAE: Pacific Northwest
by R. L. Penrose & R. L. Westcott 233-236

AQUATICS: Of Shiraz, Iran
by S. O. Hosseinie 237-243

BOOK REVIEWS 176, 184, 210, 227, 243

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OBSERVATIONS ON THE BIOLOGY, ECOLOGY, BEHAVIOR, AND LARVAE OF *DRYOBIUS SEXNOTATUS* LINSLEY (COLEOPTERA: CERAMBYCIDAE)[1]

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Abstract

Field observations, made over a period of 28 years on the biology, ecology, and behavior of *Dryobius sexnotatus* Linsley, indicate that larvae feed in *Ulmus, Fagus, Tilia americana* Linnaeus, or *Acer saccharum* Marshall for a period of 2-3 years. They seem to prefer standing overmature trees. The larva, described from 14 specimens taken from *Tilia* in Maryland, supports Linsley's suggested relationships between the Dryobiini and Callidiini. The range extends from Kansas, east to Maryland, south to Louisiana and north to Michigan; but 80% of the specimens are from the Ohio River Valley. The pseudoscorpion, *Parachelifer superbus* Hoff, was taken in a phoretic association with the adult beetle in Pennsylvania.

Introduction

Personal observations were made from 1946 to 1974 by R. W. Surdick on 3 isolated populations of *Dryobius sexnotatus* Linsley (Fig. 1) in southeastern Greene County, Pennsylvania. Data prior to 1946 was secured from entomologists who were lifelong residents of the area and who collected extensively there.

All 3 sites yielded adults in numbers while larvae were infrequently observed because of difficulty in extracting them from the host trees. However, some larvae were collected from large living, dying, or dead standing trunks of sugar maple (*Acer saccharum* Marshall), apparently the primary host here, although some were found on dead standing trunks of beech (*Fagus grandifolia* Ehrhart, F.), apparently a secondary host. It was taken on basswood (*Tilia americana* Linnaeus) in Maryland and eastern Virginia in 1920 and, we believe, it has been taken on elm (*Ulmus*) only once, reported by Say (1823).

Biology

In sugar maple, larvae work throughout the wood, especially deep into the heartwood, excavating large meandering galleries packed solid with fine-textured frass. Eventually the wood is so riddled that it becomes a solid mass of old galleries plugged with frass. Larvae continue to feed long after the tree has died and the bark has fallen off. The immature feeding period ranges from 2-3 years.

[1]For Fig. 1, see cover of this issue.

Since several large larvae, dug out of sugar maple, were immediately below the surface and were either approaching or in the last instar, it is assumed that they work their way close to the surface for pupation. Teneral adults were taken from immediately beneath the loose bark of both sugar maple and beech. The workings in beech are much less extensive and closer to the surface than those in sugar maple, probably owing to the shorter durations of the standing dead trunks and the correspondingly lower number of beetle generations. Published host records are as follows: *Acer* (Siewers 1880, Dury 1902, Knull 1946, Linsley 1964), *Fagus* (Siewers 1880, Dury 1902, Knull 1946, Linsley 1964), *Tilia* (Knull 1946), *Tilia americana* (Linsley, 1964), *Ulmus* (Say 1823, Walsh & Riley 1869, Knull 1946, Linsley 1964).

Description of Larva

The following description (by D. M. Anderson) is based on a series of 14

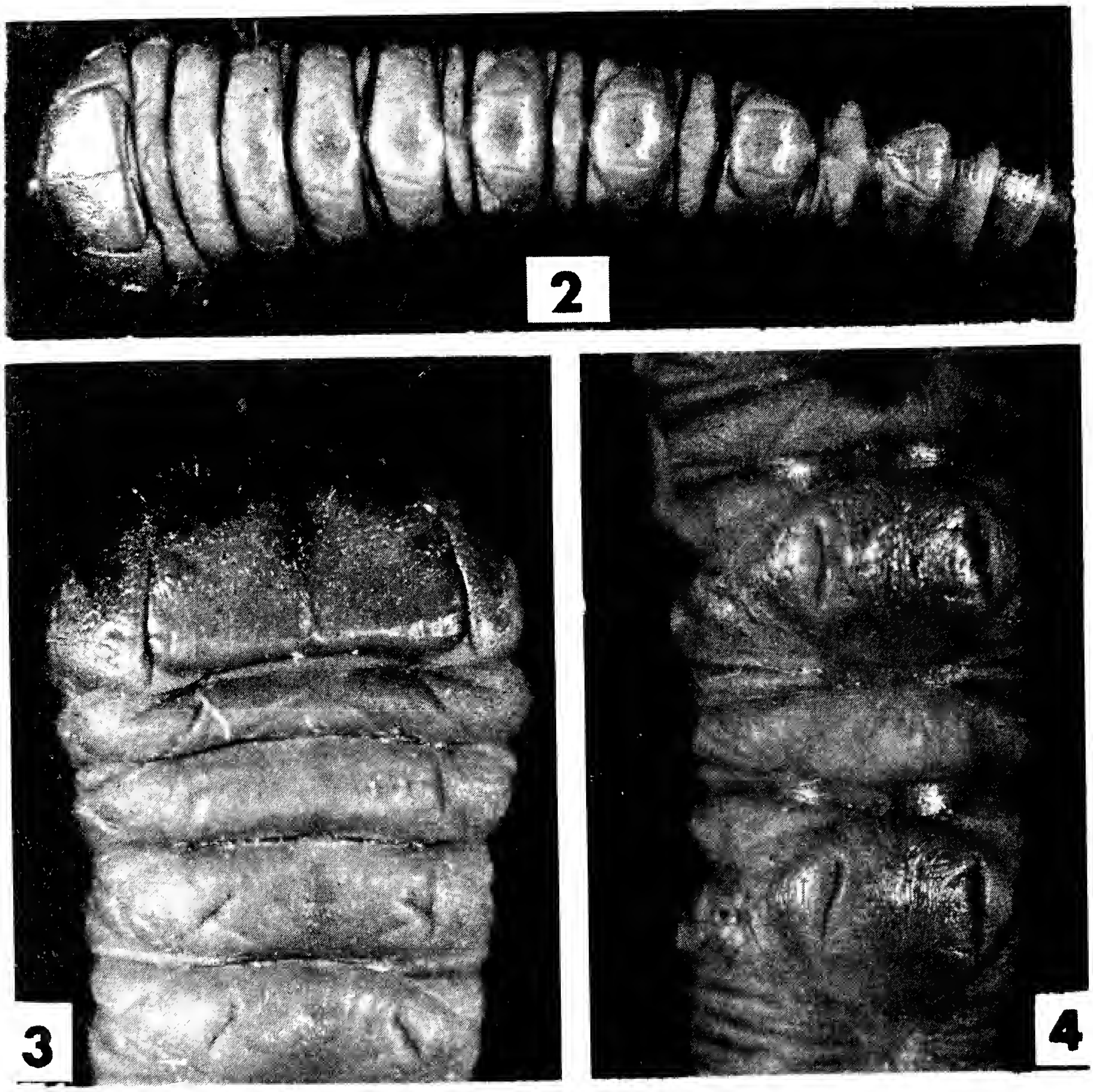

Fig. 2-4. *Dryobius sexnotatus* larva: 2) entire larva, dorsal view, actual length 32 mm (highlight on prothorax is unnaturally bright); 3) thorax and first 2 abdominal segments, dorsal view; 4) abdominal segments 5 and 6, dorsal view, showing ampullae.

larvae, of which 3 are apparently full grown, associated with a single adult in the collection of the U. S. National Museum of Natural History in Washington, D. C. The only collecting data with this series are "Maryland, *Tilia*, Hopkins U.S. No. 10635a.", but the labels with a pinned adult, bearing the same Hopkins number, indicate that the material was collected from *Tilia* on the Virginia-facing side of Plummers Island, Maryland (in the Potomac River) by H. S. Barber and F. C. Craighead, and that the rearing of the pinned specimen was completed on 16 July 1920. The technical terminology used here follows Duffy (1953).

With respect to subfamily characters, which are not included here, these larvae agree entirely with the characterizations of the Cerambycinae by Craighead (1923) and by Duffy (1953). They key to the tribe Callidiini in Craighead (1923), of interest because Linsley (1964) indicated that it is allied to the Callidiini on the basis of certain adult structures.

Maximum length: 32.0 mm; maximum width of prothorax: 7.7 mm. Form subcylindrical, slightly depressed across thorax, distinctly widest across prothorax (Fig. 2). Mandibles black, mouthframe piceous to reddish brown and broad enough at sides to narrowly enclose antennae; head capsule pale yellowish brown otherwise. Antennae of 3 distinct articles and salient, first article slightly longer than second. Genae sloping away from mouthframe; genal setae sparse and rather slender. Ocelli absent. Front margin of frons very dark and broadly emarginate. Hypostoma reddish brown, obliquely striate, distinctly emarginate at junction with submentum. Subfossal tubercle absent. Gula distinctly raised, its sutures diverging posteriorly. Mandibles faintly striate and bearing a shallow median longitudinal furrow on external surface. Process of maxillary palpifer distinct, not prominent. Second article of maxillary palpus slightly longer than first. Prothorax bearing 4 brownish dorsal plates behind anterior margin; opaque and sparsely punctate at sides; thinly clothed with yellowish-brown hairs on dorsolateral areas and on anterior half of the pronotum. Posterior third of pronotum less shining and darker than anterior half of the pronotum. Posterior third of pronotum less shining and darker than anterior portion, and finely reticulate, with median cleavage line raised (Fig. 3). Lateral furrows of pronotum distinct and deep (Fig. 3). Postnotal fold present behind pronotum (Fig. 3). Prosternum without a distinct eusternum. Legs distinctly 4-segmented, slightly longer than maxillary palpi. Dorsal and ventral ampullae of abdominal segments 1 to 7 rather prominent and (except on segment 7) without transverse furrows, but with distinct lateral furrows (Fig. 4); surface texture between lateral furrows longitudinally rugulose. Pleural discs distinct on abdominal segments 1 to 4, and depressed medially but without a sclerotized pit. Epipleurum distinctly more prominent on abdominal segments 7 and 8. Abdominal spiracles small, elliptical, without marginal chambers. Anal opening terminal, distinctly trilobed.

Flight Period

From collections and literature, we find the flight period ranges from 7 March to 7 September. However, most records (56.7%) are from 15 June to 15 July. Months and percentages of capture follow: March (1%), April (2.9%), May (1%), June (28.8%), July (57.6%), August (7.7%), September (1%). The males appear first and account for about 85% of the adult population (104 dated specimens consulted).

Distribution

This species has been recorded from 14 states (Fig. 5): Alabama (Haldeman 1847, LeConte 1850, LeConte 1859); Arkansas (LeConte 1850, OSU); Indiana (Linsley 1964, CU, FMNH, MCZ); Kansas (OSU); Kentucky (Linsley 1964, USNM, RHP, CMNH, MCZ); Louisiana (MCZ); Maryland (Linsley 1964, USNM, MCZ); Michigan (Linsley 1964); Missouri (Say 1823, Linsley 1964, MCZ); Ohio (Haldeman 1847, LeConte 1859, Dury 1902, Knull 1946, Linsley 1964, USNM, CU, CMNH, CAS, MCZ OSU, CINC); Oklahoma (Linsley 1964); Pennsylvania (Linsley 1964, RHP, RWS, CMNH); Tennessee (Jamerson MS., USNM, CU); and Virginia (Linsley 1964, USNM). Over 80% of the specimens were taken in the Ohio River Valley. The primary host, *Acer saccharum,* occurred abundantly in this area which was noted for its sugar maple industry over 50 years ago. Drs. Wingo and Enns tell us (pers. comm.) that the type locality, Loutre Island in the Missouri River, "lies about 8 miles east of Herman, Missouri in Warren County."

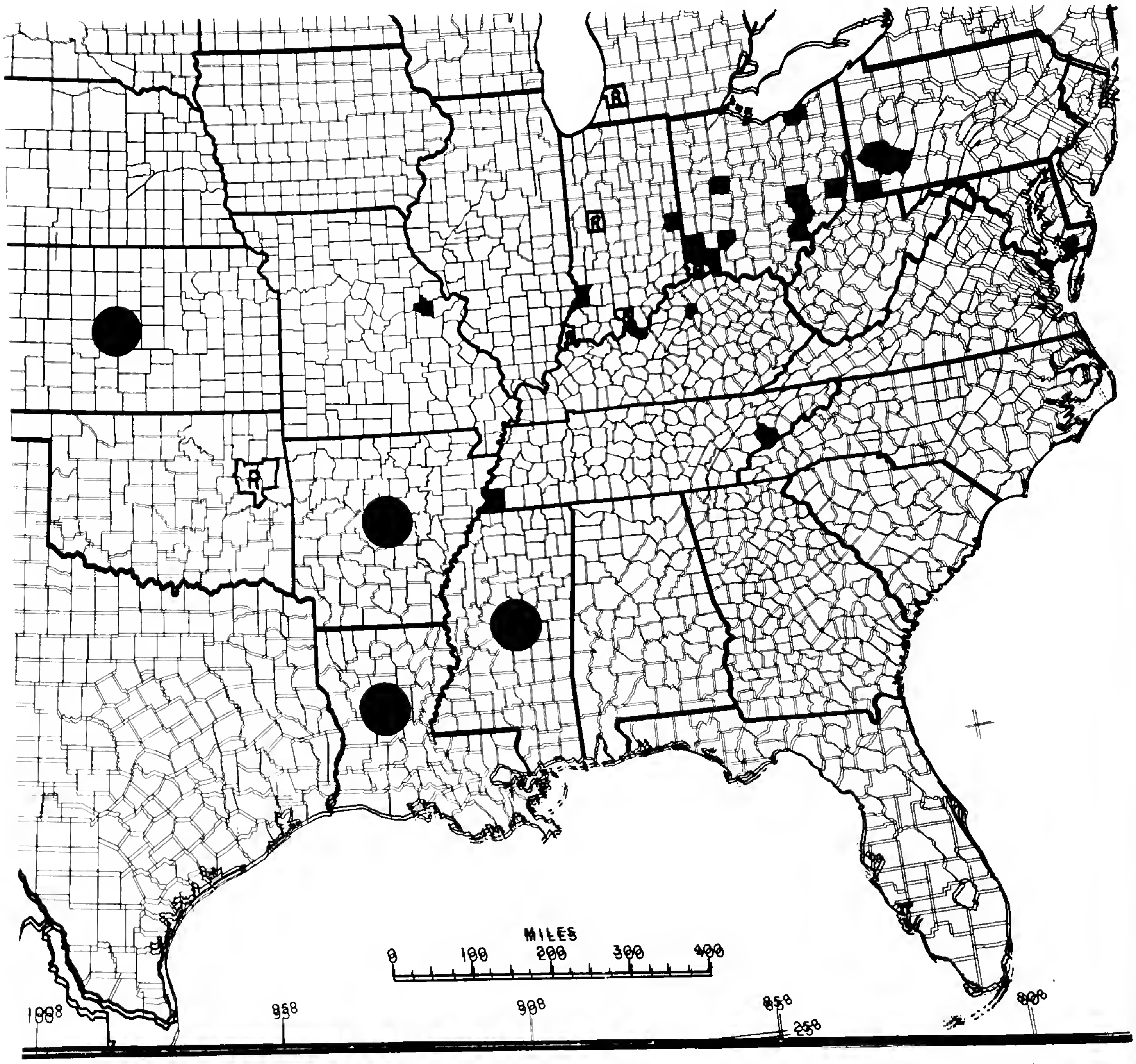

Fig. 5. Distribution of *Dryobius sexnotatus*: solid counties = specimens seen; R counties = recorded in literature but not examined by us; open circles = specimens with state data only.

Personal Observations

In Pennsylvania, all of the sugar maples observed were very old trees, at least 3 feet across, and all had once been tapped for syrup. This occurred prior to 1930, since the trees examined in the early 1940's showed no evidence of recent tapping, with all scars well healed over.

The beetles have been collected walking on the surface and flying (rarely) about the standing trunks of large sugar maples, under the loose bark of sugar maples and beech and secreted in cavities at the base of sugar maples. When beech is the host, it is only the dead trees with solid lower trunks, that are attractive to the beetle, never those with hollow trunks. The vivid coloration of the beetles is much less discernible when observed in the dappled sunlight of the partially shaded habitat.

Most diurnal activity occurred from about noon to mid-afternoon in heavily wooded situations and from midmorning until late afternoon among host trees that were more exposed to sunshine. An adult male was observed emerging on 7 Aug 1974 at 3:45 PM. Only 3 adults were observed at dusk and none was observed fully exposed after dark (however, some were taken hidden in cavities after dark). In flight, they were seen only within several yards of the host trees.

Most sites are located in stream valleys where humidity is usually high. However, periods of excessive humidity appear to be either fatal to the larvae or inhibit emergence, because during the abnormally wet summer of 1972 only 3 adult beetles were collected, although our observations were continuous during their flight period. Mating activity was observed during periods of high temperature. Oviposition was not observed.

There have been only 3 occasions during R. W. Surdick's 28 years of observations when adults were collected on a fallen trunk. The 3 specimens, secured on 3 separate occasions (1973) at dusk, were on a severed end of a fallen sugar maple that fell the previous year. They were fully exposed but appeared to be seeking a suitable retreat for the night.

After much of the bark had either fallen off or been removed from the standing trees in search of the beetles, a method of collecting was initiated that produced good results. Large slabs of fallen bark were leaned against the base of the tree and these were then carefully removed at intervals and examined for adults. When present, the beetles were found clinging to the trunk, but never on the loose bark. Dury (1902) reported trapping them "... by nailing slabs of loose bark on the dead tree trunks", and Siewers (1880) stated "I tied the bark on ..."

Of the 3 populations observed in Greene County, Pennsylvania, 1 appears to be extinct or disappearing, no specimens having been collected there for several years. This small area, called Dark Hollow, retained an isolated active population of *Dryobius sexnotatus* on dead and dying mature beech trees until 1960. More recent searching, especially during the summers of 1970-1973, failed to produce any beetles or any indication of their presence, even though a suitable host still exists (beech). There had been a stand of sugar maple growing among the beech at one time, and speculation exists that it was the original host. Apparently beech maintained the population for a decade but could not support it indefinitely.

A second site on Whitely Creek contained several old sugar maples which maintained a population of beetles for many years. This grove was cut over long ago and somehow managed to be spared, possibly because the wood was by then unsuitable for commercial purposes due to years of tapping. Successionally other hardwoods grew up and surrounded the few remaining old trunks which were still standing. Ultimately, a few beech began to die, and during the past few years these dead, standing trunks were host to a few *Dryobius sexnotatus*. However, few of the unsound beech remain, the trunks have fallen from natural decay as well as from the feeding of other larvae, principally *Bellamira scalaris* (Say) (Cerambycidae) and *Chalcophorella campestris* (Say) (Buprestidae). This area may support *Dryobius sexnotatus* for a few years since one old sugar maple with initial signs of infestation is still there.

The third site, Little Whitely Creek, also consists of an overgrown, former sugarmaking grove with remains of wooden structures used in the sugaring operation many years ago and a few old sugar maples that are slowly succumbing to the ravages of time. One standing dead trunk, a recently (1972) fallen tree, a partially dead trunk, and one healthy sugar maple are all that remain of the original 30-40 trees in this collecting site. Since beech never existed in or near this grove, over the period covered in this work, the population is assumed to be one of many continuous generations on sugar maple as a host.

Phoresy

Eight specimens of the pseudoscorpion, *Parachelifer superbus* Hoff, were collected from adult beetles. This species has been recorded from Florida,

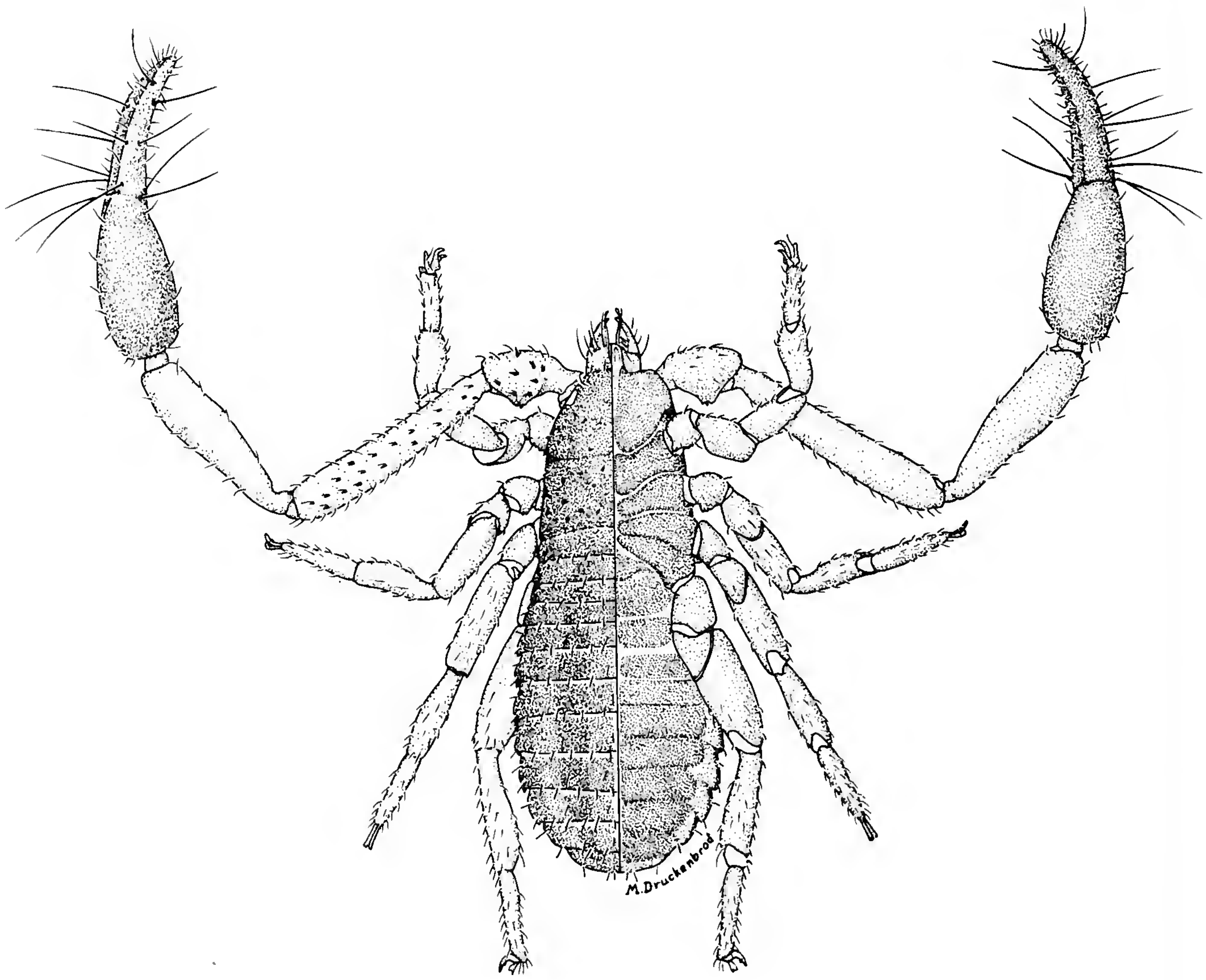

Fig. 6. *Parachelifer superbus* Hoff, male.

North Carolina, and Virginia; and this Pennsylvania material is a northern record. This species has been found almost exclusively associated with pines in Florida and North Carolina (although it has been taken on dead locust in Virginia by W. B. Muchmore). One pseudoscorpion was found on the dorsum of the abdomen under the wings. There appears to be a phoretic relationship between these 2 species in which the pseudoscorpion "hitchhikes" on the beetle from tree to tree. Muchmore (1971) discussed this phenomenon in greater detail. The pseudoscorpions are in the collection of R. W. Surdick (4), [FMNH] (1) [RHP] (1)., and Rebecca F. Surdick (3).

Summary

Dury (1902) noted that *Dryobius sexnotatus* was once abundant but was even then becoming rare. We have noted a sharp decline in the collection of this species since 1942 with the exception of the more than 110 specimens that R. W. Surdick and S. M. Gifford have taken since 1946 at the 3 previously mentioned localities in Greene County, Pennsylvania. This is 1 of the 3 counties where the species is still known to exist. Although *D. sexnotatus* can maintain itself on other hosts for a short period, its survival seems to depend on the availability of large, very old (overmature) sugar maple trees. These 3 counties still have some *Acer saccharum,* but the number of trees is diminishing and, so we believe, is the existence of *Dryobius sexnotatus.*

Acknowledgements

We would like to thank the following for the loan of specimens and assistance: Henry Dybas and Mike Prokop (Field Museum of Natural History [FMNH]), Thomas J. Henry (Pennsylvania Department of Agriculture), Lee Herman (American Museum of Natural History), Josef N. Knull and Charles Triplehorn (Ohio State University [OSU]), Hugh B. Leech (California Academy of Sciences [CAS]), Charles Oehler (Cincinnati Museum of Natural History [CINC]), L. L. Pechuman (Cornell University [CU]), Ted Spilman and John Kingslover (United States National Museum [USNM]), George Wallace (Carnegie Museum of Natural History [CMNH]), and Janice White (Museum of Comparative Zoology [MCZ]); for the identification of and information about the pseudoscorpion, William B. Muchmore (University of Rochester); for information about the type locality, Curtis Wingo and Wilbur Enns (University of Missouri-Columbia); for information on behavior, Samuel M. Gifford; for the color separations, Pittsburgh-Atlas Photoengraving Co. (Pittsburgh, Pa.); for the cover printing, Cox Lithographing Corp. (Warren, OH); for the illustration of the pseudoscorpion, Mike Druckenbrod (United States National Museum). Robert W. Surdick [RWS] did the color illustration of the *Dryobius,* and Donald M. Anderson took the photographs of the larva.

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BOOK REVIEW

Desert: The American Southwest (The Naturalist's America Series) 1973. Ruth Kirk. Houghton Mifflin Co., 2 Park St., Boston, Mass. 02107. $10.00. 361 p., with 17 color and numerous black and white photos.

This beautiful volume is the 3rd in "The Naturalist's America Series" designed to treat the wildlife, plants, and geology of North America. Every beetle collector will find useful information as well as enjoyable reading in this thorough treatise.—R. E. Woodruff

THE SYSTEMATIC POSITION OF *ASKLEPIA* LIEBKE, 1938, WITH THE DESCRIPTION OF A NEW SPECIES (COLEOPTERA, CARABIDAE)

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ABSTRACT

Asklepia ocellata, sp. n. (type-locality, Brazil, Amazonas, Tapuruquara), is described and compared to *Asklepia strandi* Liebke, 1938, the only species formerly known in the genus. The systematic position of the genus is discussed together with the structure of the tribe Lachnophorini of Carabidae.

The genus *Asklepia* was described by Liebke (1938:113) in a paper entitled "Denkschrift über die Carabiden-Tribus Colliurini". As mentioned in the introduction, Liebke considered Anchonoderini (at present part of Agonini), Ctenodactylini and most genera of Lachnophorini (both distinct tribes) as part of his Colliurini.

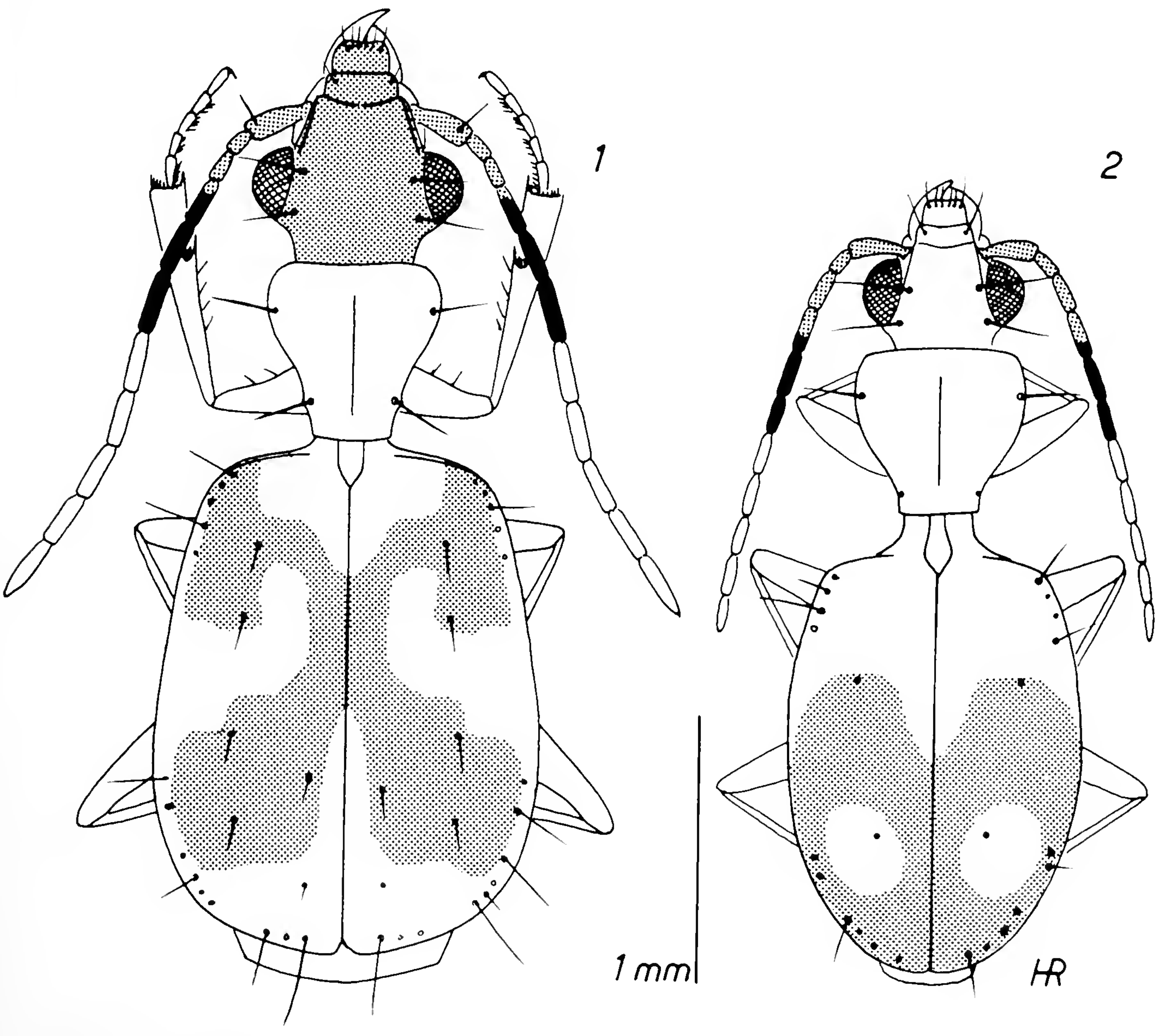

Fig. 1. *Asklepia strandi* Liebke (Santarém). Fig. 2. *Asklepia ocellata,* sp. n. (holotype).

The monotypic *Asklepia* (described for *strandi,* a new species from "Guiana"—the single known specimen, originally placed in Liebke's private collection, was most probably destroyed), is actually related to *Calybe* and *Ega,* both described by Castelnau, and any relation to Colliurini is due only to external resemblance.

Jeannel (1948:743) proposed the subdivision of Lachnophorini (his Lachnophoritae) in Lachnophorina (his Lachnophorini) and Selinina (his Selinini), based on the different form of the 2 apical segments of the maxillary palpi. In Lachnophorina the last segment would be "très renflé et pubescent", while in Selinina the last segment would be "subulé, très petit et glabre". Jeannel exemplified the palpi of Lachnophorina with *Ega sallei* Chevrolat, 1839 (Jeannel, 1948: fig. 252). I have not seen this species, but have studied several unidentified Brazilian species of *Ega,* as well as *Calybe basalis* Bates, 1871, and *C. puncticollis* Chaudoir, 1872, and in all species the structure of the maxillary palpi is that of *Asklepia strandi* Liebke, 1938 (fig. 4). This structure is reminiscent of the palpi of Bembidiini; in these Lachnophorini, however, the small apical point is not a distinct segment as in *Bembidion,* but part of the inflated apical segment. The subtribe Selinina of Jeannel must thus be suppressed.

These studies were based on the collection of the Museu de Zoologia, Universidade de São Paulo, in which 2 different species of *Asklepia* are represented.

Asklepia strandi Liebke, 1938 (fig. 1, 3-7), was collected by myself at light in the Brazilian state of Pará, at Santarém (2 males, 6 females) and Pacoval (1 female). These specimens agree with the original description; however, they

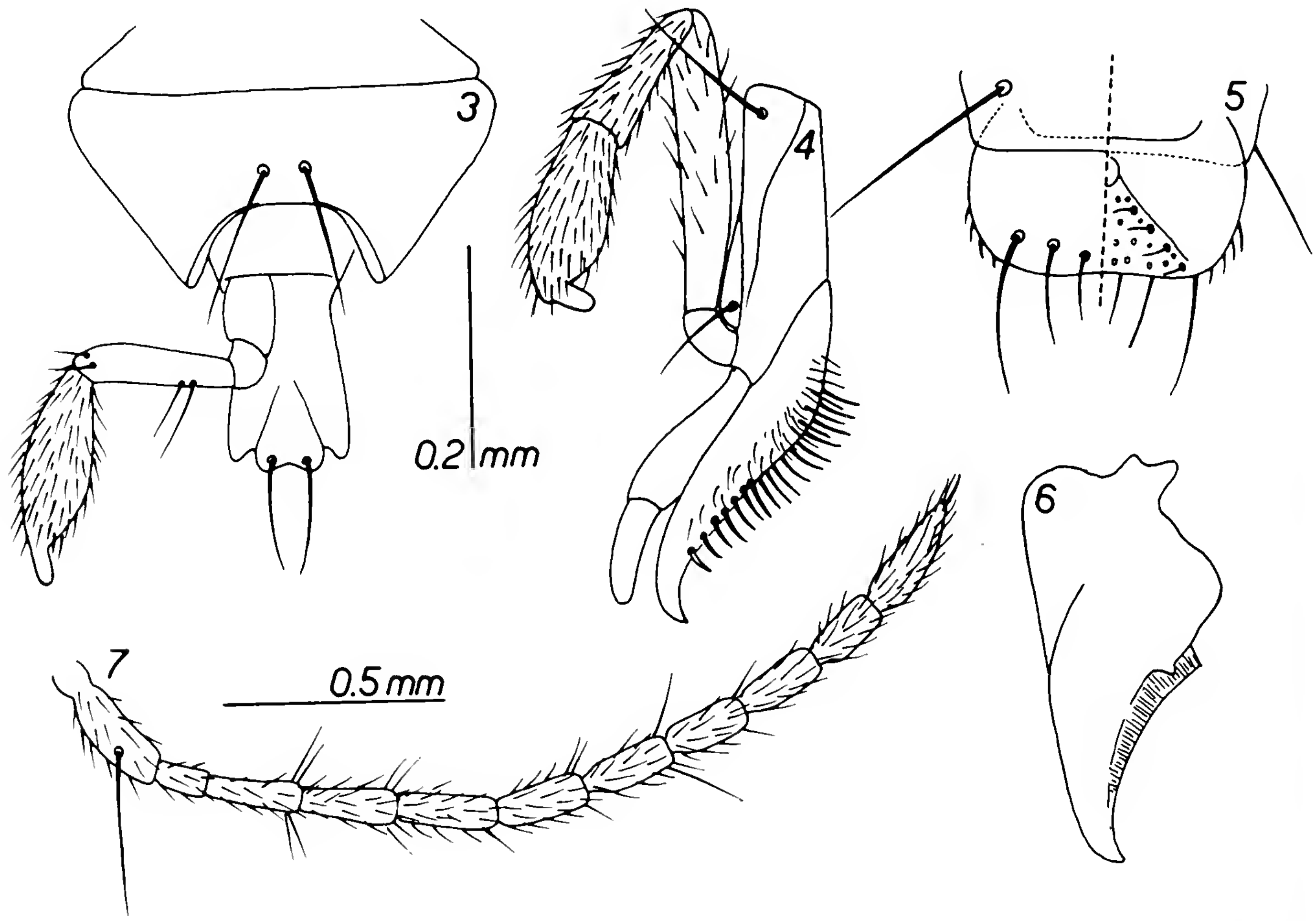

Fig. 3-7. *Asklepia strandi* Liebke (male from Santarém): 3) labium; 4) maxilla; 5) labrum (dorsal view on left, ventral view on right); 6) mandible; 7) antenna.

show that the elytral pattern is somewhat variable. As the original description, complemented by my illustrations, is sufficient for recognition, a redescription is unnecessary.

The second species is new, and is described below.

Asklepia ocellata Reichardt, **new species**
(Fig. 2)

Holotype and 6 paratypes, BRAZIL, *Amazonas*: Tapuruquara, 5-11.II.1963 (J. & B. Bechyné). 11 paratypes, *Pará*: Utinga, 25.IV.1961 (J. & B. Bechyné). 10 paratypes, *Mato Grosso*: Cuiabá, Fazenda Ricardo Franco, 15-16.III.1961 (J. & B. Bechyné). 3 paratypes, *Mato Grosso*: Itiquira, Rio Corrente, 6.VIII.-1973 (H. Reichardt & S.A. Vanin). 1 paratype, *Goiás*: Goiânia, 24-25.III.1961 (J. & B. Bechyné. 1 paratype, *Goiás*: 30 km N Gurupi de Goiás, 30.V.1966 (H. Reichardt).

Body light reddish-brown, except elytra, with a dark brown, almost black area in posterior half, as outlined in Fig. 2, with an enclosed, yellowish, ocellar spot on each elytron. Legs light testaceous. Antennae: 3 basal segments and basal 0.75 of IV, reddish-brown; apex of IV and segments V, VI, black; apical segments white. Total length, 2.9mm.

DISCUSSION: *Asklepia ocellaris* is readily distinguished from *Asklepia strandi* by a series of characters: much smaller size, head colored as pronotum (darker than pronotum in *strandi*), different shape of pronotum, and especially lack of the small angle at insertion of posterior pronotal setae; different shape of elytra, and especially different elytral pattern. In both species the elytra are very smooth, without striae (seen from certain angles, there is a slight indication of striation, especially near suture). The unstriated elytra, as well as the practically glabrous dorsal surface, distinguish the genus *Asklepia* from the remaining Neotropical Lachnophorini.

Asklepia ocellaris is a quite common species in the states of Mato Grosso, Goiás, and Pará. In Goiás (30 km N of Gurupi de Goiás) I have collected the species running along the sandy beach of a creek, together with a large series of an undetermined species of *Ega*; at Rio Corrente (State of Mato Grosso), the species was collected under leaves on wet rocks at the edges of a waterfall. This indicates that *Asklepia ocellata* occurs in riparious habitats.

Due to the very small size of the species, I was unable to sex the specimens. Front tarsi are apparently not furnished with papillate hairs, as I have observed in *Asklepia strandi.*

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AN IMPROVED METHOD OF MAKING ACCURATELY PROPORTIONED DRAWINGS

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A recent article by Moore (Coleopt. Bull. 28:26. 1974) on producing outline drawings, elicited enough interest that it seems worthwhile to document a simplification or refinement of that method.

Scientific illustrations continue to be one of the best means of describing minute organisms. Unfortunately, the majority of people who need accurate drawings to impart their research findings possess little artistic ability. Further, a professional scientific illustrator's services may be too costly or not available at the time the drawing is desired. Various drawing techniques have been used in order to achieve the highest degree of precision with a minimum of drawing ability and time investment. Among the more accurate methods of producing drawings is one described by D. M. Anderson (Bio Science. 16:758-759. 1966). Anderson's technique involved the use of a model 900 Polaroid Land Camera which accepts black and white transparency film. Once the photograph is taken the transparency is cut to fit a 2 × 2 inch glass super slide. It is then projected with the aid of a slide projector onto a sheet of drawing paper. After careful focusing, the image is then traced.

The procedure followed by Moore makes use of the model 350 Polaroid Land Camera adapted to the ocular of either a dissecting or compound microscope for obtaining black and white prints. The prints are then enlarged to a suitable size from which a tracing is made. The tracing is then reproduced on drawing paper as an ultimate outline drawing, with the aid of a well-illuminated tracing table.

Our improved method employs the use of an opaque projector. It provides a more efficient means of getting from the polaroid print to the finished inked drawing. Black and white polaroid prints are taken in the same manner as described by Moore. As soon as the print is coated and dry it is ready to be projected. For this we use an American Optical Opaque model 3525. Opaque projection provides a sharp image with good definition over a wide range of enlargement sizes as determined by the projection distance. The unit we employ is designed for wall (horizontal) projection. However, desk or table (vertical) projection would further facilitate drawing. Horizontal tracing is accomplished by taping drawing paper to the wall after centering it on the projected image. Tracing is done in pencil, later to be inked. The degree of detail copied is left up to the individual within the limits of the quality of the print. Further details and final finish are added later when the drawing is compared with the specimen as seen through the microscope.

RECLASSIFICATION, SYNONYMY, AND DESCRIPTIONS OF SOME NORTH AND CENTRAL AMERICAN CERAMBYCIDAE (COLEOPTERA)

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ABSTRACT

Synonymies and new combinations are presented for primarily Mexican Cerambycidae. In the subfamily Cerambycinae, taxa are in the tribes Purpuricenini, Trachyderini, Elaphidionini, Hesperophanini, Molorchini, Clytini, and Anaglyptini. Tribe Holopleurini, new tribe is proposed and characterized. In the subfamily Lamiinae, items in the tribe Tetraopini are listed along with the description of a new genus, *Mecasoma*.

During the course of preparation of a checklist of Cerambycidae of North and Central America and the West Indies, it has seemed desirable to incorporate certain changes in nomenclature, synonymy, and classification. Since Blackwelder (1946) published his checklist of the New World Cerambycidae, many new taxa have been described. Also, the availability of much additional material, primarily from the tropics, and an opportunity to examine the collections of Cerambycidae at the British Museum (Natural History) and Musée d'Histoire Naturelle, Paris, has contributed to a better understanding of the New World fauna.

Rather than publishing the changes in a checklist, we are presenting the new combinations, generic transfers, synonymies, and a description of one necessary new genus and tribe below.

These studies were made in conjunction with a National Science Foundation sponsored grant (GB-4944X) on North American Cerambycidae.

Subfamily Cerambycinae
Tribe Purpuricenini

Callona praestans (Casey) 12-320, **new combination.** Transferred from the genus *Crioprosopus* Serville. Casey (1912) allied this species with *Crioprosopus iridescens* White which was transferred to *Callona* Waterhouse by Linsley (1962) on the basis of the metallic elytra and sexual dimorphism of the pronotum.

Callona praestans semiplicatus Casey 12-320 = *C. praestans* Casey, **new synonymy.**

Chlorida Serville 34-31 transferred from the tribe Hesperophanini.

Chrotoma Casey 91-27 transferred from the tribe Hesperophanini.

Crossidius nigrescens Chemsak 59-113 = *Deltaspis alutacea* Bates 85-323, **new synonymy.**

Deltaspis fulva Bates 92-174 = *Deltaspis rubens* Bates 85-323, **new synonymy.**

Deltaspis tumacacorii (Knull) 44-91, **new combination.** Transferred from *Crossidius* LeConte.

Deltaspis cruentus (LeConte) 62-42, **new combination.** Transferred from *Crossidius.*
Elytroleptus Duges 79-182. Transferred from the Pteroplatini.
Mannophorus ferreus Bates 80-82=*Mannophorus laetus* LeConte 53-442, **New synonymy.**
Metaleptus lecontei (Casey) 12-325, **new combination.** Transferred from *Purpuricenus.*
Metaleptus binoculus Bates 72-193=*Metaleptus angulatus* Chevrolat 34-67, **new synonymy.**
Metaleptus coccinatus Bates 72-193=*Metaleptus angulatus* Chevrolat 34-67, **new synonymy.**
Parabatyle inflaticollis (Linsley) 35-101, **new combination.** From *Stenobatyle* Linsley.
Parabatyle eburata (Chevrolat) 62-755, **new combination.** From *Entomosterna.*
Parabatyle miniaticollis (Chevrolat) 62-756, **new combination.** From *Entomosterna.*
Parabatyle prolixa (Bates) 92-180, **new combination.** From *Entomosterna.*
Parabatyle trucidata (Chevrolat) 62-755, **new combination.** From *Entomosterna.*
Parevander Aurivillius 12-453. Transferred from the Pteroplatini.
Parathetesis Linsley 61-7. Transferred from the Pteroplatini.
Pteroplatidius Linsley 61-8. Transferred from the Pteroplatini.
Stenobatyle Casey 12-326=*Parabatyle* Casey 12-331, **new synonymy.**
Stenobatyle cribrata Casey 12-331=*Parabatyle miniaticollis* (Chevrolat) 62-756, **new synonymy.**
Zenochloris Bates 85-311. Transferred from the Heteropsini.

Tribe Trachyderini

Trachyderes spinicollis Bates 85-332=*Dendrobias mandibularis* Serville 34-42, **new synonymy.**

Tribe Elaphidionini

Anelaphus misellus (Bates) 80-251, **new combination.** Transferred from *Peranoplium.*
Aneflus longissimus (Bates) 85-250, **new combination.** Transferred from *Elaphidion.*

Tribe Hesperophanini

Knullanoplium Linsley 57-16=*Cacophrissus* Bates 85-252. **new synonymy.**
Knullanoplium subpubescens (Schaeffer) 09-100=*Cacophrissus pauper* Bates 85-252, **new synonymy.**

Tribe Molorchini

Oxycoleus bicolor (Melzer) 34-214, **new combination.** Transferred from *Merionoedea.*
Oxycoleus culicina (Bates) 70-315, **new combination.** Transferred from *Merionoedea.*
Oxycoleus gratiosa (Bates) 85-287, **new combination.** Transferred from *Merionoedea.*
Oxycoleus clavipes Lacordaire 69-485. Returned to *Oxycoleus* from *Merionoedea.*

Tribe Clytini

Clytopsis nimbata Casey 12-373 = *Clytopsis dimidiaticornis* (Chevrolat) 60-487, **new synonymy.**
Ochraethes nigropunctatus (Chevrolat) 60-486, **new combination.** Transferred from *Tanyochraethes.*
Ochraethes brevicornis Chevrolat 60-480. Returned to *Ochraethes* from *Triodoclytus.*
Ochraethes virescens Chevrolat 60-481. Returned to *Ochraethes* from *Triodoclytus.*

Tribe Holopleurini Chemsak & Linsley, **new tribe**

Form moderate sized, depressed, pubescence minute. Head rather small, front short; eyes finely faceted, deeply emarginate, not embracing antennal insertions; palpi slightly unequal, slender; ligula membranous; mandibles short, stout, apex acute; antennae slender, longer than body in males, second segment short. Pronotum rounded at sides; prosternum with coxae small, weakly transverse, coxal cavities moderately angulate externally, open behind, intercoxal process rather broad, flat; mesosternum with intercoxal process broad, coxal cavities open to epimeron; metasternum with episternum slender, gradually tapering posteriorly. Elytra with epipleurae flaring toward apices, sides delimited by strong costae beginning behind humeri; disk with a shallow oblique costa on each side at about basal 1/4; wings with a simple postcubital vein. Legs with femora weakly clavate.

The genus *Holopleura* has been placed in the Pteroplatini on the basis of the posteriorly expanding epipleurae of the elytra. However, this is a superficial character, and *Holopleura* differs markedly from the Neotropical group Pteroplatini by the slender, unfringed antennae, rounded pronotum, angulate front coxae, broad, flat intercoxal process of the prosternum, and nonexpanded elytral apices. The Holopleurini appear to have strong affinities with the Callidiini and could be placed with them except for the small palpi, weakly angulate front coxae, feebly clavate femora, and the small second segment of the antennae.

Tribe Anaglyptini

Aphysotes Bates 85-307. Transferred from the Tillomorphini.
Clytoderus Linsley 35-89. Transferred from the Tillomorphini.
Diphyrama Bates 72-187. Transferred from the Tillomorphini.

Subfamily Lamiinae
Tribe Tetraopini

Mecasoma Chemsak & Linsley, **new genus**

Form moderate sized, depressed, elytra slightly expanding behind middle. Head small, narrower than pronotum; front short, finely impressed; vertex broad, concave between antennal tubercles; palpi unequal, slender; antennae short, barely attaining middle of elytra in males, segments from fifth short; eyes finely faceted, divided, lobes connected by a line. Pronotum broader than long, sides rounded with an obtuse tubercle on each side near base; disk convex, feebly impressed across middle at base; prosternum narrow, impressed at apex, intercoxal process narrow, expanded at apex, coxal cavities

closed behind, angulate externally; mesosternum with intercoxal process short, flat; metasternum with episternum narrow, slightly tapering posteriorly. Elytra less than 2.5 times as long as broad, slightly expanding posteriorly; apices broadly rounded. Legs short; middle pair with sinus; tarsal claws with a short broad, internal tooth.
Type species: *Tetrops validicornis* Bates.

This genus differs from the Old World *Tetrops* by the shorter antennae, larger broader scutellum, transverse, bituberculate pronotum, and expanding elytra. The short antennae and distinctive pronotum should distinguish *Mecasoma* from its New World relatives.

The species *validicornis* was originally described from Oaxaca, Mexico. The type has brownish elytra and is a rather small individual of this species. We have examined a series from 9 miles W. Tepatitlan, Jalisco, Mexico, 3-5-VII-1953 (C. & P. Vaurie) most of which are larger than the type and have black elytra. Only 3 of 16 individuals possess coloration similar to the type.

Phaea canescens (LeConte) 52-157, **new combination.** Transferred from *Tetrops.*
Phaea monostigma (Haldeman) 47-57, **new combination.** Transferred from *Tetrops.*

Literature Cited

Blackwelder, R. E. 1946. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 4. U. S. Nat. Mus. Bull. 185:551-763.

BOOK REVIEW

The grants register 1973-75. Editor: Roland Turner. 1973. St. Martin's Press, 175 Fifth Ave., N. Y., N. Y. 10010. $17.50. 685 p.

In this huge volume are listed 1,927 awards available from governmental and, national, or private organizations. These include scholarships, fellowships, research grants, exchange opportunities, prizes, honoraria, and similar awards. New editions of the work appear every two years. The awards are subject indexed for each country under the following headings: 1) all subjects, 2) creative arts, 3) humanities, 4) social sciences, 5) natural and mathematical sciences, 6) applied sciences, engineering and technology, 7) medical & health sciences, 8) agricultural and veterinary sciences, 9) natural resources & environmental protection, 10) education and teaching, 11) social development & welfare, 12) professions & occupations. There is also an index of awards and awarding bodies.—R. E. Woodruff

DESCRIPTIONS OF LARVAL CARABIDAE I.[1]

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ABSTRACT

Descriptions and illustrations are provided for the following species: *Notiophilus novemstriatus* Say, *Pasimachus elongatus* Lec., *Agonum punctiformis* Say, and *Chlaenius prasinus* Dej. They are compared with other known larvae in each respective genus.

Many species belonging to the beetle family Carabidae are important predators of other arthropods, but it has been impossible to carry out complete ecological studies on the group because most larvae have not been described and are therefore unidentifiable. For several years, studies on many aspects of the ecology and biology of Carabidae have been in progress in Arkansas. During this time, the authors have attempted to rear field collected larvae in order to associate immature stages with adults. In this paper, larvae of *Notiophilus novemstriatus* Say, *Pasimachus elongatus* Leconte, *Agonum punctiformis* Say, and *Chlaenius prasinus* Dejean are described and compared with previously described species in the genus where possible.

METHODS AND MATERIALS

All larvae were tentatively identified to genera with the aid of Van Emden's (1942) key. Identifications were correct in each of the cases where larvae were eventually reared to the imago. All measurements were made with an ocular micrometer in a stereoscope. All descriptions were taken from third instar larvae unless otherwise stated.

COLLECTING DATA

Larvae collected in pitfall traps in a loblolly pine wood lot on the Arkansas Agricultural Experiment Station's main farm, Washington County, Arkansas, were identified as belonging to the genus *Notiophilus*. Numerous adults of *N. novemstriatus* were also collected in these traps. This is the only species in the genus that has been collected in Arkansas. No larvae were reared to adult, but we assume they are *N. novemstriatus*. The pitfall traps were in continuous operation for an entire year. Larvae were collected on the following dates in 1971: (number of larvae in parentheses) March 25(6): April 9(3), 16(1), 26(12), 30(2); May 7(5), 10(8), 20(5), 28(2).

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[2]We thank Sarah McCuisiton for preparing the illustrations.

In the case of the following 3 species, *P. elongatus, A. punctiformis* and *C. prasinus,* not all larvae collected were reared to the adult stage. The unreared larvae were identified by comparing them with the exuviae of reared specimens and also with live larvae that were eventually reared to the adult stage.

P. elongatus larvae were collected at 3 localities. The 1 larva reared to adult was collected by hand under a rock in a grassy meadow on 8 May 1970, on the Wichita National Wildlife Refuge near Lawton, Oklahoma, in Comanche County. Six additional larvae of *P. elongatus* were collected as follows: White River National Wildlife Refuge, Arkansas County, Arkansas, pitfall traps in grassland, 9 June 1969(1); 9 July 1969(1), 28 July 1969(1); 27 August 1971(1); same locality, hand collected, forest duff 13 September 1971(1); Fayetteville, Washington County, Arkansas, hand collected, soil in a flower bed 4 June 1971(1).

A. punctiformis was collected at Pickens, Desha County, Arkansas, where 35 larvae were collected in a field which had soybeans the previous summer. The upper 2 to 3 inches of soil was turned, and larvae were easily found. These specimens were collected on the following dates: 2 February 1971(4); 4 March 1971(24); 13 March 1971(7). Eight larvae from the 4 March collection and 2 larvae from the 13 March collection were reared to adults.

Fourteen *C. prasinus* larvae were collected on the shore area of Lake Wilhelmina in Polk County, Arkansas, on 16 September 1970. During the day larvae were collected under rocks near the shore line. A head light was used to collect at night in the same area when the larvae were active on the open ground. Three larvae were reared to adults.

Rearing Procedures

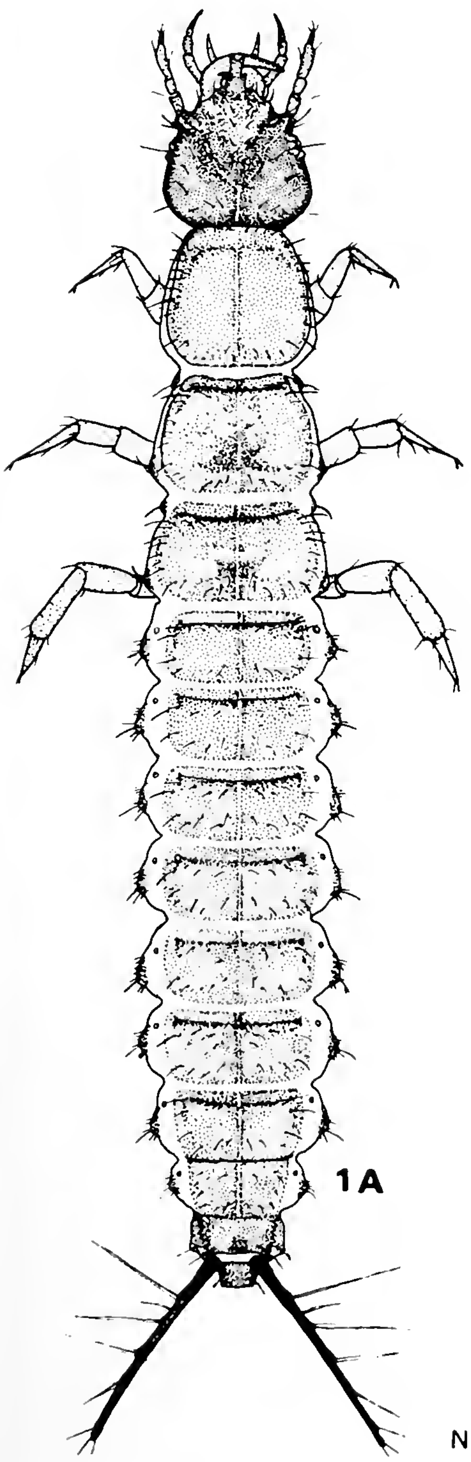
A. punctiformis and *C. prasinus* were reared in 2 oz salve tins containing a small amount of soil (Dogger & Olson, 1966). *P. elongatus* was reared in an 8 oz plastic butter container with 1 inch of soil in the bottom. The 2 oz tins were too confining for the large *P. elongatus* larva. Larvae of the yellow mealworm, *Tenebrio molitor* L., were used as a food source.

Descriptions

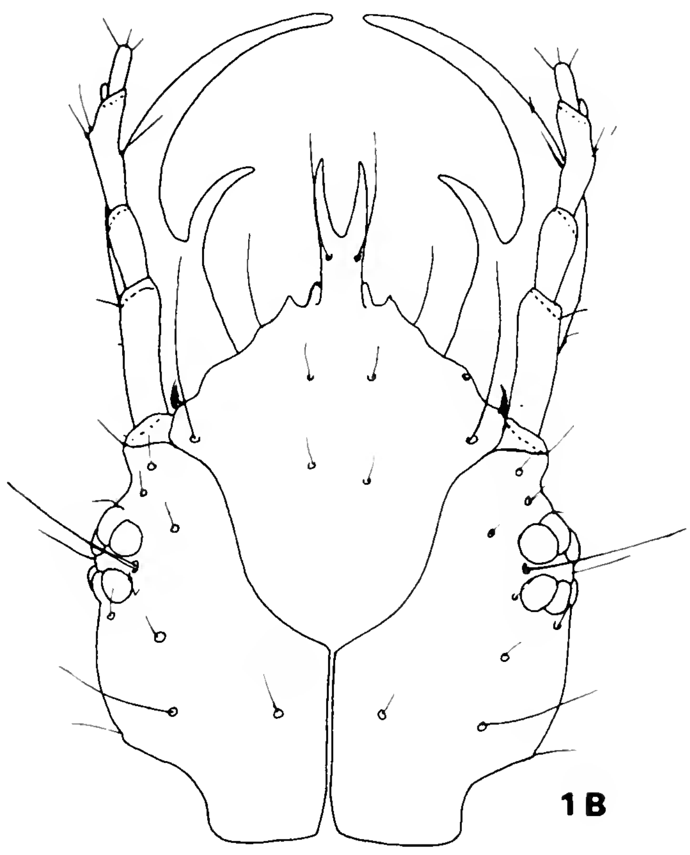
Notiophilus novemstriatus Say
(Fig. 1A, 1B, 1C)

General Description (Fig. 1A): Mature larvae small, ranging 6.0 to 8.5mm. Head oval, dark brown to black, thoracic tergites similarly pigmented. Legs yellow to white. Neck constricted. Middle segments of abdomen widest. Cerci articulating, black, short, diverging, with setiferous nodes. Mandibles long, yellow, curved distally with large curved retinaculum. Nasale a large central projection with a pair of diverging teeth on apex. Abdominal tergites darkly pigmented. Abdominal sternites lightly pigmented with posterior areas membranous and white. Antennae yellowish to white with base of article I black, article II uniformly brown, article III brown becoming darker distally, article IV uniformly dark brown.

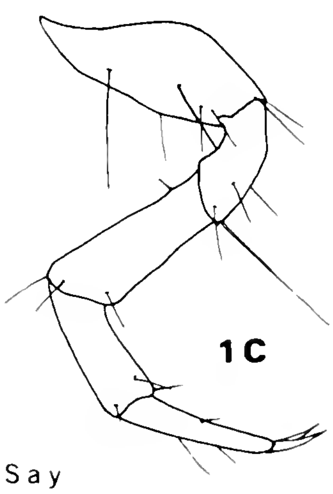
Head (Fig. 1B): *Antennae* subequal in length to mandibles. Article I subcylindrical, 0.33 longer than article II, subequal to article III and glabrous except for a dorsolateral seta on distal end. Article II glabrous, club-shaped, subequal to article IV. Article III narrow at base, bearing sensory nodes distally and encircled near middle by 3 prominent setae. Article IV cylindrical, truncate apex encircled with prominent setae, apex with minute setae. *Mandibles* slender, sharp, approximately 5 times longer than basal width, distal 0.66 strongly curved, bearing a small lateral seta; ventral bases yellowish-white. Retinaculum slender, sharp, longer than basal width of mandible, curving sub-parallel with mandible. *Maxillae* yellowish-white, widely separated, pointing ventrolaterally. Stipes slightly club-shaped, prominent seta located distally opposite to outer lobe. Inner lobe absent, replaced by a strong prominent seta adjacent to its normal position. Outer lobe small, 2 articles. Article 1 short and globose; article 2 is 3 times as long as article 1, apex acute. *Labium* equilateral, ventral and lateral aspect sclerotized with dark brown pigmentation, dorsal aspect membranous, white, bearing a prominent seta at base of palpiger. Labial palpus, 2 articles, glabrous, pointing ventrally, usually dark brown, ultimate segment almost black. Article 1 short, stout, subcylindrical, equal to width of antennal article I. Article 2 long, slender, tapering to an acute apex and equal to ultimate article of maxillary palpus,



1A



1B



1C

Notiophilus novemstriatus Say

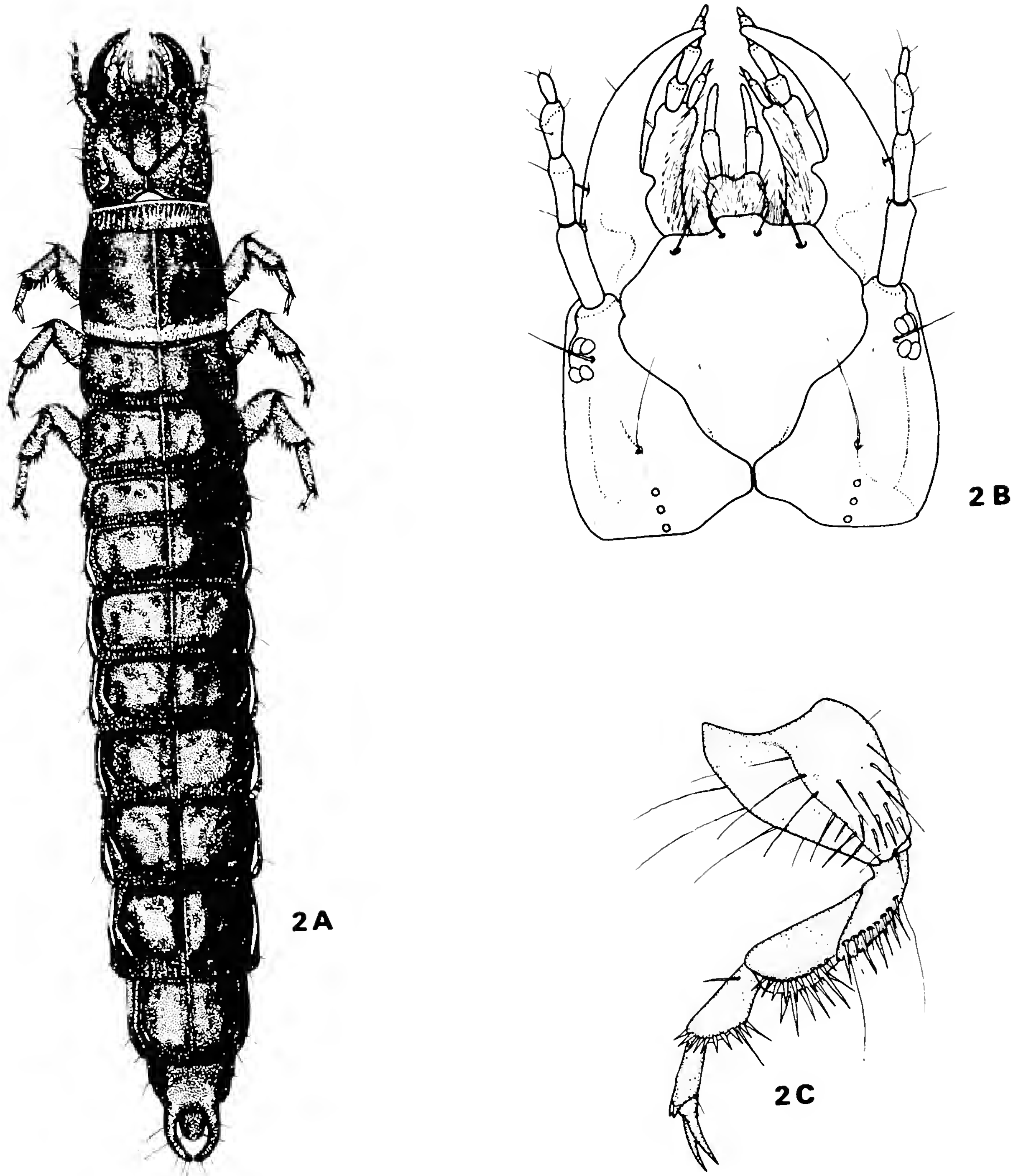
bearing 2 dark brown diverging setae. *Nasale* extending forward obscuring medial mouth appendages (labium and most of stipes), rounded, a large central bifurcate horn, a pair of small sharp teeth located ventrally at base of horn on each side. A pair of teeth, subequal in length located ventrobasally, but slightly laterad to the previous pair. Two setiferous nodes located on anterior edge between base of antennae and first tooth. Distal node small, adjacent to base of tooth, bearing fine setae. Second node quite large, much broader than secondary teeth, bearing a prominent seta directed anteriorly which become finer in last instar. The base of the bifurcate horn bears a pair of setae located laterally. Adnasale bears a prominent seta at the anterior angle of the frontoclypeal plate adjacent to antennal base. *Fronto-clypeal plate* slightly convex, sloping from medial ridge to sides, black, fading to yellowish-brown anteriorly, short, not reaching hind margin of head capsule, leaving the *ecdysial cleavage line* long and well developed. Cervical groove absent. Head capsule constricted caudally, 0.5 width of head. Setal pattern of head shown in Fig. 1B. *Eyes* composed of 6 subequal ocelli arranged in 2 transverse arcs of 3 ocelli each. Dorsal ocular seta large and located nearer anterior arc; ventral seta smaller, located more or less centrally at ends of arcs, not visible dorsally.
THORAX: *Prothoracic shield* oval, dark brown to black, with a lighter band across posterior 0.20, bearing numerous prominent setae on lateral margin from posterior angle to near middorsal line, small patch of sparsely separated setae near middorsal line just anterior to posterior band. *Middorsal line* distinct on all tergites. *Meso-* and *metathoracic tergites* dark pigmented with lighter band on posterior 0.25. Setal patterns similar to prothoracic tergite except setae on anterior aspect lacking. Anterior margin of mesothoracic tergite slightly arched. *Prosternite* cresent-shaped, lightly pigmented, curving around ventral "neck" region, bearing a pair of prominent setae on anteromedial aspect. *Episternite* of pro- meso- and metathoraces rectangular with lateral coxal articulations and bearing setae. Mesosternite oval, lightly pigmented, bearing 2 prominent setae posteriorly. Two small circular sclerites bearing a single seta each located near anteroventral junction of meso- and metathoraces, anterior to sternites and lateral to midline. Metasternite larger than mesosternite, both oval, lightly pigmented, bearing 2 pairs of setae. One pair located laterally near middle of sternite; other pair located posteromedially. *Legs* short (Fig. 1C), lightly pigmented, becoming darker toward ends. Coxa of prothorax lightly pigmented. Meso- and metathoracic coxae dark brown except for yellowish to white in distal 0.33. *Mesothoracic spiracle* large with circular black peritreme.
ABDOMEN: *Abdomen* increasing in width from segment I to segment IV or V then decreasing to ultimate segment. *Tergites* subequal in width and length except tergite of segment I narrower and shorter. Setal pattern similar in segments I-VIII with a line of prominent setae on lateral margin and across posterior margin, just anterior to light band on each tergite. Spiracles on abdominal segments small with circular black peritremes. *Epipleurites* (Fig. 3D, ep) of segments I-VIII dark brown to black lobes bearing 2 prominent setae located transversely on the obtuse apexes among numerous lesser setae. *Hypopleurite* (Fig. 3D, hp) elongate, 0.33 the length of segment, rounded anteriorly and posteriorly, bearing 3 prominent setae, 2 posteriorly, 1 anteriorly. *Lateral postventrite* (Fig. 3D, lpv) divided; posterior section 5 times larger than anterior section and typically bearing 4 setae while anterior section bears 1. Anterior section often lacking in segments VII and VIII. *Medial postventrite* (Fig. 3D, mpv) subrectangular, typically bearing 2 setae.

Ventrite (Fig. 3D, ven) large, ovular, bearing 4 prominent setae transversely at middle and 2 lesser setae near posterior edge. Ventral abdominal sclerites brown to dark brown. Ventrites of segments VIII and IX fused with lateral medial postventrites. Setal pattern same as previous segments. Segment IX bearing a pair of articulating, black, diverging *cerci* subequal in length to the 3 thoracic segments combined. Cerci taper slightly to obtuse apexes, bearing 8 to 9 setiferous nodes with a seta on each. Five conspicuous nodes on the length of each cercus and 3 lesser nodes encircling extreme apex which may bear 2 to 3 minute setae. Tenth segment stout, truncate, subconical, membranous on lateral aspects, terminating with a large anal orifice. Anal crochets absent.
Comments and Comparisons: Lindroth (1969) reported that of the 14 species of *Notiophilus* known from North America the larvae of 2 species (*N. aquaticus* and *N. biguttatus*) had been described. The larvae of both species were described and illustrated by Schiodte (1867).
Translation of these descriptions was not available, but illustrations of *biguttatus* were fairly complete, although only the cerci were illustrated for *aquaticus*. We utilized these illustrations for comparative purposes. In *aquaticus* the cerci are divergent in the basal 0.5 and subparallel distally. In *biguttatus* and *novemstriatus* the cerci are divergent their entire length. The general appearance of *biguttatus* presented by Schiodte is very similar to *novemstriatus*. The only obvious difference is the presence of 4 large dorsolateral depressions on the frontoclypeal plate of *biguttatus* (lacking on Van Emden's [1942] illustration of same). These depressions not present on *novemstriatus*. The illustration of the head (dorsal view) of *biguttatus* by Van Emden (1942) has several features comparable to *novemstriatus*. On close examination, a number of subtle differences appear: 1) the eyes of *biguttatus* appear considerably smaller than *novemstriatus*; 2) *biguttatus* bears 2 setiferous nodes on the anterolateral edge of the nasale, *novemstriatus* only 1; 3) the nasale of *biguttatus* is not as produced as in *novemstriatus*; 4) the teeth at the base of the "horn" are more produced in *biguttatus*; 5) the setal arrangement on the head of the 2 species is different.

Pasimachus elongatus Leconte
(Fig. 2A, 2B, 2C)

General Description (Fig. 2A): Mature larvae large, ranging 40 to 50 mm. Head trapezoidal, dark reddish-brown to black, typically darker than thoracic tergites. Legs short, stout, reddish-brown. Neck not constricted. Thoracic segments normally widest. Cerci dark reddish-brown, shorter than segment X, curving ventrally, converging distally. Mandibles moderately long, coloration as head, moderately curved, retinaculum small. Nasale blunt. Abdominal tergites covering entire dorsum, contiguous, reddish-brown, margined laterally and posteriorly darker reddish-brown to near black. Antennae shorter than mandibles, 4 articles, same coloration as head with distal ends of each article typically membranous white.
Head (Fig. 2B): *Head capsule* slightly wider than long, excluding mandibles, total length slightly longer than prothorax, caudal width subequal to anterior width of prothoracic sclerite. *Antenna* of 4 articles; reddish-brown, total length less than mandibles. Articles I and II glabrous, subequal in length. Article I subcylindrical, sometimes margined distally with a membranous band of lighter reddish-brown to white. Article II club-shaped, distal end with light membranous band, noticeably shorter than article I and II, bearing 3

prominent setae, 1 on each lateral aspect on distal 0.33, third seta middorsal behind middle. Article IV club-shaped, 0.33 length of article II, distal end light, encircled with 3 prominent setae, a minute seta often on extreme apex. Bands of very light color on distal ends of articles become darker in latter stage of third instar, also true of other segmented head appendages. *Mandibles* slightly recurved, rather heavy, black at apex and dark reddish-brown at bases. Retinaculum small, blunt, located behind middle. Mandibles bearing 2 prominent lateral setae; a short stout seta on base, a longer stout seta behind middle, even with proximal slope of retinaculum. *Labial palps* reddish-brown, 2 articles, situated on a slightly darker Y-shaped base. Base densely covered dorsally by long fine setae with no evident pattern, all projecting forward.



Pasimachus elongatus Lec.

Ventral side glabrous except for 2 prominent lateral setae just past middle. Articles of palpus glabrous, subequal in length. Article 1 club-shaped with distal end lighter. Article 2 cylindrical, slightly enlarged midway, distal 0.33 sloping to truncate apex. *Maxillary* stipes long, curved, converging distally, with numerous lines of long fine setae on dorsal side running entire length from dorsal midline to lateroventral, 2 long, heavier setae present on distal ends on ventrolateral edge (often obscured by dense fine setae). Maxillary palpi of 4 articles, reddish-brown with light bands on distal ends of articles 1 to 3. Article 1 short, slightly more than 0.5 the length of article 2 with 1 long, stout seta near ventral base. Article 2 longest of the 4, glabrous, club-shaped. Article 3 is 0.75 length of article 2, only slightly clubbed, glabrous. Article 4 conical, truncate, glabrous, 0.25 length of article 3. Inner lobe slightly smaller than article 4 of maxillary palpi, bearing a long stout seta located in distal lighter band. Inner lobe seta seen dorsally but lobe obscured by long setae. Outer lobe of 2 articles, uniformly reddish-brown. Article 1 club-shaped, subequal in length to article 3 of maxillary palp with light band on distal end. Article 2 conical, curving medially, sometimes slightly lighter toward apex, bearing a short stout seta directed dorsally on medial margin near base. Nasale smooth, rectangular, projecting forward approximately 0.33 its width, area directly behind nasale concave. Laterally, to either side of nasale, a small linear patch of fine setae projects forward from anteroventral edge. Frontoclypeal plate 2.3 to 2.8mm maximum width, 2.6 to 2.9mm maximum length, not reaching hind margin of head capsule, *ecdysial cleavage line* short, bearing 4 prominent setae, 2 lesser setae near basal corners of nasale, each in a deep pore; 2 lesser setae even with midline of mandibular bases. Two subparallel grooves at apex of plate extend anteriorly to a point approximately even with ocular setae. *Eyes,* 6 ocelli located laterally, arranged in 2 transverse arcs with distal arc situated slightly more dorsal than proximal arc. *Ocular seta* situated between the most dorsal ocelli of each arc. Ocelli in distal arc nearly contiguous with ocelli in proximal arc widely spaced, separated by more than 0.5 diameter of most dorsal ocellus. *Cervical groove* extends 0.66 the distance across head, intersecting *inner dorsolateral furrow* at sides which extend anteriorly from near hind margin of head capsule stopping even with ocular setae. Caudal portion of inner dorsolateral furrow shallow, sometimes incomplete, appearing as a line of punctures often containing very short setae, with a single prominent seta located in each furrow at 0.5 its length. *Outer dorsolateral furrow* slightly curved, extending from cervical groove to medial edge of proximal ocellus. Ocular setae appearing contiguous with outer furrow.

THORAX: *Meso-* and *metatergites* margined anteriorly, with medial longitudinal line prominent. Prothorax as long as meso- and metanota combined, dark reddish-brown, coloration similar to head. Anterior edge of mesonotum curved with cephalad-projecting anterolateral corners. Pronotum with membranous band of lighter pigment on anterior and posterior edges. Extreme lateral margins of pronotum bearing a single prominent seta in caudal 0.33. Meso- and metanota bearing a prominent seta on lateral margins in anterior 0.33, slightly more dorsal than pronotal seta. *Mesothoracic spiracle* large, approximately twice the size of first abdominal spiracle, 3 times the size of typical abdominal spiracles. All *spiracles* oval with black peritremes located latero-cephalo-ventrad to dorsal tergites. *Legs* as in Fig. 2C. No sclerotized sternites present on meso- or metathoracic segments. Anteroventral margin of prothoracic segment covered by a large convex triangular sternite (apex directed caudally), bearing a pair of prominent setae, contiguous with small subtriangular sclerites laterally. Lateral sclerites bearing a single prominent seta.

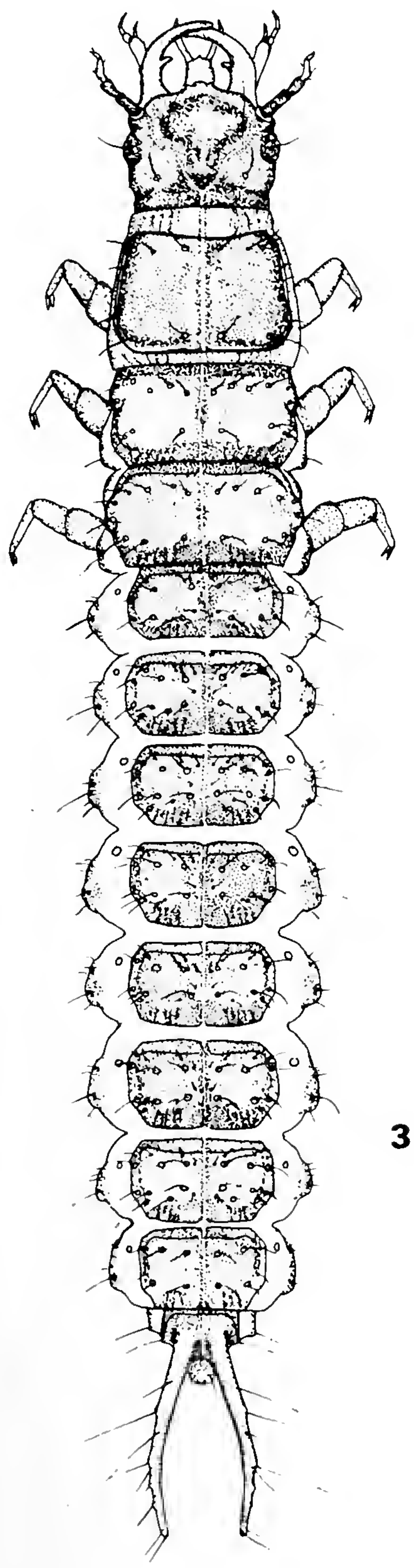
ABDOMEN: *Tergites* of abdominal segments heavily sclerotized, dark reddish-brown to near black on terminal segments. Segments I-VIII margined anteriorly and laterally with a dark band across posterior 0.25, bearing a prominent seta at intersection of lateral margin and posterior band. Abdominal segment I noticeably shorter than segments II-VIII. Segments II-VII uniform in width but length increases with each from anterior to posterior. Segment VIII noticeably longer, narrower and darker than previous segments. Segment IX almost black, narrower than segment VIII, bearing a pair of unarticulating cerci. Each abdominal segment I-VIII bearing 2 darkly pigmented, heavily sclerotized, linear pleurites ventrolaterad, one long, the other short. Short sclerite, located dorsocaudally to larger sclerite, separated by a membranous suture bearing a prominent seta. Ventrally, abdominal segments I-VII covered by 7 lightly pigmented sternites. Sides enclosed by single linear subrectangular pleurites (*epipleurites*) bearing a prominent seta in posterior 0.33. Another linear pleurite (*hypopleurite*) located more ventral, 0.66 length of most lateral sclerites, bearing a prominent seta. Large disk-like ventrite bearing fine seta on anterior lateral edge midventrally. *Median postventrites* and the *lateral postventrites* located posterior to ventrite, separated by a narrow suture. Segment VIII possesses 3 sclerites ventrally, lateral sclerites similar to previously described sclerites, midventral area covered by fused ventrite and postventrites bearing 2 setae caudolaterad. Segment IX appearing covered entirely by a single sclerite bearing 2 setae in same positions as previous segment. Segment X cone-shaped with large anal opening surrounded by a few heavy setae, a pair of small finer setae corresponding to the pair previously mentioned on segment IX present midventrally in middle of segment. Cerci smoothly cylindrical, parallel for basal 0.5, gently curving ventrally, distal 0.5 converging. Distal ends of cerci contiguous or nearly so, shorter than segment X. Each cercus glabrous ventrally, but dorsally bearing 5 prominent setae on its length.

COMMENTS AND COMPARISONS: No complete larval description for species of *Pasimachus* has previously been reported in the literature. A description of the genus presented by Van Emden (1942) developed from unidentified *Pasimachus* larvae fits *P. elongatus* with only one exception. He described the hypoventrite without setae. *P. elongatus* bears a prominent seta. The illustration and comment on the nasale of *P. elongatus* made by Kirk (1972) agree with our diagnosis.

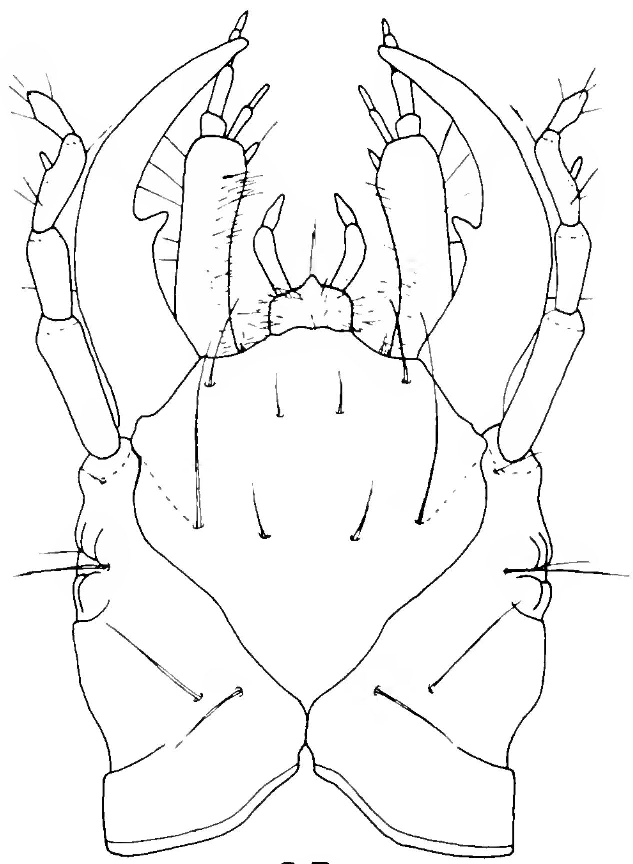
Agonum punctiformis Say
(Fig. 3A, 3B, 3C, 3D)

GENERAL DESCRIPTION (Fig. 3A): Mature larvae small, ranging 8.0 to 12.2mm. Head capsule rounded, dark brown, appendages lighter brown. Pronotum dark brown to near black. Legs light brown to yellow. Abdomen wider than head or prothorax. Cerci nonarticulating, short, diverging slightly to parallel toward ends, bearing setiferous nodes. Nasale slightly projecting typically bearing 5 blunt teeth. Abdominal tergites, pigmented in shades of brown, transversely ovate, not contiguous in mature larvae. Antennae uniform light brown with light membranous bands at joints, shorter than mandibles.

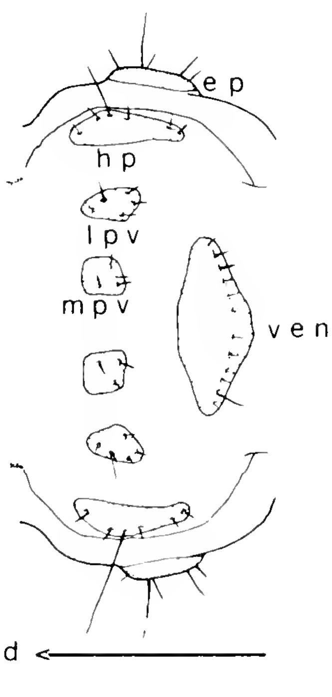
HEAD: (Fig. 3B): *Head capsule* wider than long, excluding appendages, slightly constricted at base to form a broad "neck", narrower than pronotum, pigmented slightly lighter, measuring approximately 0.9mm long and 1.1mm wide. *Antennae* subequal to mandibles, light reddish-brown, of 4 articles. Article I cylindrical, lighter on distal end, 0.75 as long as articles II and III combined. Article II slightly club-shaped, lighter on distal end, subequal in length to article III. Article IV short, 0.5 length of article III, apex lightly pigmented, encircled with 3 setae and 1 minute seta on extreme apex. *Mandibles* 0.75 length of head capsule, more than 3 times longer than basal width, sharply curved, reddish-brown, with a prominent seta on basal 0.25. Re-



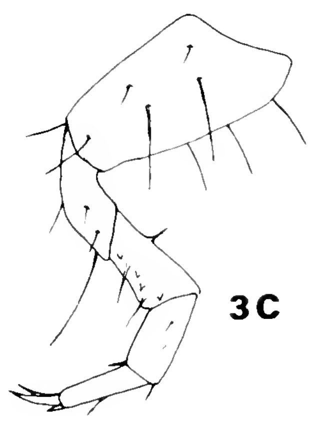
3A



3B



3D



3C

Agonum punctiformis Say

tinaculum prominent at inside base of each mandible. *Maxillary* stipes long, cylindrical, 0.66 length of antennae, curving inward distally. Seta on stipes sparse and fine dorsally and ventrally, with a few prominent setae on lateral edges. Inner lobe very small node, bearing a prominent seta on apex. Outer lobe of 2 articles, glabrous. First article subequal in length to antennal article IV, slightly club-shaped, lighter on distal end. Article 2 cylindrical, rod-like, apex truncate. Maxillary palpus of 4 articles, articles 2 to 4 glabrous, subequal in length to antennal articles III and IV combined. Article 1 globose, glabrous dorsally, a single stout spine ventrally, 0.5 length of article 2. Article 2 slightly clubbed, lighter in color on distal end. Article 3 subcylindrical, subequal in length to article 2. Article 4 short, 0.5 length of article 1, cone-shaped, tapering to a blunt apex. Base of *labium* rectangular with numerous long setae laterally and dorsally. Ventral surface glabrous except for a prominent seta at base of each labial palpus. Labial palpi of 2 articles. Article 1 clubbed, subequal in length to antennal article I, glabrous. Article 2 is 0.66 length of segment 1, conical, tapering to an acute apex, glabrous. Ligula node-like, centrally located on distal end of labium, bearing 2 setae contiguous at least on distal ends. Nasale centrally enlarged, bearing 2 large blunt teeth medially often notched, with a small sharp tooth on lateral aspect of each. Lateral teeth generally shorter than medial teeth. *Frontoclypeal plate* concave in anterior 0.33 with 2 prominent setae on a line between eyes, 2 lesser setae on adnasale areas. Frontoclypeal plate not reaching hind margin of head, *ecdysial cleavage line* well developed but short. Medially converging grooves on lateral edges of plate near antennal bases, short and shallow. *Eyes* composed of 6 ocelli located laterally, arranged in 2 transverse rows. Anterior row small, in a straight line with the posterior row strongly arched. Ocelli slightly larger in posterior row, with a prominent seta located dorsolaterally between the 2 rows, a lesser seta located ventrolaterally directly under end of anterior row. *Cervical groove* short, curved, beginning ventrolaterally, tapering to a shallow furrow dorsally to give the impression of a "neck" constriction with 2 pair of prominent setae and a pair of lesser setae located just anterior to and parallel with constriction. Lesser pair located more medially. *Ocellar furrow* present laterally, extending dorsally, terminating at top of posterior row of ocelli. Hind margin of dorsal head capsule deeply notched centrally at ecdysial cleavage line.

THORAX: Pronotum with marginal groove entire, meso- and metatergites with marginal groove anteriorly and laterally, with *middorsal longitudinal line* prominent. *Prothorax* 0.75 as long as *meso-* and *metathoraces* combined, slightly narrower, pigmented darker than either. Prominent setae numerous on prothoracic shield, a number of setae located on anterolateral corner and few sparse setae around entire margin. Meso- and metatergites subequal in width, length, and pigmentation, (mesonotum slightly darker anteromedially) with anterior margin of mesonotum more concave. Setal pattern same on both segmental sclerites (i.e., 6 prominent setae inside of and parallel to marginal groove). Smaller setae fairly numerous on each tergite with a small patch dorsal of anterolateral corner, a line of setae across anterior edge parallel and posterior to marginal groove and across posterior of tergite (with fewer setae here). Setal patterns similar on all abdominal tergites. Prosternite subtriangular, heavily sclerotized, darkly pigmented. *Legs* short (Fig. 3C), appearing weak, lightly pigmented. Coxae subconical with a concave surface extending the length of lateral aspect. Meso- and metathoracic segments each bearing 3 lightly sclerotized sternites. Each lateral sclerite bearing 2 short setae aligned longitudinally; a delicate seta anteriorly, a stouter 1 posteriorly. Ventrite oval, bearing 2 prominent setae aligned transversely on lateral aspects. Pleurites on meso- and metathoracic segments subtriangular, each bearing a prominent seta and lesser seta. *Mesothoracic spiracle* about 2 times the size of spiracle on abdominal segment I, peritreme lightly pigmented.

ABDOMEN: Abdominal membrane white to yellowish white. Tergites dark brown to tan. First abdominal segment slightly larger than metathoracic segment. Tergites of abdominal segments I-VIII margined anteriorly and laterally, pigmented in shades of brown, with numerous setae. Setal pattern is 2 transverse lines of setae; first, from posterior to anterior margin extending past lateral margin to lateral edge; second with fewer setae near posterior margin of sclerite. Segments II-V subequal in size. Segments VI-VIII becoming progressively smaller with tergites becoming more circular. Spiracles 2-8 smaller than spiracle 1. *Epipleurite* simple, subcircular to linear with rounded anterior ends, tapering posterior ends, with 5 prominent setae; typically 2 on anterior end (often only 1 on abdominal segment I), 2 slightly behind middle, 1 on posterior tapered area. *Hypopleurite* linear, usually same length as entire segment with 7 setae; 3 setae anteriorly (1 on abdominal segment I, often 2 on abdominal segments II and VIII), 3 setae near middle of sclerite (1 on segment I, often 2 on segment VIII), 1 on posterior ventral edge. *Ventrite* rhombic with a row of prominent and lesser setae aligned transversely between lateral apexes, a pair of prominent setae on posterior border on each side of midline. *Lateral postventrites* on I-VII trapezoidal, bearing a prominent seta and typically 5 lesser setae. *Medial postventrites* square, bearing a prominent seta and typically 3 lesser setae. Ventrite and postventrites appear fused on segment VIII with setal arrangement essentially the same as typical segment. General arrangement of prominent setae on typical tergites aligned in 2 transverse lines anterior and posterior. Segment VIII modified slightly. Segments IX and X highly modified. Segment X an *anal tube,* sclerotized dorsally and ventrally, separated laterally by a membranous strip for its entire length. Prominent setae present in approximately the same pattern dorsally and ventrally as typical segments. Anal crochets absent. Length of anal tube subequal to length of abdominal segment VIII. Nonarticulating *cerci* on segment IX pigmented lighter than other dorsal sclerotized areas, subequal in length to abdominal segments VII and VIII combined, each tapering to a moderately blunt apex with setiferous nodes bearing prominent setae (typically 9) which point all directions except medially.

COMMENTS AND COMPARISONS: According to the available literature, the larvae of 7 species of North American *Agonum* are known (Lindroth 1969): *extensicolle* (Schaupp, 1881, Dimmock and Knab, 1904), *decorum* (Dimmock and Knab, 1904), *ruficorne* (Kemner 1913), *mannerheimi* (Saalas 1917), *muelleri* (Larson 1941), *thoreyi* (ibid.), and *consimile* (Lindroth 1955). Descriptions were attempted for only a few. Most of these were very brief and/or translations were unavailable. We were unable to secure the descriptions of *ruficorne* by Kemner (1913) and *mannerheimi* by Saalas (1917). The description of *extensicolle* by Schaupp (1889) was very general, and the illustrations (located in a separate publication) were extremely diagrammatic. It would be virtually impossible to make a definitive identification on a field collected larva of *extensicolle* with this description. Comparisons could not be made with *extensicolle, decorum,* and *mannerheimi.* A limited number of comparisons were possible with *muelleri, ruficorne, thoreyi,* and *consimile.*

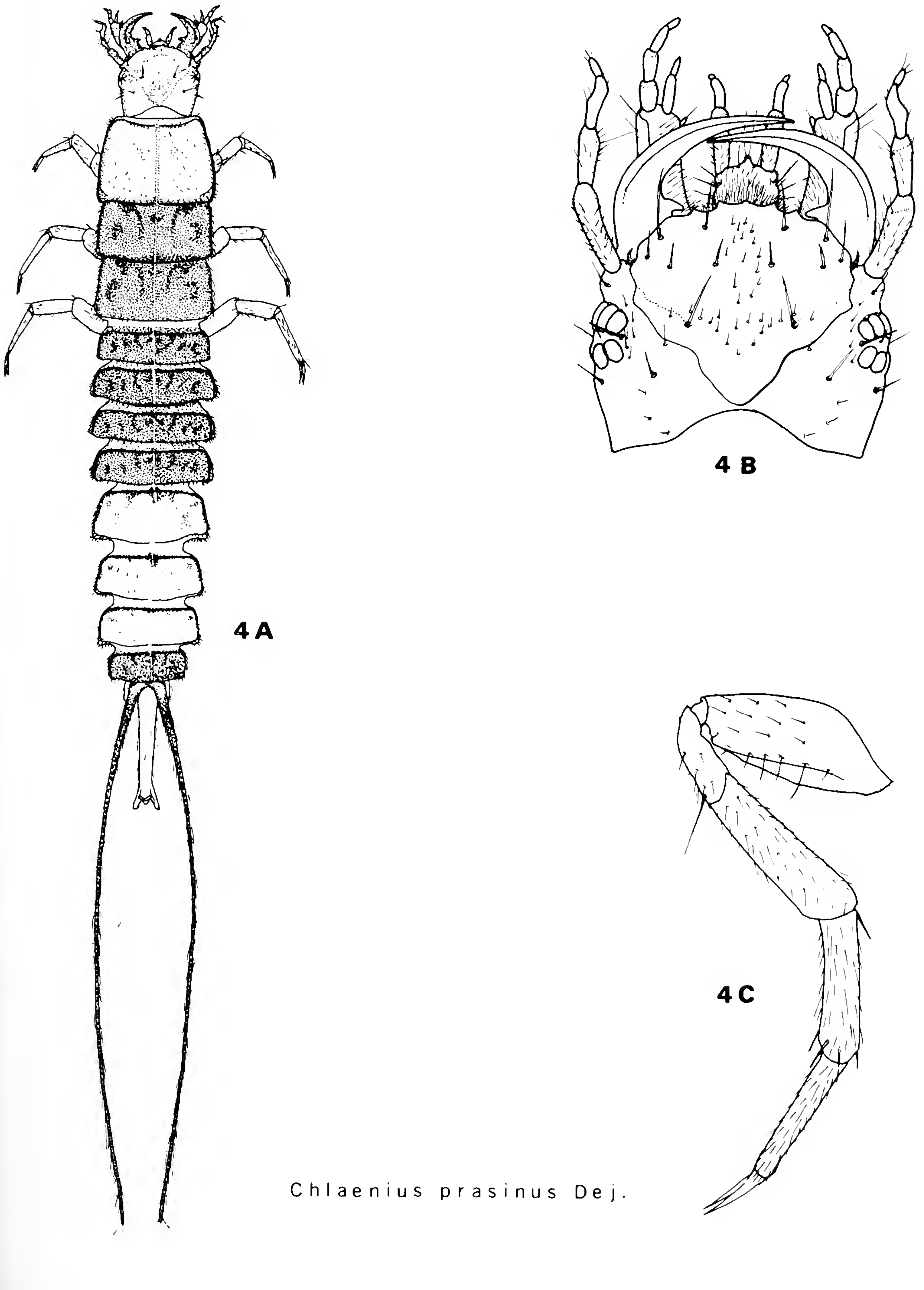
The nasale of *thoreyi* and *consimile* is not as produced as in *punctiformis.*

They also appear to bear a pair of medial sharp teeth which are blunt in *punctiformis*. The leading edge of nasale is serrate in *thoreyi* and *consimile* but lacking in *punctiformis*. The nasale of *muelleri* and *punctiformis* is produced but serrulate only in *muelleri*. The nasale is minutely serrulate in *ruficorne*. The mandibles are notched or serrate anterior to the retinaculum in *thoreyi* and *consimile* but not in *punctiformis*. Article 1 of the maxillary palpus bears a seta which is lacking in *punctiformis*. Article 3 and 4 of the maxillary palpus of these same species bear setae (1 on article 3 and 2 to 4 encircling apex of article 4) which are lacking in *punctiformis*. Kirk (1972) illustrated and described the nasale and adnasalia of *A. placidum*. The prominent teeth of the nasale of *placidum* are lacking in *punctiformis*. The adnasalia areas are similar.

Chlaenius prasinus Dejean
(Fig. 4A, 4B, 4C)

General Description (Fig. 4A): Larvae of medium size, cerci long, equal in length to body. Mature larvae ranging 25 to 30mm, including cerci. Pigmentation distinctive with head and prothorax yellow to yellowish-brown, remaining thoracic segments and first 4 abdominal segments dark brown to black, abdominal segments V-VII white to light tan, abdominal segments VIII and IX including cerci brown to dark brown. Eyes black. Tergites covering entire dorsal surface and projecting laterally. Prothoracic shield wider than head and broadly joined at "neck". Body uniform in width, tapering from abdominal segments VI and VII. Legs long, slender, usually pigmented same as head and prothorax.

Head (Fig. 4B): *Head capsule,* excluding appendages, equilaterally trapezoidal. Total length of head and appendages subequal to length of prothoracic shield. Width across eyes subequal to prothoracic shield length. *Antennae* of 4 articles, article I long, nearly twice the length of II, straight, sides parallel, cylindrical, bearing numerous small setae with stouter setae on medial aspects. Article II short, 0.75 length of III, slightly club-shaped, bearing numerous small setae with stouter setae on medial surface, a prominent seta mediodistally. Article III 0.66 length of segment I, curving medially, slightly larger anteriorly, bearing sensory nodes, setae present on mediodistal aspect, a prominent seta mediolaterally. Article IV club-shaped, 3 to 4 prominent setae encircling obtuse apex. *Mandibles* strongly curved, sharp, slightly concave medial aspect from retinaculum to apex. Retinaculum acute apically, directed slightly posteriorly with mandibles closed. Mandibular base wide dorsally but width less than 3 times length, small seta on lateral margin opposite retinaculum and a small group of minute setae basolaterally, otherwise glabrous. *Pencillius* present on dorsomedial base. Stipes long, sides subparallel, ventral and lateral aspects sclerotized while dorsomedial surface membranous, bearing numerous rows of long fine setae which become robust and prominent distally. Lateral sclerotized area bearing numerous lesser setae, with 2 more prominent setae; 1 distally and 1 medially. Inner lobe distinct, slender, obtusely cone-shaped apex bearing a prominent seta, 0.5 length of ultimate antennal article. Outer lobe of 2 articles. Article I 0.66 length of antennal article II, cylindrical, glabrous except for a prominent seta on ventral surface anterior of middle. Article 2 conical, tapering to an acute apex, glabrous, subequal in length to ultimate antennal article. *Maxillary* palps of 4 articles, article 1 short, globular, bearing a prominent seta ventrally, smaller dorsal setae on distal end. Article 2 slightly club-shaped, robust, glabrous, subequal to ultimate antennal segment. Article 3 subcylindrical, more slender than articles 1 and 2, subequal in length to ultimate segment of outer lobe. Article 4 obtusely conical, short, glabrous, subequal to width of article 3. *Labium* rectangular, membranous dorsally, sclerotized ventrally, densely



4 A

4 B

4 C

Chlaenius prasinus Dej.

covered with long fine setae basally and basolaterally with setal tufts. Setae larger and more prominent around palpigers dorsally, ventrally glabrous except for a prominent seta at base of each palpiger. Ligula obtusely conical, subequal in length to penultimate article of maxillary palps, bearing 2 prominent setae apically, parallel, often becoming contiguous distally. Labial palpi 2 articles with a sensory node appearing as a third segment. Article 1 slightly club-shaped, long, subequal in length and similar in shape to antennal article II but more robust, bearing long setae over its entire length which becomes more prominent distally. Sensory node robust and obtusely conical, glabrous, subequal in length to ultimate antennal segment. *Nasale* equipped with 4 to 7 teeth; typically 4 large sharp teeth (a pair on each side of mid-line) often with a small central tooth, seldom with a very small tooth between laterally located large teeth. Adnasale lobes project anteriorly, slightly shorter than large teeth. *Frontoclypeal plate* large, covering most of head dorsally, almost reaching hind margin of head capsule, *ecdysial cleavage line* short, not well-developed. *Eyes* comprised of 6 ocelli arranged in 2 transverse arcs. Intraocellar area black, bearing 4 setae; a prominent seta at each end of arcs dorsally and ventrally, 2 lesser setae near middle ocellus of anterior arc. *Ocellar furrow* and *cervical groove* lacking.

THORAX: *Pronotum* wide, base wider than apex, overhanging laterally, not appearing heavily sclerotized, with shallow furrows across anterior 0.33 and laterally to near posterior margin. Apex subequal to head width at eyes. Numerous small setae cover entire dorsum, becoming slightly more prominent on posterior and lateral margins, more dense on anterior and posterior apexes. *Mesonotum* darker pigmented than pronotum, normally lighter than *metanotum,* twice as wide as long, margined anteriorly and laterally, overhanging laterally, setal pattern similar to pronotum but fewer setae. Metanotum subequal to mesonotum but anterior edge less concave, and pigmented darker. *Legs* (Fig. 4C) moderately long, lightly pigmented (almost white), slender. Prothoracic legs stoutest and metathoracic legs longest. *Prosternite* appearing as half a shallow cone with a wide membranous-like band on anterior margin, setae small, sparse. *Episternum* contiguous with coxal articulation and prosternite, bearing sparse small setae, a more prominent seta situated on apex of ventral angle. Sternites of meso- and metathoraces similar, consisting of 5 small sclerites; a large central ovular *ventrite* bearing 2 prominent setae near middle, 2 small setae near anterior edge; remaining 4 small oval sclerites lie laterad (2 anterior, 2 posterior) of ventrite, each lateral sclerite bearing a seta. Ventrite often extends even with most anterior small sclerites bearing at least 4 setae. Lateral postventrites often fused on metathorax. Pleurites produced as lobes under notal plates of meso- and metathoraces projecting past them at posterior apexes. *Mesothoracic spiracle* circular with dark pigmented peritreme encircled by a subtriangular sclerite contiguous with base of pronotum and anterior corner of mesonotum.

ABDOMEN: *Abdominal tergites* narrower than thoracic tergites, 0.5 length of prothoracic tergite, 3 times wider than long, dark brown pigmented, margined anteriorly and laterally, overlapping lateral margins. Thoracic tergites and abdominal tergites subequal in width making sides parallel, tapering begins at fifth abdominal segment. Abdominal segments I-IV subequal in size, shape, setal pattern. Setal pattern similar to thoracic tergites. Abdominal tergites on V-VII lightly pigmented, decreasing in width and increasing in length, margins dark brown to black. Setal pattern similar to anterior segments, setae more sparse on dorsum. Tergite of VIII darker pigmented than tergites of segments V-VII, subequal in length, but narrower than segment VII, setal pattern similar to anterior tergites but setae more dense than previous 3 segments. Tergite of IX small, margin darker than remaining tergite, few sparse setae on dorsal aspect and few on lateral aspects, bearing a pair of long articulating filamentous *cerci*. Ninth segment withdrawn under tergite of VIII. Tenth abdominal segment long, subequal to length of ultimate tarsus of metathoracic leg including ungues. Three finger-like appendages present on distal end ventral to anal opening. Appendages subequal in length to antennal segment I, sides parallel, apexes obtusely rounded, covered with numerous minute spines. Abdominal sternites lightly sclerotized, lightly pigmented, bearing numerous small setae. *Hypopleurite* produced on a lobe, pigmented darker than remaining sternites. *Epipleurite* produced on a smaller lobe. Ventrite subovular, large covering most of anteroventral area. *Lateral postventrite* shaped subtrapezoidal. *Medial postventrite* fused, forming a rectangular sclerite along posterior margin of segment. Cerci of ninth abdominal segment subequal in length to entire body, irregularly annulated, bearing numerous small setae.

COMMENTS AND COMPARISONS: At the present time, 9 additional species of *Chlaenius* larvae have been described; 1) *cumatilis* Leconte, 2) *impunctifrons* Say, 3) *laticollis* Say, 4) *leucoscelis* Chevr., 5) *pennsylvanicus* Say, 6) *platyderus*Chaudoir, 7) *sericeus* Forster, 8) *tomentosus* Say, 9) *tricolor* Dejean.

Four species other than *prasinus* were described by Chu (1945); 1) *cumatilis,* 2) *sericeus,* 3) *tricolor,* 4) *pennsylvanicus.* The larva of *pennsylvanicus* and *tricolor* differ markedly from *prasinus* by having short non-annulated cerci which bear setiferous nodules. The nasale is quite different in the species mentioned. On *pennsylvanicus* it bears a single broad median tooth and 2 blunt teeth on each side, on *tricolor* it is serrulate medially. The nasale of *cumatilis* and *sericeus* are similar to *prasinus* but differ by the presence of small teeth between the median tooth and the lateral pairs. Also, the body is tricolored in *prasinus* and not in *cumatilis* and *sericeus.* One of the characters used by Chu to separate *prasinus* from *cumatilis* and *sericeus* was the presence of setae on the back of the mandibles (2 in *prasinus,* 4 in *cumatilis* and, 5 in *sericeus*). We found this number to be highly variable in our *prasinus*; always more than 2.

Chu described and figured the larva of what he accepted as *Chlaenius prasinus.* Because of many differences we have observed in our specimens when compared with Chu's description, we feel that it is necessary to redescribe the larva of this species. Chu's identification was based exclusively on the larvae. The larval stadia was not determined and information explaining how measurements were taken was not given.

TABLE I. Measurements (in mm.) of *Chlaenius prasinus* larvae.

	Chu	Thompson & Allen
Head width	2.1	2.1
Prothorax, width	3.3	2.9
Body, length	24.8	21.6
Cerci, length	14.4	15.6
9th abd. seg., length	0.5	0.8
10th abd. seg., length	1.9	2.3

Chu found: head brown, but we found it ochraceous; prothorax brown, we found it slightly darker than the head; abdominal segments 5 to 10 light brown, we found segments 5 to 7 ochroleucus (whitish ochre-yellow), segments 8 and 9 slightly darker than the prothorax; segment 10 ochraceous; legs light brown, we found them as light colored as the head.

All 9 epipleurites were described by Chu as being heavily sclerotized but we found only the epipleurites of segments 1 to 4 heavily sclerotized. He also found all 8 hypopleurites heavily sclerotized as compared with our observation that hypopleurites 1 to 4 were heavily sclerotized and the remainder, lightly sclerotized. He also described the sternites of segments 8 and 9 as being fused into 1 piece on each segment, whereas we found that only the ventral group of sternites fused on segment 8 and on segment 9 the ventral group was fused with the hypopleurite.

Two species, *laticollis* and *leucoscelis,* described and identified by Schaupp (1880) were poorly illustrated. In the descriptions *laticollis* has dark blue thoracic scutes, black abdominal scutes, a light rufous head, the cerci are rufous basally, black in the middle and white at tip and the labrum (nasale) bears 5 teeth. The larva of *leucoscelis* is entirely a deep shining black, a dark red head, cerci dark at the base and the rest fuscous and the labrum (nasale) with the middle tooth bifid.

All stages of *impunctifrons* Say have been figured and described by Claasen (1919). His description reveals numerous differences when compared with *prasinus.* The general body color is dark brownish-black with the head yellowish-brown. The caudal cerci of the third instar larva appear to be about 0.25 length of body which is considerably shorter than cerci of *prasinus.* The habitus of *impunctifrons* is much broader and much shorter than in *prasinus.*

Kirk (1972) described and illustrated the head and nasale of 2 other species and updated this information on a previously described species, all were compared with *prasinus*: 1) *platyderus,* 2) *sericeus,* 3) *tomentosus.* His species and *prasinus* all bear 5 blunt medium-sized teeth on the nasale. The teeth of *prasinus* are more broadly spaced than *platyderus* and *tomentosus* and smaller denticles are not as apparent. The nasale of *prasinus* is generally more similar to *sericeus* but adnasilia are more produced and lateral angles are more acute.

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OCCURRENCE OF *ERNOBIUS OPICUS* FALL IN EASTERN UNITED STATES (COLEOPTERA: ANOBIIDAE)

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ABSTRACT

Collection of first known males and new distribution records are presented for *Ernobius opicus* Fall.

Ernobius opicus was described by H. C. Fall in 1905 from 2 females collected in Michigan and Massachusetts by Hubbard and Schwarz. In 1962, Dr. R. E. White stated that *E. opicus* was very rare in collections, and the male was unknown. I have carefully screened light trap collections for 14 years (1960-1974) and found 6 specimens including 3 males. Collection data are: MARYLAND, Anne-Arundel County, Baltimore-Washington International Airport, 11-VII-67 and 25-VII-67 (2); Baltimore County, 23-VI-66, VI-68, and 18-V-68 (3). PENNSYLVANIA, Cowans Gap, 30-VI-68 (1).

In studying external characteristics I found that the only reliable difference for separation of the sexes is in the structure of the antennae. In the male the apical antennal segment is obviously longer than either of the 2 preceding segments (Fig. 1a). In the female the apical segment is approximately equal to the 2 preceding segments (Fig. 1b).

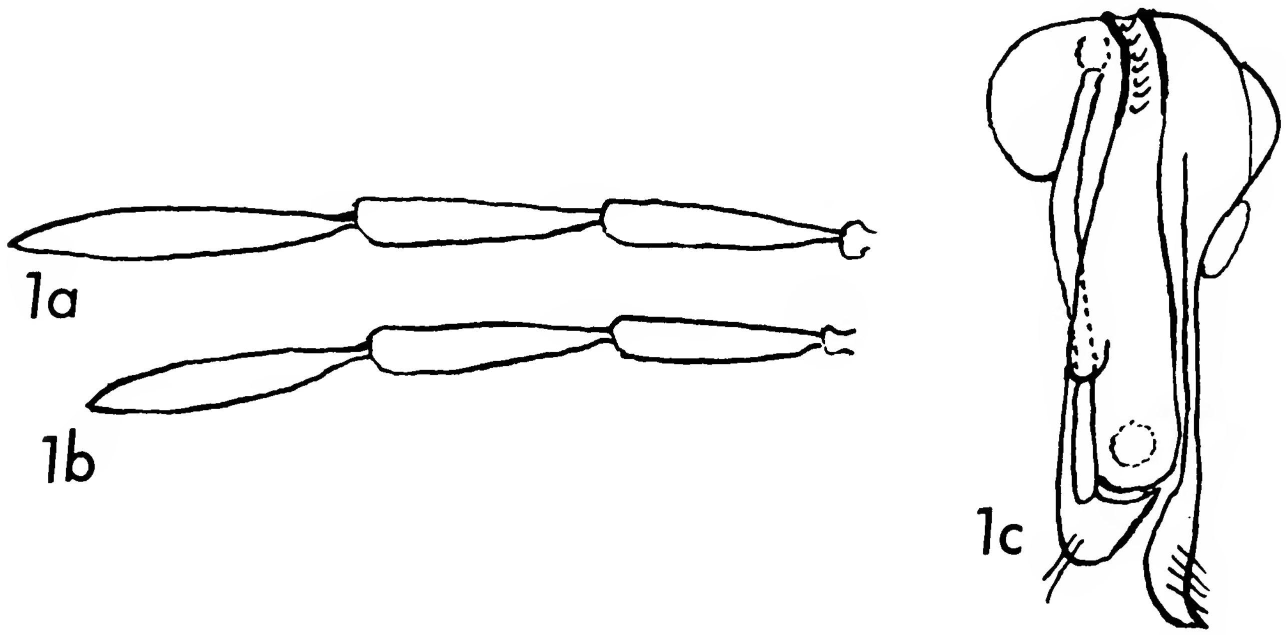

Fig. 1: a) apical segments of male antenna; b) apical segments of female antenna; c) male genitalia.

Host records for most species of *Ernobius* are lacking, but dead coniferous bark and cones are likely the preferred food materials, judging from the few existing records. The Maryland specimens were collected in areas where pine is the dominant tree.

Future research may eventually provide an explanation for the apparent scarcity of *E. opicus,* but, for now, it can only be said that it is rare for reasons that remain a mystery.

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NOTES ON THE RANGES AND HABITATS OF SOME LITTLE-KNOWN AQUATIC BEETLES OF THE SOUTHEASTERN U.S. (COLEOPTERA: GYRINIDAE, DYTISCIDAE)

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Abstract

Significant range extensions are reported for *Dineutus robertsi, Gyretes iricolor, Laccophilus schwarzi, Laccophilus undatus, Hydroporus dixianus, Celina contiger, Laccornis deltoides, Matus leechi,* and *Hoperius planatus.* Information is included on the habitats of some species, and the distinguishing features of *Celina contiger* are noted.

The scholarly work by Young (1954) on the Floridian fauna has provided a sound basis for further study of aquatic beetles in the Southeast. However, little specific information is available on the aquatic beetle faunas of southeastern states other than Florida.

The information aggregated here has been accumulated over several years of collecting, mainly in Alabama. Specimens from a number of other collections were also examined.

Acknowledgments

We would like to thank Dr. Paul J. Spangler, U. S. National Museum [USNM]; Dr. Robert E. Woodruff, Florida State Collection of Arthropods [FSCA]; and Miss Francis McAlister for allowing us to examine specimens in their care or contributing information on certain species. Unless otherwise noted, specimens are deposited in the Auburn University Insect Collection [APIC].

Dineutus robertsi Leng

This species was originally described from Rabun County, Georgia (Leng, 1911). Leech (1938) reported specimens from Pickens County, South Carolina, and Habersham County, Georgia.

This beetle apparently occurs throughout the southeastern U. S. in cool shaded streams above the Fall Line. Although at times it is found with its similar and more common congener, *Dineutus ciliatus* (Forsberg), the 2 species are seldom encountered in the same aggregation.

In the field, they can be differentiated by the difference in ventral pigmentation (*ciliatus* black or reddish-black and *robertsi* brown, reddish-brown, or tan). Leech (1938) noted a difference in the shape of the terminal antennal segment, that of *ciliatus* being blunter. However, one feature emphasized by previous workers, namely the completely bronzed elytra of *robertsi* contrasted with the lateral bronzed vittae in *ciliatus,* has not been completely reliable or easily discernible in a number of the series we have examined.

In addition to the localities mentioned previously, we have seen specimens of *robertsi* from Oconee County, SOUTH CAROLINA, and Cleburne and Talladega counties, ALABAMA.

Gyretes iricolor Young

This species was described from Holmes County, FLORIDA, where Young (1949) found specimens beneath the overhanging banks of Sandy Creek. By searching in similar situations we found that *iricolor* is quite common in relatively undisturbed sand- and gravel-bottomed streams of the Lower Gulf Coastal Plain east of the Apalachicola-Chattahoochee River. It is most easily located by wading in the streams and finding spots where the bank projects out over the water surface to a distance of 2 dm or more. The surface of the water beneath the overhang must often be vigorously disturbed to wash individuals from their resting sites on twigs or roots (Folkerts and Donovan, 1973).

We examined a total of 140 specimens from Geneva, Covington, Escambia, and Baldwin counties, ALABAMA, and Forrest County, MISSISSIPPI.

Laccophilus schwarzi Fall

Zimmerman (1970), in his excellent revision of the North American *Laccophilus,* referred to *schwarzi* as "the rarest" member of this genus in the U. S. Since it was previously known only from localities in Maryland, Virginia, and the District of Columbia, its presence in relative abundance in northern Alabama is perhaps surprising. Although we have not seen specimens from the intervening areas, the species probably ranges throughout the Piedmont, Blue Ridge, and Ridge and Valley provinces. In Alabama it does not occur below the Fall Line.

The habitat of L. *schwarzi* is unique among the U. S. *Laccophilus.* The species occurs in microhabitats where the stream has undercut the bank, creating an overhang with the undersurface in contact with the water. It can often be found in abundance among the root masses that penetrate through the overhang from the terrestrial bank vegetation above. We have been most successful in collecting *schwarzi* by using a sturdy dipnet to reach beneath the overhang and scrape the undersurface vigorously.

At some sites where damage to the watershed has resulted in increased high flows and decreased low flows, the microhabitat of *schwarzi* may be dry during periods of low rainfall. It can then be found sparsely in other areas in the stream where leaf litter and detritus have accumulated. Fall (1917) stated that Sherman collected *schwarzi* in such situations in Maryland in the fall. However, our experience indicates that such sites are not its preferred microhabitat.

We have examined 103 specimens from the following ALABAMA counties: Cleburne, Lee, Tallapoosa, Walker, Winston.

Laccophilus undatus Aube

Previously (Zimmerman, 1970), this species was known only from localities in the northeastern U. S., from Illinois east to Vermont. Its presence in the mid-South is therefore somewhat unexpected.

We found it to be most abundant in temporary or semi-permanent pools or oxbows formed and isolated by the rise and fall of waters along the edges of streams and rivers. Apparently it occupies somewhat similar habitats in the northern portion of its range. Zimmerman (1970) remarked that, in southern Indiana, *undatus* occurred in "slough ponds in the drainage of a former intermittent stream." A few Alabama specimens were taken in heavily vegetated swamps.

Although most of the specimens available from Alabama and Mississippi are essentially identical with those from the northeastern states, individuals from 2 Alabama localities are much darker, appearing almost black in gross aspect. We attach no taxonomic significance to the darker color in these specimens and provisionally hypothesize that it may relate to pH or other factors of water quality. It is possible that the darker color is typical for southern populations and the lighter individuals are teneral. However, the state of hardness of the exoskeleton of most of the lighter individuals did not indicate a teneral condition.

We examined 26 specimens from Macon and Sumter counties, ALABAMA, and 34 specimens from Lamar County, MISSISSIPPI. The latter locality is only about 70 miles inland from the Gulf of Mexico.

Whether the southern populations represent an isolate, presently disjunct from the northeastern demes, is a matter of conjecture. The lack of specimens from the intervening area may be the result of a lack of collecting. Alternatively, in the upland areas comprising much of the area between the known populations, suitable habitats are probably rare except along the larger watercourses. However, the Mississippi embayment and Atlantic Coastal Plain provide numerous areas where suitable habitats occur. It is possible that *undatus* occurs in one or both of these regions.

Hydroporus dixianus Fall

This species was previously known from Decatur County, GEORGIA, Liberty County, FLORIDA (Young, 1955), and Clarendon County, SOUTH CAROLINA (Kirk, 1969). We recently took 2 specimens of *dixianus* from Line Creek at the Interstate 85 crossing on the Macon-Montgomery county line, ALABAMA. The individuals were obtained among root masses just below water level at the edge of the stream. Subsequent searching has yielded no additional specimens even though a number of different microhabitats were investigated.

This beetle may be widely distributed on the Coastal Plain of the southeastern U. S., but it's specific microhabitat requirements seem to make it rare or difficult to find.

Celina contiger Guignot

This species was described on the basis of a single male collected by Blatchley in Pinellas County, FLORIDA (Guignot, 1947). Young (1954) reported no additional specimens.

We took this species in heavily vegetated swamps at several localities in ALABAMA and FLORIDA. At most sites it occurs with other members of the genus. Like *C. grossula* LeConte and *C. slossoni* Mutchler, *C. contiger* burrows in detritus and silt around the bases of rooted aquatic plants and among root masses at the bases of vertical banks. The fact that vigorous scraping of the substrate is often necessary to obtain specimens indicates that *contiger* burrows to considerable depths.

Since *contiger* does not seem to be unusually rare, its apparent absence from collections may be attributable to confusion with *C. angustata* Aube. Some of the confusion results because most specimens of *contiger* are not as small as the 3.0 mm which Guignot listed for the holotype. Our specimens range from 3.0 mm to 3.4 mm in length. Florida specimens are largest, averaging 3.3 mm; Alabama specimens average 3.1 mm. The size range of *contiger* therefore overlaps the size range of *angustata*. In Florida, some specimens of the latter are as small as 3.35 mm, although the average size is 3.5 mm. In more northerly areas *angustata* is larger, averaging about 3.65 mm.

Since size alone cannot always be used to differentiate these 2 species, additional characters are needed. In *angustata*, the prosternal process is comparatively narrow, lanceolate in shape, and bears a prominent anterior protruberance which is angulate when viewed laterally. In *contiger*, the prosternal process is wider, roughly diamond-shaped, with the widest portion anterior to the center. The anterior elevation is lacking.

The eyes of *contiger* are much smaller than those of *angustata*, a feature probably related to its greater burrowing tendencies. When the head of *contiger* is viewed from above, the distance between the eyes averages 6 times the width of an eye. In *angustata*, the mean interocular distance is only 3.7 times the eye width.

Also helpful in identification is the larger, more conspicuous and extensive microreticulation of the ventral surfaces of *contiger*. The pronotal disc of *contiger* is more sparsely and less obviously punctate than in *angustata*. In *contiger*, the terminal segments of the maxillary palpi tend to be blunter than in *angustata*.

As noted in the original description (Guignot, 1947), the male genitalia are also distinctive. The aedeagus of *contiger* possesses lateral flanged teeth about one-fifth the length proximally from the tip. Although not conspicuous, these teeth are easily visible at 90 magnifications. The tip of the aedeagus is rounded and somewhat expanded rather than being bluntly pointed as in *angustata*.

We have examined a total of 26 specimens of *contiger* from Baldwin, Macon, and Montgomery counties, ALABAMA, and from Alachua [FSCA], Dade [FSCA], Highlands [FSCA], and Putnam counties, FLORIDA. The distribution of these localities indicates a probable distribution throughout much of the Coastal Plain of the southeastern U. S.

Laccornis deltoides (Fall)

In the original description of this species, Fall (1923) listed 4 specimens from ILLINOIS. As far as we can determine, no other specimens are known.

We have 1 teneral male from Bullock County, ALABAMA that is almost certainly this species. It fits in all respects the characters listed by Fall (1923) and by Leech (1940). Its size alone (6.6 mm) precludes it from being any of the other described U. S. species of the genus. An additional specimen [USNM] is available from Calhoun County, FLORIDA. Both individuals were taken from root masses at the edge of small gravel-bottomed streams, suggesting that this is a lotic species.

Matus leechi Young

Young (1953), when describing this species, reported it from Gulf and Liberty counties, FLORIDA. We have recently taken 3 specimens of *M. leechi* at localities in Baldwin and Geneva counties, ALABAMA. The individuals were taken by dipnetting at the bases of edge vegetation in gravel-bottomed streams. The localities reported here suggest that this beetle may have an extensive distribution along the Lower Gulf Coastal Plain.

Hoperius planatus Fall

The monotypic genus *Hoperius* was originally described from ARKANSAS (Fall, 1927). Kirk (1969) recorded the species from Florence and Horry counties, SOUTH CAROLINA. Spangler (1973) reported additional localities in ARKANSAS, MARYLAND, and VIRGINIA. The single available ALABAMA specimen was taken at light in Elmore County.

Hoperius is grossly similar in size and shape to a number of other southeastern dytiscids, notably *Rhantus calidus* (Fabricius). Re-examination of series of the latter species and similar ones may yield additional specimens of *Hoperius.*

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PROSOCLITUS BATES A SYNONYM OF *PSEUDACANTHUS* KAUP (COLEOPTERA, PASSALIDAE)

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In my recent paper on American genera of Passalidae (Reyes-Castillo, 1970:170-174, fig. 77), I revalidated the genus *Prosoclitus* Bates (1886:7) on the basis of the original description and revision of specimens of new species, not yet described, in view of the fact that I could not see specimens of the type species, *P. obesus* Bates.

Recently I had the opportunity to study the type specimen of *P. obesus,* which due to the generic characters it presents must be assigned to *Pseudacanthus* Kaup, and for this reason *Prosoclitus* must pass to synonymy. The specimen studied by Bates has a label with the locality "Mexico" and another one with the identification "*Prosoclitus obesus* Bates". Both labels are hand-written and there is a third label, printed with the following data: "H. W. Bates, Biol. Cent. Amer." This specimen, that belonged to the R. Oberthur collection, has been deposited in the Museum National d'Histoire Naturelle, Paris.

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NEW SYNONYMY AND LECTOTYPE DESIGNATIONS IN NORTH AMERICAN COCCINELLIDAE (COLEOPTERA)

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In the course of preparing a taxonomic revision of the North American Scymnini, the types of *Hyperaspis sexualis* Casey (transferred to *Scymnus* by Dobzhansky, 1941) were examined and found to be conspecific with *Blaiselliana vanduzeei* Gordon (1970). The correct synonymy is listed below.

This opportunity is also taken to discuss several Mulsant names included by Dobzhansky (1941) in his revision of the United States Hyperaspini. In most instances the types were not available to him for examination. The species most in doubt are those Mulsant named from the Dejean collection; the latter is now in the Muséum d'Histoire Naturelle, Lyon, France. Through the courtesy of the Director of that museum, Dr. L. David, I have been able to examine the Dejean Coccinellidae and am able to make the confirmations or corrections on Dobzhansky's assignments listed below.

Blasidelliana sexualis (Casey), **new combination**

Hyperaspis sexualis Casey, 1924:167.
Scymnus sexualis; Dobzhansky, 1941:86.
Blaisdelliana vanduzeei Gordon, 1970:43. **NEW SYNONYMY.**

There are 4 type specimens of *sexualis* in the Casey collection [USNM], all labeled "St. George, Utah, July, Wickham/35158". The first of these, a male, is here designated and labeled lectotype, the other 3 paralectotypes.

Hyperaspis binotata (Say)

Coccinella binotata Say, 1826:302.
Hyperaspis guexi Mulsant, 1850:687. **NEW SYNONYMY.**

Dobzhansky (1941) placed *guexi* as a synonym of *H. bigeminata* (Randall), but *guexi* is a typical example of *binotata.* The single male specimen remaining in the Dejean collection labeled "Am. Bor., LeConte" is here designated lectotype, because it is clear from Mulsant's description that he had more than 1 specimen.

Hyperaspis inedita Mulsant

Hyperaspis inedita Mulsant, 1850:684.
Hyperaspis pinorum Casey, 1924:162; Dobzhansky, 1941:28. **NEW SYNONYMY.**

Dobzhansky was not certain of the identity of *inedita* and so retained the name *pinorum,* stating that if they were found to be conspecific, *inedita* would be the correct name. This is indeed the case, thus the synonymy listed above. It is not clear how many specimens Mulsant had, so the single female in the Dejean collection labeled "Amer. Bor., LeConte" is here designated lectotype.

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Hyperaspidius venustula (Mulsant), **new combination.**

Hyperaspis venustula Mulsant, 1850:671.

This species was placed as a junior synonym of *Hyperaspis lugubris* (Randall) by Dobzhansky but is actually a *Hyperaspidius* and is completely unlike any presently known North American species of *Hyperaspidius*. It is not clear how many specimens Mulsant had, so the single female in the Dejean collection labeled "Amer. bor., LeConte" is here designated lectotype.

Notes and lectotype designations

Hyperaspis rufomarginata Mulsant (1850) was correctly placed as a synonym of *H. fimbriolata fimbriolata* Melsheimer by Dobzhansky (the single female specimen in the Dejean collection labeled "Amer. Bor., LeConte" is here designated lectotype); *Hyperaspis elegans* Mulsant (1850) was correctly placed as a junior synonym of *H. undulata* (Say) by Dobzhansky (it is not clear how many specimens Mulsant had, so the single female in the Dejean collection labeled "Amer. bor., LeConte" is here designated lectotype).

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BOOK REVIEW

The Naturalists' Directory (International) Supplement. 1973. PCL Publications, Inc., P. O. Box 583, South Orange, N. J. 07079. $2.00 if paid in advance, $2.50 if billed. 58 p.

This is a supplement to the 41st edition (1972), brought up to date to Sept. 1, 1973. The 42nd edition is now in preparation. This supplement has 2 new indexes (in addition to the listing of names by States and Countries): 1) by specialty, and 2) alphabetically. All members of the Coleopterists Society are urged to send for a copy of the questionnaire so they may be listed to increase the usefulness of the publication.—R. E. Woodruff

NEW DATA ON *EPURAEA ALTERNANS* GROUVELLE (COLEOPTERA: NITIDULIDAE)[1]

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ABSTRACT

Epuraea alternans Grouvelle has been collected in the Rocky Mountains from British Columbia to Chihuahua. Its distinctive hair tuft on Sternite I is described in detail, and the male genitalia are figured.

Epuraea alternans Grouvelle was described as *Epuraea alticola* by H. C. Fall (1907). Grouvelle (1912) proposed the replacement trivial name since *alticola* was preoccupied. Fall's description was based on a single male collected by his colleague T. D. A. Cockerell in the Las Vegas Range, New Mexico, at 11,000 feet altitude. No other ecological data are with the specimen or the description. The most distinctive character in the male is a tuft of long setae projecting down from the middle of the 1st sternite.

Recently Vernon Kirk sent me 7 specimens of *E. alternans,* including 2 males, which he collected at Mt. Rushmore, South Dakota, 29-VI-1965, by sweeping. Cockerell's specimen is lighter in color than those from South Dakota, but this may be due to fading. Fall described it as "pale rufotestaceous", while Parsons (1943), in redescribing it 31 years later, called it simply "testaceous". The Mt. Rushmore specimens have the pronotum rufo-testaceous; head and elytra rufo-testaceous to rufous; antennal basal segment testaceous, scape testaceous to rufo-testaceous, club rufo-piceous to piceous; and legs testaceous. The type is about the size of the smallest of those from South Dakota. The latter range from 2.5 to 3.2 mm long by 1.5 to 1.8 mm wide.

Fall (1907) described the hair tuft on the 1st sternite as "two longitudinal parallel lines of erect hairs". They are erect, but in none of the 3 males studied are they parallel. These setae (Fig. 1) have the same pale testaceous color as the recumbent ones on the sternite, but are 3 to 4 times longer as well as more robust. They arise from punctures that appear no different from others on the sternite except for being placed closer together. They are arranged around a bare and sparsely punctate triangular area, about 0.3 mm long and about 0.1 mm wide at the hind margin, which narrows to a point in the direction of the intercoxal piece. The punctures bearing these setae are placed in an irregular pattern in a band on each side of this bare space. The width of this band is about 3 times the diameter of a puncture.

At the anterior, or narrowest, end of the hair tuft the setae are only partially erect and are directed over others behind them in the structure. Moving back from this point the setae gradually become more erect and finally those in the posterior half appear upright for most of their length. The exception is that each bends over sharply near the tip toward the interior of the structure. These setae originate, as has been stated, from two divergent

[1]Miscellaneous Paper No. 676, with approval of the Director, Delaware Agricultural Experiment Station. Publication No. 430, Department of Entomology and Applied Ecology.

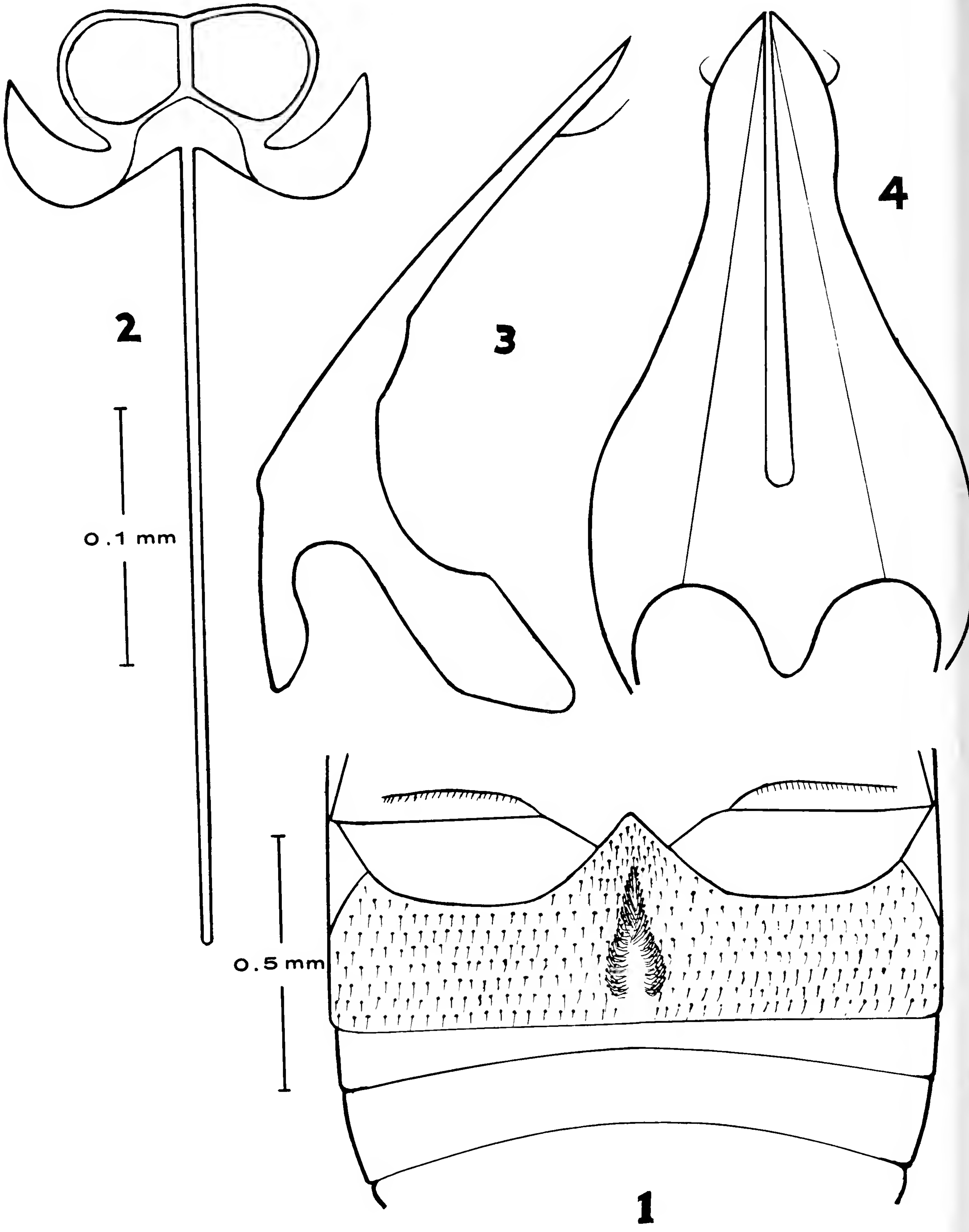

Fig. 1-4: *Epuraea alternans* Grouvelle: 1) sternite I and adjacent structures; 2) sternite *VIII*; 3) lateral aspect of tegmen, 4) Dorsal aspect of tegmen.

bands of scattered punctures, each band being approximately .04 mm wide, but where they bend sharply, near their distal ends, they have become lined up into an apparently uniform row on each side of the structure.

The function of the hair tuft cannot be deduced without additional information. When the legs are drawn up under the body, either the middle or hind tarsi can be brought in contact with this structure. The hind legs appear to be under a slight strain in this position, but the middle legs do not, and these tarsi fit perfectly the configuration of the hair tuft.

Another interesting feature of this species is the apparent paucity of setae on the male genitalia. This conclusion was reached after dissection of 1 of the Mt. Rushmore males. The 8th sternite was found devoid of setae (Fig. 2), and the tegmen bore a single stout bristle on each arm a short distance behind the tip (Fig. 3).

I express my appreciation to John Lawrence for permission to examine the type in the Fall Collection at the Museum of Comparative Zoology.

Addenda

Following preparation of this note, Carl Parsons (personal communication) advised that other specimens of *E. alternans* have been taken. The earliest of these has a 1933 label, but its existence was unknown to him at the time of his revision (Parsons 1943).

He indicated that there were specimens in the following collections: American Museum of Natural History [AMNH], California Academy of Sciences [CAS], Canadian National Collection [CNC], Cornell University [CU], University of Arizona [UA], C. T. Parsons [CTP], G. H. Nelson [GHN], Karl Stephan [KS] and L. R. Gillogly [LRG]. The localities at which they were taken are: British Columbia, Oliver [CNC]; S. Dakota, Black Hills and Pringle [CNC], Custer Peak [CTP]; Colorado, Science Lodge [CNC]; Arizona, Chiricahua Mts. [AMNH, CAS, CNC, LRG], Graham Mts. [UA, LRG], Huachucha Mts. [CAS, GHN], San Francisco Mts. [AMNH], St. Catalina Mts. [UA, KS], Ariz. [CU], Centr. Ariz. [UA], Apache Co. [CNC]; Mexico State of Chihuahua, San Juanito [AMNH].

One-third of the labels give altitude data. This ranges from 5,400 to 12,600 feet. Most were collected in malt traps, but a St. Catalina Mts. lot was from "sap of spruce" and those labelled Central Arizona were taken by sweeping alfalfa. Collection dates range from 14-IV to 10-IX, with 40% in August.

In addition to these records there is a doubtful specimen, a female, from Northern Michigan in the LeConte Collection [MCZ].

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NOTES ON *VICELVA* MOORE AND LEGNER WITH NEW SYNONYMY (COLEOPTERA: STAPHYLINIDAE)

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Alfred F. Newton, Jr., has kindly called to my attention that *Vicelva paradoxica* Moore and Legner (Canadian Ent. 105:36) was previously described under the name *Coprophilus vandykei* Hatch (beetles of the Pacific Northwest, 2:90). *Vicelva paradoxica* was placed in Phloeocharinae whereas *Coprophilus* is in Oxytelinae. Newton, who dissected a female specimen in the Museum of Comparative Zoology, gives (in litt.) the following reasons for believing that it belongs in Phloeocharinae: "1) the female genital segment is virtually identical to that of *Charhyphus* as illustrated for that genus by L. Herman in his revision, without the glandular openings characteristic of Oxytelinae, and 2) the raised areas on terga IV and V are in the same position as the cuticular processes of *Phloeocharis, Ecbletis* and *Charhyphus*. . . ." In the original description of *Vicelva* attention was called to the fact that it lacked a second sternite. The presence of a second sternite is characteristic of members of Oxytelinae. This species is not a *Coprophilus;* it should at present be placed in Phloeocharinae. In consequence, the following synonymy is in order:

Vicelva Moore and Legner
 vandykei Hatch
  =*paradoxica* Moore & Legner, **New Synonym**

The specimen in the collection of the Museum of Comparative Zoology is from "Alder Creek, Hood Loop, Oregon., VII-8-27, Darl." which is a new state record for the species, previously known only from Washington.

NOTES ON THE LONG-HORNED BEETLES OF VIRGINIA, PART II (COLEOPTERA: CERAMBYCIDAE)

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ABSTRACT

Four cerambycid beetles are recorded as having their northern records in a 3 county area on the southeastern Virginia coast; 2 in Fairfax Co.; and 2 in the coastal plain of Maryland.

In preparation for a paper on the Long-horned beetles of Virginia, I have noticed several species where there is only one recorded locality within the state, or the locations were bunched in a single section. Two particular areas stand out: the southern Appalachian-Cumberland region and the coastal plain. In this paper I discuss some southern species that reach the coastal plain but never into the Piedmont region.

Within a 3 county area on the Virginia coast we have 4 northern records. These counties recorded the highest average rainfall and temperature and the longest growing season in the state. The species are not mountain forms so we should find them at the lower altitudes. Two species extend up the coastal plain to the District of Columbia and 2 reach eastern Maryland (which must be considered à coastal plain).

The following is an annotated list of the 8 species.

Stenodontes dasytomus dasytomus (Say)

This large species has been recorded from Alabama, Arkansas, Arizona, Florida, Louisiana, Mississippi, Oklahoma, South Carolina, Tennessee, and Texas. In Virginia, I have taken it in Holland in middle and late July at blacklight traps.

Scaphinus muticus (Fabricius)

This rare species has been recorded from Arkansas, Florida, Georgia, Louisiana, and South Carolina. It has been taken at Cape Henry in April on *Taxodium distichum* (Linnaeus).

Curius dentatus Newman

This uncommon species has been recorded from Florida and Maryland (Linsley reports its range as Southeastern United States). It has been taken at Cape Henry and Virginia Beach (on *Pinus* sp.) in late July and mid August. To the north, it has been taken at Vienna, Alexandria, Mt. Vernon, Fairfax and Falls Church (on *Acer rubrum* Linnaeus) from mid April to August.

Physocnemum andreae (Haldeman)

This rare species has been recorded from Florida, Georgia, North and South Carolina. It has been taken at Newport News and Cape Henry in mid September.

Ancylocera bicolor (Olivier)

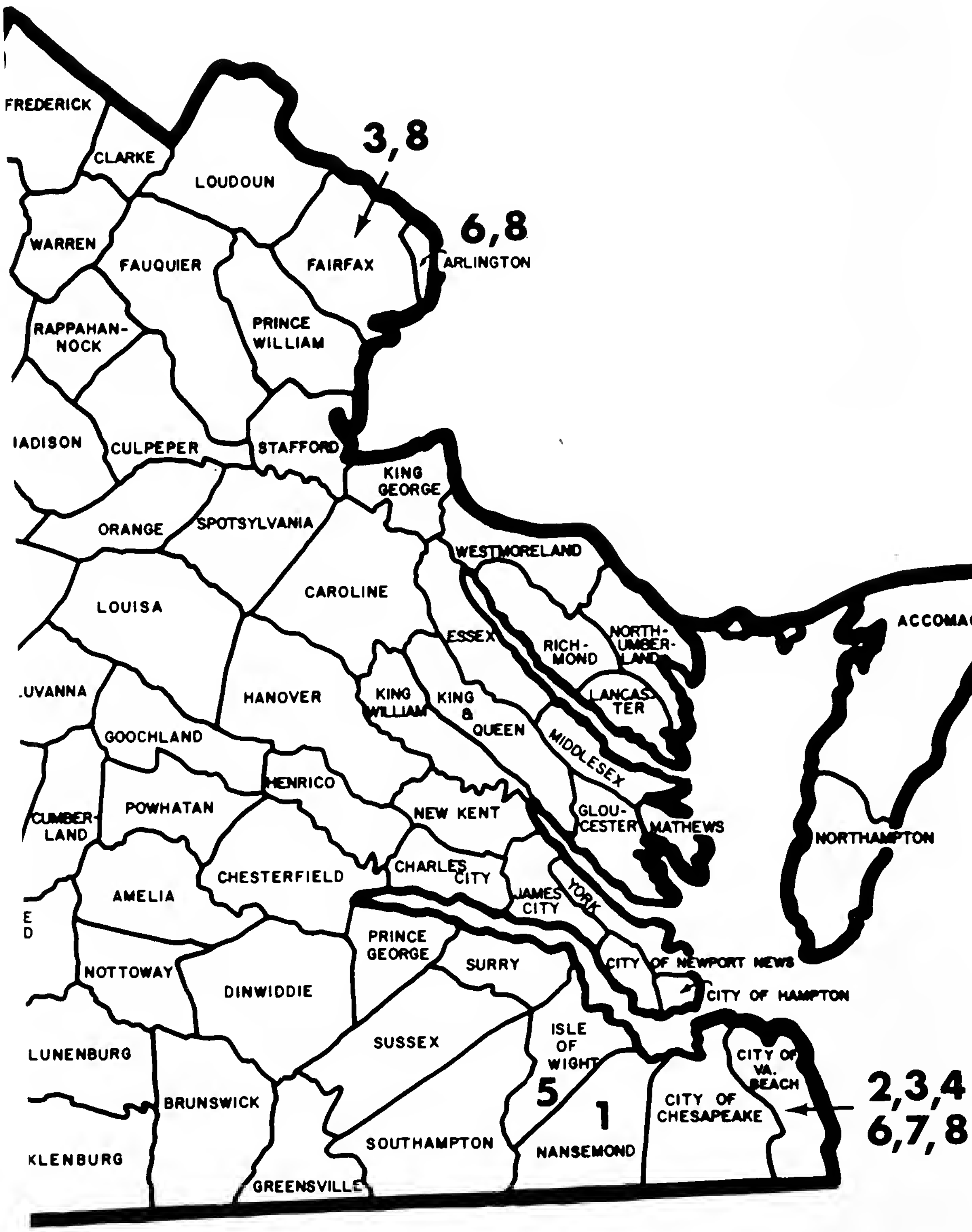
This species has been recorded from Texas to Florida to North Carolina. In Virginia it has been taken at Carrsville in early June at a blacklight trap.

Leptostylus albescens (Haldeman)

This attractive species has been recorded from Alabama, District of Columbia, Florida, Mississippi, South Carolina, and Texas. I recently took it at Virginia Beach in early September.

Amniscus arcuatus knulli (Fisher)

This species has been recorded from Alabama, Arkansas, Maryland, Mississippi, North and South Carolina. In Virginia it has been taken at Virginia Beach in early September.



1) *Stenodontes dasytomus dasytomus* (Say); 2) *Scaphinus muticus* (Fabricius); 3) *Curius dentatus* Newman; 4) *Physocnemum andreae* (Haldeman); 5) *Ancylocera bicolor* (Olivier); 6) *Leptostylus albescens* (Haldeman); 7) *Amniscus arcuatus* knulli (Fisher); 8) *Sternidius moderator* (Casey).

Sternidius moderator (Casey)

This species has been recorded from the District of Columbia, Florida, Louisiana, and North Carolina. It has been reported from Mt. Vernon and Virginia Beach (on *Morus* sp.) in mid June.

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EUBRIANAX EDWARDSI IN NEVADA WITH NOTES ON LARVAL PUPATION AND EMERGENCE OF ADULTS (COLEOPTERA: PSEPHENIDAE)

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Abstract

Larvae of *Eubrianax edwardsi* were collected near Reno, Nevada 16 March 1969. In the laboratory, pupation occurred between 21 April and 17 May. Adults emerged between 17 and 29 May. Twenty per cent of the larvae pupated and emerged as adults.

On 16 March 1969 a series of larvae of *Eubrianax edwardsi* (Le Conte, 1874) was collected from the submerged sides and bottoms of rocks in Hunter Creek, Washoe County, Nevada, about 150 m above its confluence with the Truckee River (T19N, R19E, S19), elevation 4680′ (1427 m). The rocks protruded above the surface of the water. This locality is on the present western edge of Reno. La Rivers (1950) reported the only known collection of the beetle from Nevada: Douglas County, Zephyr Cove (Lake Tahoe), 31-VII-41, T. J. Trelease, 6300′ (1920 m), 56 km S of our collection, and predicted a wider distribution along the eastern edge of the Sierra Nevada. Brown (1972) noted that the larvae are found "on or under submerged rocks in California and Oregon streams up to about 6,000 feet" (1829 m) elevation. Brown (In press) listed the genus from Nevada without further details.

The evening of 16 March 1969, 40 larvae were placed into a 5 gallon aquarium containing water and rocks from Hunter Creek. The rocks were large enough to protrude from the water's surface. A fine mesh wire screen top was fitted over the aquarium to prevent loss of any adults after emergence. The water was maintained at room temperature (ca 23°C) and kept under constant aeration.

Within an hour the majority had attached to the submerged portions of the rocks, where they remained until pupation. The results of the pupation and emergence studies are shown in Fig. 1. Observations were made for 81 days, until the beetles had either emerged or died. The first larva pupated above the water surface on 21 April, after 36 days in the aquarium. Larvae pupated until 17 May, all above the water line. At that time nearly half the larvae were dead. Adults emerged from 17 to 29 May, approximately 1 month after pupation. Adults flew around inside the aquarium and occasionally landed on the exposed portions of the rocks. Drowning claimed several adults which had not been collected the day of emergence.

Specimens are located in the collections of the authors and Harley P. Brown (University of Oklahoma, Norman) who also verified our identification and provided a copy of his distributional checklist. This research was conducted while the authors were at the University of Nevada, Reno.

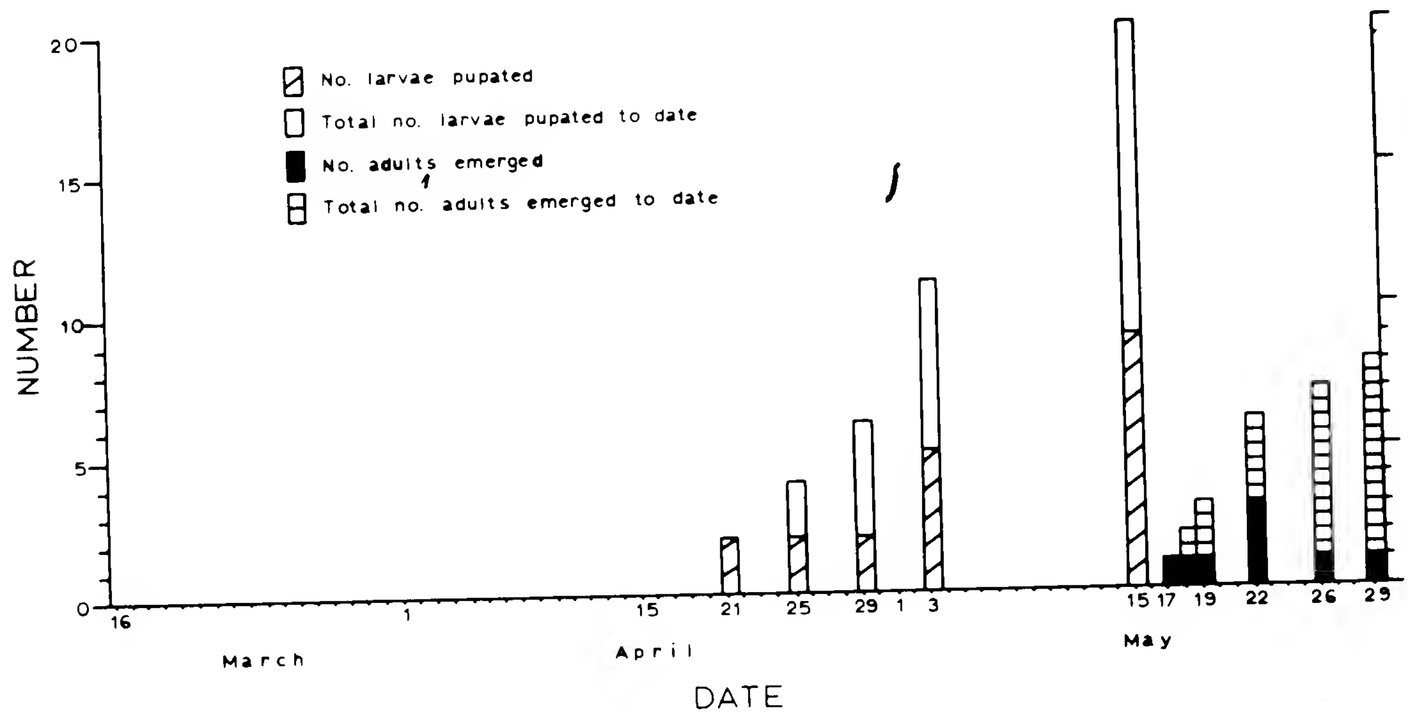

Fig. 1. Pupation and emergence of *Eubrianax edwardsi* at 23°C, Reno, Nevada. Forty larvae were collected and placed in the aquarium on 16 March 1969.

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ALLENDIA, A NEW SOUTH AMERICAN GENUS WITH NOTES ON ITS EVOLUTIONARY RELATIONSHIPS TO OTHER GENERA OF ANISODACTYLINA (COLEOPTERA: CARABIDAE: HARPALINI)

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Abstract

Harpalus chilensis Solier, 1849 is not a member of the genus *Harpalus* but belongs in the subtribe Anisodactylina and warrants separate generic rank. The genus *Allendia* is described with *Harpalus chilensis* Solier, 1849 as its type species. This genus is the sister group of *Criniventer* van Emden, 1953, and these 2 possibly evolved in a region west of the Andes of South America and then later dispersed eastward. The valvifer of the ovipositor of *Criniventer rufus* (Brullé, 1838) is also described and illustrated, and a correction made in an earlier characterization of the elytra of this species.

Introduction

The species *Harpalus chilensis* was originally described by Solier (1849), subsequently listed by Csiki (1932) as a member of the genus *Anisotarsus,* and stated by van Emden (1953) to belong to the subtribe Pelmatellina due to having only 2 setae on the anterior margin of the penultimate article of the labial palpus. Henri Goulet (personal communication) noted while revising the North and Middle American species of the genus *Pelmatellus* Bates 1882 that *H. chilensis* specimens actually have 2 long setae and 1 slightly more proximal short fine seta on the anterior margin of the penultimate article of the labial palpus. In contrast, all members of Pelmatellina that he examined lacked the fine short seta and had bisetose palpi. He also noted that specimens of *H. chilensis* bore several long setae at the apex of the prosternal intercoxal process (=apex of prosternal lobe in Noonan, 1973) while all Pelmatellina examined by him lacked such setae.

I have established (Noonan, 1973) that all members of the subtribe Anisodactylina have long setae at the apex of the prosternal intercoxal process and for this paper have also confirmed Goulet's observations by examination of the following Pelmatellines: 14 species of *Lecanomerus* Chaudoir, 1850; 9 species of *Pelmatellus*; and 3 species of *Syllectus* Bates, 1878.

The trisetose condition of the anterior margin of the penultimate article of the labial palpus together with the presence of long setae on the apex of the prosternal intercoxal process indicate that *H. chilensis* is not a member of Pelmatellina but rather belongs in the subtribe Anisodactylina whose member species all have 3 or more setae on the anterior margin of the penultimate article of the labial palpus and long setae at the apex of the prosternal intercoxal process. Therefore, the species *H. chilensis* is herewith transferred to the subtribe Anisodactylina.

Ranking of *Harpalus chilensis*

Harpalus chilensis is the sister taxon of *Criniventer rufus* (Brullé, 1838) as elucidated in the section entitled "Evolutionary relationships". The question therefore is whether to include *H. chilensis* in *Criniventer* or to rank it in a separate genus.

The most fundamental character separating the 2 species is that specimens of *H. chilensis* have 2 long setae at each side of the pronotum while specimens of *C. rufus* have only 1 such seta at each side. The number of pronotal lateral setae has been accepted by past workers as an important character within the tribe Harpalini for defining and ranking taxa. Jeannel (1942) emphasized the presence of 2 such setae at each side of the pronotum to partly justify ranking *Trichocellus* Ganglbauer, 1892 as a separate genus rather than as a subgenus of *Bradycellus* Erichson, 1837. In my 1973 study of the genera and subgenera of the subtribe Anisodactylina, I confirmed the importance of this character in ranking taxa of the tribe Harpalini, used it to partly justify generic rank for *Progonochaetus* G. Müller, 1838 and *Diachromus,* and concluded that the presence of 2 pairs of pronotal lateral setae in members of Harpalini is an apomorphic condition useful in elucidating the evolutionary relationships of supra-specific taxa. To the best of my knowledge, the tribe Harpalini presently contains no genus in which members of some species have the plesimorphic condition of only 1 pair of pronotal lateral setae and members of other species have the apomorphic condition of 2 pairs of these setae.

Members of *H. chilensis* also differ from those of *C. rufus* by having a narrow, moderately delimited pronotal lateral depression while that of *C. rufus* is broad and very sharply delimited. The condition of a very sharply delimited pronotal lateral depression is an apomorphic feature within the subtribe Anisodactylina and is moderately important for ranking supra-specific taxa. In my 1973 paper I partly justified the proposal of a new subgenus for the single species *Anisodactylus laetus* Dejean, 1829 by reference to the very sharply delimited pronotal lateral depression found in this species.

Less important differences between *H. chilensis* and *C. rufus* are: *H. chilensis* has a complete scutellar stria while *C. rufus* either lacks a scutellar stria or has only a vestigial one; and the dorsal coloration of the 2 species is different. These 2 characters show variation within many supra-specific taxa of Anisodactylina and therefore are not of great value in defining and ranking taxa of this subtribe.

I believe that the presence of 2 pairs of pronotal lateral setae in *H. chilensis,* the difference in pronotal lateral depressions between *H. chilensis* and *C. rufus,* and to a lesser degree the differences in scutellar stria and dorsal coloration require that *H. chilensis* be accorded separate generic status. Therefore, I here describe a new genus for this species.

Allendia Noonan, **New Genus**

Type Species: *Harpalus chilensis* Solier, 1849, by present designation and monotypy.

Diagnosis: The presence of 2 long setae on each side of the pronotum and the green color of the dorsum distinguish *Allendia chilensis* from all other taxa of the subtribe Anisodactylina.

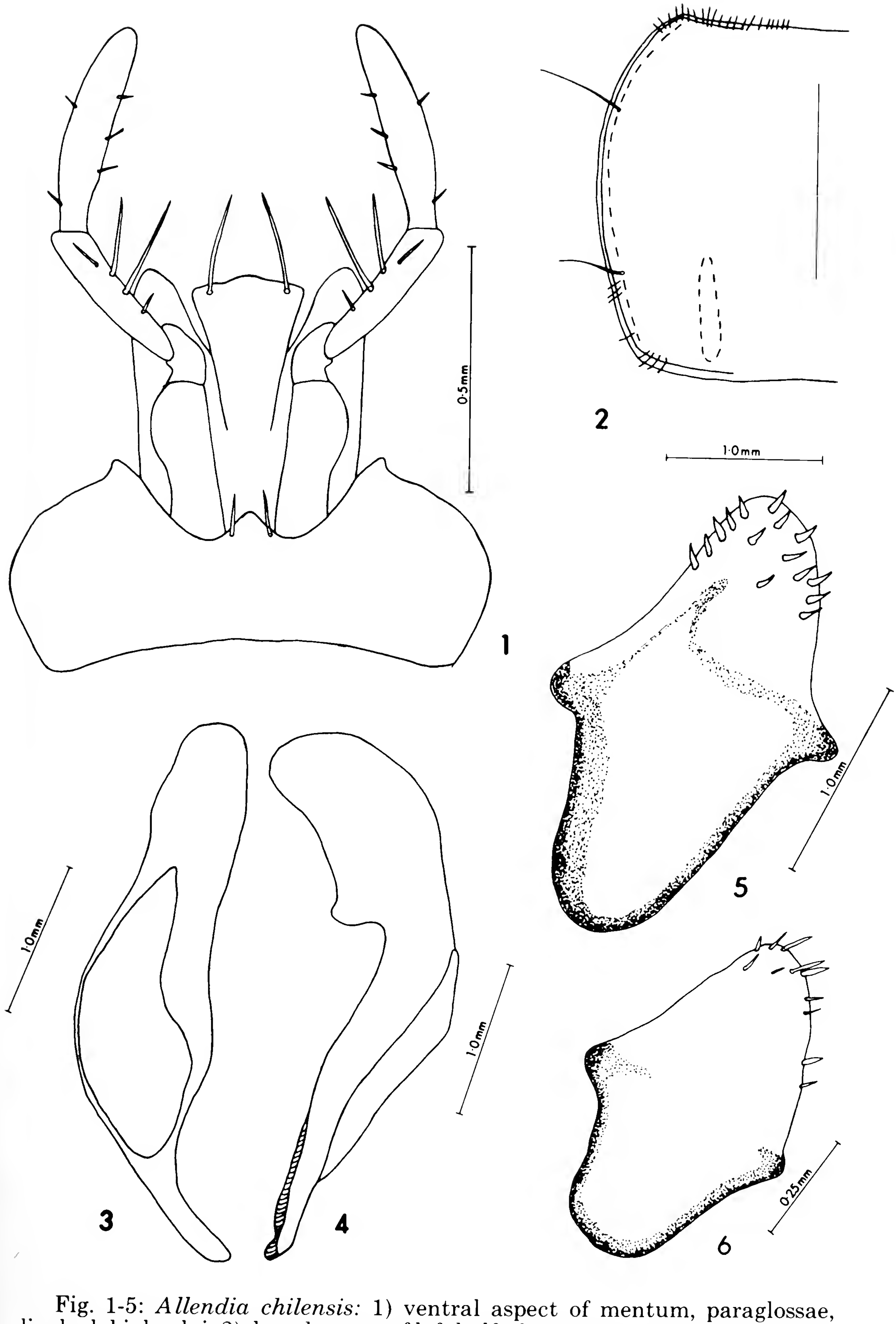

Fig. 1-5: *Allendia chilensis:* 1) ventral aspect of mentum, paraglossae, ligula, labial palpi; 2) dorsal aspect of left half of pronotum; 3) dorsal aspect of median lobe of male genitalia; 4) lateral aspect of median lobe of male genitalia; 5) ventro-lateral aspect of valvifer of ovipositor. 6) Ventro-lateral aspect of valifer of ovipositor of *Criniventer rufus.*

Description: Body length 8.5 to 11 mm.

COLOR: Clypeus reddish black or dark metallic green; remainder of dorsum dark metallic green, elytral apices of some specimens with cupreous tinge.

MICROSCULPTURE: Isodiametric mesh on pronotum and elytra, of such mesh on frons of head but obsolenscent medially in many males.

HEAD: Mandibles average for Anisodactylina. Mentum (fig. 1) with prominent median tooth; 1 seta at each side of tooth base. Mentum and submentum separated by complete transverse suture. Submentum with 1 long inner and 1 short outer seta at each side. Ligula (fig. 1) with apex prominently expanded laterally, with 2 distal ventral setae. Paraglossae (fig. 1) glabrous, slightly longer than ligula. Labial palpi (fig. 1) each with 2 long setae and 1 short fine seta[1] on anterior margin of penultimate article.

THORAX: Pronotum (fig. 2) at each side with 1 long seta in anterior half and 1 long seta in posterior half; with short setae along lateral margin in most specimens; in all specimens with irregular series of fine short setae along at least lateral portions of basal and apical margins.

LEGS: Posterior margins of hind femora each with 3 or more long setae and varied numbers of short fine setae. Dorsum of tarsi pubescent. Fore- and mid tarsi of male with articles 1 to 4 laterally expanded and spongy-pubescent beneath.

ELYTRA: Scutellar striae each with origin near ocellate puncture close to base of stria 2; striae moderate in depth medially, progressively shallower laterally to 8; 8 deep and with ocellate punctures along entire length; intervals flat and 1,3,5,7 each with irregular row of fine short setae extended from apex nearly to base; subapical sinuations obsolescent; sutures obtusely rounded.

ABDOMEN: Sterna with irregular short pubescence; sterna 3 to 5 each with 1 pair of ambulatory setae; sternum 6 with 2 pairs of ambulatory setae. Apex of female tergum 8 broadly rounded.

MALE GENITALIA: Median lobe (fig. 3,4) asymmetrical; apex elongate, curved to right.

OVIPOSITOR: Valvifer (fig. 5) moderately sclerotized, with several spine like distal setae. Stylus of unmodified type described by Noonan (1973:277-278, fig. 237, p. 471).

DERIVATION OF GENERIC NAME: This genus is named for Salvador Allende, the late president of Chile, and is dedicated to his memory.

Since this species was only briefly described by Solier (1849), I here provide a redescription.

My 1973 key to the genera and subgenera of Anisodactylina is here modified to permit identification of the genus *Allendia*.

1. Pronotum with 2 lateral setae on each side (in most specimens anterior seta located before or in mid-region of lateral margin and posterior seta located in region of posterior angle) 2

---- Pronotum with 1 lateral seta on each side (such seta situated in mid-region of lateral margin) 4

[1]The short fine seta may be difficult to discern; on specimens viewed with a dissecting microscope, it is best seen when the specimens have been relaxed in hot water and are still covered with a film of water.

2(1). Dorsum tricolored, head and elytral bases reddish black, pronotum black, elytral apices violaceous or bluish brown; range England, Europe, Mediterranean area .... *Diachromus* Erichson
---- Dorsum not so colored, reddish black to black or dark metallic green and with dark metallic green or cupreous elytral apices 2A

2A(2). Dorsum dark metallic green, elytral apices dark metallic green or cupreous; range Chile and western Argentina.......... .... *Allendia* new genus
---- Dorsum reddish black to black; range Madagascar and Africa south of the Sahara Desert 3

Allendia chilensis (Solier)

Harpalus chilensis Solier, 1849:262-263.

Description: COLOR: Antenna with first article yellowish to reddish, remaining articles black. Palpi reddish brown to reddish black; apices of some articles lighter in many specimens than remainder of articles. Legs reddish brown to reddish black.

HEAD: Labral apex straight to moderately emarginate medially. Clypeus with apex straight to moderately emarginate medially; 1 long seta at each outer distal angle. Frontal foveae each crescent shaped, continued posterolaterally as clypeo-ocular prolongation extended to eye or not.

THORAX: Pronotum (fig. 2) relatively narrow; sides evenly curved from apex to base; posterior angles obtusely rounded; anterior and posterior beads present laterally; lateral beads complete but narrow; lateral depressions narrow, especially posteriorly, moderately sharply delimited from disc; basal foveae elliptical, moderately deep, each separated from lateral bead by convexity.

HIND WINGS: Full and apparently functional.

Discussion: Solier (1849) did not mention how many specimens he had of *H. chilensis,* but his stating of a single length and a single width for this species suggests he had only 1 specimen. I was unable to locate the type in the Museum National d'Histoire Naturelle, Paris, where Solier's specimens are supposedly located. Fortunately, there is no disagreement among workers as to the identity of *H. chilensis.*

Bionomics: Specimens have been collected from January to April, June to July, and September to December. According to the Philips Series of Comparative Wall Atlases, South American Vegetation, scale 1:9,000,000 (1966) the localities from which I have seen *A. chilensis* are in areas with vegetation of Temperate Rain Forest or Mediterranean Hard-leaved Woodlands. These 2 vegetation types are clearly temperate assemblages of plants. These localities are distributed from sea level to approximately 1000 feet.

Distribution: This species occurs (fig. 7) from coastal areas to the western edge of the Andes in Chile and along the eastern edge of the Andes in western Argentina.

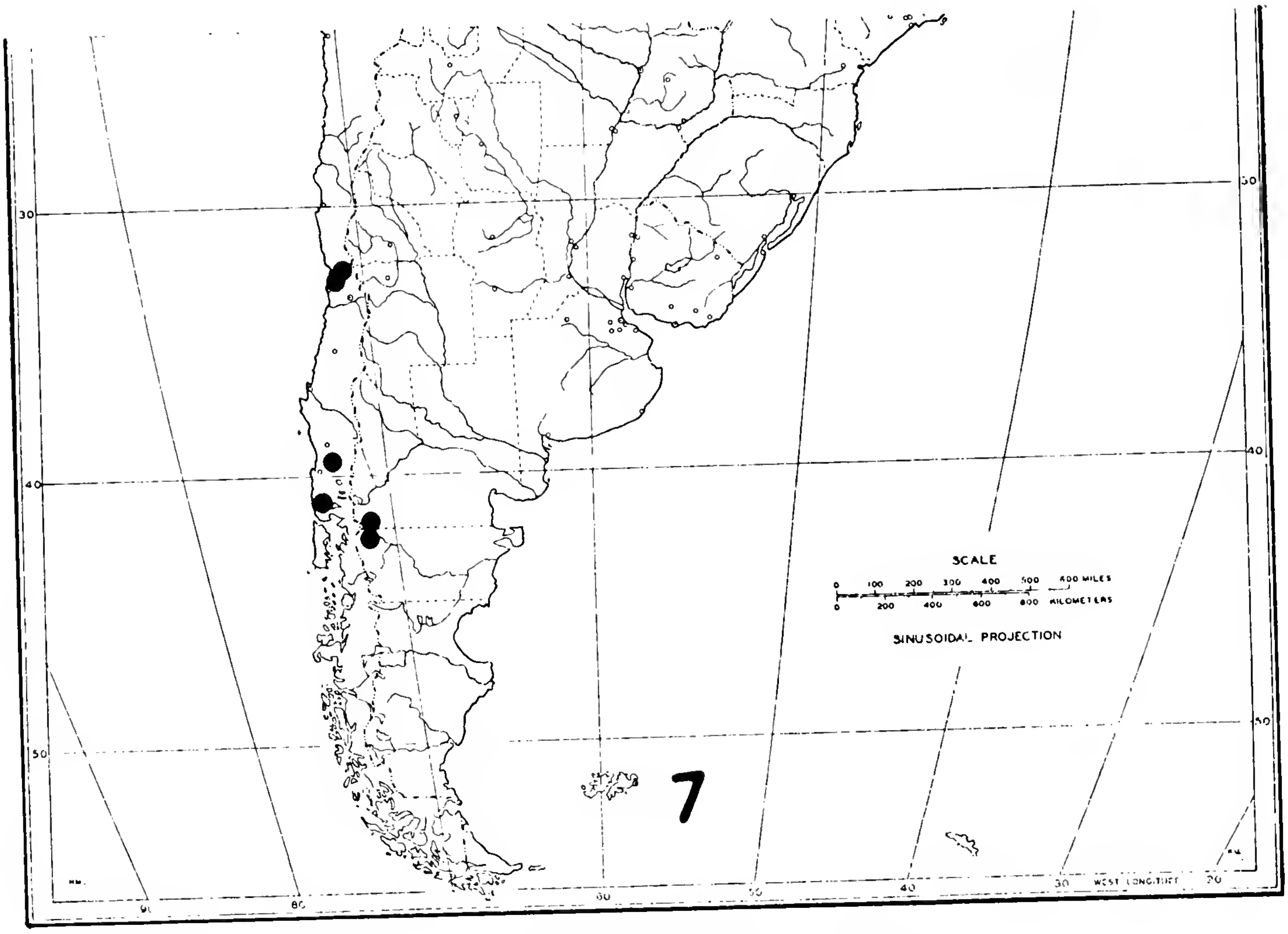

Fig. 7. Distribution of *Allendia chilensis*.

Material examined: (87 specimens, CAS=California Acad. Sci.; LACM=Los Angeles County Museum): ARGENTINA: Province of Chubut: Cholila, Andor Kovacs, (LACM), 7 males, 9 females II-58; Leleque, Andor Kovacs, (LACM), 2 males I-56. Province of Rio Negre: El Bolson, Andor Kovacs, (LACM), 1 male, 2 females I-56, 1 male II-56, 1 male, 4 females II-58, 1 male, 1 female 10-III-59, 1 male, 1 female IV-58, 2 males 1-5-IX-56, 1 female 10-15-X-56, 1 male 8-10-XI-56, 1 female 22-XI-58, 1 female XII-55, 1 male 10-XII-56. CHILE: Province of Cautin: Temuco, Fuentes, (CAS), 3 males; 22 K. E. of Temuco, M. G. Smith, (CAS), 3 males VI-VII-51. Province of Llanquihue: Los Muermos, Ross and Michelbacher collectors, Forest, (CAS), 1 female 19-I-51. Province of Valparaiso: 10 mi. N. of Concon, Ross and Michelbacher collectors, (CAS), 3 males, 7 females 16-XII-50; Miramar, Faz, (CAS), 1 female III. Either province of Valparaiso or city of Valparaiso in this province, (CAS) 3 males, 2 females. No locality information other than "central Chile", (CAS), 3 males, 2 females. I have also seen 21 specimens which bear labels containing contradictory locality information.

EVOLUTIONARY RELATIONSHIPS

(The reader of this section should make reference to pages 388-397, Figure 240 and Table 2 of my 1973 study.)

In Figure 240 and Table 2 of my 1973 paper I mistakenly characterized *Criniventer rufus* (Brullé, 1838) as having dorsal non setigerous punctures on odd, and, in some specimens, also even intervals of the elytra. I had not then been able to examine the ovipositor of this species. I have secured additional specimens and found that the punctures on the elytral intervals each contain a very short and very fine seta (setae were broken off on specimens I examined for 1973 study), and the valvifer of the ovipositor (fig. 6 of this paper) is non-vestigial, with several distal spine-like setae, and the stylus is of the unmodified type described by me (1973:277-278, Fig. 237, p. 471).

The complete transverse suture between the mentum and submentum of specimens of *Allendia chilensis* places the genus *Allendia* in the Notiobioid group. And the genus *Allendia* belongs in the *Criniventer* stock due to members of *A. chilensis* sharing the following 3 features with all other members of this stock: 1) short fine setae along lateral parts of pronotal anterior margin; 2) rows of dorsal setae on elytral intervals; and 3) extra setae on abdominal sterna. It is assumed that the immediate common ancestor of

TABLE OF PLESIOMORPHIC AND APOMORPHIC CHARACTER STATES USED IN FIG. 8.

No.	Character	Character State plesiomorphic	apomorphic
	Head		
1	ligula apex	not to slightly expanded laterally	strongly expanded laterally
2	dorsal setae on ligula	absent	present
	Pronotum		
3	no. of long setae at each side	1	2
4	short, fine setae	present along lateral part of anterior margin	present along lateral part of anterior and posterior margins and along lateral margins
5	lateral depression	not sharply delimited	moderately sharply delimited (a) very sharply delimited
	Elytron		
6	scutellar stria	present	absent or vestigial
	Ovipositor		
7	valvifer	moderately sclerotized, not vestigial	vestigial
8	articles of stylus	separate	fused

the *Criniventer* stock shared these 3 features which are apomorphic states when comparing supra-specific taxa of Anisodactylina but plesiomorphic states when comparing taxa within the *Criniventer* stock.

The ancestor of the *Criniventer* stock produced the *Pseudanisotarsus* and *Criniventer* lineages each characterized by the plesiomorphic and apomorphic character states shown in Figure 8 and explained in the accompanying table. The *Pseudanisotarsus* lineage is today represented only by the genus *Pseudanisotarsus* Noonan, 1973. The *Criniventer* lineage ultimately gave rise to the sister genera *Criniventer* van Emden, 1953 and *Allendia* (Fig. 8).

The genera of the *Criniventer* stock are each monotypic. The lack of additional species in these 3 genera probably is due either to these genera being recently evolved or more likely to past species extinctions. The *Criniventer* stock is treated in my 1973 paper as probably having evolved by the middle Cretaceous. Unless the 3 extant genera of this stock took a long time to evolve, they are each tens of millions of years old and presumably have had time to acquire and lose species.

The distribution of the taxa of the *Criniventer* stock is as follows: *Pseudanisotarsus* is found in eastern Argentina and possibly Brazil (Noonan, 1973); *Criniventer* is reported by van Emden (1953) from Argentina, Chile, and

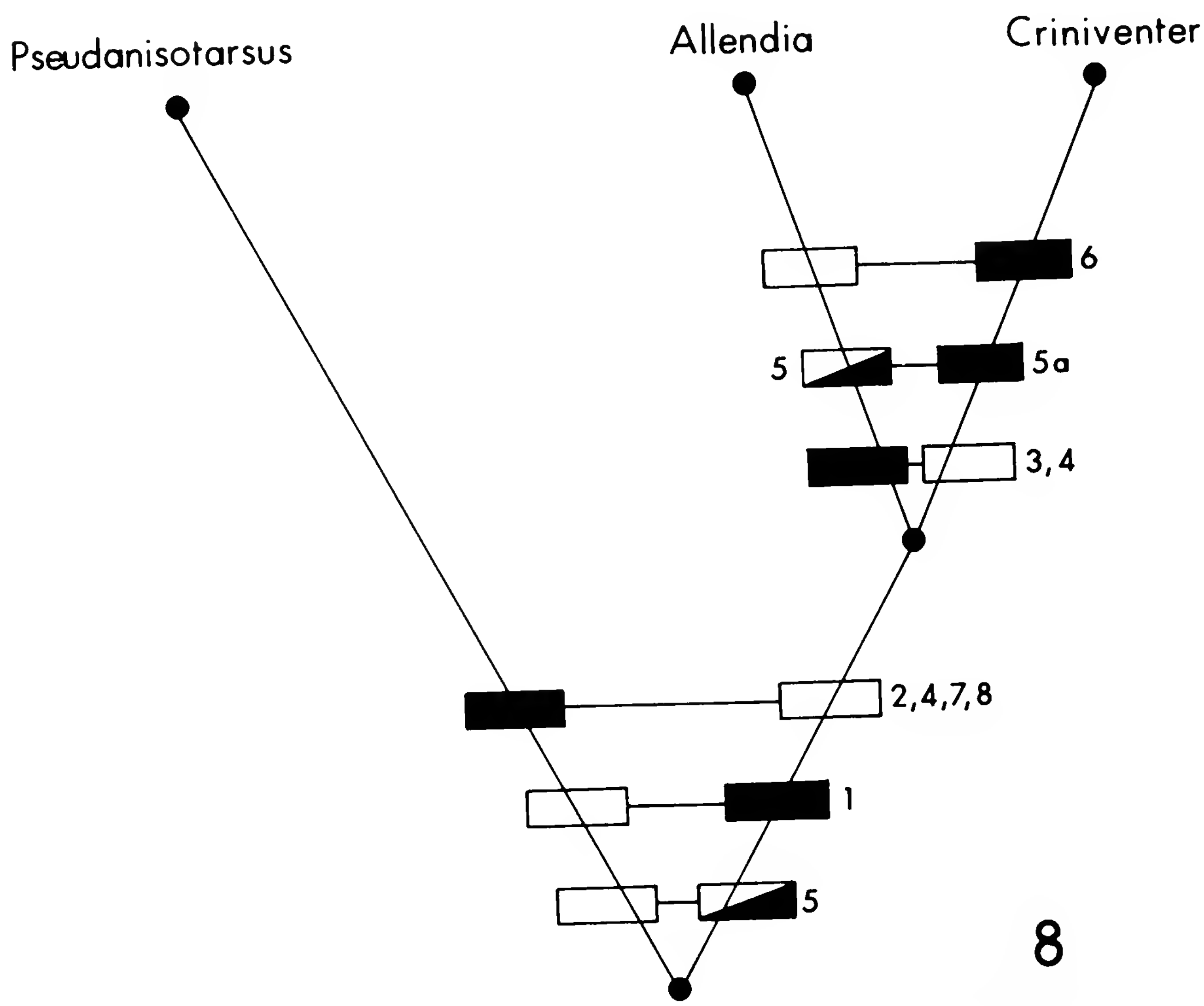

Fig. 8. Postulated sequence of evolution of the genus *Allendia* and other genera of the *Criniventer* stock. (Hollow rectangles denote plesiomorphic character states, half black rectangles denote intermediate apomorphic character states, fully black rectangles denote apomorphic character states).

Uruguay; and *Allendia* is found in Chile and eastern Argentina. The presence of the 2 sister genera *Allendia* and *Criniventer* west of the Andes and the apparent absence of *Pseudanisotarsus* from this region suggest that *Allendia* and *Criniventer* may have evolved west of the Andes and then later dispersed eastwards.

Acknowledgments

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We have tried to notice all lists of types that are brought to our attention, and we solicit such information from members. This list, sent by Sr. Peña, contains label data and literature citations for all holotypes, allotypes, paratypes, topotypes, homotypes, and metatypes in his private collection. It contains 282 species of Coleoptera, many with the patronym for Peña; including *Penaus penai* Freude and *Luispenaia paradoxa* Martinez.

WEST INDIAN COCCINELLIDAE I (COLEOPTERA): THE GENUS *PSOROLYMA* SICARD

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ABSTRACT

Two new species of the genus *Psorolyma, sicardi* and *cyanella,* are described, a key to species is provided, and a lectotype is designated for *Psorolyma maxillosa* Sicard.

This is the first of a series of papers dealing with the classification of West Indian Coccinellidae. Although West Indian members of the family are much better known than those from Central or South America, it will be some time before the West Indian Coccinellids can be treated as a whole. These papers are intended as an outlet for information resulting from interim investigations.

The genus *Psorolyma* was described by Sicard (1922) for the species *P. maxillosa* Sicard and has remained a monobasic genus ever since. *P. maxillosa* was described from Puerto Rico and is probably restricted to that island. There are many specimens of *maxillosa* in the U. S. National Museum collection, all from Puerto Rico. Specimens of 2 other species of *Psorolyma* from Hispaniola and Jamaica are present in collections and are herein described.

Material from the Canadian National Collection (CNC), U. S. National Museum (USNM), Museum of Comparative Zoology (MCZ), American Museum of Natural History (AMNH) and British Museum (Natural History) (BMNH) has been examined.

I wish to thank Dr. R. D. Pope (BMNH) for permitting examination of the types of *Psorolyma maxillosa* Sicard. Illustrations presented herein were prepared by Miss Kate Conway.

Psorolyma Sicard

Psorolyma Sicard, 1922:358; Korschefsky, 1931:84; Blackwelder, 1945:443.
Type-species: *Psorolyma maxillosa* Sicard, monobasic.

Head wide, eyes widely separated, narrowed anterior to antennal insertion, apex of clypeus feebly to deeply emarginate (Fig. 1); gena slightly extended onto margin of eye; antenna long, slender, inserted under lateral margin of frons immediately beside eye, club 2-segmented, ultimate segment conical, penultimate segment widened and produced (Fig. 3); maxillary palpus securiform; apical segment of labial palpus densely pubescent, strongly tapered toward apex. Pronotum short, wide, margined laterally and basally. Prosternum with anterior margin broadly, feebly emarginate, intercoxal process truncate apically, lacking carinae. Legs slender, unmodified; tarsus

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cryptotetramerous; claw without tooth but with distinct basal angulation. Epipleuron flat (*P. maxillosa*) or obliquely inclined. Abdomen with 6 visible sterna; postcoxal line incomplete, extending nearly to posterior margin of first sternum with apical part nearly parallel to margin (Fig. 4). Male genitalia with basal lobe more or less compressed laterally, expanded dorsoventrally (Fig. 6, 7); sipho extremely slender (Fig. 8). Female genitalia with cornu of spermathecal capsule strongly bent, with a falciform appendix at apex, no nodulus or ramus present, accessory gland short, sperm duct slightly pigmented (Fig. 18); genital plate long, slender.

Key to species of *Psorolyma* Sicard

1. Dorsal punctation composed of mixed coarse and fine punctures; clypeus of male with a strong, triangular projection on each side (Fig. 1); Puerto Rico .... *maxillosa* Sicard

1′. Dorsal punctation fine, not mixed; clypeus of male not as figured above; not known from Puerto Rico 2

2. Elytron yellow with 2 black spots (Fig. 2); Jamaica .... *sicardi*, n. sp.

2′. Elytron dark metallic blue, violet or green; Hispaniola...... .... *cyanella*, n. sp.

Psorolyma maxillosa Sicard

Psorolyma maxillosa Sicard, 1922:360; Korschefsky, 1931:84; Blackwelder, 1945:443.

The male of this species cannot be confused with any presently known species of Coccinellidae because of the unusual clypeal margin (Fig. 1). The metallic blue or green dorsal surface gives *maxillosa* a slight resemblance to members of the genus *Scymnillus*. The male genitalia are distinctive (Fig. 6-9). Female spermathecal capsule as in Fig. 18.

There are 6 specimens in the BMNH collection, all labeled "Lares, Porto Rico, Apr. 19, 1921". The first of these is here designated lectotype and so labeled, the remaining 5 as paralectotypes.

Psorolyma sicardi Gordon, **new species**

Male: length 2.23 mm, greatest width 1.73 mm. Form oval, widest at middle of elytra. Color yellow except elytron with 2 large, black spots, anterior spot at basal margin covering humeral callus, posterior spot larger than anterior, occupying most of apical half (Fig. 2). Head with clypeal margin broadly, distinctly emarginate, lateral angle bluntly rounded; eyes widely spaced, separated by slightly less than length of antenna; surface shining, punctured, punctures separated by their diameter or less. Pronotum and elytron shining, punctures on pronotum fine, separated by 1 to 2 times their diameter, punctures on elytron coarser than on pronotum, separated by less than to 3 times their diameter. Epipleuron slightly obliquely inclined. Abdomen with postcoxal line indistinct, short, widely incomplete (Fig. 4); apex of 6th sternum feebly emarginate apically. Genitalia with basal lobe flattened in ventral view, anterolateral angle abrupt (Fig. 10, 11); sipho as in Fig. 12 and 13.

Female: Similar to male except apex of 6th sternum entire, rounded. Spermathecal capsule abruptly curved (Fig. 19).

Variation: Length 2.00 to 2.31 mm, width 1.49 to 1.76 mm. A single specimen has the head and pronotum black and all femora piceous.

Holotype: Male, JAMAICA: St. Thomas, Penlyne Castle, 20-VII-1966, Howden & Becker [CNC].

Paratypes: Total 26, 10 with same data as holotype; 5, JAMAICA, 4000', Hardwar Gap, 17-VII-1966, Howden & Becker; 10, JAMAICA, St. Thomas, Whitfield Hall, 27-VII-1966; 1, JAMAICA, Port., Port Antonio, 1-7-VII-1966, E. C. Becker. [CNC] [USNM].

This species bears a strong resemblance to *Zagreus ritchiei* (Sicard), which is also from Jamaica. With the exception of *ritchiei, P. sicardi* can immediately be distinguished on dorsal color pattern alone. The species closely resembles *P. maxillosa* in all details except color, male genitalia and distribution.

Psorolyma cyanella Gordon, **new species**

Male: length 2.27 mm, greatest width 1.75 mm. Form round, slightly elongate, widest at middle of elytra. Dorsal surface black with strong metallic sheen, head with violet sheen, pronotum greenish violet, elytron green; ventral surface mostly piceous to dark brown except antenna, mouthparts, tibiae and tarsi yellow. Head with clypeal margin feebly emarginate medially, anterior angle broadly rounded; eyes separated by 0.75 length of an antenna; surface shining, punctured, punctures separated by 1 to 3 times their diameter. Pronotum shining, punctures separated by less than to 3 times their diameter. Elytron shining, punctured, punctures separated by twice, or less, their diameter. Epipleuron obliquely inclined. Apical margin of prosternum protruding slightly at middle. Postcoxal line on metasternum beginning in deep pit. Abdomen with postcoxal line narrowly incomplete, beginning in deep pit (Fig. 5); apex of fifth sternum truncate. Genitalia simple, basal lobe as long as paramere, flattened laterally (Fig. 14, 15); sipho slender (Fig. 16, 17).

Female: Similar to male except apex of fifth abdominal sternum rounded. Spermathecal capsule elongate, slender, cornu abruptly bent (Fig. 20).

Variation: length 1.98 to 2.39 mm, width 1.53 to 1.85 mm. Dorsal color varies from almost entirely metallic green to entirely metallic violet or occasionally metallic blue.

Holotype: Female, DOMINICAN REPUBLIC: Puerto Libertad, '52, C. F. Dowling [USNM type no. 72841].

Paratypes: Total 37, 3 with same data as holotype; DOMINICAN REPUBLIC: 1, San Juan, July 1-30, 1955, Rodriguez Paniagua; 1, Santiago, 1938, Darlington; 1, foothills Cord. Cent. s. of Santiago, June, 1938, Darlington; 1, Sanchez, July, 1938, Darlington; 1, Villa Altagracia, July, 1938, Darlington; 4, Constanza, 3-4000 ft., Darlington; 2, Mt. Diego de Ocampo, 3-4000 ft., July, 1938, Darlington; 7, San Jose de las Matas, 1-2000 ft., June, 1938, Darlington; HAITI: 1, Desbarrie Mf. La Hotte, nr. 400 ft., Oct. 12-14, 1934, Darlington; 1, Trow d' East, 19-XI-400 ft., 1934, Darlington; 1, Mannevill, Nov. 16-17, '34, Darlington; 2, Grande Riviere, W. M. Mann; 4, Pt. au Prince, Oct., 1950, NLH Krauss; 1, Pt. au Prince, R. J. Crew; 3, Port-au-Prince 8 vic., 3-X-1934, Darlington; 1, Kenscoff, Aug. 1-6, 1961, J. Maldonado C.; 2, Camp Perrin, July, 1925, W. A. Hoffman. [CNC] [USNM] [MCZ].

This species differs from *P. maxillosa* in that the apical anterior margin of the prosternum is not evenly rounded, the postcoxal lines originate in more distinct pits, the epipleuron is obliquely descending, not flat, and the female

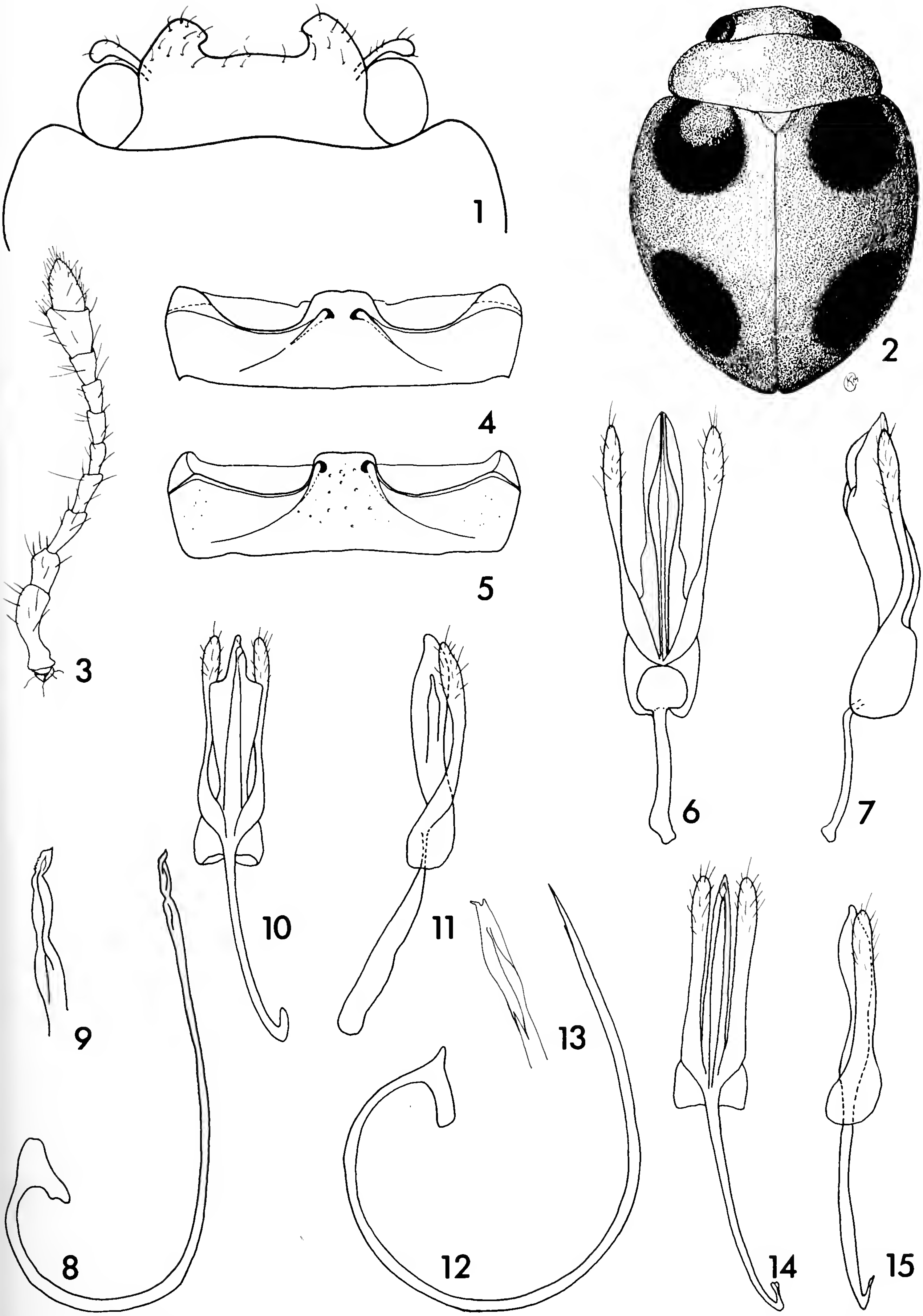

Fig. 1-15: 1) *P. maxillosa,* head; 2) *P. sicardi,* habitus; 3) *P. maxillosa,* antenna; 4) *P. sicardi,* first abdominal sternum; 5) *P. cyanella,* first abdominal sternum; 6-9) *P. maxillosa,* male genitalia; 10-13) *P. sicardi,* male genitalia; 14, 15) *P. cyanella,* male genitalia.

spermathecal capsule is much more elongate. In all other respects *cyanella* agrees with *maxillosa*. It is possible that *cyanella* may be placed in a new genus when the West Indian Coccinellidae are better known. I have seen 3 males with the clypeal apex deeply emarginate and the lateral angle acute. There are no apparent differences in the genitalia or any other characters between these males and typical *cyanella*, and they are here considered to be *cyanella* but are not included in the type series. *P. cyanella* is apparently restricted to the island of Hispaniola.

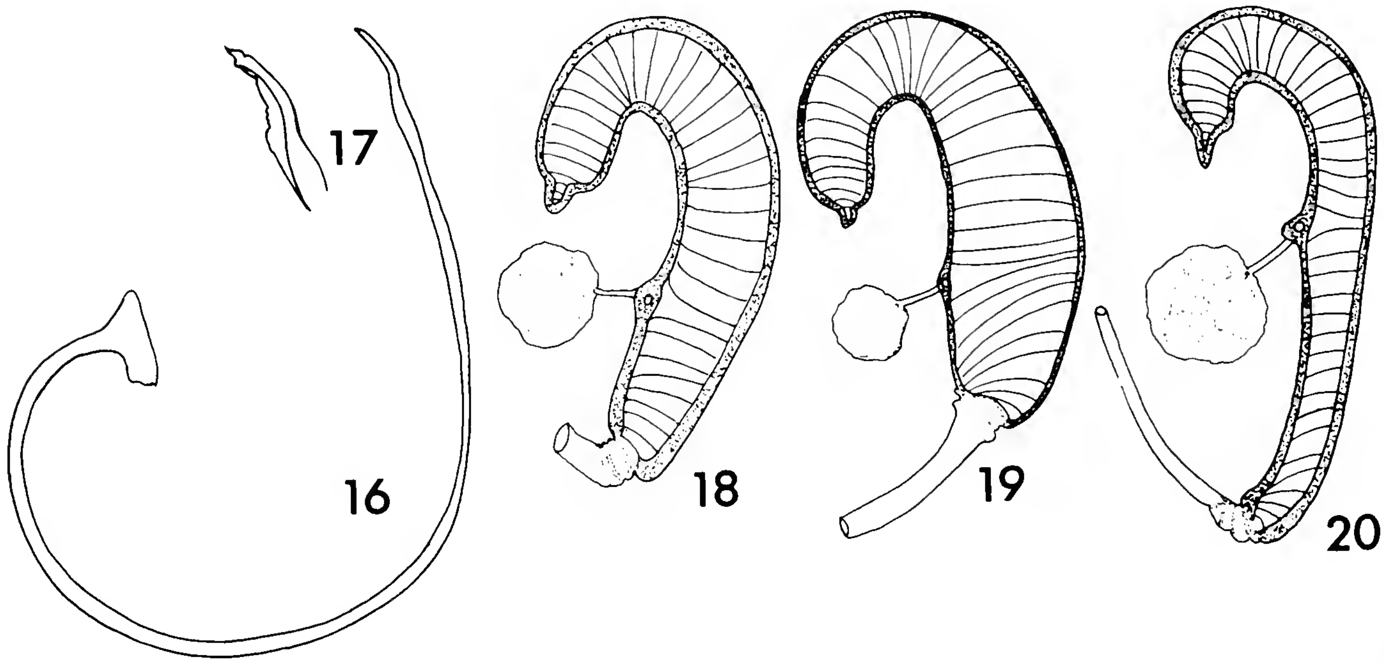

Fig. 16-20: 16, 17) *P. cyanella,* male genitalia; 18) *P. maxillosa,* spermathecal capsule; 19) *P. sicardi,* spermathecal capsule; 20) *P. cyanella,* spermathecal capsule.

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NOTES ON THE DISTRIBUTION, HOSTS AND BIONOMICS OF SOME PACIFIC NORTHWEST CERAMBYCIDAE (COLEOPTERA)

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Abstract

New host, bionomical, and distributional information is presented for 12 species of Pacific Northwest Cerambycidae, primarily from Oregon. Species treated include: *Anoplodera canadensis* Olivier, *Encyclops californica* Van Dyke, *Hesperanoplium antennatum* (Linsley), *Holopleura marginata* LeConte, *Leptalia macilenta* (Mannerheim), *Neoclytus interruptus* LeConte, *N. provoanus* Casey, *N. resplendens* Linsley, *Plectrura spinicauda* Mannerheim, *Prionus integer* LeConte, *Purpuricenus dimidiatus* LeConte and *Tetraopes annulatus* LeConte. *N. interruptus* is recorded as prey of *Stenopogon inquinatus* Loew (Diptera:Asilidae).

The publication of Hatch (1971), "The Beetles of the Pacific Northwest", and the continuing revisionary work of J. A. Chemsak and E. G. Linsley on the Cerambycidae of North America have revealed that we possess some pertinent new data on several species of Pacific Northwest Cerambycidae. This data, presented herein, is largely a result of insect survey and detection activities for the Oregon Department of Agriculture during the past 5 years. Specimens of each species treated in this paper are deposited in the collections of the Oregon Department of Agriculture and/or the authors, unless otherwise indicated.

Special thanks are extended to Loren Russell, Oregon State University, Corvallis; M. H. Hatch, University of Washington, Seattle; W. F. Barr, University of Idaho, Moscow; and R. W. Zwick and G. J. Fields, Mid-Columbia Branch Experiment Station, Hood River, for allowing us to examine specimens in their care.

Anoplodera canadensis Olivier

On June 23, 1971, sections of old logs and dead, standing trunks of large Oregon white oak, *Quercus garryana* Dougl., were collected 2 miles northwest of Suver, Polk Co., Oregon, and placed in a large screened cage in a greenhouse at Salem, Oregon. Beetles emerged as follows: 1 male, 22-VII-1971; 2 females, 31-VII-1971, 9-IX-1971; 4 females, 26-VII-1972, 6-VIII-1972 (R. L. Westcott). None emerged during 1973. This is a new host record. *A. canadensis* has not previously been recorded as reared from any hardwood, but Gardiner (1970) observed ovipositing females on *Acer* and *Ostrya* in eastern Canada. Additional collecting records for western Oregon are: Polk Co.: 4 mi E Rickreall, 26-VIII-1947 (J. W. Bell); 2 mi NW Suver, 7-VIII & 2-IX-1968 (R. L. Westcott). Marion Co.: Hopmere, 26-VIII-1971 (R. L. Penrose). All specimens are of the red form, ab. *erythroptera* Kirby, fide Hatch (1971).

Encyclops californica Van Dyke

Linsley and Chemsak (1972) listed the distribution of this lepturine as "coastal northern California". This may now be expanded to include west-central Oregon based on a single specimen present in the Oregon State University Collection. Collection data are as follows: Lane Co., Blue River, H. J. Andrews Experimental Forest, mid-age Douglas-fir stand, 10-VII-1972, IBP Biome Survey, beating *Tsuga*.

Hesperanoplium antennatum (Linsley)

This nocturnal longhorn, previously recorded only from California (Linsley, 1962), has been collected at a southwestern Oregon locality. Single specimens were taken in a blacklight trap at Medford, Jackson Co., 12-VII and 23-VIII-1970 (K. J. Goeden); 12-VI-1969 (L. G. Gentner, K. J. Goeden).

Holopleura marginata LeConte

Bedard (1938) first recorded Douglas-fir as a host for this species, stating that "adults were reared from branches during May". Linsley (1962) and Hatch (1971), following Linsley, questioned this association, possibly since Bedard gave no specific locality for his record. However, *H. marginata* has been collected in southeastern British Columbia (Linsley, 1962). This, coupled with the following observations, indicate there is no reason to doubt that Bedard reared this species from Douglas-fir in the northern Rocky Mountain region.

Teneral adults were collected from dead Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco., 1 mile east of Buell, Polk Co., Oregon, 11-IV-1971 (R. L. Penrose). Specimens were found in the terminal trunk sections of 15 to 20 foot tall standing trees and in smaller, 0.75 to 1 inch diameter lower, shaded out branches which were still attached to larger living trees. An additional collection from this host has been made at Stageroad Pass, Josephine Co., 28-IV-1971 (R. L. Penrose).

Observations made at Buell indicate that the larvae deeply score both the inner bark and outer sapwood of recently dead branches, constructing a wide gallery which is tightly packed with coarse frass. Pupation takes place in an elongate tunnel constructed in the heartwood and oriented parallel to the longitudinal axis. Both ends of the cell are plugged with frass. The outer plug is longest and composed of the coarsest wood fibers. This plug is often well removed from the pupa, sometimes up to 1.5 inches, plugging the gallery where the larva entered the sapwood.

Leptalia macilenta (Mannerheim)

Chemsak and Powell (1971) discussed the mating behavior and habits of the immatures of this species on one of its hosts, *Umbellularia californica* (H. & A.) Nutt., in the central Coast Range of California. *Alnus* and *Salix* were also listed as host genera.

In Oregon, 2 previously unreported host plant associations were discovered during the spring of 1971. Teneral adults and pupae were collected April 17 under the bark of decayed logs of bitter cherry, *Prunus emarginata* (Dougl.) Walp., at Salem, Marion Co., and adults were reared from pupae collected

April 5 from portions of a dead trunk section of big leaf maple, *Acer macrophyllum* Pursh., in McDonald Forest, near Corvallis, Benton Co.

Neoclytus interruptus LeConte

The first Pacific Northwest record for this species is given by Hatch (1971) and is based on a single specimen from Seattle, Washington. This specimen has been examined and its identity verified. The occurrence of *N. interruptus* in an area of such differing habitat, so far removed from the nearest known localities, suggests the possibility of mislabeling. Linsley (1964) gives the range of this species as "coastal California from Humboldt Co. south to Ventura Co." The first records for Oregon are: 10 mi ENE Ashland, Jackson Co., 14-VIII-1968 (K. J. Goeden); 2 mi SW Keno, Klamath Co., 2-VIII-1968 (R. L. Westcott). Both are based on single specimens, the latter being taken as prey of the robber fly, *Stenopogon inquinatus* Loew.

Neoclytus provoanus Casey

Linsley (1964) recorded this species from the Pacific Northwest, but no specific locality data exists in the literature confirming the occurrence of this clytine in Oregon or Idaho. Cited localities are in Utah, California, Washington and British Columbia. Three specimens from Idaho in the University of Idaho Research Collection, Moscow, bear the following data: Latah Co.: Laird Park, 3-VII-1963; 4.9 mi S Juliaetta, 19-VII-1964 (E. R. Logan). Twin Falls Co.: Rock Creek, 12-IX-1961. A single specimen was seen from Oregon: Crook Co.: SE¼ Sec. 19, T13S, R19E, Ochoco National Forest, 16-VII-1974, on yarrow flower (R. L. Penrose).

Neoclytus resplendens Linsley

This striking beetle is recorded for the first time from Oregon (and the Pacific Northwest) as follows: 1 male, 10 mi N Grants Pass, Josephine Co., 15-VII-1969, sitting on *Arctostaphylos* sp. (J. M. Davidson); 1 female, same locality, 21-VII-1970, flying between *Ceanothus cuneatus* and *Arctostaphylos viscida* (R. L. Westcott). Linsley (1964) listed host plants as "*Quercus* spp." At least 2 species of oak occur at the above locality.

Plectrura spinicauda Mannerheim

Forty-five specimens of this strange lamiine were collected 4 miles west of Doty, Lewis Co., Washington, 22 & 23-VIII-1970 (R. L. Westcott). Most were collected from vine maple, *Acer circinatum,* (a few on nearby weeds) where they were well camouflaged on dead leaves, twigs, etc. The beetles appeared to favor certain plants, many of which were small, either young or with regrowth from browsing or other damage. On these plants the apical portions of many stems, mostly of new growth, had much of the bark chewed away. This feeding damage was noted on many maples in the area even when no beetles could be found. Several adult *P. spinicauda* were kept alive in the lab and supplied with young twigs of vine maple. Observations confirmed that the twig damage seen in the field was that of *P. spinicauda* and that feeding takes place almost entirely during darkness.

Prionus (Homaesthesis) integer LeConte

In the Pacific Northwest this prionine has previously been recorded only from southern Idaho (Barr and Penrose, 1969). Its range now may be expanded to include adjacent regions of eastern Oregon. Single specimens were collected under street lights in Ontario, Malheur Co., 29-VII-1970 (R. L. Penrose, R. L. Westcott); 20-VII-1968 (K. J. Goeden).

Purpuricenus dimidiatus LeConte

The distribution of this rare and beautiful purpuricenine was restricted to California by Linsley (1962). Hatch (1971) provided the first Pacific Northwest record based on a collection from northeastern Oregon (LaGrande airport). Linsley (1962) gave as hosts oak and willow. Oak does not occur naturally near LaGrande and, unless the specimen was a hitchhiker, this longhorn likely utilizes willow in the area. Additional records are from western Oregon and include: 1 female, Hood River, Oak Grove District, Hood River Co., 24-VII-1962, in bait pot (F. E. Ellertson; Mid-Columbia Expt. Sta. Coll.); 1 female, Siskiyou Pass, Jackson Co., 8-VII-1970, on dead twig of *Quercus* sp. (R. L. Westcott); 1 male, 2 mi E Grants Pass, Josephine Co., 7-VII-1970, in Oriental fruit moth bait pot (R. L. Westcott).

Bait formulations containing terpinyl acetate, brown sugar and yeast seem to be quite attractive and may possibly be used to collect adults in numbers.

Tetraopes annulatus LeConte

A single specimen from Strevell, Cassia Co., Idaho, 24-VIII-1972 (G. F. Knowlton, Utah State Univ. Coll.), represents a new state record. The closest recorded locality is 159 miles to the southeast in Wasatch Co., Utah (Chemsak, 1963).

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WATER BEETLES FOUND IN THE VICINITY OF SHIRAZ, IRAN (COLEOPTERA: DYTISCIDAE, NOTERIDAE, HALIPLIDAE, GYRINIDAE, AND HYDROPHILIDAE)[1]

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Abstract

Collections of water beetles were made at regular intervals (biweekly or monthly) over a period of 1 year in 5 aquatic habitats near Shiraz, Fars Province, Iran: 472 specimens were collected in the families Dytiscidae (251), Noteridae (22), Haliplidae (76), Gyrinidae (27), and Hydrophilidae (96). The greatest diversity was found in the Zarghan Marshes, a periodic marsh complex northeast of Shiraz (11 genera, 14 species). The least diversity was encountered in marshes and other situations fed by perennial springs at Barm-E-Delak and Dasht-E-Arjan (5 genera, 5 species combined).

Records of aquatic Coleoptera from Iran are very scanty. The families Dytiscidae and Gyrinidae have been studied most thoroughly, but only a few genera and species are known mainly from the Caspian Sea area, Kerman, and Busher. Very few species have been recorded from Shiraz and its vicinity in Fars Province. The present study attempts to identify the water beetles found near Shiraz and to correlate them with their habitats.

Fars Province in southwestern Iran includes the Zagros Mountains, the Persian Gulf Coastal Plain in the southwest, and parts of the Central Plateau in the northeast. The region of Shiraz lies between the Mand Rud and Kur Rud, rivers which have their sources in the mountains to the north and usually disappear in their lower courses during the summer months. The area is generally over 1500 m in elevation and ringed by mountains over 3000 m high. The rainfall, which is variable from year to year, averages approximately 336 mm/year. Most of the rain comes in the period from December to March. The climate is thus characterized as desert or semidesert with cold winters with low rainfall and hot dry summers. Cereals and livestock are the principal agricultural products of the area.

Due to the irregular and scanty rainfall in some months, most aquatic situations near Shiraz dry up completely or nearly so for part of the year. Only where marshes, ponds, or ditches are fed by perennial springs does water persist throughout the year and then usually only in limited areas.

Collections were made at biweekly or monthly intervals from April 1970 through March 1971 in 5 aquatic situations around Shiraz. The localities and the aquatic beetles collected were as follows:

Zarghan Marshes: about 35 km northeast of Shiraz, a fluctuating marsh complex with several springs along the southern edge. The vegetation is

[1]Aided in part by a grant from the Pahlavi University Research Council.

sparse except in limited areas. It became completely dry by June 1970, and only recently was flooded by winter rainfall (Fig. 1,7).

Fig. 1. The general pattern of the **Zarghan Marshes.** The marshes were partly dried when this picture was taken.

Fig. 2. **Paul-E-Fassa:** This is the enlarged part of the river which then continues beneath the bridge on the right, partly collects into small ditches, but mostly streams toward Lake Maharlu. Collections were made from this area and the ditches on the other side. Water is partly dried up.

Fig. 3. **Barm-E-Shur:** There are two ditches of water here covered by dense vegetation. Most of the collections were made from such ditches. Water is partly dried up, and the area is taken over by cattle for grazing. In the wet seasons the ditches unite into large flooded areas.

Fig. 4. **Barm-E-Delak:** This is the expanded and shallow part of a stream which starts by the perennial spring on the left, where water partly collects into a ditch with dense vegetation. It continues to the right where it is used for irrigation. Collections were made from the ditch and this shallow part of the stream.

Fig. 5. **Dasht-E-Arjan:** The water from the Cheshm-E-Salman springs is collected into this pond. It then passes beneath the road to the other side where it forms a fall, and then supplies the marshes there (shown in Fig. 6).

Fig. 6. **Dasht-E-Arjan Marshes:** Water is supplied from the Cheshm-E-Salman springs. Water was mostly dried up when this picture was taken.

Beetles collected were as follows: DYTISCIDAE: *Agabus (Xanthodytes) conspersus* (Marsh), 4; *Agabus* sp., 1; *Guignotus geminus* (Fabr.), 4; *Cybister lateralimarginalis* DeG., 2; *Porhydrus lineatus* (Fabr.), 13; *Hygrotus versicolor* (Schall.), 2. NOTERIDAE: *Noterus clavicornis* DeG, 16; *Canthydrus* sp. probably *notula* (Er.), 4. HALIPLIDAE: *Haliplus variegatus* Sturm, 4. HYDROPHILIDAE: *Enochrus quadripunctatus* var. *halophilus* Bedel, 21; *E. ochropterus* Marsh., 24; *E.* sp., 4; *Paracymus* sp., 1; *Laccobius* sp., 9. Total 109.

Paul-E-Fassa: the shallow, enlarged, course of a river and related ditches, about 20 km southeast of Shiraz. This is essentially a pool left in a fluctuating stream. The vegetation is sparse, the water level fluctuates with rainfall, and the situation may be dry for part of the year.

Beetles collected were as follows: DYTISCIDAE: *Cybister lateralimarginalis* DeG., 3; *Cybister tripunctatus* var. *asiaticus* Sharp, 1; *Hygrotus versicolor* (Schall.), 1; NOTERIDAE: *Canthydrus* sp. probably *notula* (Er.), 1.

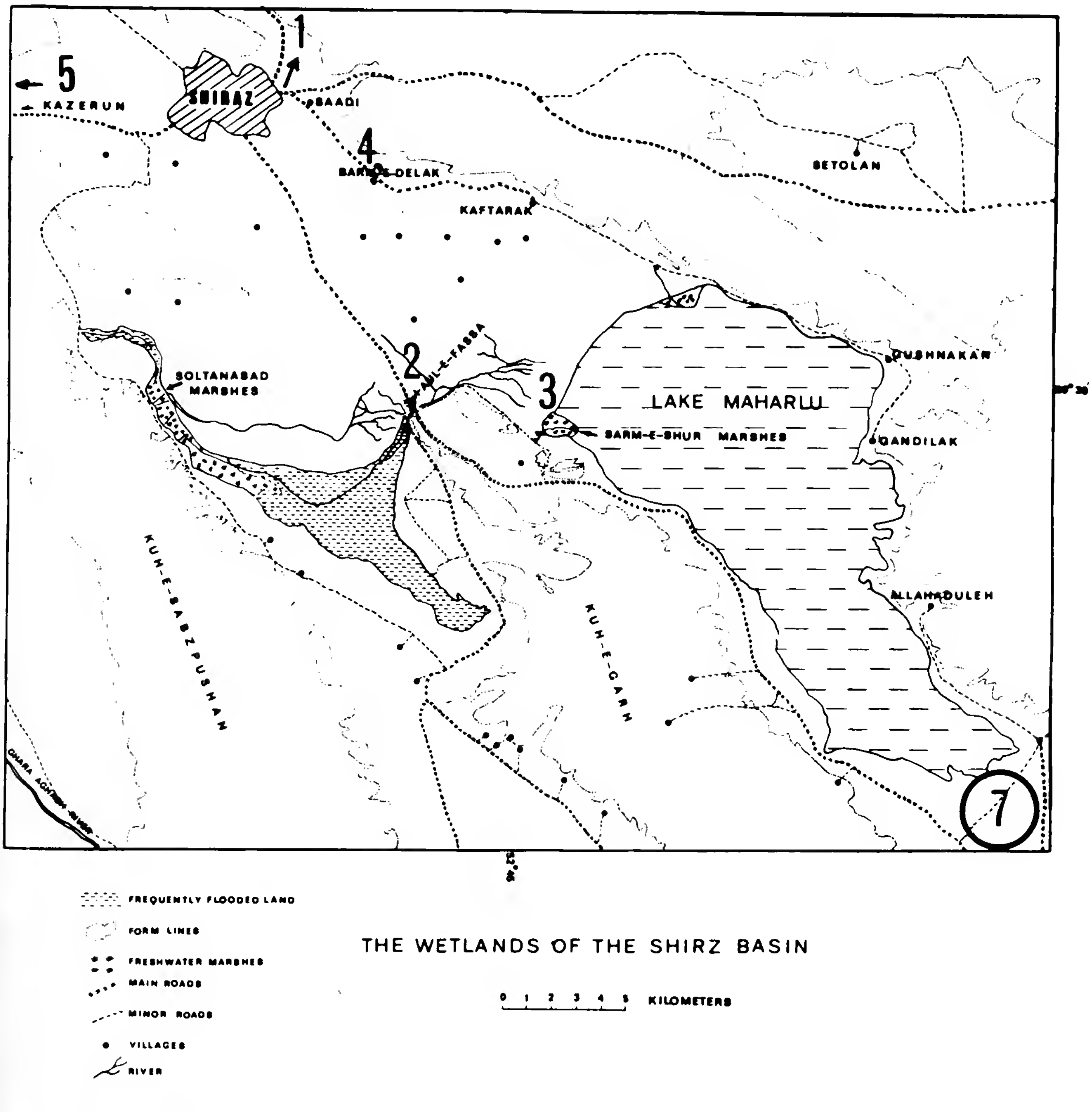

Fig. 7. **The wetlands of the Shiraz Basin.** The collection areas of **Zarghan** (1), **Paul-E-Fassa** (2), **Barm-E-Shur** (3), **Barm-E-Delak** (4), and **Dasht-E-Arjan** (5) are shown.

HALIPLIDAE: *Haliplus variegatus* Sturm, 61. HYDROPHILIDAE: *Paracymus* sp., 1. Total 68.

Barm-E-Shur: a marshy area at the northeast end of Maharlu salt lake, the lake fed by perennial springs flowing into Barm-E-Shur stream. Some water is always present in this situation although the level fluctuates. The vegetation is sparse.

Beetles collected were as follows: DYTISCIDAE: *Cybister lateralimarginalis* DeG, 23; *C. tripunctatus* var. *asiaticus* Sharp, 26. NOTERIDAE: *Canthydrus* sp. probably *notula* (Er.), 1. GYRINIDAE: *Gyrinus* sp., 26. HYDROPHILIDAE: *Enochrus quadripunctatus* var. *halophilus* Bedel, 10; *E.* sp., 1; *Paracymus* sp., 2; *Laccobius* sp., 2; *Hydrophilus (Stethoxus) aterrimus* Esch., 19. Total 110.

Barm-E-Delak: an area flooded by perennial springs forming a stream from which ditches have been dug for irrigation purposes, about 30 km roughly east of Shiraz. The water level fluctuates, but some water is present in most months of the year. The vegetation is moderately dense in places shading parts of the stream.

Beetles collected were as follows: DYTISCIDAE: *Cybister tripunctatus* var. *asiaticus* Sharp, 10; *Laccophilus hyalinus* (Deg.), 171. HALIPLIDAE: *Peltodytes caesus* (Duft.), 11. *Laccophilus hyalinus* is characteristically associated with running water, and *Peltodytes caesus* is sometimes found in brackish water. Total 182.

Dasht-E-Arjan Marshes: the large marsh area about 55 km west of Shiraz, fed by the run-off from the perennial springs of Cheshm-E-Salman near the village of Dasht-E-Arjan and a stream on the east side. Water may be present in at least small areas even during the dry seasons.

Beetles were very scarce in this situation. The following were collected: GYRINIDAE: *Gyrinus* sp., 1. HYDROPHILIDAE: *Hydrophilus (Stethoxus) aterrimus* (Esch.), 2. Total 3.

All of the species identified prove to be widely distributed outside Iran. Some such as *Agabus consperus, Peltodytes caesus,* and *Enochrus quadripunctatus* var. *halophilus* Bedel are frequently associated with brackish water. Others such as *Porhydrus lineatus, Guignotus geminus,* and *Noterus clavicornis* are characteristic of detritus ponds with decaying plant material according to Balfour-Browne (1950).

ACKNOWLEDGMENTS

I wish to express my appreciation for the assistance of Dr. Frank N. Young, Indiana University, Bloomington, Indiana. My thanks are also due Mr. L. Cornwallis for allowing me to use maps of the Shiraz wetlands area which he prepared.

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ZIMMERMAN, C. 1924. Die Halipliden der Welt . . . Ent. Blatter 20(1):1-16; (2):65-80; (3):129-144; (4):193-213.

BOOK REVIEW

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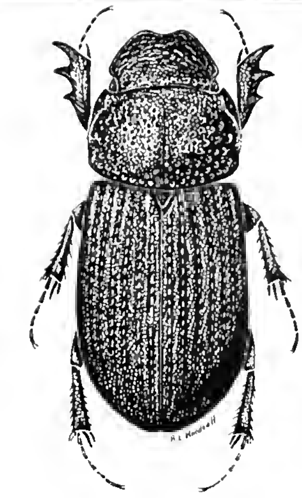

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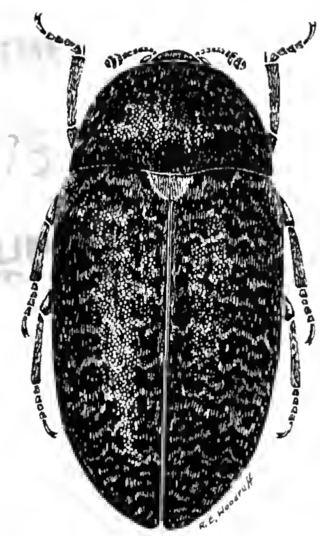


BUPRESTIDAE: *Basalis* group of *Chrysobothris*
by G. H. Nelson 1-30

STAPHYLINIDAE: Holotype disposition
by Ian Moore 30

FAMILY-GROUP NAMES: Priority
by J. C. Watt 31-34

STAPHYLINIDAE: New Mexican *Quedius*
by A. Smetana 35-38

TENEBRIONIDAE: New cave taxa
by C. A. Triplehorn 39-43

CERAMBYCIDAE: Fecundity note
by A. J. Mullins 43

CLERIDAE: Prolonged diapause
by J. A. Powell 44

TRAPS: Baited pitfalls
by A. Newton & S. B. Peck 45-46

CARABIDAE: Glacier Nat. Pk.
by J. G. Edwards 47-58

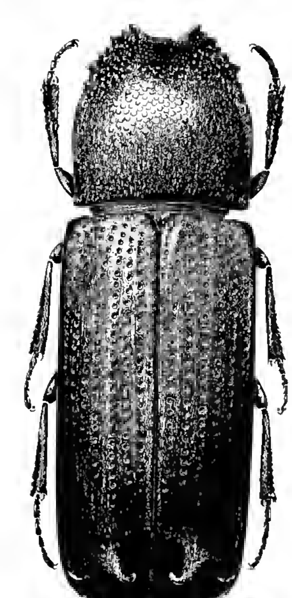
CERAMBYCIDAE: Virginia, Pt. III
by R. H. Perry 59

MINUTES OF NATIONAL MEETING 61-63

TREASURER'S REPORT 63-64

LITERATURE NOTICES & BOOK REVIEWS 58, 60

NOTICE 38



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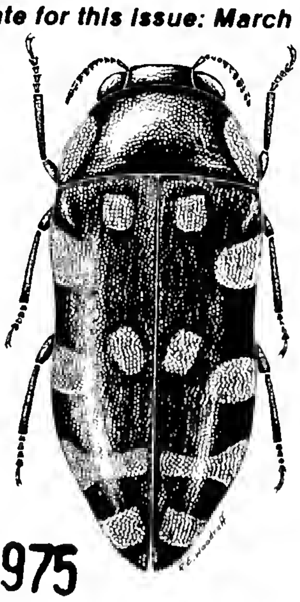

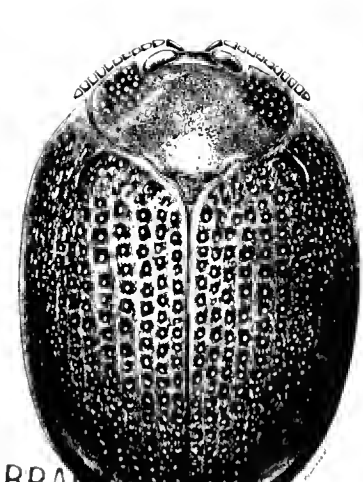

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A REVIEW OF THE *BASALIS* GROUP OF THE GENUS *CHRYSOBOTHRIS* (COLEOPTERA: BUPRESTIDAE)

G. H. NELSON

Department of Anatomy, Kansas City College of Osteopathic Medicine, Kansas City, Missouri

ABSTRACT

The habits, geographical distribution, and taxonomy of 13 species from the United States, Mexico, and El Salvador are discussed. Adults prefer leguminous shrubs of the genera *Prosopis, Acacia,* and *Cercidium* in which to oviposit, and Mexico appears to be the center of distribution for this group. Illustrations and a key to separate the species are presented, and the following 7 new species are described: *Chrysobothris paramodesta,* and *C. vogti* from Mexico, Yucatan; *C. explicationis* from Mexico, Sinaloa; *C. knulli* from Arizona; *C. brevitarsis* from Mexico, Oaxaca; *C. verityi* from Mexico, Michoacan; and *C. paratabalipa* from Mexico, Oaxaca.

INTRODUCTION

The confusion that has existed concerning the identity of the species in the *basalis* group of *Chrysobothris* has resulted from the close similarity of their external morphology. Horn (1886) considered *C. basalis* LeC. a synonym of *C. atabalipa* Lap. & Gory. Waterhouse (1887) considered *C. multistigmosa* (Mann.), *C. atabalipa* Lap. & Gory, and *C. basalis* LeC. to be 1 species with the males exhibiting dimorphic antennae. Obenberger (1934) considered *C. basalis* as a synonym of *C. multistigmosa* (Mann.). Fisher (1942) recognized that these species were distinct from each other but did not treat those from Mexico. His concept of *C. multistigmosa* (Mann.) wasn't clear, however, since Knull (1947) mentioned Arizona records of that species based on determinations by Fisher. These specimens actually represent a new species, *C. knulli* Nelson. It is apparent from his discussion and illustrations that Domínguez (1969) included several species under *C. basalis* LeC.

The types of all described species have been studied, and examination of the male aedeagi and last visible abdominal segment of females has revealed useful characters for separating the 13 species, 7 of which are described as new. Drawings of the critical anatomical features and a key are presented to facilitate identification. The species are numbered for easier reference between the key and the descriptions. Abbreviations for institutions and individuals used i this paper are indicated in the acknowledgements.

BIOLOGY

With the exception of *C. octocola* LeC., which has been reared from *Prosopis juliflora* and *Cercidium floridum,* rearing records are unknown for the species of this group. However the adults have been collected on several species of leguminous trees, especially of the genera *Prosopis* and *Acacia.*

They show a preference for recently downed trees or the dead or dying branches on standing trees where the adults can be found either resting, running actively along the trunk or branches, or ovipositing on them.

Geographical Distribution

The center of distribution for this group of *Chrysobothris* appears to be central Mexico with extensions northward into southwestern United States, eastward into Yucatan and Quintana Roo, and southward as far as Nicaragua.

The following species have their centers of abundance in the central part of Mexico according to collecting records: *C. multistigmosa* (which extends as far north as Ciudad Victoria and south to El Salvador), *C. storkani* (primarily east central), *C. verityi* (known only from Michoacan), *C. paratabalipa* (extends south to the state of Oaxaca), *C. atabalipa* (extends south to Chiapas and east to Quintana Roo), and *C. modesta* (extends south to Oaxaca). The species of mainly northern distribution include *C. explicationis* from the states of Nayarit and Sinaloa, *C. knulli* from northwest Mexico and Arizona, *C. basalis* principally from northeast Mexico and southwest United States, and *C. octocola* from northern Mexico including Baja California and all of southwest United States. Two species, *C. vogti* and *C. paramodesta,* are known from Yucatan and Quintana Roo, while 1 species, *C. brevitarsis,* has a more southern distribution, from Oaxaca in Mexico, and Nicaragua.

Acknowledgements

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Classification

Family Buprestidae
Tribe Chrysobothrini
Genus *CHRYSOBOTHRIS* Eschscholtz

The species of the *basalis* group of *Chrysobothris* are characterized by the following features: body form elongate with parallel sides; pronotum convex without median channel; elytron with 4 costae, medial 2 weak at base and strongly raised apically and lateral 2 obsolete; and with 4 punctate foveae, 1 at base, second before middle interrupting second costa, third just behind middle interrupting third costa, and fourth near apical third between first and second costae; lateral margins of last visible abdominal sternite serrate; and protibia of male with series of small teeth (Fig. 1, 2).

The general body color of aeneo- or cupreous-brown does not vary much, however it is definitely blueish in *C. verityi*. The front of the head contrasts with the body color in the males being golden or greenish while it is more like the general color in the females.

HEAD. Modifications are minor except in depth of the clypeal emargination, helping to distinguish *C. modesta* from *C. octocola*. Of more significance are the differences in shape of the third segment of the male antennae. It is broadly triangular in *C. basalis* and *C. multistigmosa* but elongate in the other species.

PRONOTUM. Variations here do not appear to be distinctive, and the scutellum is relatively small and acuminate.

ELYTRA. The general form and surface sculpturing is rather uniform in this group, with some variation in the size of the discal foveae and extent of the lateral serrations.

VENTRALLY. Males tend to have more setae than females, and differences in density and distribution of setae are sometimes distinctive. Tibial shape varies from arcuate to straight, with male protibiae and sometimes mesotibiae having a row of small teeth. The distribution of femoral teeth varies also. The variations in sculpture at the apex of the last visible abdominal sternite in the female are useful in distinguishing among some species. The pygidium of the female exhibits modifications in surface carinae and apical teeth and/or notches that are useful in differentiating the species.

MALE GENITALIA. The general shape of the parameres is one of the most useful characters in separating species, although rather uniform within specific limits, it is sometimes strikingly different in otherwise closely similar species. The apex of the penis is rounded or truncate.

RELATIONSHIPS OF SPECIES

A study of the modifications in the third antennal segment and aedeagi of the male, and in the last visible abdominal segment of the female, gives some indication of inter-species relationships within the *basalis* group of *Chrysobothris*. In comparing these features I see 4 subgroups.

One subgroup involves 2 species: *C. basalis*, and *C. multistigmosa* which have the third antennal segment of the male broadly triangular, the male aedeagi are not strongly narrowed apically, and the pygidium of the female has a midline carina and apical notch bounded by ventrally projecting teeth. *C. basalis* occurs in northeastern Mexico and southwestern United States, while *C. multistigmosa* occurs primarily in central and southern Mexico to El Salvador.

The second subgroup includes 3 relatively small species: *C. paramodesta*, *C. modesta*, and *C. octocola*. This subgroup has the third antennal segment elongate in both sexes, the male aedeagi are not strongly narrowed apically, and the pygidium of the female has a midline carina and apical notch not bounded by teeth. *C. modesta* occurs in the central part of Mexico, *C.*

paramodesta eastward in Yucatan and Quintana Roo, and *C. octocola* in northern Mexico including Baja California and southwestern United States.

The third subgroup includes 2 species: *C. vogti,* and *C. storkani.* The first is from Yucatan and Quintana Roo, and the second is from eastern central Mexico. This subgroup has characteristics of antennae and male aedeagi in common with subgroup 2, but the modifications of the pygidium of the female, with a projecting midline tooth without projecting postero-lateral angles, indicates a transition toward subgroup 4.

Subgroup 4 includes 6 species: *C. explicationis, C. knulli, C. brevitarsis, C. verityi, C. atabalipa,* and *C. paratabalipa.* Most of these occur in central Mexico, with *C. brevitarsis* more southern, *C. explicationis* in northwest Mexico, and *C. knulli* in northwest Mexico and Arizona. This subgroup has the third antennal segment of the male elongate, the male aedeagi with strongly narrowed apices, and the pygidia of the females with projecting postero-lateral angles.

Key to Species of the *Basalis* Group of *Chrysobothris*

1. Third antennal segment of male triangular, nearly as wide as long (Fig. 4); pygidium of female with pair of deflexed apical tooth-like lobes and discal median carina (Fig. 9, 10) 2

1′. Third antennal segment of male elongate, not broadly triangular (Fig. 3); pygidium of female without pair of deflexed apical tooth-like lobes and if discal median carina is present then with apical notch (Fig. 11-19) 3

2(1). Aedeagus of male with apex of penis truncate (Fig. 20); only profemur of male with dense brush on inner margin; pygidium of female with weak median carina, shallow depression on either side of carina, and apical deflexed tooth-like lobes as wide as emargination separating them (Fig. 9) [southwestern United States to central Mexico] .... 1. *C. basalis* LeConte

2′. Aedeagus of male with apex of penis narrowly rounded (Fig. 21); pro- and mesofemora of male with dense brush on inner margin; pygidium of female with strong median carina, deep depression on either side, and apical deflexed tooth-like lobes narrower than emargination separating them (Fig. 10) [middle and southern Mexico] .... 2. *C. multistigmosa* (Mannerheim)

3(1′). Aedeagus of male with parameres either abruptly narrowed with elongate slender apex or dorsum of parameres with definite median channel; if pygidium of female has median apical tooth it either has notch on either side or lateral margin is rather parallel sided toward base 4

3′. Aedeagus of male with parameres tapering gradually to apex without apical prolongation and dorsum of parameres convex without apparent median channel (Fig. 25); pygidium of female with lateral margins rounded from base and with median apical tooth (Fig. 14) [Yucatan and Quintana Roo] .... 6. *C. vogti* Nelson

4(3). Males with parameres of aedeagus more gradually narrowed and without pronounced slender apex (Fig. 22-24); pygidium of female with strong median carina, distinct depression on either side, and with apical notch without tooth-like lobes (Fig. 11-13) 5

4′. Males with parameres of aedeagus distinctly constricted with a usually pronounced slender apex (Fig. 26-32); pygidium of female without or with only weak discal carina or depressions but with apical tooth-like projections (Fig. 15-19) 7

5(4). Aedeagus of male with parameres widest near lateral teeth, apex of penis narrow (Fig. 22); pygidium of female with small apical notch (Fig. 11) [Yucatan and Quintana Roo] .... 3. *C. paramodesta* Nelson

5′. Aedeagus of male with parameres widest much basal to lateral teeth, apex of penis less narrow (Fig. 23, 24); pygidium of female with larger apical notch (Fig. 12, 13) 6

6(5′). Aedeagus of male with teeth on lateral margin of parameres not as strong and not as near apex (Fig. 23); last visible abdominal sternite of female with middle of subapical crest notched and with median carina usually extending from base to notch (Fig. 6) [central Mexico] ...... 4. *C. modesta* Waterhouse

6′. Aedeagus of male with teeth on lateral margin of parameres strong, more pyramidal and located slightly nearer apex (Fig. 24); last visible abdominal sternite of female with middle of subapical crest not retracted and median carina extending base only part way to subapical crest (Fig. 7) [southwest United States and Baja California to northern Mexico] .... 5. *C. octocola* LeConte

7(4′). Color blue with aeneous tint [Michoacan] .... 11. *C. verityi* Nelson

7′. Color brassy to cupreous-brown 8

8(7′). Color shining cupreous; aedeagus of male only moderately constricted and with moderately narrowed apex (Fig. 26); pygidium of female with apical median tooth without notch on either side (Fig. 17) [Veracruz to San Luis Potosi & Oaxaca] .... 7. *C. storkani* Obenberger

8′. Color usually less shining; aedeagus of male strongly tapered to prominent narrowed apex (Fig. 27-32); pygidium of female either without median apical tooth or with notch on either side of median tooth (Fig. 15, 16, 18, 19) 9

9(8′). Aedeagus of male with parameres strongly but gradually narrowed to long slender apex (Fig. 27, 28); pygidium of female either with apex notched at middle or with tooth projecting but little beyond lateral lobes (Fig. 15, 16) 10

9′. Aedeagus of male with parameres abruptly narrowed to slender apex (Fig. 29-32); pygidium of female with apical median tooth usually strongly projecting beyond lateral lobes (Fig. 18, 19) 11

10(9). Aedeagus of male less gradually tapering to slender apical part and when viewed from side strongly angulate below (Fig. 27); pygidium of female with median apical tooth (Fig. 15) [Sinaloa, Nayarit] .... 8. *C. explicationis* Nelson

10′. Aedeagus of male more gradually tapering to slender apical part and when viewed from side weakly angulate below (Fig. 28); pygidium of female with median apical notch and posteriorly projecting teeth on either side (Fig. 16) [Arizona, Sonora, Sinaloa, Chihuahua] .... 9. *C. knulli* Nelson

11(9′). First joint of metatarsus less than 2.5 times as long as high (Fig. 8a); parameres of male aedeagus strongly angulate at sides and without lateral teeth (Fig. 29); smaller species, 14 to 16.5mm [Oaxaca to Nicaragua] .... 10. *C. brevitarsis* Nelson

11′. First joint of metatarsus 2.5 or more times as long as high (Fig. 8b); parameres of male aedeagus parallel at sides proximal to constriction and with lateral teeth (Fig. 31, 32); larger species, usually over 16mm 12

12(11′). Narrowed apical region of male aedeagus shorter, aedeagus when viewed from side gently angulate below at middle (Fig. 31); females with mesotibia slightly arcuate and averaging shorter (16 to 21mm, average 18.2mm) .... 12. *C. atabalipa* Laporte & Gory

12′. Narrowed apical region of male aedeagus elongate, aedeagus when viewed from side abruptly angulate at middle below (Fig. 32); females with mesotibia straight and averaging longer (18 to 24mm, average 21.6mm) ...... 13. *C. paratabalipa* Nelson

1. *Chrysobothris basalis* LeConte
(Fig. 9, 20)

Chrysobothris basalis LeConte, 1858, Acad. Nat. Sci. Philadelphia Proc. [10]:68.

Diagnosis: Cupreous-brown above, elytral foveae usually contrasting to general color, brighter aeneo-cupreous below; male with third antennal segment triangular (Fig. 4); profemur with dense brush on inner margin; apex of penis truncate (Fig. 20); female pygidium with weak median carina, shallow depressions on either side of carina, and apical notch of same width as ventrally projecting teeth (Fig. 9).

This species is well described by Fisher (1942). Female differs from male as follows: front of head less brightly colored, with chevron-shaped callus more evident; third segment of antenna elongate; pro- and mesotibiae without row of teeth; last visible abdominal sternite with midline carina; and pygidium, in male simple, in female with midline carina and depressions on either side, and apex with midline notch same width as ventrally directed teeth.

Length (female lectotype) 17mm; **width** 6.5mm.

Male genitalia (Fig. 20). Parameres not strongly narrowed apically; apex of penis truncate.

Variation: Color varies from dark brownish-black to cupreous-brown with the elytral foveae varying from cupreous to greenish-yellow. Males vary from 15.0 to 20.5mm long and from 4.7 to 7.5mm wide; females from 11.5 to 20.5mm long and from 4.5 to 7.5mm wide.

Type Locality: TEX., Laredo to Ringgold Barracks (type labelled with a red disk); lectotype female [MCZ, No. 2689].

Geographical Distribution: (From 65 specimens examined) Arizona: Patagonia, 24-III-38; San Carlos, 9-VI-63, G. H. Nelson. Texas: Brownsville, II-VII, various collectors; San Patricio County, Portland, 5-VI-48, M. A. Cazier; Laredo, 10-X-24; Hidalgo County, 11-IV-63, G. Jackson; Southwest Hidalgo County, 22-VII-46, G. B. Vogt; Bentsen-Rio Grande State Park,

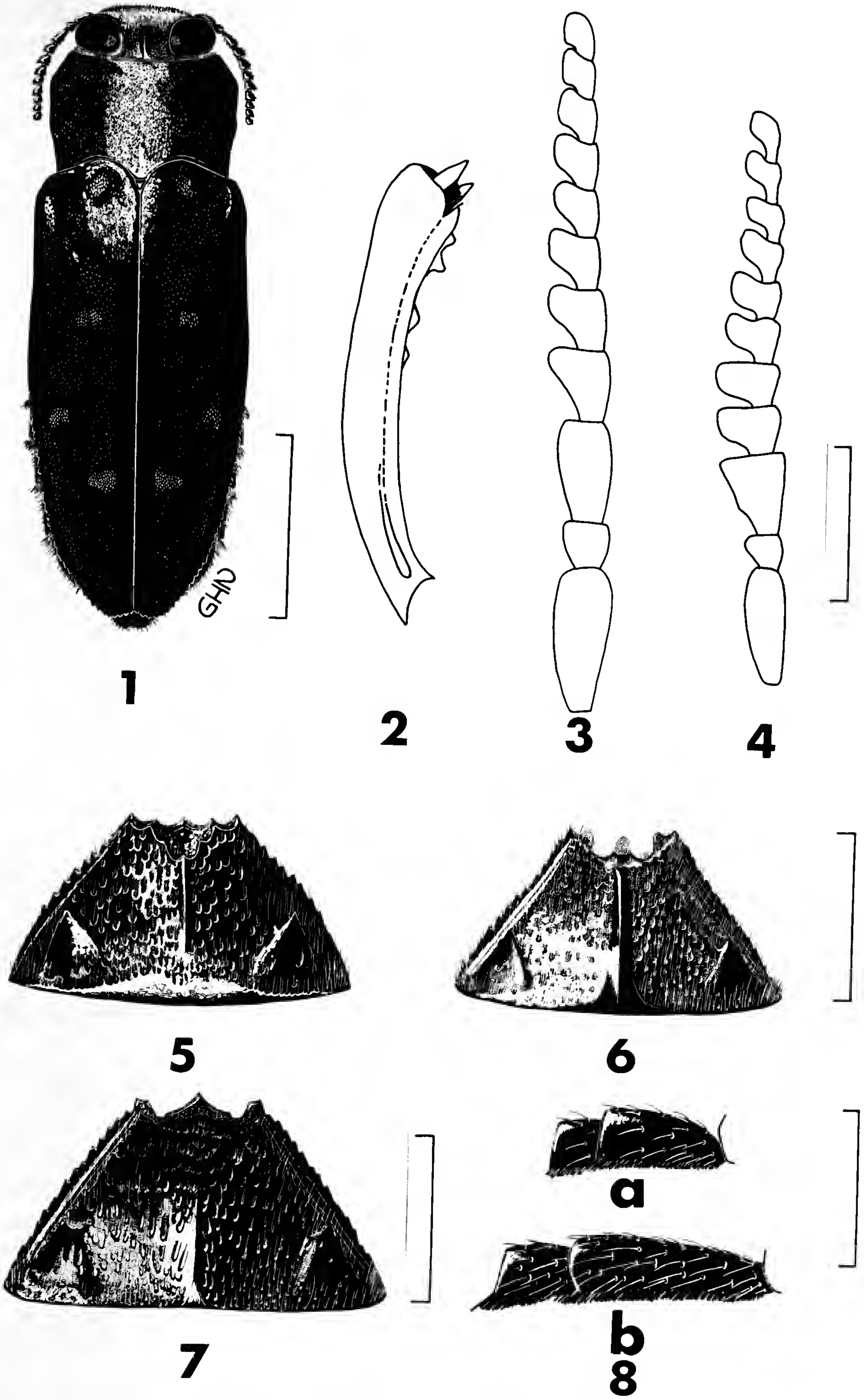


Fig. 1-8: 1) dorsal view of male type, *Chrysobothris knulli* Nelson; 2) protibia of male, *C. paratabalipa* Nelson; 3) antenna of male, *C. paratabalipa* Nelson; 4) antenna of male *C. multistigmosa* (Mannerheim); 5) last visible abdominal sternite of female, *C. paramodesta* Nelson; 6) last visible abdominal sternite of female, *C. modesta* Waterhouse; 7) last visible abdominal sternite of female, *C. octocola* LeConte; 8) basal 2 segments of metatarsi, (A) *C. brevitarsis* Nelson and (B) *C. atabalipa* Laporte & Gory. (Line = 5 mm for Fig. 1; 1 mm for Fig. 2-4, & 8; and 1.5 mm for Fig. 5-7).

4-VI-54, H. F. Howden; 15 mi NE Rio Grande City, 3-VI-54, H. F. Howden; Lake Corpus Christi State Park, 7-VI-54, H. F. Howden, (19-21)-VI-71, and 8-IV-72, G. H. Nelson. MEXICO: TAMAULIPAS: 20 mi W Antiguo Morelos, VII-54, D. G. Kissinger; 20 mi N Ciudad Victoria, 16-VII-55, D. Giuliani; NUEVO LEON: 5 mi NE Villa Garcia, 18-VII-55, D. Giuliani; Monterrey, 2-V-55, A. Enríquez; 5 mi S Monterrey, (9-27)-VII-63, A. T. & H. F. Howden; COAHUILA: 40 mi S Nueva Rosita, 25-VI-65, G. H. Nelson; 2 mi W San Pedro, 20-VII-55, D. Giuliani; JALISCO: 3 mi N Barra de Navidad, Bahia de Coastecomate, 19-VIII-64, W. L. Nutting & Sons; mountains and canyons north of Ajijic, to 6200 feet, 26-VII to 9-VIII-64, W. L. Nutting & Sons; 25 mi N Guadalajara, 19-VIII-70, M. S. & J. S. Wasbauer; MEXICO: 3 mi N Valle de Bravo, 30-VI-65, G. H. Nelson.

HOST: Most commonly collected on *Acacia farnesiana* (L.) Wildenow in Texas, but collected on *Cercidium floridum* Bentham in Arizona, and on *Acacia constricta* Bentham in Coahuila, Mexico.

COMPARISONS: In the male the triangular third segment of the antenna and the form of the aedeagus, and, in the female the characteristics of the pygidium, show this species to be closely allied with *C. multistigmosa* (Mann.) and easily separated from the other species of the group. Besides the key characters that separate *C. basalis* LeC. and *C. multistigmosa* (Mann.), the elytral foveae in *C. basalis* tend to be of a more contrasting color to the general color than in *C. multistigmosa*.

2. *Chrysobothris multistigmosa* (Mannerheim)
(Fig. 4, 10, 21)

Colobogaster multistigmosa Mannerheim, 1837, Bull. Soc. Nat. Moscou X, 8:82.

DIAGNOSIS: Dark brownish-black above with cupreous tint and foveae of elytra usually same as general color, brighter cupreous below; male with third segment of antenna triangular (Fig. 4), pro- and mesofemora with dense brush on inner margin and apex of penis narrowly rounded (Fig. 21); pygidium of female with strong median carina, deep depression on either side of carina, and ventrally projecting teeth narrower than apical notch (Fig. 10).

MALE LECTOTYPE: **Head.** Front greenish bronze, flattened, densely confluently punctate, densely clothed with semirecumbent white setae and smooth raised areas above antennal sockets, as chevron on front and as grooved longitudinal line on occiput; clypeus angularly emarginate, broadly rounded on each side; antennae greenish bronze proximally, becoming cupreous distally; first segment elongate globose, second short and triangular, third broadly triangular and subequal in length to fourth and fifth combined, antennae strongly narrowed distally (Fig. 4).

Pronotum. Distinctly wider than long; sides slightly sinuate and gradually diverging from base to widest at apical fourth, then obliquely converging to narrowest at anterior angles; anterior margin shallowly arcuately emarginate with weak median lobe; base arcuately emarginate on each side of truncate median lobe; disk convex, glabrous, finely punctate toward middle, punctures becoming confluent and coarse laterally; scutellum acuminate.

Elytra. Slightly wider than pronotum; sides parallel from rounded humeral angles to middle, then arcuately converging to separately rounded apices; lateral margins strongly serrate posteriorly; disk of elytron glabrous, finely densely punctured, with broad shallow humeral depression and with typical pattern of costae and foveae.

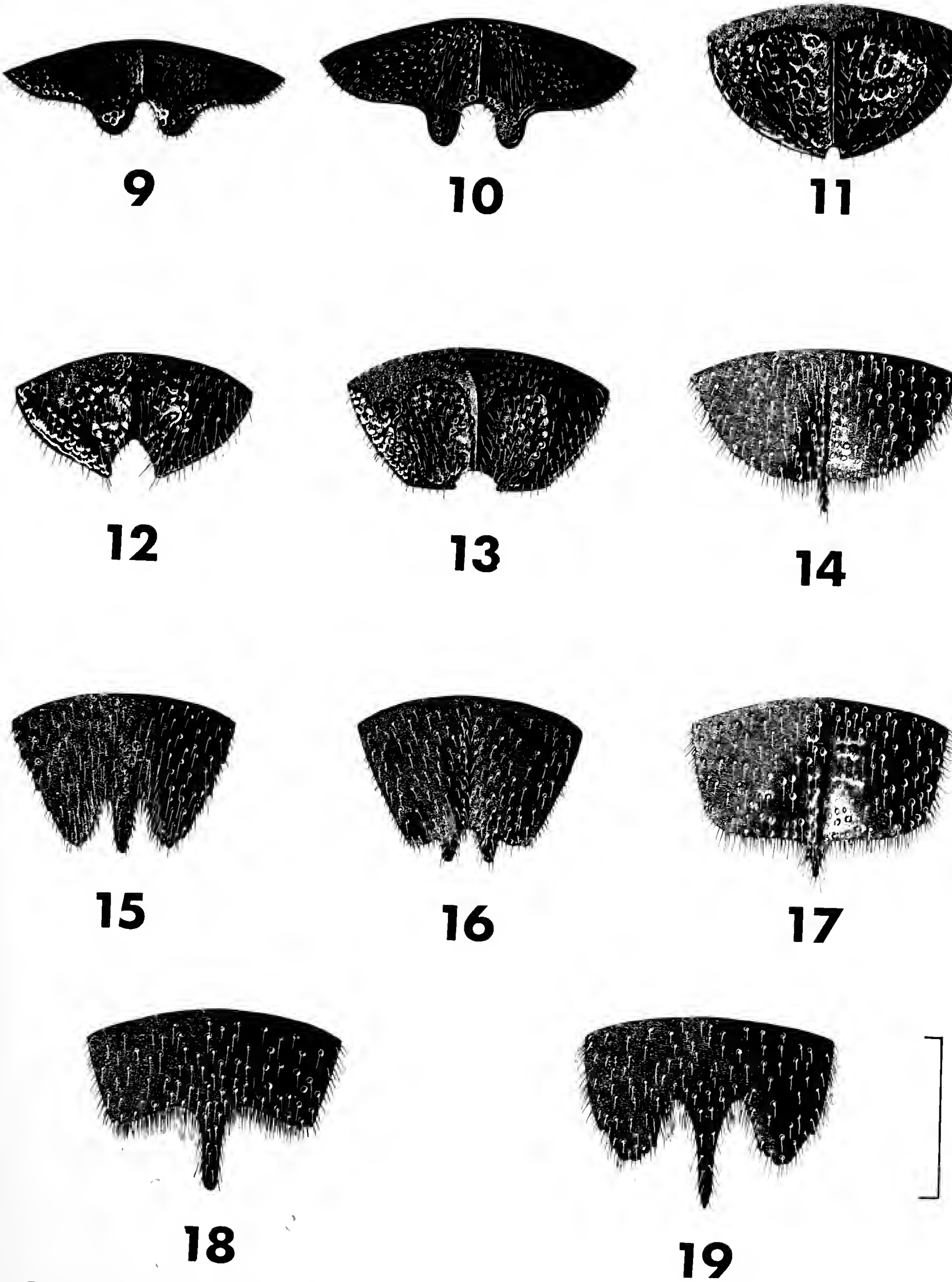


Fig. 9-19. Female pygidia (9-10 posterior view, 11-19 dorsal view): 9) *Chrysobothris basalis* LeConte; 10) *C. multistigmosa* (Mannerheim); 11) *C. paramodesta* Nelson; 12) *C. modesta* Waterhouse; 13) *C. octocola* LeConte; 14) *C. vogti* Nelson; 15) *C. explicationis* Nelson; 16) *C. knulli* Nelson; 17) *C. storkani* Obenberger; 18) *C. brevitarsis* Nelson; 19) *C. atabalipa* Laporte & Gory. (Line=1 mm).

Ventrally. Nearly impunctate medially, punctures becoming coarse and rugose laterally; setae white, semirecumbent and moderately dense laterally throughout, prosternum with setae semierect and longer near medial glabrous area; prosternum with anterior margin feebly broadly lobed, prosternal process with submarginal impressed punctate line; profemur with obtuse tooth dentately margined and with dense brush of setae behind tooth; mesofemur with dense brush of setae on inner margin; metafemur with inferior margin coarsely dentate; pro- and mesotibiae strongly arcuate with row of small teeth on inner margin; metatibia straight without row of teeth; abdominal sternites depressed in midline, posterior margins smooth and purplish-black, lateral angles acutely produced, sternites with purplish callosities laterally; last visible sternite with lateral margins serrate, apex shallowly arcuately emarginate, disk with raised tooth laterally and transverse smooth area at basal margin; pygidium evenly convex with slight median emargination and postero-inferior surface densely punctate and clothed by dense brush of setae.

Male genitalia (Fig. 21). Parameres not strongly narrowed apically; apex of penis narrowly rounded.

Length: 17mm; width: 6mm.

Redescribed from a male specimen (Mannerheim collection, UZMH) which bears 2 labels, 1 with Sommer written on it and the other with Mexico, Oaxaca written on it. Since this specimen matches the original description and is from the type locality I designate it as the lectotype, number 2853.

FEMALE: Differs from male as follows: front of head brassy brown, less densely punctate and less densely clothed with setae; antennae brassy brown, third segment elongate; pro- and mesofemora without dense brush on inner margin; mesotibia feebly arcuate; tibiae without row of small teeth; last visible abdominal sternite angularly emarginate; pygidium with median carina and deep depression on either side, apical margin with median notch and ventrally directed tooth on either side not as broad as notch (Fig. 10).

Length 21.0mm; **width** 7.5mm.

Described from female plesiallotype from MEXICO, Morelia, Yautepec, Canyon de Lobos, 4000 feet, 18-III-59, H. E. Evans [GHN].

VARIATION: The color, usually a dark brownish-black, is sometimes rather cupreous and the median carina of the female pygidium is less pronounced in some from Nayarit, Rosalva. Males vary from 15.5 to 23.0mm long and from 5.0 to 8.0mm wide; females from 15.5 to 21.7mm long and from 5.0 to 8.0mm wide.

GEOGRAPHICAL DISTRIBUTION: (From 142 specimens examined). MEXICO: SINALOA: Morcorito, Crawford; NAYARIT: 15 mi N Tepic, 25-VII-54, M. Cazier, W. Gertsch, Bradts; 18 mi E San Blas, 29-VII-66, G. C. Walters; 12.3 mi NE San Blas, 21-VII-63, R. L. Westcott; near Jesus Maria, Arroya Santiago, 5-VII-55, B. Malkin; 18 mi E San Blas, 27-VII-66, D. S. Verity; JALISCO: Guadalajara, III-23, W. M. Mann; 60 mi S Guadalajara, Highway 15, 8-VIII-65, G. H. Nelson; Chapala, 28-VII-63, R. L. Westcott; 22 mi NW La Piedad, 23-VII-54, E. I. Schlinger; San Juan Lagos, 27-VII-51, P. D. Hurd; MICHOACAN: 5 mi S Tuxpan, 4-VIII-62, D. S. Verity, 21-VII-66, D. S. Verity & G. C. Walters and 7-VIII-65, G. H. Nelson; GUERRERO: Acahuizotla, X, H. H. Smith; Iguala, 31-VIII-64, E. Fisher & D. S. Verity; 5 mi S Iguala, 15-XI-46, E. C. Van Dyke; Mexcala, 18-VII-56, K. Wilson and 29-VI-51, P. D. Hurd; 24 mi N Chilpancingo, Cañon del Zopilote, 11-VII-70, E. Fisher, P. Sullivan; DIS-

TRITO FEDERAL: Temascaltepec, 31, G. B. Hinton; HIDALGO: 5 mi E Jacala, 21-XI-46, E. C. Van Dyke; TAMAULIPAS: Ciudad Victoria, 30-VIII-65, E. M. Fisher; Rosalva, 22-V-52, M. Cazier, W. Gertsch, R. Schrammel; VERACRUZ:

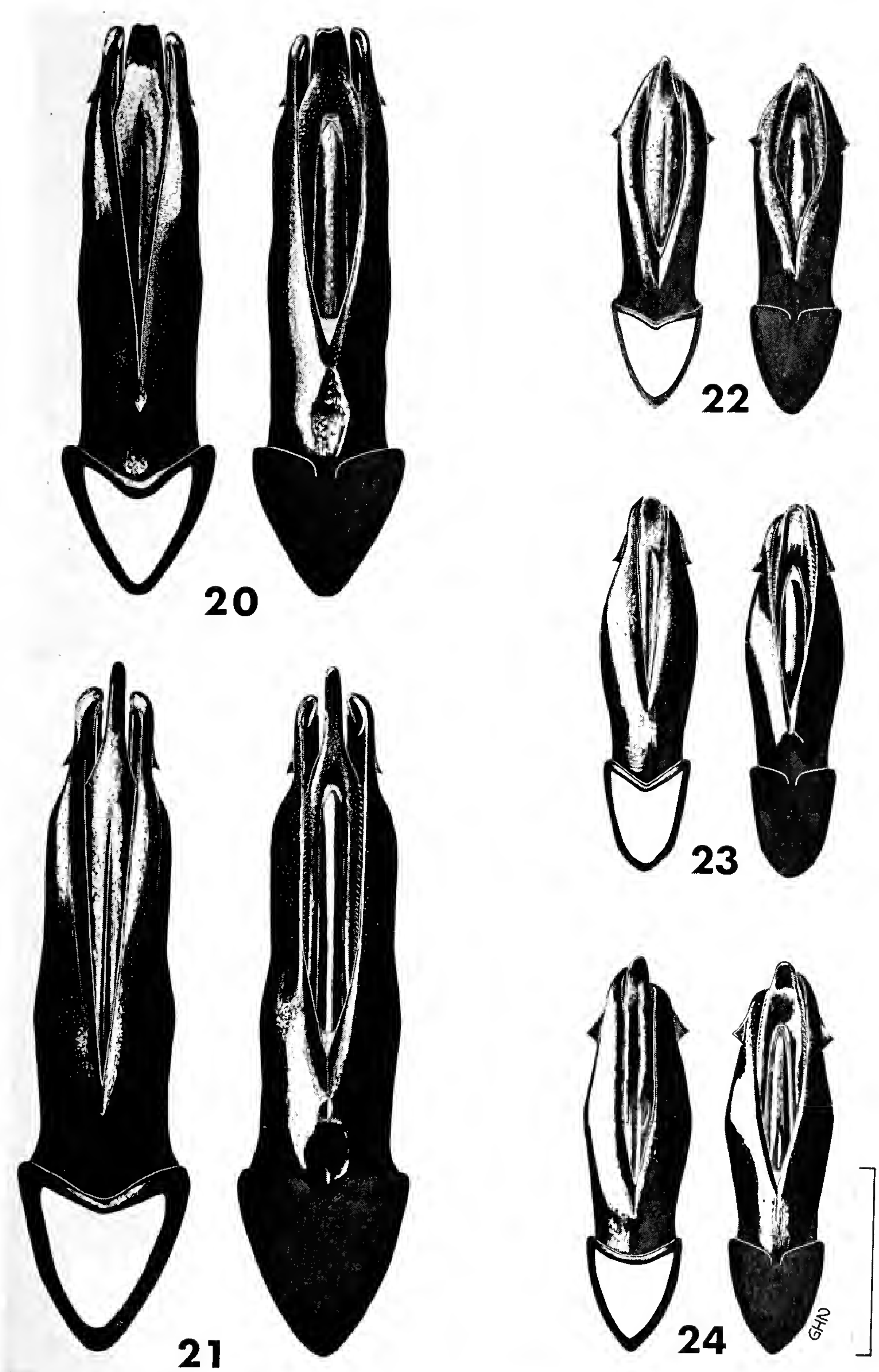


Fig. 20-24. Dorsal and ventral views of male genitalia: 20) *Chrysobothris basalis* LeConte; 21) *C. multistigmosa* (Mannerheim); 22) *C. paramodesta* Nelson; 23) *C. modesta* Waterhouse; 24) *C. octocola* LeConte. (Line = 2 mm).

14 mi SE Xalapa, 29-VII to 1-VIII-64, D. S. Verity; 21 mi SW Panucho, 3-VII-64, E. Fisher & D. S. Verity; 15 mi E Cordoba, (12-25)-VII-64, E. Fisher & D. S. Verity; 12 mi E Cordoba, 3-VII-65, G. H. & K. T. Nelson; 6 mi S Tinaja

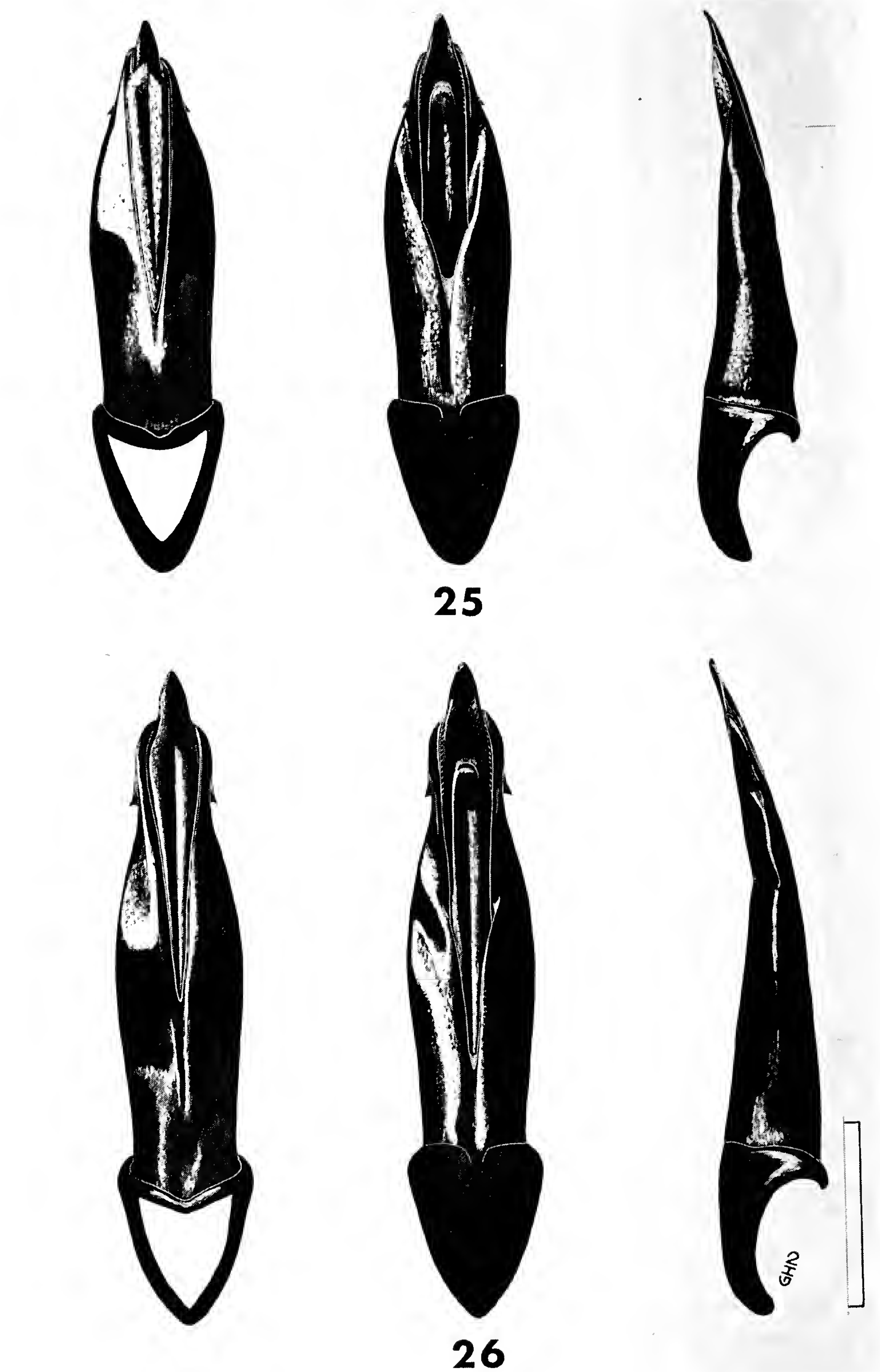


Fig. 25-26. Dorsal, ventral, and lateral views of male genitalia: 25) *Chrysobothris vogti* Nelson; 26) *C. storkani* Obenberger. (Line = 2 mm).

Junction, 26-VI-72, G. H. Nelson; MORELOS: 12 mi S Cuernavaca, 8-VII-62, D. H. Janzen; 15 mi S Cuernavaca, 15-XI-46, E. C. Van Dyke; Yautepec, Canyon de Lobos, 4000 feet, 18-III-59, D. Anderson & H. E. Evans; Morelos; PUEBLA: Atlisco, Hoege; Tehuitzingo, 27-II-53, R. C. Bechtel & E. I. Schlinger;

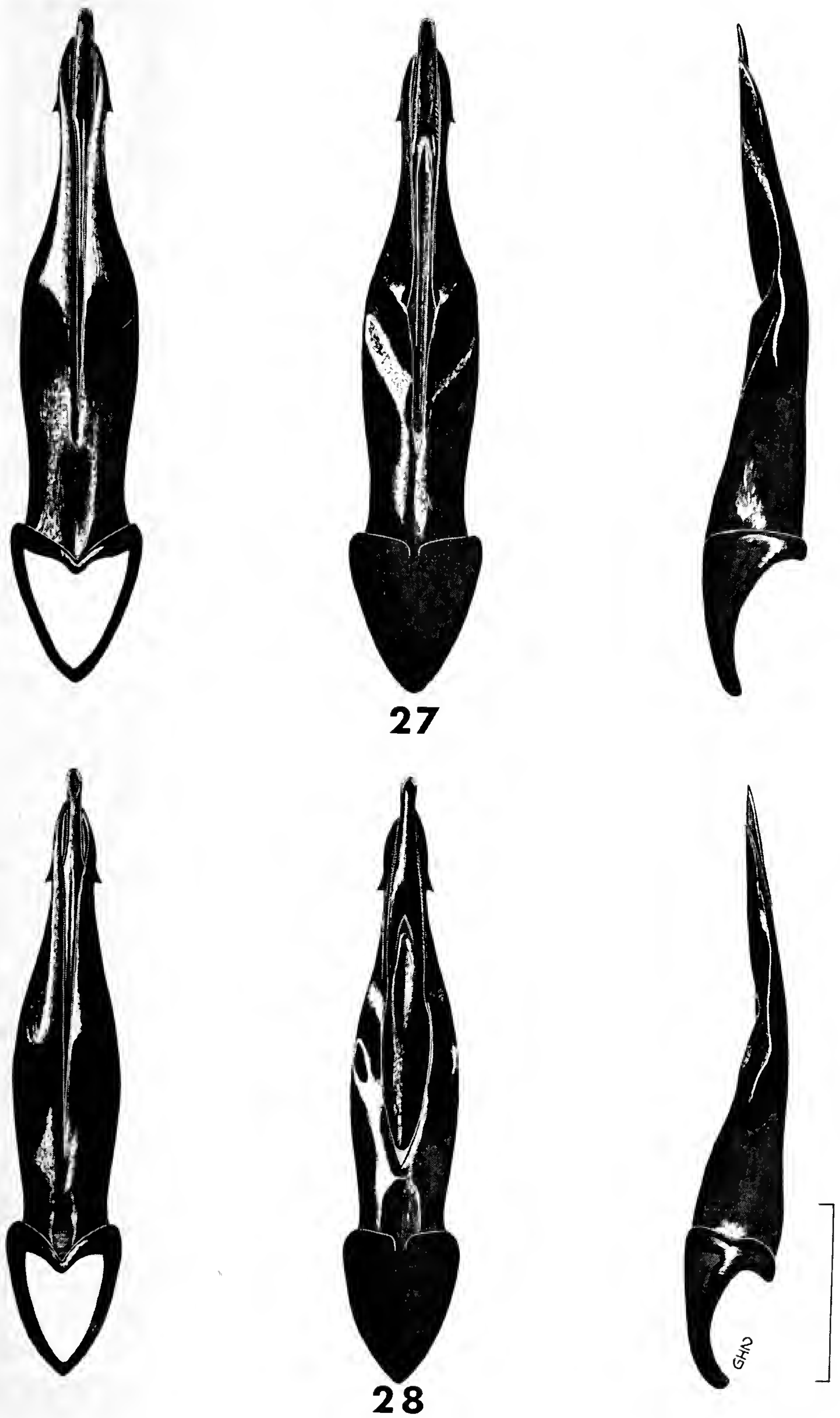


Fig. 27-28. Dorsal, ventral, and lateral views of male genitalia: 27) *Chrysobothris explicationis* Nelson; 28) *C. knulli* Nelson. (Line = 2 mm).

OAXACA: 40 mi W Tehuantepec, 22-VIII-64, E. Fisher & D. S. Verity; Oaxaca, 1912, J. Rickards; Valerio Trujano, 4500 feet, 29-VII-37, M. A. Embury; CHIAPAS: 30 mi S Comitan, 24-VII-63, W. A. Foster; EL SALVADOR: Santa Cruz, Salle.

HOST: Unknown but specimens have been taken on *Mimosa sp., Acacia sp.,* and *Prosopis juliflora* (Sw.) D.C.

COMPARISONS: Most similar to *C. basalis,* and comparison is made under that species.

3. *Chrysobothris paramodesta* Nelson, **new species**
(Figs. 5, 11, 22)

DIAGNOSIS: Cupreous-brown above, shining cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with lateral margins of parameres roundly converging apically and with lateral teeth near widest part (Fig. 22); pygidium of female strongly depressed on either side of strong median carina, with narrow median apical notch (Fig. 11), and last visible abdominal sternite with middle of subapical crest deeply but not strongly notched (Fig. 5).

MALE HOLOTYPE: **Head.** Front and antennae golden-green with cupreous tints especially on clypeus and apical parts of antennal segments, vertex brassy-brown; front flattened, densely confluently punctate, moderately densely clothed with semi-erect white setae not obscuring surface; small callus above each antennal socket, as faint chevron on front and longitudinal grooved area on vertex; clypeus broadly triangularly emarginate and rounded on either side; third segment of antenna elongate, slightly broader apically, segments broadly triangular from fourth and narrowing apically.

Pronotum. Much wider than long; lateral margins slightly sinuately diverging from posterior angles to widest at apical fourth, then obliquely converging to narrowest at anterior angles; anterior margin shallowly arcuately emarginate with faint median lobe; basal margin deeply arcuately emarginate on either side of truncate median lobe; disk evenly convex, glabrous; punctures fine and moderately dense medially, becoming larger and rugose laterally; surface with some irregular smooth areas; scutellum minute, acuminate.

Elytra. Wider than pronotum; lateral margins sinuately parallel from rounded humeri to near middle, then arcuately converging to apex; margins strongly serrate apically; disk glabrous, finely punctate medially, punctures becoming coarse and dense laterally; with typical pattern of costae and foveae.

Ventrally. Finely sparsely punctate medially, more coarsely densely sculptured laterally; moderate semirecumbent white setae laterally and on legs; anterior margin of prosternum with broad median lobe and with some white setae behind lobe and on punctures along lateral margins of prosternal process; profemur with obtuse tooth margined by small teeth; metafemur with row of small teeth along inferior margin; pro- and mesotibiae arcuate, each with several small teeth; metatibia straight, without teeth; abdominal sternites with midline concavity stronger basally, with posterior margins smooth, with purplish tooth-like callosities laterally on each, and with posterior angles of segments acutely produced; last visible abdominal sternite with raised serrate submarginal ridge, with serrate lateral margins and with apex strongly arcuately emarginate; pygidium convex, depressed with small notch apically, and with submarginal area densely punctate and clothed with white setae.

Male genitalia (Fig. 22). Widest part near apex, then strongly arcuately narrowed to apex, lateral teeth at widest part.

Length 12.0mm; **width** 4.5mm.

FEMALE ALLOTYPE: Differs from male as follows: head with front and antennae aeneo-cupreous and front with large chevron shaped callus; pro- and mesotibiae without teeth; last visible abdominal sternite with median carina and with moderately raised submarginal ridge serrate and notched apically (Fig. 5); pygidium with strong median carina with deep coarsely punctate depression on either side, and with very small median apical notch (Fig. 11).

Length 13.0mm; **width** 5.0mm.

Type material: All type material from MEXICO, collected by E. C. Welling M. unless otherwise indicated. Holotype, male [USNM, No. 72506] and Allotype, female [GHN], YUCATAN: Pisté, 120 km E Mérida, near Chichén-itza, VIII-68; Paratypes: 29 males, 26 females, same data as holotype; 3 males, 2 females, VI-68; 48 males, 31 females, VII-68; 29 males, 37 females, IX-68; 9 males, 7 females, Pisté, Mpo. Tinum, V-68; 1 female, Temax, Gaumer; 1 male, 2 females, QUINTANA ROO: X-cán Nuevo, VI-67; 5 males, 13 females, same place, VII-67. Paratypes deposited in the following collections: AMNH, BMNH, CAS, CNC, CUI, USNM, UCB, WFB, FMB, HH, HFH, GHN, DSV, GCW, RLW.

VARIATION: Males vary from 10.5 to 13.0mm long and from 4.0 to 5.0mm wide; females from 10.2 to 14.5mm long and from 4.0 to 5.7mm wide.

HOST: Unknown.

COMPARISONS: *C. paramodesta, C. modesta,* and *C. octocola* form a subgroup and are species of relatively small size. The 3 species are quite similar and *C. paramodesta* is distinguished from the other 2 by the shape of the male genitalia and the smaller apical notch of the female pygidium as indicated in the key.

4. *Chrysobothris modesta* Waterhouse
(Fig. 6, 12, 23)

Chrysobothris modesta Waterhouse, 1887, Biol. Centrali Americana, 3(1):46.

DIAGNOSIS: Cupreous-brown above, shining cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres gradually narrowed to apex and with lateral teeth well apical to widest part (Fig. 23); pygidium of female moderately depressed on either side of strong median carina, with wide apical notch (Fig. 12), and last visible abdominal sternite with middle of subapical crest strongly deeply notched (Fig. 6).

MALE LECTOTYPE: **Head**. Front and antennae aeneo-cupreous with green tints especially along margin of clypeus, vertex brassy-brown; front flat, densely confluently punctate, clothed with semierect white setae not obscuring surface; small oblique callus above each antennal socket, and faint midline groove on vertex; clypeus deeply triangularly emarginate and rounded on either side; antenna with first segment elongate clavate, second short, third elongate, more than twice as long as second and slightly wider apically, segments broadly triangular from fourth and slightly narrowed apicalward.

Pronotum. Distinctly wider than long; lateral margins sinuately diverging from rounded basal angles to widest at apical fourth, then converging to narrowest at anterior angles; anterior margin shallowly arcuately emarginate with faint median lobe; basal margin arcuately emarginate on either side of evident median lobe; disk evenly convex, glabrous; punctures fine and dense medially, becoming larger and rugose laterally; scutellum small, acuminate.

Elytra. Wider than pronotum; lateral margins sinuately parallel from broadly rounded humeri to near middle, then serrate and converging to rounded apex; disk glabrous, finely punctate medially, punctures larger and confluent laterally; pattern of costae and foveae typical.

Ventrally. As in *paramodesta* except pygidium only depressed apically.

Male genitalia (Fig. 23). Widest near middle then tapering to apex; lateral teeth with basal margin at right angles to long axis.

Length 11.5mm; **width** 4.5mm.

FEMALE ALLOLECTOTYPE: Differs from male as follows: head with front and antennae brassy-brown, front with several smooth raised areas, and with setae greatly reduced; pro- and mesotibiae without teeth; last visible abdominal sternite with median carina, and with serrate submarginal ridge strongly and deeply notched apically (Fig. 6); pygidium with strong median carina and with moderately deep punctate depression on either side, and with pronounced median apical notch (Fig. 12).

Length 12.3mm; **width** 5.0mm.

Type material: The original description by Waterhouse (1887) was from 6 specimens. There are now 5 syntypes in the British Museum which were sent to me for examination by Miss C. M. F. von Hayek. I designate as lectotype a male with the genitalia mounted on a card, labelled "syntype" on first label, "Huetamo, Michoacan, Hoege" on second label and hand written on third label "*Chrysobothris modesta (Type)* Waterh." The female allolectotype has the same first and second labels as the lectotype and a third label as follows: "SYNTYPE, *Chrysobothris modesta* Waterh., C. M. F. von Hayek 1973"; 3 paralectotypes, 1 male and 2 females, are labelled: "Tacambaro, Michoacan, Hoege."

VARIATION: Males vary from 9.0 to 14.0mm long and from 3.4 to 5.2mm wide; females from 9.5 to 14.2mm long and from 3.7 to 5.5mm wide.

GEOGRAPHICAL DISTRIBUTION: (From 71 specimens examined, all from MEXICO): MICHOACAN: Huetamo, Hoege, type locality; 22 mi SE Huetamo, 9-VII-70, E. Fisher, P. Sullivan; Tacambaro, Hoege; 12 mi S Nuevo Italia, 21-VIII-54, J. W. MacSwain; Apatzingan, 1200 feet, 1-VIII-40, Hoogstraal, Knight; 5 mi E Apatzingan, 19-VII-54, Linsley, MacSwain, Smith; 12 mi E Apatzingan, 20-VIII-54, Linsley, MacSwain, Smith; 13 mi W Cuatro Caminos, 13-VII-72, 10 mi W Cuatro Caminos, 12-VII-72, and 9 mi S Cuatro Caminos, (11-13)-VII-72, all G. H. Nelson; GUERRERO: 5 mi S Iguala, 15-XI-46, E. C. Van Dyke; Canyon del Zopilote, 24 mi N Chilpancingo, 11-VII-70, E. Fisher, P. Sullivan; 3 mi N Chilpancingo, 18-XI-46, E. C. Van Dyke; 15 mi S Cuernavaca, 15-XI-46, E. C. Van Dyke; 23 mi W Arcelia, 10-VII-70, E. Fisher, P. Sullivan; 17 mi N Mexicala, 23-VIII-58, E. L. Mockford; 6 mi S Rio Mexcala, Highway 95, (5-6)-VIII-65, G. H. Nelson; MORELOS: Alpuyeca, 27-VI-51, P. D. Hurd; OAXACA: Valerio Trujano, 4500 feet, (28-29)-VII-37, M. A. Embury; 18 mi E La Ventosa Junction, Highway 190, 21-VII-65, 3 mi W Tehuantepec, 9-VII to 2-VIII-65, 7 mi W Tehuantepec, 2-VII-72, and near Tecomavaca, 500 meters, 28-VI-72, all G. H. Nelson; COLIMA, 10 mi W Colima, 1-VIII-54, M. Cazier, W. Gertsch, Bradts.

HOST: Unknown.

COMPARISONS: This species is similar to *C. paramodesta*, under which it is compared, and *C. octocola*. From the latter *C. modesta* differs in the elytral foveae usually being smaller and more similar in color to the body and in having the clypeus deeply triangularly emarginate which is usually less deeply emarginate in *C. octocola*. Males differ in the characteristics of the aedeagus and females in the excavation of the last visible abdominal sternite, both as indicated in the key.

5. *Chrysobothris octocola* LeConte
(Fig. 7, 13, 24)

Chrysobothris octocola LeConte, 1858, Acad. Nat. Sci. Philadelphia Proc. [10]:67.

DIAGNOSIS: Cupreous-brown above, shining cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres gradually narrowed to apex, and with lateral teeth triangular, strong and well apical to widest part (Fig. 24); female pygidium with median and lateral carinae, with wide apical notch (Fig. 13), and last visible abdominal sternite usually projecting at middle of subapical crest (Fig. 7).

This species is described by Fisher (1942). Female differs from male as follows: front of head aeneous instead of golden-green, frontal callus more evident; pro- and mesotibiae without row of small teeth; last visible abdominal sternite with midline carina and with midline projection in apical emargination; pygidium in male simple, in female with midline and lesser lateral carinae with depression between, and apex with midline notch.

Length (female type) 17.0mm; **width** 6.5mm.

Male genitalia (Fig. 24). Widest at middle then tapering weakly to apex; lateral teeth pyramidal in shape.

VARIATION: This widespread species varies in general color from aeneo- and purpureus-black to cupreous with the elytral foveae from green to bright cupreous, usually contrasting distinctly with the body color. The general sculpture of the body is rather consistent but the apical notch of the pygidium in the female varies from semicircular to broadly transverse in shape and the subapical crest of the last visible abdominal sternite in the female varies from hardly projecting to a sharply projecting tooth. Males vary from 10.2 to 14.0mm long and from 4.0 to 5.2mm wide; females from 11.0 to 17.0mm long and from 4.0 to 6.2mm wide.

TYPE LOCALITY: ARIZONA, Colorado River near Gila, female type [MCZ, No. 2688].

GEOGRAPHICAL DISTRIBUTION: (From 316 specimens examined) CALIFORNIA: Many localities from Panamint and Death Valleys southward through San Bernardino, Los Angeles, San Diego, Riverside, and Imperial Counties. NEVADA: Glendale, 25-V-35; Clark County, Mount Charleston, Kyle Canyon, 23-V-40, Reeves, Cazier, Ting. ARIZONA: many localities. NEW MEXICO: Silver City, 10-VII-35, R. T. Kellogg. TEXAS: many localities. MEXICO: BAJA CALIFORNIA: many localities throughout. SONORA: 12 mi N Hermosillo, 14-VIII-65, G. H. Nelson; San Bernardo, Rio Mayo, 15-X-34, H. S.

Gentry. CHIHUAHUA: Samalayuca, 24-VI-47, Gertsch. TAMAULIPAS: Abasola, 17-V-52, Cazier, Gertsch, and Schrammel; 15 mi N Ciudad Mante, 14-VII-55, D. Giuliani.

HOSTS: Reared from *Prosopis juliflora* (Swartz) Candolle and *Cercidium floridum* Bentham from various parts of its range. It has also been collected on the following plants: *Acacia greggii* Gray, *Atriplex lentiformis* (Torrey) Watson, and *Pluchea sericea* (Nuttall) Coville.

COMPARISONS: Most similar to *C. modesta* and *C. paramodesta* under which it is compared.

6. *Chrysobothris vogti* Nelson, **new species**
(Fig. 14, 25)

DIAGNOSIS: Cupreous or brownish-black above, cupreo-aeneous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres gradually tapering to apex. without apical prolongation and dorsum of parameres convex without apparent median channel (Fig. 25); pygidium of female with lateral margins rounded from base to truncate apex, apex with slender ventrally projecting midline tooth (Fig. 14).

MALE HOLOTYPE: **Head**. Front bronzy gold, flattened, densely confluently punctate, moderately clothed with semirecumbent white setae and with small raised smooth area above antennal sockets; vertex darker, glabrous with midline groove; clypeus triangularly emarginate; antennae as body color with third segment elongate, segments triangular from fourth and narrowing apically.

Pronotum. Distinctly wider than long; lateral margins feebly sinuate from rounded basal angles to anterior fourth, then strongly converging to narrowest at anterior angles; disk convex, glabrous, finely punctate medially, punctures becoming larger and confluent laterally; scutellum small, acuminate.

Elytra. Wider than pronotum, lateral margins parallel from rounded humeri to middle, then converging gradually to strongly rounded apices, margins serrate posteriorly; disk glabrous, punctures fine medially becoming larger and dense laterally; with typical pattern of costae and foveae.

Ventrally. Sparsely finely punctate medially, becoming more coarsely sculptured and chagreened laterally; sparsely clothed with semirecumbent white setae (which are matted and rubbed in type); prosternum with anterior margin feebly, broadly lobed; prosternal process impunctate medially, with rows of numerous fine punctures parallel to lateral margin; profemur with dentately margined obtuse tooth, without dense brush; mesofemur without but metafemur with row of coarse teeth; protibia strongly arcuate, mesotibia slightly so, both with row of small teeth; metatibia straight, without teeth; abdominal sternites flattened along midline, posterior margins smooth, lateral angles acutely produced; sternites with callosities laterally; last visible sternite with lateral margin serrate, apex arcuately emarginate, disk with raised tooth laterally; pygidium convex, slightly depressed apically with serrate margin and inferior marginal area densely clothed with punctures and setae.

Male genitalia (Fig. 25). Parameres tapering gradually to apex, and dorsum convex without apparent median channel.

Length 16.5mm; **width** 6.0mm.

FEMALE ALLOTYPE: Differs from male as follows: head with front aeneous and with chevron shaped callus; protibia arcuate, meso- and metatibiae straight, all without row of small teeth; last visible abdominal sternite with midline carina, apex arcuately emarginate with median tooth; pygidium with midline groove becoming deeper apically and with lateral margins rounded from base to truncated serrate apex, apex with slender ventrally projecting midline tooth (Fig. 14).

Length 16.5mm; width 6.0mm.

Type material: The male holotype [USNM, No. 72502] and female allotype [BMNH] from MEXICO, N. Yucatan, Temax, Gaumer. Paratypes: 1 male, MEXICO, Quintana Roo, X-cán Nuevo, VI-67, E. C. Welling M.; 2 males, 5 females, same place, VII-67, E. C. Welling M. Paratypes are deposited in the following collections: GHN, GCW, and SGW.

VARIATION: The type series is quite uniform in appearance. Males and females vary from 15.5 to 17.0mm long and from 5.5 to 6.0mm wide.

HOST: Unknown.

COMPARISONS: The elongate third antennal segment, the shape of the male aedeagus, and the shape of the female pygidium will serve to distinguish *C. vogti* from its relatives. It is most similar to *C. storkani* and differences are mentioned under that species.

7. *Chrysobothris storkani* Obenberger
(Fig. 17, 26)

Chrysobothris storkani Obenberger, 1940, Sbornik Ent. Odd. Nar. Mus. Praha, 18:92.

DIAGNOSIS: Cupreous-brown above, more brilliantly cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin and aedeagus with apical prolongation of parameres only moderately narrowed (Fig. 26); pygidium of female with lateral margins parallel from base to rounded posterior angles and with median apical tooth without notch on either side (Fig. 17).

Original description: "Corporis forma et aspectu primo illae *Chr. multistigmosae* Mann. simillima, eadem forma elongata, eodem colore, eadem macularum elytrorum dispositione, sed ab hac specie, uti sequitur, divergens: maculis elytrorum maioribus et magis cuprascentibus, rotundatis. Fronte in mare multo densius sculpta, granulosa, laetius cuprescente, reliefo angulari minus conspicuo, vertice eadem forma, sed fortius punctato. Epistomate angulose, in angulo obtuso distincto emarginato (apud *multistigmosam* subarcuatim emarginato); antennarum articulo tertio breviore, illo secundo solum duplo longiore (apud *multistigmosam* triplo longiore); thorace antice distincte bisinuatim, (apud *multistigmosam* fere simpliciter) emarginato, thorace breviore, angulis anticis minus productis, margine laterali solum in tertia parte media parallelo, in tertia parte basali subanguloso atque versus, basim oblique, leviter, distincte attenuato, thoracis sculptura simili, sed lobo antescutellari paullo latius rotundato. Elytris paullo brevioribus, carina secunda (a sutura) magis sinuata, intervallis multo sparsius, fortius, distincte strigose punctatis. Tarsorum posteriorum articulo basali distincte breviore. Tibiis anticis maris angustioribus, curvatis, in parte interna granulis distinctis subdentiformibus parvis 6-7 munita, granulis his in mare *Chr. multistigmosae* lotaliter absentibus. Corpore subtus cupreo, sternitis concoloribus, reliephis lateralibus similibus, sternito anali simili, sed breviore, lateribus fortius serrulatis, apice angustius et profundius in mare emarginato. Sternito anali feminae uti in *multistigmosa* carinato, sed breviore et postice latius emarginato. Scutello in sexu utroque minore, thoracis disco saepe longitudinaliter subdepresso".

Male genitalia (Fig. 26). Lateral margins of parameres moderately narrowed toward apex, dorsally with midline sulcus; penis broad, bluntly acute at apex.

Length (lectotype male) 17.0mm; **width** 6.0mm.

FEMALE: Differs from male as follows: pro- and mesotibiae without row of teeth; last visible abdominal sternite has midline carina; margins of pygidium rounded from base in male with slight midline notch apically while in female they are parallel at sides and rounded to truncate apex with ventrally directed midline tooth (Fig. 17).

VARIATION: Some specimens are less brightly cupreous than usual, otherwise fairly uniform. Males vary from 15.5 to 19.5mm long and from 5.5 to 6.8mm wide; females from 14.5 to 19.0mm long and from 5.5 to 7.0mm wide.

TYPE LOCALITY: MEXICO, VERACRUZ, Cordoba, 21-XI-27, (cited in error as June in original description) (Storkan, collector) [NMP].

GEOGRAPHICAL DISTRIBUTION: (From 26 specimens examined) MEXICO: OAXACA: Temascal, 26-IX and 24-XI-63, D. H. Janzen; 4 mi E Temascal, 26-IX to 24-XI-63 and 6-I-64, D. H. Janzen; VERACRUZ: Crawford; Cordoba, 10-V-08, Fred K. Knab; 10 mi N Orizaba, 17-XI-63; Cotaxtla Experiment Station, 27-VI to 15-VIII-62, all by D. H. Janzen; Cordoba, Salle; Veracruz, 27-VII-64, E. Fisher and D. S. Verity; Almolonga, Hoege; Zempuala, 11-VIII-63, M. E. Pendleton; SAN LUIS POTOSI: Valles, 13-X-1894.

HOST: Collected on *Acacia cornigera* Willd.

COMPARISONS: This species is more shining cupreous than its relatives and the shape of the male genitalia is distinctive. The female pygidium with its apical tooth without a notch on either side will distinguish *C. storkani* Obenb. from all except *C. vogti,* however the lateral margin is more parallel from base to rounded posterior angles than in *C. vogti.*

8. *Chrysobothris explicationis* Nelson, **new species**
(Fig. 15, 27)

DIAGNOSIS: Cupreous-brown above, shining aeneo-cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres strongly but gradually narrowed to elongate apex and when viewed from side strongly angulate below at middle (Fig. 27); pygidium of female with median apical tooth projecting but little beyond lateral lobes (Fig. 15).

MALE HOLOTYPE: **Head**. Front and antennae bronzy-green, vertex aeneous; front flattened, densely confluently punctate, densely clothed with semierect white setae not obscuring surface; small transverse callus above antennal socket, chevron on front, and longitudinal grooved area on vertex; clypeus triangularly emarginate, rounded on either side; third segment of antenna elongate, segments triangular and narrowing from fourth apically.

Pronotum. Wider than long; lateral margins sinuate from acute basal angle to anterior fourth, then strongly converging to narrowest at anterior angles; anterior margin arcuately emarginate with faint median lobe; basal margin deeply arcuately emarginate on either side of median truncate lobe; disk evenly convex, glabrous; punctures fine and only moderately dense medially, becoming larger and rugosely punctate laterally; scutellum small, blue, and acuminate.

Elytra. Wider than pronotum; lateral margins parallel from obliquely rounded humeri to near middle, then gradually narrowed to separately rounded apices; marginal serrations beginning before third fovea, becoming larger apically; disk glabrous, punctures fine and moderately dense medially, larger and more dense laterally; with typical pattern of costae and foveae.

Ventrally. Finely sparsely punctate medially, more coarsely sculptured laterally; semirecumbent white setae laterally and on legs; anterior margin of prosternum with feeble median lobe and with dense semierect white setae anteriorly, along punctate lateral margin of prosternal process and extending onto profemur and base of mesofemur; profemur with dentate obtuse tooth; meso- and metafemora with row of teeth; protibia moderately arcuate, mesotibia straight, both with row of small teeth; metatibia straight, without row of teeth; abdominal sternites feebly concave along midline, each with raised dark callosity near lateral margin, callosity acutely tooth-like on last segment; posterior angles of each segment acutely produced; last visible abdominal sternite finely serrate along lateral margin, apex arcuately emarginate; pygidium convex, depressed apically at midline, and with area under margin densely punctured and densely clothed by white setae.

Male genitalia (Fig. 27). Tapering to long slender apex; strongly angulate below at middle when viewed from side.

Length 19.0mm; **width** 6.3mm.

FEMALE ALLOTYPE: Differs from male as follows: front of head and antennae aeneo-brown; front with callosities more evident; ventrally with setae less dense on prosternum and femora; pro- and mesotibiae without teeth; last visible abdominal sternite with midline carina, with strong serrate subapical margin, and apical margin with small arcuate emargination; apex of pygidium with slender median tooth projecting but little beyond produced postero-lateral angles (Fig. 15).

Length 19.0mm; **width** 6.5mm.

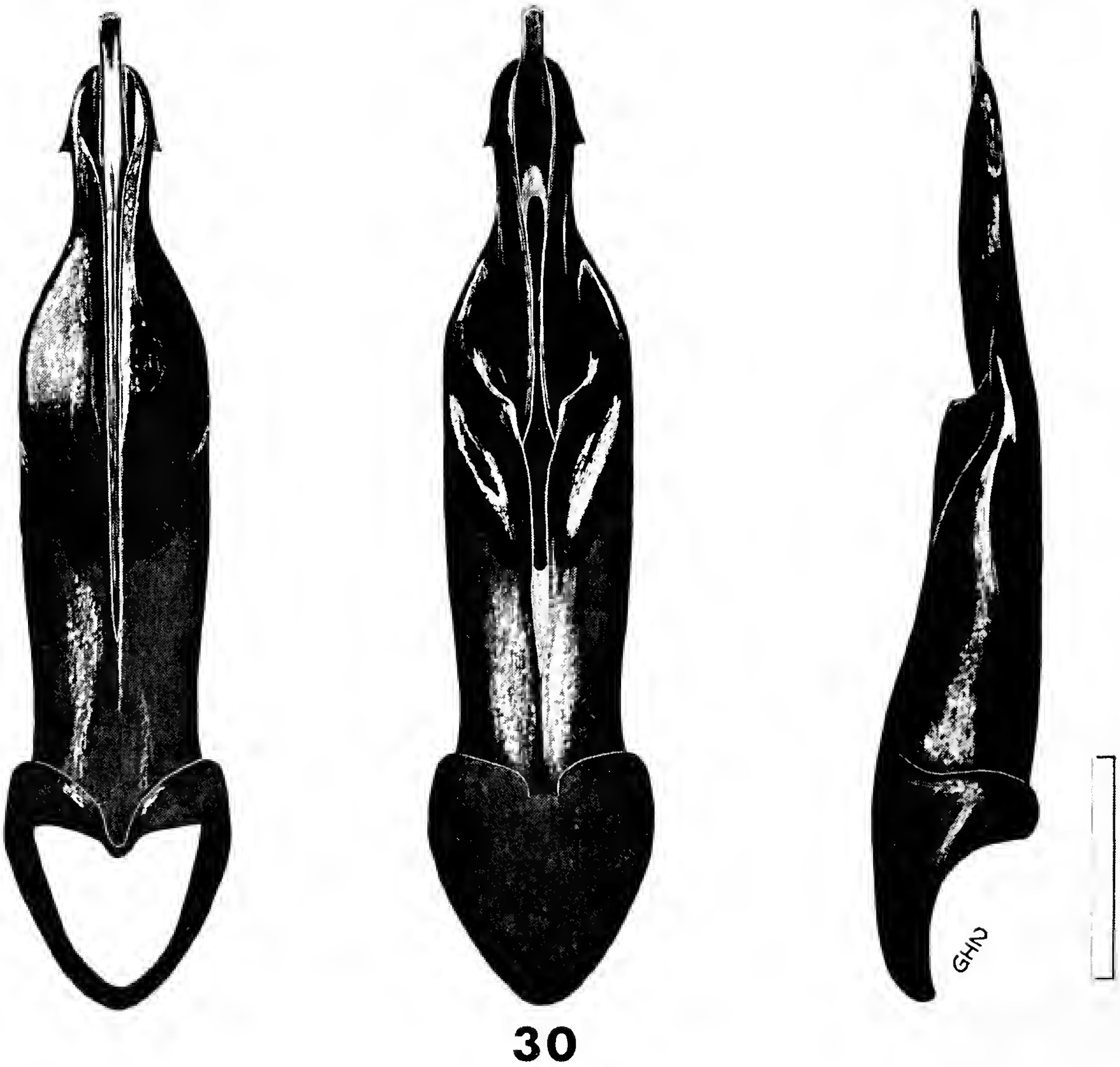
Type material: All from MEXICO. Holotype, male [CAS, Department of Entomology] from SINALOA, 2.5 mi N Mazatlan, 12-VIII-70, M. Wasbauer. Allotype, female [GHN] from SINALOA, 5 mi N Mazatlan, 19-VII-72, G. H. Nelson. Paratypes: 1 male, 1 female, same data as allotype; 1 female, same place, 10-VIII-65, G. H. Nelson; 3 males, 3 females, same place, 28-VII-66, G. C. Walters & D. S. Verity; 4 females, same place, 22-VII-72, J. & M. A. Chemsak, A. & M. Michelbacher; 1 female, same place and collectors, 31-VII-72; 2 females, same place as holotype, (10-11)-VIII-70, J. A. Chemsak; 1 female, Mazatlan, 15-IX-18; 1 male, 10 km S Mazatlan, 9-VII-63, Eric Fisher; 5 females, 9 mi N Mazatlan, (25-28)-VII-72, J. & M. A. Chemsak, A. & M. Michelbacher; 3 males, 2 females, 3 mi E Villa Union, 24-VII-72, same collectors; 1 female, 10 mi N Escuinapa, 27-VIII-62, D. S. Verity; 1 female, NAYARIT: 18 mi E San Blas, 27-VII-66, D. S. Verity. Paratypes are deposited in the following collections: CAS, UCB, GHN, DSV, and GCW.

VARIATION: Fairly uniform in general appearance. Males vary from 18.0 to 19.5mm long and from 6.0 to 6.5 mm wide; females from 16.5 to 19.0mm long and from 5.5 to 6.5mm wide.

HOST: Collected on *Acacia sp.* and *Mimosa sp.*

COMPARISONS: Similar to *C. knulli* but differs as indicated in the key. Females are difficult to distinguish from *C. atabalipa* and *C. paratabalipa*, but the median apical tooth of the pygidium projects well beyond the lateral lobes in the latter 2 and but little in *C. explicationis.*

29



30

Fig. 29-30. Dorsal, ventral, and lateral views of male genitalia: 29) *Chrysobothris brevitarsis* Nelson; 30) *C. verityi* Nelson. (Line = 2 mm).

9. *Chrysobothris knulli* Nelson, **new species**
(Fig. 1, 16, 28)

Chrysobothris multistigmosa Knull (not Mannerheim), 1947, Ent. News, 58(8):211.

DIAGNOSIS: Cupreous-brown above, shining aeneo-cupreous below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres gradually but strongly narrowed to elongate apex and when viewed from side weakly angulate below at middle (Fig. 28); pygidium of female without carina but with median apical notch and posteriorly projecting tooth on either side (Fig. 16).

MALE HOLOTYPE: **Head**. Front aeneous with green on margins of clypeus, eyes, and antennal sockets, vertex darker; rest of head as in *C. explicationis*.
Pronotum, elytra and **ventrally** as in *C. explicationis* except color a darker brown and elytral foveae smaller than in that species.
Male genitalia (Fig. 28). Gradually tapering to long slender apex; weakly angulate below at middle when viewed from side.
Length 17.5mm; **width** 6.0mm.

FEMALE ALLOTYPE: Differs from male as follows: front of head darker aeneo-cupreous, callosities more evident; ventrally with setae less dense anteriorly; pro- and mesotibiae without row of teeth; last visible abdominal sternite with median carina, and apical margin with a small arcuate emargination; apex of pygidium with small median notch and posteriorly projecting tooth on either side (Fig. 16).
Length 18.5mm; **width** 6.5mm.
Type material: Holotype, male [USNM, No. 72503] from ARIZONA, Cochise Co., 2 mi E Portal, 15-VII-69, G. H. Nelson. Allotype, female [GHN], same data as holotype. Paratypes, ARIZONA: 5 males, 6 females from type locality, (14-27)-VII-69, G. H. Nelson; 1 female, Cochise Co., Dragoon, 4-VII-73, J. Wappes: 1 male, 1 female, Wickenburg, 20-VIII-38, D. J. & J. N. Knull; 1 female, Baboquivari Mountains, 1-IX-38, D. J. & J. N. Knull; 1 female, Congress Junction, 7-VII, D. J. & J. N. Knull; 1 female, near Roosevelt Lake, 29-IV-47, H. & M. Townes; 1 male, Oracle, 15-VI-03, Oslar; 1 female, Tucson, (12-14)-VIII, Wickham; 1 male, Tucson, 6-V-53, G. M. Bradt; 1 male, Tucson, 5-IX-49, G. M. Bradt; 1 female, Cochise Co., SE end of Whetstone Mountains, Dry Canyon Sands Ranch, 10-VIII-52, H. B. Leech & J. W. Green; 1 female, San Carlos, Gila River Valley, IX, D. K. Duncan; 1 female, Pima County, Canoa Ranch, 19-VIII-60, D. E. Rich; 1 male, NEW MEXICO: Hidalgo County, 19 mi N Rodeo, Granite Gap, 15-VIII-65, K. W. Brown. MEXICO: SONORA: 5 males, 10 females, 2 mi E Alamos, 22-VIII-59, R. L. Westcott; 10 males, 2 females, 10 mi W Alamos, 26-XII-72, D. S. Verity; 1 female, San Bernardo, Rio Mayo, 16-VIII-35 and 1 male, 1 female, 15-X-34, all by H. S. Gentry; 2 males, Sierra de Alomas, 16-I-68, V. Roth; 1 female, Minas Nuevas, 7-VIII-52, C. & P. Vaurie; CHIHUAHUA: 1 female, west of Chinipas, 26-I-68, V. Roth; SINALOA: 1 male, Los Mochis, 17-VI-24, A. H. Amis; 1 male, Culican, 22-VIII-60, D. S. Verity; 2 males, 1 female, 20 mi S Culican, 22-VII-65, D. S. Verity; 1 female, 7 mi S Guamuchil, 29-XII-63, D. S. Verity; 1 male, 4 mi S Guamuchil, 10-IX-64, E. Fisher & D. S. Verity. Paratypes are deposited in the following collections: AMNH, CAS, USNM, WFB, FMB, JNK, GHN, DSV, JW, and RLW.

VARIATION: Fairly uniform in appearance. Males vary from 16.5 to 19.5mm long and from 5.7 to 6.5mm wide; females from 14.5 to 19.0mm long and from 5.0 to 7.0mm wide.

HOST: Collected on limbs of *Acacia constricta* Benth. at the type locality and on *Acacia sp.* in New Mexico.

COMPARISONS: Differences between this species and the similar *C. explicationis* are indicated in the key. Male genitalia and the female pygidium with the small apical median notch with a posteriorly projecting tooth on either side will serve to distinguish this species from others in the group.

It is named in honor of Professor J. N. Knull who has contributed much to the knowledge of the Buprestidae.

10. *Chrysobothris brevitarsis* Nelson, **new species**
(Fig. 8a, 18, 29)

DIAGNOSIS: Cupreous-brown above, shining aeneo-cupreous below; first segment of metatarsus less than 2.5 times as long as high (Fig. 8a); male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres strongly angulate at sides and abruptly narrowed to moderately elongate apical part, without lateral tooth (Fig. 29); pygidium of female with apical median tooth strongly projecting beyond only moderately produced lateral lobes (Fig. 18).

MALE HOLOTYPE: **Head**. Front and vertex brassy-gold with green on margin of clypeus, antennal sockets and eyes; antenna cupreous becoming darker apically and with green at base of proximal segments; front flattened, densely confluently punctate, white semierect setae fairly dense but not obscuring surface; weak callus above antennal socket and median grooved smooth line on vertex; clypeus triangularly emarginate; third segment of antenna elongate, segments triangular and narrowing from fourth apically.

Pronotum and **elytra** essentially as in *C. explicationis* except marginal serrations of elytra begin apical to third discal fovea.

Ventrally. Shining aeneo-cupreous with green tints; finely sparsely punctate medially, more coarsely sculptured laterally; semirecumbent white setae laterally and on legs; anterior margin of prosternum with median lobe, white setae rather sparse medially, inconspicuous along lateral margins of prosternal process, and not dense on femora; profemur with serrately margined obtuse tooth; meso- and metafemora with row of teeth; protibia arcuate, mesotibia weakly so, both with row of small teeth; metatibia straight, without row of teeth; first segment of metatarsus less than 2.5 times as long as high (Fig. 8a); abdominal sternites feebly concave along midline, each with raised dark callus near lateral margin, callus acutely tooth-like on last segment; posterior angles of each segment acutely produced; last visible sternite finely serrate along lateral margin, apex arcuately emarginate; pygidium convex, depressed apically at midline, and with densely punctured area under margin densely clothed by white setae.

Male genitalia (Fig. 29). Sides of parameres angulate and abruptly tapering to short moderately slender apex, without lateral teeth; strongly angulate below when viewed from side.

Length 14.5mm; **width** 5.0mm.

FEMALE ALLOTYPE: Differs from male as follows: front of head and antennae aeneo-brown; front with distinct chevron-shaped callus; pro- and mesotibiae without row of teeth; last visible abdominal sternite with midline carina and apex with narrow deep emargination; apex of pygidium with long slender median tooth and only slightly produced lateral angles (Fig. 18).

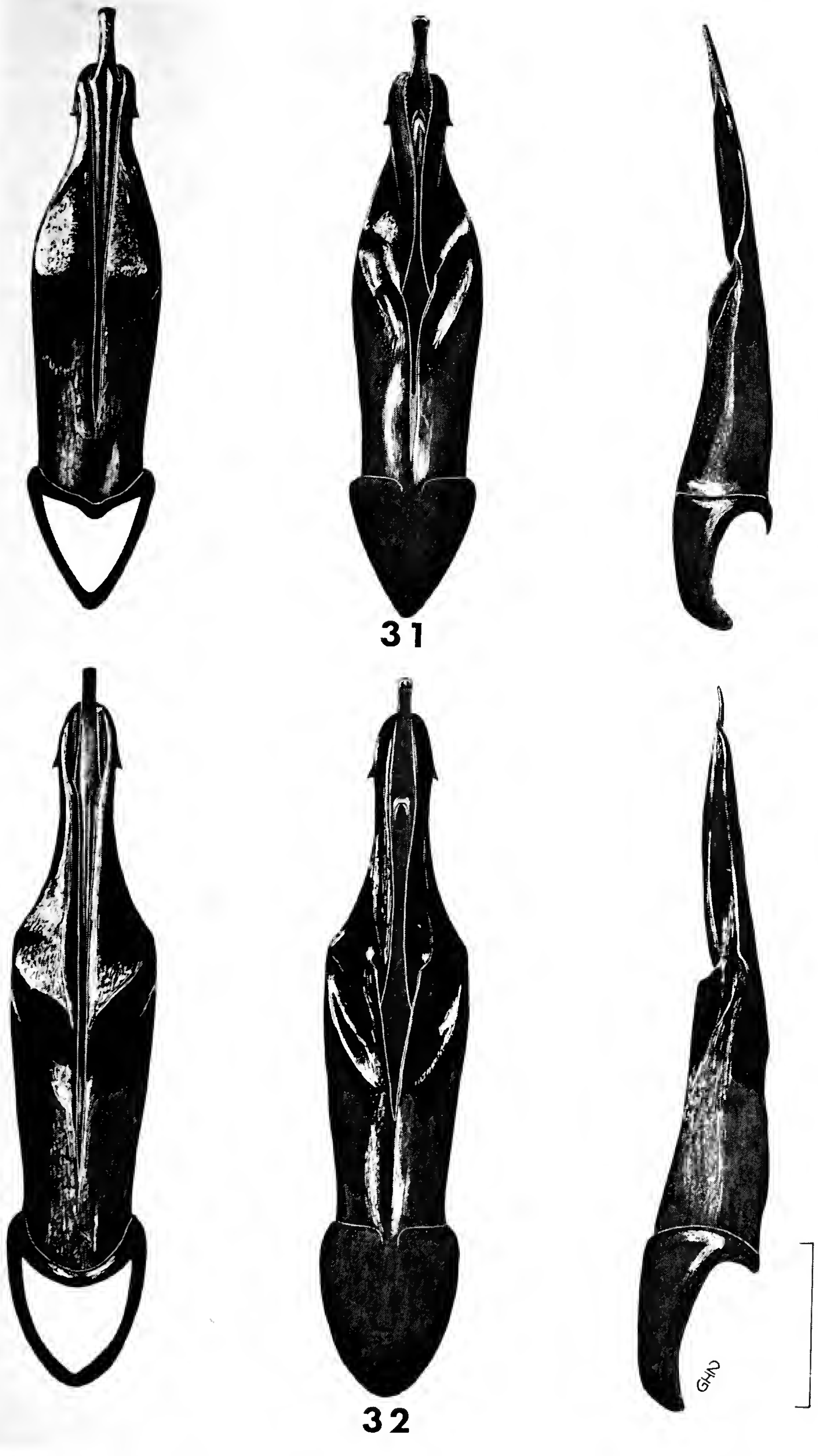


Fig. 31-32. Dorsal, ventral, and lateral views of male genitalia: 31) *Chrysobothris atabalipa* Laporte & Gory; 32) *C. paratabalipa* Nelson. (Line = 2 mm).

Length 15.5mm; **width** 5.5mm.

Type material: Holotype, male [USNM, No. 72504] from MEXICO, OAXACA, 3 mi W Tehuantepec, 19-VII-65, G. H. Nelson. Allotype, female [GHN], same locality as holotype, 2-VIII-65, G. H. Nelson. Paratypes: 1 male, same data as holotype; 1 female, OAXACA, 15 mi N La Ventosa Junction, Highway 185, 8-VII-65, G. H. Nelson; 1 male, NICARAGUA, Managua, 29-VI-63, L. J. Bottimer. Paratypes are deposited in the following collections: CNC, and GHN.

VARIATION: The 2 male paratypes have a faint indication of a chevron on the front, and the male from Nicaragua lacks the green areas of the head and antennae. Males vary from 14.5 to 16.5mm long and from 5.0 to 5.8mm wide; females from 15.5 to 16.0mm long and from 5.5 to 5.8mm wide.

HOST: Holotype and allotype collected on *Acacia pennatula* (S. & C.) Bentham.

COMPARISONS: Appears most similar to small specimens of *C. atabalipa,* but the short first metatarsal segment of *C. brevitarsis* is distinctive as is the shape of the male genitalia and the female pygidium.

11. *Chrysobothris verityi* Nelson, **new species**
(Fig. 30)

DIAGNOSIS: Blue with aeneous tint above and below; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres abruptly constricted to narrowed apex (Fig. 30); pygidium of female with median apical tooth strongly projecting beyond rather strongly produced lateral lobes.

MALE HOLOTYPE: **Head**. Front vivid golden-green above becoming cupreous below and on antennae, blue on vertex; front flattened, densely confluently punctate, clothed with short, moderately dense, semierect white setae; faint thin chevron on front and longitudinal smooth area with midline groove on vertex; clypeus triangularly emarginate; third segment of antenna elongate, segments triangular and narrowing from fourth segment apically.

Pronotum. Wider than long; lateral margins sinuately diverging from roundly acute posterior angles to widest at anterior fourth, then converging sharply to narrowest at anterior angles; anterior margin arcuately emarginate with median lobe; basal margin arcuately emarginate on either side of truncate median lobe; disk evenly convex, glabrous; finely punctate medially, punctures becoming larger and rugosely confluent laterally; scutellum small and acuminate.

Elytra. Wider than pronotum; lateral margins parallel from obliquely rounded humeri to near middle, then gradually narrowed to separately rounded apices; marginal serrations beginning at middle becoming larger apically; disk glabrous, finely punctate medially, punctures larger and confluent laterally; with typical pattern of costae and foveae, foveae shining golden-green.

Ventrally. Finely sparsely punctate medially, more coarsely sculptured laterally; semirecumbent white setae laterally and on legs; anterior margin of prosternum with trace of median lobe and with dense semierect white setae in transverse depression behind margin; prosternal process convex with punctate groove near lateral margin; profemur with weakly serrate obtuse tooth; mesofemur without evident row of teeth; metafemur with row of evident teeth; protibia arcuate, mesotibia straight, both with row of teeth; metatibia straight, without teeth; abdominal sternites feebly concave along midline, each with smooth callus near lateral margin, callus acutely tooth-like on last sternite; posterior angles of each sternite acutely produced; last visible abdominal sternite with serrate submarginal crest and serrate along lateral margin, apex deeply arcuately emarginate; pygidium convex, depressed in midline apically, and with submarginal area densely punctate and clothed by dense white setae.

Male genitalia (Fig. 30). Abruptly narrowed to short narrowed apex; abruptly angulate below when viewed from side.

Length 22.5mm; **width** 8.0mm.

FEMALE ALLOTYPE: Differs from male as follows: front of head and antennae blue with aeneous tint, clypeus more cupreous; front with distinct chevron and with callosities above antennal sockets; prosternum with setae less dense anteriorly; pro- and mesotibiae without row of teeth; last visible abdominal sternite with midline carina and arcuate narrow emargination apically; apex of pygidium with elongate median tooth curved downward and projecting well beyond rather strongly produced lateral angles.

Length 21.5mm; **width** 8.0mm.

Type material: All from MEXICO, MICHOACAN. Holotype, male [USNM, No. 72505] from 9 mi S Cuatro Caminos, 12-VII-72, G. H. Nelson. Allotype, female [GHN] from same place, 11-VII-72, G. H. Nelson. Paratypes: 1 male, same data as holotype; 4 males, 3 females, type locality, 13-VII-72, G. H. Nelson; 3 males, 5 females, type locality, 20-VII-66, D. S. Verity and G. C. Walters; 1 female, type locality, 29-VII-66, D. S. Verity; 1 male, 1 female, 11 mi E Apatzingan, 20-VIII-54, E. G. Linsley, J. W. MacSwain, & R. F. Smith. Paratypes are deposited in the following collections: UCB, GHN, DSV, and GCW.

VARIATION: Some specimens are more vivid blue than others. Males vary from 21.0 to 23.0mm long and from 7.0 to 8.0mm wide; females from 19.0 to 22.5mm long and from 6.5 to 8.0mm wide.

HOST: Most of the type series were taken on trunks of downed *Prosopis juliflora* (Sw.) D. C. but some were collected on *Acacia sp.*

COMPARISONS: The blue color makes *C. verityi* distinctive. It is structurally most similar to *C. atabalipa* and *C. paratabalipa,* but the male genitalia will distinguish it. The short narrowed apical area of the aedeagus is similar to *C. atabalipa,* but when viewed from the side the angulation below is more abrupt in *C. verityi* and the narrowed apical area is not as elongate as in *C. paratabalipa.*

It is named for David S. Verity, good friend and fine collector.

12. *Chrysobothris atabalipa* Laporte & Gory
(Fig. 8b, 19, 31)

Chrysobothris atabalipa Laporte & Gory, 1841, Monogr. Bupr., 2:43; Pl.8, Fig. 60.

DIAGNOSIS: Cupreous-brown above, shining cupreous below; first segment of metatarsus 2.5 or more times as long as high (Fig. 8b); male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus with parameres abruptly constricted to moderately elongate narrow apex (Fig. 31); mesotibia of female faintly arcuate; pygidium of female with median apical tooth strongly projecting beyond rather strongly produced lateral lobes (Fig. 19).

FEMALE LECTOTYPE: **Head**. Antennae and head bronze; front flattened, densely confluently punctate, moderately clothed with semirecumbent white setae, with smooth raised areas above antennal sockets, as chevron on front and as grooved longitudinal line on occiput; clypeus triangularly emarginate, broadly rounded on each side; antennae narrowed apically, first segment elongate globose, second short rounded, third elongate parallel, subequal in length to fourth and fifth combined, serrate from fourth distalward.

Pronotum. Distinctly wider than long; sides faintly sinuate and gradually diverging from base to widest at apical fourth, then obliquely converging to narrowest at anterior angles; anterior margin shallowly arcuately emarginate with faint median lobe; base arcuately emarginate on either side of truncate median lobe; disk convex, glabrous, finely sparsely punctate toward middle, punctures becoming confluent and coarse laterally.

Elytra. Slightly wider than pronotum; sides parallel from rounded humeri to middle, then arcuately converging to separately rounded apices; lateral margins strongly serrate posteriorly; disk convex, glabrous, finely densely punctured; with typical pattern of costae and foveae.

Ventrally. Nearly impunctate medially, punctures becoming coarse and dense laterally; setae white, semirecumbent and moderately dense laterally throughout, setae longer and semierect more medially on prosternum; prosternum with anterior margin feebly broadly lobed; prosternal process impunctate except for impressed punctate submarginal line; profemur with serrate obtuse tooth, meso- and metafemora with row of teeth along posterior border; protibia arcuate, mesotibia feebly so, metatibia straight, none with row of teeth; first segment of metatarsus 2.5 or more times as long as high (Fig. 8b); abdominal sternites shallowly depressed in midline, smooth along posterior margins, with purplish callosities laterally, callosity on last sternite acutely tooth-like; posterior angles of sternites acutely produced; last visible sternite with lateral margins serrate, apex shallowly arcuately emarginate, disk with median carina in basal two-thirds; pygidium with narrow median tooth curved downward and projecting well beyond strongly produced lateral lobes (Fig. 19).

Length 18.5mm; **width** 7.0mm.

Redescribed from female lectotype, designated by A. Descarpentries [MHNP].

MALE: Differs from female as follows: Head with front and basal antennal segments golden-green, vertex and apical antennal segments bronzy; pro- and mesotibiae with row of teeth; last visible abdominal sternite without median carina, apex deeply arcuately emarginate; pygidium convex, depressed in midline apically, and with submarginal area densely punctate and clothed by dense white setae.

Male genitalia (Fig. 31). Abruptly constricted to short narrow apex; obliquely angulate below when viewed from side.

Length 17.5mm; **width** 6.2mm.

Described from male plesiallotype from MEXICO, OAXACA, 3 mi W Tehuantepec, 20-VII-65, G. H. Nelson [GHN].

VARIATION: The cupreous color may be dulled, possibly by killing medium, and the apical tooth of the pygidium on the female may be shortened occasionally. Males vary from 15.5 to 22.0mm long and from 5.3 to 7.8mm wide; females from 13.5 to 21.0mm long and from 4.7 to 7.5mm wide.

GEOGRAPHICAL DISTRIBUTION: (From 646 specimens examined) MEXICO: YUCATAN: Pisté, 120 km E Mérida, near Chichén-itza, VI to IX-68, E. C. Welling; Tinum, V-68, E. C. Welling; Temax, Gaumer; QUINTANA ROO: X-cán Nuevo, VI-VII-67, E. C. Welling; Cozumel, 9-IX-68; CHIAPAS: Tuxtla Gutierrez, 1800 feet, (6-10)-VII-55, P. & C. Vaurie; Simojovel, (1-16)-VIII-58, J. A. Chemsak; OAXACA: La Ventosa, 6-IV-53, E. I. Schlinger; El Camaron, 4-IV-56, D. H. Janzen; Tehuantepec, 1-VI-05, Fred K. Knab; 5 mi N Tehuantepec, 10-VIII-64, E. Fisher & D. S. Verity; 3 mi W Tehuantepec, 9-VII to 2-VIII-65 and (1-3)-VII-72, G. H. Nelson; 25 mi SE El Camaron, 22-VIII-64, E. Fisher & D. S. Verity; PUEBLA: Tehuitzingo, 27-II-53, R. C. Bechtel & E. I. Schlinger; Izucar de Matamoris, 24-VII-62, A. E. Michelbacher; GUERRERO: Chilpancingo, 23-VII-62, A. E. Michelbacher; NAYARIT: Navarrette, 1-VII-62, A. E. Michelbacher; 12.3 mi NE San Blas, 21-VII-63, R. L. Westcott; 14 mi E San Blas, 21-VII-54, E. I. Schlinger. GUATEMALA, Torola, 1000 feet, Champion.

HOST: Collected on *Acacia pennatula* (S. & C.) Bentham.

COMPARISONS: Most similar to *C. paratabalipa* and *C. verityi* and compared to the latter under that species. From *C. paratabalipa* it can be distinguished by the male aedeagus as indicated in the key. Females are separated with difficulty, and the smaller size of *C. atabalipa* (average 18.2mm) as compared to 21.6mm in *C. paratabalipa* is not always indicated, however the mesotibia is slightly arcuate in *C. atabalipa* and straight in *C. paratabalipa*. Small specimens are similar to *C. brevitarsis* and are compared under that species.

13. *Chrysobothris paratabalipa* Nelson, **new species**
(Fig. 2, 3, 32)

DIAGNOSIS: Cupreous-brown above, shining aeneo-cupreous below; first segment of metatarsus 2.5 or more times as long as high; male with third segment of antenna elongate, femora without dense brush on inner margin, and aedeagus abruptly constricted to moderately elongate narrow apex (Fig. 32); female mesotibia straight, pygidium with apical median tooth strongly projecting beyond rather strongly produced lateral lobes.

This species is so similar to *C. atabalipa* that only the differences will be mentioned.

MALE HOLOTYPE: **Head**. Front golden with green tint and antennae aeneo-cupreous basally, more cupreous apically; mesotibia straight.

Male genitalia (Fig. 32). Abruptly narrowed to moderately elongate apex; abruptly angulate below when viewed from side.

Length 21.0mm; **width** 7.5mm.

FEMALE ALLOTYPE: Differs from male as in *C. atabalipa*. Differs from female of *C. atabalipa* in having mesotibia straight.

Length 21.5mm; **width** 8.0mm.

Type material: All from MEXICO. Holotype male and allotype female [CAS, Department of Entomology] from OAXACA, Valerio Trujano, 4500 feet, 29-VII-37, M. A. Embury. Paratypes: 9 males, 16 females, same data as holotype; 3 males, 9 females, same place, 28-VI-37, M. A. Embury; 1 male, near Tecomavaca, 500 meters, 28-VI-72, G. H. Nelson; 2 females, MORELOS: 1 male, Morelos, 2-XI-02, Koebele; 3 males, 2 females, 15 mi S Cuernavaca, 15-XI-46, E. C. Van Dyke; 1 male, GUERRERO: 6 mi S Rio Mexcala, 6-VIII-65, G. H. Nelson; 1 male, 5 mi S Iguala, 15-XI-46, E. C. Van Dyke; 1 male, 1 female, Zopilote Canyon, 30 mi N Chilpancingo, 29-VIII-69, D. S. Verity; 1 male, 1 female, Zopilote Canyon, 24 mi N Chilpancingo, 11-VII-70, E. Fisher & P. Sullivan; 2 males, MEXICO; 1 male, DISTRITO FEDERAL, J. R. Inda; 1 male, no data. Paratypes are deposited in the following collections: ANSP, BMNH, USNM, CAS, GHN, DSV, and RLW.

VARIATION: Males vary from 19.5 to 23.5mm long and from 7.0 to 8.5mm wide; females from 17.0 to 23.5mm long and from 6.0 to 8.5mm wide.

HOST: Collected on dead limb of *Prosopis juliflora* (Sw.) D. C. and on *Acacia sp.*

COMPARISONS: Similar to *C. atabalipa* and *C. verityi* and compared under those species.

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DISPOSITION OF THE HOLOTYPE OF *EDAPHUS CONGENER* PUTHZ (COLEOPTERA: STAPHYLINIDAE)

Edaphus congener Puthz, 1974 (Studies on the Neotropical Fauna, 9(1):35-37) was based on 5 specimens from Brazil in the collection of the University of California at Riverside. The holotype male and 2 paratype females were returned to this institution. The holotype will be deposited on permanent loan in the collection of the California Academy of Sciences at San Francisco.—**Ian Moore**, Staff Research Associate, Division of Biological Control, University of California, Riverside 92502.

NOTES ON PRIORITY OF FAMILY-GROUP NAMES IN COLEOPTERA

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ABSTRACT

Attention is drawn to pioneering works on suprageneric classification by Latreille, Gyllenhal, and Leach, which have been overlooked often by coleopterists when citing the first use of family-group names. A list of all family-group names proposed for Coleoptera before 1816 is presented.

INTRODUCTION

In the International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology (London, 1961), the Principle of Priority, which had hitherto been confined to names of the genus- and species-groups, was extended to family-group names. Fortunately, although the application of this principle to family-group names had not been mandatory, it had been applied commonly for many years previously, in most groups of animals.

There is no reference which will enable the earliest use of every family-group name in Coleoptera to be determined quickly. Even the Junk Catalogue cannot be relied on to quote the earliest use of a name as such. In many cases, the earliest reference appears to refer to the first use of the name to denote a taxon including approximately the same range of subordinate taxa as recognised in the appropriate part of the catalogue. Thus the references are often taxonomic rather than nomenclatorial.

The most useful reference work for usage of family-group names of insects in general is Handlirsch (1925). The section on Coleoptera contains a few errors and omissions, and the publication is not generally available, at least in English-speaking countries. Handlirsch (1925: 676) referred to Rhynchophori Clairville, 1798, which predates Curculionites Latreille [1802]. Fortunately, reference to Clairville's book shows that his "Rhynchophori" is not based on a generic name (included genera being *Cossonus, Calendra, Cionus, Rhynchaenus, Curculio, Rhamphus, Rhinomacer, Platyrhinus, Attelabus, Anthribus,* and curiously but not surprisingly, *Mycterus*).

The only generally available work on Coleoptera which quotes authorship and date for family-group names is Arnett (1963). Unfortunately this book suffers from the same faults as the Junk Catalogue (i.e., the citation frequently does not refer to the earliest use of the family-group name in question). Most of the earliest family names are attributed to Leach (1815), but many of them had been used 13 years earlier by Latreille [1802].

This latter work was the first in which suprageneric family-group names for Coleoptera, based on generic names, and not merely plural nouns referring to members of a genus, were used (Code, Article 11(e)). The year of publication of Volume 3 (which contains the section on Coleoptera) is quoted as "AN X" (i.e., Year 10 of the French Revolution). This extended from 22 September 1802 to 16 September 1803 (with 5 additional festival days), but according to

Horn & Schenkling (1928-9), vol. 3 was published in 1802. Latreille's work laid the foundations of the higher classification of Coleoptera, and deserves much more attention from Coleopterists than it has usually received. Gyllenhal's and Leach's publications also made substantial contributions in this field.

In the following list, every family-group name used for Coleoptera up to and including Leach (1815) is noted, with the ending appropriate to its usually recognised rank today. Later usage is nearly always recorded in the Junk Catalogue. In the interests of brevity, some arbitrary decisions have been taken regarding rank (e.g., some of the subfamilies of Chrysomelidae are frequently treated as families). As all categories are co-ordinate, any family-group name can be given potentially any rank between superfamily and tribe, but for the purposes of this list, superfamilies have been ignored.

The application of the Principle of Priority to family-group names in Coleoptera will upset few established family-group names. The names Cantharoidea Latreille [1802] and Cantharidae, based on a misidentified type genus (*Cantharis* Müller, 1764 non Linnaeus, 1758=*Lytta* Fabricius, 1775), should not have been used in the sense of the Junk Catalogue, Crowson (1955), and others for an entirely different group, for which the names Telephoroidea Leach, 1815 and Telephoridae have priority. As *Telephorus* Schaeffer, 1766=*Cantharis* Linnaeus, 1758, and the names Cantharoidea and Cantharidae sensu Crowson appear to have won wide acceptance, yet another name change is not desirable, and a specialist on the group should refer the case to the Commission.

The family usually now known as Meloidae Gyllenhal, 1810, actually should be known as Horiidae Latreille [1802]. This also should be referred to the International Commission.

The family Bostrichidae frequently has been spelled Bostrychidae, but this latter spelling is wrong. The type genus is *Bostrichus* Müller, 1764 and subsequent emendations are "unjustified".

LIST OF FAMILY-GROUP NAMES OF COLEOPTERA BEFORE 1816

Current Name	Family or Synonymy	First Use as Family-Group Name
APHODIINAE	SCARABAEIDAE	Aphodida Leach, 1815:97
BLAPTINI	TENEBRIONIDAE	Blapsida Leach, 1815:101
BOSTRICHIDAE		Bostrichini Latreille [1802]:202
BRUCHIDAE		Bruchelae Latreille [1802]:192
BUPRESTIDAE		Buprestides Leach, 1815:85
BYRRHIDAE		Byrrhii Latreille, 1806:239
CANTHARIDAE	MELOIDAE	Cantharidiae Latreille [1802]:185
CARABIDAE		Carabici Latreille [1802]:80
CASSIDINAE	CHRYSOMELIDAE	Cassidiae Gyllenhal, 1813:434
CEBRIONIDAE		Cebrionates Latreille [1802]:97
CERAMBYCIDAE		Cerambycini Latreille [1802]:211
CERCOMATINAE	MELOIDAE	Cercomatida Leach, 1815:105
CETONIINAE	SCARABAEIDAE	Cetonida Leach, 1815:99
CHRYSOMELIDAE		Chrysomelinae Latreille [1802]:220
CICINDELINAE	CARABIDAE	Cicindeletae Latreille [1802]:77
CISTELIDAE	ALLECULIDAE	Cisteleniae Latreille [1802]:188
CLAVIGERINAE	PSELAPHIDAE	Clavigerides Leach, 1815:177

Cleridae		Clerii Latreille [1802]:110
Coccinellidae		Coccinellidae Latreille, 1807:*3*:70
Coprini	Scarabaeidae	Coprides Leach, 1815:96
Cossyphinae	Tenebrionidae	Cossyphores Latreille [1802]:164
Criocerinae	Chrysomelidae	Criocerides Latreille, 1807:*3*:43
Cryptocephalinae	Chrysomelidae	Cryptocephaloideae Gyllenhal, 1813:582
Cucujidae		Cucujipes Latreille [1802]:210
Curculionidae		Curculionites Latreille [1802]:195
Dermestidae		Dermestini Latreille, 1807:*2*:3
Diaperinae	Tenebrionidae	Diaperialae Latreille [1802]:161
Dytiscidae		Dyticides Leach, 1815:84
Elaphrinae	Carabidae	Elaphrii Latreille [1802]:81
Elateridae		Elaterides Leach, 1815:85
Endomychidae		Endomychides Leach, 1815:116
Erotylidae		Erotilenae Latreille [1802]:233
Galerucinae	Chrysomelidae	Galerucae Latreille [1802]:228
Geotrupidae		Geotrupini Latreille [1802]:142
Graphipterini	Carabidae	Graphipterides Latreille [1802]:83
Gyrinidae		Gyrinites Latreille, 1810:141
Helophorinae	Hydrophilidae	Helopherida (sic) Leach, 1815:95
Helopini	Tenebrionidae	Helopii Latreille [1802]:176
Hispinae	Chrysomelidae	Hispoideae Gyllenhal, 1813:448
Histeridae		Histeroides Gyllenhal, 1808:74
Horiinae	Meloidae	Horiales Latreille [1802]:182
Hydrophilidae		Hydrophilii Latreille [1802]:136
Ipidae	Scolytidae	Ipsides Latreille 1807:*2*:19
Lemini	Chrysomelidae	Lemoideae Gyllenhal, 1813:632
Lepturinae	Cerambycidae	Lepturetae Latreille [1802]:218
Lucanidae		Lucanides Latreille, 1806:*1*:241
Megalopodinae	Chrysomelidae	Megalopides Latreille [1802]:227
Megatominae	Dermestidae	Megatomida Leach, 1815:94
Melandryidae		Melandryida Leach, 1815:104
Meloidae		Melooides Gyllenhal, 1810:481
Melyridae		Melyrides Leach, 1815:87
Micropeplinae	Staphylinidae	Micropeplida Leach, 1815:90
Mordellidae		Mordellonae Latreille [1802]:183
Mycetophagidae		Mycetophagides Leach, 1815:110
Nemosomatinae	Trogossitidae	Nemosomida Leach, 1815:110
Nitidulidae		Nitidulariae Latreille [1802]:131
Oedemeridae		Oedemerites Latreille, 1810:216
Passalidae		Passalida Leach, 1815:100
Paussidae		Paussili Latreille, 1807:*2*:234
Peltidae		Peltides Latreille, 1807:*2*:8
Phalacridae		Phalacrurida Leach, 1815:116
Pimeliinae	Tenebrionidae	Pimeliariae Latreille [1802]:166
Prioninae	Cerambycidae	Prionii Latreille [1802]:212
Pselaphidae		Pselaphii Latreille [1802]:239
Ptinidae		Ptiniores Latreille [1802]:112
Pyrochroidae		Pyrochroides Latreille, 1807:141
Sagrinae	Chrysomelidae	Sagrida Leach, 1815:113
Salpingidae		Salpingides Leach, 1815:106
Scaphidiidae		Scaphidilia Latreille, 1807:*2*:3
Scarabaeidae		Scarabaeides Latreille [1802]:144
Scolytidae	Ipidae	Scolitarii Latreille, 1807:*2*:273
Scydmaenidae		Scydmaenides Leach, 1815:92
Silphidae		Silphales Latreille, 1807:*2*:1
Sphaeridiinae	Hydrophilidae	Sphaeridiota Latreille [1802]:135

STAPHYLINIDAE		Staphyliniae Latreille [1802]:124
TELEPHORIDAE	CANTHARIDAE sensu Crowson	Telephorides Leach, 1815:85
TENEBRIONIDAE		Tenebrionites Latreille [1802]:165
TILLINI	CLERIDAE	Tillides Leach, 1815:87
TROGOSSITIDAE		Trogossitarii Latreille [1802]:159

ACKNOWLEDGMENTS

I am very grateful to Dr. John F. Lawrence, Museum of Comparative Zoology, Harvard University, for carefully checking the manuscript, correcting errors, and suggesting improvements; and to my colleague Dr. Guillermo Kuschel for advice on nomenclature and literature.

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A NEW *QUEDIUS (MEGAQUEDIUS)* SPECIES FROM MEXICO (COLEOPTERA, STAPHYLINIDAE)

(96th contribution to the knowledge of Staphylinidae)

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ABSTRACT

Quedius (Megaquedius) martini spec. nov., from rodent burrows in the state of Durango, Mexico, is described and illustrated. A key to all known species of the subgenus *Megaquedius* Casey is given.

A small series of a *Megaquedius* species was found among the beetles collected by H. F. Howden and J. E. H. Martin, in the burrows of the geomyid rodent, *Thomomys umbrinus*. The specimens resembled individuals of *Quedius (Megaquedius) explanatus* LeC., but comparison with that species and all other known species of the subgenus showed that they were new. Several new *Aphodius* species have already been described from these burrows (Gordon & Howden 1973). The new species described below is the first representative of the subgenus *Megaquedius* known from Mexico.

Quedius (Megaquedius) martini Smetana, **new species**

Uniformly piceous-black to black; palpi dark brownish to piceous-black, antennae slightly paler apically, legs piceous to piceous-black. Head about as wide as pronotum at apical margin; of a rounded quadrangular shape, slightly wider than long (index 70:60), moderately dilated behind eyes; eyes rather small, flat, temples much longer than length of eyes seen from above (index 34:16); no additional setiferous punctures between anterior frontal punctures; posterior frontal puncture situated distinctly closer to posterior margin of eye than to posterior margin of head; 2 fine punctures between posterior fronval puncture and posterior margin of head, situated near posterior margin; temples with numerous punctures and setae. Surface of head covered with dense microsculpture consisting of isodiametric meshes with intermixed fine punctures. Antennae distinctly narrowed towards apex, not differing from those of *explanatus*. Pronotum transverse (index 92:75); with explanate lateral portions; lateral margins slightly arcuate and moderately narrowed anteriorly; front angles slightly extended; basal margin evenly arcuate; dorsal rows each with 3 fine punctures; sublateral rows reduced and consisting only of 2 punctures near apical margin of pronotum. Surface of pronotum with similar microsculpture as on head, but both microsculpture and intermixed punctures finer, areolae of microsculpture showing more or less distinct tendency to become elongate; intermixed punctures sometimes hardly noticeable. Scutellum covered with fine microsculpture, punctate in apical part. Elytra moderately long, at base slightly narrower than pronotum, at sides longer (index 82:75); at suture indistinctly shorter (index 71:75) than pronotum at midline; punctation and pubescence dense, about same as in *explanatus*. First 3 visible tergites of abdomen slightly impressed at base, punctation and pubescence of tergites slightly finer and denser than on elytra, more or less evenly covering tergal surface.

MALE: Sixth sternite with obtuse triangular emargination in middle of apical margin; small triangular area before emargination slightly impressed and smooth. Aedeagus essentially of same shape as in *explanatus* but smaller; median lobe shorter and wider, apically more suddenly narrowed, apical part less distinctly hooked in lateral view; paramere wider and distinctly shorter, narrowly and rather deeply bifurcate, bifurcate apical part bearing several bristles; 2 sensory tubercles on each side of apical bifurcation (Fig. 1-4).

Length 12.0 to 14.0 mm.

TYPE MATERIAL: holotype male: MEXICO: Durango, 10 mi W El Salto, 9000′, 14-VI-64, H. F. Howden, and J. E. H. Martin. Allotype female: same data as holotype; both in the Canadian National Collection, Ottawa (CNC No. 13362).

Paratypes: 1 male and 1 female, same data as holotype except 4-VI-64 and 26-VI-64 (CNC).

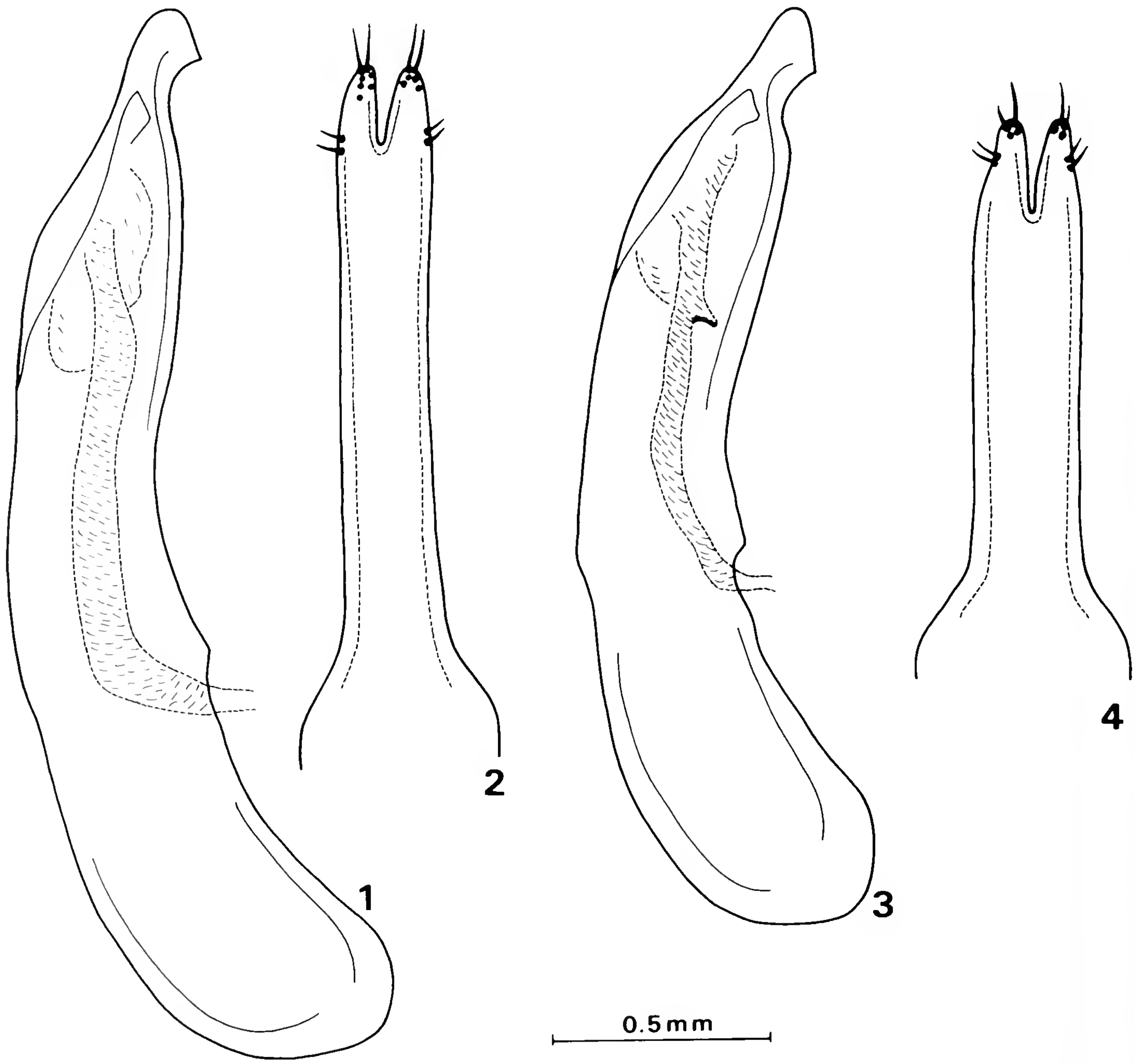

Fig. 1-2: *Quedius explanatus* LeC. 1) aedeagus, lateral view; 2) underside of paramere (Arizona, Chiricahua Mts., Rustler Park). 3-4: *Quedius martini* 3) aedeagus, lateral view; 4) underside of paramere (holotype).

DISTRIBUTION: At present the species is known only from the state of Durango, but it is probably more widely distributed in the montane regions of northern Mexico.

BIONOMICS: All specimens were found in the burrows of the geomyid rodent *Thomomys umbrinus*. The female paratype was found in the pupal stage, and emerged later in the laboratory.

DISCUSSION: The species closely resembles *explanatus*, but it can be distinguished, in addition to the differences in the male copulatory organ, by the following characters: average size smaller, shape narrower, less robust; male of "small type" (see Smetana 1971:4; 1973:1422) not differing in shape of head and pronotum from the female; head and pronotum narrower, latter less conspicuously explanate laterally, microsculpture of head and pronotum finer and less dense, surface therefore more shiny; punctation of elytra slightly finer.

It differs from *manitobensis* (Csy.) by the different shape of the male copulatory organ, especially of the paramere (see Smetana 1971:42, 47, 285 Fig. 66), and externally by the characters given for *explanatus* except for microsculpture.

The fact that presently only small type males are known may not be significant. As in the case of *Q. validus* Smet. (Smetana 1973:1422), large males may be found later.

The female paratype reared in the laboratory from the pupa is immature. In the male paratype both antennae are missing except for 3 segments on the left side and 1 segment on the right side.

The species is named in honor of Mr. J. E. H. Martin, Biosystematics Research Institute, Ottawa, who collected, together with Dr. H. F. Howden, the original specimens.

The following modified key (see Smetana 1971, 1973) can be used to distinguish all known species of the subgenus *Megaquedius*:

1(6). Microsculpture of disc of pronotum consisting of meshes which are either isodiametric or more or less elongate.

2(3). Paramere very narrow and elongate (Fig. 1, 2). Microsculpture on head and pronotum very dense and deep, surface of head and pronotum therefore opaque. Length 11.5 to 21.0 mm. Western United States east to western Missouri .. *Q. explanatus* LeC.

3(2). Paramere wider and shorter (Fig. 4). Microsculpture on head and pronotum more or less dense but finer and/or superficial, surface of head and pronotum therefore slightly shiny.

4(5). Paramere dilated apically (Fig. 66, in Smetana 1971). Pronotum decidedly transverse (index 100:75) with lateral portions strongly explanate, punctation of elytra coarser.

5(4). Paramere not dilated apically (Fig. 4). Pronotum less transverse (index 92:75) with lateral portions only moderately explanate, punctation of elytra finer. Length 12.0 to 14.0 mm. Mexico (Durango) .... *Q. martini* spec. nov.

6(1). Microsculpture on disc of pronotum consisting of irregular waves, definitely not forming meshes.

7(8). Aedeagus as in Fig. 67 (Smetana 1971) and Fig. 4, 5 (Smetana 1973). Antennae shorter, middle and outer segments about as long as wide. Basal margin of pronotum more or less bisinuate. Elytra moderately long, at sides longer than pronotum at midline (index 84:70). Length 13.0 to 19.0 mm. California .... *Q. validus* Smet.

8(7). Aedeagus as in Fig. 1-3 (Smetana 1973). Antennae longer, middle and outer segments slightly longer than wide. Basal margin of pronotum almost evenly arcuate. Elytra rather short, at sides about as long as pronotum at midline (index 85:87). Length 18.0 mm. Washington .... *Q. syphax* Smet.

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COLOR STANDARDS

The Color Standards Committee of The Coleopterists Society has been working toward the possible production of a color standards publication (see discussion in the Minutes of the 1974 annual meeting). The committee wishes to obtain as much input as possible, and to determine interest and potential sales. Would you be interested in such a volume for $5 to $10? Please let the committee know if you might be interested and any other ideas you might have. Send to: **Dr. Howard Frank**, Florida Medical Entomology Laboratory, Division of Health, P. O. Box 520, Vero Beach, Florida 32960.

A NEW SUBGENUS OF *ELEODES*, WITH THREE NEW CAVE-INHABITING SPECIES (COLEOPTERA: TENEBRIONIDAE)

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ABSTRACT

Caverneleodes, a new subgenus of *Eleodes* is described to include 3 cave-inhabiting species: *E. easterlai* and *E. labialis* from Texas and *E. leptoscelis* from Arizona, all of which are described as new.

A number of species of Tenebrionidae, including many members of the genus *Eleodes*, are found in caves, but few are confined to such a habitat. This paper deals with 3 very similar species which I consider sufficiently distinct to warrant subgeneric rank; 2 of the 3 were taken in caves and the third might have come from a cave also. All have structural modifications which I speculate are associated with a cavernicolous existence.

Eleodes subgenus *Caverneleodes* Triplehorn, **New Subgenus**

Form elongate, slender, flattened dorsally; eyes reduced; antennae extremely long (terminal 4 to 5 segments extending beyond pronotal base) and slender; lateral lobes of mentum fully exposed; legs long and slender, profemora mutic in both sexes; protibial spurs similar in the sexes, protarsus with plantar grooves not interrupted. Primary female genital characters indicate relationship with subgenus *Metablapylis*.

In general appearance, external morphological characters, and female genitalia, the affinities of this subgenus clearly lie with the subgenus *Metablapylis*.Species of *Caverneleodes* may be distinguished from those of *Metablapylis* by the unusually long, slender antennae and the reduced eyes. The species of *Caverneleodes* have the longest antennae, the most slender legs, and the most reduced eyes of any species of *Eleodes* known to me. Type species: *Eleodes easterlai* Triplehorn.

Eleodes (Caverneleodes) easterlai Triplehorn, **New Species**

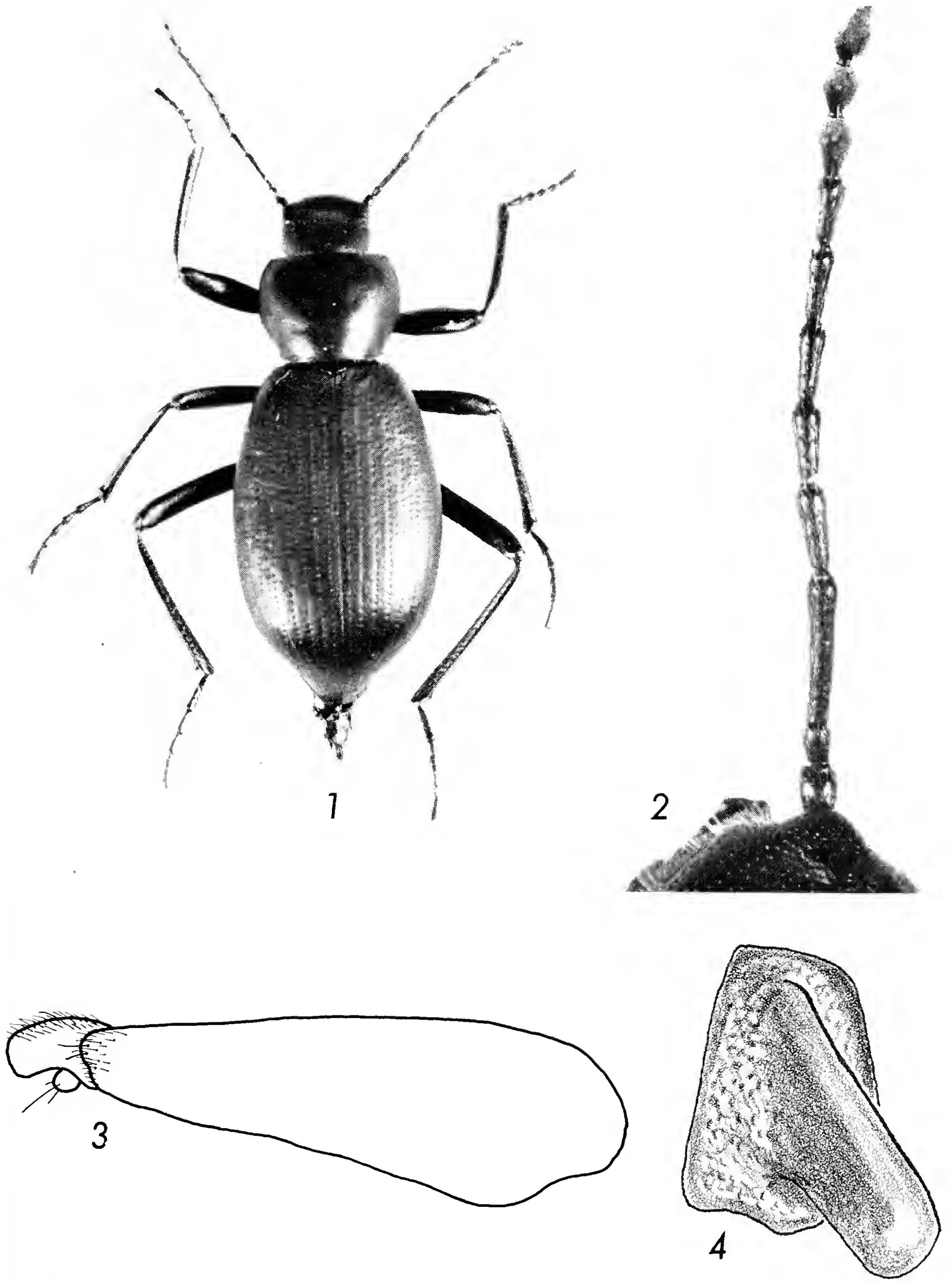
DESCRIPTION: holotype, female: elongate, moderately slender, flattened dorsally, black, subopaque, minutely setose. Head 0.85 as long as broad, clypeal suture fine but evident, epistomal margin truncate; surface finely but deeply, sparsely punctured, no conspicuous setae except immediately behind eyes; eyes unusually small, narrow, and distinctly flattened, separated dorsally by a distance subequal to 5.5 times the diameter of 1 eye as viewed from above; antennae (Fig. 2) extremely long and slender, terminal 4 segments extending beyond base of pronotum, segments 2 to 7 subcylindrical, segment 3 is 6 times as long as broad, segments 4 to 7 are 3 times as long as broad, segment 8 shorter and somewhat flattened, segments 9-11 short, robust and flattened; lateral lobes of mentum fully exposed and conspicuous; median lobe twice as broad as long, finely sculptured and with a conspicuous median longitudinal carina; gular area coarsely and densely granulate except for the triangular median portion which is longitudinally wrinkled. Pronotum 0.8 as long as broad, broadest in anterior third, conspicuously narrowed posteriorly, lateral margins strongly arcuate from apex to about basal fourth then briefly sinuate to base; marginal bead strong and visible from above throughout its length and continued around apical angles for about 0.33 the length of apical margin, barely traceable medially; anterior margin broadly and shallowly emarginate, the angles right; basal margin feebly rounded, the angles abruptly obtuse; surface finely and sparsely punctured on disc, punctures gradually smaller laterally, becoming scarcely evident on lateral 0.25. Scutellum smooth, impunctate. Elytra elongate-oval, somewhat flattened medially, broadest behind middle, sides evenly arcuate, slightly divergent from base, rounding more abruptly in region of apical declivity; base shallowly emarginate and equal in width to pronotal base; humeri obtuse with marginal bead conspicuous and visible from above along basal 0.1 of elytra; surface minutely alutaceous, striae conspicuous but not impressed, consisting of small, muricate punctures, each of which bears a short, porrect, golden seta; intervals flat, each with a single row of seta-bearing, muricate punctures which are slightly smaller and more widely spaced than those of striae. Epipleura very broad basally, gradually tapering to apex, impunctate. Legs long and slender, femora finely and sparsely punctured; metatibiae extending beyond suture separating terminal 2 abdominal sterna; profemora unarmed, protibial spurs small, subequal in size; tarsal plantar grooves without fine setae; tibiae all strongly spiculiferous. Ventral surface alutaceous, that of prothorax impunctate; prosternum finely and irregularly granulate, prosternal process expanded between coxae, deeply grooved on each side with apex acute and reflexed; mesosternum moderately coarsely granulate-setose, without pronounced groove receiving prosternal process; metasternum impunctate but with scattered, long, fine, golden setae; basal 4 abdominal sterna minutely and sparsely punctate, each puncture bearing a fine but conspicuous, recumbent golden seta, terminal sternum more coarsely and densely punctured with longer, more porrect setae. Genital segment elongato-triangular in outline, ovipositor valve (Fig. 3) with dorsal plate elongate, convex, glabrous, external edge converging apically, angle not evident; appendage small, mammiliform, with only 2 or 3 setae. Length: 17.3 mm; width: 6.9 mm.

Allotype, male: similar to female but smaller, more slender. Length: 14.3 mm; width: 5.6 mm.

Range of size in type series: males: length: 13.2-17.3 mm; width: 5.1-6.3 mm: females: length: 15.2-18.5 mm; width: 6.3-7.6 mm.

TYPES: holotype, allotype, and 22 paratypes (12 females, 10 males): TEXAS: Big Bend National Park, Brewster County, Emory Peak (7400 feet), 18-VII-1972, C. A., W. E., and B. W. Triplehorn, D. A., and D. J. Easterla; 3 female paratypes: same location, 27-VII-1971, D. A. Easterla. Holotype (USNM #73088), allotype, and paratypes in United States National Museum; paratypes in The Ohio State University Collection of Insects and Spiders.

The entire type series came from a 3-level breakdown cave inhabited by the only known United States colony of the Mexican long-tongued bat, *Leptonycteris nivalis longala* Stains. These bats feed only upon pollen and nectar, and their guano deposits are very different from those of insectivorous species. Specimens of *E. easterlai* were found on the first and second levels of the cave and 1 was found at the very entrance. Two specimens of *E. knullorum* Triplehorn were also taken in the cave in company with *easterlai.*



Eleodes easterlai: 1) female paratype; 2) right antenna; 3) dorsal view of right ovipositor valve. *E. labialis* 4) mentum, showing anteriorly-directed process.

I take pleasure in naming this species in honor of Dr. David A. Easterla who sent me the first specimens, and who graciously led the successful expedition to obtain additional material.

Eleodes (Caverneleodes) labialis Triplehorn, **New Species**

This species is based upon 2 specimens which are superficially very similar to *E. easterlai* in general appearance. It differs from *easterlai* primarily in the prominent finger-like structure of the mentum (Fig. 4). In all of the available specimens of *easterlai,* the mentum has a similar structure, but it is not developed to the remarkable degree seen in the present species. I am unaware of such a modification in any other species of *Eleodes.* Other differences, which appear distinct and constant enough to separate the 2 species, are relative in nature but are worthy of mention; each character which follows is based upon a comparison with *easterlai,* described in detail above: the sides of the head above the antennal insertions are more convex and the clypeus is more abruptly swollen, creating a more well-defined transverse concavity in the fronto-clypeal area; the head is less densely and more finely punctate, with coarse punctures confined to the epistomal margin; the pronotal punctures are finer but more numerous and closer together; the setae of the abdominal sterna are not as long nor as dense, in fact, they are scarcely evident. Measurements: (Holotype): length: 15.7 mm; width: 5.7 mm; (Paratype): length: 14.4 mm; width: 5.4 mm.

TYPES: holotype and paratype (both males): TEXAS: Big Bend National Park, Brewster County, Santa Elena Canyon, 3-IX-1968, J. A. Brubaker, and F. J. Moore. Holotype (USNM #73089) in United States National Museum; paratype in The Ohio State University Collection of Insects and Spiders.

F. J. Moore, 1 of the collectors of this species, informed me that the 2 specimens were taken at night at the entrance of deep rock fissures in the canyon walls above Terlingua Creek near its junction with the Rio Grande River. Such fissures would certainly approximate cave conditions and they may be indicative of more extensive caverns in this area.

Eleodes (Caverneleodes) leptoscelis Triplehorn, **New Species**

This species also strongly resembles *E. easterlai* and may be characterized best by comparison with that species. In *leptoscelis* the head is not at all excavate in the fronto-clypeal area, the clypeus scarcely defined except laterally, the epistomal margin is concavely arcuate rather than truncate, and the surface is densely but minutely punctate throughout; pronotum much less transverse (length about 0.85 times width; 0.80 or less in *easterlai),* more cylindrical, has an extremely fine marginal bead, the median portion not visible from above (completely obliterated medially in some specimens), and the surface minutely and uniformly densely punctate; elytra as in *easterlai*; legs extremely long and slender, hind femora at least 8 times as long as wide (about 6.5 times as long as wide in *easterlai*); abdominal setae dense but short and inconspicuous. Measurements: length: 12.9-14.9 mm; width: 5.0-6.0 mm.

TYPES: holotype (female) and 2 paratypes: ARIZONA: Coconino County, Cave of Domes, 16-X-1953; 1 paratype, same data except 14-X-1954; 2 paratypes, Coconino County, Cave 68—Olje, 14-X-1954; 1 paratype, Coconino County, Tse-an-cho, 7-XI-1953. Holotype (USNM #73090) and paratypes in

United States National Museum; paratypes in The Ohio State University Collection of Insects and Spiders. The following information on cave locations was supplied by Paul S. Bartholomew in 1957: Cave of Domes and Tse-an-Cho are both caves on Horseshoe Mesa, about 12 miles east of South Village, which is on the south rim of the Grand Canyon; Cave 68-Olje (also called Tse-an-Olje) is a cave east of South Village; the 3 caves are at approximately 4500 feet elevation (T. J. Spilman, in litt.).

The female genitalia of *leptoscelis* are, to me, indistinguishable from those of *easterlai*; the female of *labialis* is unknown.

Key to Species of *Eleodes (Caverneleodes)*

1. Mentum with median longitudinal carina rising abruptly to form a conspicuous blunt finger-like process (Fig. 4).... *labialis* n.sp.
1′. Mentum with median longitudinal carina only slightly raised anteriorly and with apex acute 2
2. Pronotal length less than 0.8 of width; hind femora less than 7 times as long as wide; pronotum with lateral marginal bead strong .... *easterlai* n.sp.
2′. Pronotal length at least 0.85 of width; hind femora at least 8 times as long as wide; pronotum with lateral marginal bead weakly developed, scarcely visible from above.......... *leptoscelis* n.sp.

I wish to thank: Dr. David A. Easterla for his help in obtaining the series of *Eleodes easterlai*; Mr. T. J. Spilman, United States Department of Agriculture, for allowing me to study the specimens under his care; Mr. Spilman and Dr. Donald J. Borror for helpful suggestions in preparation of this paper; Mr. Glen Berkey, Ohio Agricultural Research and Development Center, who took the photographs.

A NOTE ON THE FECUNDITY OF *PRIONUS IMBRICORNIS* (LINN) (COLEOPTERA: CERAMBYCIDAE).

A gravid female, with abdomen partially severed by a lawn mower, was obtained 25-VII-1974, Montgomery County, Virginia. The eggs were still intact, except a few that were being removed by ants. These eggs, after being laid, would most likely suffer from predation by ants and other organisms. Eggs, totaling 254, ranged from 3.6 mm to 4.0 mm long.—**Anthony J. Mullins**, Biology Department, Christiansburg High School, Christiansburg, Virginia 24073.

PROLONGED DIAPAUSE IN *ENOCLERUS ZONATUS* (CLERIDAE)

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Enoclerus zonatus (Klug) is widespread in the southwestern United States, where adults are encountered in flowers and fruit of Agavaceae. I have taken the beetles in flowers of yucca in June in central Arizona, in pods of agave and yucca in southern Arizona in August and September, and in May in southern California on joshua tree (*Yucca brevifolia).* I have reared adults from larvae in pods of *Yucca schottii,* stalks of *Agave palmeri,* and seed clusters of *Nolina micocarpa* from the Santa Rita Mountains, Arizona. During a several year study of moths associated with *Yucca schottii,* larvae of *E. zonatus* were recovered from mature, green pods on many occasions. It appeared that this predator gained access only after larvae of the pollinator moths, *Tegeticula yuccasella* (Riley) and *Parategeticula pollenifera* Davis, had evacuated, leaving their conspicuous emergence holes. Probably prey of *Enoclerus* in this situation consisted primarily of secondary species, particularly the blastobasid moth *Holcocera gigantella* (Chambers) and *Carpophilus* nr. *yuccae* (Crotch) (Nitidulidae), larvae of which often were abundant in the pods.

Larvae collected in September and October sometimes produced adults in the following year, from June to October. However, individuals are capable of successfully prolonging their resting stage as fully fed larvae under certain circumstances. One adult emerged from stalks of *Agave* containing larvae of the prodoxine moth, *Agavenema barberella* (Busck), between 3 and 4 years after collection. Dry stalks collected in June, 1968, at Madera Canyon in the Santa Rita Mountains (JAP 68F44) produced many moths during the following 2 seasons but no clerids. The lot was stored overwinter 1970-71 in a constant temperature laboratory (21°C + 1°), then returned to an outdoor shed in inland Contra Costa County, California, for the 1971-72 winter, and 1 *Enoclerus zonatus* emerged by July, 1972.

An instance of greater longevity and more precise surveillance also resulted from a 1968 collection from Madera Canyon. A single larva was excised from a pod of *Yucca schottii* on 18 October, 16 days following collection (JAP 68K6) and was isolated in a plastic vial with paper toweling. It was stored at constant temperature in the lab without prey. After 3 years, on 31 August 1971, the prepupal larva was exposed for examination, and its cell was then reclosed with masking tape. The vial was housed overwinter 1973-74 at the inland shed and was transferred back to a mobile trailer lab in Berkeley on 4 June, 1974. Transformation to the pupa occurred by 16 June; color change was noted by 1 July; and the adult beetle emerged by 19 July, after 70 months in diapause.

Cases of prolonged diapause have been reported in other genera of Cleridae. (e.g., Linsley and MacSwain, 1945, Pan-Pacific Ent., 22:18, reported emergences of *Trichodes ornatus* Say and *Pelonium fasciatum* (LeConte) after 5 to 6 years in dry storage).

BAITED PITFALL TRAPS FOR BEETLES

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Many beetles are attracted to dung, carrion, and other decaying organic materials. Various trapping methods have been devised which exploit this attraction to increase the ease and efficiency of collecting such beetles, and to permit control over the many variables of bait type and size, location, etc. for ecological studies. Many of these techniques are given in T. R. E. Southwood (1966. Ecological methods, with particular reference to the study of insect populations. Methuen and Co., London. 391 p.). Through much experimentation we have developed traps which are simple, inexpensive, easily transported and installed, and inconspicuous while in use. We have used them successfully for several years throughout the forested areas of temperate and tropical North, Central, and South America in studies on dung and carrion beetles. Because of the many people who have asked us about our trapping methods, we describe them below, especially for the benefit of others interested in collecting Scarabaeidae, Staphylinidae, Silphidae, Ptiliidae, Histeridae, Hydrophilidae, and Leiodidae (Catopinae = Leptodiridae).

Jars or cans may be used, but the best trap containers are deep flexible plastic ones of the type in which icecream is sold. These can be obtained readily from several manufacturers (e.g., Dixie Co. of Easton, Pa.) or local container distributors in sizes up to 1 gallon. They are light, do not rust or break, nest for easy storage and come with lids. The container is buried at a suitable site so that the top is level with the ground surface. A 1 to 2 inch depth of a liquid is then poured into the bottom of the container to drown the attracted insects which fall to the bottom. For short intervals of about 1 to 2 days, water to which a small amount of wetting agent (e.g., a squirt of Palmolive Liquid Detergent) has been added is suitable. For longer intervals, especially in hot weather or in the tropics, a preservative is necessary. The best one found suitable for trap use is an aqueous solution of about 5% each of chloral hydrate and sodium chloride (salt), to which a wetting agent is added as above (the salt may be omitted without much harmful effect). This has prevented decomposition of the trapped insects for a month in hot weather. On extended trips only the chloral hydrate need be carried, and the solution mixed up as needed. Another solution nearly as good, and perhaps easier to obtain, is a 50-50 mixture of ethylene glycol and water. Several brands of ethylene glycol base antifreezes have been used with no detectable damage to the beetles which might be caused by other compounds in the antifreeze.

Various kinds of dung, carrion, soft fungi, etc. may be used as bait. In our experience human dung is best of the readily available kinds, and we have relied on it almost exclusively. Dung of other omnivores and carnivores is good, but that of herbivores such as cattle and horses has given poor results. Squid and octopus make superb carrion baits that remain attractive longer than most others because of a tendency to liquify and hence resist drying. Beef or hog liver, chicken heads, and fish are good and inexpensive. In the absence of meat markets, dead birds, lizards, frogs, etc. will serve. About one-fourth pound of bait is recommended for most purposes; smaller amounts dessicate rapidly and lose effectiveness. The bait is wrapped in cheesecloth or other open-weave cloth and tied with a plastic bag tie or piece of wire. It is suspended by the tie from the middle of a wire screen which is then placed over the mouth of the buried trap container. Malt or molasses syrups with a trace of proprionic acid are well-known as scarab bait, but we have found the diversity of beetles to be much lower when compared to carrion or human dung.

One inch mesh chicken wire will admit all North American insects attracted to the bait while preventing most leaves and vertebrates from falling into the trap. Smaller meshes (one-half or one-fourth inch, sold in hardware stores as "hardware cloth") will serve in cool temperate areas where large Scarabaeidae are absent. A 1 foot square screen is convenient for a 1 gallon size trap. We have successfully used small versions of these traps in animal burrows, such as pocket gopher burrows in Mexico, after the gopher is removed.

The screen must be weighed down with rocks or logs to hinder disturbance by vertebrates seeking the bait (especially carrion). A large flat rock or piece of log is then placed on top to minimize entrance of rainwater and to conceal the trap from humans. Camouflage is especially important in Latin America where many people roam the forests hunting and collecting firewood (and plastic containers!), and further efforts such as not trampling vegetation in the vicinity, tossing excavated dirt far away, throwing leaf litter on the completed trap etc. may be necessary. In areas of high rainfall a piece of flat aluminum, Formica, or similar material wide enough to cover the trap and placed below the covering rock or log will prevent flooding. Where suitable cover objects are scarce a dome-shaped piece of aluminum will serve.

An optimum period of operation for the traps is about 5 days. Longer intervals may result in an accumulation of maggots which makes later sorting more difficult, and of course the risks of flooding and other disturbances increase with time. On the other hand a minimum of 1 full day is recommended for good results because of differing diel activities of attracted insects. The "catch" may be removed from the trap by pouring the agitated solution through a fine sieve (the type sold as tea strainers in supermarkets is good) and rapping or washing the contents of the inverted sieve into a jar. Alternatively, the trap liquid may be carefully poured off through the sieve (which catches the few floating specimens) and the insects remaining in the bottom of the container scraped or washed directly into the jar. The "wash" liquid above is the permanent preservative, such as 70%-80% ethyl or isopropyl alcohol (the chloral hydrate trap solution may be suitable but we have not tried it for more than a month). We have found that Barber's Fluid (a mixture of 265 parts of 95% ethyl alcohol, 245 parts water, 95 parts ethyl acetate, and 35 parts benzene) or a mixture of 70% acetone, 25% water, and 5% benzene will keep insect tissue in a relaxed state indefinitely, and hence facilitate later genitalia dissections, compared with alcohol-preserved material which tends to stiffen. Both of these solutions, however, are more volatile than alcohol and eventually ruin most common lid-sealing materials.

Baby food jars are useful field containers (the food isn't bad either!). Pint or quart size jars are often needed in the southeastern coastal plain of the U. S. and particularly in tropical areas where traps may be clogged with large Scarabs in 1 or 2 days. Heavy plastic bags such as the 18 ounce capacity Nasco "Whirl-Pak" bags (available from Turtox) are useful for air travel or reserve storage capacity. Of course, a label, preferably in india ink on good quality paper, should be placed inside each jar or bag.

THE CARABIDAE OF GLACIER NATIONAL PARK, MONTANA

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Since 1947 I have spent much of each summer in Glacier National Park. During 9 summers I was seasonal Ranger Naturalist or Park Naturalist, and since 1956 I served almost every summer as Biological Collaborator for the Park, devoting much of my time to insect studies of that area.

Hopefully, annotated lists of the various insect taxa represented in the northern Rockies near the Canadian border will be of interest to other biologists, especially entomologists and ecologists, and a series of articles of this sort is therefore anticipated.

Ground beetles are abundant throughout the park, from the 3,000 foot level near Park Headquarters to the high alpine meadows at 6,000 to 7,500 feet. They occur still higher in favorable habitats on the dozens of peaks that exceed 9,000 feet, and even above 10,000 feet on the 6 highest mountains in the Park. While preparing the manuscript for the *Climbers Guide to Glacier National Park,* I made ascents of more than 80 major summits, each of which provided opportunities to collect beetles in unique habitats. Some of those summits were visited repeatedly, often 2 or 3 times during a single season. As a result, some seasonal and annual variation was indicated by the collections made.

Acknowledgments

Dr. Terry L. Erwin, now of the U. S. National Museum, was primarily responsible for completion of this manuscript, because of his expertise and enthusiasm, and his willingness to identify hundreds of these beetles for me. I am also indebted to Dr. Melville H. Hatch, Gordon Stace-Smith, and David H. Kavanaugh for identifying specimens, and to Alice and Janie Edwards (my wife and daughter) for accompanying me on hundreds of collecting trips and mountain-climbing expeditions during those wonderful years in Glacier National Park.

General Discussion

Because this great mountainous park contains 1.5 million acres, with a remarkably diverse range of habitats, one can hardly sample the insect fauna without hiking several hundred miles of the extensive trail system. The tremendous diversity in precipitation, temperature, and humidity (especially distinct when comparing the areas east of the Continental Divide with those to the west of the Divide) results in floral differences of great magnitude. Even the forests on the 2 sides of the crest are composed of entirely different trees, despite the fact that they are only a dozen miles apart. These ecological differences, and many others, have been discussed in greater detail elsewhere (Edwards, 1957).

The major lowland areas, where collecting has been done, are near highways and visitor facilities. They are: Lake McDonald (3100 ft., in Western red cedar forests with dense, damp ground-cover); St. Mary Valley (4500 ft., forested with lodgepole pine, Engelmann spruce, and alpine fir); and Swiftcurrent Valley, or the Many Glacier Area (4800 ft., with forests similar to the St. Mary Valley). St. Mary and Swiftcurrent are both east of the Divide, while McDonald Valley lies to the west. Waterton Lake is shared by the U. S. and Canada in the joint park known as "Waterton-Glacier International Peace Park." The fauna and flora there resemble the other valleys east of the Divide, but the peaks appear to be considerably drier and a little lower (4180 ft. elevation). At the highest point of Going-to-the-Sun Highway, on Logan Pass (6,650 ft.), several square miles of alpine meadows extend toward the west and southwest. This is the only place in the park where alpine habitats can be approached by road. Other high habitats frequented by people are the 2 mountain chalets which are accessible only by trail. Sperry Chalet is 6.5 miles uphill from Lk. McDonald, and Granite Park Chalet is 7 miles north of Logan Pass at about the same elevation. Sperry is surrounded by alpine fir trees, in a narrow cirque. Granite Park perches on a barren bench with unlimited views to the north, west, and south, and is surrounded by alpine meadows and scattered alpine fir and whitebark pine trees. Tree-line generally lies at 6500 to 7000 feet, and alpine meadows extend to 8000 feet or above, in areas where there is sufficient soil to support plant growth. At higher elevations there are numerous horizontal ledges and shelves which accumulate soil deposits, and frequently grasses, herbs, and mosses thrive there, especially on south- and west-facing exposures.

Carabid habitats include all of the Life Zones and all sorts of areas from the lowest to the highest elevations in the Park. Most productive habitats have been near water; along streams, beside lakes, on and near melting snowbanks, and in marshy or swampy regions everywhere. Much collecting was done after dark using head lamps, because the beetles are actively searching for food at that time. Even on the surface of the large glaciers one finds numerous ground beetles roaming over the ice all night long, exposed to temperatures well below freezing as they seek arthropod victims that have been immobilized by the cold.

In the following pages annotated records are presented for nearly 800 specimens of ground beetles from the National Park, representing 109 species. Undoubtedly many others occur there, for these specimens were collected mostly from east of the Continental Divide and mostly from the riparian habitats. Forest-inhabiting species and species of the dense Canadian Life Zone forests west of the Divide should be added to the list in the future.

ANNOTATED LIST OF CARABIDAE COLLECTED IN GLACIER NATIONAL PARK, MONTANA

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS (FT)
Trachypachus holmbergi Mannerheim				
25-VI-62	(1)	#6599	Near Lk. McDonald Hotel, under damp rag	3145
12-VII-53	(1)	5330	Iceberg Lk., north shore, under rock	6050
16-VII-55	(1)	5691	Numa Ridge Fire Lookout, under gravel	6800
Trachypachus gibbsi Leconte				
10-VII-55	(1)	5511	Lake McDonald, east shore, under rock	3145
Gehringia olympica Darlington				
8-VII-61	(4)	6443	Swiftcurrent Cr., south shore, near Lake	4865
9-VII-65	(1)	7020	Swiftcurrent Creek, south shore	4880
16-VII-72	(14)		Appekunny Cr., near highway bridge	4750
28-VII-65	(4)	7031	Atlantic Cr. 3 mi west of Cutbank R.S.	5300
3-VIII-59	(8)	5931	Swiftcurrent Cr., near foot bridge	4865
Omophron ovale Horn				
21-VII-53	(2)	5347	Jct of McDonald Cr. with Flathead River	3100
Carabus taedatus agassii Leconte				
26-VI-55	(6)	5672	Logan Pass, under rocks on bare ridge	6700
1-VII-61	(2)	6415	Snow Moon Lake, under large boulders (Northeast cirque of Mt. Allen)	6550
27-VII-54	(5)	5538	Piegan Pass, under deeply embedded boulders in meadow	7900
22-VIII-68	(1)	8294	Swiftcurrent Camp Resthouse, at lights	4880
23-VIII-68	(1)	8295	Low on south slope of Mt. Altyn, under log on grassy hillside in old burn	5600
Scaphinotus marginatus Fischer				
19-VII-68	(1)	8226	Fifty Mountain Camp, by creek at night	6600
23-VII-68	(1)	8297	Swiftcurrent Camp Resthouse, at lights	4880
Nebria arkansana Casey				
20-VII-52	(1)	4038	Morning Eagle Falls, under rock	5500
3-VIII-53	(2)	5364	Grinnell Glacier, by drainage stream (under rock, mating)	6150
4-VIII-54	(2)	5544	Grinnell Glacier, by drainage stream	6150
15-VIII-52	(7)	4072	Grinnell Glacier, by drainage stream	6150
15-VIII-53	(15)	5387	By stream above Grinnell Falls	6100
19-VIII-66	(1)	8065	Beside creek west of Piegan Pass	7900
31-VIII-52	(7)	4085	Grinnell Lake shore, by inlet stream	5050

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Nebria gebleri Dejean			(Dr. T. L. Erwin says N. meanyi not in Rockies)	
27-VI-50	(1)	3094	Going-to-the-Sun Point, under dead bark of old stump near St. Mary Lake shore	4500
30-VI-60	(1)	6147	Lake McDonald inlet of Snyder Creek	3155
7-VII-56	(1)	5826	Big stream northwest of Two Medicine Lake uphill toward Dawson Pass, by trail	5850
14-VII-62	(1)	6600	Swiftcurrent Cr. shore, near Ranger Stn.	4870
16-VII-63	(2)	6786	Swiftcurrent Cr. shore, near Ranger Stn.	4870
17-VII-51	(1)	3675	Swiftcurrent Camp, under dead log	4900
17-VII-53	(1)	5337	Grinnell Cr., below Grinnell Lake (gravel)	5000
19-VII-63	(1)	6788	Swiftcurrent Cr. shire, near Ranger Stn.	4870
20-VII-52	(2)	4038	Below Morning Eagle Falls, under rocks	5500
25-VII-65	(2)	7022	By Wilbur Cr., near Swiftcurrent Cr.	4950
28-VII-53	(3)	5361	Grinnell Glacier, by drainage stream	6150
30-VII-66	(1)	8035	Sperry Chalets, under rock in meadow	6600
1-VIII-53	(2)	5381	Grinnell Glacier, by drainage stream	6150
3-VIII-54	(3)	5544	Creek east of Weeping Wall, near road	5800
4-VIII-66	(2)	8044	Nameless Peak southwest of Mt. Reynolds	8600
6-VIII-66	(2)	8050	Just east of Swiftcurrent Pass, by Creek	7100
7-VIII-55	(1)	5715	Hidden Pass, under rock by creek	7100
10-VIII-53	(2)	5387	By Camas Creek, near North Fork Road	3779
15-VIII-52	(4)	4072	Grinnell Glacier, by drainage stream	6150
15-VIII-53	(1)	5387	Grinnell Cr., near Swiftcurrent Lake	4870
15-VIII-53	(1)	5387a	By creek above Grinnell Falls	6100
28-VIII-54	(1)	5584	Active on ice of Grinnell Glacier, on cold night at 3:30 A.M.	6300
Nebria gyllenhali Schönherr			(Dr. Erwin says N. nivalis much further N.)	
8-VII-61	(1)	6440	Swiftcurrent Cr. shore, near Swiftcurrent Lake inlet	4865
27-VII-54	(3)	5538	Piegan Pass meadows, under large rocks	7900
14-VIII-54	(1)	5552	Swiftcurrent Cr. shore, at night	4870
17-VIII-66	(3)	8064	Active on snowbank west of Mt. Reynolds	7500
28-VIII-54	(1)	5584	Active under rocks at edge of Grinnell Glacier, 3:30 A.M. (45° F air temperature)	6300
Nebria hudsonica Leconte				
12-VIII-66	(2)	8057	Mudflats at junction of McDonald Cr. with Middle Fork of Flathead River	3100
Nebria intermedia Van Dyke			(Dr. Erwin says specimens identified as N. crassicornis are most likely intermedia)	
26-VI-55	(8)	5672	Logan Pass, on bare ridge near chalet	6700
28-VI-62	(2)	6601	Shangri-La Lk., north of Mt. Wilbur	6700
31-VI-47	(2)	2196	Logan Pass, active on snowfields	6800
2-VII-56	(2)	5821	Logan Pass, active on snow a half mile from nearest rock or soil	6900
4-VII-51	(2)	3633	Logan Pass, running rapidly on snowfield	6850
5-VII-56	(2)	5825	Swiftcurrent Lk. shore, active at 2 A.M.	4870
9-VII-50	(2)	3154	Logan Pass, active on snowfields	6800
13-VII-47	(2)	2233	Iceberg Lk., under rock on snowfield	6050
13-VII-55	(3)	5688	Sperry Chalets, under snow-covered logs	6600
16-VII-68	(4)	8219	Granite Park Chalets, in meadows (teneral)	6600
17-VII-55	(3)	5693	Logan Pass, bare ridge surrounded by snow	6700
18-VII-55	(2)	5695	Logan Pass, active on snowfields	6900
19-VII-54	(2)	5524	Outlet of Hidden Lake, under rocks	6375
19-VII-63	(2)	6790	Outlet of Snow Moon Lk. (Northeast cirque of Allen Mtn)	6550
21-VII-51	(1)	3690	Logan Pass, active on snowfields	6800
25-VII-52	(2)	4044	Grinnell Lk., under rocks by shore	5050
27-VII-54	(2)	5538	Piegan Pass, under rocks in meadows	7930
29-VII-56	(2)	5867	Boulder Pass, on snowfields, active	7900
31-VII-53	(2)	Levi	Gunsight Pass, under rocks (H.W.Levi)	6700
5-VIII-64	(1)	6978	Chaney Glacier, on snowfield	7500
8-VIII-53	(5)	Levi	Hidden Pass, on snowfields (H.W.Levi, Coll)	7100
10-VIII-47	(2)	2313	Grinnell Glacier, at edge of the ice-cave	6300
Nebria obtusa Leconte				
23-VII-67	(2)	8159	St. Mary entrance, at lights	4500

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Nebria sahlbergi Fisher			(Erwin doubtful about this identification, but says "it seems to be this species")	
1-VIII-53	(8)	5381a	Grinnell Glacier, outlet drainage stream (May be N. arkansana instead of this sp.)	6180
Opisthius richardsoni Kirby				
14-VII-55	(4)	5690	Bowman Cr., by bridge north of Polebridge	3550
16-VII-55	(2)	5692	Flathead River shore, mud-bank, Polebridge	3540
12-VIII-66	(7)	8057	Mudflats at junction of McDonald Cr. with Middle Fork of Flathead River	3100
31-VIII-53	(7)	5404	Mudflats at junction of McDonald Cr. with Middle Fork of Flathead River	3100
Notiophilus directus Casey				
29-VI-55	(1)	5673	Lk. McDonald, east shore, under board	3150
16-VII-55	(1)	5691	Numa Ridge Fire Lookout, under gravel	6700
24-VII-54	(1)	5524	Swiftcurrent Pass, near highest point	7000
8-VIII-68	(1)	8250	By Wilbur Cr., above Swiftcurrent Falls	5050
19-VIII-66	(1)	8065	Beside tiny creek west of Piegan Pass	7900
Notiophilus simulator Fall				
21-VII-51	(1)	3692	On snowfield at Swiftcurrent Pass	7100
Elaphrus californicus Mannerheim				
18-VIII-51	(1)	3692	Mudflat at jct of McDonald Cr. & Flathead River, Middle Fork	3100
Elaphrus lecontei Crotch				
3-VIII-68	(1)	8240	Muddy shore, small pond east of Chief Mtn.	5550
Elaphrus riparius Linnaeus				
8-VII-53	(1)	5329	Belly River shore, near Mountain View, Alta. (A few miles east of park boundary, but near)	
Nomius pygmaeus Dejean				
5-VII-55	(1)	5150	Floor of auditorium, Lk. McDonald Hotel	3150
Psydrus piceus Leconte				
25-VI-55	(2)	5668	Under loose moist bark, larch log, east shore of Lk. McDonald	3145
25-VI-62	(2)	6599	In duff on ground, east shore, Lk. McDonald	3150
Patrobus longicornis Say				
30-VII-54	(1)	5543	Under gravel by Swiftcurrent Cr.	4870
Diplous aterrimus Dejean				
27-VI-68	(2)	8237	Under log, Swiftcurrent Camp	4880
2-VII-62	(1)	6604	Wilbur Cr., near Swiftcurrent Camp	4900
8-VII-53	(3)	5329	Belly River east of Waterton, Alberta (North of Glacier N. P., but near)	
8-VII-61	(1)	6440	By Swiftcurrent Cr., near Swiftcurrent Camp	4875
9-VII-61	(1)	6443	By Wilbur Cr., near Swiftcurrent Camp	4900
14-VII-55	(2)	5690	By Bowman Cr., under bridge north of Polebridge Ranger Station	3550
16-VII-63	(3)	6786	Beside Swiftcurrent Creek, under rocks	4870
17-VII-53	(3)	5337	By Grinnell Cr., at Josephine Lk. inlet	5000
21-VII-66	(3)	8022	Crypt Lk., Waterton National Park, Alta.	6500
29-VII-65	(2)	7033	Beside Swiftcurrent Cr., near Ranger Stn.	4870
1-VIII-53	(1)	5381	By creek draining Grinnell Glacier	6250
4-VIII-54	(1)	5544	By Grinnell Glacier drainage creek	6150
12-VIII-66	(1)	8057	By Flathead River, West Glacier Montana	3100
15-VIII-52	(1)	4072	By Grinnell Cr., near Grinnell Glacier	6250
15-VIII-53	(3)	5387	By Grinnell Cr., above Grinnell Falls	6100
30-VIII-50	(2)	Hatch	By Divide Cr., St. Mary Montana (M.H.Hatch)	4480
Platiolus vandykei Kurnakow (= Patroboidea rufa Van Dyke)				
29-VII-65	(1)	8165	Swiftcurrent Campground, under log	4900

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Trechus chalybeus Dejean				
15-VII-53	(1)	Levi	On shore of Iceberg Lk. (Coll. H.W.Levi)	6050
19-VII-63	(1)	6790	Falling Leaf Lk., Northeast of Allen Mtn.	6700
30-VII-66	(4)	8036	Swiftcurrent Campground, under rocks	4900
4-VIII-68	(1)	8244	By Swiftcurrent Cr., below Sherburne Dam	4760
29-VIII-53	(1)	5396	Shore of Josephine Lake	4900
Trechus tenuiscapus Lindroth				
27-VII-55	(1)	5711	Near Sperry Chalets, under large rock	6500
Bembidion bifossulatum Leconte				
19-VII-63	(1)	6790	Outlet of Snow Moon Lk., northeast cirque of Allen Mtn.	6550
27-VIII-52	(6)	4081	Mud shore of small pond east of Chief Mtn.	5550
29-VIII-53	(3)	5396	By Grinnell Cr. near Josephine Lk. inlet	4950
Bembidion bimaculatum Kirby				
14-VII-62	(1)	6600	Beside Swiftcurrent Creek	4870
31-VIII-53	(1)	5404	Mudflat at jct of McDonald Cr. with Middle Fork of Flathead River	3100
Bembidion californicum Hayward				
19-VII-67	(1)	8154	By Swiftcurrent Cr. near Swiftcurrent R. S.	4870
23-VII-67	(1)	8159	St. Mary Entrance Station, at lights	4500
3-VIII-66	(1)	8041	Old Flathead River Bridge, West Glacier	3100
14-VIII-54	(1)	5552	By Swiftcurrent Cr., near Ranger Station	4870
Bembidion castor Lindroth				
23-VII-67	(1)	8159	St. Mary Entrance Station, at lights	4500
24-VII-50	(1)	3194	Mudflat at jct of McDonald Cr. with Middle Fork of Flathead River	3100
Bembidion coloradense Hayward				
12-VII-53	(1)	5332	Eating ladybug, under rock on Salamander Glacier (above Grinnell Glacier)	7100
27-VIII-52	(1)	4081	Mud shore of small pond east of Chief Mtn.	5550
Bembidion commotum Casey				
26-VI-55	(2)	5672	Logan Pass, on rocky bare ridge surrounded by snowfields	6670
10-VII-62	(1)	6627	Summit, Mt. Gould, by summit showbank	9541
19-VII-67	(1)	8154	By Swiftcurrent Cr., near Ranger Station	4870
21-VII-51	(2)	3690	Logan Pass, beside snow-bank	6800
21-VII-67	(1)	8155	Swiftcurrent Camp, at light	4900
Bembidion complanulum Mannerheim				
8-VII-65	(4)	7017	South slope, Mt. Henkel, by snowbank	6800
8-VII-65	(3)	7018	Summit of Mt. Altyn, by snowbank	7900
20-VII-65	(1)	7021	Summit of Mt. Clements, under rock	8764
21-VII-66	(2)	8022	Crypt Lk., Waterton National Park, Alta	6500
24-VII-66	(4)	8024	Mt. Henkel, south slope, by drainage creek	7500
28-VII-65	(1)	7031	Atlantic Cr., 3 miles west of Cutbank R.S.	5300
29-VII-65	(8)	7034	High on Bearhat Mtn., east face, near rill	7500
1-VIII-65	(1)	7037	Summit of Mt. Wilbur, under rock	9293
4-VIII-54	(2)	5544	Grinnell Glacier drainage stream	6150
6-VIII-66	(1)	8050	Swiftcurrent Pass, beside stream	7100
17-VIII-66	(1)	8062	On ridge-top southwest of Mt. Reynolds	8600
17-VIII-66	(1)	8064	By large snowbank west of Mt. Reynolds	7800
19-VIII-66	(1)	8065	By stream west of Piegan Pass meadows	7900
Bembidion dyschirinum Leconte				
28-VI-52	(1)	3977	South slope of Mt. Altyn, in tall grass beside tiny stream	5100
3-VII-64	(1)	6932	By old bridge, Flathead River (West Glacier)	3200
Bembidion erasum Leconte				
27-VII-66	(1)	8032	South slope of Mt. Altyn, by small stream	6000
3-VIII-66	(1)	8041	By old bridge, Flathead River (West Glacier)	3200

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Bembidion flebile Casey				
26-VI-55	(3)	5671	Active on snowfields, Logan Pass	6800
1-VII-61	(4)	6415	Snow Moon Lk. northeast of Allen Mtn	6550
8-VII-61	(1)	6440	Swiftcurrent Cr., near Ranger Station	4875
12-VII-64	(3)	6948	Summit of Grinnell Point, by snowbank	7400
13-VII-55	(1)	6584	On snowfield near Sperry Glacier	7750
18-VII-55	(1)	5695	Active on snow at Logan Pass	6800
19-VII-67	(1)	8154	By Swiftcurrent Cr., near Ranger Station	4875
1-VIII-53	(1)	5381	By drainage stream near Grinnell Glacier	6150
4-VIII-54	(7)	5544	By drainage stream near Grinnell Glacier	6150
31-VIII-52	(21)	4085	By Grinnell Cr., inlet of Grinnell Lake	5050
Bembidion gebleri Gebler				
2-VII-62	(1)	6600	By Swiftcurrent Cr., near Ranger Station	4875
8-VII-61	(2)	6440	By Swiftcurrent Cr., foraging at night	4875
9-VII-61	(7)	6443	By Swiftcurrent Cr., near Ranger Station	4875
14-VII-55	(1)	5690	By Bowman Cr. near bridge north of Polebridge Ranger Station	3540
21-VII-66	(3)	8022	Crypt Lk., Waterton National Park, Alta.	6500
23-VII-67	(1)	8159	St. Mary Entrance, by Divide Creek	4500
28-VII-65	(2)	7031	Atlantic Cr., 3 miles west of Cutbank R.S.	5300
1-VIII-53	(1)	5381	By drainage stream near Grinnell Glacier	6150
12-VIII-53	(1)	5387	On floating debris in eddy, Swiftcurrent Cr.	4875
15-VIII-52	(2)	4072	By drainage stream near Grinnell Glacier	6150
31-VIII-52	(1)	4085	Inlet of Grinnell Lk., by Grinnell Creek	5050
Bembidion incertum Motschulsky				
28-VI-62	(4)	6602	On Iceberg floating in Iceberg Lake	6050
4-VII-51	(3)	3633	Active on snowfields at Logan Pass	6850
7-VII-56	(5)	5826	By first stream up trail from Two Medicine Lake toward Dawson Pass	5850
7-VII-62	(3)	6610	Along the Garden Wall Trail near Granite Pk.	6700
8-VII-62	(1)	6614	By pond near snowbank, Granite Park Chalets	6000
10-VII-62	(1)	6627	Summit of Mt. Gould, by snowbank	9541
11-VII-55	(1)	5682	Active on snowfield, Logan Pass	6670
13-VII-51	(1)	3665	High east face of Mt. Wilbur, by trickle	8000
13-VII-55	(2)	5688	Under logs embedded beneath snow, Sperry Chalets, surrounded by snowfields	6600
22-VII-54	(1)	5524	North shore of Iceberg Lake	6050
27-VII-55	(2)	5711	By stream east of Sperry Chalets	6600
28-VII-65	(1)	7031	Atlantic Cr. 3 miles west of Cutbank R. S.	5300
30-VII-65	(1)	5544	By Swiftcurrent Cr. near Swiftcurrent R. S.	4875
30-VII-67	(1)	8165	Embedded rocks in meadow near Ptarmigan Lk.	6600
4-VIII-64	(1)	6976	By stream south of Fifty Mtn Camp	6900
6-VIII-66	(3)	8050	Under rocks on Swiftcurrent Pass, by trail	7100
12-VIII-53	(1)	5387	On floating debris in Swiftcurrent Cr. eddy	4875
27-VIII-55	(1)	5733	By Howe Creek, along North Fork Road	3500
31-VIII-52	(1)	4085	By drainage creek near Grinnell Glacier	5050
4-IX-54	(1)	5596	Under rock in meadow near Iceberg Lake	6070
Bembidion incrematum Leconte				
23-VII-67	(1)	8159	St. Mary Entrance, at lights	4500
Bembidion interventor Lindroth				
23-VII-67	(1)	8159	St. Mary Entrance, at lights	4500
24-VII-50	(1)	3194	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
Bembidion iridescens Leconte				
3-VIII-66	(1)	8041	By old Flathead River Bridge, West Glacier	3200
Bembidion kuprianovi Mannerheim				
30-VI-60	(1)	6147	Lk. McDonald shore, near Snyder Cr. inlet	3155
8-VII-61	(2)	6440	By Swiftcurrent Cr., near Ranger Station	4875
16-VII-63	(2)	6786	By Swiftcurrent Cr., near Ranger Station	4880
19-VII-55	(1)	5698	By Snyder, near shore of Lk. McDonald	3155
1-VIII-53	(2)	5381	By drainage stream near Grinnell Glacier	6150
14-VIII-54	(2)	5552	By Swiftcurrent Cr., near Ranger Station	4880
31-VIII-52	(1)	4085	By Grinnell Cr., below Grinnell Falls	5050

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Bembidion levettei Casey				
24-VII-50	(4)	3192	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
12-VIII-66	(2)	8057	Ibid	3100
18-VIII-51	(1)	3732	Ibid	3100
31-VIII-53	(7)	5404	Ibid	3100
Bembidion nigricornis Hayward				
12-VIII-66	(1)	8057	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
Bembidion nigripes Kirby				
21-VI-60	(1)	5917	By small stream northeast of Iceberg Lk.	6050
18-VIII-51	(1)	3732	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
Bembidion nigrocoeruleum Hayward				
12-VIII-61	(1)	8057	By old Flathead River bridge, West Glacier	3200
Bembidion nitidum Kirby				
12-VII-53	(2)	5332	Active on ice under rocks, Salamander Gl.	7100
20-VII-53	(3)	5347	By Belly River east of Waterton, Alberta	
Bembidion obscurellum Motschulsky				
8-VII-53	(11)	5329	By Belly River east of Waterton, Alberta (Not in Glacier N. P., but near it)	
12-VII-53	(1)	5332	Active on Salamander Glacier, preying on ladybugs under rocks on ice, under snow	7100
19-VII-67	(2)	8154	By Swiftcurrent Cr. near Ranger Station	4880
21-VII-47	(1)	2262	Rising Sun, north shore of St. Mary Lk.	4600
28-VII-65	(4)	7022	St. Mary Entrance, at light	4500
18-VIII-51	(1)	3732	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
31-VIII-52	(1)	4085	By Grinnell Cr., at inlet to Grinnell Lk.	5050
Bembidion patruele Dejean				
12-VII-53	(1)	5332	Under rock on ice of Salamander Glacier	7100
15-VIII-53	(1)	5387	By Grinnell Cr., at Josephine Lk. inlet	5000
18-VIII-51	(2)	3732	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
Bembidion planatum Leconte				
24-VII-50	(1)	3194	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
28-VII-65	(3)	7031	By Atlantic Cr., 3 miles west of Cutbank Ranger Station (gravel bank near water)	5300
12-VIII-66	(2)	8056	St. Mary Entrance, by Divide Creek	4480
Bembidion platynoides Hayward				
8-VII-61	(1)	6440	By Swiftcurrent Cr., near Ranger Station	4880
Bembidion quadrifoveolatum Mannerheim				
1-VII-61	(2)	6415	Snow Moon Lk., northeast cirque, Allen Mtn.	6550
7-VII-62	(1)	6610	By small stream along Garden Wall trail	6600
8-VII-62	(2)	6614	Mud edge of meltpond in meadow below Granite Park Chalets	6500
1-VIII-53	(1)	5381	By drainage stream at Grinnell Glacier	6150
Bembidion quadrimaculatum Linnaeus				
3-VII-64	(1)	6932	Near old Flathead River bridge, West Glacier	3200
20-VII-53	(1)	5347	By Belly River, east of Waterton, Alberta (Northeast of Glacier N. P. borders)	
21-VII-53	(1)	5347c	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
29-VIII-53	(1)	5396	By Grinnell Cr., at Josephine Lk. inlet	5000
Bembidion quadrulum Leconte				
20-VII-53	(1)	5347a	By Belly River, east of Waterton, Alta. (Not in Glacier N.P., but near it)	

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Bembidion recticolle Leconte				
23-VII-67	(2)	8159	St. Mary Entrance, at lights	4500
31-VIII-52	(1)	4085	Below Grinnell Falls, by Grinnell Cr.	5050
Bembidion rupicola Kirby				
5-VIII-52	(1)	4063	Inside Swiftcurrent Ranger Station office	4880
Bembidion rusticum Casey				
14-VII-55	(1)	5690	By Bowman Cr., north of Polebridge R. S.	3530
16-VII-63	(1)	6786	By Swiftcurrent Cr., near Ranger Station	4900
23-VII-67	(2)	8159	St. Mary Entrance, at lights	4500
27-VII-65	(1)	7028	By Wilbur Cr., near Swiftcurrent Cr. jct.	4900
29-VII-65	(1)	7031	By Atlantic Cr., 3 miles west of Cut-bank Ranger Station, on gravel-bar	5300
1-VIII-53	(3)	5381	By drainage stream near Grinnell Glacier	6150
2-VIII-65	(1)	7036	By Swiftcurrent Creek, near Ranger Station	4900
12-VIII-63	(1)	5387	On floating debris in Swiftcurrent Creek, near Swiftcurrent Ranger Station	4870
12-VIII-66	(3)	8057	By Flathead River near old bridge (West Glacier, Montana)	3200
15-VIII-52	(5)	4072	By drainage stream near Grinnell Glacier	6150
31-VIII-52	(4)	4085	By Grinnell Cr., near Grinnell Lk. inlet	5050
Bembidion salebratum Leconte				
8-VII-62	(4)	6600	By Swiftcurrent Cr., near Ranger Station	4875
2-VIII-63	(4)	6805	By Swiftcurrent Cr., near Ranger Station	4875
14-VIII-63	(2)	5552	By Swiftcurrent Cr., near Ranger Station	4876
Bembidion scopulinum Kirby				
8-VII-53	(2)	5329	By Belly River, east of Waterton, Alta. (Not in the Park, but near it)	
19-VII-67	(1)	8154	By Swiftcurrent Cr., near Ranger Station	4875
2-VIII-63	(1)	6805	By Swiftcurrent Cr., near Ranger Station	4875
Bembidion timidum Leconte				
12-VII-53	(5)	5332	Active on ice of Salamander Glacier	7100
27-VIII-52	(5)	4081	Mud bank of small pond east of Chief Mtn.	5550
29-VIII-53	(1)	5396	By Grinnell Cr., at Josephine Lk. inlet	5000
Bembidion transversale Dejean				
2-VII-62	(1)	6604	By Wilbur Cr., near Swiftcurrent Camp	4900
8-VII-53	(1)		By Belly River, east of Waterton, Alta. (Not in Glacier N. P., but near it)	
9-VII-61	(1)	6443	By Swiftcurrent Cr., near Ranger Station	4875
16-VII-55	(1)	5692	By Flathead Riv., north of Polebridge R.S.	3540
22-VII-59	(1)	5918	In Swiftcurrent Campground	4900
23-VII-67	(2)	8159	Mud shore of pond below highway south of St. Mary, near viewpoint	4900
5-VIII-63	(1)	6805	By Swiftcurrent Cr., near Ranger Station	4870
15-VIII-53	(1)	5387d	By Grinnell Cr., at Grinnell Lk outlet	5050
Bembidion umbratum Leconte				
16-VII-55	(1)	5692	Gravel-bar, North Fork of Flathead River, north of Polebridge (with many Georyssids)	3550
21-VII-53	(1)	5347c	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
12-VIII-66	(4)	8057	Ibid	3100
18-VIII-51	(12)	3732	Ibid	3100
27-VIII-51	(1)	4081	Mud shore of pond east of Chief Mtn	5550
31-VIII-53	(13)	5404	Mudflats at jct between McDonald Cr. and Middle Fork of Flathead River	3100
Pterostichus adstrictus Eschscholtz				
10-VII-56	(1)	5831	Under rock beside Swiftcurrent R. S.	4900
3-VIII-66	(3)	8041	By old Flathead River bridge, West Glacier	3200
Pterostichus ecarinatus Hatch				
25-VI-55	(1)	5669	Under loose dead hemlock bark, east side of Lake McDonald	3150
13-VII-55	(1)	5835	Crawling in trail to Grinnell Glacier	5500
29-VII-51	(2)	3706	Under dead bark of old log at Hole-in-the-Wall Camp (south of Boulder Pass)	6800

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Pterostichus riparius Dejean				
26-VI-55	(3)	5672	Logan Pass, on bare ridge in snowfields	6700
11-VII-53	(1)	5330	Under fireplace stones, Iceberg Lk. shore	6050
25-VII-55	(1)	5709	Active on snowfields at Logan Pass	6800
26-VII-55	(1)	5710	By Snyder Cr., near Lk. McDonald shore, in dense redcedar forest	3150
27-VII-55	(3)	5711	Under rocks beside Sperry Chalets	6600
28-VII-65	(5)	7034	Near snowbank, high on east side of Bear-hat Mtn (above Hidden Lake)	7500
4-VIII-64	(1)	6974	Fifty Mountain Camp, under rock near creek	6600
Pterostichus sphodrinus Leconte				
1-VII-61	(1)	6418	Snow Moon Lk., northeast cirque of Allen Mt.	6550
Calathus advena Leconte				
31-VI-47	(1)	2196	Active on snowfields at Hidden Pass	7150
13-VII-55	(2)	5688	Under logs embedded in snowfield near Sperry Chalets	6600
25-VII-67	(1)	8162	North slope of Allen Mtn, under log	6500
22-VII-54	(1)	5524d	Under rock in snow-field, Iceberg Lk shore	6050
4-VIII-68	(1)	8244	Below Sherburne Dam, near Swiftcurrent Cr. shore, under dead log in mud	4760
Calathus ingratus Dejean				
24-VII-54	(1)	5524f	Swiftcurrent Pass, beneath large rock	7300
Agonum bogemanni Gyllenhal				
11-VII-50	(1)	3162	Active on snowfield at Logan Pass	6880
Agonum corvus Leconte				
12-VII-53	(1)	5332	Preying on ladybugs under rocks on the surface of Salamander Glacier	7100
Agonum cupreum Dejean				
12-VII-53	(1)	5332	Preying on ladybugs under rocks on the surface of Salamander Glacier	7100
21-VII-66	(1)	8022	Crypt Lk., Waterton National Park, Alta.	6500
Agonum cupripenne Say				
3-VIII-66	(1)	8041	By old Flathead River bridge, West Glacier	3200
Agonum placidum Say				
11-VII-63	(2)	6778	Frigid on snowfield, during sleet storm on Salamander Glacier	7100
15-VII-63	(1)	6786	Under damp rocks below edge of Gem Glacier	8100
Amara apricaria Paykull				
11-VII-63	(1)	6778	Active on snowfield during sleet storm on Salamander Glacier	7100
12-VII-53	(2)	5332	Preying on ladybugs under rocks on the ice of Salamander Glacier	7100
15-VII-63	(1)	6786	Under damp rocks below edge of Gem Glacier	8100
23-VII-51	(1)	3696	Active on snowfields of Grinnell Glacier	6500
29-VII-56	(1)	5867	Active on snowfields near Boulder Pass	7900
Amara conflata Leconte				
24-VII-53	(1)	5350	On snowfields near Boulder Pass, active	7900
Amara confusa Leconte				
18-VII-55	(1)	5695	Active on snowfields at Logan Pass	6800
5-VIII-66	(6)	8047	St. Mary Entrance, at lights	4500
Amara convexa Leconte				
12-VII-53	(1)	5332	Preying on ladybugs under rocks on ice of Salamander Glacier	7100
28-VII-53	(1)	5378	Active on surface of Vulture Glacier	8200
Amara cupreolata Putzeys				
25-VIII-55	(1)	5732	Active on snowfields of Sperry Glacier	7750

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Amara discors Kirby				
26-VI-55	(2)	5672	Logan Pass, on bare ridge in snowfields	6700
30-VII-67	(1)	8165	Under rock in meadow by Ptarmigan Lake	6600
19-VIII-66	(1)	8065	By small stream west of Piegan Pass	7900
Amara erratica Duftschmid				
17-VII-51	(1)	3679	By small lake at Shangri-La (northeast basin of Mt. Wilbur).	6650
Amara familiaris Duftschmid				
21-VII-51	(1)	3692	Active on snowfield at Swiftcurrent Pass	7100
Amara farcta Leconte				
26-VI-60	(1)	6136	In flight, Swiftcurrent Campground	4900
3-VII-51	(1)	3633	Active on snowfields, Logan Pass	6800
7-VII-62	(1)	6610	Garden Wall trail, near Haystack Butte	6700
8-VII-64	(1)	6940	By snowbank, by goat trail on east end of Grinnell Point	6050
10-VII-62	(1)	6627	Active on summit snowbank of Mt. Gould	9541
15-VII-53	(1)		Shore of Iceberg Lk. (Coll. H.W.Levi)	6050
17-VII-51	(1)	3679	By small lake at Shangri-La, in northeast shoulder basin of Mt. Wilbur	6650
6-VIII-66	(1)	8050	By stream in big basin east of Swiftcurrent Pass, under rocks	6900
Amara impuncticollis Say				
11-VII-63	(3)	6778	Active on snow of Salamander Glacier, high above Grinnell Glacier	7100
30-VII-51	(1)	3712	Mud shore of pond east of Chief Mtn	5550
Amara latior Kirby				
11-VII-63	(1)	6778	Active on snow of Salamander Glacier	7100
Amara littoralis Mannerheim				
21-VII-50	(1)	3186	Active on snowfields of Logan Pass	6700
6-VIII-66	(1)	8050	Under rocks in meadow, Swiftcurrent Pass	7100
Amara pallipes Kirby				
26-VI-55	(1)	5672	Under rocks on bare ridge surrounded by snowfields on Logan Pass	6700
Amara pennsylvanica Hayward				
5-VIII-63	(1)	6805	By Swiftcurrent Cr., near Ranger Station	4870
Amara pseudobrunnea Lindroth				
15-VII-63	(1)	6786	Under rock below east edge of Gem Glacier	8100
Amara scitula Zimmermann				
19-VII-63	(1)	6790	Under log, outlet of Falling Leaf Lake (northeast cirque of Allen Mtn.)	6700
Amara sinuosa Casey				
13-VII-55	(1)	5668	Under log beneath snowbank, Sperry Chalets	6800
21-VII-51	(1)	3690	Active on snowfields of Logan Pass	6700
Harpalus amputatus Say				
27-VII-64	(1)		On snow of Grinnell Glacier	6300
Harpalus animosus Casey				
28-VI-56	(1)	5806	In trail, near Ptarmigan Falls	5900
11-VII-56	(1)	5832	Ibid	5900
16-VII-54	(1)	5515	Ibid	5900
19-VII-54	(1)	5523	Crawling on moss, at Hidden Lake Pass	7100
Harpalus egregius Casey				
29-VII-51	(1)	3707	Active on snowfields near Boulder Pass	7900
Harpalus fraternus Leconte				
23-VII-65	(1)	7022	St. Mary Entrance, at lights	4500
Harpalus funerarius Casey				
18-VII-55	(1)	5695	Active on snowfields of Logan Pass	6900

NAMES AND DATES			LOCALITIES AND HABITATS	ELEVATIONS
Harpalus pleuriticus Kirby				
14-VII-63	(1)	6778	Alive but inactive, Salamander Glacier	7100
Harpalus seclusus Casey				
26-VI-55	(1)	5672	Rocky ridge surrounded by snow, Logan Pass	6700
28-VI-56	(1)	5806	Iceberg Lk. trail, near Ptarmigan Falls	5900
28-VI-62	(1)	6601	By lake at Shangri-La, northeast of Mt. Wilbur in hanging basin	6700
29-VI-60	(2)	6146	Iceberg Lake trail, below Ptarmigan Falls	5300
2-VII-56	(1)	5821	Active on snowfields of Logan Pass	6900
7-VII-62	(3)	6610	Garden Wall trail near Haystack Butte	6600
11-VII-53	(2)	5330	Under old logs near Iceberg Lake	6050
11-VII-55	(2)	5682	Active on snowfields of Logan Pass	6900
12-VII-51	(1)	3660	In trail near Ptarmigan Falls	5900
12-VII-64	(2)	6947	Goat trail on east cliff of Grinnell Point	6005
13-VII-55	(2)	5688	Under log buried in snow, Sperry Chalets	6600
15-VII-51	(3)	3669	In trail below Morning Eagle Falls	5300
15-VII-53	(2)	5333	Under rocks in Iceberg Lk. meadows	6050
17-VII-51	(1)	3679	By lake at Shangri-La (Mt. Wilbur)	6700
18-VII-51	(1)	3681	On snowbank in Grinnell Glacier trail	5880
22-VII-54	(1)	5524f	East of top of Swiftcurrent Pass	6660
27-VII-54	(1)	5538	In meadows near Piegan Pass	7900
27-VII-55	(2)	5711	Under rocks near Sperry Chalets	6600
27-VII-64	(1)	6966	High on south face of Grinnell Point	7500
28-VII-53	(1)	5378	Vulture Glacier, near top of Vulture Peak	8600
28-VII-65	(1)	7034	At summit of Bearhat Mtn.	7500
30-VII-51	(1)	3712	Dirt lane one mile from Slide Lk.	5550
31-VII-52	(1)	4055	In trail to Grinnell Glacier	5500
4-VIII-64	(2)	6974	Under rocks by stream, Fifty Mtn Camp	7000
7-VIII-55	(1)	5716	Active on snowfields of Logan Pass	6900
8-VIII-53	(1)	Levi	Hidden Pass (Coll. H.W.Levi)	7100
9-VIII-54	(1)	5549	Small streambed above tree-line on west face of Rainbow Peak	8000
15-VIII-52	(1)	4068	Under rock at end of Grinnell Glacier trail	6200
16-VIII-54	(3)	5554	Under rocks in meadow at Hidden Pass	7100
17-VIII-66	(1)	8064	Cold damp gravel by snowfield on west side of Mt. Reynolds	7800
Harpalus somnulentus Dejean				
4-VIII-64	(3)	6974	Under rocks in meadow near Fifty Mtn Camp	6600
Discoderus parallelus Haldeman				
28-VII-65	(1)	7030	At Triple Divide Pass	7500
Bradycellus congener Leconte (= Stenocellus alutaceus Casey)				
12-VII-53	(1)	5332	Preying on ladybugs under rocks on ice of Salamander Glacier (above Grinnell)	7100
Stenolophus conjunctus Say				
12-VII-53	(1)	5332	Preying on ladybugs under rocks on ice of Salamander Glacier (above Grinnell)	7100
Chlaenius harpalinus Eschscholtz				
5-IX-51	(1)	3744	Beside Chief Mtn Customs Station (in road)	5100
Dromius piceus Dejean				
20-VII-56	(1)	5860	At end of Grinnell Glacier trail	6200
Metabletus americanus Dejean				
28-VI-52	(1)	3977	Under a rock low on south slope of Altyn Mt.	5200
20-VII-53	(1)	5490	Dense woods near Lk. McDonald Hotel	3155
3-IX-51	(1)	3739	In trail 5 miles west of Red Eagle Lk.	5300
Cymindis cribricollis Dejean				
8-VII-61	(2)	6441	Both on 8"-long stick floating in eddy in Wilbur Creek near Swiftcurrent Camp	4900
3-VIII-68	(1)	8240	Under rock in meadow at eastern side of Divide Mtn, at end of lane	6600
23-VIII-68	(1)	8295	Low on Mt. Altyn, by tiny stream	5550
25-VIII-68	(1)	8300	Under log, Swiftcurrent Camp	4880

NAMES AND DATES	LOCALITIES AND HABITATS	ELEVATIONS
Cymindis obliqua Casey 18-VII-51 (1) 3681	On snowbank in Grinnell Glacier trail	5800
Cymindis planipennis Leconte 16-VII-68 (1) 8219	Granite Park Chalets, under rock	6600
Cymindis unicolor Kirby 26-VI-55 (1) 5672	On bare ridge surrounded by snowfields, on Logan Pass	6700

TOTAL NUMBER OF SPECIES - 109
TOTAL NUMBER OF GENERA - 28

NOTE: The numbers in parentheses following the dates indicate the numbers of specimens taken. The four-digit numbers preceding the locality citations are my field-note reference numbers, which usually contain more information than could be included in this annotated list.

References

EDWARDS, J. G. 1957. Some general observations on the ecology of Glacier National Park, Montana, with special reference to certain entomological aspects. Wasmann J. Biol. 15:123-151; 5 photos.

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LITERATURE NOTICES

A revision of the genus *Psephenus* (Waterpenny beetles) of the United States and Canada (Coleoptera, Dryopoidea, Psephenidae), by H. P. Brown and C. M. Murvosh. 1974. Trans. Amer. Ent. Soc. 100:289-340.

Type-material in the insect collection of the Department of Entomology, Texas A & M University, by H. R. Burke and R. R. Murray. 1974. Texas Agr. Exp. Sta. MP-1161:1-14. (The collection contains 71 holotypes, 52 allotypes, 2,271 paratypes, 17 neoparatypes, and 5 syntypes; 142 species of Coleoptera are represented by types [sens. lat.]).

NOTES ON THE LONG-HORNED BEETLES OF VIRGINIA, PART III (COLEOPTERA: CERAMBYCIDAE)

ROBERT H. PERRY

118 Pilgrim Court, Bolingbrook, Illinois 60439

ABSTRACT

Thirty species of Cerambycidae have been reared from Virginia pine in Blacksburg, Virginia; of these, 20 have not been previously recorded from pine.

In preparation for a paper on the long-horned beetles of Virginia, I have reared several species from both standing and fallen *Pinus virginiana* Mill. from 3 miles west of Blacksburg, Virginia. The thirty species reared are as follows:

Asemum striatum Esch.*, 6-VI-70; *Distenia undata* (Fab.), 25-VII-69; *Elaphidionoides villosus* (Fab.), 9-30-VI-69, (4); *Phymatodes testaceus* (Linn.), 5-VI-69; *Xylotrechus sagittatus sagittatus* (Germ.)*, 3-29-VII-69, (4); *Xylotrechus colonus* (Fab.), 7-VII-69, (2); *Neoclytus mucronatus mucronatus* (Kby.), 8-21-69; *Tilloclytus geminatus* (Hald.), 7-V-69, (3); *Crytophorus verucosus* (Oliv.), 26-V-69; *Leptura plebja* Rand., 5-VI-69; *Leptura lineola* Say, 17-VI-69, (3); *Anoplodera minnesotana* (Csy.), 6-30-VI-69, (2); *Anoplodera vagans* (Oliv.)*, 23-VI-69, (2); *Anoplodera pubera* (Say), 31-V-69; *Encyclops coerulea* (Say), 26-V-69; *Rhagium inquisitor* (Linn.)*, 3-V-69; *Acmaeops discoideus* (Hald.)*, 23-V-23-VI-69, (4); *Bellamira scalaris* (Say), 17-23-VI-69, (2); *Necydalis mellita* (Say), 17-VI-69; *Monochamus scutellaris* (Say)*, 3-V-23-VI-69, (15); *Monochamus carolinensis* (Oliv.)*, 23-VI-17-VII-69, (3); *Monochamus titillator* (Fab.)*, 11-VI-29-VII-69, (3); *Goes pulverulentus* (Hald.), 10-VII-69; *Microgoes occulatus* (LeC.), 30-V-70; *Aegoschema modestum* (Gyll.), 3-VII-21-VIII-69, (3); *Amniscus sexguttata* (Say)*, 30-VI-1-IX-69, (6); *Graphisurus fasciatus* (DeG.), 17-VI-69; *Neocanthocinus obsoletus* (Oliv.)*, 17-22-VII-69, (3); *Lepturges angulatus angulatus* (LeC.), 25-VII-69; *Saperda lateralis* (Fab.), 31-V-11-VI-69, (2).

I have found records for 10 of these species (asterisked) on *Pinus* in the literature. Two records that seem very unusual are those of *Necydalis mellita* (Say) and *Goes pulverulentus* (Hald.). *N. mellita* is normally taken on *Quercus* and *Castanea,* and *Goes* spp. are normally found on *Quercus*. I would like to thank Barry Guthrie, John Hines, and Herman J. Heikkenen, formerly or presently with Virginia Polytechnic Institute, for their help in obtaining the material.

BOOK REVIEWS

Directory of American Coleopterists, including descriptions of their research projects and a list of abbreviations of collection names for the world. Compiled by Richard L. Jacques, Jr. 1974. Published by the Biological Research Institute of America (BRIA), 57 W. Glenwood Dr., Latham, N. Y. 12110. Spiral bound, 86 p., $5.00 (postage free if accompanied by payment).

I'm sure that any of our readers who have seen this volume will agree to its usefulness. Most have known of its preparation for some time and congratulate Dr. Jacques for seeing the project to fruition. I know from my editorial duties how much a chore it is just to keep up with current addresses. By utilizing the files of BRIA it was possible to produce a more current listing.

There are 238 coleopterists listed with 235 research projects. Some of the readers may not recognize their own due to the length of time in preparation of the list. However, this is not meant as criticism. Such a small number of projects, when I personally know at least twice this number, only reflects the major problem in producing such a volume. It can be more complete, more current, and more useful only through cooperation of the coleopterists themselves.

Proper forms for submission of projects, and those for a revision of the "Directory of Coleoptera Collections," can be obtained from Dr. Richard L. Jacques, Dept. Biological Sciences, Farleigh Dickinson Univ., Rutherford, N. J. 07070. Our readers are urged to participate in this tremendously useful project.

—R. E. Woodruff

The Naturalists Directory (International). 42nd Edition—1975. PCL Publications, P. O. Box 583, South Orange, N. J. 07079. Paperbound, 270 p., $7.95 in U. S. and $9.95 elsewhere.

This new edition is a great improvement over previous editions. It contains 3,500 listings, from every state and 60 foreign countries. Names are still listed under the geographic area (states for U. S., and countries), but a new feature provides an alphabetical index of persons names as well as an index by specialty, of which there are 45 listed. It should be in every library, museum, university, and will be extremely useful to all collectors and "pack rats" as well as serious scientific workers.

—R. E. Woodruff

MINUTES OF ANNUAL MEETING

The seventh annual meeting of the Coleopterists Society was held 1 December 1974 at the Radisson Hotel in Minneapolis, Minnesota. President John Lawrence welcomed members and called the meeting to order. For convenience, each topic discussed is numbered consecutively.

1. Minutes of the 1973 meeting were accepted as published in Newsletter No. 12, March, 1974.

2. Lawrence informed the members of some matters discussed at the executive committee meeting that afternoon and particularly the followup on the Welder Wildlife Field Trip following the 1973 meeting. Horace Burke discussed the benefits of writing up the trip and providing the Wildlife Refuge officials with copies. Lawrence appointed Burke a one-man committee to do this.

3. Charles O'Brien presented the report of the Color Standards Committee (J. H. Frank, Chm., S. G. Wellso, R. E. Woodruff, F. N. Young, C. W. O'Brien), the entire version of which was given to the executive committee. O'Brien indicated that standards previously published were not now available and that 2 printing companies, Munsell and Gibbons, have been contacted about the feasibility of producing a color chart sponsored by the Coleopterists Society. Becker suggested that ESA should pursue this matter. O'Brien said that coleopterists need a color chart more urgently than most other areas of entomology because other groups, such as lepidopterists, have more color publications presently available. Balsbaugh suggested that AIBS might be interested. Lawrence appointed the same committee for another year of investigation (full report available from J. H. Frank).

4. Lawrence brought up the subject of the **Coleopterists Newsletter** and whether to drop it entirely due to lack of interest, incorporate it as filler in the **Bulletin**, include it as a separate section at the back of the **Bulletin**, or continue it as a separate **Newsletter**. Some discussion followed, Lawrence explaining that the executive committee had decided to suggest that the **Newsletter** be incorporated as filler in the **Bulletin**. O'Brien suggested that the question of whether to have a **Newsletter** be put to the membership for a vote. Ekis suggested it be put into the **Bulletin** under "Notes". Second class postage was suggested but Erwin said this is not possible cause of irregular mailing of the **Newsletter** not meeting the post office requirements. The publication of an annual **Newsletter** was suggested. Burke said that the lack of interest in the **Newsletter** might be caused by its irregularity. George Ball moved that the **Newsletter** be continued in the back of the **Bulletin**, and the motion was seconded. A motion was made to table Ball's motion, seconded, and approved. A motion was made to refer the question to the membership as to whether to have a separate **Newsletter** or to include it as filler in the **Bulletin**, the motion was seconded and approved.

5. Lawrence brought up the matter of **Constitutional Amendments**. Five proposals were previously published in the **Bulletin** but there was some negative response to By-Law II, Section I, in which the editor becomes a full voting member of the executive committee. This last amendment was discussed in a letter from Lawrence to the executive committee, and an alternate proposal was put forth by Erwin, in which the editor, secretary, and treasurer are all nominated by other officers and approved by the membership. It was decided to drop the controversial amendment from the ballot along with the new By-Law VII concerning the appointment of the editor. The Erwin proposal and other constitutional matters are to be discussed in full at the 1975 meeting. Discussion followed concerning more communication between the editor and the executive committee, whether a list of titles should be sent by the editor to the executive committee prior to publication, and whether referees should be used more extensively to review papers submitted to the

Bulletin. Review policies were discussed, and a review board was suggested to review controversial articles instead of referring them to the executive committee. The discussion was terminated with no action taken.

6. Lawrence informed the members that the executive committee was recommending that the Society dues be increased from $8.00 to $10.00. Discussion followed. It was suggested that page charges be increased and library rates be increased in order to raise revenue rather than increase dues. Campbell moved to ask the membership to authorize a dues increase if it becomes necessary, the motion was seconded. Erwin pointed out that the Constitution allowed the members present to vote on the matter. Campbell withdrew the motion and moved that the president be authorized to raise dues to $10.00 if it became necessary, the motion was seconded and approved.

7. The matter of whether or not to make type depository in a recognized institution a requirement for publication was presented by Lawrence. Discussion followed and it was apparent that the members present were evenly divided as to whether or not to approve such a requirement. A move was made to drop the matter, seconded, and approved.

8. The proposal that the President-elect be automatically considered program chairman for the annual meeting was put forward by Lawrence, no objection was raised to this.

9. Officer's Reports.

a. President Lawrence. No report.

b. Secretary Gordon. No report.

c. Treasurer Erwin submitted the appended report which was audited by Paul Spangler and Ted Spilman. As of the date of the meeting there were a total of 618 members in the Society, compared to 468 in July, 1973, a 25% growth rate. There were 449 member/subscribers, 152 subscribers, 7 members and 10 gifts and exchanges. Erwin broke the membership down by Region as follows: Australian Region, 7 members, 5 subscribers; Oriental Region: 3 members, 1 subscriber; Oceanic Region, 2 members, 1 subscriber; Ethiopian Region, 1 member, 1 subscriber; Palearctic Region, 39 members, 17 subscribers; Neotropical Region, 22 members, 6 subscribers; Palearctic Region, 39 members, 17 subscribers; Nearctic Region, 375 members, 121 subscribers.

10. Committee Reports.

a) Nomination and elections committee (Howden, Ekis, Allen). Secretary Gordon reported for the committee that our new President is Paul Ritcher; Vice President, Charles Triplehorn; new Council Members are Frank Young, Floyd Werner, and Don Whitehead. Secretary and Treasurer remain as before.

b) Catalogue committee (John Kingsolver). Kingsolver reported that the computer programmers have devised a system whereby a phylogenetic arrangement of the catalogue is possible. The following families are ready to commit to the computer in final form: Platypodidae, Cupedidae, Erotylidae, Heteroceridae, Micromalthidae, Dermestidae, 2 subfamilies of Scarabaeidae and Byturidae. The Bruchidae, Colydiidae, Anobiidae, and an additional subfamily of the Scarabaeidae are on cards but still require some editorial processing. Kingsolver's complete report is available by writing him c/o U. S. National Museum of Nat. Hist., Washington, D. C. 20560.

c) Liaison: Coleopterists Society—North American Beetle Fauna Project (Ball). Ball read from a report by Ross Arnett on what has been accomplished so far (complete report available from Arnett, Box 428, Latham, N. Y. 12110). Arnett wrote that a problem has been in getting tax exempt status, because a public foundation must have a significant number of donors who contribute a substantial part of the money received by the foundation in order to achieve permanent status. Therefore he asked members of the Coleopterists Society for their support by a donation of $1,000 from Society funds to the Biological Research Institute of America, Inc. (BRIA); by members of the Coleopterists Society requesting their respective libraries to become Sustaining Members of BRIA; and by each member of the Society becoming an Annual Member of BRIA. Ball moved that the Society become a Sustaining Member of BRIA by a donation and the motion was seconded. Discussion followed and Ball changed his motion to allow the executive committee to take the matter under advisement if the members present voted for the action. This was seconded. Lawrence disagreed with supporting the project at all. Ball's motion was brought to a vote and the members present voted no.

11. President Lawrence installed Paul Ritcher as the new President "in absentia" and continued the meeting.

12. The site of the 1976 meeting was discussed, and it was moved that it be held in Washington in conjunction with the International Congress of Entomology rather than in Honolulu where the 1976 Entomological Society of America meetings are to be held. The motion was seconded and approved.

13. The proposed field trip to Jamaica following the 1975 meetings was discussed, and Lawrence said he would ask Ritcher to appoint Howard Frank as chairman of a committee to organize the trip.

14. Kingsolver and Spangler were appointed to audit the treasurer's report.

15. Lee Herman was appointed chairman of the nominating committee for next year and empowered to select the other members of the committee.

16. Other business.

The business meeting was adjourned and a scientific session held the following evening with talks by Allan Ashworth on "Quaternary Fossil Beetles" and George Ball on "Microsculpture in Beetles".

Respectfully submitted, Robert Gordon, Secretary

THE COLEOPTERISTS SOCIETY, TREASURER'S REPORT
PRELIMINARY FINANCIAL STATEMENT
(THROUGH NOVEMBER 24, 1974)

by Terry L. Erwin, audited by P. J. Spangler & J. M. Kingsolver

Assets:	
Balance from 1973 (Nov. 15, 1973)	$ 6,892.92
Income:	
Page charges, separates, postage on separates charged to authors	1,973.05
Membership dues, institutional subscriptions	4,999.32
Interest	
Savings Certificate account and Passbook savings	144.64
	$ 7,117.01
Balance of credits:	$14,009.93

Disbursements:	
Printer's costs for Bulletin production (Dec. 1973, March and June 1974) and Printer's other services (addressograph, etc.)	$ 2,951.82
Inkblot Co. services	141.80
Inkblot Co. materials	10.40
Editor's office postage kitty	58.00
Read-More, Inc. refund (overpayment)	10.00
ESA, 1973 Hospitality and coffee suite	240.00
Administration supplies, postage, envelopes	23.00
Balance of debits:	$ 3,435.02
Income over disbursements (November 24, 1974)	$ 3,681.99
Total assets carried into 1975	$10,574.91

PROPOSED 1975 BUDGET

Income:	
Page charges	$1,800
Dues and subscriptions	4,500
Interest on bank savings accounts	200
TOTAL	$6,500

Expenses:	
Bulletin costs	$5,000
Printer's other services	250
Postage, envelopes, forms, etc.	300
Inkblot Co. services and materials	200
Editor's postage, 2nd class mailing	200
ESA, Hospitality suite	250
Newsletter printing and postage	300
TOTAL	$6,500

Respectfully submitted,

Terry L. Erwin
Treasurer (1974)

(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

NOTICES

Notices to appear on this page are a free service to members and subscribers. Such copy will be limited to the back page, the older notices being moved up and replaced with the newest ones at the bottom. The editor reserves the right to reword such notices for brevity, consistency, and clarity.

SCARABAEIDAE: Studying myrmecophilous and termitophilous Aphodiinae. Request loan of New World material especially. Will sort from general scarab collections or from light trap samples. Robert E. Woodruff, Fla. Dept. Agr., P. O. Box 1269, Gainesville, FL 32601.

FREE PUBLICATION: If you are not now receiving "Progress Reports", the newsletter of the North American Beetle Fauna Project, send your name, address, and interest in beetles statement to: Dr. R. H. Arnett, NABF Project, Dept. Biol., Siena College, Loudonville, NY 12211.

COLYDIIDAE: Building up worldwide collection. I want to buy or exchange other Coleoptera. Also interested in immature stages and publications on this family. Horst D. Matern, 5000 Koeln 41, Lotharstr. 34, Western Germany.

SCARABAEIDAE: Looking for all material of Coprinae, literature and specimens, also in exchange and purchase. Klaus-Ulrich Geis, Gyrhofstr. 6, D 5 Koln 41, Western Germany.

PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

WANTED: American Geographical Society maps of Mexico: Baja California-Norte, Baja California-Sur, and Sonora. W. H. Clark, 705 Smith Street, Vale, Oregon 97918.

EXCHANGE: I am interested in trading Colorado beetles for Meloidae and/or Scarabaeidae. I prefer Meloidae. D. Hartman, P. O. Box 444, Frederick, Colorado 80530.

FOR SALE: Comparative anatomy of the male genital tube in Coleoptera. Classic Sharp & Muir monograph on genitalia & six related papers. An essential work for all serious students of Coleoptera. 304 pp., 43 pls., bound. $10.00. Entomological Society of America, 4603 Calvert Road, Box AJ, College Park, Maryland 20740.

CARABUS, CARABIDAE, CERAMBYCIDAE: Will purchase or exchange Albert Sermet, Pres du lac 17.1400, Yverdon, (Suisse) Switzerland.

LUCANIDAE: World revision of most genera; prefer exchange for lucanids or other beetles; will identify loans, will buy if necessary. Hughes E. Bomans, 39 Avenue Charles Verhaegen, 1950 Crainhem, Belgium.

MICROPEPLIDAE: Working toward a world monograph of the entire family. Specimens, praeimaginal stages, distribution and/or ecological records needed from all areas of the World, by loan, or general exchange, correspondence invited. **SILPHIDAE:** Presently revising the genus ***Agyrtes*** for World. Request loan of adults and/or larvae & pupae. Distribution and ecological records welcome. **STAPHYLINIDAE:** Revising the genus ***Bryocharis*** (subfam. Tachyporinae). Request loan of New World and East Asiatic material especially. Petr Nohel, Botany Inst., Czech. Acad. Sci., 25243-Pruhonice nr. Prague, Czechoslovakia.

SCARABAEIDAE: ***Chalcosoma atlas*** and subspecies from Malaysia, Philippines, Java, & Sumatra (5-11cm) For Sale. K. A. Schmitt, W168 N11469 El Camino, Germantown, Wisc. 53022.

EXCHANGE: Curculionidae, Buprestidae, and Carabidae. Massimo Heregalli, C. A. Picco 27, 10131 Torino, ITALY.

CICINDELIDAE: Need specimens of following genera for morphological studies of family: ***Eucallia, Nickerlea, Rhysopleura, Langea, Opisthencentrus, Iresia, Oxygonia, Ctenostoma, Pogonostoma, Caledonomorpha, Caledonica, Distipsidera, Aniara, Prothyma.*** Wish to exchange, borrow, or purchase and can use poorly labelled or damaged material. R. D. Ward, Dept. Ent., Michigan State Univ., East Lansing, Mich. 48823.

FOR SALE: Exotic beetles from Malaysia, New Guinea, Africa, Brazil, etc. Send $1.00 for 64 p. catalogue. Prospect Biological, P. O. Box 307, Round Lake, Illinois 60073.

PHILIPPINE BEETLES: Leonard L. Lengyel, c/o Mrs. Manuela R. Ablan, Rizal St., Laoag City, Ilocos Norte, Rep. Philippines.

LITERATURE DESIRED: Donations of reprints, journals, and reference works are solicited to build up library. Wau Ecology Institute, Box 77, Wau, PAPUA, NEW GUINEA.

SCARABAEIDAE: Want to purchase ***Dynastes tityus*** and ***Plusiotus*** from North and Central America or trade for ***Psalidognathus superbus*** and French Scarabaeidae. T. D. Haas, 97 Barnes St., Long Beach, N. Y. 11561.

WANTED: Casey, T. L. 1912. Memoir III, p. 1-386. Henry Dietrich, Dept. Ent., Cornell Univ., Comstock Hall, Ithaca, N. Y. 14850.

BUPRESTIDAE: Buy, exchange, determine Central American Agrilinae for revisionary studies. Henry A. Hespenheide, Dept. Biology, Univ. California, Los Angeles, California 90024.

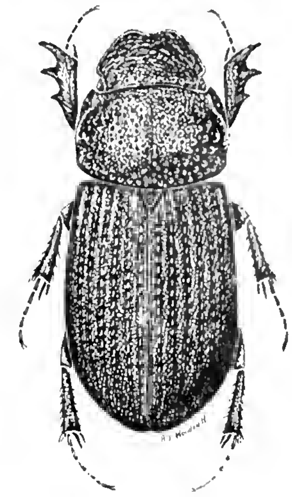
CERAMBYCIDAE & HISTERIDAE: Respectively wish *Eburia* (regional studies) and *Plegaderus* (World revision); all stages. Robert H. Perry, 118 Pilgrim Ct., Bolingbrook, Ill. 60439.

SCARABAEIDAE: Would like to purchase or trade for various species of *Plusiotus, Megasoma joergenseni, M. janus* v. *argentina, Dynastes hercules* v. *equatoriana, D. satannae, Parachrysina truquii, Chrysina karschi, C. modesta, Homoiosternus beckeri, Heterosternus ludeckei, H. oberthuri.* T. W. Taylor, 8529 Norwood Pl., Rosemead, CA 91770.

WANTED: Carabidae *larvae.* Studying the phylogeny of the tribes Morionini, Pterostichini, Agonini, and Amarini as a thesis problem. Request loans, will sort. Contact for further information and/or send to Raymond G. Thompson, Dept. Ent., Univ. of Arkansas, Fayetteville, AR 72701. 501/575-2451.

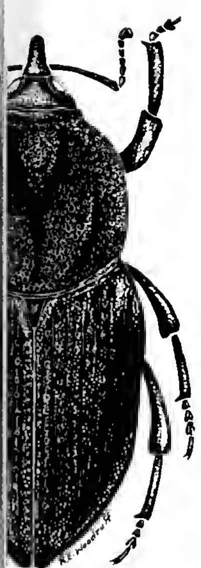
STAPHYLINIDAE: If anyone wishes to send us unsorted Staphylinidae in 70% alcohol we will *eventually* return 1 or 2 specimens mounted, labeled and identified to the nearest possible taxon. Ecological data particularly desired. Ian Moore, Div. Biological Control, Univ. of California, Riverside, CA 92502.

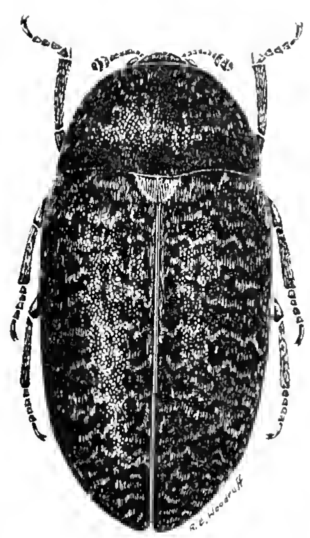
IDAHO ANTS: A guide to Idaho ants is being prepared by Nicholas P. Yensen & William H. Clark. Request loan or gifts of Idaho ant specimens (or collection data) & pertinent literature. W. H. Clark, 1614 W. Jefferson St., Boise, Idaho 83702.



THE COLEOPTERISTS BULLETIN

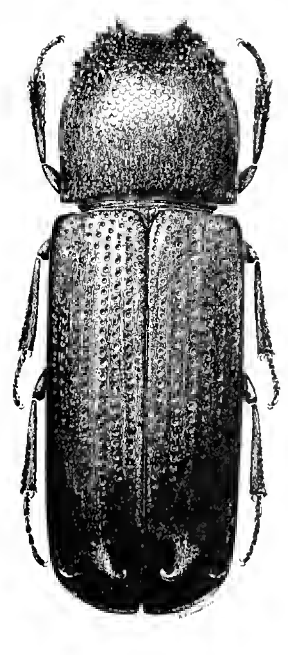
AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES





VOLUME 29, NUMBER 2 JUNE, 1975

RHYSODIDAE: New *Clinidium*
by R. T. Bell & J. R. Bell 65-68
BUPRESTIDAE: Distribution & biology notes
by G. C. Walters, Jr. 69-70
NOSODENDRIDAE: *Nosodendron californicum*
by H. L. Osborne & D. L. Kulhavy 71-73
DRAWINGS: Symmetry & proportion
by J. Micheli 74
PASSALIDAE: Comparative copulation
by J. C. Schuster 75-81
CARABIDAE: *Platypatrobus lacustris* in N. H.
by P. M. Choate, Jr. & T. J. Dyrkacz 82
ANOBIIDAE: N. A. *Xestobium*
by R. E. White 83-86
THROSCIDAE: Review of *Pactopus*
by E. Yensen 87-91
MYCETOPHAGIDAE: Nearctic revision
by C. T. Parsons 93-108
CARABIDAE: Casey holotypes & lectotypes
by C. H. Lindroth 109-148
BOOK REVIEWS & NOTICES 70, 86, 92, 148



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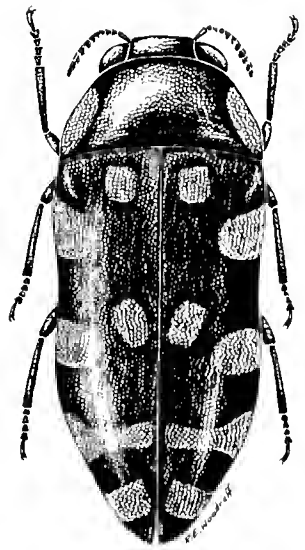

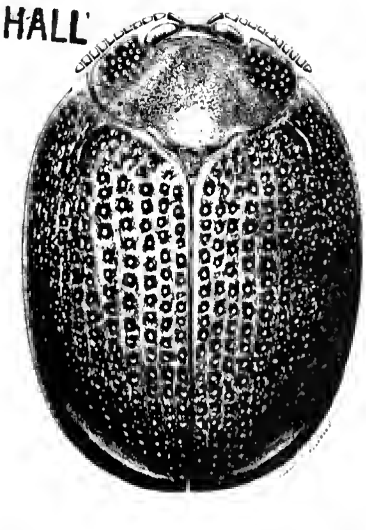

THE COLEOPTERISTS BULLETIN

(FOUNDED 1947 BY ROSS H. ARNETT, JR.)

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The following exceptions are noted: 1) all geographical names are to be spelled out, 2) use words, not symbols, for male and female, 3) use numerals throughout, except to begin a sentence, 4) entomology, -ical, -ist, etc. are to be abbreviated Ent. in literature citations.

Specimen label data should be listed in the following manner: MEXICO: State of Veracruz, Fortin de las Flores, 10-VIII-70, I. B. Jones, under bark of **Pinus moctezumae,** 7000ft. [USNM] (2). The number in parentheses indicates the number of specimens. Geographical names are listed in order with largest units first, with states,

Continued inside back cover

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TWO NEW TAXA OF *CLINIDIUM* (COLEOPTERA: RHYSODIDAE OR CARABIDAE) FROM THE EASTERN U.S., WITH A REVISED KEY TO U.S. *CLINIDIUM*

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Abstract

Clinidium (Arctoclinidium) allegheniense n. sp. and *Clinidium allegheniense georgicum* n. ssp. are described and illustrated. A revised key to *Clinidium* of the U.S. is provided.

We have recently undertaken a survey of *Clinidium* in U. S. museums in order to define the ranges of the eastern species more accurately. We were surprised to discover 2 undescribed taxa, probably representing subspecies of a single species.

Clinidium (Arctoclinidium) allegheniense Bell & Bell, **new species.** Holotype: Male. Pennsylvania, Pittsburg, 1-VI-24, Chermock (Univ. of Kansas). Paratypes: 2 females, same data, (Univ. of Kansas). 1 male, 1 female same data, (MCZ). 13 males, 2 females. Pennsylvania, Wall, VI-21, H. Klages Collection (Carnegie Museum).

Description: (Fig. 1) Length 5.5-7.0 mm; dark reddish-brown to piceous; dorsal surface, including striation, as in *Clinidium sculptile* Newman; temporal seta absent; apical setae of elytra present; metasternum with complete median sulcus.

Male prosternum not pilose in midline; male front femur sharply angulate as in *sculptile*; front tibia slightly angulate on inner margin proximad to antenna-cleaner (less angulate than in *sculptile*); calcars of hind tibiae (Fig. 7) smaller than in *sculptile* but larger than in *rosenbergi*, C/T2 = 0.39; C/T3 = 0.37; C2/C3 = 0.96 (ratios calculated as in Bell, 1970); pilose area of sternite II narrow, T-shaped (Fig. 8c); sternites IV and V each with complete, dilated pilose strip connecting transverse sulci (Fig. 4).

Female with transverse sulci of sternite III deeply excavated (Fig. 3); those of sternite IV not at all excavated; sternite VI not impressed or only slightly so (Fig. 5); cauda small, rounded, more reduced than in *sculptile* (Fig. 6).

Range: Known from localities in western Pennsylvania near Pittsburgh.

Locality Records: (See abbreviations for collections listed after discussion) Pennsylvania: Allegheny County [CM, CU]; Allegheny (now the Northside district of Pittsburgh) [MO]; Jeannette [CM, UVM]; Pittsburgh [UK, CM, UVM]; Wall [CM].

A group of 3 specimens (1 male [FM], 2 females [CA]) from Mt. Mitchell, Black Mts., North Carolina, are provisionally assigned to this form. Though the male agrees with the Pennsylvania specimens, rather than the subspecies from Georgia described below, in having the median pilose area on sternite V, it differs from both Pennsylvania and Georgia specimens in having the inner impression of sternite VI more deeply impressed and extending anteriorly nearly to the anterior pits, while the pilose area on sternite II is more broadly dilated posteriorly (so that it resembles a vertical section through a mushroom rather than the letter T). This form may be subspecifically distinct, but more material is necessary to establish the fact.

Clinidium (Arctoclinidium) allegheniense georgicum
Bell & Bell, **new subspecies**

Holotype: Male. GEORGIA, Cartersville, 26-III-39, P. W. Fattig [USNM]. Paratypes: 1 male, same data, [GA]; 2 females, same data [FM]; GEORGIA: 1

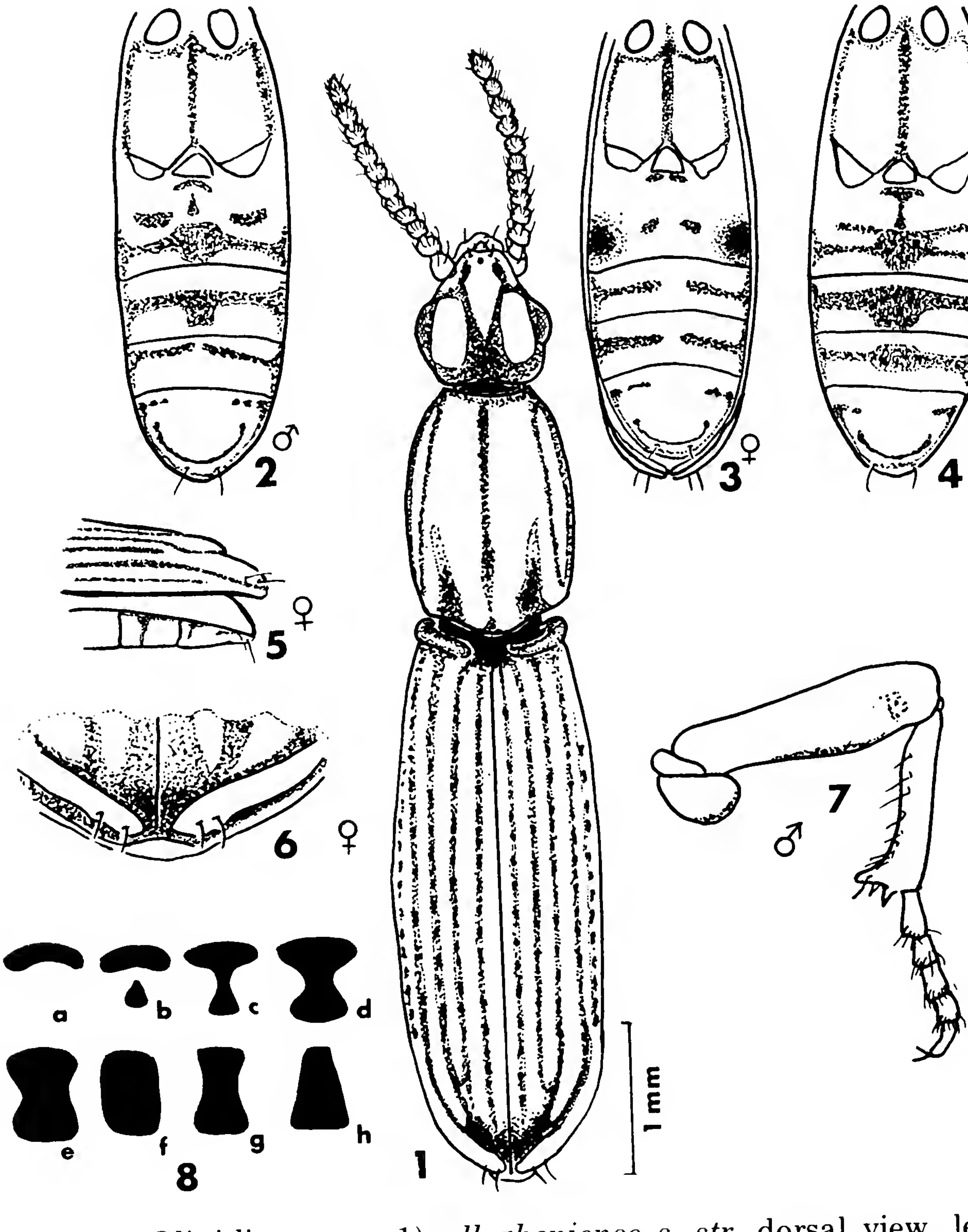

Fig. 1-8. *Clinidium* spp.: 1) *allegheniense s. str.* dorsal view, legs not shown; 2-4: pterothorax and abdomen, ventral view: 2) *allegheniense georgicum*, male; 3) *allegheniense s. str.*, female; 4) *allegheniense s. str.*, male; 5) lateral view of tip of abdomen and elytron, female, *allegheniense s. str.*; 6) tip of elytra, dorsal view, female, *allegheniense s. str.*; 7) hind leg, male, *allegheniense s. str.*; 8) pattern of pilosity of sternite II, male: a-b. *allegheniense georgicum*; c. *allegheniense s. str.*; d. *sculptile*; e. *rosenbergi*; f. *baldufi*; g. *valentinei*; h. *calcaratum*.

male, Athens, 6-X-54, K. Parrish [GA]; 2 males, West Pace's Ferry X., Marietta Hgy (DeKalb County), 12-IX-54, W. H. Cross [UVM]; 1 female, Dallas, 16-IV-44, P. W. Fattig [UVM].

Description: Length 5.6-6.3 mm, similar to *allegheniense*, but with males lacking pilose area at midline of sternite V (Fig. 2) and T-shaped pilose area on sternite II much narrower and usually interrupted; in 1 specimen the stem of the T is entirely absent, so the pilose area is in the form of a chevron (Fig. 8a). Female as in *allegheniense.*

Range: Confined to the mountains of northern Georgia.

Locality Records: GEORGIA: Athens [UVM]; Cartersville [GA, FM]; Dallas [UVM]; West Pace's Ferry X (De Kalb County) [UVM].

Discussion: Males of new taxa resemble *Clinidium baldufi* Bell in lacking the pilose strip on the midline of the prosternum. However, they differ from *C. baldufi* in having a much smaller hind calcar and in lacking a median carina on sternites IV and V. The median pilose area on sternite II is in the form of a narrow letter T (often interrupted in *C. allegheniense georgicum*), while in *C. baldufi* it is in the form of a broad rectangle (Fig. 8f). This character has not been used previously, although it seems that the males of each species of *Clinidium* have a characteristic pattern on the second sternite. *C. sculptile* (Fig. 8d) has a very broad "T", with the base almost as wide as the top, while in *C. rosenbergi* (Fig. 8e) the patch has the top and bottom equally broad, with a constriction at the middle, like a broad hour glass. In both *C. valentinei* and *C. calcaratum* the widest point is at the posterior margin. *C. calcaratum* (Fig. 8h) has a trapezoidal shape whereas *valentinei* (Fig. 8g) is slightly constricted in the middle and widened at the anterior margin.

Females of the new species resemble *C. baldufi* rather than other eastern species in having deep excavations in the transverse sulci of Sternite III, and in lacking any excavation in the sulci of Sternite IV. They differ from *C. baldufi* in having a reduced and rounded cauda and in having the last sternite unimpressed or only slightly impressed. Both of these characters are similar to *C. rosenbergi.*

It should be noted that the diagnostic features of the eastern species of *Clinidium* are located entirely on the ventral surface. Accordingly, rhysodid beetles should always be mounted so that the ventral surface is fully exposed.

REVISED KEY TO *Clinidium* OF THE UNITED STATES
(Supersedes that of Bell, 1970)

1a. Calcars present (males) 2
1b. Calcars absent (females) 8

2a. Metasternum not sulcate 3
2b. Metasternum with median sulcus 4

3a. Hind femur with large ventral tooth; hind calcar small, less than 0.25 length of tibia; temporal seta present .... *valentinei* Bell
3b. Hind femur without tooth; hind calcar very large, more than 0.5 length of tibia; temporal seta absent .... *calcaratum* Leconte

4a. Prosternum with median pilose area 5
4b. Prosternum glabrous in midline 6

5a. Transverse sulci of sternite V broadly separated by glabrous space; hind calcar small .... *rosenbergi* Bell
5b. Transverse sulci of sternite V closely approximate, the space between them occupied by a pilose area........ *sculptile* Newman

6a. Sternites IV and V each with very fine median carina; that of sternite V completely dividing median pilose area, that of sternite IV dividing pilose area only in posterior half; hind calcars moderately large........ *baldufi* Bell
6b. Sternites IV, V without median carina 7

7a. Transverse sulci of sternite V separated by a pilose area........ *allegheniense s. str.*, new species
7b. Transverse sulci of sternite V separated by a glabrous space........ *allegheniense georgicum*, new subspecies

8a. Metasternum not sulcate 9
8b. Metasternum with median sulcus........ 10

9a. Transverse sulci of sternite III deeply excavated laterally, those of sternite IV not at all excavated........ *valentinei* Bell
9b. Transverse sulci of sternite III not at all excavated, those of sternite IV deeply excavated laterally .... *calcaratum* Leconte

10a. Transverse sulci of sternites III and IV both excavated laterally........ 11
10b. Transverse sulci of sternite III deeply excavated laterally, those of sternite IV not at all excavated........ 12

11a. Sternite VI not impressed; excavations of sternites III and IV equal .... *rosenbergi* Bell
11b. Sternite VI distinctly impressed; excavations of sternite IV smaller than those of sternite III .... *sculptile* Newman

12a. Sternite VI very deeply impressed; cauda angulate, projecting........ *baldufi* Bell
12b. Sternite VI not impressed or only slightly so; cauda small, rounded........ *allegheniense s. str.* Bell & Bell, new species.
.... *allegheniense georgicum* Bell & Bell, new subspecies.

Abbreviations and Acknowledgments

CA, California Academy of Science; CM, Carnegie Museum of Natural History; CU, Cornell University; FM, Field Museum; GA, University of Georgia; MCZ, Museum of Comparative Zoology, Harvard; MO, University of Missouri; UK, University of Kansas; UVM, University of Vermont. We wish to thank the curators of the lending institutions for the opportunity to study their collections of *Clinidium*.

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NOTES ON THE DISTRIBUTION AND BIOLOGY OF CERTAIN BUPRESTIDAE (COLEOPTERA): PART I

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Abstract

Biological and distributional data are presented for certain species in the following genera of Buprestidae: *Hippomelas, Melanophila, Chrysobothris, Polycesta, Acmaeoderoides,* and *Agrilus.*

These notes are based on collections made in Southern California from 1965 through 1973, by Mr. V. Lukson and me. All specimens are currently in my collection.

Hippomelas (Prasinalia) imperialis Barr 1969: J. Kansas Ent. Soc. 42:321-335. This attractive species was collected on *Eriogonum deserticola* Wats, California: Imperial Co., 5 mi. W. of Glamis, 17-VI-73 (7).

Melanophila pini-edulis Burke 1908: Proc. Ent. Soc. Washington 9:117-118. This species was recorded from the Pinyon Flats area of the San Jacinto Mountains in Southern California (Nelson 1962); 8 specimens were collected in the San Gabriel Mountains on *Pinus monophylla* Torr. and Frem., California: San Bernardino Co., Wrightwood, 1-VII-67 (6) and 6-VII-68 (2).

Chrysobothris deleta LeConte 1859: American Phil. Soc. Trans. 11:255. This species was collected on *Cassia armata* Watson, California: San Bernardino Co., 6-16 miles N.E. of Red Mountain, 27-V-72 to 28-V-72 (11).

Chrysobothris bisinuata Chamberlin 1938: Pan-Pacific Ent. 14:13. Three specimens were beaten from small branches of *Cercocarpus betuloides* Nutt. ex. T. and G., California: San Bernardino Co., Etiwanda, 29-V-73 (2), and 16-VI-73 (1).

Chrysobothris bacchari Van Dyke 1923: Brooklyn Ent. Soc. Bull. 18:38-40. Nelson (1962) recorded collecting this species from the San Jacinto Mountains on *Baccharis sergiloides* Gray, which extended the known range southward by several hundred miles. A pair was collected on *Baccharis sergiloides* Gray, California: San Diego Co., Jacumba, 3-VII-65 (2) thus furthering the southward extension by another 100 miles.

Chrysobothris piuta Wickham 1903: Canadian Ent. 35:67-69. This attractive species was collected by beating dead branches of *Cercocarpus betuloides* Nutt. ex. T. and G., California: San Bernardino Co., Etiwanda, 16-VI-73 (3).

Chrysobothris atrifasciata Leconte 1860: American Phil. Soc. Trans. (1859) 11:240. Fourteen specimens of this colorful species have been collected over a 5 year period on *Atriplex* sp., California: San Bernardino Co., Victorville, 13-VII-68 (1), 4-VII-70 (7), 26-VI-71 (2), and 1-VII-72 (4).

Polycesta flavomaculata Nelson 1960: Coleopterists Bull. 14:30-32. On 5 December 1966, I made a trip to the type locality of *Polycesta flavomaculata* in the San Jacinto Mountains of Southern California. After examining numerous trees of *Quercus dumosa* Nuttall, numerous buprestid larvae were found in the roots, trunk, and branches of a tree which had recently died. Live adults of *Polycesta californica* LeConte were found in the branches. No live adults of *Polycesta flavomaculata* Nelson were found, although dead, partially emerged specimens were found at the base of the trunk and in the roots. Wood was taken from the roots, trunk, and branches. The wood from the roots and trunk was placed in a container separate from that of the limbs. From 1967 through 1973 over 190 specimens of *Polycesta flavomaculata* emerged, most of which were taken from the container housing wood from the roots and trunk. This would seem to indicate that *Polycesta flavomaculata* works primarily in the roots and trunk. The earliest emergence occurred in April and the latest in September, with the majority (139) emerging during July. During the winter months of 1967 through 1973, I split some of the wood which was collected in 1966. Live adults of *Polycesta californica* were found, but no adult *Polycesta flavomaculata*. This would seem to indicate that, while *Polycesta californica* probably over-winters in the pupal cells as adults, *Polycesta flavomaculata* does not.

Acmaeoderoides humeralis (Cazier) 1938: Bull. Southern California Acad. Sci. 37:12. This little species was taken sweeping the blossoms of *Palafoxia*, CALIFORNIA: Riverside Co., Dos Palmas Rancho, 18-IV-73 (60).

Agrilus inhabilis Kerremans 1900: Ann. Soc. Ent. Belgique, 44:341. This attractive species seems to be uncommon in collections. Six specimens were collected on *Hymenoclea salsola* T. and G., CALIFORNIA: Riverside Co., Whitewater Canyon, 15-IV-72 (1) and 22-IV-72 (5).

ACKNOWLEDGEMENTS

Thanks are expressed to V. Lukson for joining me on collecting trips; to D. S. Verity for assisting in plant identification; and to G. H. Nelson for assisting in identification of certain specimens and review of the article.

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NOTES ON *NOSODENDRON CALIFORNICUM* HORN ON SLIME FLUXES OF GRAND FIR, *ABIES GRANDIS* (DOUGLAS) LINDLEY, IN NORTHERN IDAHO (COLEOPTERA: NOSODENDRIDAE)[1]

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Abstract

Adults and larvae of *Nosodendron californicum* Horn were observed and collected from sap exudations on and adjacent to frost cracks of *Abies grandis* (Douglas) Lindley. This is the first published record of this species in Idaho and east of the Cascade Range in the Pacific Northwest.

Introduction

The habitat-niche of *Nosodendron californicum* Horn in the western United States is delimited as slime fluxes (i.e., infected sap exudations from tree wounds) of white fir, *Abies concolor* (Gord. and Glend.) Lindl. (Hayes and Chu, 1946, and Sokoloff, 1959), grand fir, *Abies grandis* (Douglas) Lindley (=*Picea grandis* in Fletcher, 1902), and the California black oak, *Quercus kelloggii* Newb. (Sokoloff, 1959, 1964). Records of *N. californicum* in the West are California (Arnett, 1968), southwest British Columbia, western Washington, and southwestern Oregon (Hatch, 1961).

General Observations

Three adults were taken from frost cracks of grand fir, *Abies grandis,* that were exuding sap in June, 1972. This is the first record of *N. californicum* for Idaho and the region east of the Cascade Range in the West. The following year, grand fir trees were examined, and adults and larvae were collected on sap exudations from frost cracks on 15 trees. These trees had fruiting structures of *Echinodontium tinctorium* (Ell. and Ev.) Ell. and Ev., the Indian paint fungus which causes a severe heartrot of grand fir in Idaho. Trees ranged from 30-35 cm in diameter (breast height) and were greater than 120 years in age. Host trees were found in the mixed conifer forest of the *Abies grandis/ Pachistima myrsinites* (Pursh) Raf. and *Thuja plicata* Donn/*Pachistima myrsinites* habitat types (Daubenmire and Daubenmire, 1968).

One host grand fir (Fig. 1) was selected for study and observation of *N. californicum* throughout the 1973 field season (5 July to 24 September 1973). Temperature recordings and observations were made periodically throughout the summer. Sap exudation was underway when the first observation of the beetles were made. By early July, adults and 3 larval instars were observed on the frost crack exudations up to 1 m above the root collar.

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[2]Research Assistant and Graduate Assistant respectively.
[3]Supported in part by a Stillinger Memorial Grant.

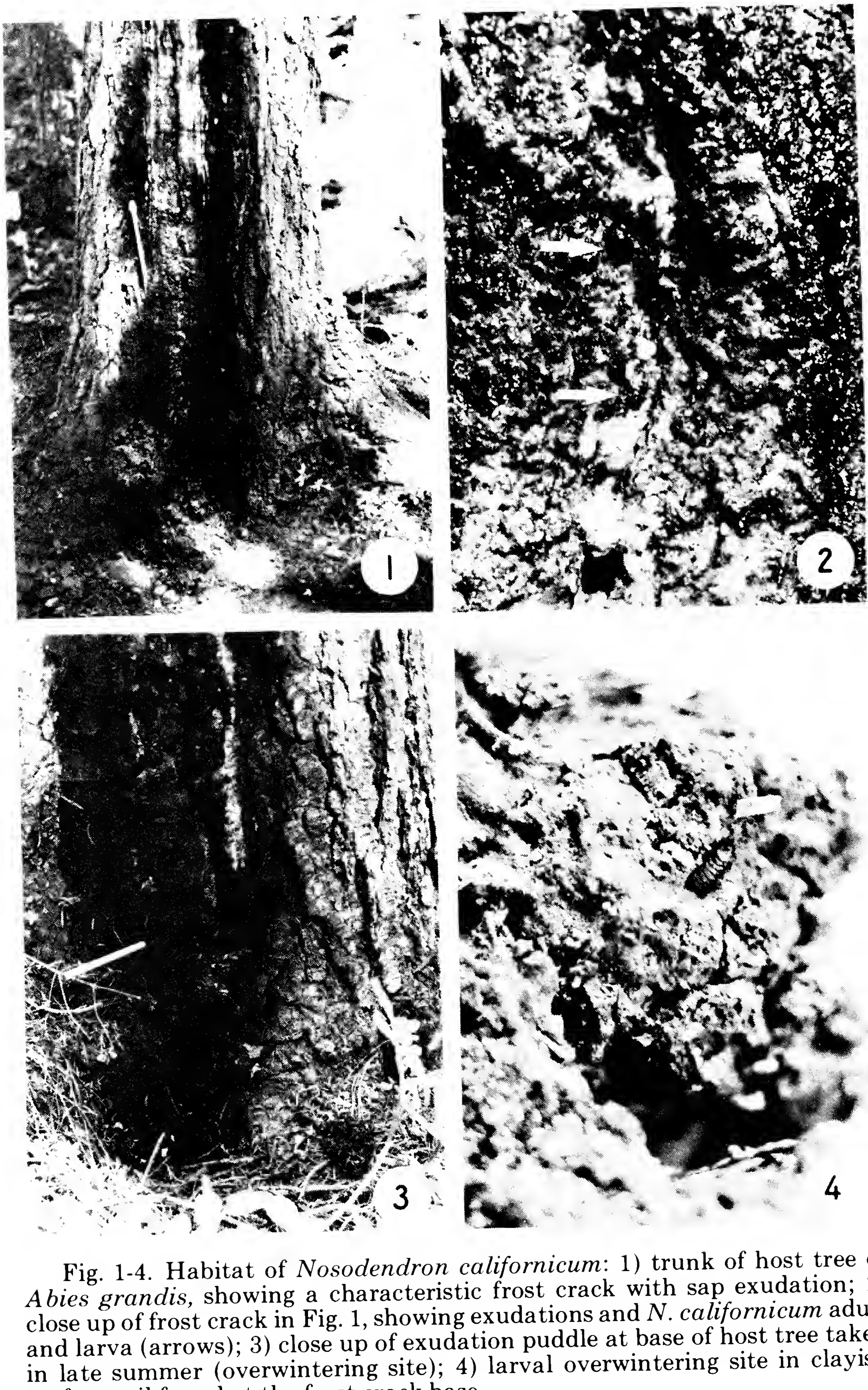

Fig. 1-4. Habitat of *Nosodendron californicum*: 1) trunk of host tree of *Abies grandis,* showing a characteristic frost crack with sap exudation; 2) close up of frost crack in Fig. 1, showing exudations and *N. californicum* adult and larva (arrows); 3) close up of exudation puddle at base of host tree taken in late summer (overwintering site); 4) larval overwintering site in clayish surface soil found at the frost crack base.

Adults and larvae are cryptic and were found covered with sap exudations within 2 cm of the center of the frost crack (Fig. 2). However, greater numbers of adults and larvae were found throughout a moistened mass of grand fir needles and decomposing litter with accumulated sap exudations at the base of the frost crack (Fig. 3). The pH value of the sap exudate varied from 4.0 to 6.0 throughout the summer. The maximum extent of the exudate puddle at the base of the frost crack was 9 × 25 × 4 cm deep with the beetles found throughout this area. As the season progressed, the volume of exudate from the frost crack decreased as moisture relations within the forest became more severe. By mid-August, adults and larvae were no longer present on the frost crack, but were confined to the damp litter and duff at the base of the host tree where the frost crack exudate had drained. As the exudate puddle dried out, adults and larvae of *N. californicum* became inactive and were found incrusted in the decomposed litter and clayish surface soil at the base of the host tree. Adults and larvae were observed in this condition by early September. Observations were made again in mid-March 1974, and adults and larvae were found still incrusted in the soil (Fig. 4) and against the tree bole between the root collar and the clayish soil from 2 to 8 cm below ground level. Observations on adult and larval behavior are being continued throughout the 1974 season. Distribution of the beetle is being studied throughout northern Idaho, Washington, and Oregon.

Acknowledgements

Thanks are extended to: J. M. Kingsolver for identification of the initial specimen in 1972; W. F. Barr, R. W. Stark, and E. R. Canfield for review of the manuscript.

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SYMMETRY AND PROPORTION IN DRAWINGS: AN ACCURATE AND REFINED METHOD

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Today biologists usually have a good camera, probably a 35 mm single lens reflex type. This method makes use of such a camera and a 35 mm slide projector. There is no need to obtain a special second camera and no need for the opaque projector. Depending on the size of the specimen, one of the following items is needed: a close-up lens, a set of extension tubes or bellows, or a camera-to-microscope adapter.

There are 2 alternatives. Black and white reversal film or color transparency film may be used. I recommend using color film for 2 reasons. The color transparency may be kept as an excellent record, and it is convenient for comparing color when one is doing color illustrations. Black and white reversal film is less expensive and faster and may become indispensable when working with the microscope at high magnifications, due to its higher speed. With black and white film it will be easier to compare tone values. The final decision on which film to use will depend on individual need, artistic ability, and budget.

For color I recommend using a low speed daylight film with negligible grain. Use direct sunlight for illuminating the subject. There is no need for special lights and color rendition is normally more accurate. Reflectors, such as white paper, crumpled aluminum foil, or a mirror may be placed on the other side of the subject. One can experiment with various reflectors until the desired effect is obtained. One may even keep out of direct sunlight (protecting camera and film) by working in the shade, while using a mirror at some distance to reflect light on the specimen. A faster color film may be used when working with the microscope.

Accurate symmetry in the drawing is usually desired in top views. One should try to arrange the specimen to look as symmetrical as possible. With Coleoptera, for example, head, pronotum, and elytra should fall symmetrically on a head to tail axis. It is only necessary to arrange legs, antennae, and palpi on 1 side of the body. In some cases horns and mandibles may be treated the same way.

The actual method for making the drawing follows: Take a sheet of tracing paper and draw a straight line down the middle. With adhesive tape or other means secure the paper to a sheet of white illustration board. Secure both to a flat vertical surface (such as a wall) at the appropriate height corresponding to the height of the projector. Project the transparency unto the paper. Adjust the distance between projector and paper until the correct size image is obtained. Focus. Make sure the axis of the projected image coincides with the axial line on the paper. Draw one side of the specimen. Check the actual specimen in case corrections are necessary. Remove paper from the board and fold on the middle line. Trace the drawing on the other side of the line. Once completed, turn the drawing paper over and secure it to the final illustration paper or board. Trace by pressing hard with pencil or ball-point on the lines seen through the tracing paper. Carbon paper or graphite transfer paper may be used instead to obtain a stronger line when transferring the drawing from the tracing paper to the final illustration surface. The drawing is now ready to be inked.

A variation of the method is to project the image directly onto the final illustration surface (do not forget the line down the middle) and drawing 1 side of the specimen. Then take tracing paper trace the drawing, turn over the tracing paper and secure it to the illustration surface making sure both sides fit together. Transfer the second half. Ink the final drawing.

A COMPARATIVE STUDY OF COPULATION IN PASSALIDAE (COLEOPTERA): NEW POSITIONS FOR BEETLES[1]

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ABSTRACT

Copulation, observed in 6 species of Passalidae, occurred with one beetle up-side-down in relation to the other. In *Odontotaenius* they were end to end (known for Coleoptera only in Scolytidae); in *Passalus* they were venter to venter facing nearly the same direction (known for no other beetles and only for certain Diptera and Mecoptera among other insects).

INTRODUCTION

Little is known about mating behavior in most families of beetles. Passalidae are no exception, despite the fact that *Odontotaenius disjunctus* (formerly *Passalus cornutus* and *Popilius disjunctus*), a large beetle inhabiting rotten hardwood in the eastern U. S., is a common laboratory and classroom subject. Wojcik (1969), in his comprehensive literature survey of copulation in Coleoptera, listed no reference for Passalidae.

METHOD

For the past 8 years I have kept passalid beetles in my home to study their acoustical signals. As a result, I have occasionally observed them to mate. Usually, they were kept in large (15cm × 2cm) glass petri dishes, which afford good visibility and broadcast the sounds of stridulation throughout the house when the elytra touch the glass. They were kept in a prominent place, usually the kitchen table, to allow for more frequent observation. A fresh supply of moist rotten wood was introduced into the dishes about every 2 weeks. Various species were maintained, usually in separate dishes, 1 to 8 individuals per dish. Some individuals lived under these conditions for more than 2 years.

RESULTS

All or part of copulation was observed in 6 species of Passalidae, including members of both New World tribes. Copulation occurred between beetles that had been together from less than 1 month to as long as 11 months. In at least 1 case, partners had previously produced offspring together. In another case, a female copulated with a second male to which she was introduced after her first mate died.

Courtship often began with what appeared to be mild aggression by the male, including the production of an acoustical signal characteristic of aggressive interactions. In less than a minute, however, the pair began circling.

[1]University of Florida, Journal Series No. 5552.

This courtship behavior may continue to 12 hours, continually accompanied by a characteristic acoustical signal (Schuster & Schuster, 1971). During the circling, the male is frequently parallel and beside the female, facing in the same direction. One member (usually the male) will, at times, turn onto its back, then right itself again. Sometimes, the dorsum-up beetle (usually the female) shifts its hind legs and abdomen over the venter-up beetle resulting in the posterior halves of the bodies being venter to venter. The abdomens of both beetles are bent ventrally out of the elytra. A certain amount of rotation in the horizontal plane ensues, the degree varying among the species. In all cases, however, the tips of the abdomens are placed in close proximity, venter to venter. The tips then brush across each other a few times, finally stopping with the genital pores juxtaposed. The aedeagus is extruded and enters the female with its dark, sclerotized side (Fig. 1a, 1c) facing the female's dorsum. The courtship acoustical signal has usually ceased by this time. After a period of little or no movement, 1 or both coupled beetles begin to move their legs actively. Separation usually occurs when the female walks away, the aedeagus stretching between the beetles until it finally dislodges from her. Copulations lasted from 2 to 28 min. The male often makes a few loud sounds soon after union is broken. He is also very active, frequently pivoting on his front legs, rotating left and right. Low intensity postcopulatory acoustical signals are often produced. This general pattern varies among the species studied as follows:

Odontotaenius disjunctus (Illiger)
(4, 4, Florida, Alachua Co., Gainesville*)

This is the only species of Passalidae occurring in the eastern United States. All pairs proceeded in the same manner: the male turned on his back and the female shifted the posterior portion of her body onto his ventral surface. She then rotated until their bodies were end to end, the beetles facing in exactly opposite directions, with the tips of the abdomens still venter to venter (Fig. 2). Once in this position, the tip of the female's abdomen oscillated slightly from side to side probably stimulating the hairs around the genital pores. About 15 sec later, oscillation stopped with genital pores juxtaposed, and the aedeagus was extruded and entered the female. The 4 observed copulations lasted 28 min, 23 min, 12 min, and 10 min. Toward the end of copulation the female began to walk forward. Before union was broken, the male sometimes turned over, resulting in a 180° twist in the aedeagus. In these cases, as the aedeagus stretched between the 2 beetles, it began to untwist, so that at the time separation occurred, it was often only 90° from its original orientation. The last portion of the aedeagus to emerge from the female appeared to be a membranous, eversible sack extended from its mid-dorsal region. Orientation of the aedeagus was easily determined by its structure; the ventral surface is highly pigmented and sclerotized, while the dorsal surface is white and membranous. (See Fig. 1)

Odontotaenius striatopunctatus (Percheron)
(1, 1, MEXICO: Nuevo Leon, 12 mi. west Cola del Caballo Falls)

This is a common species ranging from northern Mexico to Costa Rica

*The first number refers to the number of copulations observed, the second to the number of different pairs observed, followed by their collection locality.

(Reyes-Castillo, 1970). The position assumed during copulation was similar to that of *O. disjunctus* (Fig. 3a), but apparently with the male dorsum-up and the female venter-up. Near the end of copulation, as the beetles walked apart in opposite directions, the aedeagus stretched between them. The evaginated membranous area of the aedeagus was observed to stretch at least 1mm from the sclerotized portion of the female genital pore.

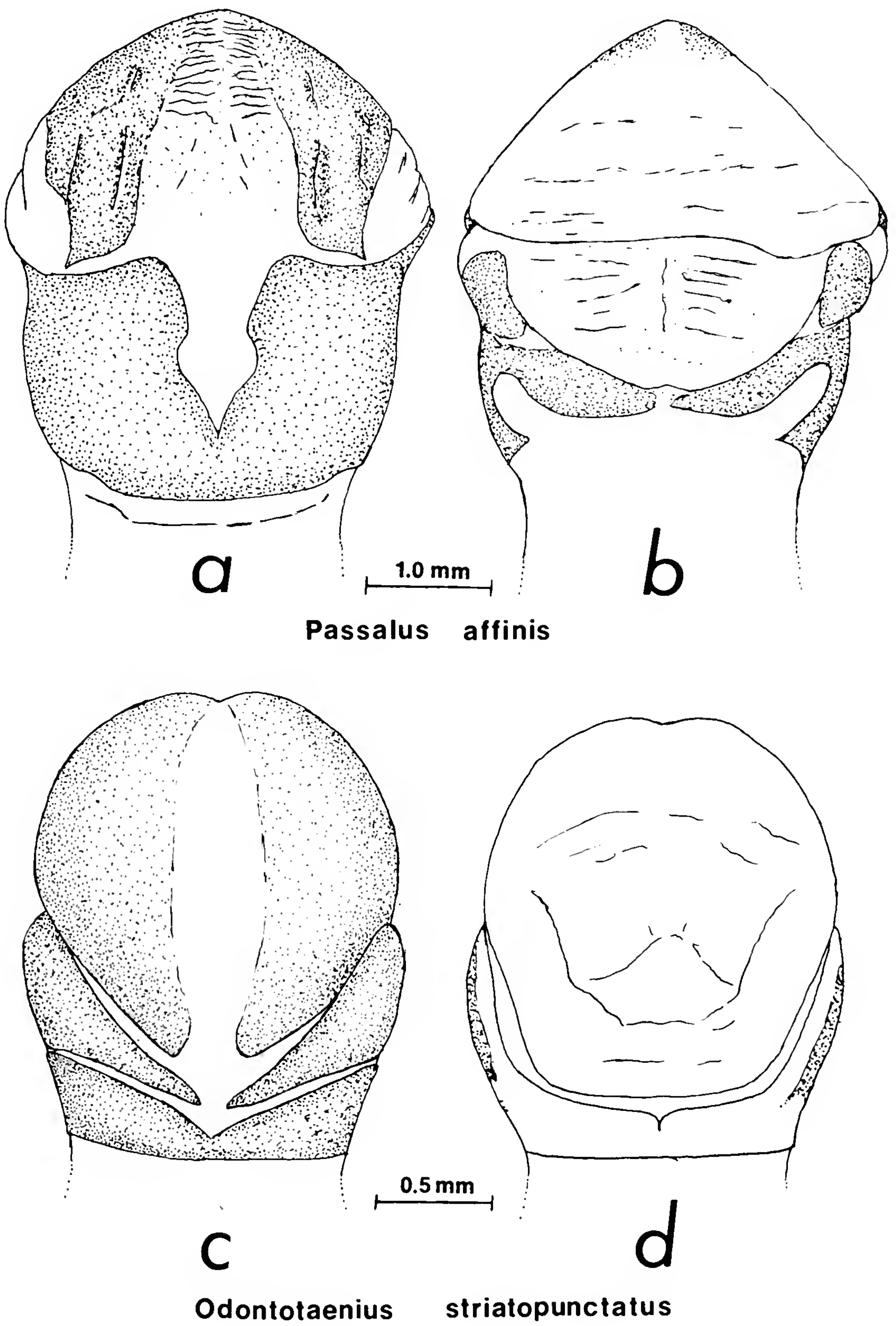

Fig. 1. Passalid aedeagi: a) *P. affinis,* ventral view; b) same, dorsal view; c) *O. striatopunctatus,* ventral view; d) same, dorsal view.

Odontotaenius zodiacus (Truqui)
(1, 1, Mexico: Hidalgo, Zacualtipán)

This species is found in the Sierra Madre Oriental of Mexico. The position during copulation was the same as in *O. disjunctus.* The individuals were joined for at least 5 min. Toward the end of copulation, the male turned over and began walking.

Passalus (Passalus) punctiger Lepeletier et Serville
(4, 2, Mexico: Tamaulipas, Gomez Farías; 2, 1, Costa Rica: Osa Peninsula)

This very common species has a broad range, from northern Mexico to Argentina. Copulation of the first Mexican pair began, as in *O. disjunctus,* with the beetles facing in the same direction, the male turning on his back, and the female (still dorsum-up) shifting the posterior part of her body over the male's venter. The female did not rotate as in *O. disjunctus.* Instead, intromission occurred immediately, while the beetles were at an angle of 30° or less (Fig. 3c). Male behavior was different, too; the aedeagus, when extruded, was twisted 180° from its usual position within the male's body. The twist permitted it to enter the female in the normal manner (i.e., with the dark sclerotized portion toward the female's dorsum, in this species in which the female faces the same way as the male. In species which copulate facing in opposite directions, the aedeagus enters the female in the normal manner without being twisted). Soon after intromission, the female, in one case, superimposed her body completely venter to venter with the male. In all cases, the angle between the beetles remained at 30° or less until the initiation of separation. At this point the female rotated laterally, increasing the angle between them up to 90°, and the male turned dorsum-up. The female remained stationary and the male began walking forward. Duration of copulation was from 3 to 5.5 min.

With the second pair, only the termination of copulation was observed. It is noteworthy that in the 2 pairs, the males were different individuals, but the female was the same. The female was placed with the second male after her first mate died.

The copulatory position assumed by the Costa Rican beetles was an angle of about 90° (Fig. 3b) (intromission was not observed). In one case, the male was the dorsum-up beetle (duration 2 min.); in the other, the female was dorsum-up (duration more than 7 min).

Passalus (Pertinax) affinis (Percheron)
(4, 2, Dominican Republic: El Seibo Prov., 8 km west of Miches)

This species is apparently the commonest of 4 species cited from the island of Hispañola (Sto. Domingo). Copulation proceeded in a manner very similar to that of *P. punctiger* of Mexico, except that the beetles remained in their original position after intromission (Fig. 3c). The female was dorsum-up. The aedeagus entered the female so that only the basal 0.5 mm of its dark sclerotized portion was visible. The 2 copulations of one pair occurred 4 months apart. Copulations lasted from 2 to 2.5 min in all cases.

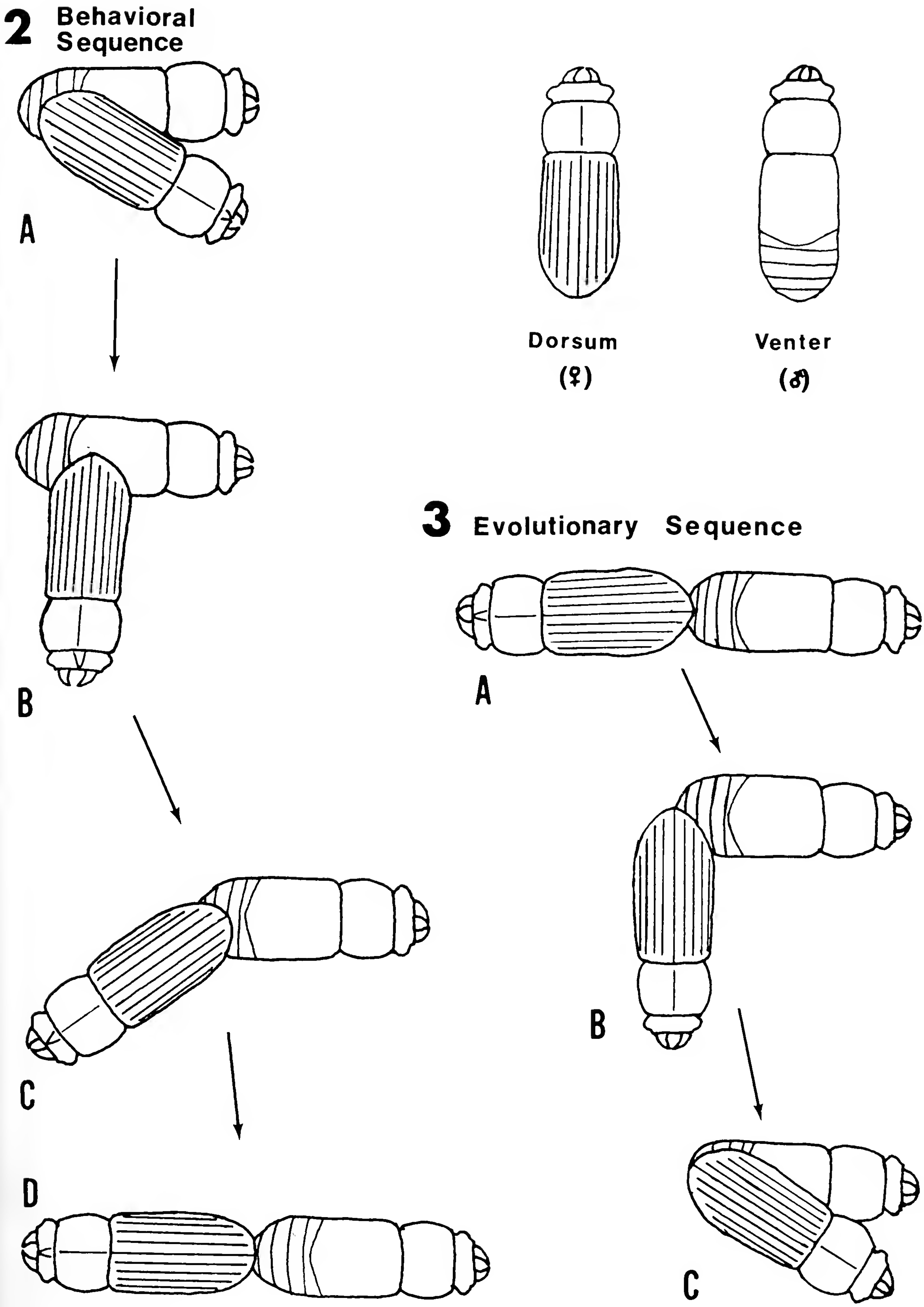

Fig. 2. Behavioral sequence of positions in *O. disjunctus* just prior to intromission. Intromissison occurs in position (D).

Fig. 3. Position at intromission in (A) *Odontotaenius* spp., and (B & C) *Passalus* spp. Arrows indicate possible evolutionary sequence.

Passalus (Pertinax) convexus Dalman
(1, 1, PERU: Huánuco Dept., Tingo María)

In this common South American species, the position during copulation was 90° (Fig. 3b), with the female dorsum-up. Near the end of copulation the position shifted to 180°, the male subsequently turning over. The female started walking, pulling the male after her until the aedeagus finally dislodged.

DISCUSSION AND CONCLUSIONS

In the cases where the initiation of copulation was observed (*O. disjunctus, P. punctiger,* and *P. affinis*), the beetles remained quiescent in approximately the intromission position until separation began. Thus, in situations where the initiation of copulation wasn't observed, but the beetles were found quiescent *in copula,* it may be inferred that this position was that in which intromission occurred. Therefore, it appears that in *Passalus,* intromission occurs with the beetle's longitudinal axes oriented at 90° or less, the pair partially or totally venter to venter, whereas, in *Odontotaenius* intromission takes place with the beetles end to end, up-side-down in relation to each other.

The only beetles previously known to have this inverted end to end copulation are scolytids: *Dendroctonus spp.* (Yu and Tsao, 1967; Cerezke, 1964; Reid, 1958) and *Pityogenes* (Reid, 1958). These also live in tunnels in wood. For example, in *D. monticolae* Hopk., the male, after contacting the female's posterior with the anterior section of his body, backs down the tunnel to a wider area, where he turns around. He then backs up the tunnel again and contacts the female end to end, the position in which copulation ensues (Reid, 1958). No previous cases are known for beetles using the venter to venter position (Wojcik, 1969 and pers. comm., 1974) as in *Passalus*. For insects in general, inverted end to end mating as in *Odontotaenius* occurs in a few Diptera, Homoptera, Hemiptera, Tettigonioidea (Alexander, 1964), Blattodea (Alexander and Otte, 1967), Dermaptera (Fulton, 1924), and the scolytids mentioned above. Among insects, only certain Diptera (Alexander, 1964) and *Bittacus* (Mecoptera) (Thornhill, 1974) are known to mate venter to venter facing the same way. In other Arthropoda, inverted end to end mating occurs in some Acarina, whereas venter to venter mating facing the same way occurs in Crustacea, Diplopoda (Alexander, 1964) and some Acarina (Radinovsky, 1965).

Fig. 3 suggests an evolutionary sequence of intromission positions in the Passalidae. I speculate that the sequence was from "a" (end to end) to "c" (almost superimposed). In all species, during the courtship dance just prior to copulation, the male and the female are usually side by side, facing in the same direction. Usually the male then turns over and the female moves her body over onto his, both beetles still facing in nearly the same direction. From this position, a female of *O. disjunctus* rotates through a series of angles, corresponding to intromission positions in *Passalus,* and finally arrives at the end to end position (Fig. 2), where intromission occurs with the aedeagus untwisted. As the male developed better ability to twist the aedeagus, intromission could occur earlier in the rotational sequence. This should be a selective advantage because it would decrease the time until intromission and minimize the likelihood of loss of contact between the sexes. Contact was, in fact, often broken as the *O. disjunctus* female rotated. If contact were renewed, courtship began again with the dance, and time was consumed passing through the whole sequence once again. Also, if intromission occurs at an angle of 30° or less, the beetles remain in antennal contact, and thus other avenues for stimulation and communication are available. The advantages of retaining the end to end position in *Odontotaenius,* however, are as yet unclear. Reading the sequence in reverse (i.e., from "c" to "a", would require the evolution of the initial aedeagal twist and subsequently its loss again in *Odontotaenius*). This is rejected because it is not the simplest interpretation in the light of the present evidence. Thus, I postulate that copulation in Passalidae evolved from an end to end position, with untwisted aedeagus (as illustrated by *Odontotaenius*) to an almost superimposed position with twisted aedeagus (as in *Passalus*).

Acknowledgments

Thanks are extended to L. B. Schuster for assistance in all phases of this work; T. J. Walker and J. E. Lloyd for criticisms of the manuscript; P. Reyes-Castillo, T. J. Walker, and R. and G. Wilkerson for aid in collecting the beetles; P. Reyes-Castillo for help in identification; D. Wojcik for information and references; and the University of Florida, Universidad Nacional Agraria de la Selva, U. S. Peace Corps-Peru, and the Organization for Tropical Studies for their support and the research opportunities they provided.

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A NEW STATE RECORD FOR *PLATYPATROBUS LACUSTRIS* DARLINGTON (COLEOPTERA: CARABIDAE)

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ABSTRACT

Platypatrobus lacustris Darlington is reported from New Hampshire for the first time.

Darlington (1938) described *Platypatrobus lacustris* from a single specimen taken at Batchawana Bay, Ontario 15-VIII-1876 or 1877. A second specimen was determined by C. H. Lindroth (1962) and P. J. Darlington, taken at a light by A. E. Brower, in northernmost Maine. Two specimens were taken at a light by Dr. and Mrs. R. T. Bell at Stowe, Vermont on 28-VII-1963. The habitat of this beetle remained unknown until Goulet (1965) captured 51 specimens near an abandoned beaver house.

On 28-VIII-1974, while we were digging at the base of an active beaver house, 8 specimens of *Platypatrobus lacustris* Darlington were collected. The beetles were found within the layers of mud and sticks that made up the base and outside of the beaver lodge. Choate returned to the same beaver house on 29 August. Digging deeper into the side of the house yielded 8 more specimens. During this trip a small hole was made into the interior of the house.

On 30-VIII both authors again returned to the house. The hole made on the previous day had been partially repaired. As we re-opened the hole, numerous specimens of *P. lacustris* were collected from the new sticks used to repair the damage from the 2 earlier trips. The beetles were running about on the newly positioned wood. After the opening was enlarged, approximately 50 specimens were taken from within the house, in the beaver nest, and in the muddy foundation that made up the base of the house and nest.

This beaver house was found in Ossipee, N. H., 2 miles northwest of Rt. 16, on Brown's Ridge Road, Carroll County, and represents the first record for *Platypatrobus lacustris* Darlington from New Hampshire.

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NORTH AMERICAN *XESTOBIUM* (ANOBIIDAE) WITH A NEW SPECIES

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Abstract

The North American species of *Xestobium* are reviewed, a key to species is presented, and the male genitalia are illustrated. *X. gaspensis* n. sp. is described from Gaspé County, Quebec.

The species of *Xestobium* Motschulsky are primarily wood-borers. The deathwatch beetle, *X. rufovillosum* (DeGeer), 1774, though rarely important in North America, has at times badly damaged structural wood of buildings in England and Europe. Hosts of these species are listed in the catalog of North American Anobiidae (White, in press).

Fall (1905) included 2 species in his treatment of *Xestobium,* namely *rufovillosum* and *affine* Lec. Fisher (1947) described *abietis,* and White (1969) transferred *marginicolle* (Lec.), 1859, to *Xestobium.* The new species below brings the total to 5. A key to species is provided, and the male genitalia of all species are illustrated.

Xestobium gaspensis White, **new species**
(Fig. 3, 6, 7)

General: Elongate, cylindrical, body 2.3 times as long as wide; ground color brown, pronotum, ventral surface, and sometimes head clouded with black, legs and antennae brown to red brown; elytra with irregular reflective patches of weakly golden pubescence, remainder of body with weakly golden, evenly distributed, reflective pubescence, pubescence appressed nearly throughout, some on ventral surface suberect; all body surfaces granulate or granulate-punctate.

Head: Antenna (both sexes) 0.33 as long as body, 1st segment large, broad, 2nd segment much smaller, broad, 3rd segment elongate narrow, about 3 times as long as wide, segments 4 through 8 subequal, each about 1.5 times as long as wide, segments 9, 10, and 11 elongated and broadened, together as long as preceding 5 segments combined. Front densely granulate, female with a median longitudinal, impunctate, shining carina, carina obscure in male. Eyes bulging, separated by 2.3 to 2.8 times vertical diameter of an eye. Last segment of maxillary and labial palpi fusiform, each about 2 times as long as wide.

Dorsal surface: Pronotal pubescence moderately dense, reflective, swirled; surface densely granulate; lateral margin explanate, in lateral view sinuate; disk feebly, longitudinally depressed at middle. Scutellum moderate in size, covered with dense pubescence. Elytra with reflective patches of pubescence forming no discernible pattern, areas between reflective patches

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with short, sparse, dark, nonreflective pubescence; female with base of elytra bearing fine, dense, nonreflective pubescence, in area about 3 times as wide as scutellum and 3 times as long, with very fine granulation in this region, each elytron diagonally behind scutellum weakly, broadly depressed; in male nonreflective patch and depression smaller and less distinct; surface densely granulate.

Ventral surface: Densely granulate-punctate; abdominal sutures distinct, nearly straight; abdominal apex of male weakly produced ventrally and broadly, weakly sinuate, apex of female distinctly, abruptly produced ventrally and narrowly, distinctly sinuate.

Length: 5.5-6.7mm.

The male holotype (USNM no. 72668) and a female paratype (in USNM) bear the data "Gaspé Co., Que., 30 Aug. 1933, E. B. Watson; Dry Abies balsamea"; a single female paratype (in USNM) differs in that it was taken on 27-VI-1934, and has no host data.

X. gaspensis is most similar to *abietis*; the latter averages larger with a range of 5.9-8.0mm, the pubescence at the base of the pronotum before the scutellum tends to coalesce, especially in the female, and the female has adjacent to the scutellum a finely granulate, vaguely depressed area bearing fine, nearly nonreflective pubescence, this area is about 0.5 the size of the corresponding region in *gaspensis*. *X. gaspensis* differs from *affine* as follows: the latter averages smaller with a range of 4.8-6.0mm, the bases of the pronotum and elytra are depressed (most distinct in lateral view), the pubescence is coarser and the patches less distinct, and there is no fine, nonreflective pubescence adjacent to the scutellum, and no depressed area. *X. rufovillosum* differs from *gaspensis* in that the granulation of the dorsal surface is much coarser, and the scutellar area of the elytra is unmodified.

Attempts to use the above characters will emphasize the subtle nature of the external differences between most species of *Xestobium*. Of the 5, only *marginicolle* is readily identified by external characters alone. However, the male genitalia of the species are markedly distinct, and these offer the most reliable characters for separation; distribution is also an aid. Following is a key to species.

Key to North American Species of *Xestobium*

1. Pubescence of dorsal surface evenly distributed and erect in part; California to British Columbia; male genitalia Fig. 1 .... *marginicolle* (Lec.)

1′. Pubescence of dorsal surface not evenly distributed, appressed, forming irregular yellow patches; various localities; male genitalia Fig. 2-5 2

2(1). Apex of 5th abdominal segment produced ventrally and distinctly sinuate at middle, Fig. 7, (females) 3

2′. Apex of 5th abdominal segment not produced ventrally, evenly arcuate to weakly sinuate at middle, Fig. 6 (males and females) 4

3(2). Pronotal pubescence before scutellum not coalescing; elytra at base vaguely depressed and with a patch of fine, nonreflective pubescence about 3 times as wide and 3 times as long as scutellum; Quebec .... *gaspensis* White

3′. Pronotal pubescence before scutellum coalescing; elytra at base not as above; Oregon to British Columbia .... *abietis* Fisher

4(2′). Granulation of dorsal surface quite coarse; northeast U. S. and in commerce; male genitalia Fig. 5 .... *rufovillosum* (DeG.)

4′. Granulation of dorsal surface less coarse; Quebec or western North America 5

5(4′). Male genitalia Fig. 3; Quebec .... *gaspensis* White

5′. Male genitalia Fig. 2, 4; Western North America 6

6(5′). Length 4.8 to 6.0mm; male genitalia Fig. 4; California to British Columbia .... *affine* Lec.

Length 5.9 to 8.0mm; male genitalia Fig. 2; Oregon to British Columbia .... *abietis* Fisher

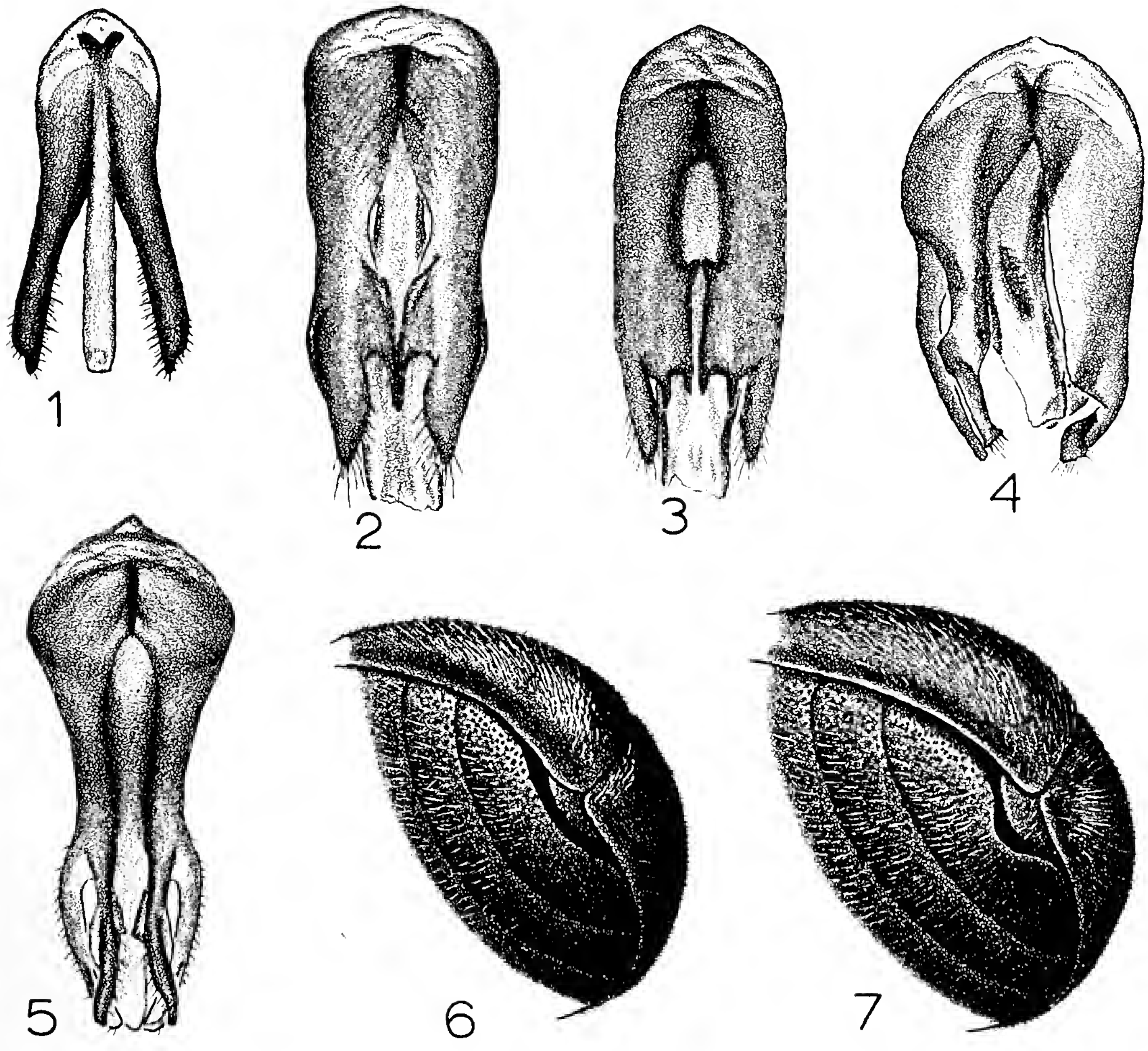

Fig. 1-5: Male genitalia: 1) *X. marginicolle* (Lec.); 2) *X. abietis* Fisher, holotype; 3) *X. gaspensis* White, holotype; 4) *X. affine* Lec.; 5) *X. rufovillosum* (DeG.). Fig. 6-7: abdominal apices, *X. gaspensis*: 6) male; 7) female.

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Book Notices

With the current emphasis on behavior (or ethology if you wish), there have been many new, excellent books on the subject. The following should be of interest to our readers.

Experimental Analysis of Insect Behavior. 1974. Edited by L. Barton Browne. Springer-Verlag, Inc., 175 Fifth Ave., New York, New York 10010. 366 p., 151 fig. (printed from camera-ready typed copy). $15.40, cloth.

The Sixth Sense of Animals. 1973. Maurice Burton. Taplinger Publ. Co., 200 Park Ave., So., New York, New York 10003. 182 p., 16 pages of photos, 41 text illustr. $6.95, cloth.

The Behaviour of Animals. 1972. Jiro Kikkawa & Malcomb J. Thorne. Taplinger Publ. Co., 200 Park Ave., So., New York, New York 10003. 223 p., 106 fig. $7.95, cloth.

The Study of Instinct. 1974. Niko Tinbergen. Oxford University Press, Inc., 200 Madison Ave., New York, New York 10016. 228 p., 130 fig. $3.95. (a paper back printing of a well-known book first issued in 1951).

The Animal in its World. (2 vols.) 1975. Niko Tinbergen. Harvard University Press, 79 Garden St., Cambridge, Mass. 02138. Volume 1: Field Studies. 343 p., 111 fig., $15.00. Volume 2: Laboratory Experiments & General Papers. 231 p., 157 fig., $14.00, cloth.

—R. E. Woodruff

A REVIEW OF THE GENUS *PACTOPUS* LECONTE (COLEOPTERA: THROSCIDAE)[1]

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ABSTRACT

The genus *Pactopus* consists of a single living species, *P. horni* Leconte. *P. fuchsi* Casey is returned to synonomy. The genus and species are redescribed, and a detailed distribution is given for over 750 specimens.

INTRODUCTION

In 1868, Leconte described *Pactopus horni* as a new genus and species of Throscidae from California. In 1894, Casey described a second species, *P. fuchsi,* also from California. There has been confusion ever since concerning the validity of Casey's species. Blanchard (1917), followed by Leng (1920), considered *P. fuchsi* a synonym of *P. horni,* whereas Schenkling (1928) and Arnett (1963) listed or indicated 2 species of *Pactopus.* A review of *Pactopus* was thus undertaken.

Pactopus Leconte

Pactopus Leconte, 1868:63.
Pactopus Latreille: Blanchard, 1917:8 (*lapsus*).
TYPE SPECIES: *Pactopus horni* Leconte, type by monotypy.

Diagnosis: Antennae eleven-segmented, fusiform, with terminal 3 or 4 segments slightly enlarged; frons projecting in front of eyes; eyes large, nearly round, without an emargination or dividing sclerite; prosternal sutures deepened into deep sinuous sulci for reception of antennae, sulci extending laterally to hind angles of pronotum; metasternum with deep oblique tarsal grooves extending from posterior margin of coxae to or nearly to lateroposterior corner of metasternum; abdomen with deep grooves for reception of tarsi extending posterior to posterior margin of third visible abdominal sternite; aedeagus with median lobe longer than lateral lobes.

Discussion: The name *Pactopus* apparently comes from the Greek *pactos* meaning "solid, firm, or coagulated" (Jaeger 1966) and refers to the compact body shape.

There are currently 3 species referred to the genus, 1 living on the west coast of the United States and British Columbia, *Pactopus horni* Leconte, and 2 fossil species, *P. americanus* Wickham from the Miocene Florissant shale in Colorado (Wickham 1914), and *P. avitus* Britton from the Eocene London Clay in England (Britton 1960).

Judging from Wickham's camera lucida drawing and from Britton's photographs, the 2 fossil species are separate species rather than segments of a

[1]From a portion of a thesis submitted in partial fulfillment of the requirements for the M. A. degree at Oregon State University, 1971.

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chronocline. They appear to be closely related to, but specifically distinct from, *P. horni.* The prosternum is wider and the tarsal grooves are less arcuate in the fossil species.

Pactopus horni Leconte

Pactopus horni Leconte, 1868:63.
Pactopus fuchsi Casey, 1894:585.

TYPES: The holotype of *Pactopus horni,* a female from "Cala." in a series with 3 other females and 2 males, is located at the Museum of Comparative Zoology, Harvard University. The holotype of *P. fuchsi,* a female from "Cal." (San Francisco and Santa Cruz counties fide Casey 1894:585), is located in the Casey collection at the U. S. National Museum, along with 2 female paratypes.

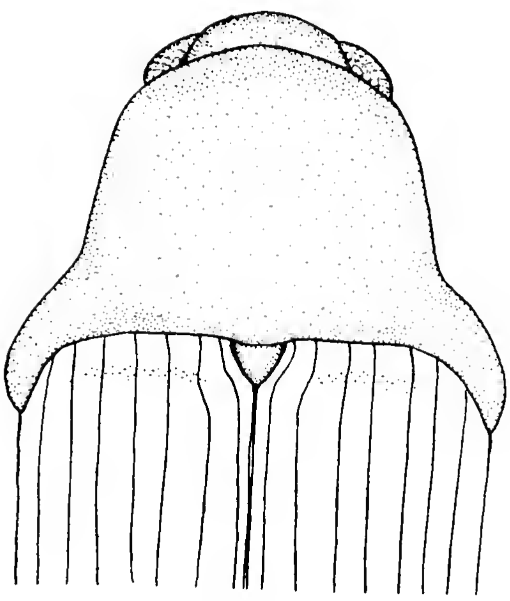
Diagnosis: First 3 abdominal sternites with arcuate grooves for reception of metatarsi; relatively narrow prosternum; prosternal carinae close together, divergent anteriorly; very distinct elytral striae. These characters separate *P. horni* from the 2 fossil species.

Description: Body oblong-oval. Color red-orange to blackish-brown. Length 2.7 to 6.0mm; width at mid-elytron 1.1 to 1.8mm. Pubescence short, appressed, gray, setae of small diameter.

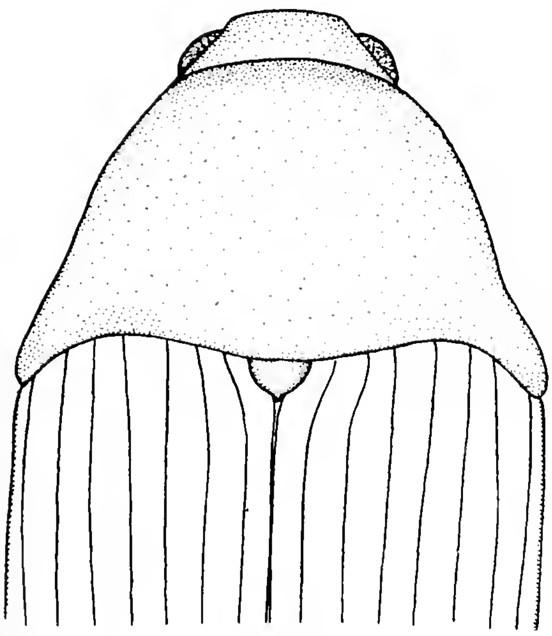
Head with frons projecting in front of eyes; frons without carinae. Eyes large, facing laterally; larger and closer together in males, separated by less than twice their own width; smaller in females, separated by more than twice their own width. Antennae fusiform with terminal 3 to 4 segments enlarged; terminal segment subacute, varying from 1 to 2 times length of tenth segment.

Pronotum sinuate laterally; sides of pronotum very sinuate in males with sides sharply narrowed and nearly parallel anteriorly; female less sinuate, sides convergent anteriorly (Fig. 1). Posterior angles "horn"-shaped, enveloping elytral humeri. Mesosternal fossa with small striker plate; fossa about as long as wide and deepening posteriorly to depth equal to width of fossa. Scutellum triangulate-oval to ogival. Elytra elongate, from 1.5 to 3 times as long as wide, longest and narrowest in males; lightly pubescent; 9 rows of punctate striae, interstrial rows with numerous punctations.

Abdomen with 5 visible sternites, each with an abdominal spiracle located in the membranous pleural region. Tarsal grooves cut obliquely through the second and third visible abdominal sternites, reaching or nearly reaching the fourth visible sternite. The first sternite divided externally by depressions for hind coxae. Aedeagus about 3 times as long as wide; lateral lobes about 0.2 length of aedeagus, with enlarged basal joint, tapering to a hooked point, capable of flexing mesodorsally but normally closely appressed to the median lobe; median lobe slightly longer than lateral lobes, tapering distally with a slight median bulge, 2.5 times longer than basal width; basal lobe elongate, about 0.8 length of entire aedeagus, divided anteriorly (basally) into 2 basal lobules, about as long as wide, hooked mesally. Female genitalia with eighth sternite spatulate, congruent with eighth tergite but with 2 long chitinous rods extending anteriorly and joining mesally. External genitalia elongate-oval, tapering posteriorly with a pair of coxites and an anterior pair of chitinous rods which are longer than the rods on eighth sternite; rods, alimentary canal, and vagina enclosed in a membranous sheath extending anteriorly about half length of rods; bursa copulatrix with 2 ring-shaped sclerites; accessory gland "u"-shaped.



1A



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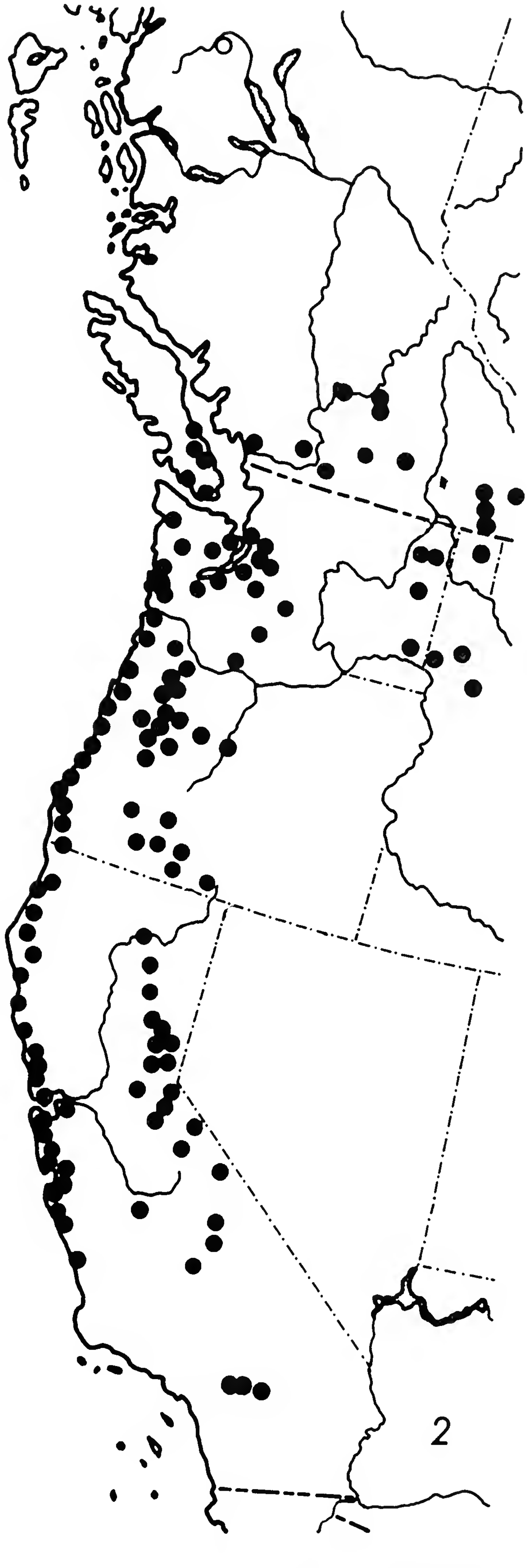

2

Fig. 1-2 *Pactopus horni* Lec.: 1A) Prothorax of male; 1B) prothorax of female; 2) distribution.

Discussion: I have examined the types of *P. horni* Leconte and *P. fuchsi* Casey. The holotypes of both species are ordinary *P. horni* females. The *P. horni* box in the Casey collection contained 4 males, while the *P. fuchsi* box contained 3 females. Since Casey evidently had not seen Leconte's type, he must have thought the males to be *P. horni* and mistook the females for a new species. His key to the species is a good key to the sexes and was responsible for my own early recognition of sexual dimorphism in this species. The differences in prothorax shape are shown in Fig. 1.

P. horni is more variable in size and color than the other throscid species I have examined. The generic characters, especially the abdominal sulci, make recognition of *P. horni* easy.

Distribution: *Pactopus horni* is restricted to the Pacific coast of North America and is found in areas of abundant rainfall (Fig. 2). I have examined about 750 specimens from the following localities:

CANADA. BRITISH COLUMBIA: Beaverfoot Range, Bowser, Copper Mountains, Cowichan Lake, Creston, Gordon Head, Hoquiam, Kamloops, Marysville, Nanaimo, Royal Oak, Salmon Arm, Sanca, Soanich District, Summerland, Terrace, Vancouver, Vernon, Victoria, Wellington, "Wigwaw Inn", Wynndel.

UNITED STATES. CALIFORNIA: Alta Sierra, Amador County, Ben Lomond, Breckenridge, Big Sur, Bear Valley, Bull Creek (Humboldt County), Chester, Cisco, Carrville (Trinity County), Cresent City, Carmel, Deer Lodge (Humboldt County), Fort Bragg, Felton, Fresno, Green Point, Guerneville, Hillcrest, Hobart Mills, Johnsville, Lagunitas, La Honda, Lake Almanor, Lake Arrowhead, Meadow Valley, Mendocino, Mineral, Miami, Mokelumne Hill, Muir Woods (Marin County), Mill Valley, Nevada County, Norval Flats (Lassen County), Orick, Portola State Park (San Mateo County), Pacific Grove, Peavine Creek, (El Dorado County), Pebble Beach, Pine Crest, Postpile Camp (Tehama County), Quincy, Redwood Canyon (Alameda and Contra Costa Counties), Riverton, Sausalito, San Bernardino Mountains, San Simeon, Santa Cruz, Sequoia National Park, Sierraville, Sonoma County, Soquel Creek (Santa Cruz County), South Fork Kings River Canyon (Fresno County), Sugar Pine, Tallac, Taylorville, Tom's Place, Trout Meadow, (Tulare County), Truckee, Van Duzen River (Humboldt County), Weott, Westwood Hills, Whitehall, Yosemite Valley, Yuba Pass. IDAHO: Krassel, Moscow, Naples, Orofino. NEVADA: no other data. OREGON: Albany, Astoria, Bear Springs, Blodgett, Bly, Bridge Camp (Myrtlewood), Brookings, Cannon Beach, Carlton, Charleston, Chiloquin, Copper, Corvallis, Crater Lake National Park, Dayton, Dead Indian Soda Spring (Jackson County), Forest Grove, Garibaldi, Hood River, Humbug Mountain State Park (Curry County), Kane, Klamath Falls, Lake of Woods-Ashland Road (Jackson County), Lakeside, Lakeview, McCredie Spring, MacDonald State Forest (Benton County), McMinneville, Marshfield (Coos Bay), Marys Peak (Benton County), Metolius River, Mount Hood, Newberg, Newport, Oak Creek (Benton County), Odessa Creek, Olney, Pistol River (Curry County), Portland, Quartz Pass, Roseburg, Salem, Sandlake, Saint Helens, Scappoose, Springfield, Sulphur Springs (Benton County), Three-mile Creek, Upper Klamath Lake (Klamath County), Tygh Valley, Waldport, Walterville, Warner Canyon, Wheatland Ferry, Winchester Bay. WASHINGTON: Baring, Bosewallips River (Olympic National Park), Chehalis County, Chinook, Cooks, Easton, Everett, Falls City, Fort Lewis, Forks, Hoh River (Olympic National Park), Ilwaco, Lake Cushman, Monroe, Nasel River, North Bend, Paradise Park (Mount Ranier), Peshastin Creek, Ocean Park, Olympia, Port Angeles, Port Ludlow, Pullman, Quinault, Renton (Cedar River), Seattle, Soda Spring, Spokane, Thomas Lake (Stevens County).

Biology

Little is known about the life history or ecology of *Pactopus*. The adults are found on vegetation or at lights on warm evenings in spring and summer. The remainder of the time they may be found in deep leaf or needle litter by berlesing or other suitable techniques. Dr. W. F. Barr sent me 16 males and 18 females of *P. horni* which he collected as pupae under a debarked log in a heavily burned area near Naples, Idaho, 5-X-1969. The larvae of this species are unknown.

Acknowledgements

I am happy to acknowledge the following curators who loaned specimens: G. E. Ball, University of Alberta; W. F. Barr, University of Idaho; E. C. Becker, Canadian National Collection; G. W. Byers, University of Kansas; H. S. Dybas, Field Museum of National History; M. G. Emsley, Academy of Natural Sciences of Philadelphia; R. L. Fischer, Michigan State University; S. Frommer, University of California, Riverside; K. Goeden, Oregon Department of Agriculture; W. J. Hanson, Utah State University; M. H. Hatch, University of Washington; C. L. Hogue, Los Angeles County Museum; M. T. James, Washington State University; J. D. Lattin, Oregon State University; J. F. Lawrence and P. J. Darlington, Harvard University; H. B. Leech, California Academy of Sciences; L. D. Newsom, Louisiana State University; L. L. Pechuman, Cornell University; Dr. J. G. Rozen, Jr., American Museum of Natural History; M. W. Sanderson, Illinois Natural History Survey; R. O. Schuster, University of California, Davis; G. G. E. Scudder, University of British Columbia; C. A. Triplehorn, Ohio State University; and F. G. Werner, University of Arizona.

J. Schuh and J. F. Cornell loaned specimens from their personal collections. J. F. Lawrence, P. J. Darlington, and T. J. Spilman extended every courtesy while I was examining type specimens in their care. I thank J. D. Lattin and P. O. Ritcher for their help and advice during the course of this investigation. I have also profited from discussions with J. F. Cornell. My wife, Dana, prepared the illustrations and assisted in various other ways. Newell Younggren, Department of Biological Sciences, University of Arizona, provided funds for preparation of the map while I was a student in his department.

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Book Review

Grzimek's Animal Life Encyclopedia. Vol. 2 Insects. 1975. Van Nostrand Reinhold Co., 450 W. 33rd St., New York, New York 10001. $29.95 each volume, $325.00 for the 13 volume set. (First published in Switzerland in 1969). Edited by: Franz Bachmaier, Wolfgang Dierl, Eberhard Ernst, Bernhard Grzimek, Hubert Markl, Werner Rathmayer, Peter Rietschel, Friedrich Schaller, Richard zur Strassen, Heinz Wundt, and Fritz Zumpt. Scientific editor: Erich Klinghammer; Translator: M. A. Biederman-Thorson; Scientific consultant: Ross H. Arnett, Jr.

This is one of the volumes in a beautiful set of encyclopedias covering the entire animal kingdom; others include 1) lower animals, 3) mollusks and echinoderms, 4) fishes I, 5) fishes II and amphibians, 6) reptiles, 7-9) birds, 10-13) mammals.

The Coleoptera are treated on pages 231 to 308, authored by R. zur Strassen. There are 12 gorgeous plates of beetles painted by K. Grossmann and 8 plates of color photos. The figure numbers are not arranged in order, causing some confusion when trying to locate a specific figure.

Misspellings of scientific names were noted in figure legends (e.g., page 248, fig. 8, *Choirotonus* should be *Cheirotonus*) and in the systematic section at the end. Some incorrect names were noted (e.g., page 251, fig. 4, *Dynastes gideon* should be *Xylotrupes*). The Coleoptera section contains little new information, and falls short in attempting to treat the whole Order in such a small amount of space. Only because of popularity, and not because of importance, do birds rate 3 vols. and mammals rate 4 vols. However, the treatment is well-done, although most examples are European.

The Stylopidae are treated as a specialized family of Coleoptera. One statement made regarding the family is completely unsupported and seems to be useless speculation to me: " . . . only about 400 species have been described so far, one can expect that there will be about 1000 altogether."

There is a "systematic classification" section on pages 537-561 which does little to clarify and appears to do nothing but list a few examples of genera and species in a few families. I believe it could have been omitted in its present form without any great loss.

There is a valuable dictionary of common names in English, German, French, and Russian. This occupies pages 565-618 and is the most complete such list that I know about. It would be useful if other languages could be added in future editions. There is a set of metric conversion tables which, although useful, occupy space that could have enlarged treatment of the Coleoptera.

One great disappointment is the section on supplemental reading (p. 625-627). Although an encyclopedia is usually thought of as the most ex-tensive treatment of a subject, it cannot hope to cover the more than 1 million insects. Therefore some emphasis should be placed on sending the reader to monographs, books, and periodicals which can complete the picture. Very few references are listed and these seem to have been randomly chosen. General works which are conspicuously absent are: Arnett's "Beetles of the United States"; Borror and White's "Field guide to the insects", Klot's "Field guide to the butterflies", etc. At the same time Lutz's (1935) "Field guide to the insects" is listed, along with such specialized items as Selander and Mathieu's 1969 paper on ecology, behavior, and anatomy of the *albida* group of *Epicauta*. Ironically a half page was left blank (p. 627) at the end of 2½ pages of references. Surely that space could have been put to good use by listing more books and monographs.

Although most of my remarks have been critical so far, I believe this to be a valuable addition to any entomologist's library. It is certainly pleasant to see such a beautiful volume (and set) offered at a reasonable price, when so many recent volumes are bleeding the scientific community.

—R. E. Woodruff

REVISION OF NEARCTIC MYCETOPHAGIDAE (COLEOPTERA)

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ABSTRACT

The family Mycetophagidae is composed, in the Nearctic region, of 26 species in the following 5 genera (numbers of species in parentheses): *Mycetophagus* (15), *Litargus* (6), *Berginus* (3), *Typhaea* (1), and *Thrimolus* (1). Keys are provided to all taxonomic units, several species are synonymized, and one new species of *Mycetophagus* is described.

INTRODUCTION

Since there is so much confusion as to the limits of both genera and species of the Nearctic Mycetophagidae, keys are here presented, a number of names are placed in synonymy, and one new species is described. Two genera, *Lendomus* Casey and *Myrmechixenis* Chev., included by Arnett (1968), are here removed, since they have been found to belong to other families. For a discussion of *Tilargus* Casey, as recognized by Sharp (1902), see under *Litargus*.

Key to Genera

1. Head across eyes nearly as wide as pronotum; pronotum as wide at anterior as at posterior angles; antennal club two-segmented .... *Berginus*

1′. Head across eyes much narrower than pronotum; pronotum narrowed anteriorly; antennae without a club or if club is present it is composed of 3 or more segments 2

2(1′). Basal angles of pronotum well defined; length more than 1.4mm 3

2′. Basal angles of pronotum broadly rounded; length less than 1.3mm .... *Thrimolus*

3(2). Length more than 3.1mm; eyes transverse; sinuate in front; epipleural fold horizontal and flat .... *Mycetophagus*

3′. Length 3.1mm or less (except 4.5mm in *Litargus grandis*); eyes more rounded, not sinuate in front; antennal club three-segmented 4

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[1]This article is published posthumously. The manuscript was essentially completed at the author's death in Dec. 1973. It has been organized and submitted for publication by John F. Lawrence, Museum of Comparative Zoology, Harvard Univ., where the Parsons collection reposes.

[2]The numbers used for distributions represent major regions of North America adopted by the North American Beetle Fauna Project (1—Northeast; 2—Southeast; 3—Southwest; 4—Northwest; 5—North Central). The two-letter state abbreviations are from the same project (modified from those of the U. S. Post Office; note that NK indicates Nebraska and NB New Brunswick).—(J. F. Lawrence)

4(3′). Epipleural fold concave and descending except in *didesmus* and some *sexpunctatus*; elytra with pale markings; length 1.5-2.8mm (4.5mm in *Litargus grandis*) .... *Litargus*

4′. Epipleural fold horizontal and flat; elytra unicolorous; length 2.5-3.1mm .... *Typhaea*

Mycetophagus Hellwig

Mycetophagus Hellwig, 1792, in Schneider Neuest Mag. Ent., 1:394.

TYPE OF GENUS: *Mycetophagus quadrimaculatus* Hellwig = *quadripustulatus* Linnaeus.

Except for the Holarctic *Mycetophagus quadriguttatus* and European *multipunctatus* there is no correlation between the subgenera of *Mycetophagus* in Europe and North America. According to a recent review by Vogt (1967), 10 European *Mycetophagus* are arranged in the following subgenera: *Ulolendus* Reitter (*atomarius* Fabricius, *decempunctatus* Fabricius, *piceus* Fabricius, *salicis* Brisout), subg. *Mycetophagus (quadripustulatus* (Linnaeus), *ater* (Reitter)), subg. *Mycetoxides* Motschulsky (*fulvicollis* Fabricius), subg. *Ilendus* Casey (*multipunctatus* Fabricius), subg. *Parilendus* Casey (*quadriguttatus* Müller), subg. *Philomyces* Ganglbauer (*populi* Fabricius). I have examined the above species in the American and British Museums of Natural History.

According to the subgenera proposed by Casey (1900) for the Nearctic *Mycetophagus*, the European species would be arranged as follows: subg. *Mycetophagus (ater, atomarius, decempunctatus, piceus, quadripunctatus,* and *salicis*; subg. *Ilendus (fulvicollis, multipunctatus*); subg. *Parilendus (quadriguttatus, populi*). Therefore Casey's subgenera are not entirely natural and are used here chiefly for convenience in keying to species. Also *Mycetophagus pluriguttatus* LeConte is anomalous in having very different genitalia.

Key to Subgenera of Nearctic *Mycetophagus*

1. Antennae gradually incrassate toward apex, with 3, 4, or 5 segments before the terminal segment more or less distinctly subserrate (Fig. 36-39) .... *Mycetophagus* s. str.

1′. Antennae forming a 3, 4, or 5-segmented club which may be strongly or very feebly differentiated, bilaterally symmetrical (Fig. 40-49) 2

2(1′). Antennae with a very feebly differentiated subparallel 5-segmented club (Fig. 40-42) .... *Ilendus* Casey

2′. Antennae with a 3 or 4-segmented club 3

3(2′). Antennae with feeble 4-segmented club (Fig. 44) ...... *Parilendus* Casey

3′. Antennae with feebly to distinctly developed 3-segmented club (Fig. 45-49) .... *Gratusus* Casey

Subgenus *Mycetophagus* s. str.

1. Apical antennal segment longer than 2 preceding combined, antennal segments 7-10 subserrate; length 4.6-6.3mm .... *punctatus* Say

1′. Apical antennal segment usually shorter but may be as long as the 2 preceding combined; length 3.0-4.6mm 2

2(1′). Elytra with pale markings involving the suture from basal 0.2 to 0.6; apical antennal segments 7-10 feebly subserrate, more distinctly so in the male (Fig. 37) .... *flexuosus* Say

2′. Elytra with pale markings not reaching the suture 3

3(2′). Each elytron with a large pale humeral spot and a smaller transverse pale spot at apical third, not attaining the suture or margin; antennal segments 8-10 feebly subserrate; length 3.5-4.9mm; western North America east to Utah ...... *californicus* Horn

3′. Each elytron with very variable pale markings but not as above (Fig. 9-16); antennal segments 5-10 distinctly subserrate (Fig. 39); eastern North America west to Texas, Oklahoma, Nebraska, and Manitoba .... *serrulatus* (Casey)

Subgenus *Ilendus* Casey

1. Elytra conjointly at least twice as long as wide; pronotal disc deeply punctate, nearly all punctures of uniform size 2

1′. Elytra conjointly distinctly less than twice as long as wide; pronotal disc less deeply punctate, punctures may be of various sizes 3

2(1). Length 4.3-4.6mm; color above piceous to black; elytra with pale markings, intervals with rows of short and a row of longer pubescence; median lobe in profile apparently thicker (Fig. 60) .... *melsheimeri* LeConte

2′. Length 4.7mm; color uniformly black above; pubescence short, sparse, and not arranged obviously in rows; median lobe in profile apparently thinner (Fig. 61)................. *obscurus* LeConte

3(1′). Color above uniformly brown to black; punctures on pronotal disc of 2 intermixed sizes separated by less than their diameters; averaging smaller, 3.2-4.5mm (Fig. 41) .... *pini* Ziegler

3′. Color above brown to black; elytra with pale markings; punctures not as above; averaging larger, 3.2-4.9mm 4

4(3′). Punctures on pronotal disc of nearly uniform size, separated by 2 to 3 times their diameters; lateral margins of prothorax not serrulate; each elytron with a large oblique basal pale spot beginning at humerus and a large transverse pale spot at apical 0.66, occasionally the 2 spots join along the suture (Fig. 18, 19, 42); length 3.9-4.9mm .... *distinctus* Hatch

4′. Punctures on pronotal disc of various sizes separated on average by less than their diameters, occasionally with finer punctures which are separated by at least their diameters; lateral margins of prothorax serrulate; pale markings of elytra variable and complex (Fig. 20-22, 43); length 3.2-4.7mm .... *pluripunctatus* LeConte

Subgenus *Parilendus* Casey

Strongly convex; dark brown; each elytron with a large pale humeral spot, a transverse pale spot at 0.6, a small lateral spot at middle, and often a pale round spot near suture at basal 0.25 (Figs. 23, 44); each elytral interval with a row of longer hairs; length 3.3-4mm .... *quadriguttatus* P. Müller

Subgenus *Gratusus* Casey

1. Each elytron with about 11 rows of punctures; larger, length 4.2-5.5mm 2
1′. Each elytron without rows of punctures; smaller, length 3.3-4.2mm; about 8 pale spots on each elytron with 3 of the spots centered in a circle of 6 spots on the 2 elytra (Fig. 24, 45) .... *confusus* Horn

2(1). Pair of basal pronotal foveae very obsolete 3
2′. Pair of basal pronotal foveae deep and elongate, nearer the sides than center and nearer the base than length of scutellum. Color above may be uniformly rich dark brown or the pronotum may be rufous to dark brown and the elytra blackish; elytra may be immaculate or with yellow markings as in Fig. 25-31; punctures on pronotum may be nearly of uniform size or somewhat variable; male protibia with blunt tooth at middle of inner edge; length 4.3-5.8mm .... *pluriguttatus* LeConte

3(2). Pronotal lateral margins serrulate; punctures on pronotal disc deep and coarse, the largest punctures at least twice as large as eye facets; punctures on prosternum and hypomeron dense, deep and coarse, about 3 times eye facets 4
3′. Pronotal lateral margins not serrulate; punctures on pronotal disc very fine and variable in size, the largest punctures about same size as eye facets; punctures on prosternum and hypomeron very dense and fine, about same size as eye facets; first ventral segment of male with brush of hairs; color above dark brown to black, each elytron with 5-7 small yellow or grayish spots (Fig. 32, 33, 47); length 4.2-5.5mm .... *tenuifasciatus* Horn

4(3). First ventral segment of male without a brush of hairs, color above black, each elytron with large oblique y-shaped yellowish spot not including the humerus, a zigzag transverse yellowish spot at apical third, a yellowish spot near apex, and a small yellowish spot at side at middle; length 4.9-5.3mm (Fig. 34, 48) .... *obsoletus* (Melsheimer)
4′. First ventral segment of male with broad brush of yellow hairs; color above dark brown, each elytron with small obscure pale yellow or grayish markings formed by the pubescence, the elytra beneath the pale pubescence being at most only slightly more pale; length 4.2-5.2mm (Fig. 35, 49) .... *praetermissus* n. sp.

Mycetophagus punctatus Say
Fig. 1-3, 36

Mycetophagus punctatus Say, 1826, Proc. Acad. Nat. Sci. Philadelphia 5:260.

Type: from eastern United States, presumably Pennsylvania since J. F. Melsheimer was the collector, lost.

Distribution: 1(QU,ON,NH,VT,NY,CT,NJ,PA,MD,DC,MI,IL,WI); 2(NC,TN,GA, LA); 3(TX,CA); 4(ID); 5(KS,MO,MB).

Mycetophagus flexuosus Say
Fig. 4-6, 37

Mycetophagus flexuosus Say, 1826, Proc. Acad. Nat. Sci. Philadelphia 5:260.
Type: from eastern United States, lost.
Distribution: 1(QU,ON,ME,NH,VT,MA,NY,NJ,PA,DC,MD,OH,IL,MI,WI); 2(VA, WV,NC,KY,GA,FL,LA,AR); 3(TX); 5(MO,IA,NK,ND,MB,MT).

Mycetophagus californicus Horn
Fig. 7, 8, 38

Mycetophagus californicus Horn, 1878, Proc. Am. Philos. Soc. 17:603-4.
Type: lectotype from Lake Tahoe, California, no. 3219 [MCZ]. Examined. A syntype with same data in LeConte collection [MCZ].
Mycetophagus provensis Casey, 1916, Mem. Coleoptera 7:175. **New Synonymy**.
Type: female from Provo, Utah, no. 37495 [USNM]. Examined.
Another teneral female [CAS], evidently collected with the type, certainly confirms the above synonymy.
Distribution: 3(CA); 4(UT,NV,ID,OR,WA,BC); 5(WY).

Mycetophagus serrulatus (Casey)
Fig. 9-16, 39

Tritoma serrulata Casey, 1900, Journ. New York Ent. Soc. 8:132.
Type: male from Virginia, no. 37493 [USNM]. Examined.
Tritoma picta Casey, 1900, J. New York Ent. Soc. 8:132. **New Synonymy**.
Type: female and female paratype from New York, no. 34490 [USNM]. Examined.
Tritoma subdepressa Casey, 1900, J. New York Ent. Soc. 8:132. **New Synonymy**.
Type: male and male paratype presumably from Indiana, no. 37491 [USNM]. Examined.
Mycetophagus quadralius Casey, 1916, Mem. Coleoptera 7:172. **New Synonymy**.
Type: male from Southern Pines, North Carolina and 2 female paratypes from Asheville, North Carolina, no. 37494 [USNM]. Examined.
Mycetophagus tribalteatus Casey, 1916, Mem. Coleoptera 7:173. **New Synonymy.**
Type: female from Southern Pines, North Carolina, no. 37492 [USNM]. Examined.
Distribution: 1(QU,ON,VT,NY,OH,IN,IL,WI); 2(VA,WV,NC,TN,GA,FL,AR, MS, LA); 3(TX,OK); 5(NK,MB).

Four of Casey's names are here suppressed because the variations do not appear to segregate in any logical manner. Even Casey's diagnosis of *serrulatus* is not valid since he separates that species by its serrulate pronotal margins. But this character appears in 1 paratype of *quadralius*, is very evident from beneath in the type of *pictus*, and turns up in other specimens which disagree with *serrulatus* in other characters. Casey separates *subdepressus* by stating that the 3rd and 4th antennal segments are equal. But in the type the 4th segment is shorter than the 3rd. Also this species is defined as depressed but this condition is due to being gently squashed, since the apices of the

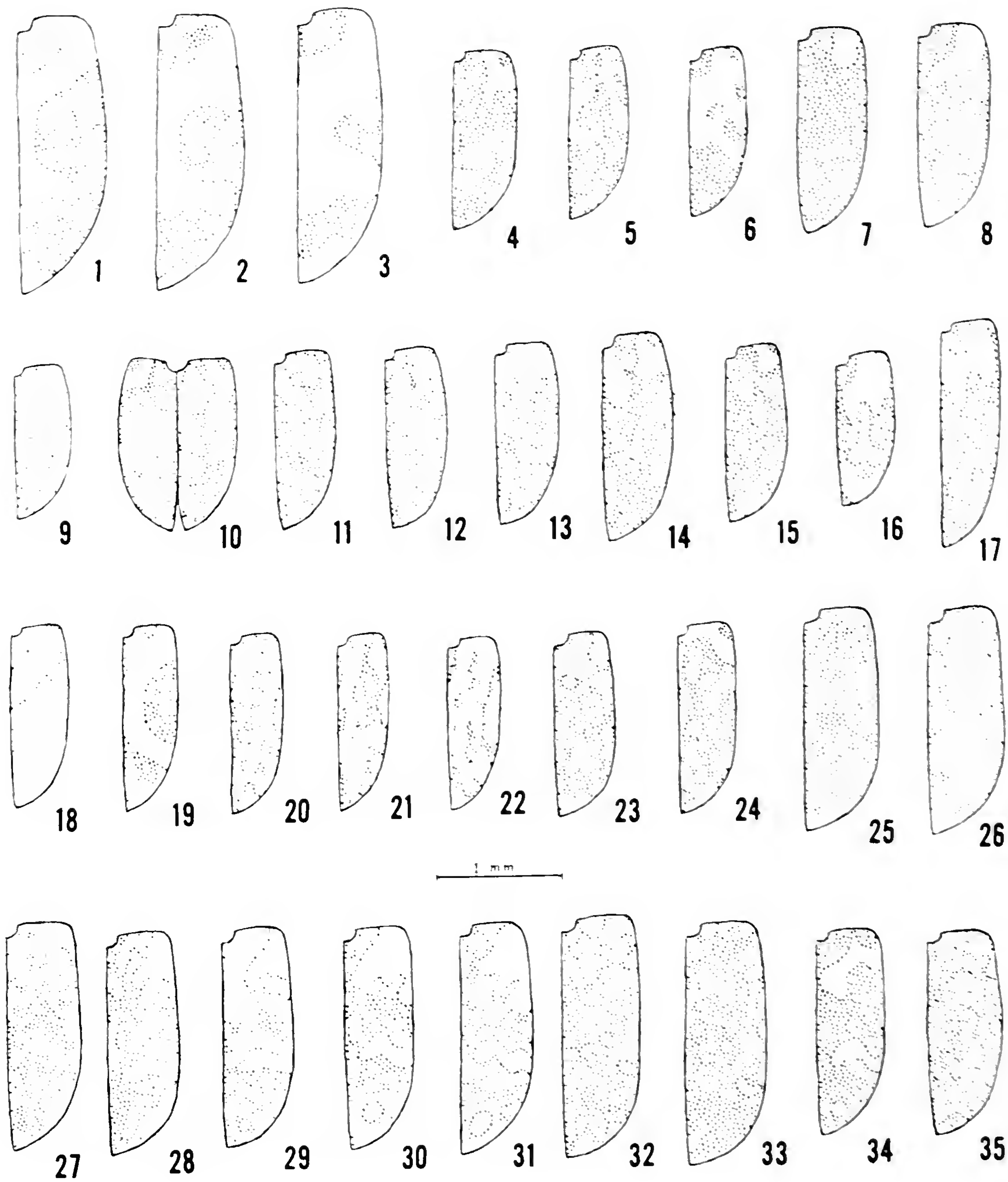

Fig. 1-35. Nearctic *Mycetophagus*, right elytron: 1-3. *M. punctatus*. 4-6. *M. flexuosus*. 7-8. *M. californicus*. 9-16. *M. serrulatus* (9, holotype of *quadralius*; 10, paratype of *quadralius*; 11, holotype of *subdepressus*; 12, paratype of *subdepressus*; 13, holotype of *tribalteatus*; 14, holotype of *pictus*; 15, holotype of *serrulatus*; 16, example from Dallas, Georgia). 17. *M. melsheimeri*. 18-19. *M. distinctus*. 20-22. *M. pluripunctatus*. 23. *M. quadriguttatus*. 24. *M. confusus*. 25-31. *M. pluriguttatus* (25-27, variation *"franciscanus"*; 28-31, typical *pluriguttatus*). 32-33. *M. tenuifasciatus*. 34. *M. obsoletus*. 35. *M. praetermissus* (paratype).

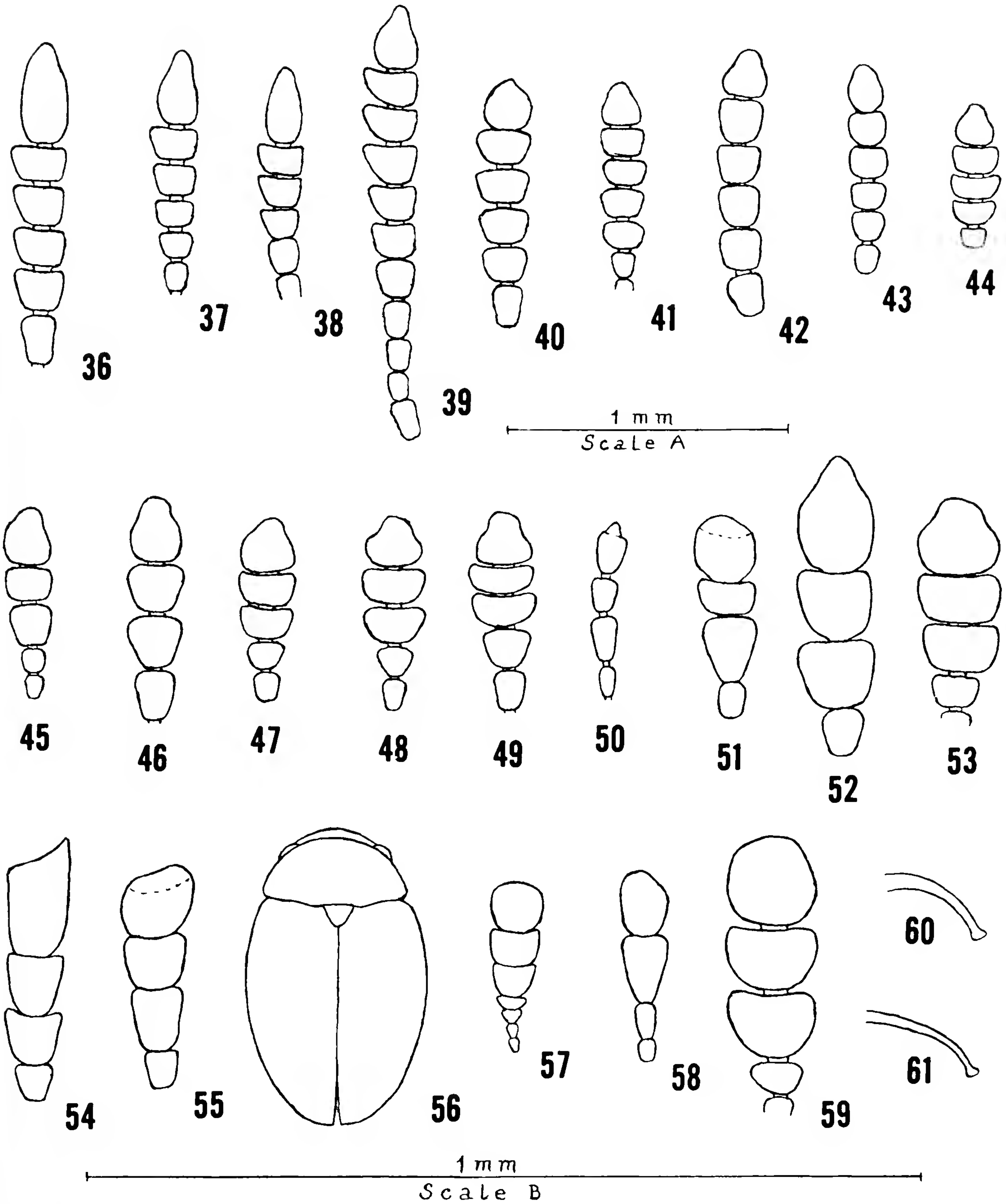

Fig. 36-49. Nearctic *Mycetophagus*, apical antennal segments: 36. *M. punctatus*, male. 37. *M. flexuosus*, male. 38. *M. californicus*, female. 39. *M. serrulatus*. 40. *M. melsheimeri*, male. 41. *M. pini*, female. 42. *M. distinctus*, male. 43. *M. pluripunctatus*, female. 44. *M. quadriguttatus*, female. 45. *M. confusus*, female. 46. *M. pluriguttatus*, male. 47. *M. tenuifasciatus*, female. 48. *M. obsoletus*, female. 49. *M. praetermissus*, male (holotype).

Fig. 50-55. Nearctic *Litargus*, apical antennal segments: 50. *L. grandis*, male. 51. *L. tetraspilotus*, male. 52. *L. sexpunctatus*, female. 53. *L. didesmus*, female. 54. *L. balteatus*, female. 55. *L. nebulosus*, male. Fig. 56. *Thrimolus minutus*. Fig. 57. *T. minutus*, apical antennal segments. Fig. 58. *Berginus pumilus*, apical antennal segments. Fig. 59. *Typhaea stercorea*, apical antennal segments. Fig. 60. *Mycetophagus melsheimeri*, median lobe, lateral view. Fig. 61. *M. obscurus*, median lobe, lateral view. Fig. 36-50, 56 enlarged to scale A. Fig. 51-55, 57-59 enlarged to scale B. Fig. 60, 61 not to scale.

elytra are turned outward in both the type and paratype. Casey also separates his species on the basis of elytral markings. The complete range of variation of elytral markings covered by Casey's types (Fig. 9-15) are shown by a series collected by P. W. Fattig, 19-VII-1942 at Dallas, Georgia [USNM]. From the same series a further extreme of pale markings is shown by Fig. 16. Fig. 9 (*quadralius*) and 14 (*pictus*) apparently represent extremes of allometric growth found also among other species.

Mycetophagus melsheimeri LeConte
Fig. 17, 40, 60

Mycetophagus melsheimeri LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:13.

Type: male from Pennsylvania, no. 6846 in LeConte coll. [MCZ]. Examined.

Distribution: 1(MD,PA); 2(VA,SC,GA,AL,MS,LA); 3(TX); 5(IA).

Mycetophagus obscurus LeConte
Fig. 61

Mycetophagus obscurus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:13.

Type: male from Georgia, no. 6847, in the LeConte Coll. [MCZ]. Examined.

Distribution: known only from the type and 1 specimen without locality label from Levette in the Casey coll. [USNM].

LeConte (1878:604) may have been correct in making *obscurus* a synonym of *melsheimeri*. But in addition to the key characters *obscurus* seems to differ in being larger and more coarsely punctate.

Mycetophagus pini Ziegler
Fig. 41

Mycetophagus pini Ziegler, 1845, Proc. Acad. Nat. Sci. Philadelphia 2:270.

Type: specimen with orange disc = southern states and name label in LeConte coll. [MCZ]. Examined. Although not fully colored it is here designated lectotype.

Distribution: 1(NJ,DC,MD,IN); 2(NC,SC,GA,AL,FL,MS,LA,AR); 3(TX).

Mycetophagus distinctus Hatch
Fig. 18, 19, 42

Mycetophagus distinctus Hatch, 1962, Beetles Pacific Northwest 3:227.

Type: from Seattle, Washington. Paratypes from Idaho, Oregon, and British Columbia, all at the University of Washington.

Distribution: 4 (ID,OR,WA,BC); 5(WY,MB,SA,AB).

Mycetophagus pluripunctatus LeConte
Fig. 20-22, 43

Mycetophagus pluripunctatus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:13.

Type: male with orange disc = southern states, no. 6848 in LeConte coll. [MCZ]. Examined.

Distribution: 1(QU,ON,NH,VT,MA,NY,NJ,DC,MD,OH,IN,IL,MI); 2(VA,WV, NC,LA,AR); 3(TX,OK); 4(BC); 5(MO,KS,IA).

This is a particularly variable species; some specimens from Quebec and Michigan in particular have unusually fine and sparse punctation above and on the hypomeron. Also the prothorax may be less convex and the posterior pronotal angles more prominent.

Mycetophagus quadriguttatus P. Müller
Fig. 23, 44

Mycetophagus quadriguttatus P. Müller, 1821, *in* Germar, Mag. Zool. 4:198.
Mycetophagus pubescens Stephens, 1830, Illustr. Brit. Ent. Mand. 3:87.
Mycetophagus variegatus Sahlberg, 1837, Ins. Fenn. 2:168.
Mycetophagus bimaculatus Melsheimer, 1844, Proc. Acad. Nat. Sci. Philadelphia 2:114. **New Synonymy**.

Type: 2 syntypes on 1 pin with name label and asterisk in Melsheimer coll. [MCZ].

Mycetophagus bipustulatus Melsheimer, 1844, Proc. Acad. Nat. Sci. Philadelphia 2:114. **New Synonymy**.

Type: with pink disc = middle states and name label in LeConte coll. [MCZ] is here designated lectotype.

Mycetophagus bisignatus Melsheimer, 1853, Cat. Descr. Coleopt. U. S.:47. Incorrect subsequent spelling.

Type: specimen with name label and asterisk in Melsheimer coll. [MCZ] is here designated lectotype.

Distribution: Holarctic. Nearctic: 1(NB,QU,ON,NH,VT,MA,NY,PA,IL, MI,WI); 2(NC,AR); 3(TX,CA); 4(ID,OR,BC); 5(IA,MB,NK,WY,SA,AB).

Mycetophagus confusus Horn
Fig. 24, 45

Mycetophagus confusus Horn, 1878, Proc. Amer. Phil. Soc. 17:605.

Type: from Colorado, no. 3220, in Horn coll. [MCZ]. Examined.

Mycetophagus arizonensis Schaeffer, 1910, J. New York Ent. Soc. 18:211-212. **New Synonymy**.

Type: from Huachuca Mts., Arizona, not examined. One evident paratype given by Schaeffer [USNM]. Examined.

Distribution: 3(NM,AZ); 5(CO).

This species is aptly named, since it was unknown to Casey who placed it in *Parilendus*. Thus Schaeffer, to whom it was also unknown, did not realize that *confusus* belonged in *Gratusus*.

Mycetophagus pluriguttatus LeConte
Fig. 25-31, 46

Mycetophagus pluriguttatus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:13.

Type: from San Jose, California, in LeConte coll. [MCZ]. Examined.
Mycetophagus pluriguttatus franciscanus Van Dyke, 1939, Pan-Pacific Ent. 15:17-18. **New Synonymy**.

Type: from hills behind Oakland, California, no. 4768 [CAS]. Paratype with same data examined.

Distribution: 3(CA); 4(OR,WN,ID,BC); 5(MT).

Van Dyke (1939) states: "More typical bicolored *pluriguttatus* is generally found more inland, especially in the Sierra Nevada Mountains. Once or twice I have found the coastal subspecies with more or less well defined subapical elytral light markings but never with pattern approaching that of the typical form." After examining a large series from the California Academy of Sciences and University of British Columbia, I find the above statement not to hold true. I have figured 7 variations in elytral pattern, all chosen from coastal examples. Fig. 25-27 represent "*franciscanus*" and Fig. 28-31 represent "*pluriguttatus*." Other characters intergrade in a random manner, and the elaborately developed male genitalia appear identical throughout the series.

Mycetophagus tenuifasciatus Horn
Fig. 32, 33, 47

Mycetophagus tenuifasciatus Horn, 1878, Proc. Amer. Phil. Soc. 17:604.

Type: male from Colorado, lectotype no. 3221, in Horn coll. [MCZ]. Examined.

Mycetophagus notatulus Casey, 1900, J. New York Ent. Soc. 8:133-134. **New Synonymy**.

Type: female from British Columbia, no. 37496 [USNM]. Examined.

Distribution: 1(QU,ON,NH,MI); 4(BC); 5(CO,AB).

For years I separated *tenuifasciatus* and *notatulus* on the basis of size (less than 4.8 or more than 5.0mm), color of elytral spots, pronotal shape, and elytral punctation, but examination of a large series from the University of British Columbia has shown that these differences are illusory.

Mycetophagus obsoletus (Melsheimer)
Fig. 34, 48

Tetratoma obsoletus Melsheimer, 1844, Proc. Acad. Nat. Sci. Philadelphia 2:113.

Type: female from Pennsylvania. Specimen with name label in LeConte coll. [MCZ] is here designated lectotype. Examined.

Distribution: 1(NY,NJ,PA,DC,MD,OH,IN); 2(VA,NC,GA,FL,AR); 3(TX,OK).

Mycetophagus praetermissus Parsons, **New Species**
Fig. 35, 49

Color uniformly dark brown with a tendency for the labrum and anterior part of clypeus to be paler. Covered with short, fine, brown pubescence which becomes pale, forming yellow markings laterally and anteriorly on pronotum; many small, pale markings on elytra (fig. 35); pubescence on underside tending to be paler, especially on the ventral abdominal segments.

A convex species, about as convex as *quadriguttatus* and *obsoletus*, distinctly more convex than *tenuifasciatus*. Antennal club 3-segmented (Fig. 49) but occasionally the 8th segment is enlarged so that club appears feebly 4-segmented. Vertex with coarse, nearly contiguous punctures. Pronotum with length/width as 1/1.6(1.5-1.7); lateral margins finely serrulate, strongly arcuate; hind angle forming an angle of about 110°, with a pair of vague central foveae, another vague fovea at posterior margin at middle, and the usual pair of obsolete foveae very near the posterior margin and a little nearer the hind angles than the middle. Surface of pronotum with dense, deep punctures separated by their diameters and about twice as large as eye facets, intervals densely punctulate. Elytra conjointly with width/length as 1/1.56 (1.4-1.6), with 11 rows of punctures arranged in striae, the intervals irregularly, densely, asperately punctate. When fully developed, elytral markings are as in Fig. 35, but may be reduced. The markings caused by pale yellow pubescence which may appear grayish under certain conditions. The surface beneath the pale pubescence may be somewhat more pale. Hypomeron and prosternum equally densely, coarsely punctate, the punctures separated by about their diameters and about as large as the large punctures on the pronotum. First ventral abdominal segment of male with a brush of yellow hairs as wide as width of procoxa. Length: holotype male 4.6 mm; allotype female 4.8mm; paratype male 4.2mm; 4 female female paratypes 4.6-5.2mm.

Holotype male, Brookline, Norfolk Co., Massachusetts, 9-IX-1895; allotype, same locality, 24-VIII-1895; both from Bowditch Collection [MCZ]. Paratypes: 2 females, Brookline, Mass., 24-VII-1891 [MCZ]; 1 female, Marquette, Marquette Co., Michigan, 29-VI [LeConte Collection, MCZ]; 1 male Eagle River, Keweenaw Co., Michigan, Hubbard and Schwarz coll. [USNM]; 1 female, Rock[away] B[each], Long Island, New York, 27-V-1916, Ernest Shoemaker [USNM].

This species appears most nearly related to *obsoletus*, but *obsoletus* has a smaller 8th antennal segment, lateral margins of prothorax less arcuate and with narrower anterior angles, surface between large punctures on pronotum and elytra more finely and sparsely punctate so that the surface appears shining, and very different elytral markings. Also, *obsoletus* lacks the male ventral brush, which is also present in *tenuifasciatus*, a species which is more depressed and more finely punctate.

Litargus Erichson

Litargus Erichson, 1846, Naturg. Ins. Deutschl. 3:415-416.

TYPE OF GENUS: *Litargus bifasciatus* (Fabricius) = *L. connexus* (Fourcroy).

Casey (1900) proposed 5 subgenera for the few Nearctic species. Until the more than 60 exotic species are studied, these subgenera cannot be correctly applied. Moreover, there are species which do not fit Casey's subgenera. Sharp (1902) recognized *Tilargus* Casey as a distinct genus with *Litargus tetraspilotus* LeConte as genotype. It also seems premature to adopt *Tilargus*.

Key to Nearctic Litargus

1. Length 1.8-2.8mm 2

1′. Length 4.5mm; color above piceus with indistinct pale spots on pronotum and 3 more or less distinct, undulate, transverse rows of pale spots on elytra; antennal club as in Fig. 50; Arizona .... *grandis* Schaeffer

2(1). Each elytron with short, sparse pubescence arranged in about 22 longitudinal rows without any pubescence in between; each elytron with 2 pale spots; pronotum without a pair of foveae near base; antennal club as in Fig. 51 ...... *tetraspilotus* LeConte

2′. Each elytron with pubescence confusedly arranged, except that in *sexpunctatus* there are in addition 10 rows of longer pubescence; pale spots on elytra not as above 3

3(2′). Each elytron with fine, dark pubescence and with 10 rows of longer yellow hairs (not always clearly evident); each elytron with 3 pale spots; a pair of feeble, elongate foveae on pronotum, nearer the center than sides and nearer base than length of scutellum; antennal club as in Fig. 52 ......*sexpunctatus* (Say)

3′. Each elytron without any pubescence arranged in rows and with markings not as above 4

4(3′). Epipleurae flat and horizontal; apical antennal segment broadly rounded at tip; each elytron with basal pale spot, which is joined (sometimes obscurely) near suture to a transverse pale spot beyond middle; pronotum and elytra asperately punctate; antennal club as in Fig. 53........ *didesmus* Say

4′. Epipleurae concave and descending externally; elytra with markings not as above 5

5(4′). Antennal segment 11 as long as 9th and 10th combined; pronotum and elytra with variable pale markings; antennal club as in Fig. 54 .... *balteatus* LeConte

5′. Antennal segment 11 a little longer than 10th; pronotal punctures feebly elevated and subannulate; each elytron testaceous with incomplete piceous fasciae; antennal club as in Fig. 55........ *nebulosus* LeConte

Litargus grandis Schaeffer
Fig. 50

Litargus grandis Schaeffer, 1910, J. New York Ent. Soc. 18:212-213.

Type: from Huachuca Mountains, Arizona, not examined. An evident male paratype presented by Schaeffer in 1913 [USNM]. Examined.

Distribution: known only from the type locality.

Litargus tetraspilotus LeConte
Fig. 51

Litargus tetraspilotus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:14.

Type: male from southern states, in LeConte collection [MCZ]. Examined.

Distribution: 1(QU,ON,NH,VT,NY,MA,RI,NJ,PA,MD,OH,MI,WI); 2(VA,WV,NC,SC,TN,GA,FL,LA); 3(TX); 5(IA,MO,KS,NK).

Litargus sexpunctatus (Say)
Fig. 52

Mycetophagus sexpunctatus Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:261.
Type: from United States, lost.
Litargus 6-punctatus var. *obsolescens* Casey, 1900, J. New York Ent. Soc. 8:135. **New Synonymy**.
Type: female from New Jersey, no. 37498 in Casey collection [USNM]. Examined.
Distribution: 1(ON,VT,MA,NY,NJ,DC,MD,PA,OH,IN,IL,MI,WI); 2(VA,NC,TN, FL,LA,AR); 3(TX); 5(MO,NK).

Litargus didesmus (Say)
Fig. 53

Mycetophagus didesmus Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:261.
Type: from United States, lost.
Litargus asperulus Casey, 1900, J. New York Ent. Soc. 8:136. **New Synonymy**.
Type: female from Dakota, no. 37499 in Casey collection [USNM]. Examined. Two paratypes from Kansas are actually *nebulosus*.
Distribution: 1("Canada" VT,MA,NY,NJ,DC,MD,PA,IL,WI); 2(VA,WV,KY, NC,GA,FL,MS,LA,AR); 3(TX); 5(MO,IA, "Dakota").

Litargus balteatus LeConte
Fig. 54

Litargus balteatus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:14.
Type: male from "Colorado River, California near the junction of the Gila" no. 6851 in the LeConte collection [MCZ]. Examined.
Litargus transversus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:14. **New Synonymy**.
Type: from San Jose, California, no. 6854 in the LeConte collection [MCZ]. Examined.
Litargus infulatus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:14.
Type: female from Illinois in the LeConte collection [MCZ]. Examined.

Actually *balteatus* is the third name proposed on the same page, but since it has been in use for so long, it should be retained. Casey considered *transversus* a variety, since it is larger, more elongate-oval, more depressed, and generally darker in color. Zimmerman (1939) felt that it was premature to recognize *transversus*. I prefer to consider *balteatus* an unusually variable species.

Distribution: Cosmopolitan; 1(VT,PA,DC,MD,OH,IN,IL,WI); 2(FL,LA,AR); 3(TX,NM,AZ,CA); 4(UT); 5(KS,NK,IA); Hawaiian Islands [CAS].

Litargus nebulosus LeConte
Fig. 55

Litargus nebulosus LeConte, 1856, Proc. Acad. Nat. Sci. Philadelphia 8:15.
Type: female from Maryland, no. 6853 in LeConte collection [MCZ]. Examined.

Litargus longulus Casey, 1916, Memoirs Coleoptera 7:174-175. **New Synonymy**.

Type: from Las Cruces, New Mexico, no. 37500 in the Casey collection [USNM]. Examined.

Litargus pallens Casey, 1916, Memoirs Coleoptera 7:175. **New Synonymy**.

Type: female from the Catskill Mts., New York, no. 37501 in the Casey collection [USNM]. Examined.

The color is variable; *longulus* is unusually dark and *pallens* is a very pale teneral.

Distribution: 1(NY,NJ,PA,MD,DC,WI); 2(WV,TN,GA,FL); 3(TX,NM); 4(UT); 5(KS,CO,NK).

Typhaea stercorea (Linnaeus)
Fig. 54

Dermestes stercorea Linnaeus, 1758, Syst. Nat., ed. 10:357.

Type: from Europe, in horse dung.

Dermestes fumata Linnaeus, 1767, Syst. Nat., ed. 12:564. For complete synonymy, see Hetschko, 1930, Coleopt. Cat., pars. 108:19-20.

Distribution: Cosmopolitan. 1(ME,VT,MA,NY,NJ,DC,IN,IL); 2(SC,NC,GA,FL,AR); 3(TX,AZ,NM,CA,BJ); 4(ID,OR,WA,BC); 5(IA,MO,KS,CO,WY).

Thrimolus Casey

Thrimolus Casey, 1900, Jour. New York Ent. Soc. 8:137.

TYPE OF GENUS: *Thrimolus minutus* Casey.

Thrimolus minutus Casey
Fig. 56, 57

Thrimolus minutus Casey, 1900, J. New York Ent. Soc. 8:137-138.

Type: from Columbus, Texas, no. 37502 in Casey collection [USNM]. Examined.

Thrimolus duryi Casey, 1916, Mem. Coleoptera 7:176-177. **New Synonymy**.

Type: from Cincinnati, Ohio, in Casey collection [USNM]. Examined.

Distribution: 1(DC,PA,OH,IN); 2(FL); 3(TX).

The length of the type of *minutus* is 1.0mm, not .78mm as originally stated or .68mm as corrected under the description of *duryi*. The length of *duryi* is given as .78, whereas it is about 1.0mm. Under *duryi* is the explanation of why so many of Casey's measurements are too short. Casey stated that he was "forced to estimate dimensions by a scale and reading glass, and the apparent length and width of these very small objects depend very much upon the relative distances of the beetle, scale and eye." I cannot see the other differences mentioned by Casey. Length varies from 1.0-1.2mm.

Berginus Erichson

Berginus Erichson, 1846, Naturg. Ins. Deutschl. 3:405.

TYPE OF GENUS: *Berginus tamarisci* Wollaston.

Key to Nearctic *Berginus*

1. Pronotum with a longitudinal impression on each side. Each elytron with 5 rows (counting the sutural margin) of heavier, squamate, cinereous pubescence (often rubbed off) arising along feeble costae, the coarse punctures in rows made confused by transverse rugae .... *pumilus* LeConte
1′. Pronotum without a longitudinal impression on each side. Each elytron with seriately arranged, moderately coarse punctures bearing much finer pubescence and lacking the transverse rugae 2

2(1′). Antennae reddish brown. Bahamas, Cuba, Florida .. *bahamicus* Casey
2′. Antennae black. Central America to extreme southern Texas.. .... *nigricolor* Champion

Berginus pumilus LeConte
Fig. 58

Berginus pumilus LeConte, 1863, Smiths. Misc. Coll. 167:72-73.
Type: from Pennsylvania, in LeConte collection [MCZ].
Berginus californicus Pierce, 1939, Bull. S. Calif. Acad. Sci.:53. **New Synonymy**.
Type: from El Segundo, California. Not examined.
Distribution: 1(?PA); 3(CA,BJ).

Pierce separated *californicus* because LeConte stated that in *pumilus* the thorax was longer than wide, the length was 2.0mm, and the type locality Pennsylvania. None of these reasons is valid. John Lawrence kindly examined the 2 syntypes and found that the thorax is actually about as long as wide or perhaps even a little wider than long, and the length is 1.8 and 1.9mm. In a series of 67 specimens [CAS], the length varies from 1.5-1.9mm, and the prothorax of both sexes has the length/width ratio 1/1.05 (1/1.00-1/1.06). Since I know of no other eastern examples, the type locality is at least questionable. All of the many specimens examined are from Los Angeles and San Diego Counties, California, and Baja California south to Bahia Tortugas.

Berginus bahamicus Casey

Berginus bahamicus Casey, 1900, J. New York Ent. Soc. 8:129.
Type: from Eleuthera Island, Bahama Islands, in the Casey collection [USNM]. Examined.
Distribution: Key West, Florida; Cayamas, Cuba; Long Island, Bahamas [USNM].

Although Casey describes the color as blackish, most specimens I have seen are reddish-brown (possibly teneral).

Berginus nigricolor Champion

Berginus nigricolor Champion, 1913, Trans. Ent. Soc. London:117.
Type: syntypes from Guatemala, Nicaragua, and Panama [BM] [USNM]. Not examined.
Distribution: In addition to the types, Champion recorded a mutilated example provisionally as *nigricolor* in dead cotton bolls from Browns-

ville, Texas [USNM]. Although this record may be adventitious, *nigricolor* is so widespread as to be expected along Mexico's northern boundary. Five specimens were examined from Maria Madre Indian Village, Tres Marias Islands, Mexico [CAS]. These differ from *pumilus* in being more slender, averaging smaller (1.4-1.5mm), as well as in the key characters. It is possible that *nigricolor* is not specifically distinct from *bahamicus*.

Acknowledgments

Specimens in the collections of the following individuals and institutions were studied (abbreviations are given for those cited in text): Academy of Natural Sciences, Philadelphia, Pa.; American Museum of Natural History, New York, N. Y.; J.-C. Aube Rigaud, Quebec; British Museum (Natural History), London, England [BM]; California Academy of Sciences, San Francisco, Calif. [CAS]; Canadian National Collection, Ottawa, Ontario; C. Chantal, Quebec, Quebec; Field Museum of Natural History, Chicago, Ill.; H. Howden, Ottawa, Ontario; J. Laliberte, Ste-Foy, Quebec; Museum of Comparative Zoology, Harvard University, Cambridge, Mass. [MCZ]; J. Neal, Nacogdoches, Tex.; Ohio State University, Columbus, Ohio; W. D. Shepard, Frederick, Md.; G. Stace Smith Collection, University of Washington, Seattle, Wash.; United States National Museum, Washington, D.C. [USNM]; University of Arkansas, Fayetteville, Ark.; University of British Columbia, Vancouver, B.C.; University of Wisconsin, Madison, Wisc.

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DESIGNATION OF HOLOTYPES AND LECTOTYPES AMONG GROUND BEETLES (COLEOPTERA, CARABIDAE) DESCRIBED BY THOMAS L. CASEY[1]

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Introduction

Thomas L. Casey (1857-1925) was an army engineer by profession, but from the year 1884 and, especially, after his retirement in 1912, he devoted most of his time to the study of Coleoptera, describing more than 9,000 species, subspecies, and varieties, mostly from North America.

In the carabid family (excl. Cicindelinae) 1,376 Casey names were listed as distinct North American species in Leng's Catalogue (1920, with 1st suppl., 1927). Of these, I have studied 897 on earlier occasions (notably accounted for in the papers of 1954, 1955, 1961-69), and 5 more species are treated in the present paper. The result is that only 81 names should be regarded as valid for good species. Casey's concept for this unit was apparently considerably different, not only from that of our time, but also from that of his contemporaries and most older authors.

Casey frequently used the term "type" with reference to his new species, but he did not label any specimens as such, except 5 species described in 1884 (now sunk into synonymy) within the genus *Harpalus* (see *H. convictor, H. canonicus, H. lustralis, H. aenescens,* and *H. placidus*). This was carried out after his death, when the collection had been moved to the National Museum, Washington, D.C., by L. L. Buchanan who re-arranged the entire collection (see Buchanan 1935; Blackwelder 1950).

Buchanan marked 1 specimen, almost constantly the first of each Casey taxon series (species, subspecies, or variety) as "Type," and often 1 or more additional specimens as "Paratypes," those "evidently examined by Casey at the time of the original description" (Buchanan 1935:8).

Buchanan's "Type" and "Paratype" labels, though applied with utmost skill, unfortunately are not valid (Intern. Code Zool. Nomencl. 1961, Article 72 a.f.): a) because the inaccurate term "Type" should be replaced by either *Holotype* or *Lectotype* (and the "Paratypes," if considered necessary, changed into Paralectotypes); b) because such designations are not valid unless published.

Consequently, though virtually all 902 Casey names I have studied in Carabidae have already been interpreted (1961-69, etc.), in part already by earlier authors, the first (or valid) specimen of each taxon erected by Casey had to be labeled either as Holotype or as Lectotype, and the information accompanying the specimen (notably geographical provenance) had to be published. This was a somewhat tedious but quite necessary task, performed during 2 visits at the U.S. National Museum, 23-25 September 1972, and 23 September through 1 October 1973.[2]

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Restriction of the investigation

As mentioned above, I have studied only about two-thirds of the carabid taxa described by Casey from North America (902 in number). All species and taxa of lower rank originally known from Canada and/or Alaska, and most of the ones from the northern parts of the U.S.A. proper, are among these. A Holotype or Lectotype has been labeled as noted below, except in some groups, for which more competent specialists have already done or are available to do this, namely: a) *Tachys* and related genera (T. L. Erwin 1974a, 1974b); b) the tribe *Licinini* (G. E. Ball); c) subgenus *Cryobius* of genus *Pterostichus* (G. E. Ball); and d) in the subtribe *Anisodactyli* (Anisodactylina) among the *Harpalini* (G. R. Noonan 1968, 1973) had already designated types in several species, and these are omitted here. A few other cases where I have refrained from type designation are mentioned under the pertinent genus below.

Casey publications

The taxa here treated were described in the following papers:

1884 a, 1885. Contributions to the descriptive and systematic coleopterology of North America. I. II. Philadelphia. p. 1-198.
1884 b. Notes on Coleoptera. Bull. Brooklyn Ent. Soc. 7:64-67.
1897. Coleopterological notices. VII. Ann. New York Acad. Sci. 9:287-684.
1905. A new *Carabus* and *Cychrus,* with miscellaneous notes on Coleoptera. Canadian Ent. 37:160-164.
1909. Studies in the Caraboidea and Lamellicornia. Ibid. 41:252-284.
1913. Memoirs on the Coleoptera. 4:1-400.
1914. Memoirs on the Coleoptera. 5:1-387.
1916. Memoirs on the Coleoptera. 7:1-300.
1918. Memoirs on the Coleoptera. 8:1-427.
1920. Memoirs on the Coleoptera. 9:1-529.
1924. Memoirs on the Coleoptera. 11:1-347.

Arrangement of information

The original genus names used by Casey were followed but the species are arranged in the order of my "Ground-Beetles of Canada and Alaska" (1961-69). Leng's Catalogue (1920, 1927) was regarded as too antiquated for the purpose. Then, under each taxon, the following information is given:
(a) reference to the original description;
(b) number of specimens labeled as "Type" or "Paratype" (by L. L. Buchanan);
(c) locality label of the "Type", often in abbreviated form, as used by Casey. (The symbol "L", = Levette collection, was often doubtfully translated in the description as meaning Colorado or Indiana.);
(d) possible disagreement between "Type" and Casey's original description;
(e) decision whether a *Holotype* or a *Lectotype* should be designated;
(f) valid name according to present opinion (as a rule with reference to a paper, where Casey's name was synonymized).

As *Holotype* a specimen is available only under the condition that Casey himself expressly stated the original description to have been based on a single individual. Under all other circumstances, even if the species is represented by a single specimen in Casey's collection, a *Lectotype* must be selected.

The 4 kinds of "types" have been abbreviated as a single bold-face letter, as follows: **T** = "Type"; **P** = "Paratype"; according to L. L. Buchanan's labeling (and almost without exception conspecific).

H = Holotype; **L** = Lectotype; according to my own decision. Paralectotypes have not been marked.

The species

Trachypachus oregonus (1920:145). Female **T** and female **P**, Oregon. **T** designated as **L**. - *T. holmbergi* Mnh. (Van Dyke 1925:112).

T. specularis (1920:146). Male **T**, 2 **P**, L. Tahoe, Calif.; 7 ex. from Idaho & Oreg., not marked as P. **T** = **L**. - *T. holmbergi* Mnh. (Van Dyke 1925:112).

T. alticola (1920:144). Male **T**, male **P**, L. Tahoe, Calif. **T** = **L**. - *T. gibbsi* Lec. (Lth. 1961:4).

Genus *Omophron*: The Casey names were interpreted according to the revision by Benschoter & Cook (1956) (Lth. 1961:9-13), and I do not feel entitled to make type designations.

Genus *Scaphinotus* (incl. *Brennus*): No types were designated. The Casey forms studied by me belong to *marginatus* Fisch. (Lth. 1961:22-24), as subspecies, at most, and require further studies.

Cychrus pustulosus (1905:160). Single male **T**, Washington State, = **H**. - *C. tuberculatus* Harris (Roeschke 1907).

The forms of *Carabus* described by Csy., either as subspecies or species near *taedatus* F. (1913:57-59; 1920:153-155) all have infraspecific rank (Lth. 1961:38-39). Designation of types should be postponed until the population biology of *taedatus* has been properly studied.

In *Calosoma* I have not designated types for forms described by Csy. as subspecies under the correct species name. (See Gidaspow 1959).

Calosoma comes (1920:156). Male **T**, "N.W.T." (N.W. Territory, Canada), = **H**. - *C. calidum* F. (Breuning 1928:84).

C. concreta (1920:157). Male **T**, "Canada", = **H**. - *C. calidum* F. (Breuning 1928:84).

C. pellax (1920:160). Male **T**, without loc., = **H**. - *C. tepidum* Lec. (Breuning 1928:88; Gidaspow 1959:263).

C. semicuprea (1920:161). Male **T** without loc., = **H**. - *C. tepidum* Lec. (Breuning 1928:88; Gidaspow 1959:263).

C. cogitans (1920:161). Female **T**, Stockton, Utah, = **L**. - *C. tepidum* Lec. (Breuning 1928:88; Gidaspow 1959:263).

Callisthenes concinnus (1913:66). Male **T**, Priest L., Idaho, = **L**. - *Calosoma moniliatum* Lec. (Gidaspow 1959:305).

Leistus nigropiceus (1913:45). Female **T**, 6 **P**, Metlakatla, B.C. **T** = **L**. - *L. ferruginosus* Mnh. (Lth. 1954b:46).

L. longipennis (1920:148). Female **T**, Humboldt Co., Calif., = **H**. - *L. longipennis* Csy. (Lth. 1961:57; Erwin 1970).

Pelophila shermani (1913:45). Female **T**, 4 **P**, W. St. Modest, Labr. As described by Csy., the "Type" alone has rufinistic elytra; it may therefore be regarded as **H**. - *P. borealis* [cf. Nebria catenata.] *ulkei* Horn (Bänninger 1930:101).

Nebria cuneata (1913:50). Male **T**, 3 **P**, Alaska. **T** = **L**. - *N. gregaria* Fisch. (Lth. 1961:66-67).

N. arkansana (1913:52). Male **T**, 1 **P**, "Indiana"; 2 **P**, "S. Arkansas"; 1 **P**, "Levette coll.". **T** = **L**. - The locality labels are obviously wrong and a new type locality, Valley Upper San Juan, Colorado, was designated (Lth. 1961:70-71). - *N. arkansana* Csy.

N. fragilis (1924:21). Male **T**, male **P**, North Fork, Provo Cañon, Utah. **T** = **L**. - *N. fragilis* Csy.

N. testaceipes (1913:54). Male **T**, Glenora, B.C., = **H**. - *N. obtusa* Lec. (Hatch 1953:59).

N. incerta (1913:53). **T** (sex ?), "Color." (Levette coll.), 1 **P**, "Indiana" (probably wrong, *fide* Csy.). **T** = **L**. - *N. obliqua* Lec. (Lth. 1961:73).

N. texana (1913:54). Male **T**, Texas, = **H**. - *N. obliqua* Lec. (Lth. 1961:73).

N. nimbosa (1920:150). Female **T**, L. of the Clouds, Mt. Washington, N. H., = **H**. - *N. suturalis* Lec. (Lth. 1954a:122).

N. oregona (1913:52). Male **T**, 2 **P**, Clackamas, Oreg. **T** = **L**. - *N. mannerheimi* Fisch. (Hatch 1953:58; Lth., 1961:74).

N. corvallis (1924:20). Male **T**, Corvallis, Oreg., = **L**. - *N. mannerheimi* Fisch. (Hatch 1953:58).

N. hippisleyi (1924:21). Male **T**, Terrace, B.C., = **H**. - *N. mannerheimi* Fisch. (Lth. 1961:74).

N. tenuipes (1913:51). Female **T**, Alameda, Calif.; male **P**, Clackamas, Oreg. **T** = **L**. - *N. eschscholtzi* Mén. (Hatch 1939:121; Lth. 1961:75).

N. transversa (1920:152). Female **T**, Corvallis, Oreg., = **H**. - *N. eschscholtzi* Mén. (Hatch 1953:58).

N. formalis (1920:153). Female **T**, 3 **P**, Wawawai, Wash. **T** = **L**. - *N. eschscholtzi* Mén. (Hatch 1953:58).

N. pallidissima (1924:19). Male **T**, female **P**, Wawawai, Wash. **T** = **L**. - *N. eschscholtzi* Mén. (Hatch 1953:58; Lth. 1961:75).

N. pugetana (1924: 1 female). Female **T**, Wawawai, Wash., = **L**. - *N. eschscholtzi* Mén. (Hatch 1953:58; Lth. 1961:75).

N. townsendi (1924:19). Female **T**, Port Townsend, Wash., = **L**. - *N. diversa* Lec. (Hatch 1953:59).

N. brevis (1913:55). Male **T**, Corvallis, Oreg.; 4 **P**, other Oreg. loc.:s. **T** = **L**. - *N. virescens* Horn (Hatch 1939:120; Lth. 1961:76).

N. lacustris (1913:56). Female **T**, Bayfield, Wisc.; 2 **P**, Wisc. & Minnes. **T** = **L**. - *N. lacustris* Csy.

N. expansa (1913:56). Female **T**, Texas; female **P**, "L" (= Levette coll.; the record Indiana, given by Csy. is unreliable). **T** = **L**. - Regarded as synonym of *lacustris* Csy. (Lth. 1961:77) but possibly at least subspecifically distinct (Bell in litt.).

N. labradorica (1920:151). Female **T**, 5 **P** (3 of which later, 1924, transferred to *curtulata* Csy.), W. St. Modest, Labr. **T** = **L**. - *N. gyllenhali* Schnh. (Lth. 1955:41; 1961:79).

N. prominens (1920:151). Female **T**, female **P**, Mt. Washington, N.H. **T** = **L**. - *N. gyllenhali* Schnh. (Lth. 1955:40-41).

N. curtulata (1924:20). Male **T**, 2 **P**, W. St. Modest, Labr. **T** = **L**. - *N. gyllenhali* Schnh. (Lth. 1954a:122).

N. reducta (1920:150). Female **T**, 6 **P**, labeled St. Paul Isl., Alaska. **T** = **L**. The type locality is probably wrong (Lth. 1961:24, 81). - *N. frigida* R. F. Sahlb. (Lth. l.c.).

N. catenata (1913:49). Female **T**, 6 **P**: 4 Color., 2 "L" (= Levette coll.). **T** = **L**. - *N. trifaria catenata* Csy. (Erwin and Ball 1972).

N. mobilis (1913:50). Female **T**, 2 **P**, Color. (Levette coll.). **T** = **L**. - *N. purpurata* Lec. (Lth. 1961:86).

N. columbiana (1913:48). Male **T**, Inverness, B.C., = **L.** - *N. kincaidi* Schw. (Darlington 1930:104).

Notiophilus coloradensis (1920:141). Male **T**, Boulder, Color., = **H.** - *N. semistriatus* Say (Lth. 1961:94).

N. evanescens (1913:47). Female **T, 4 P, 1** additional ex. mentioned by Csy., later made "Type" of *coloradensis* (see above), all from Boulder, Color. **T = L.** - *N. simulator* Fall (Csy. 1914:356; cancelled 1920:141) (Lth. 1961:97).

N. directus (1920:142). Female **T,** "L" (Levette coll.), female **P,** "Iowa, Keokuk & vic.". **T = L.** - Csy. recorded Indiana and Iowa, both equally improbable; Jasper, Alta., therefore chosen as type loc. (Lth. 1961:98). - *N. directus* Csy.

N. sierranus (1920:140). Female **T**, L. Tahoe, Calif., = **H.** - *N. obscurus* Fall, dwarf specimen (Lth. 1961:98).

N. parvus (1920:142). Female **T**, Catskill Mts., N.Y., = **L.** - *N. novemstriatus* Lec. (Lth. 1961:101).

Blethisa hudsonica (1924:18). Male **T**, female **P**, plus 2 additional ex., all Edmonton, Alta. **T = L.** - *B. multipunctata aurata* Fisch. (Lth. 1954:15).

B. columbica (1909:277). Male **T**, Brit. Col., = **L.** - *B. oregonensis* Lec. (Hatch 1953:62).

Elaphrus politus (1897:345; nec Lec. 1850:209). Female **T** and 2 **P,** San Francisco. **T = L.** - *E. laevigatus* Lec. (Van Dyke 1925:113).

E. rhodeanus (1924:17). Female **T**, Boston Neck, R.I., = **L.** - *E. cicatricosus* Lec. (Lth. 1961:114).

E. devinctus (1920:139). Female **T**, Wray, Color., = **L.** - *E. lecontei* Crotch (Lth. 1961:114).

E. spissicornis (1924:18). Female **T**, Parowan, Utah, = **L.** - *E. lecontei* Crotch (Lth. 1961:114).

E. bituberosus (1924:17). Male **T**, Terrace, B.C., = **L.** - *E. americanus* Dej. (Lth. 1961:115).

E. hesperius (1920:138). Female **T**, Mendocino Co., Calif.; 10 **P** from several loc.:s in Calif. **T = L.** - *E. californicus* Mnh. (Lth. 1961:118).

E. texanus (1924:17). Female **T**, Galveston, Tex., = **L.** - *E. ruscarius* Say (Lth. 1961:119).

Loricera uteana (1920:147). Female **T**, Provo, Utah, = **L.** - *L. pilicornis* F. (Lth. 1961:123).

Promecognathus debilis (1897:346). **T** (sex ?), Sta. Cruz, Calif., = **H.** - *P. laevissimus* Dej. (Lth. 1961:127).

P. contractus (1913:94). Female **T**, labeled Napa Co., Calif., and therefore not designated (the description says "Lake Co."). The specimen is larger than Casey's measure (greater than 11 instead of 9.7 mm) and not a male; this adds to the probability that it is not the original insect. - *P. crassus* Lec. (Lth. 1961:128).

P. corpulentus (1913:94). **T** (sex ?), "Calif., Mar." (? = March) (Monterey, acc. to the description), = **L.** - *P. crassus* Lec. (Lth. 1961:128).

P. grandiceps (1913:94). **T** (sex ?), Calif., = **L.** - *P. crassus* Lec. (Lth. 1961:128).

Zacotus angustus (1920:290). Male **T,** Josephine Co., Oreg., = **L.** - *Z. matthewsi* Lec. (Ball 1956).

Patrobus canadensis (1924:67). Male **T**, female **P**, Redwater NE Edmonton, Alta., given as type loc. **T = L.** - *P. lecontei* Chd. (Darlington 1938).

P. labradorinus (1918:395). Male **T**, female **P**, W. St. Modest, Labr. **T = L.** - *P. septentrionis* Dej. (Darlington 1938); by me earlier regarded as a ssp. (Lth. 1955:84; cf. 1961:185-86).

P. minuens (1918:396). Male **T**, W. St. Modest, Labr., = **L.** - *P. septentrionis* Dej. (Darlington 1938).

P. tritus (1920:186). Male **T**, female **P**, Marquette, Mich. (as mentioned by Csy. 1918:396, "*tenuis*"). **T.** = **L.** - *P. septentrionis* Dej. (Darlington 1938).

P. laeviceps (1918:397). Male **T**, W. St. Modest, Labr., = **L.** - *P. foveocollis* Eschz. (Darlington 1938).

P. insularis (1918:397). Female **T**, 12 **P**, labeled as from St. Paul Isl., Alaska, which is doubtful (Lth. 1961:24, 185-86). **T = L.** - *P. foveocollis* Eschz. (Darlington 1938).

Platidius latipennis (1918:399). Male **T**, 2 **P**, Gualala, Mendocino Co.; 2 **P**, Humboldt Co.; Calif. (1 ex. labeled as "P" from Sonoma Co., Calif., not mentioned by Csy.). **T = L.** - *Diplous californicus* Mtsch. (Darlington 1938).

P. incisus (1918:399). Female **T**, male **P**, nr. San Francisco. **T = L.** - *D. californicus* Mtsch. (Darlington 1938).

P. strenuus (1918:400). Male **T**, male **P**, Washington State. **T = L.** - *D. californicus* Mtsch. (Darlington 1938).

P. rectus (1918:400). Male **T**, 1 **P**, Reno, Nev. **T = L.** - *D. californicus* Mtsch. (Darlington 1938).

P. sierranus (1918:401). Male **T**, 2 **P**, Mokelumne Hill, Calaveras Co., Calif.; 10 **P** from Calif. & Nev. **T.** = **L.** - *D. californicus* Mtsch. (Darlington 1938).

P. breviusculus (1918:401). Male **T**, Reno, Nev., = **H.** - *D. californicus* Mtsch. (Darlington 1938).

P. breviceps (1918:402). Male **T**, female **P**, Boulder, Color. **T = L.** - *D. aterrimus* Dej. (Darlington 1938).

P. tenuitarsis (1918:403). Male **T**, 5 **P**, Color. **T = L.** - *D. aterrimus* Dej. (Darlington 1938).

P. coloradensis (1918:403). Male **T**, Red Cliff, Color., = **L.** - *D. aterrimus* Dej. (Darlington 1938).

P. reflexus (1918:403). Female **T**, Color., = **L.** - *D. aterrimus* Dej. (Darlington 1938).

P. filicornis (1918:404). Female **T**, Humboldt Co., Calif., = **L.** - *D. filicornis* Csy. (See Darlington 1938).

Trechus tahoensis (1918:407). Female **T**, female **P**, L. Tahoe, Calif. **T = L.** - *T. chalybeus* Dej. (Lth. 1961:197).

T. saxatilis (1918:408). Female **T**, female **P**, Color. **T = L.** - *T. coloradensis* Schffr. (Lth. 1963:201).

T. pallescens (1918:407, 411). New name for *fulvus* Lec. 1848, nec Dej. 1831. Type, from Madeline Isl., Wisc., in the Lec. coll., MCZ! - *T. apicalis* Mtsch. (Lth. 1963:202).

T. puritanus (1918:407). Male **T**, Fall R., Mass., = **L.** - *T. apicalis* Mtsch. (Lth. 1963:202).

T. rhodensis (1918:408). Male **T**, female **P**, Boston Neck, R.I. **T = L.** - *T. apicalis* Mtsch. (Lth. 1963:202).

T. brumalis (1918:408). Male **T**, W. St. Modest, Labr., = **L.** - *T. apicalis* Mtsch. (Lth. 1963:202).

Bembidion levettei (1918:9). Male **T**, Color., = **L.** - *B. levettei* Csy. (Lth. 1963:231-32).

B. carrianum (1924:23). Female **T**, Edmonton, Alta.; 2 **P**, St. Albert (close to Edmonton), Alta. **T**=**L**. - *B. levettei* Csy. (Lth. 1963:231-32).

B. tristiculum (1924:22). Male **T**, male **P**, S Oreg. **T**=**L**. - *B. zephyrum* Fall (Lth. 1963:233), of which it was described as a subspecies.

B. marginosum (1924:23). Male **T**, female **P**, DelNorte Co., Calif. **T**=**L**. - *B. zephyrum* Fall (Lth. 1963:233).

B. opaciceps (1918:8). Female **T**, "Calif.", =**L** (3 additional ex., 1 Calif., 2 Oreg., do not belong in the type series; Csy. l.c.:9). - *B. inaequale opaciceps* Csy. (Lth. 1962:8).

B. hesperium (1918:9) is a new name for *hesperum* Fall 1910, nec Crotch 1867, and the type, from Vancouver Isl., is in the Fall coll. (MCZ).

B. binarium (1918:9). Male **T**, "Calif.", =**L**. - *B. hesperium* Csy. (Lth. 1963:235).

B. tacomae (1924:22). Male **T**, Wawawai, Wash., =**L**. - *B. lorquini* Chd. (Lth. 1962:9).

B. unicum (1918:12). Female **T**, Laredo, Tex., =**L**. - *B. coxendix* Say (Lth. 1963:243).

B. venator (1918:12). Female **T**, 3 **P**, El Paso, Tex. **T**=**L**. - *B. coxendix* Say (Lth. 1963:243).

B. snowi (1918:12). Male **T**, Kansas, =**L**. - *B. coxendix* Say (Lth. 1963:243).

B. vigilans (1918:13). Male **T**, female **P**, "L" (=Levette coll.; "probably from Indiana", Csy. l.c.). **T**=**L**. - *B. coxendix* Say (Lth. 1963:243).

B. aeneorubrum (1918:11). Female **T**, Ohio, =**L**. - *B. confusum* Hayw. (Lth. 1963:245), of which it was described as a subspecies.

B. marquettense (1918:11). Female **T**, Marquette, Mich., =**L**. - *B. confusum* Hayw. (Lth. 1963:245), of which it was described as a subspecies.

B. integrum (1918:79). Female **T**, male **P**, Texas. **T**=**L**. - *B. integrum* Csy. (Lth. 1963:249).

B. illini (1918:15). Female **T**, Keokuk, Iowa, =**L**. - *B. americanum* Dej. (Lth. 1963:249-50).

B. sufflatum (1918:15). Male **T**, Calif., =**L**. - *B. bifossulatum* Lec. (Lth. 1963:250).

B. cheyennense (1918:15). Male **T**, 2 **P**, Cheyenne, Wyom. **T**=**L**. - *B. bifossulatum* Lec. (Lth. 1963:250).

B. regestum (1918:16). Male **T**, "L" (=Levette Coll.; "probably Color.", Csy. l.c.), =**L**. - *B. bifossulatum* Lec. (Lth. 1963:250).

B. nuperum (1918:16). Male **T**, "L" (=Levette coll.; "almost undoubtedly Color.", Csy. l.c.), =**H**. - *B. bifossulatum* Lec. (Lth. 1963:250).

B. ferreum (1924:24). Female **T**, Iron Co., Utah, =**L**. - *B. bifossulatum* Lec. (Lth. 1963:250).

B. edolatum (1924:24). Male **T**, 2 **P**, Duluth Minnes. **T**=**L**. - *B. nitidum* Kby. (Casey's "*nitidum*" = *obliquulum* Lec.; Lth. 1963:251, 254).

Casey's *josephineum* (1924:25) is described as a "variation" of his *nitidum* (=*obliquulum* Lec.), and the name is therefore not valid.

B. delawarense (1924:24). Male **T**, "Penns.", =**H**. - *B. levigatum* Say (Lth. 1963:254), of which it was described as a subspecies.

B. aleneanum (1918:114). Male **T**, Coeur d'Alene, Idaho, =**L**. - *B. dyschirinum* Lec. (Lth. 1963:255).

B. perturbatum (1918:115). Female **T**, female **P**, Boulder, Color. **T**=**L**. - *B. dyschirinum* Lec. (Lth. 1963:255).

B. agitabile (1918:115). Female **T**, male **P**, Coeur d'Alene, Idaho. **T**=**L**. - *B. dyschirinum* Lec. (Lth. 1963:255).

B. atrolucens (1918:115). Male **T**, Bull Run, Clackamas Co., Oreg., = **L**. - *B. dyschirinum* Lec. (Lth. 1963:255).

B. speculinum (1924:32). Female **T**, Terrace, B.C., = **H**. - *B. dyschirinum* Lec. (Lth. 1963:255).

B. osculans (1918:20). Female **T**, Calif., = **L**. - *B. osculans* Csy. (Marin Co., designated as type loc.; Lth. 1963:259).

B. speculum (1918:20). Female **T**, Marin Co., Calif., = **L**. - *B. osculans* Csy. (Lth. 1963:259).

B. lascivum (1918:21). Male **T**, 2 **P**, L. Tahoe; 1 **P**, Truckee; Calif. **T** = **L**. - *B. erasum* Lec. (Lth. 1963:261).

B. lubricum (1918:21). Male **T**, 7 **P**, Truckee, Nevada Co., Calif. **T** = **L**. - *B. erasum* Lec. (Lth. 1963:261).

B. probatum (1918:22). Female **T**, 7 **P**, Boulder, Color. **T** = **L**. - *B. erasum* Lec. (Lth. 1963:261).

B. castum (1918:20). Male **T** (not female, cf. Csy.), Sta. Cruz, Mts., Calif., = **L**. - *B. castum* Csy. (Lth. 1963:261).

B. serenum (1918:21). Female **T**, Arcata; 3 **P**, Hoopa Valley; both loc.:s in Humboldt Co., Calif. **T** = **L**. - *B. castum* Csy. (Lth. 1963:261).

B. nescium (1918:30). **T** (sex ?), Metlakatla, B.C., = **L**. - *B. castum* Csy. (Lth. 1963:261).

B. brumale (1918:22). Female **T**, 2 **P**, Metlakatla, B.C. **T** = **L**. - *B. brumale* Csy. (Lth. 1963:262).

B. vacivum (1918:22). Female **T** (not male, cf. Csy.), Skeena R., Terrace, B.C., = **L**. - *B. brumale* Csy. (Lth. 1963:262).

B. fabrum (1918:27). Female **T**, Redwood Creek, Humboldt Co., Calif., = **H**. - *B. iridescens* Lec. (Lth. 1963:266).

B. obliviosum (1918:27). Female **T**, 1 **P**, Spokane, Wash. **T** = **L**. - *B. iridescens* Lec. (Lth. 1963:266).

B. volatile (1918:28). Male **T**, Gilroy Hot Springs, Sta. Clara Co., Calif., = **L**. - *B. iridescens* Lec. (Lth. 1963:266).

B. impium (1918:28). Female **T**, male **P**, Agassiz, B.C. **T** = **L**. - *B. iridescens* Lec. (Lth. 1963:267).

B. amicum (1918:29). Male **T**, Hoopa Valley, Humboldt Co., Calif., = **L**. - Described as a subspecies of *parallelecolle* Motsch. Both are simple synonyms of *iridescens* Lec. (Lth. 1963:366-67).

B. deceptor (1918:29). Male **T**, Metlakatla, B.C., = **L**. - *B. iridescens* Lec. (Lth. 1963:267).

B. repens (1918:35). Female **T**, Booneville, Mendocino Co., Calif., = **L**. - *B. iridescens* Lec. (Lth. 1963:267).

B. essexense (1924:26). Male **T**, Keene Heights, Essex Co., N.Y., = **H**. - *B. simplex* Hayw. (Lth. 1963:268).

B. adultum (1918:33). Female **T**, 2 **P**, Truckee, Calif. **T** = **L**. - *B. kuprianovi* Mnh. (Lth. 1963:269-70).

B. dilutum (1918:33). Female **T**, Truckee, Calif., = **L**. - *B. kuprianovi* Mnh. (Lth. 1963:269-70).

B. bucolicum (1918:34). Male **T**, 5 **P**, Stickeen R., B.C. **T** = **L**. - *B. kuprianovi* Mnh. (Lth. 1963:269).

B. expansipenne (1924:26). Female **T**, Shasta Retreat, Siskiyou Co., Calif., = **L**. - *B. nigrocoeruleum* Hayw. (Lth. 1963:271).

B. blanditum (1918:23). Female **T**, Metlakatla, B.C., = **L**. - *B. incertum* Mtsch. (Lth. 1963:273).

B. saturatum (1918:24). Female **T**, Placer Co., Calif., = **L**. - *B. incertum* Mtsch. s.l. (Lth. 1963:273).

B. ampliatum (1918:24). Male **T**, Color., = **L**. - *B. incertum* Mtsch. s.l. (Lth. 1963:273).

B. lividulum (1918:25). Female **T**, Placer Co., Calif., = **L**. - *B. incertum* Mtsch. s.l. (Lth. 1963:273).

B. improvisum (1918:25). Male **T**, Color., = **L**. - *B. incertum* Mtsch. s.l. (Lth. 1963:273).

B. laxatum (1918:24). Male **T** (not female, cf. Lth. l.c.), Placer Co., Calif., = **L**. - *B. laxatum* Csy. (Lth. 1963:274).

B. adumbratum (1918:26). Male **T**, Placer Co., Calif., = **L**. - *B. laxatum* Csy. (Lth. 1963:274).

B. haruspex (1918:31). Female **T**, 6 **P**, Inverness; 5 **P**, Metlakatla; B.C. **T** = **L**. - *B. haruspex* Csy.

B. illex (1918:31). Male **T**, Metlakatla, B.C., = **L**. - *B. quadrifoveolatum* Mnh. (Lth. 1963:275).

B. viator (1918:31). Male **T**, Queen Charl. Isl., B.C., = **L**. - *B. viator* Csy.

B. improvidens (1924:25). Male **T**, Placer Co., Calif., = **L**. - *B. improvidens* Csy. (Lth. 1963:283).

B. solutum (1918:38). Female **T**, San Francisco & vic., = **L**. - *B. planatum* Lec. (Lth. 1955:51-52).

B. adjutor (1918:39). Female **T**, Duncan's Mills, Sonoma Co.; 7 male **P**, from other loc.:s near San Francisco. "The description is drawn from the female" (Csy. l.c.). **T** = **H**. - *B. planatum* Lec. (Lth. 1955:51-52).

B. sierricola (1924:28). Female **T**, Nevada Co., Calif., = **L**. - *B. sierricola* Csy.

B. gratiosum (1918:34). Male **T**, 11 **P** (1 marked "L", = Levette coll., only), Color. **T** = **L**. - *B. gratiosum* Csy. (Lth. 1963:288).

B. turbatum (1918:32). Female **T**, female **P**, Boulder, Color. **T** = **L**. - Subspecies of *B. gebleri* Gebl. (Lth. 1963:290-91).

B. conflictum (1918:32). Male **T**, Red Cliff, Color., = **L**. - *B. gebleri turbatum* Csy. (Lth. 1963:290-91).

B. rusticum (1918:33). Male **T**, Catskill Mts., N.Y., = **H**. - *B. rusticum* Csy. s.str. (Lth. 1963:291-92).

B. notmani (1924:27). Male **T**, Keene Heights, Essex Co., N.Y., = **H**. - *B. rusticum* Csy. s.str. (Lth. 1963:291).

B. flebile (1918:41). Female **T**, Santa Rosa; 7 **P**, Santa Rosa and Santa Clara Co.; Calif. **T** = **L**. - *B. flebile* Csy.

B. timefactum (1918:41). Female **T**, 1 **P**, Soda Springs, Anderson Valley; 1 **P**, Gualala; Mendocino Co., Calif. **T** = **L**. - *B. flebile* Csy. (Lth. 1963:295-96).

B. decrepitum (1918:41). Male **T**, 12 **P**, Color. **T** = **L**. - *B. flebile* Csy. (Lth. 1963:295-96).

B. curtulatum (1918:39). Male **T**, Hoopa valley, Humboldt Co., Calif., = **L**. - *B. ?flebile* Csy. (The specimen is teneral and not identifiable beyond doubt; Lth. 1963:295-96).

B. carolinense (1924:27). Male **T**, Black Mts., N.C., = **H**. - *B. carolinense* Csy.

B. keeneanum (1924:28). Female **T**, Keene Heights, Essex Co., N.Y., = **L**. - *B. carolinense* Csy.

B. vulsum (Lth. 1955:54-55). Female **T**, Catskill Mts., N.Y., = **L**. - *B. planum* Hald. (Lth. 1963:298).

B. filicorne (1918:56). Male **T**, male **P**, Oak Ridge, N.J. **T**=**L**. - *B. planum* Hald. (Lth. 1963:298).

B. champlaini (1918:56). Male **T**, 5 **P**, N. Cumberland, Penns. **T**=**L**. - *B. fugax* Lec. (Lth. 1963:299).

B. facile (1918:48). Female **T**, Illin.,=**L**; 3 supposed **P**, same label, in a different box. - *B. nigrum* Say (Lth. 1963:301-2), of which it was described as a subspecies.

B. morosum (1918:49). Male **T**, Virginia,=**L**. - *B. nigrum* Say (Lth. 1963:301-2).

B. inopinum (1918:51). Male **T**, female **P**, Maine. **T**=**L**. - *B. salebratum* Lec. (Lth. 1963:302).

B. consessor (1918:52). Female **T**, Bluff Point, L. Champlain, N.Y.,=**L**. - *B. salebratum* Lec. (Lth. 1963:302).

B. tartareum (1918:49). Female **T**, Coeur d'Alene, Idaho,=**L**. - *B. quadrulum* Lec. (Lth. 1963:303).

B. porrectum (1918:55). Female **T**, Las Vegas, New Mex.,=**L**. - *B. quadrulum* Lec. (Lth. 1963:303).

B. viridinigrum (1924:31). Male **T**, Govan, Wash.,=**L**. - *B. quadrulum* Lec. (Lth. 1963:303).

B. oblatum (1918:52). Female **T** (plus 2 ex. outside type series), Nevada,=**L**. - *B. recticolle* Lec. (Lth. 1963:304).

B. pertinax (1918:53). Female **T**, Nevada,=**L**. (The 2 further ex. mentioned by Csy. are probably the ones under *oblatum*). - *B. recticolle* Lec. (Lth. 1963:304).

B. umbraticola (1918:54). Female **T**, 3 **P**, Provo, Utah. **T**=**L**. - *B. recticolle* Lec. (Lth. 1963:305).

B. govanicum (1924:31). Male **T**, female **P**, Govan, Wash. **T**=**L**. - *B. nebraskense* Lec. (Hatch, 1953:89; Lth. 1963:312).

B. commotum (1918:23). Female **T**, 2 **P**, L. Tahoe; 6 **P**, Truckee; Calif. **T**=**L**. - *B. commotum* Csy. (syn. *breve* auct. nec Mtsch., Lth. 1963:313).

B. seclusum (1918:23). Male **T**, Placer Co., Calif. (a second ex., from same loc., later added but not labeled as P). **T**=**H**. - *B. commotum* Csy. (Lth. 1963:313).

B. vancouveri (1918:73). Female **T**, male **P**, Victoria, B.C. **T**=**L**. - *B. striola* Lec. (Hatch, 1953:90; Lth. 1963:315).

B. shastanicum (1918:74). Female **T**, 4 **P**, Dunsmuir, Siskiyou Co.; 1 **P** nr. Mt. Diablo; Calif. **T**=**L**. - *B. striola* Lec. (Lth. 1963:315).

B. angustior (1924:33). Male **T**, male **P**, Del Norte Co., Calif. **T**=**L**. - *B. striola* Lec. (P=*B. debilicolle* Csy.) (Lth. 1963:315).

B. modulatum (1924:34). Male **T**, Josephine Co., Oreg.,=**H**. - *B. striola* Lec. (Lth. 1963:315).

B. urgens (1924:35). Female **T**, Modoc Co., Calif.,=**L**. - *B. debilicolle* Csy. (Lth. 1963:318).

B. satelles (1918:71). Female **T**, Truckee, Calif.,=**H**. - *B. satelles* Csy.

B. seductum (1918:66). Female **T**, Eldorado, Color.; male **P**, Color. **T**=**L**. - *B. grapei* Gyll. (Lth. 1963:319); described as a subspecies of *nitens* Lec.

B. insopitans (1918:68). Female **T**, Victoria, B.C.,=**L**. - *B. platynoides* Hayw. (Lth. 1963:322).

B. optatum (1918:69). Female **T**, 6 **P**, Redwood Creek, Humboldt Co., Calif. **T**=**L**. - *B. platynoides* Hayw. (Lth. 1963:322-23).

B. merens (1918:70). Male **T**, Gualala, Mendocino Co., Calif., = **L.** - *B. platynoides* Hayw., immature (Lth. 1963:322-23).

B. militare (1884a:65). The single male **T** (reported by Csy. as lost), from Long Isl., N.Y., is in the Leconte coll. (MCZ) and has been labeled by me as **H.** - *B. lacunarium* Zimm. (Hayward, 1897:83; Lth. 1963:325).

B. histricum (1918:68). Male **T**, "L" (= Levette coll., "probably" Indiana), = **H.** - *B. lacunarium* Zimm. (Lth. 1963:325).

B. nactum (1918:77). Female **T**, nr. New York City, = **L.** - *B. tetracolum* Say (Lth. 1963:331), of which it was described as a subspecies.

B. lepusculum (1918:75). Male **T**, Color., = **H.** - *B. petrosum* Gebl. (Lth. 1963:333-34).

B. castalium (1918:75). Female **T**, 2 **P**, Las Vegas, New Mex. **T** = **L.** - *B. petrosum* Gebl. (Lth. 1963:333-34).

B. exiguiceps (1924:34). Female **T**, Terrace, B.C., = **L.** - *B. petrosum* Gebl. (Lth. 1963:333-34).

B. caducum (1918:80). Male **T,** 3 **P,** Cheyenne, Wyom. **T** = **L.** - *B. obscurellum* Mtsch. (Lth. 1963:338).

B. albidipenne (1918:80). Female **T**, Montrose, Color., = **L.** - *B. obscurellum* Mtsch. (Lth. 1963:338).

B. parowanum (1918:80). Male **T,** 3 probable **P** (in the *caducum* box), **L.** Salt L., Parowan, Utah. **T** = **L.** - *B. obscurellum* Mtsch. (Lth. 1963:338).

B. petulans (1918:81). Male **T**, "Col.?" (Levette coll.), = **H.** - *B. obscurellum* Mtsch. (Lth. 1963:338).

B. sejunctum (1918:79). Male **T**, "between Fort Wingate and Jemez Springs", New Mex., = **L.** - *B. sejunctum* Csy. (Lth. 1963:340).

B. marinicum (1918:57). Female **T**, Marin Co., Calif., = **H.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. sarpedon (1918:58). Male **T**, Cañon City, Color., = **L.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. acomanum (1918:59). Female **T**, 7 **P**, Jemez Springs, New Mex.; 5 **P** from other loc.:s in New Mex, and Utah. **T** = **L.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. excursum (1918:59). Female **T,** Tuçson, Ariz., = **L.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. animatum (1918:62). Female **T**, 3 **P**, Jemez Springs; 1 **P**, Fort Wingate; New Mex. **T** = **L.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. tuolumne (1924:30). Male **T**, Tuolumne Co., Calif., = **L.** - *B. transversale* Dej. s.l. (Lth. 1963:341).

B. salinarium (1918:86). Female **T**, 3 **P**, Parowan; 4 **P**, Provo, Utah. **T** = **L.** - *B. salinarium* Csy.

B. mobile (1918:95). Female **T**, Metlakatla, B.C., = **L.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. semotum (1918:96). Male **T**, Truckee, Calif., = **L.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. nubiferum (1918:96). Male **T**, Duncan's Mills, Sonoma Co., Calif., = **L.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. gulosum (1918:96). Female **T**, Coeur d'Alene, Idaho, = **L.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. oblectans (1924:36). Female **T**, Edmonton, Alta., = **H.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. fortunatum (1924:36). Female **T**, male **P**, Edmonton, Alta. **T** = **L.** - *B. incrematum* Lec. (Lth. 1955:63-64).

B. spissicorne (1924:40). Female **T**, Bellevue, Utah, = **L.** - *B. scudderi* Lec. (Lth. 1963:351).

B. cornix (1918:111). Male **T**, "W.T." (= Washington State), = **L.** - *B. obtusangulum* Lec. (Hatch, 1953:96).

B. dejectum (1884a:67). Male **T**, male **P**, Arizona. **T** = **L.** - *B. dejectum* Csy.

B. fidele (1918:113). Male **T**, Provo, Utah, = **L.** - *B. dejectum* Csy. (Lth. 1963:356).

B. imperitum (1918:91). Male **T**, Victoria, B.C.; 2 **P**, Washington State. **T** = **L.** - *B. coloradense* Hayw. (Lth. 1963:357).

B. prociduum (1918:91). Male **T**, Washington State, = **L.** - *B. coloradense* Hayw. (Lth. 1963:357).

B. amplipenne (1924:36). Female **T**, trout Creek, Juab Co., Utah, = **L.** - *B. coloradense* Hayw. (Lth. 1963:357).

B. albertanum (1924, 40). Female **T**, 3 **P**, Edmonton, Alta. **T** = **L.** - *B. coloradense* Hayw. (Lth. 1963:357).

B. simulator (1918:93). Female **T**, Mt. Diablo, Contra Costa Co.; female **P**, Santa Rosa, Sonoma Co.; Calif. Csy. mentions only Sonoma Co.; therefore **P** = **L.** - *B. approximatum* Lec. (Lth. 1963:359).

B. curiosum (1918:95). Male **T**, San Francisco, = **L.** - *B. indistinctum* Dej. (Lth. 1963:361).

B. devinctum (1918:97). Female **T**, 2 **P**, E of San Francisco ("Alameda", Csy.). **T** = **L.** - *B. indistinctum* Dej. (Lth. 1963:361).

B. extricatum (1918:98). Female **T**, San Diego, Calif., = **L.** - *B. indistinctum* Dej. (Lth. 1963:361).

B. caudex (1918:98). Female **T**, Tehachapi, Calif., = **L.** - *B. indistinctum* Dej. (Lth. 1963:361).

B. barbarae (1918:99). Female **T**, 2 **P**, Sta. Barbara, Calif. **T** = **L.** - By Csy. regarded as a subspecies of *consentaneum* Lec., a syn. of *B. indistinctum* Dej. (Lth. 1963:361-62).

B. sociale (1918:127). Female **T**, Marquette, Mich.; 21 **P** from several states. **T** = **L.** - *B. rapidum* Lec. (Lth. 1963:363).

B. accuratum (1924:39). Male **T**, Edmonton, Alta., = **L.** - *B. semipunctatum* Don. (Lth. 1963:367-68).

B. graphicum (1918:108). Male **T**, Bayfield, Wisc., = **L.** - *B. graphicum* Csy.

B. debiliceps (1918:104). Female **T**, Corvallis, Oreg., = **L.** - *B. debiliceps* Csy.

B. retractum (1918:109). Male **T**, Boulder, Color., = **L.** - *B. nigripes* Kby. (Lth. 1963:369-70).

B. concitatum (1924:35; replacing *nigripes* Csy., 1918:92, nec Kby.). Male **T**, 1 **P**, Marquette, Mich. (5 ex, from other regions should not have been marked as P). **T** = **L.** - *B. nigripes* Kby. (Lth. 1963:370).

B. imitator (1918:105). 1 **T**, 4 **P**, Brit. Col., unrecorded loc.; male **P** no. 2, Kamloops, B.C., selected as **L.** - *B. patruele* Dej. (Lth. 1963:371).

B. monstratum (1918:106). Male **T**, 5 **P**, Highland Park, Illin. **T** = **L.** - *B. patruele* Dej. (Lth. 1963:371).

B. fenisex (1918:106). Male **T**, 1 **P**, "L" (= Levette coll.); **P** no. 1, Indiana, selected as **L.** - *B. patruele* Dej. (Lth. 1963:371).

B. plectile (1918:107). Male **T**, Indiana; 1 **P**, Bayfield, Wisc. **T** = **L.** - *B. patruele* Dej. (Lth. 1963:371).

B. exclusum (1918:109). Male **T**, Highland Park, Illin., = **L.** - *B. patruele* Dej. (Lth. 1963:371).

B. marcidum (1918:110). Female **T**, nr. New York City (2 P seem to be missing). **T**=**L**. - *B. patruele* Dej. (Lth. 1963:371).

B. subexiguum (1924:37). Male **T**, Terrace, B.C.,=**L**. - *B. patruele* Dej. (Lth. 1963:371-72).

B. contristans (1924:37). Male **T**, 1 **P**, Rhode Isl. **T**=**L**. - *B. patruele* Dej. (Lth. 1963:371).

B. thespis (1918:128). Male **T**, Marquette, Mich.,=**L**. - *B. affine* Say (Lth. 1963:376).

B. tolerans (1918:132). Female **T**, 6 **P**, Metlakatla, B.C. **T**=**L**. - *B. versicolor* Lec. (Lth. 1955:70).

B. terracense (1924:41). Male **T**, Terrace, B.C.,=**L**. - *B. versicolor* Lec. (Lth. 1955:70).

B. wisconsinium (1924:41). Female **T**, Bayfield, Wisc.,=**L**. - *B. versicolor* Lec. (Lth. 1963:377).

B. oregonum (1924:42). Male **T**, male **P**, Josephine Co., Oreg. **T**=**L**. - *B. timidum* Lec. (Lth. 1963:378).

B. rotundiceps (1918:132). Female **T**, Long Isl., N.Y., =**L**. - *B. mimus* Hayw. (Lth. 1963:380).

B. pellax (1918:136). Male **T**, female **P**, Boston Neck, R.I. **T**=**L**. - *B. mimus* Hayw. (Lth. 1955:71).

B. impotens (1918:129). New Name for *pictum* Lec. 1848, nec Dft. 1812. Holotype thus in coll. Lec. (MCZ), and so labeled by me. - *B. impotens* Csy.

B. aestivum (1918:129). Male **T**, Highland Park, Illin.,=**L**. - *B. impotens* Csy. (Lth. 1963:380).

B. diligens (1918:114). Male **T**, 3 **P**, Provo, Utah. **T**=**L**. - *B. diligens* Csy.

B. parabile (1918:114). Female **T**, Reno, Nev.,=**L**. - *B. diligens* Csy. (Lth. 1963:382).

B. vilescans (1924:43). Male (*not* female) **T**, Bellevue, Utah,=**H**. - *B. diligens* Csy. (Lth. 1963:382).

B. gregale (1918:148). Female **T**, 3 **P**, Agassiz, B.C. **T**=**L**. - *B. quadrimaculatum dubitans* Lec. (Lth. 1963:384).

B. pugetanum (1918:148; nec Fall, 1916). Male **T**, 7 **P**, "W.T." (=Washington State). **T**=**L**. - *B. quadrimaculatum dubitans* Lec. (Lth. 1963:384).

B. sapphicum (1918:149). Male **T**, 3 **P**, Reno, Nev. **T**=**L**. - *B. quadrimaculatum dubitans* Lec. (Lth. 1963:384).

B. vegetum (1918:151). Female **T**, 4 **P**, Boulder, Color. **T**=**L**. - *B. mutatum* G. & H. (Lth. 1963:386).

B. novellum (1918:113). Male **T**, Truckee, Calif.=**H**. - *B. convexulum* Hayw. (Lth. 1963:392).

B. blaidelli (1918:222). New name for *concinnum* Blaisd. 1902, nec Stephens 1829; type in Calif. Acad. Sci. - *B. roosvelti* Pic (Lth. 1963:392).

B. edomontonense (1924:37). Female **T**, Edmonton, Alta.,=**L**. - *B. transparens* Gebl. (Lth. 1955:75).

B. concretum (1918:156). Female **T**, Marquette, Mich.,=**L**. - *B. concretum* Csy. (syn. *anguliferum* auct. nec Lec; Lth. 1963:395-96).

B. congruens (1918:156). Female **T**, female **P**, Boston Neck, R.I. **T**=**L**. - *B. concretum* Csy. (Lth. 1963:395-96).

B. habile (1918:162). Male **T**, Highland Park, Illin.; male **P**, Marquette, Mich. **T**=**L**. - *B. concretum* Csy. (Lth. 1963:395-96).

B. tersum (1918:162). Male **T**, L. Tahoe, Calif.,=**L**. - *B. anguliferum* Lec. (Lth. 1963:396).

B. umbraticum (1918:158). Male **T,** Marquette, Mich.,=**L.** - *B. fortestriatum* Mtsch. (syn. *cautum* Lec.; Lth. 1963:396-97).

B. peregrinum (1918:159). Female **T,** Queen Charl. Isl.,=**H.** - *B. fortestriatum* Mtsch. (syn. *cautum* Lec.; Lth. 1963:397).

B. canadianum (1924:43). Female **T**, 2 **P**, Edmonton, Alta. **T**=**L.** - *B. canadianum* Csy. (Lth. 1963:399).

B. digressum (1918:155). Female **T**, St. Helena, Calif.,=**L.** - *B. connivens* Lec. (Lth. 1963:401).

B. ampliceps (1918:161). Male **T**, Gilroy Hot Springs, Santa Clara Co., Calif.,=**H.** - *B. ampliceps* Csy. (Lth. 1963:401).

B. siticum (1918:157). Male **T**, Gualala, Mendocino Co., Calif.; 3 **P** from Calif. & Nev. **T**=**L.** - *B. siticum* Csy. (Lth. 1963:402).

B. adolescens (1918:158). Female **T**, Booneville, Mendocino Co., Calif.,=**L.** - *B. siticum* Csy. (Lth. 1963:402).

Amerizus longicornis (1918:166). Male **T**, Sta. Cruz Mts., Calif.,=**L.** - *Bembidion spectabile* Mnh. (Lth. 1963:403-04).

A. crassicornis (1918:165). Male **T**, Inverness, B.C.,=**L.** - *B. oblongulum* Mnh. (Lth. 1963:404).

A. keeni (1918:166). Male **T**, male **P**, Metlakatla, B.C. **T**=**L.** - *B. oblongulum* Mnh. (Lth. 1963:404).

Phrypeus rutilinus (1924:44). Female **T,** 3 **P,** Josephine Co., Oreg. **T**=**L.** - *P. rickseckeri* Hayw. (Lth. 1963., 408).

For *Tachys,* and related genera, see T. L. Erwin (1974a, 1974b).

Cylindrocharis sulcatula (1918:327). Male **T,** 1 **P,** without loc. label ("probably Indiana", acc. to Csy.). **T**=**L.** - *Pterostichus rostratus* Newm. (Van Dyke, 1925b:75; Lth. 1966, 457; Barr, 1971).

C. piceata (1918:327). Male **T**, New York,=**L.** (No specimen from Maine.) - *P. rostratus* Newm. (Van Dyke, 1925b:75; Lth. 1966:457; Barr, 1971).

Holciophorus vancouveri (1913:97). Male **T**, Victoria, B.C.,=**L.** - *Pterostichus lama* Mén. (Lth. 1966:458).

H. pollens (1913:97). Male **T**, 2 **P**, L. Tahoe, Calif.; 1 **P** labeled Calif. only. **T**=**L.** - *P. lama* (Mén. (Lth. 1966:458).

H. cephalus (1913:98). Male **T,** Calif.,=**H.** - *P. lama* Mén. (Csy., 1924:68; Lth. 1966:458).

H. domitor (1913:98). Male **T**, no. loc. label; 1 "**P**", L. Tahoe, Calif., not belonging to the type series. **T**=**L.** - *P. lama* Mén. (Lth. 1966:458).

Pterostichus rectilatus (1913:106). Male **T**, Clackamas, Oreg.,=**L.** - *P. crenicollis* Lec. (Lth. 1966:460).

P. pugetanus (1913:107). Female **T**, Clackamas, Oreg.,=**L.** - *P. crenicollis* Lec. (Cay., 1918:328:Lth. 1966:460).

Hypherpes innatus (1918:328). Female **T,** "Canada ?",=**L.** - *Pterostichus algidus* Lec. (Lth. 1966:460).

H. responsor (1918:330). Female **T**, Victoria, B.C.,=**L.** - *Pterostichus algidus* Lec. (Lth. 1966:460).

H. anthrax (1918:331). Female **T**, Vanc. Isl., B.C.,=**L.** - *Pterostichus algidus* Lec. (Lth. 1966:460).

Pterostichus fontinalis (1913:110). Male **T**, Yellowstone Park,=**L.** - *Pterostichus protractus* Lec. (Lth. 1966:463).

Hypherpes vivax (1918:333). Male **T,** Yellowstone Park,=**L.** - *Pterostichus protractus* Lec. (Lth. 1966:463).

H. provensis (1924:69). Female **T**, Provo Cañon,; male **P**, Miner's Peak; Utah. **T** = **L.** Utah, = **L.** - *P. contractus* Lec. (Lth. 1966:463).

H. utensis (1924:69). Female **T**, Provo Cañon, Utah, = **L.** - *Pterostichus protractus* Lec. (Lth. 1966:463).

Pterostichus scenicus (1913:103). Female **T**, Brit. Col., = **H.** - *P. herculaneus* Mnh. (Hatch, 1953:108; Lth. 1966:464).

P. novellus (1913:102). Male **T**, 1 **P**, Hydeville, Valley of Eel R., Calif.; 6 **P**, Calif., Oreg., Wash. **T** = **L.** - Described as a subspecies of *amethystinus* Mnh. but not in need of a name (Hatch, 1953:111; Lth. 1966:464).

P. metlakatlae (1913:102). Female **T**, 1 **P**, Metlakatla, B.C. **T** = **L.** - Described as a subspecies of *amethystinus* Mnh. but not in need of a name (Hatch, 1953:111; Lth. 1966:464).

P. jejunus (1913:104). Female **T**, "L" (= Levette coll.; probably Calif., acc. to Csy.), = **H.** - *P. amethystinus* Mnh. (Lth. 1966:464).

Hypherpes stoicus (1924:68). Male **T**, Inverness, B.C., = **L.** - *P. amethystinus* Mnh. (Lth. 1966:464).

Pterostichus wrangelli (1913:131). Male **T**, Fort Wrangell, Alaska, = **H.** - Aberrant specimen of *castaneus* Dej., with dorsal puncture on 3rd elytral interval (Csy., 1918:328; Lth. 1966:466).

Hypherpes terracensis (1924:68). Male **T**, Terrace, B.C., = **L.** - *Pterostichus castaneus* Dej. (Hatch, 1953:110; Lth. 1966:466).

Pterostichus zephyrus (1884a:2). Male **T**, without loc., = **H.** (By Perrault designated as **L.**) - *P. tristis* Dej. (distinct from *adoxus* Say, acc. to Perrault, 1973).

P. tetricula (1913:130). Female **T**, female **P**, Bayfield, Wisc. **P** labeled as **L**, by Perrault, and **T** as "paralectotype" - *P. tristis* Dej. (distinct from *adoxus* Say, acc. to Perrault, 1973).

Hypherpes sufflatus (1920:187). Female **T**, no loc. ("probably Indiana", acc. to Csy.), = **H.** (By Perrault designated as **L.**) - *Pterostichus adoxus* Say (Lth. 1966:467-68; Perrault, 1973:39).

Pterostichus osculans (1884a:2). Female **T**, male **P**, no loc. **T** = **L.** (Perrault labeled the male **P** as **L**) - *P. diligendus* Chd. (Darlington 1931:160; Lth. 1966:469).

P. idahoanus (1924:78). Male **T**, Moscow Mt., Idaho, = **H.** - *P. sphodrinus* Lec. (Darlington 1931:158; Lth. 1966:470).

P. pumilus (1913:129; *"pumilis"*, changed by Csy., 1914:356). Male **T**, 3 **P**, Bull Run, Clackamas Co., Oreg. **T** = **L.** - *P. pumilus* Csy. (syn. *longicollis* Lec.; Hatch 1953:112; Lth. 1966:171).

Micromaseus longicollis (1924:75). Male **T**, "W.T." (Washington State), = **H.** - *Pterostichus pumilus* Csy. (Hatch 1953:112; Lth. 1966:471).

Gastrellarius atronitens (1918:339). Male **T**, Indiana, = **L.** - *Pterostichus honestus* Say (Lth. 1966:472).

G. scolopaceus (1918:340). Male **T**, "L" (= Levette coll., "probably Indiana", acc. to Csy.), = **H.** - *P. honestus* Say (Lth. 1966:472).

G. deficiens (1918:340). Female **T**, Indiana, = **L.** - *P. honestus* Say (Lth. 1966:472).

Pterostichus manhattanis (1884a:76); subspecies of *lucublandus* Say (Csy. 1924:76). Male **T**, Long Isl., N.Y. = **H.** - *P. lucublandus* Say (Lth. 1966:482).

Poecilus elucens (1924:76). Male **T**, 2 **P**, Edmonton, Alta. **T** = **L.** - *Pterostichus lucublandus* Say (Lth. 1966:482).

P. planifer (1924:76). Female **T**, 2 **P**, Agassiz, B.C. **T**=**L**. - *P. lucublandus* Say (Lth. 1966:482).

Bothriopterus latescans (1913:139). Female **T**, male **P**, L. Tahoe, Calif. **T**=**L**. - *Pterostichus adstrictus* Eschz. (Lth. 1955:93).

B. sericeus (1913:140). Female **T**, Clackamas, Oreg.,=**L**. - *P. adstrictus* Eschz. (Lth. 1955:93).

B. latebricola (1913:141). Female **T**, 8 **P**, Truckee, Calif. **T**=**L**. - *P. adstrictus* Eschz. (Lth. 1955:93).

B. shastanus (1913:141). Male **T**, Siskiyou Co., Calif.,=**L**. - *P. adstrictus* Eschz. (Lth. 1955:93).

B. saxatilis (1913:142). Male **T**, Boulder, Color.; 7 **P**, Color., Ariz. **T**=**L**. - *P. adstrictus* Eschz. (Lth. 1955:93).

B. laxicollis (1913:142). Male **T**, 2 **P**, Color. **T**=**L** - *P. adstrictus* Eschz. (Lth. 1955:93).

B. angusticollis (1924:77). Male **T**, Provo Cañon, Utah,=**L**. - *P. adstrictus* Eschz. (Lth. 1955:93).

Dysidius trinarius (1918:377). Female **T**, 10 **P**, Camphill, Pa. **T**=**L**. - *Pterostichus ohionis* Cki. (*purpuratus* Lec.), of which it was described as a subspecies (Lth. 1966:489).

D. egens (1924:74). Female **T**, New Jersey,=**L**. - *P. mutus* Say (Lth. 1955:92).

Parargutor atrolucens (1918:378). Male **T**, female **P**, Clackamas, Oregon. **T**=**L**. - *Pterostichus lustrans* Lec. (Lth. 1966:490).

Pterostichus probus (1913:133). Female **T**, Asheville, N.C.,=**L**. - *P. stygicus* Say (Nicolay & Weiss 1934; Lth. 1966:492-93).

P. vapidus (1913:134). Male **T**, Adirondack Mts., N.Y.,=**L**. - *P. stygicus* Say (Nicolay & Weiss 1934; Lth. 1966:492-93).

Euferonia quadrifera (1918:366). Male **T**, Ontario,=**L**. - *P. stygicus* Say (Nicolay & Weiss 1934; Lth. 1966:493).

E. umbonata (1918:368). Male **T**, female **P**, Boston Neck, R.I. **T**=**L**. - *P. stygicus* Say (Nicolay & Weiss 1934; Lth. 1966:493).

E. subaequalis (1918:368). Male **T**, Indiana,=**L**. - *P. stygicus* Say (Nicolay & Weiss 1934; Lth. 1966:493).

E. ingens (1918:367). Female **T**, Willow Spring, Illin.; 5 **P** from Missouri and unknown loc. **T**=**L**. - *P. iripennis* Nic. & Weiss, if distinct from *stygicus* Say (Lth. 1966:493).

Pterostichus erebeus (1913:134). Female **T**, Bayfield, Wisc.,=**L**. - *P. coracinus* Newm. (Lth. 1966:494).

Euferonia roanica (1920:188). Male **T**, Roan Mt., N.C.,=**L**. - *Pterostichus coracinus* Newm. (Lth. 1966:494).

E. venator (1920:189). Male **T**, 2 **P** Danville, Pa. **T**=**L**. - *P. coracinus* Newm. (Lth. 1966:494), of which it was described as a subspecies.

E. ludibunda (1920:189). Female **T**, Buena Vista Spring, Franklin Co., Pa.,=**L**. - *P. coracinus* Newm. (Lth. 1966:494), of which it was described as a subspecies.

E. lacustris (1924:71). Male **T**, nr. Chicago, Illin.,=**L**. - *P. coracinus* Newm. (Lth. 1966:494; though wrong type loc. given).

E. strigosula (1924:72). Male **T**, Hagerstown, Md.,=**L**. - *P. coracinus* Newm. (The Csy. name was unintentionally omitted in Lth. 1966.)

Lophoglossus vernix (1913:146). Male **T**, Lyme, Conn.,=**L**. - *Pterostichus vernix* Csy.

Omaseus aequalis (1924, 72). Female **T**, New Jersey, = **L**. - *Pterostichus corvinus* Dej. (Lth. 1966:499).

O. brevibasis (1924:73). Female **T**, nr. N.Y. City, = **L**. - *P. caudicalis* Say (Lth. 1966:500).

O. tenuis (1924:73). Female **T**, New Jersey, = **L**. - *P. luctuosus* Dej. (Lth. 1955:90; 1966:501).

O. confluens (1924:73). Male **T**, Boston Neck, R.I. (A second ex., from the Levette coll., wrongly labeled as P.). **T** = **L**. - *P. luctuosus* Dej. (Lth. 1955:90; 1966:501).

O. testaceus (1924:74). Female **T**, Boston Neck, R.I., = **H**. - *P. luctuosus* Dej. (Lth. 1955:90; 1966:501).

Micromaseus aequicollis (1918:379). Male **T**, Missouri (St. Louis, acc. to Csy.), = **H**. - *Pterostichus femoralis* Kby. (Lth. 1966:504).

Subg. *Cryobius*. Types will be designated by G. E. Ball.

Abacidus planifer (1913:136). Female **T**, Indiana, = **H**. - *A. permundus* Say (Lth. 1966:535-36).

Loxandrus velocipes (1918:390). Male **T**, Distr. of Col., = **L**. - *L. velocipes* Csy.

L. inquietus (1918:389). Female **T**, labeled "L" (= Levette coll.; though Csy. reports Indiana, the loc. must be regarded as doubtful) = **L**. - *L. minor* Chd. (Lth. 1966:540).

Calathus sonoricus (1913:156). Male **T**, Arizona, = **L**. - *C. opaculus* Lec. (Lth. 1966:543).

C. coloradensis (1913:157). Female **T**, 2 **P**, Boulder, Color. **T** = **L**. - *C. ingratus* Dej. (Lth. 1955:112).

C. labradorinus (1913:158). Female **T**, 3 **P**, W. St. Modest, Labr. **T** = **L**. - *C. ingratus* Dej. (Lth. 1955:112).

C. planifer (1920:217). Female **T**, St. Paul Isl., Alaska, = **H**. (The loc. is no doubt wrong). - *C. ingratus* Dej. (Lth. 1955:112).

C. beringi (1920:218). Male **T**, 10 **P**, St. Paul Isl., Alaska. **T** = **L**. (The loc. is no doubt wrong). - *C. ingratus* Dej. (Lth. 1955:112).

C. nanulus (1920:218). Male **T**, 10 **P**, St. Paul Isl., Alaska. **T** = **L**. (The loc. is no doubt wrong). - *C. ingratus* Dej. (Lth. 1955:112).

C. calator (1920:220). Female **T**, Peaceful Valley, Color., = **L**. - *C. ingratus* Dej. (Lth. 1966:544-45).

C. aquilus (1920:220). Male **T**, Ouray, Color., = **L**. - *C. ingratus* Dej. (Lth. 1955:112).

C. grandicollis (1920:215). Male **T**, 2 **P**, Hydesville, Eel R., Calif. **T** = **L**. - *C. grandicollis* Csy. (Lth. 1966:547).

Pristodactyla binaria (1920:222). Female **T**, 4 **P**, S Arkansas. **T** = **L**. (The loc. is highly doubtful; cf. *Nebria arkansana*.) - *Calathus advena* Lec. (Lth. 1955:114).

P. scolopax (1920:223). Male **T**, 8 **P**, Colorado. **T** = **L**. - *C. advena* Lec. (Lth. 1955:114).

P. convexa (1913:160). Female **T**, L. Champlain, N.Y., = **L**. - *Synuchus impunctatus* Say (Lth. 1955:115), of which it was described as a subspecies.

P. arizonica (1913:160). Male **T**, Arizona, = **L**. - *S. dubius* Lec. (Lth. 1956:523).

P. zuniana (1913:161). Male **T**, New Mex., = **L**. - *S. dubius* Lec. (Lth. 1956:523).

P. neomexicana (1920:221). Male **T**, New Mex.; male, female **P**, Cloudcroft, New Mex. The male **P** designated as **L.** - *S. dubius* Lec. (Lth. 1956:523).

P. juabitica (1924:87). Female **T**, Trout Creek, Juab Co., Utah, = **L.** - *S. dubius* Lec. (Lth. 1956:523).

P. semirufa (1913:161). Female **T**, Chihuahua, Sierra Madre Mts., Mexico, = **L.** - *S. semirufus* Csy. (Lth. 1956:522).

P. subopaca (1920:223). Female **T**, Tres Marias, Morelos, Mexico, = **L.** - *S. ? semirufus* Csy. (Lth. 1956:522).

Olisthopus pictus (1913:169). Male **T**, Bayfield, Wisc., = **L.** - *O. parmatus* Say (Lth. 1966:553).

O. iterans (1913:170). Male **T**, Indiana; 1 **P**, "L" (= Levette collection). **T** = **L.** - *O. parmatus* Say (Lth. 1966:553), of which it was described as a subspecies.

Sericoda insulina (1920:97). Male **T**, Victoria, B.C., = **L.** - *Agonum obsoletum* Say (Lth. 1966:566).

S. invidiosa (1920:97). Male **T**, 1 **P**, Colorado. **T** = **L.** - *A. bogemani* Gyll. (Lth. 1966:567).

S. tacomae (1920:98). Female **T**, "W.T." (= Washington State), = **H.** - *A. bogemani* Gyll. (Lth. 1966:567).

S. monticola (1920:94). Female **T**, Colorado, = **L.** - *A. bembidioides* Kby. (Lth. 1966:569).

S. colonicum (1920:94). Female **T**, 2 **P**, Sierra Madre Mts., Mexico. **T** = **L.** - *A. bembidioides* Kby. (Lth. 1966:569).

Agonum invalidum (1924:84). Male **T**, Edmonton, Alta., = **H.** - *A. consimile*Gyll. (Lth. 1955:126).

Anchomenus ineptus (1920:63). Male **T**, Coeur d'Alene. Idaho, = **L.** - *A. sordens* Kby. (Lth. 1966:575).

Europhilus frosti (1924:86). Male **T**, Eastbrook, Maine, = **L.** - *A. sordens* Kby. (Lth. 1955:126).

E. collusor (1920:129). Male **T**, Montana, = **L.** - *A. retractum* Lec. (Lth. 1955:127).

E. facilis (1920:130). Female **T**, 5 **P**, Boston Neck, R.I. **T** = **L.** - *A. retractum* Lec. (Lth. 1955:127).

E. serenus (1920:131). Male **T**, 1 **P**, Bayfield, Wisc.; 3 **P**, Duluth, Minnes. **T** = **L.** - *A. retractum* Lec. (Lth. 1955:127).

E. symmetricus (1920:129). Female **T**, Devil's L., N. Dak.; 2 **P**, B.C. & Kans., resp. **T** = **L.** - *A. gratiosum* Mnh. (Lth. 1955:128).

E. properans (1920:129). Female **T**, Durham, N.H., = **L.** - *A. gratiosum* Mnh. (Lth. 1955:128).

E. carri (1924:85). Female **T**, male **P**, Edmonton, Alta. Male **P** = **L**, because the **T** does not fit the description (see Lth. 1966:577). - *A. gratiosum* Mnh. (Lth., l.c.).

E. elegantulus (1920:127). Male **T**, New Jersey, = **L.** - *A. lutulentum* Lec. (Lth. 1966:580), of which it was described as a subspecies.

E. adustus (1920:127). Male **T**, 1 **P**, Indiana; 4 **P**, "L" (= Levette coll.). **T** = **L.** - *A. lutulentum* Lec. (Lth. 1966:580), of which it was described as a subspecies.

E. atriceps (1920:128). Female **T**, Mass., = **L.** - *A. lutulentum* Lec. (Lth. 1966:581).

E. galvestonicus (1920:126). Male **T**, Galveston, Texas, = **H.** - *A. galvestonicum* Csy.

Platynomicrus fragilissimus (1920:92). Male **T**, Toronto, = **L**. - *Agonum nigriceps* Lec. (Lth. 1955:129).

Anchomenus tritus (1920:63). Male **T**, 2 **P**, Bayfield, Wisc. **T** = **L**. - *Agonum piceolum* Lec. (Lth. 1966:587).

A. fractus (1920:63). Male **T**, Provo, Utah, = **L**. - *A. piceolum* (Lth. 1966:587), described as a subspecies of *tritum* Csy.

A. lacsivus (1920:66). Male **T**, Stikeen R., B.C., = **L**. - *A. piceolum* Lec. (Lth. 1966:587).

A. frigidulus (1920:66). Male **T**, Stikeen R., B.C., = **L**. - *A. piceolum* Lec. (Lth. 1966:587).

A. dissensus (1920:67). Female **T**, Priest R., Idaho, = **L**. - *A. piceolum* Lec. (Omitted in Lth. 1966.)

A. wadei (1920:62). Female **T**, Wilbur, Wash., = **L**. - *A. ferruginosum* Dej. (Lth. 1966:588).

A. marcidus (1920:65). Male **T**, Ouray, Color., = **L**. - *A. ferruginosum* Dej. (Lth. 1966:588).

Sericoda coronadina (1920:96). Female **T**, 1 **P**, San Diego, Calif. **T** = **L**. - *Agonum variolatum* Lec. (Lth. 1966:589), of which it was described as a subspecies.

S. shastanica (1920:96). Female **T**, Siskiyou Co., Calif. = **L**. - *A. variolatum* Lec. (Lth. 1966:589).

Agonum gemmeum (1920:103). Male **T**, Kansas, = **L**. - *A. cupripenne* Say (Lth. 1966:591).

A. viridissimum (1920:103). Male **T**, Stockton, Utah; 2 **P**, Color.; 1 **P**, Oreg. **T** = **L**. - *A. subsericeum* Lec. (Lth. 1966:591).

A. suffusum (1920:104). Female **T**, Agassiz, B.C.; 10 **P**, Wash., Oreg. **T** = **L**. - *A. subsericeum* Lec. (Lth. 1966:591).

A. latiusculum (1920:104). Female **T**, Calif., = **L**. - Described as a subspecies of *suffusum* Csy. - *A. subsericeum* Lec. (Lth. 1966:591).

A. uteanum (1920:104). Female **T**, Ogden, Utah, = **L**. - Described as a subspecies of *suffusum* Csy. - *A. subsericeum* Lec. (Lth. 1966:591).

A. breviusculum (1920:119). Female **T**, L. Tahoe, Calif., = **L**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. pertinax (1920:119). Male **T**, Reno, Nev., = **H**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. atromicans (1920:120). Male **T**, "L" (= Levette coll. "possibly Color.", acc. to Csy.), = **H**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. vegetum (1920:121). Female **T**, 1 **P**, Sta. Cruz, Calif. **T** = **L**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. columbicum (1920:121). Male **T**, The Dallas, Oreg., = **L**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. tumidulum (1920:121). Female **T**, 2 **P**, Humboldt Co., Calif.; 1 **P**, Dunsmuir, Siskiyou Co., Calif. **T** = **L**. - *A. fossigerum* Dej. (Lth. 1966:596).

A. longulum (1920:107). Male **T**, Douglas, Utah, = **L**. - *A. cupreum* Dej. (Lth. 1966:596).

A. parallelum (1920:108). Female **T**, Boulder, Color., = **L**. - *A. cupreum* Dej. (Lth. 1966:596).

A. marquettense (1920:108). Female **T**, Marquette, Mich., = **L**. - *A. cupreum* Dej. (Lth. 1966:596).

A. borealinum (1920:109). Male **T**, Duluth, Minnes., = **L**. - Described as subspecies of *seminitidum* Kby.; both = *cupreum* Dej. (Lth. 1966:596).

A. ovalicauda (1920:109). Male **T**, 1 **P**, Boulder, Color. **T**=**L.** - *A. cupreum* Dej. (Lth. 1966:596).

A. esuriale (1920:109). Male **T**, Color.,=**L.** - *A. cupreum* Dej. (Lth. 1966: 596).

A. cupreolucens (1924:83). Male **T**, Winnipeg, 18 **P**, Mich., Missouri & c. **T**=**L.** - *A. cupreum* Dej. (Lth. 1966:596).

A. uintanum (1924:83). Male **T**, Mammoth. Parowan Mts., Utah,=**L.** - Probably a subspecies of *cupreum* Dej. (Lth. 1966:597).

A. militare (1920:114). Female **T**, West Point, N.Y.,=**L.** - *A. melanarium* Dej. (Lth. 1966:600).

A. fidele (1920:116). Male **T**, 2 **P**, Boston Neck, R.I. **T**=**L.** - *A. fidele* Csy. (syn. *molestum* Lec.; Lth. 1966:601).

A. subinflatum (1920:117). Male **T**, Marquette, Mich., 2 **P**, Bayfield, Wisc. **T**=**L.** - *A. fidele* Csy. (Lth. 1966:601).

A. hyslopi (1920:113). Male **T**, Wilbur, Wash.,=**L.** - *A. corvus* Lec. (Lth. 1966:603).

A. debiliceps (1920:118). Female **T**, Duluth, Minnes.,=**H.** - *A. corvus* Lec. (Lth. 1966:603).

A. lacustre (1920:114, 122). This was a new name proposed for *metallescens* Lec. (nec Dej., *nomen nudum*), and the type is therefore in coll. Lec. (MCZ) (Lth. 1955:122; 1966:608).

A. terracense (1924:85). Male **T**, Terrace, B.C.,=**L.** - *A. metallescens* Lec. (Lth. 1955:122; 1966:608).

A. mordax (1920:113). Male **T**, Beaver Dam, Wisc.,=**L.** - *A. harrisi* Lec. (Lth. 1966:609).

A. aethiops (1920:116). Female **T**, "Brit.Amer. ?",=**H.** - *A. harrisi* Lec. (Lth. 1966:609).

A. humile (1920:117). Male **T**, Kalispell, Mont.,=**L.** - *A. propinquum* G. & H. (Lth. 1955:124; 1966:611).

A. insuetum (1920:118). Female **T**, 3 **P**, Wilbur, Wash. **T**=**L.** *A. propinquum* G. & H. (Lth. 1955:124; 1966:611).

A. amens (1924:83). Male **T**, 2 **P**, Edmonton, Alta. **T**=**L.** *A. propinquum* G. & H. (Lth. 1955:124; 1966:611).

A. amplior (1920:124). Female **T**, Boulder, Color.; 6 **P**, New Mex., &c. **T**=**L.** - *A. placidum* Say (Lth. 1966:613), of which it was described as a subspecies.

A. aztecanum (1920:124). Female **T**, 2 **P**, Amecameca, Mexico. **T**=**L.** - *A. placidum* Say (Lth. 1966:613), of which it was described as a subspecies.

A. citatum (1920:124). Male **T**, New Hamps.,=**L.** - *A. placidum* Say (Lth. 1966:613), of which it was described as a subspecies.

A. rhodeanum (1924:84). Male **T**, Rhode Isl.,=**L.** - *A. placidum* Say (Lth. 1966:613).

Anchomenus metuens (1920:52). Male **T**, Newport, Oreg.,=**L.** - *Agonum quadratum* Lec. (Lth. 1966:617).

A. dilleyanus (1920:52). Male **T**, Dilley, Oreg.,=**L.** - *A. quadratum* Lec. (Lth. 1966:617).

Micragonum breviceps (1920:87), male **T**, Vicksburg, Missis.,=**L.** - *Agonum striatopunctatum* Dej. (Lth. 1966:618).

M. luculentum (1920:88). Female **T**, Indiana,=**L.** - *A. striatopunctatum* Dej. (Lth. 1966:618).

M. semiviride (1920:85). Female **T**, Fruitdale; male **P**, Salco; Alabama. **T**=**L.** - *A. crenulatum* Lec. (Lth. 1966:619).

M. ovalipenne (1920:86, 88). Female **T**, S. Pines, N.C.; female **P**, Alab. **T** = **H**. - *A. crenulatum* Lec. (Lth. 1966:619).

M. houstoni (1920:87). Male **T**, Galveston, Tex., = **H**. - *A. crenulatum* Lec. (Lth. 1966:619).

M. pinorum (1920:86). Male **T**, female **P**, S. Pines, N.C. **T** = **L**. - *A. crenulatum* Lec. (Omitted in Lth. 1966.)

M. concretum (1920:83). Female **T**, 3 **P**, Illin. **T** = **L**. - *A. basale* Lec. (Lth. 1966:620).

M. amicum (1920:83). Female **T**, N Illin., = **L**. - *A. basale* Lec. (Lth. 1966:620), described as a subspecies of *concretum* Csy.

Circinalia politissima (1920:76). Female **T**, Duluth, Minnes., 1 **P**, "L" (= Levette coll.). **T** = **L**. - *Agonum crenistriatum* Lec. (Lth. 1966:621).

C. statenensis (1920:77). Female **T**, Staten Isl., N.Y.; 1 **P**, Hagerstown, Md. **T** = **L**. - *A. crenistriatum* Lec. (Lth. 1966:621), described as a subspecies of *politissimum* Csy.

C. liticola (1920:77). Male **T**, Iowa City, = **L**. - *A. crenistriatum* Lec. (Lth. 1966:621).

C. roticollis (1920:78). Male **T**, male **P**, New Jersey. **T** = **L**. - *A. crenistriatum* Lec. (Lth. 1966:621).

C. rigidula (1920:75). Male **T**, 9 **P**, S. Pines, N.C.; 1 **P**, Alabama. **T** = **L**. - *A. rigidulum* Csy. (Lth. 1966:621).

C. semipunctata (1920:75). Female **T**, "Va." (Virginia), = **L**. - *A. rigidulum* Csy. (Lth. 1966:621), of which it was described as a subspecies.

C. putata (1920:75). Female **T**, S. Pines, N.C., = **L**. - *A. rigidulum* Csy. (Lth. 1966:261), of which it was described as a subspecies.

C. ventricula (1920:75). Female **T**, Mobile, Alab., = **L**. - *A. rigidulum* Csy. (Lth. 1966:621).

C. ludoviciana (1920:76). Male **T**, Alexandria, Louis., = **L**. - *A. punctiforme* Say (Lth. 1966:622).

C. undulata (1920:79). Male **T**, 15 **P**, S. Pines, N.C., **T** = **L**. - *A. aeruginosum* Dej. (Lth. 1966:623). The "Types" of *Circinalia undulata* and *Micragonum solidulum* were accidentally reversed in the Csy. coll. sometime before 1973; restored by me in 1973.

Anchomenus ontarionis (1920:54). Female **T**, Toronto, = **L**. - *Agonum excavatum* Dej. (Lth. 1966:623).

A. trinarius (1920:54). Male **T**, "L" (= Levette coll., "probably Indiana," Csy., l.c.)., = **H**. - *A. excavatum* Dej. (Lth. 1966:623).

Micragonum quadrulum (1920:81). Female **T**, Illin., = **L**. - *Agonum ferreum* Hald. (Lth. 1966:624).

M. solidulum (1920:82). Female **T**, 8 **P**, Highland Park, Illin.; 4 **P**, Illin.; 1 **P**, Kansas. **T** = **L**. - *A. ferreum* Hald. (Lth. 1966:624). See *Circinalia undulata* above.

Anchomenus gaudens (1920:55). Male **T**, L. Champlain, N.Y., = **L**. - *Agonum extensicolle* Say, "eastern form" (Lth. 1966:625-27).

A. clientulus (1920:55). Male **T**, Rutherford, N.J., = **L**. - *A. extensicolle* Say, "eastern form" (Lth. 1966:625-27); described as a subspecies of *gaudens* Csy.

A. vigilans (1920:56). Male **T**, male **P**, Asheville, N.C. **T** = **L**. - *A. extensicolle* Say, "eastern form" (Lth. 1966:625-27).

A. irruptus (1920:60). Male **T**, Priest R., Idaho, = **L**. - *A. californicum* Dej. (Hatch 1953; Lth. 1966:628).

A. laxatus (1920:67). **T** (sex ?), male **P**, Utah. The **T** lacks front tarsi; therefore **P** was made **L**. - *A. thoracicum* Dej. (Lth. 1966:629).

A. arenarius (1920:68). Male **T**, Galveston, Texas, = **H**. - *A. decorum* Say (Lth. 1966:629), of which it was described as a subspecies.

A. tepidus (1920:68). Female **T**, Tuçson, Ariz., = **H**. - *A. decorum* Say (Lth. 1966:629).

Anchus puncticeps (1920:2). Female **T**. Ontario, = **L**. - *Agonum puncticeps* Csy. (syn. *pusillum* Lec. nec Steph.; Lth. 1966:633).

Anchomenus oblongipennis (1920:31). Female **T**, Marquette, Mich., = **L**. - *Agonum decentis* Say (Lth. 1966:636).

A. turbidus (1920:32). Male **T**, 2 **P**, Bayfield, Wisc.; 1 **P**, Winnipeg. **T** = **L**. - *A. decentis* Say (Lth. 1966:636).

A. iowanus (1920:32). Female **T**, Iowa City, = **L**. - *A. decentis* Say (Lth. 1966:636).

A. aleneanus (1920:36). Female **T**, Coeur d'Alene, Idaho, = **L**. - *A. decentis* Say (Lth. 1966:636).

A. pacatus (1920:43). Female **T**, Peaceful Valley, Color., = **L**. - *A. decentis* Say (Lth. 1966:636).

A. missourianus (1924:81). Female **T**, Westminster, Missouri, = **L**. - *A. decentis* Say (Lth. 1966:636).

A. albertanus (1924:81). Female **T**, Edmonton, Alta., = **L**. - *A. decentis* Say (Lth. 1966:636).

A. inquisitor (1920:30). Female **T**, Marquette, Mich., = **L**. - *A. opaculum* Lec. (Lth. 1966:641).

A. boopis (1920:37). Male **T**, St. Meridan, Conn., = **L**. - *A. opaculum* Lec. (Lth. 1966:641).

A. pennsylvanicus (1920:40). Female **T**, 1 **P**, Penns. **T** = **L**. - *A. tenuicolle* Lec. (Lth. 1966:641).

A. distinguendus (1920:40). Male **T**, Ridgeway, Ont., = **L**. - *A. tenuicolle* Lec. (Lth. 1966:641).

A. arachnoides (1920:35). Male **T**, 6 **P**, Clackamas, Oreg.; 9 **P**, Calif. **T** = **L**. - *A. ovipenne* Mnh. (Lth. 1966:644).

A. similatus (1920:35). Male **T**, Hydesville, Eel R., Humboldt Co., Calif., = **L**. - *A. ovipenne* Mnh. (Lth. 1966:644).

Platynidius ontariensis (1920:8). Male **T**, female **P**, Ontario. **T** = **L**. - *Agonum hypolithos* Say (Lth. 1966:645).

P. enormis (1920:8). Female **T**, Black Mts., N.C., = **H**. - *A. angustatum* Dej. (Lth. 1966:646).

P. aesopus (1920:9). Female **T**, Adirondack Mts., N.Y., = **L**. - *A. angustatum* Dej. (Lth. 1966:646).

P. rhombiceps (1920:9). Male **T**, New Jersey, = **L**. - *A. angustatum* Dej. (Lth. 1966:646).

P. cervicalis (1920:10). Male **T**, Penns., = **L**. - *A. angustatum* Dej. (Lth. 1966:646).

P. carolinensis (1920:10). Female **T**, Black Mts., N.C., = **L**. - *A. angustatum* Dej. (Lth. 1966:646).

Atranus pallescens (1913:172). Male **T**, 1 **P**, Penns. **T** = **L**. - *A. pubescens* Dej. (Lth. 1966:648).

Curtonotus catenulatus (1918:230). Male **T**, Billings, Mont., = **L**. - *Amara carinata* Lec. (Lth. 1968:668).

C. gilvipes (1924:46). Male **T**, 2 **P**, Rosebank, Manit. **T** = **H**; the two "P" not valid (see Csy., 1924). - *A. carinata* Lec. (Lth. 1968:668).

C. manitobensis (1924:46). Female **T**, Rosebank, female **P**, Westbourne, Manit. **T** = **L**. - *A. lacustris* Lec. (Lth. 1968:669).

C. labradorensis (1918:231). Male **T**, 7 **P**, W. St. Modest, Labr. **T** = **L**. - *A. torrida* Panz. (Lth. 1955:95).

C. scrutatus (1918:231). Male **T**, male **P**, W. St. Modest, Labr. **T** = **L**. - *A. torrida* Panz. (Lth. 1955:95).

C. albertanus (1924:45). Male **T**, 4 **P**, Edmonton, Alta. **T** = **L**. - *A. torrida* Panz. (Lth. 1955:95).

C. brevipennis (1924:46). Female **T**, N.W. Terr., Canada, = **H**. - *A. torrida* Panz. (Lth. 1955:95).

C. durus (1924:47). Female **T**, Edmonton, Alta., = **L**. - *A. torrida* Panz. (Lth. 1955:95).

C. biarcuatus (1924:47). Female **T**, Edmonton, Alta., = **L**. - *A. torrida* Panz. (Lth. 1955:95).

C. rubripennis (1918:232). Male **T**, 10 **P**, Color. **T** = **L**. - *A. alpina* Payk. (Lth. 1955:97).

C. deficiens (1918:232). Female **T**, 1 **P**, Mt. Washington, N.H. **T** = **L**. - *A. alpina* Payk. (Lth. 1955:97).

C. argutus (1920:233). Male **T**, 4 **P**, New Hampsh. & Mt. Washington. **T** = **L**. - *A. alpina* Payk. (Lth. 1955:97).

C. inanis (1920:233). Female **T**, Mt. Washington, N.H., = **H**. - *A. alpina* Payk. (Lth. 1955:97).

C. subtilis (1924:45). Male **T**, "Stupart Bay", ? Labr., = **H**. - *A. alpina* Payk. (Lth. 1955:97).

Bradytus gravidus (1918:236). Female **T**, Douglas Co., Kansas, = **L**. - *Amara exarata* Dej. (Lth. 1968:680).

B. curtus (1918:236. nec *Amara curta* Dej. 1828). Female **T**, female **P**, Missouri, St. Louis, (acc. to description). **T** = **L**. - *A. exarata* Dej. (Lth. 1968: 680).

B. stygialis (1918:237). Male **T**, Penns., = **L**. - *A. exarata* Dej. (Lth. 1968:280).

B. humphreysi (1918:240). Male **T**, 3 **P**, Humphrey's Peak, Ariz. **T** = **L**. - *A. latior* Kby. (Lth. 1968:682).

B. deceptus (1918:241). Female **T**, New Mex., = **L**. - *A. latior* Kby. (Lth. 1968:682).

B. relictus (1918:242). Female **T**, Denver, Color., = **L**. - *A. latior* Kby., dwarf specimen (Lth. 1968:682).

B. nainensis (1918:238). Male **T**, female **P**, Nain, Labr. **T** = **L**. - *A. glacialis* Mnh. (Lth. 1968:684).

Percosia extensa (1918:244). Female **T**, female **P**, Clackamas, Oreg. **T** = **L**. - *Amara obesa* Say, western form (Lth. 1968:690-91).

P. latissima (1918:245). Female **T**, Highland Park, Illin., = **H**. The male marked "L" (= Levette coll.) should not have been labeled "P" (see Csy. l.c.:245-46). - *A. obesa* Say, eastern form (Lth. 1968:690).

P. ventricosa (1918:245). Female **T**, Long Isl., N.Y., = **L**. - *A. obesa* Say, eastern form (Lth. 1968:690).

P. sulcatula (1920:199). Female **T**, Mesa, Boulder Co., Color., = **L**. - *A. obesa* Say, western form (Lth. 1968:690-91).

Amara perspecta (1918:294). Female **T**, San Clemente Isl., Calif., = **L**. - *A. californica* Dej. (Lth. 1968:693).

A. pugetana (1924:56). Male **T**, Wawawai, Wash., = **L**. - *A. californica* Dej. (Lth. 1968:693-94).

Celia laxicollis (1918:258). Male **T**, Sheepshead Bay; 1 **P**, Rockaway Beach, L.I.; N.Y. **T** = **L**. - *Amara quenseli* Schnh. (Lth. 1968:694).

C. brumalis (1918:259). Male **T**, 18 **P**, Marquette, Mich. **T** = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. defecta (1918:260). Female **T**, 8 **P**, Jemez Springs, New Mex.; 2 **P**, Kansas. **T** = **L**. (2 ex. labeled "L", = Levette coll., should not have been made P.) - *A. quenseli* Schnh. (Lth. 1968:694).

C. exposita (1918:260). Female **T**, male **P**, Columbia R. Valley, Oreg. **T** = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. mimica (1918:260). Male **T**, 1 **P**, Rhode Isl. **T** = **H**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. fontinalis (1918:261). Female **T**, Jemez Springs, New Mex., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. eldorensis (1918:261). Female **T**, Eldora, Color., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. docilis (1918:262). Male **T**, Color., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. brunnescens (1918:262). Female **T**, "L" (= Levette coll., "probably Color."), = **H**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. definita (1918:263). Female **T**, male **P**, Yreka, Calif.; 1 **P**, Siskiyou Co., Calif. **T** = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. obligata (1918:263). Female **T**, 3 **P**, Utah. **T** = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. piperi (1924:49). Female **T**, Grayling nr. Bay City, Mich., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. explanatula (1924:54). Female **T**, Similkameen R., B.C., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. tahomae (1924:55). Female **T**, Wawawai, Wash., = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. washoeana (1924:55). Male **T**, female **P**, Nevada. **T** = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. cervicalis (1924:56). Male **T**, N.W. Terr., Canada, = **L**. - *A. quenseli* Schnh. (Lth. 1968:694).

C. obsolescens (1918:242). Female **T**, Colorado Springs, Color., = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. paganica (1918:259). Female **T**, Marquette, Mich., = **L**. (A second female, from Sask., is incorrectly marked "P".) - *A. discors* Kby. (Lth. 1955:103).

C. nevadica (1918:264). Male **T**, Reno, Nevada, = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. sphaerops (1918:267). Male **T**, Wyandanch, L.I., N.Y., = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. merula (1918:267). Female **T**, "L" (= Levette coll., "probably Color."), = **H**. - *A. discors* Kby. (Lth. 1968:697).

C. lugubris (1918:268). Male **T**, Reno, Nevada, = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. scolopax (1918:269). Male **T**, Boulder Co.; 1 **P**, Eldora; Colorado. **T** = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. spaldingi (1924:48). Male **T**, Callao, Utah, = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. parowana (1924:57). Male **T**, The Mammoth, Parowan Mts., Utah, = **L**. - *A. discors* Kby. (Lth. 1968:697).

C. pinorum (1918:264). Female **T**, 1 **P**, S. Pines, N.C. **T** = **L**. - *A. chalcea* Dej. (Lth. 1968:700).

C. sodalis (1918:265). Female **T**, Staten Isl., N.Y., = **L.** - *A. chalcea* Dej. (Lth. 1968:700).

C. corvina (1918:266). Male **T**, 2 **P**, S. Pines, N.C. **T** = **L.** - *A. chalcea* Dej. (Lth. 1968:700).

C. schotti (1918:266). Male **T**, 1 **P**, Jamaica, L.I., N.Y. **T** = **L.** - *A. chalcea* Dej. (Lth. 1968:700).

C. maneei (1924:55). Female **T**, S. Pines, N.C., = **L.** - *A. chalcea* Dej. (Lth. 1968:700).

C. sinuosa (1918:277). Female **T**, Aldermere, B.C., = **L.** - *A. sinuosa* Csy. (syn. *subaenea* Lec.; Lth. 1968:701).

C. elusa (1918:277). Female **T**, no loc. ("probably Color."),- = **H.** - *A. sinuosa* Csy. (Lth. 1968:701).

C. nupta (1918:278). Male **T**, Bluff Point, L. Champlain, N.Y., = **L.** - *A. sinuosa* Csy. (Lth. 1968:701).

C. thoracica (1918:278). Male **T**, Boulder, Color., = **L.** - *A. sinuosa* Csy. (Lth. 1968:701).

C. hospes (1918:279). Female **T**, Boulder, Color., = **L.** - *A. sinuosa* Csy. (Lth. 1968:701).

C. idahoana (1924:56). Male **T**, Moscow, Idaho, = **H.** - *A. idahoana* Csy. (Lth. 1968:703).

C. lyncea (1918:280). Female **T**, Sheepshead Bay, L.I., N.Y., = **L.** - *A. musculis* Say (Lth. 1968:707).

C. nugator (1918:281). Female **T**, male **P**, "L" (= Levette coll., "probably Indiana"); male **P**, New Jersey; the last-named **P** made **L.** - *A. musculis* Say (Lth. 1968:707).

C. curticeps (1918:281). Male **T**, Fort Monroe, Virginia, = **L.** - *A. musculis* Say (Lth. 1968:707).

C. shoemakeri (1918:283). Female **T**, 3 **P**, Long Isl., N.Y. **T** = **L.** - *A. musculis* Say (Lth. 1968:707).

C. vegrandis (1918:287). Female **T**, Wisc., = **L.** - *A. musculis* Say (Lth. 1968:708).

C. fluminea (1918:287). Male **T**, Vicksburg, Missis., = **L.** - *A. musculis* Say (Lth. 1968:708).

C. crenulata (1918:288). Male **T**, Duluth, Minnes., = **H.** - *A. musculis* Say (Lth. 1968:708).

C. limbalis (1918:289). Female **T**, S. Pines, N.C., = **L.** - *A. musculis* Say (Lth. 1968:708).

C. paulula (1918:289). Male **T**, Wading R., L.I., N.Y., = **L.** - *A. musculis* Say (Lth. 1968:708).

C. scintilla (1918:290). Male **T**, Fort Monroe, Virginia, = **L.** - *A. musculis* Say (Lth. 1968:708).

C. brevitarsis (1918:290). Male **T**, 2 **P**, S. Pines, N.C. **T** = **L.** - *A. musculis* Say (Lth. 1968:708).

C. minnesotana (1924:57). Female **T**, Duluth, Minnes., = **H.** - *A. musculis* Say. (Omitted in Lth. 1968.)

Amara pallida (1884a:5). Male, Willets Point, L.I., N.Y.; in coll. Lec. (MCZ; see Csy 1918:284, 291), designated as **H.** (male, Rock Bay, L.I., wrongly marked as "Neotype" in coll. Csy.) - *A. rubrica* Hald. (Lth. 1968:708, 710).

A. ferruginea (1884a:5). Male, Atlantic City, N.J., in coll. Lec. (MCZ; see Csy. 1918:291) designated as **H.** - *A. rubrica* Hald. (Lth. 1968:708, 710).

Celia lucina (1918:279). Female **T**, Delaware, = **L.** - *A. rubrica* Hald. (Lth. 1968:708).

C. proditor (1918:280). Female **T**, New Jersey, = **L**. - *A. rubrica* Hald. (Lth. 1968:708).

C. liquida (1918:282). Female **T**, male **P**, Long Isl., N.Y. **T** = **L**. - *A. rubrica* Hald. (Lth. 1968:708).

C. politissima (1918:284). Female **T**, Long Isl., N.Y., = **L**. - *A. rubrica* Hald. (Lth. 1968:709).

C. lubrica (1918:286). Female **T**, New Jersey, = **L**. - *A. rubrica* Hald. (Lth. 1968:709).

C. nigripennis (1918:286). Female **T**, Long Isl., N.Y., = **L**. - *A. rubrica* Hald. (Lth. 1968:709).

C. piceonitens (1924:58). Female **T**, S. Pines, N.C., = **L**. - *A. rubrica* Hald. (Lth. 1968:709).

C. proba (1918:274). Male **T**, 5 **P**, San Francisco & vic. **T** = **L**. - *A. aurata* Dej. (Lth. 1968:710).

C. evanida (1918:275). Male **T**, 2 **P**, Columbia R., Oreg. **T** = **L**. - *A. aurata* Dej. (Lth. 1968:710).

C. govanensis (1924:53). Female **T**, 4 **P**, Govan, Wash.; 1 **P**, Wilbur, Wash. **T** = **L**. - *A. aurata* Dej. (Lth. 1968:710).

C. fragilis (1924:53). Male **T**, 5 **P**, Govan, Wash.; 3 **P**, Wilbur, Wash.; 1 **P**, B. C. **T** = **L**. - *A. aurata* Dej. (Lth. 1968:710).

C. formalis (1918:248). Female **T**, Provo, Utah, = **L**. - *A. farcta* Lec. (Lth. 1968:712).

C. subdepressa (1918:249). Female **T**, 1 **P**, Reno, Nevada. **T** = **L**. - *A. farcta* Lec. (Lth. 1968:712).

C. shastanica (1918:251). Male **T**, Siskiyou Co., Calif., = **L**. (3 **P**, same loc., are *californica* Dej.) - *A. farcta* Lec. (Lth. 1968:712).

C. solita (1918:252). Male **T**, female **P**, Nebr. **T** = **L**. - *A. farcta* Lec. (Lth. 1968:712).

C. vancouveri (1924:50). Male **T**, Peachland, B.C.; 2 **P**, Govan and Pullman, Wash. **T** = **L**. - *A. farcta* Lec. (Lth. 1968:712).

C. olympia (1924:50). Male **T**, Wilbur, Wash., = **H**. - *A. farcta* Lec. (Lth. 1968:712).

C. subsimilis (1924:50). Male **T**, Govan; 1 **P**, Wawawai, Wash. **T** = **L**. - *A. farcta* Lec. (1968:713).

C. marginatella (1924:51). Female **T**, Monarch, Manit., = **H**. - *A. farcta* Lec. (Lth. 1968:713).

C. parallela (1924:51). Male **T**, Lethbridge, Alta., = **L**. - *A. farcta* Lec. (Lth. 1968:713).

C. albertae (1924:51). Female **T**, Lethbridge, Alta., = **H**. - *A. farcta* Lec. (Lth. 1968:713).

C. funebris (1924:52). Male **T**, Winnipeg, Manit., = **H**. - *A. farcta* Lec. (Lth. 1968:713).

C. reducta (1918:252). Male **T**, 2 **P**, Color. **T** = **L**. - *A. patruelis* Dej. (Lth. 1968:714).

C. columbiana (1924:52). Female **T**, B.C., = **H**. - *A. patruelis* Dej. (Lth. 1955:106).

Amara aeneolucens (1918:312). Female **T**, Duluth, Minnes.; 1 **P**, Marquette, Mich. **T** = **L**. - *A. laevipennis* Kby. (Lth. 1968:717).

Celia ellipsis (1918:252). Male **T**, Kansas; 1 **P**, Color. **T** = **L**. - *A. ellipsis* Csy. (Lth. 1968:718).

C. winnipegensis (1924:53). Male **T**, Winnipeg, Manit., = **H**. - *A. ellipsis* Csy. (Lth. 1968:718).

Amara marquettensis (1918:304). Female **T**, Marquette, Mich., = **L**. - *A. lunicollis* Schi. (Lth. 1955:109).

A. carriana (1924:65). Male **T**, Edmonton, Alta., = **L**. - *A. lunicollis* Schi. (Lth. 1955:109).

A. aeneopolita (1918:304). Male **T**, Marquette, Mich., = **L**. - *A. aeneopolita* Csy. (Lth. 1955:108; 1968:722).

A. rustica (1918:203). Female **T**, S. Pines, N.C., = **L**. - *A. coelebs* Hayw. (Lth. 1968:723).

A. nebraskana (1918:204). Male **T**, 3 **P**, Nebraska. **T** = **L**. - *A. coelebs* Hayw. (Lth. 1968:723).

A. oblongula (1918:305). Male **T**, Boulder, Color., = **L**. - *A. coelebs* Hayw. (Lth. 1968:723).

A. leviceps (1924:60). Male **T**, Govan; 1 **P**, Wilbur, Wash. **T** = **L**. - *A. coelebs* Hayw. (Lth. 1968:723).

A. impedita (1918:310). Male **T**, female **P**, Wyom. **T** = **L**. - *A. confusa* Lec. (Lth. 1968:726).

A. ebenina (1918:310). Female **T**, Boulder, Color., = **L**. - *A. confusa* Lec. (Lth. 1968:726).

A. viridula (1924:60). Male **T**, male **P**, Lethbridge, Alta. **T** = **L**. - *A. confusa* Lec. (Lth. 1968:726).

A. oblongiformis (1924:60). Male **T**, Govan, Wash., = **H**. - *A. confusa* Lec. (Lth. 1968:726).

A. acomana (1924:61). Male **T**, 1 **P**, Maxwell, New Mex. **T** = **L**. - *A. confusa* Lec. (Lth. 1968:726).

A. subarctica (1924:64). Male **T**, Boucher, Sask., = **L**. - *A. confusa* Lec. (Lth. 1968:726).

Celia semota (1918:251). Female **T**, Bull Run, Clackamas Co., Oreg., = **L**. - *Amara conflata* Lec. (Lth. 1968:726).

Amara diffidens (1918:306). Female **T**, 3 **P**, San Francisco & vic. **T** = **L**. - *A. conflata* Lec. (Lth. 1968:726).

A. leydeni (1918:306). Male **T**, 2 **P**, Coeur d'Alene, Idaho. **T** = **L**. - *A. conflata* Lec. (Lth. 1968:727).

A. arcuata (1918:296). Female **T**, Long Isl., N.Y., = **L**. - *A. impuncticollis* Say (Lth. 1968:728).

A. otiosa (1918:300). Male **T**, Duluth, Minnes., = **L**. - *A. impuncticollis* Say (Lth. 1968:728).

A. wadei (1924:63). Female **T**, 1 **P**, Hagerstown, Md. **T** = **L**. - *A. impuncticollis* Say (Lth. 1968:728).

A. mystica (1918:298). Female **T**, San Francisco & vic., male **P**, Los Angeles. **T** = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. hesperia (1918:298). Female **T**, San Francisco & vic.; 25 **P**, from several western States. **T** = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. keeni (1918:299). Male **T**, female **P**, Inverness, B.C. **T** = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. lacustrina (1918:299). Male **T**, 3 **P**, Bayfield, Wisc.; 2 **P**, Marquette, Mich. **T** = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. laurana (1918:300). Male **T**, Boulder, Color., = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. turbata (1918:307). Male **T**, Akron, Color., = **L**. - *A. littoralis* Mnh., without elytral pore-puncture (Lth. 1968:730).

A. oodiformis (1924:58). Male **T**, Ibo, Idaho, = **H**. - *A. littoralis* Mnh. (Lth. 1968:780).

A. convergens (1924:59). Male **T**, Peachland, B.C., = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. pullmani (1924:61). Male **T**, Pullman, Wash., = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. microcephala (1924:62). Male **T**, 2 **P**, S. Pines, N.C. **T** = **L**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. recticollis (1924:62). Male **T**, S. Pines, N.C., = **H**. - *A. littoralis* Mnh. (Lth. 1968:730).

A. humilis (1918:302). Male **T**, 2 **P**, Boston Neck, R.I.; 2 **P**, Long Isl., N.Y. **T** = **L**. - *A. familiaris* Dft. (Darlington, 1936).

A. devincta (1918:307). Male **T**, Connecticut (illegible loc.), = **H**. - *A. aenea* DeG. (Darlington, 1936).

A. tenax (1918:302). Male **T**, 2 **P**, Color. Since **T** does not fit the description (probably = *lunicollis* Schi.), 1st **P**, female, = **L**. - *A. cupreolata* Putz. (Lth. 1968:733).

A. enervis (1918:306). Male **T**, Penns., = **L**. - *A. cupreolata* Putz. (Lth. 1968:733).

A. neoscotica (1924:59). Male **T**, Halifax, N.S., = **L**. - *A. cupreolata* Putz. (Lth. 1968:733).

A. inflaticollis (1924:63). Male **T**, Aweme, Manit., = **L**. - *A. cupreolata* Putz. (Lth. 1968:733).

A. wingatei (1918:308). Male **T**, Fort Wingate, New Mex., = **L**. - *A. convexa* Lec. (Lth. 1968:734).

A. oviformis (1918:308). Female **T**, 3 **P**, Boulder, Color. **T** = **L**. - *A. convexa* Lec. (Lth. 1968:734).

A. piceola (1918:309). Male **T**, Las Vegas, New Mex., = **H**. - *A. convexa* Lec. (Lth. 1968:734).

Celia frugalis (1924:54). Male **T**, Manit. (illegible loc.), = **L**. - *A. convexa* Lec. (Lth. 1968:734-35).

Amara cockerelli (1924:64). Female **T**, Jimtown, Color., = **L**. - *A. convexa* Lec. (Lth. 1968:734).

A. breviformis (1924:65). Male **T**, Boulder, Color., = **H**. - *A. convexa* Lec. (Lth. 1968:734).

A. marylandica (1884a:4). Male, Potomac R., Maryl., in coll. Lec. (MCZ), designated as **H**. - *A. basillaris* Say (Lth. 1968:735).

Triaena flebilis (1918:316). Female **T**, Marquette, Mich., = **L**. - *A. angustata* Say (Lth. 1968:736).

T. shermani (1918:315). Female **T**, Marquette, Mich., = **L**. - *A. pallipes* Kby. (Lth. 1968:737).

T. lawrenceana (1924:66). Male **T**, Ogdensburg, N.Y., = **H**. - *A. pallipes* Kby. (Lth. 1968:737).

T. parallela (1924:67). Male **T**, L. Champlain, N.Y., = **L**. - *A. pallipes* Kby. (Lth. 1968:737).

Amara provoana (1918:300). Female **T**, Provo, Utah, = **L**. - *A. scitula* Zimm. (Lth. 1968:739).

Triaena uinta (1918:317). Male **T**, 1 **P**, Provo, Utah. **T** = **L**. - *A. scitula* Zimm. (Lth. 1968:739).

T. vapida (1918:317). Female **T**, Provo, Utah, = **L**. - *A. scitula* Zimm. (Lth. 1968:739).

Amara obliqua (1924:63). Male **T**, Victoria, B.C., = **H**. - *A. scitula* Zimm. (Lth. 1968:739).

Triaena irregularis (1924:66). Male **T**, "V.I." (=Vanc. Isl.; not Wash., as given in the description), =**H**. - *A. scitula* Zimm. (Lth. 1968:739).

T. profuga (1918:318). Female **T**, Ariz., =**L**. - *A. longula* Lec. (Lth. 1968:740).

Cratacanthus bisectus (1884a:75). Male **T**, Penns., =**L**. - *C. dubius* Beauv. (Csy. 1914:58).

C. litoreus (1884a:74). Female **T**, New Jersey, =**L**. - *C. dubius* Beauv. (Csy. 1914:58).

Piosoma brevipennis (1914:54). **T** (sex ?), no loc., =**H**. - *P. setosum* Lec. (Lth. 1968:745).

Nothopus valens (1914:55). **T** (sex ?), 5 **P**, Keokuk, Iowa; 1 **P**, Duluth, Minnes. **T**=**L**. - *Euryderus grossus* Say (Ball 1960b).

N. obtusus (1914:56). **T** (sex ?), 2 **P**, Color. **T**=**L**. - *E. grossus* Say (Ball 1960b).

N. privatus (1914:56). **T** (sex ?), El Paso, Texas, =**L**. - *E. grossus* Say (described as subspecies of *zabroides* Lec., =*grossus* Say) (Ball 1960b).

N. arizonicus (1914:56). **T** (sex ?), 2 **P**, Arizona. **T**=**L**. - *E. grossus* Say (Ball 1960b).

Harpalus mormonicus (1914:86). Male **T**, 2 **P**, Utah. **T**=**L**. - *H. pensylvanicus* DeG. (Lth. 1968:760), of which it was described as a subspecies.

H. immixtus (1924:97). Male **T**, Adirondack Mts., N.Y., =**L**. - *H. pensylvanicus* DeG. (Lth. 1968:760).

H. haldemani (1914:79). Male **T**, Penns.; male **P**, Long Isl., N.Y. **T**=**L**. - *H. longicollis* Lec. (Lth. 1968:762).

H. dolosus (1914:84). Female **T**, Boston Neck, R.I.; 2 **P**, Champlain, N.Y. **T**=**L**. - *H. (?) longicollis* Lec. (Lth. 1968:762; by Ball & Anderson, 1962, interpreted as hybrids, *erythropus* × *bicolor*).

H. latescans (1924:97). Male **T**, Penns., =**L**. - *H. longicollis* Lec. (Lth. 1968:762).

H. nactus (1914:82). Female **T**, female **P**, Ariz. **T**=**L**. - *H. bicolor* F. (Lth. 1968:763).

H. feroculus (1924:98). Female **T**, Boston Neck, R.I., =**H**. - *H. bicolor* F. (Lth. 1968:763).

H. admissus (1924:99). Male **T**, 1 **P**, Duluth, Minnes.; 1 **P**, Champlain, N.Y. **T**=**L**. - *H. bicolor* F. (Lth. 1968:763).

H. excubans (1924:99). Male **T**, Watch Hill, R.I., =**L**. - *H. (?) bicolor* F. (Lth. 1968:763; by Ball & Anderson 1962, interpreted as a hybrid, *erythropus* × *bicolor*).

H. paratus (1924:100). Male **T**, Akron, Color.; 5 **P**, Color. **T**=**L**. - *H. paratus* Csy. (Ball & Anderson 1962).

H. rufopiceus (1914:80). Female **T**, 2 **P**, Missouri. **T**=**L**. - *H. erythropus* Dej. (Lth. 1968:764).

H. deludens (1914:80). Female **T**, Keokuk, Iowa, =**L**. - *H. erythropus* Dej. (Lth. 1968:764).

H. effetus (1914:81). Male **T**, Long Isl., N.Y., =**H**. - *H. erythropus* Dej. (Lth. 1968:764).

H. fenisex (1914:81). Male **T**, St. Louis, Missouri, =**H**. - *H. erythropus* Dej. (Lth. 1968:764).

H. cupiens (1924:98). Female **T**, Highland Park, Illin., =**H**. - *H. erythropus* Dej. (Lth. 1968:764).

H. abstrusus (1914:81). Male **T**, Boston Neck, R.I., =**L**. - *H. (?) erythropus*

Dej. (Lth. 1968:764; by Ball & Anderson 1962, interpreted as a hybrid, *erythropus* × *bicolor*).

H. dux (1924:94). Female **T**, S Illin., = **L**. - *H. caliginosus* F. (Lth. 1968:765), of which it was described as a subspecies.

H. caudalis (1914:73). Male **T**, St. Louis, Missouri; 4 **P**, Nebraska, &c. **T** = **L**. - *H. erraticus* Say (Lth. 1968:766).

H. convictor (1884a:12). Male **T** (with "Type" in Csy.'s hand), Long Isl., N.Y., = **H**. - *H. aeneus* F. (*affinis* Schrank) (Csy. 1914:75; see, however, 1924:94; Lth. 1968:768).

H. canonicus (1884a:12). Male **T** (with "Type" in Csy.'s hand), Rhode Isl., = **H**. - *H. aeneus* F. (*affinis* Schrank) (Csy. 1914:75; Lth. 1968:768).

H. lustralis (1884a:12). Female **T** (with "Type" in Csy.'s hand), N.Y., = **H**. - *H. aeneus* F. (*affinis* Schrank) (Csy. 1914:75; Lth. 1968:768).

H. aenescens (1884a:12). Male **T** (with "Type" in Csy.'s hand), Rhode Isl., = **H**. (No **P** specimens.) - *H. aeneus* F. (*affinis* Schrank) (Csy. 1914:75; Lth. 1968:768).

H. transversus (1914:77). Female **T**, nr. Santa Fé, New Mex., = **L**. - *H. amputatus* Say (Lth. 1968:769).

H. papagonalis (1914:77). Female **T**, Ariz., = **H**. - *H. amputatus* Say (Lth. 1968:769).

H. bracatus (1924:95). Female **T**, Miner's Peak, Utah, = **L**. - *H. amputatus* Say (Lth. 1968:769).

H. ancillaris (1924:95). Male **T**, 1 **P**, Columbia R., Oreg. **T** = **L**. - *H. amputatus* Say (Lth. 1968:769).

H. cupreolatus (1924:96). Male **T**, Pullman, Wash., = **L**. - *H. amputatus* Say (Lth. 1968:769).

H. cuculus (1924:96). Male **T**, Las Vegas, New Mex., = **H**. - *H. amputatus* Say (Lth. 1968:769).

H. nimius (1924:100). Male **T**, Columbia R., Oreg., = **H**. - *H. fraternus* Lec. (Lth. 1968:771), of which it was described as a subspecies.

H. praestans (1924:101). Female **T**, Provo Cañon, Utah, = **L**. - *H. fraternus* Lec. (Lth. 1968:771).

Euharpalops wadei (1924:116). Male **T**, female **P**, Moro, Oreg. **T** = **L**. - *H. fraternus* Lec. (Lth. 1968:771).

Harpalus lecontei (1914:117). The name replaces *oblitus* Lec. nec Dej., and the type specimen, from Santa Fé, New Mex., is in coll. Lec. (MCZ).

H. aesopus (1914:117). Female **T**, 4 **P**, Plattsburg, N.Y. **T** = **L**. - *H. lewisi* Lec. (Csy. 1924:101).

H. solutus (1914:90). Female **T**, New Hampsh., = **L**. - *H. laticeps* Lec. (Lth. 1968:774).

H. animosus (1924:101). Female **T**, Miner's Peak, Utah, = **L**. - *H. animosus* Csy. (syn. *montanus* Lec.) (Lth. 1968:774).

H. providens (1914:90). Female **T**, New Jersey, = **L**. - *H. viduus* Lec. (Lth. 1968:775).

H. egregius (1914:88). The name replaces *alienus* Lec. nec Bates and the type specimen, from Veta Pass, Color., is in coll. Lec. (MCZ). (See Lth. 1968:776-77).

H. instructus (1924:107). Male **T**, 2 **P**, Edmonton, Alta. **T** = **L**. - *H. egregius* Csy. (Lth. 1968:776-77).

H. reversus (1924:103). Female **T**, 6 **P**, Marquette, Mich. **T** = **L**. - *H. funerarius* Cki. (Lth. 1968:779).

H. electus (1924:115). Female **T**, Edmonton, Alta., = **H.** - *H. ventralis* Lec. (Lth. 1968:781).

H. indigens (1924:114). Male **T**, Monmouth, Maine, = **H.** - *H. indigens* Csy.

H. beatulus (1924:114). Male **T**, Marquette, Mich., = **H.** - *H. indigens* Csy. (Lth. 1968:782).

Opadius piperi (1924:93). Female **T**, Grayling, Mich., = **L.** - *H. indigens* Csy. (Lth. 1968:782).

Harpalus intactus (1914:97; nec 1924:112). Female **T**, Calif., = **H.** - *H. intactus* Csy. (Lth. 1968:788).

H. uintanus (1924:106). Male **T**, Cedar City, Utah, = **L.** - *H. intactus* Csy. (Lth. 1968:788).

H. contactus (1924:106). Male **T**, Cedar City, Utah, = **L.** - *H. somnulentus* Dej. (Lth. 1968:789).

H. blanditus (1924:108). Male **T**, 2 **P**, Terrace, B.C. **T** = **L.** - *H. somnulentus* Dej. (Lth. 1968:789).

H. celox (1914:107, "*celax*"; spelling corrected 1914:383, and 1918:414). Male **T**, male **P**, Clackamas, Oreg. **T** = **L.** - *H. celox* Csy. (Lth. 1968:790).

H. uteanus (1914:118). Male **T**, 3 **P**, Provo, Utah. **T** = **L.** - *H. uteanus* Csy. (Lth. 1968:791-92).

H. oppositus (1914:125). Male **T**, Siskiyou Co., Calif., = **L.** - *H. uteanus* Csy. (Lth. 1968:791-92).

H. placidus (1884a:10). Male **T** (with "Type" in Csy.'s hand), New Jersey (lapsus calami ?; Long Isl., N.Y., acc. to description), = **H.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. aequabilis (1914:100). Female **T**, Buena Vista, Color., = **L.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. lascivus (1914:100). Male **T**, B.C., = **L.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. pumilio (1914:100). Female **T**, Bayfield, Wisc., = **L.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. perspicuus (1914:101). Male **T**, Boulder, Color., = **L.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. lividulus (1914:101). Male **T**, Bayfield, Wisc., = **L.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. nivalis (1924:109). Male **T**, Redvers, Sask., = **H.** - *H. pleuriticus* Kby. (Lth. 1955:139).

H. recisus (1914:93). Male **T**, New Jersey, = **L.** - *H. fallax* Lec. (Lth. 1968:794).

H. amiculus (1924:102). Male **T**, L. George, N.Y., = **L.** - *H. fallax* Lec. (Lth. 1968:794).

H. asensus (1924:107). Male **T**, Boulder, Color., = **H.** - *H. herbivagus* Say (Lth. 1968:794).

H. recensus (1914:99). Male **T**, 3 **P**, W. St. Modest, Labr.; 1 **P**, Mich. **T** = **L.** - *H. nigritarsis* C. R. Sahlb. (Lth. 1955:141).

H. seclusus (1914:106). Male **T**, 5 **P**, Color. **T** = **L.** - *H. seclusus* Csy. (Lth. 1968:797).

H. parowanus (1924:105). Male **T**, Mammoth, Parowan Mts., Utah, = **L.** - *H. seclusus* Csy. (Lth. 1968:797).

H. opicus (1914:106). Female **T**, Placer Co., Calif., = **L.** - *H. fuliginosus* Dft. (Lth. 1968:798).

H. persolus (1914:96). Female **T**, Oreg., = **L.** - *H. innocuus* Lec. (Lth. 1968:800).

H. fugitans (1914:98). Male **T**, Frazier Valley, B.C., = **L**. - *H. innocuus* Lec. (Lth. 1968:800).

H. intactus (1924:112, nec 1914). Male **T**, Marquette, Mich., = **H**. - *H. innocuus* Lec. (Lth. 1968:800).

H. crenatellus (1914:94). Male **T**, Calif., = **H**. - *H. cautus* Dej. (Lth. 1968:802).

H. oregonensis (1914:94). Male **T**, 1 **P**, Oreg. **T** = **L**. - *H. cautus* Dej. (Lth. 1968:802).

H. columbianus (1924:104). Male **T**, Goldstream, B.C., = **L**. - *H. cautus* Dej. (Lth. 1968:802).

H. obnixus (1924:105). Male **T**, 2 **P**, Provo Cañon, Utah. **T** = **L**. - *H. obnixus* Csy. (Lth. 1968:803).

H. lacustris (1914:111). Male **T**, 4 **P**, Bayfield, Wisc. **T** = **L**. - *H. opacipennis* Hald. (Lth. 1968:805).

H. leviceps (1924:112). Female **T**, 4 **P**, Marquette, Mich. **T** = **L**. - *H. opacipennis* Hald. (Lth. 1968:805-06).

H. plenalis (1914:108). Female **T**, New Brunsw., = **L**. - *H. plenalis* Csy. (Lth. 1955:142-43; 1968:807).

H. latebricola (1914:109). Female **T**, Las Vegas, New Mex., = **L**. - *H. plenalis* Csy. (Lth. 1968:807).

H. modulatus (1924:112). Female **T**, Fort Coulonge, Queb., = **H**. - *H. plenalis* Csy. (Lth. 1955:142).

H. lustrans (1884b:64). The name replaces *lucidus* Lec. nec Morawitz, and the type specimen, from "Nebraska" (s.l.) is in coll. Lec. (MCZ). - *H. desertus* Lec. (Lth. 1968:810).

H. vacivus (1914:123). Male **T**, Jemez Springs, New Mex., = **L**. - *H. desertus* Lec. (Lth. 1968:810).

H. dulciculus (1924:109). Male **T**, 3 **P**, Akron, Color. **T** = **L**. - *H. desertus* Lec. (Lth. 1968:810).

H. captiosus (1924:110). Female **T**, Akron, Color., = **H**. - *H. desertus* Lec. (Lth. 1968:810).

H. metuens (1924:110). Female **T**, Ariz.; 2 **P**, Kansas. **T** = **L**. - *H. desertus* Lec. (Lth. 1968:810).

Episcopellus nitescens (1914:236). Female **T**, Distr. of Col., = **L**. - *E. autumnalis* Say (Lth. 1968:813).

Harpalus oblongus (1914:126). Female **T**, Utah, = **L**. - *Harpalellus basilaris* Kby. (Lth. 1968:816).

H. sejunctus (1914:126). Male **T**, Eldora, Color., = **L**. - *H. basilaris* Kby. (Lth. 1968:816).

H. renoicus (1914:127). Male **T**, 9 **P**, Reno, Nevada. **T** = **L**. - *H. basilaris* Kby. (Lth. 1968:816).

H. furviculus (1924:110). Male **T**, 2 **P**, Wawawai; 1 **P**, Govan; Wash. **T** = **L**. - *H. basilaris* Kby. (Lth. 1968:816).

H. stocktonensis (1924:111). Female **T**, Stockton, Utah, = **H**. - *H. basilaris* Kby. (Lth. 1968:816).

H. ventricosus (1924:111). Female **T**, Spences Bridge, B.C., = **H**. - *H. basilaris* Kby. (Lth. 1968:816).

H. durescans (1924:111). Female **T**, Fort Coulonge, Queb., = **L**. - *H. basilaris* Kby. (Lth. 1968:816).

H. subenormis (1924:113). Female **T**, Callao, Utah, = **L**. - *H. basilaris* Kby. (Lth. 1968:816).

Pteropalus fluvialis (1914:133). Female **T**, Missouri, = **L**. - *Trichotichnus dichrous* Dej. (Lth. 1968:819).

P. versutulus (1924:116). Male **T**, female **P**, S. Pines, N.C. **T** = **L**. - *T. dichrous* Dej. (Lth. 1968:819).

Hemisopalus depressulus (1914:137). Male **T**, L. Worth, Flor., = **L**. - *Selenophorus depressulus* Csy. (Lth. 1968:823).

Selenophorus mustus (1914:152). Female **T**, Biscayne Bay, Flor., = **L**. - *S. mustus* Csy. (Lth. 1968:823).

Celia morphus opaculus (1914:143). Male **T**, 4 **P**, New Jersey. **T** = **L**. - *Selenophorus ellipticus* Dej. (Lth. 1968:829).

C. currens (1914:143). Male **T**, Catskill Mts., N.Y., = **L**. - *S. ellipticus* Dej. (Lth. 1968:829).

Discoderus hesperus (1914:163). Female **T**, 4 **P**, Boulder, Color.; additional **P**'s from Kansas and Texas. **T** = **L**. - *D. parallelus* Hald. (Lth. 1968: 831).

D. parvuliceps (1924:121). Male **T**, Wray, Color., = **L**. - *D. parallelus* Hald. (Lth. 1968:831).

D. gener (1924:121). Male **T**, female **P**, Wawawai, Wash. **T** = **L**. - *D. parallelus* Hald. (Lth. 1968:831).

Geopinus fluviaticus (1914:52). Female **T**, 4 **P**, Keokuk, Iowa. **T** = **L**. - *G. incrassatus* Dej. (Lth. 1968:832), of which it was described as a subspecies.

In *Anisodactylus,* and related genera, I have designated Holo- and Lectotypes only of species, which had not already been so treated by G. R. Noonan.

Anadaptus uteanus (1924:136). Female **T**, Stockton, Utah, = **L**. - *Anisodactylus sanctaecrucis* F. (Lth. 1968:839).

A. parvulus (1914:204). Male **T**, Calif., = **L**. - *A. nivalis* Horn (Lth. 1968:841).

Triplectrus oblongus (1924:128). Female **T**, Nisbet, Penns., = **H**. - *Anisodactylus rusticus* Say (Lth. 1968:843).

T. peropacus (1914:176). Male **T**, 3 **P**, Galveston, Tex. **T** = **L**. - *A. haplomus* Chd. (Lth. 1968:845).

T. breviceps (1924:129). Female **T**, Mobile, Alab., = **L**. - *A. haplomus* Chd. (Lth. 1968:845).

T. marginatus (1924:126). Male **T**, Grayling, Mich., = **L**. - *A. merula* Germ. (Lth. 1968:845).

T. wolcotti (1924:127). Female **T**, 1 **P**, nr. Chicago, Illin. **T** = **L**. - *A. merula* Germ. (Lth. 1968:845).

T. kempi (1924:130). Female **T**, L. George, N.Y., = **L**. - *A. merula* Germ. (Lth. 1968:845).

T. ovularis (1914:177). Male **T**, Missouri; female **P**, Salina, Kans. **T** = **L**. - *A. ovularis* Csy. (Lth. 1968:846-47).

T. semirubidus (1924:127). Female **T**, Highland Park, Illin., = **L**. - *A. ovularis* Csy. (Lth. 1968:846-47).

T. modicus (1914:178). Female **T**, 2 **P**, Houston, Tex. **T** = **L**. - *A. dulcicollis* Laf. (Lth. 1968:847).

T. brevior (1924:126). Female **T**, Penns., = **L**. - *A. carbonarius* Say (Lth. 1968:848).

Anisodactylus lacertosus (1924:123). Female **T**, "L" (=Levette coll.; "probably Indiana"), = **H**. - *A. harrisi* Lec. (Lth. 1968:850).

A. obsolescens (1914:188). Female **T**, San Francisco & vic., = **L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. angustus (1914:188). Male **T**, San Diego, Calif.,=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. oregonus (1914:189). Male **T**, Clackamas Co., Oregon, 5 **P**, Oregon (several loc.:s). **T**=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. sinuatus (1914:190). Female **T**, Oreg.,=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. paganicus (1914:190). Male **T**, 5 **P**, Provo, Utah. **T**=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. humeralis (1914:190). Female **T**, Reno, Nev.,=**H**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. aleneanus (1924:124). Male **T**, Coeur d'Alene, Idaho,=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. comes (1924:124). Female **T**, female **P**, Humboldt Co., Calif. **T**=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. maestus (1924:124). Female **T**, Santa Cruz, Calif.,=**L**. - *A. californicus* Dej. (Lth. 1968:854-55).

A. incisus (1914:185). Male **T**, Hoopa Valley, Humboldt Co., Calif.,=**L**. - *A. similis* Lec. (Lth. 1968:855).

A. solidus (1914:186). Male **T**, nr. San Francisco; 10 **P**, Calif. **T**=**L**. - *A. similis* Lec. (Lth. 1968:855).

Harpalus gemmeus (1914:108, 114). Female **T**, Urbana, Illin.,=**L**. - *Anisodactylus laetus* Dej. (Omitted in Lth. 1968.)

Amphasia mollis (1924:131). Female **T**, Highland Park, Illin.,=**H**. - *Anisodactylus interstitialis* Say (Lth. 1968:860).

Harpalus manhattanis (1884a:9). Male **T**, Staten Isl., N.Y.,=**H**. - *Anisodactylus lugubris* Dej. (Lth. 1968:864).

Anisodactylus tioganus (1924:123). Male **T**, Tioga, Penns.,=**L**. - *A. lugubris* Dej. (Lth. 1968:864).

Anisotarsus angusticollis (1924:137). Male **T**, 1 **P**, Missouri. **T**=**L**. - *A. terminatus* Say (Lth. 1968:867).

A. fuscipennis (1924:137). Male **T**, Bayfield, Wisc.; 3 **P**, Marquette, Mich. **T**=**L**. - *A. terminatus* Say (Lth. 1968:867).

Harpalus conspectus (1924:103). Female **T**, Mt. Royal, Queb.,=**L**. - *Anisotarsus nitidipennis* Lec. (Lth. 1968:869-70).

Dicheirus alutaceus (1914:200). Female **T**, Humboldt Co., Calif.,=**L**. - *D. piceus* Mén. (Noonan 1968; Lth. 1968:872).

D. gracilis (1924:134). Female **T**, Govan, Wash.,=**H**. - *D. brunneus* Dej. (Noonan 1968; Lth. 1968:872).

Trichocellus boreellus (1914:229). Male **T**, Queen Charl. Isl., B.C.,=**L**. - *T. cognatus* Gyll. (Lth. 1968:875).

T. lateralis (1914:230). Female **T**, Fort Wingate, New Mex.,=**L**. - *T. cognatus* Gyll. (Lth. 1968:875).

T. monticola (1914:230). Female **T**, 1 **P**, Truckee, Calif. **T**=**L**. - *T. cognatus* Gyll. (Lth. 1968:875).

T. punctipennis (1914:230). Female **T**, Reno, Nevada,=**L**. - *T. cognatus* Gyll. (Lth. 1968:875).

Stenocellus lustrellus (1914:251). Female **T**, male **P**, Humboldt Co., Calif. **T**=**L**. - *Bradycellus lustrellus* Csy. (Lth. 1968:881).

S. antennalis (1914:245). Male **T**, Catskill Mts., N.Y.,=**L**. - *B. rupestris* Say (Lth. 1968:886).

S. nubicollis (1914:253). Male **T**, San Francisco & vic.; 11 **P**, Calif. (different loc.:s). **T**=**L**. - *B. nubifer* Lec. (Lth. 1968:887).

S. alutaceus (1914:250). Female **T,** 7 **P,** Siskiyou Co., Calif. **T**=**L.** - *B. congener* Lec. (Lth. 1968:888).

S. occultus (1914:246). **T** (sex ?), Bluff Point, L. Champlain, N.Y.; 4 **P**, N.Y., Indiana, &c. **T**=**L.** - *B. nigriceps* Lec. (Lth. 1968:889).

S. insulsus (1914:246). Male **T**, N.Y. City,=**L.** - *B. insulsus* Csy. (Lth. 1968:891).

Triliarthrus properus (1914:240). Male **T,** West Point, N.Y.,=**L.** - *B. badipennis* Hald. (Lth. 1968:898).

Stenolophus curticollis (1924:146). Female **T**, Somerset, Md.,=**L.** - *B. badipennis* Hald. (Lth. 1968:898).

Triliarthrus protractus (1914:239). Male **T**, Mass.,=**L.** - *B. lugubris* Lec. (Lth. 1968:901).

T. tetricus (1914:241). Female **T**, 2 **P**, Hoopa Valley, Humboldt Co., Calif. **T**=**L.** - *B. conformis* Fall (Lth. 1968:903).

Stenolophus longitarsis (1914:277). Male **T**, female **P**, Oregon. **T**=**L.** - *S. limbalis* Lec. (Lth. 1968:908).

S. fidelis (1914:275). Male **T**, 1 **P**, Reno, Nev.; 6 **P**, Calif.; 1 **P**, Victoria, B.C. **T**=**L.** - *S. anceps* Lec. (Lth. 1968:910).

S. incultus (1914:275). Female **T**, 6 **P**, Truckee, Calif. **T**=**L.** - *S. incultus* Csy. (Lth. 1968:911).

S. consors (1914:276). Male **T**, Gualala, Mendocino Co., Calif.,=**L.** - *S. incultus* Csy. (Lth. 1968:911).

S. debiliceps (1914:276). Female **T**, L. Tahoe, Calif.,=**H.** - *S. incultus* Csy. (Lth. 1968:911).

S. testaceicollis (1924:145). Female **T**, Boston Neck, R.I.,=**H.** - *S. ochropezus* Say (Lth. 1968:912).

S. floridanus (1924:145). Male **T**, Florida,=**L.** - *S. ochropezus* Say (Lth. 1968:912).

S. rivularis (1924:145). Female **T** (male, acc. to Csy.), Missouri,=**H.** - *S. plebejus* Dej. (Lth. 1968:913).

Agonoderus gracilitarsis (1914:296). Male **T**, 1 **P**, "L" (=Levette coll. "probably Indiana"); 1 **P** (sex male ?), New York. This second **P**=**L.** - *Stenolophus comma* F. (Lth. 1968:918).

A. obliqulus (1914:297). Female **T**, 3 **P**, Provo, Utah; 6 **P**, New Mex. **T**=**L.** - *S. comma* F. (Lth. 1968:918).

A. plagiatus (1914:294). Female **T**, Wisc.,=**L.** - *S. lecontei* Chd. (Lth. 1968:919-20).

Stenolophus captiosus (1914:281). **T** (sex ?), 3 **P**, Boulder, Color. **T**=**L.** - *S. conjunctus* Say (Lth. 1968:921).

S. moquinus (1914:282). Female **T**, 2 **P**, Ariz. **T**=**L.** - *S. conjunctus* Say (Lth. 1968:921).

S. thoracicus (1914:282). The "Type" is missing; 4 **P**, Missouri; 3 **P**, Iowa. Ex. no. 6, Missouri, selected as **L.** - *S. conjunctus* Say (Lth. 1968:921).

S. scitulus (1914:283). Male **T**, 1 **P**, Penns. **T**=**L.** - *S. rotundicollis* Hald. (Lth. 1968:922).

S. incitatus (1914:283). Male **T**, "New Jersey ?",=**H.** - *S. rotundicollis* Hald. (Lth. 1968:922). Described as subspecies of *scitulus* Csy.

Acupalpus expertus (1914:267). Female **T**, 1 **P**, Boston Neck, R.I. **T**=**L.** - *A. carus* Lec., var. (Lth. 1968:930).

A. trivialis (1914:268). Female **T**, 5 **P**, L. Champlain, N.Y. **T**=**L.** - *A. carus* Lec. (Lth. 1968:930).

A. subrectus (1924:143). **T** (sex ?), 2 **P**, Illin. **T = L.** - *A. carus* Lec. (Lth. 1968:930).

A. curtipennis (1924:144). Female **T**, Illin., = **H.** - *A. carus* Lec. (Lth. 1968:930).

A. nanellus (1914:268). **T** (sex ?), 1 **P**, Boston Neck, R.I. **T = L.** - *A. nanellus* Csy. (Lth. 1968:932).

A. canadensis (1924:144). **T** (sex ?), Mt. Royal, Queb., = **H.** - *A. canadensis* Csy.

Tachistodes obscurus (1924:147). **T** (sex ?), nr. N.Y. City, = **L.** - *Acupalpus* indistinctus Dej. (Lth. 1968:935).

T. lyratus (1924:147). **T** (sex ?), Kansas, = **L.** - *A. partiarius* Say (Lth. 1968:937).

T. convergens (1924:148). **T** (sex ?), Rockaway Beach, Long Isl., N.Y., = **L.** *A. partiarius* Say (Lth. 1968:937).

T. fusciceps (1914:288). Female **T**, New Jersey, = **L.** - *A. testaceus* Dej. (Lth. 1968:938).

All Types in tribe *Licinini* will be designated by G. E. Ball.

Chlaenius zunianus (1914:38). Female **T**, Fort Wingate, New Mex., = **L.** - *C. tomentosus* Say (Bell 1960; Lth. 1969:974).

C. lacustrinus (1920:298). Male **T**, Bayfield, Wisc., = **L.** - *C. tomentosus* Say (Lth. 1969:974), of which it was described as a subspecies.

C. delectans (1914:39). Female **T**, New York, = **L.** - *C. emarginatus* Say (Lth. 1969:975).

C. uteanus (1914:35). Male **T**, Provo, Utah, = **L.** - *C. sericeus* Forst. (Bell 1960), of which it was described as a subspecies.

C. blanditus (1920:297). Male **T**, 2 **P**, Vineyard, Utah. **T = L.** - *C. pensylvanicus* Say (Lth. 1969:987).

C. albertanus (1924:93). Female **T**, Edmonton, Alta., = **L.** - *C. alternatus* Horn (Lth. 1969:992).

C. punctipennis (1920:298). Male **T**, Wilbur, Wash., = **L.** - *C. purpuricollis* Rand. (Lth. 1969:994).

Loxopeza enormis (1920:237). Female **T**, N.Y. City & vic., = **L.** - *Lebia atriventris* Say (Lth. 1969:1020).

L. nanulina (1920:238). Female **T**, male **P**, Boulder, Color., **T = L.** - *L. atriceps* Lec. (Lth. 1969:1020).

L. magister (1920:236). Female **T**, Marquette, Mich., = **L.** - *L. grandis* Hentz (Lth. 1969:1021).

Lebia cynica (1920:241). Male **T**, Boston Neck, R.I., = **L.** - *L. moesta* Lec. (Lth. 1969:1028).

L. websteri (1920:260). Female **T**, Indiana, = **L.** - *L. solea* Hentz (Lth. 1969:1031).

L. debiliceps (1913:192). Male **T**, 1 **P**, Indiana. **T = L.** - *L. vittata* F. (Lth. 1969:1032).

L. pacifica (1920:259). Female **T**, Calif., = **L.** - *L. guttula* Lec. (Lth. 1969:1035).

L. canonica (1920:257). Female **T**, 1 **P**, Marquette, Mich.; 2 **P**, Boston Neck, R.I. **T = L.** - *L. fuscata* Dej. (Lth. 1969:1036).

L. reperta (1920:255). Female **T**, New York, = **L.** - *L. ornata* Say (Lth. 1969:1036).

L. virginica (1920:255). Female **T**, Norfolk, Va., = **L.** - *L. ornata* Say (Lth. 1969:1036).

L. ashevillensis (1920, 256). Female **T**, Asheville, N.C.,=**H.** - *L. ornata* Say (Lth. 1969:1036). Described as a sbsp. of *virginica* Csy.

L. fluviatilis (1920:256). Female **T**, Vicksburg, Missis.; 4 **P**, Illin. **T**=**L.** - *L. ornata* Say (Lth. 1969:1036).

L. tertiaria (1920:248). Female **T**, Distr. of Col.,=**L.** - *L. pumila* Dej. (Lth. 1969:1038).

L. ludoviciana (1920:248). Male **T**, Alexandria, Louis.,=**L.** - *L. pumila* Dej. (Lth. 1969:1038).

L. quadrata (1920:249). **T** (sex ?), S. Pines, N.C.,=**L.** - *L. pumila* Dej. (Lth. 1969:1038).

L. illini (1920:249). Female **T**, N Illin.,=**L.** - *L. pumila* Dej. (Lth. 1969:1038).

L. frugalis (1920:250). Female **T**, Bayfield, Wisc.,=**L.** - *L. pumila* Dej. (Lth. 1969:1038).

Apristus constrictus (1920:276). **T** (sex ?), Sta. Rosa, Calif.,=**L.** - *A. constrictus* Csy. (Lth. 1969:1045).

Blechrus prominulus (1920:269). Male **T**, Reno, Nev.; 1 **P**, L. Tahoe; 1 **P**, Hoopa Valley, Humboldt Co.; Calif. **T**=**L.** - *Microlestes linearis* Lec. (Lth. 1969:1050-51).

B. fretus (1920:209). Female **T**, San Francisco & vic.,=**L.** - *M. nigrinus* Mnh. (Lth. 1969:1051-52), of which it was described as a subspecies.

B. obispinus (1920, 209). Female **T**, Port Harford, S. Luis Obispo Co., Calif.,=**L.** - *M. nigrinus* Mnh. (Lth. 1969:1051-52), of which it was described as a subspecies.

B. curtipennis (1920:270). Female **T**, San Francisco & vic.,=**L.** - *M. curtipennis* Csy. (Lth. 1969:1053).

Philophuga obscura (1924:91). Female **T**, L. George, N.Y.,=**L.** (Larson, 1969:82, doubts the type loc.) - *Calleida viridis amoena* Lec. (Larson, l.c.; Lth. 1969:1063).

Cymindis zuniana (1913:181). Male **T**, 4 **P**, Benson, Ariz.; 1 **P**, nr. Santa Fé, New Mex. **T**=**L.** - *C. arizonensis* Schffr., s.l. (Lth. 1969:1075).

C. acomana (1913:181). Male **T**, New Mex.,=**L.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. rupimontis (1913:183). Female **T**, Boulder, Color.,=**L.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. alticola (1913:183). Male **T**, New Hampsh.,=**L.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. kirbyi (1924:88). Male **T**, Caribou Distr., B.C.=**H.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. planifera (1924:89). Male **T**, "L" (=Levette coll., "probably Color."),=**H.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. obliqua (1924:89). Female **T**, Edmonton, Alta.,=**L.** - *C. cribricollis* Dej. (1955:131).

C. sinuata (1924:90; nec Reiche 1855). Female **T**, New Mex.,=**L.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. alternans (1924:90; nec Rambur 1837). Female **T**, no loc. ("probably Color."),=**H.** - *C. cribricollis* Dej. (Lth. 1955:131).

C. bipartita (1913:185). Male **T** (*not* female), Green R., Wyom.,=**L.** - *C. planipennis* Lec. (Lth. 1969:1077-78).

C. directa (1920:286). Female **T**, Akron, Color.,=**L.** - *C. planipennis* Lec. (Lth. 1969:1077-78).

C. govanica (1924:89). Female **T**, Govan, Wash., = **L**. - *C. planipennis* Lec. (Lth. 1969:1077-78).

C. evanescens (1913:179). Male **T**, 3 **P**, Marysvale, Utah. **T** = **L**. - *C. evanescens* Csy. (Lth. 1969:1079).

C. continens (1920:287). Female **T**, 1 **P**, Color. **T** = **L**. (Type loc. probably incorrect, Lth., l.c.) - *C. americana* Dej. (Lth. 1969:1079, 1082).

C. parowana (1924:88). Male **T**, 1 **P**, Mammoth, Parowan Mts., Utah. **T** = **L**. - *C. unicolor* Kby. (Lth. 1955:130).

C. agitata (1920:285). Female **T**, 2 **P**, Chihuahua, Colonia Garcia, Mex. **T** = **L**. - *C. uniseriata* Bts. (Lth. 1969:1085).

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ADDENDUM

Nebria expansa Csy. (1913:56) (see p. 112, above). D. H. Kavanaugh (*in litt.*) regards the label "Texas" of the "Lectotype" as decidedly wrong. The second specimen, labeled "L" (=Levette coll.), was interpreted by Csy. as from Indiana, acc. to Kavanaugh a quite acceptable record. I have therefore removed the Lectotype label from the Texas to the presumed Indiana specimen.

ERRATUM

The minutes of the annual meeting held in Minneapolis were published as received in the March issue (Vol. 29, No. 1). The following correction has been received to item 10C ("Arnett wrote that a problem has been in getting tax exempt status . . ."): "This has never been a problem. We have always had full tax exempt status as well as the ability to offer tax deduction status for any donation received. We are assured of this status as long as we exist. The true problem is simply that we must secure membership donations to offset large donations from individuals. A donation from the Coleopterists Society would have had to be offset by more membership donations in order for us to maintain the balance of income required by IRS. This fine point of the law is no doubt difficult to understand by the people attending a meeting unless considerable time is spent in the explanation. But the way it is reported in the 'Bulletin' will cause a lot of unneeded correspondence on our part explaining to the nearly 1,200 individuals who have already donated that their tax deduction is still valid."—Ross H. Arnett, Jr., Managing Director, Biological Research Institute of America, Inc.

INSECT STAMP(S)?

In August, 1976, the XV International Congress of Entomology will be held in Washington, D.C. We are anxious that an insect stamp, or a block of 4 insect stamps be issued to commemorate this important congress. We request that members of the Society write to the Honorable Benjamin Franklin Bailar, Postmaster General, Post Office Department, Washington, D.C. 20260 and recommend the issue of such insect stamp, or stamps. As precedent, the issue of a block of four for the International Botanical Congress of 1969 may be cited. Other valid reasons for such an issue are the importance of insects in forestry, Agriculture, etc., and also their beauty or other interest. Please write immediately and let's get some publicity for insects whether beetle, butterfly or bee.—J. F. Gates Clarke, Research Associate, Department of Entomology, Smithsonian Institution.

(continued from inside front cover)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

NOTICES

Notices to appear on this page are a free service to members and subscribers. Such copy will be limited to the back page, the older notices being moved up and replaced with the newest ones at the bottom. The editor reserves the right to reword such notices for brevity, consistency, and clarity.

FREE PUBLICATION: If you are not now receiving "Progress Reports", the newsletter of the North American Beetle Fauna Project, send your name, address, and interest in beetles statement to: Dr. R. H. Arnett, NABF Project, Dept. Biol., Siena College, Loudonville, NY 12211.

SCARABAEIDAE: Looking for all material of Coprinae, literature and specimens, also in exchange and purchase. Klaus-Ulrich Geis, Gyrhofstr. 6, D 5 Koln 41, Western Germany.

PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

EXCHANGE: I am interested in trading Colorado beetles for Meloidae and/or Scarabaeidae. I prefer Meloidae. D. Hartman, P. O. Box 444, Frederick, Colorado 80530.

FOR SALE: Comparative anatomy of the male genital tube in Coleoptera. Classic Sharp & Muir monograph on genitalia & six related papers. An essential work for all serious students of Coleoptera. 304 pp., 43 pls., bound. $10.00. Entomological Society of America, 4603 Calvert Road, Box AJ, College Park, Maryland 20740.

CARABUS, CARABIDAE, CERAMBYCIDAE: Will purchase or exchange Albert Sermet, Pres du lac 17.1400, Yverdon, (Suisse) Switzerland.

LUCANIDAE: World revision of most genera; prefer exchange for lucanids or other beetles; will identify loans, will buy if necessary. Hughes E. Bomans, 39 Avenue Charles Verhaegen, 1950 Crainhem, Belgium.

MICROPEPLIDAE: Working toward a world monograph of the entire family. Specimens, praeimaginal stages, distribution and/or ecological records needed from all areas of the World, by loan, or general exchange, correspondence invited. **SILPHIDAE:** Presently revising the genus ***Agyrtes*** for World. Request loan of adults and/or larvae & pupae. Distribution and ecological records welcome. **STAPHYLINIDAE:** Revising the genus ***Bryocharis*** (subfam. Tachyporinae). Request loan of New World and East Asiatic material especially. Petr Nohel, Botany Inst., Czech. Acad. Sci., 25243-Pruhonice nr. Prague, Czechoslovakia.

SCARABAEIDAE: ***Chalcosoma atlas*** and subspecies from Malaysia, Philippines, Java, & Sumatra (5-11cm) For Sale. K. A. Schmitt, W168 N11469 El Camino, Germantown, Wisc. 53022.

EXCHANGE: Curculionidae, Buprestidae, and Carabidae. Massimo Heregalli, C. A. Picco 27, 10131 Torino, ITALY.

CICINDELIDAE: Need specimens of following genera for morphological studies of family: ***Eucallia, Nickerlea, Rhysopleura, Langea, Opisthencentrus, Iresia, Oxygonia, Ctenostoma, Pogonostoma, Caledonomorpha, Caledonica, Distipsidera, Aniara, Prothyma.*** Wish to exchange, borrow, or purchase and can use poorly labelled or damaged material. R. D. Ward, Dept. Ent., Michigan State Univ., East Lansing, Mich. 48823.

FOR SALE: Exotic beetles from Malaysia, New Guinea, Africa, Brazil, etc. Send $1.00 for 64 p. catalogue. Prospect Biological, P. O. Box 307, Round Lake, Illinois 60073.

PHILIPPINE BEETLES: Leonard L. Lengyel, c/o Mrs. Manuela R. Ablan, Rizal St., Laoag City, Ilocos Norte, Rep. Philippines.

LITERATURE DESIRED: Donations of reprints, journals, and reference works are solicited to build up library. Wau Ecology Institute, Box 77, Wau, PAPUA, NEW GUINEA.

SCARABAEIDAE: Want to purchase ***Dynastes tityus*** and ***Plusiotus*** from North and Central America or trade for ***Psalidognathus superbus*** and French Scarabaeidae. T. D. Haas, 97 Barnes St., Long Beach, N. Y. 11561.

WANTED: Casey, T. L. 1912. Memoir III, p. 1-386. Henry Dietrich, Dept. Ent., Cornell Univ., Comstock Hall, Ithaca, N. Y. 14850.

BUPRESTIDAE: Buy, exchange, determine Central American Agrilinae for revisionary studies. Henry A. Hespenheide, Dept. Biology, Univ. California, Los Angeles, California 90024.

CERAMBYCIDAE & HISTERIDAE: Respectively wish *Eburia* (regional studies) and *Plegaderus* (World revision); all stages. Robert H. Perry, 118 Pilgrim Ct., Bolingbrook, Ill. 60439.

SCARABAEIDAE: Would like to purchase or trade for various species of *Plusiotus, Megasoma joergenseni, M. janus* v. *argentina, Dynastes hercules* v. *equatoriana, D. satannae, Parachrysina truquii, Chrysina karschi, C. modesta, Homoiosternus beckeri, Heterosternus ludeckei, H. oberthuri.* T. W. Taylor, 8529 Norwood Pl., Rosemead, CA 91770.

WANTED: Carabidae *larvae*. Studying the phylogeny of the tribes Morionini, Pterostichini, Agonini, and Amarini as a thesis problem. Request loans, will sort. Contact for further information and/or send to Raymond G. Thompson, Dept. Ent., Univ. of Arkansas, Fayetteville, AR 72701. 501/575-2451.

STAPHYLINIDAE: If anyone wishes to send us unsorted Staphylinidae in 70% alcohol we will *eventually* return 1 or 2 specimens mounted, labeled and identified to the nearest possible taxon. Ecological data particularly desired. Ian Moore, Div. Biological Control, Univ. of California, Riverside, CA 92502.

IDAHO ANTS: A guide to Idaho ants is being prepared by Nicholas P. Yensen & William H. Clark. Request loan or gifts of Idaho ant specimens (or collection data) & pertinent literature. W. H. Clark, 1614 W. Jefferson St., Boise, Idaho 83702.

SCARABAEIDAE: Studying myrmecophilous and termitophilous Aphodiinae. Request loan of New World material especially. Will sort from general scarab collections or from light trap samples. Robert E. Woodruff, Fla. Dept. Agr., P. O. Box 1269, Gainesville, FL 32601.

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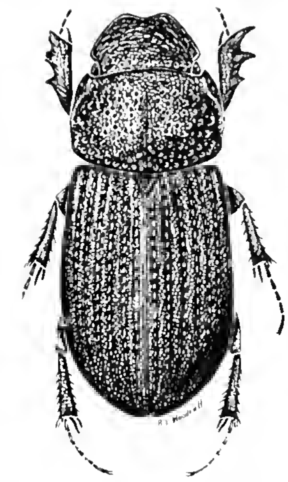
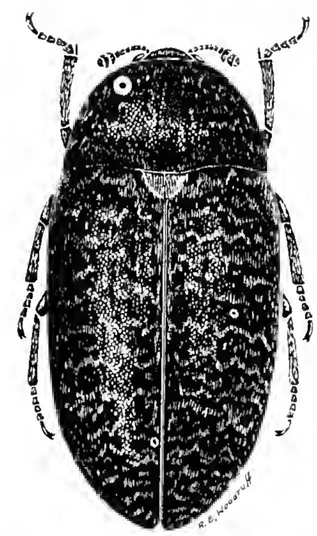
THE COLEOPTERISTS BULLETIN



AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES

VOLUME 29, NO. 3 SEPTEMBER, 1975



DRYOPOIDEA & DASCILLOIDEA: Checklist by H. P. Brown 149-160

SCARABAEIDAE: *Aphodius* with pocket gophers by R. R. Blume & A. Aga 161-162

ELATERIDAE: 4 introduced *Conoderus* by M. W. Stone 163-166

STAPHYLINIDAE: Book review by D. H. Kistner 167-168

BUPRESTIDAE: New Mexican *Polycesta* by G. H. Nelson 169-171

HYDROPHILIDAE: *Sphaeridium* in Mexico by J. Hendrichs S. 171

SCARABAEIDAE: New Nevada *Serica* by R. D. Gordon 173-176

CARABIDAE: *Psydrus* in Arizona by S. McCleve 176

STAPHYLINIDAE: New World *Erichsonius* by J. H. Frank 177-203

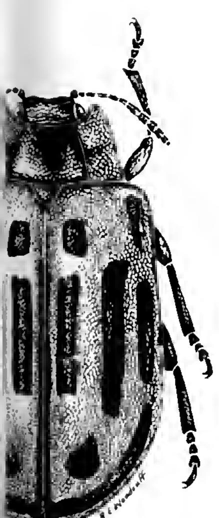
STAPHYLINIDAE: Lectotype in *Conosoma* by J. M. Campbell 204

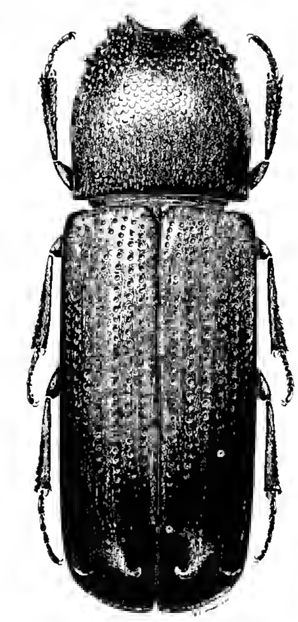
FIELD TRIP TO JAMAICA 204

SCARABAEIDAE: New World Gymnetini by A. R. Hardy 205-208

LITERATURE NOTICES 172

NOTICE 208





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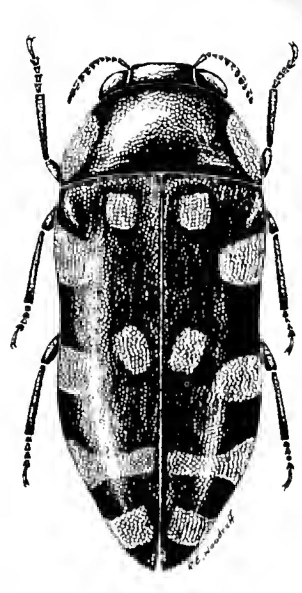

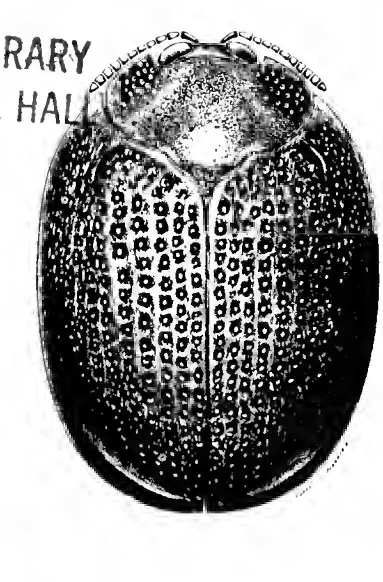

THE COLEOPTERISTS BULLETIN

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Manuscripts will be considered from any authors, although those from members of the Coleopterists Society will be given priority. It is suggested that all prospective authors join the Society. All manuscripts should conform to instructions in the **Style Manual for Biological Journals** (3rd Ed.) prepared by the Committee on Form and Style of the Conference of Biological Editors, and published by the American Institute of Biological Sciences, 2000 P Street NW, Washington, DC 20063.

The following exceptions are noted: 1) all geographical names are to be spelled out, 2) use words, not symbols, for male and female, 3) use numerals throughout, except to begin a sentence, 4) entomology, -ical, -ist, etc. are to be abbreviated Ent. in literature citations.

Specimen label data should be listed in the following manner: MEXICO: State of Veracruz, Fortin de las Flores, 10-VIII-70, I. B. Jones, under bark of **Pinus moctezumae,** 7000ft. [USNM] (2). The number in parentheses indicates the number of specimens. Geographical names are listed in order with largest units first, with states,

Continued inside back cover

(Mailed under second-class permit at Gainesville, Florida. Postmaster: send form 3579 to editorial office—Dr. R. E. Woodruff, Florida Dept. Agr., Div. Plant Industry, P. O. Box 1269, Gainesville, FL 32601).

A DISTRIBUTIONAL CHECKLIST OF NORTH AMERICAN GENERA OF AQUATIC DRYOPOID AND DASCILLOID BEETLES

(ELMIDAE, DRYOPIDAE, LIMNICHIDAE, CHELONARIIDAE, HETEROCERIDAE, PSEPHENIDAE, PTILODACTYLIDAE, CYPHONIDAE, GEORYSSIDAE)

HARLEY P. BROWN

Department of Zoology and Stovall Museum of Science and History, University of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069, U. S. A.

ABSTRACT

Distributional maps show the known range within the United States of every aquatic or semi-aquatic genus representing the dryopoid families Elmidae (Elminthidae), Dryopidae, Limnichidae, Chelonariidae, Heteroceridae, Psephenidae, and Ptilodactylidae, the dascilloid family Cyphonidae (Helodidae), and the hydrophiloid family Georyssidae. Occurrences in Canada and Mexico are also indicated, but not by province or state. Genera known from Mexico, but not from the United States, are listed, but not included in maps. The dryopoid genera are discussed in terms of possible geographic origin and their distribution within the continent, hemisphere, and world. Selected references are presented in addition to the literature cited.

INTRODUCTION

Judging from the frequency with which I receive requests for information or other forms of aid relating to dryopoid distribution, it should be worthwhile to make available such records as I have, at least at the generic level. This summary of records is based primarily upon the specimens in the dryopoid collections of the Stovall Museum of Science and History at the University of Oklahoma, the Illinois Natural History Survey (which includes the Paul N. Musgrave collection), the U. S. National Museum of Natural History, the California Academy of Sciences, California Insect Survey (Univ. Cal., Berkeley), Univ. California at Davis, Univ. California at Riverside, Univ. Arizona, and Royal Ontario Museum. Additional records have been gleaned from many other public and private collections (see acknowledgments) and from the literature, including Leng's list and the supplements thereto, but no claim is made that the list is complete. The maps are especially effective at revealing obvious gaps, which might be filled by specimens in collections I have not checked, or which may indicate regions in which no one has yet seriously sought dryopoids. I should appreciate being informed of additional records that would serve to fill in gaps—or better, receipt of specimens.

In this condensed list, I have made no attempt to cite sources for the records. The bibliography includes selected references which might be helpful to the reader.

There is no complete accord at present as to whether certain genera should be included among the Dryopoidea. For example, *Anchycteis, An-*

chytarsus, and *Stenocolus*—here listed in the family Ptilodactylidae, and *Acneus, Dicranopselaphus, Ectopria,* and *Eubrianax*—here listed in the family Psephenidae, are all included by Arnett (1963) within the family Dascillidae in the Superfamily Dascilloidea. In view of Crowson's (1967) convincing argument, I agree that the Georyssidae are not dryopoids; I list them only because someone might seek them here. The ptilodactylids included here are only those associated with an aquatic habitat. The Cyphonidae (Helodidae) are not dryopoids, but are included because they often turn up in dryopoid collections and information concerning their distribution is scant. The heterocerid records included are almost entirely from the literature. The families and genera represented in the list are as follows (those indicated by an asterisk are not known to occur north of Mexico, and are not shown in the maps):

DRYOPOIDEA

ELMIDAE (ELMINTHIDAE)

LARINAE
*Hexanchorus**
Lara
Phanocerus

ELMINAE
Ancyronyx
Ampumixis
Atractelmis
*Austrolimnius**
Cleptelmis
Cylloepus
Dubiraphia
Elsianus
Gonielmis
Heterelmis
Heterlimnius
Hexacylloepus
(*Limnius,* see *Oulimnius*)
Macronychus
Microcylloepus
Narpus
Neocylloepus
Neoelmis
Optioservus
Ordobrevia
Oulimnius
Promoresia
Rhizelmis
Stenelmis
*Tolriolus**
*Xenelmis**
Zaitzevia

DRYOPIDAE
Dryops
*Elmoparnus**
Helichus
Pelonomus

LIMNICHIDAE
*Cyphonichus**
*Ersachus**
Limnichus
Lutrochus
*Phalacrichus**
Physemus
Throscinus

CHELONARIIDAE
Chelonarium

PSEPHENIDAE

EUBRIINAE
Acneus
Dicranopselaphus
Ectopria

EUBRIANACINAE
Eubrianax

PSEPHENINAE
*Psephenops**
Psephenus

PTILODACTYLIDAE
(genera associated with aquatic habitats)
Anchycteis
Anchytarsus
Stenocolus
*Tetraglossa**

HETEROCERIDAE
Centuriatus
*Culmus**
Dampfius
Efflagitatus
Explorator
Lanternarius
Lapsus
Microaugyles
Neoheterocerus
*Olmedous**
Peditatus
Tropicus

HYDROPHILOIDEA

GEORYSSIDAE
Georyssus

DASCILLOIDEA

CYPHONIDAE (HELODIDAE)
Cyphon
Elodes
Microcara
Ora
Prionocyphon
Sarabandus
Scirtes

COMMENTS

Although the maps need no explanation, I include a few helpful remarks concerning some of the genera. Speculations concerning origins, etc. are based upon known distribution, not upon paleontological or other evidence. Among the elmids: *Phanocerus, Cylloepus, Elsianus, Heterelmis, Hexacylloepus, Neocylloepus,* and *Neoelmis* are essentially Neotropical genera invading the border states from Mexico, although *Heterelmis* ranges somewhat farther afield than the rest. *Microcylloepus* is most widespread throughout the hemisphere. *Dubiraphia,* though abundant and widespread in the United States, is rare in the southwest. *Stenelmis* occurs in much of the Old World and is extremely successful in our eastern and central states, but barely extends into Mexico and is represented west of the great plains chiefly by very restricted relict populations in a few warm springs or similarly isolated sites. In the western coastal states *Stenelmis* is replaced by *Ordobrevia,* which is very similar and probably derived from *Stenelmis. Macronychus* and *Oulimnius* are Palearctic genera which probably entered from Europe. *Zaitzevia* and *Ordobrevia,* on the other hand, probably entered from Asia. *Optioservus* and *Cleptelmis* also occur in eastern Asia

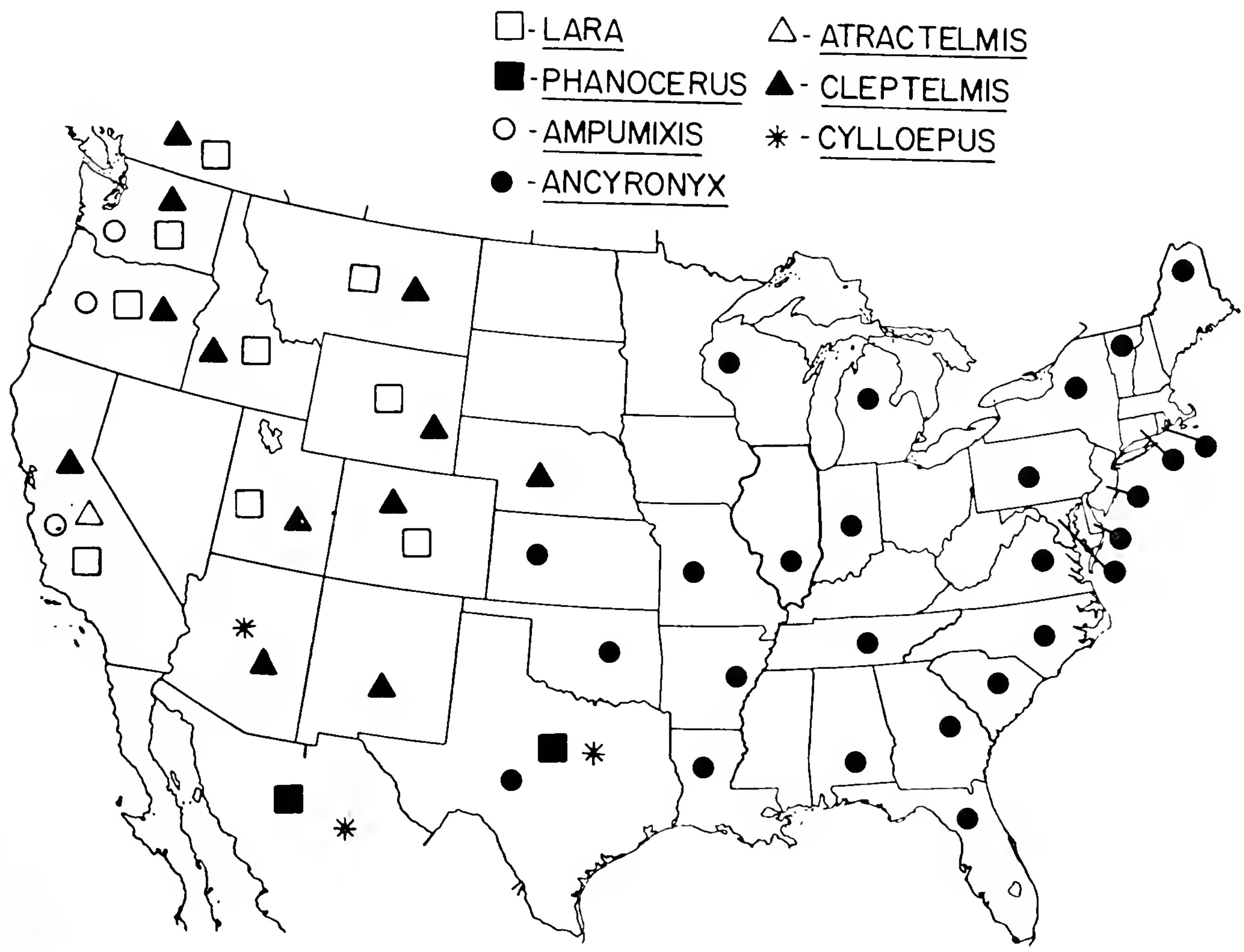

Fig. 1. Distribution of Dryopoidea. Elmidae: Larinae: *Lara, Phanocerus.* Elminae: *Ampumixis, Ancyronyx, Atractelmis, Cleptelmis, Cylloepus.* In Canada and Mexico, the symbols indicate only the occurrence of the appropriate genera in the country, not the province or state.

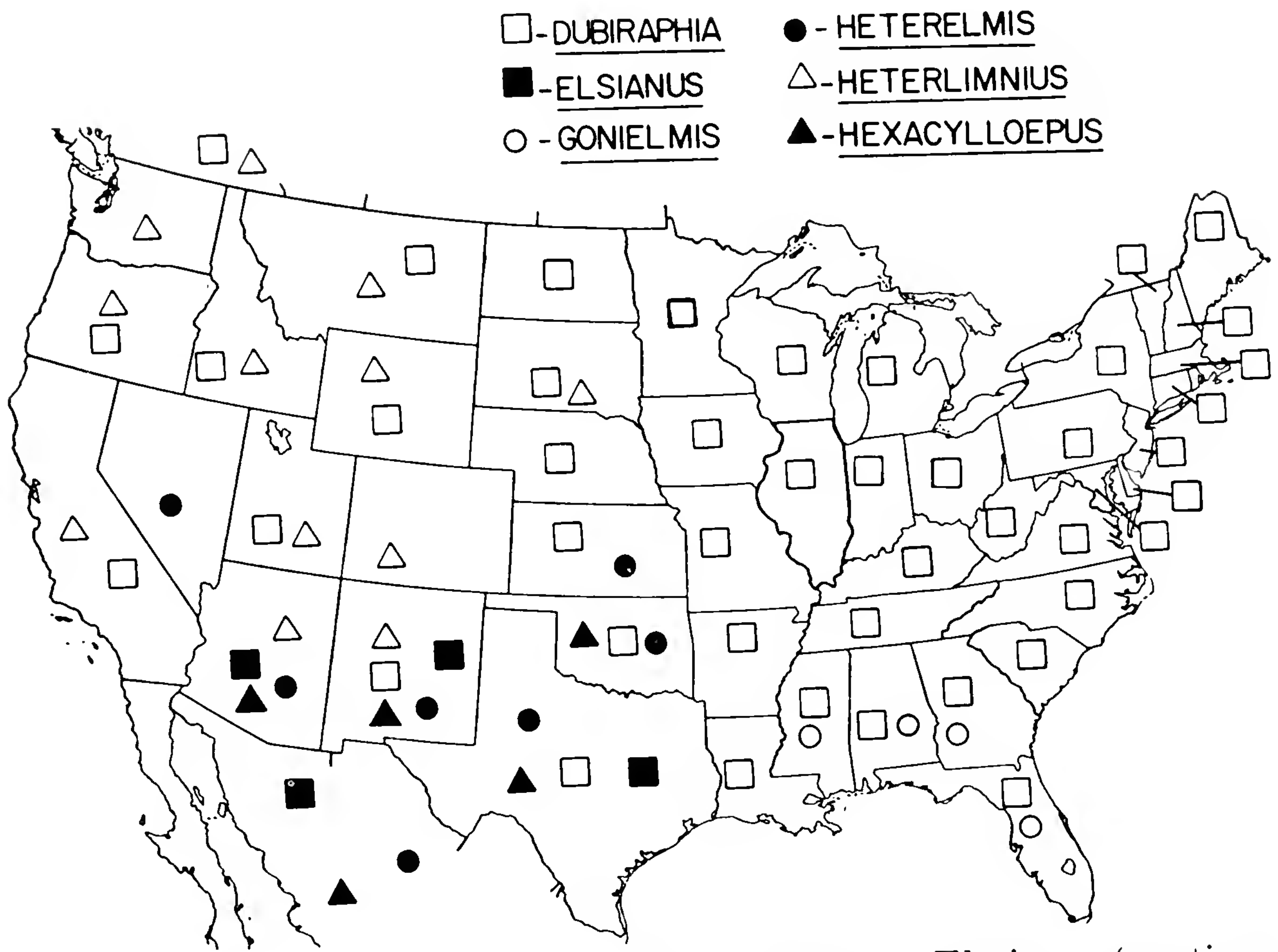

Fig. 2. Distribution of Dryopoidea. Elmidae: Elminae (continued): *Dubiraphia, Elsianus, Gonielmis, Heterelmis, Heterlimnius, Hexacylloepus.* In Canada and Mexico, symbols indicate only occurrence within the country.

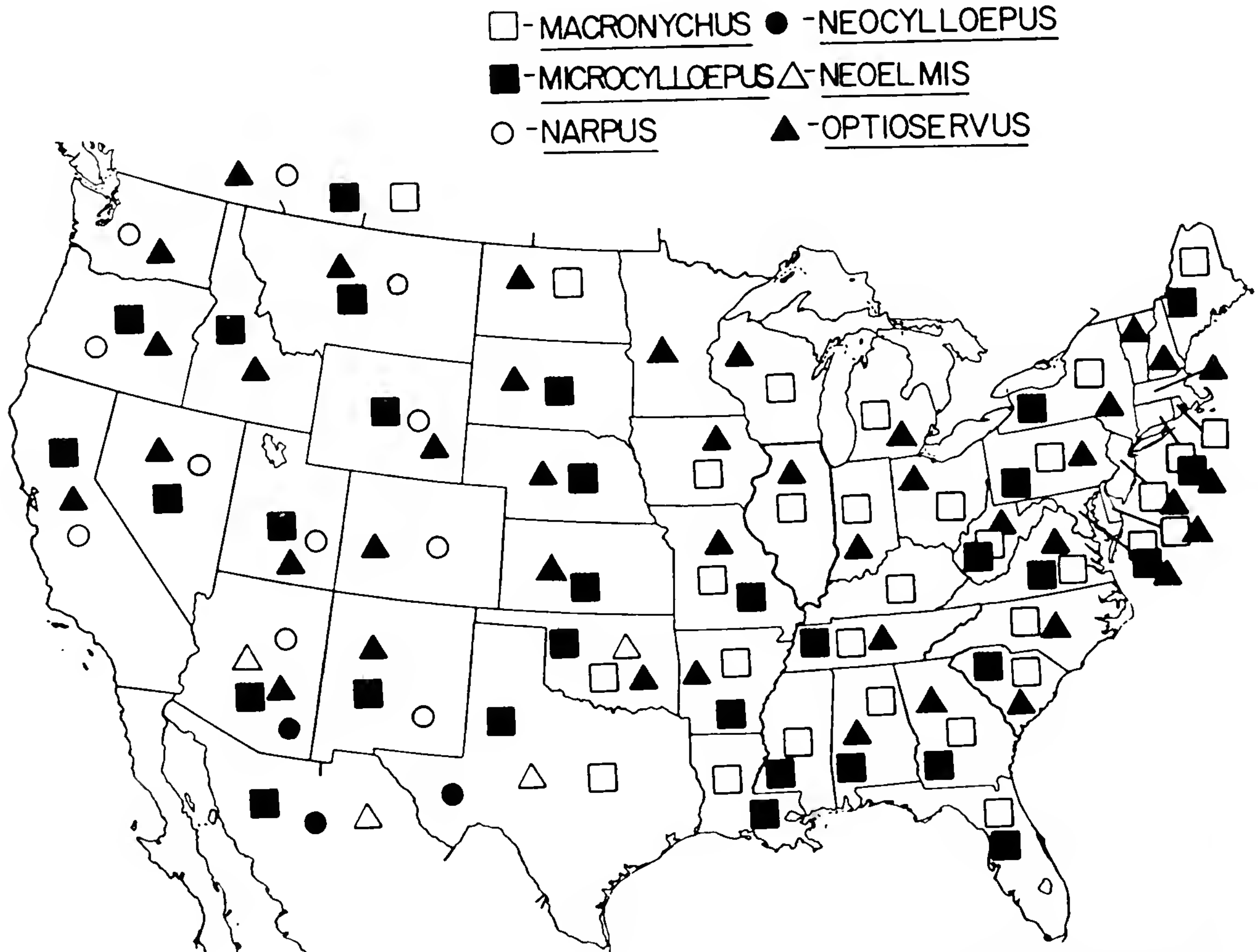

Fig. 3. Distribution of Dryopoidea. Elmidae: Elminae (continued): *Macronychus, Microcylloepus, Narpus, Neocylloepus, Neoelmis, Optioservus.* In Canada and Mexico, symbols indicate only occurrence within the country.

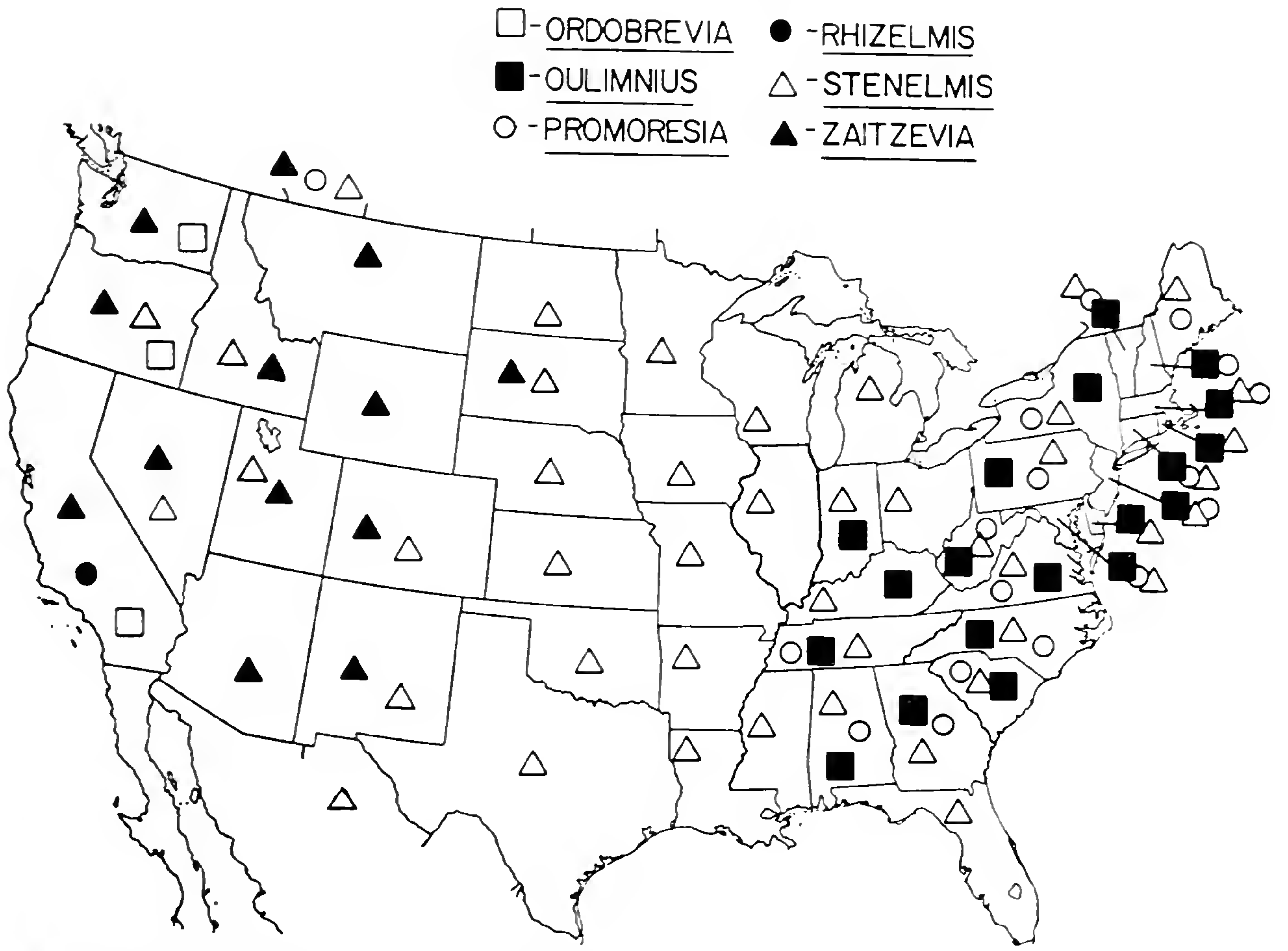

Fig. 4. Distribution of Dryopoidea. Elmidae: Elminae (continued): *Ordobrevia, Oulimnius, Promoresia, Rhizelmis, Stenelmis, Zaitzevia.* In Canada and Mexico, symbols indicate only occurrence within the country.

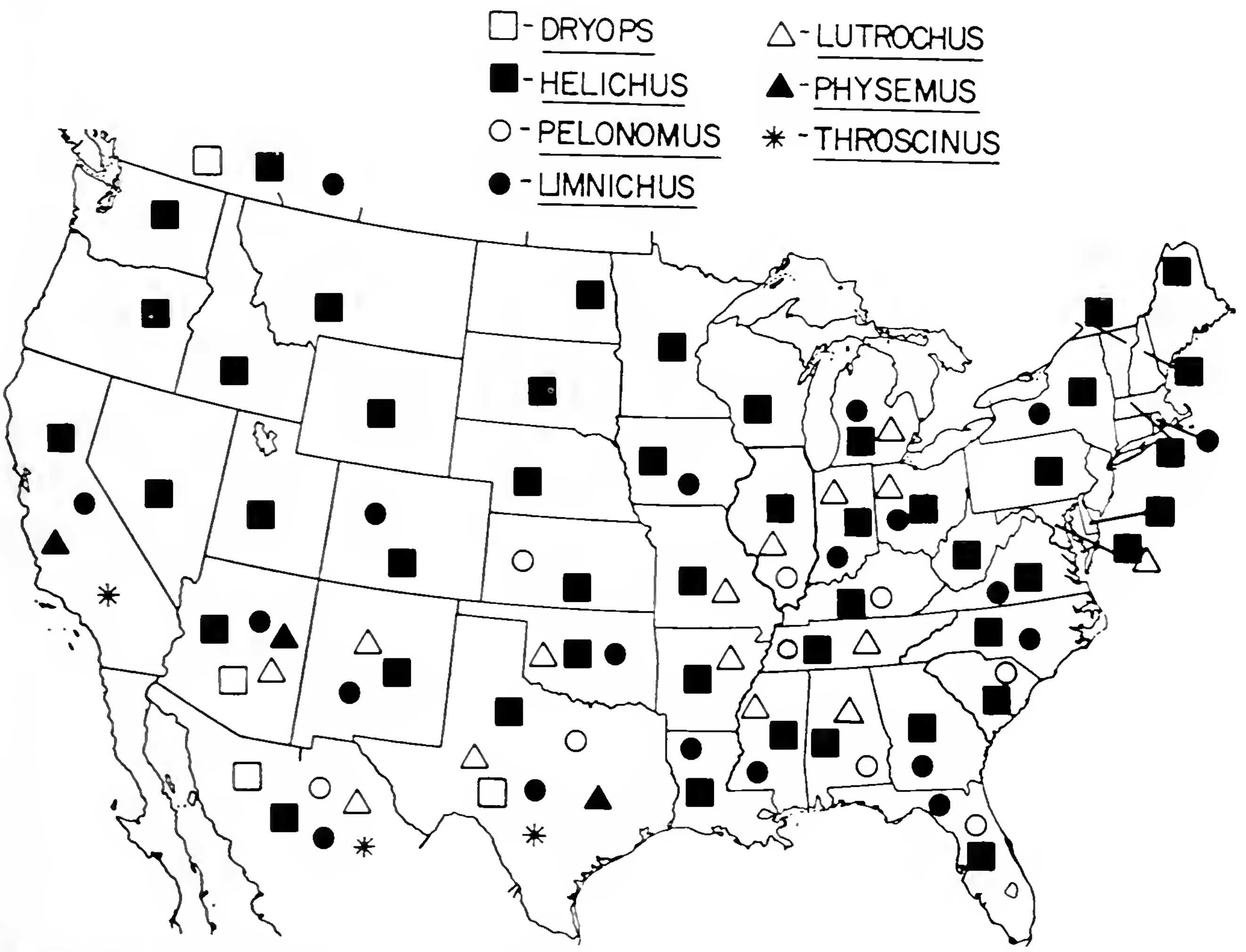

Fig. 5. Distribution of Dryopoidea. Dryopidae: *Dryops, Helichus, Pelonomus.* Limnichidae: *Limnichus, Lutrochus, Physemus, Throscinus.* In Canada and Mexico, symbols indicate only occurrence within the country.

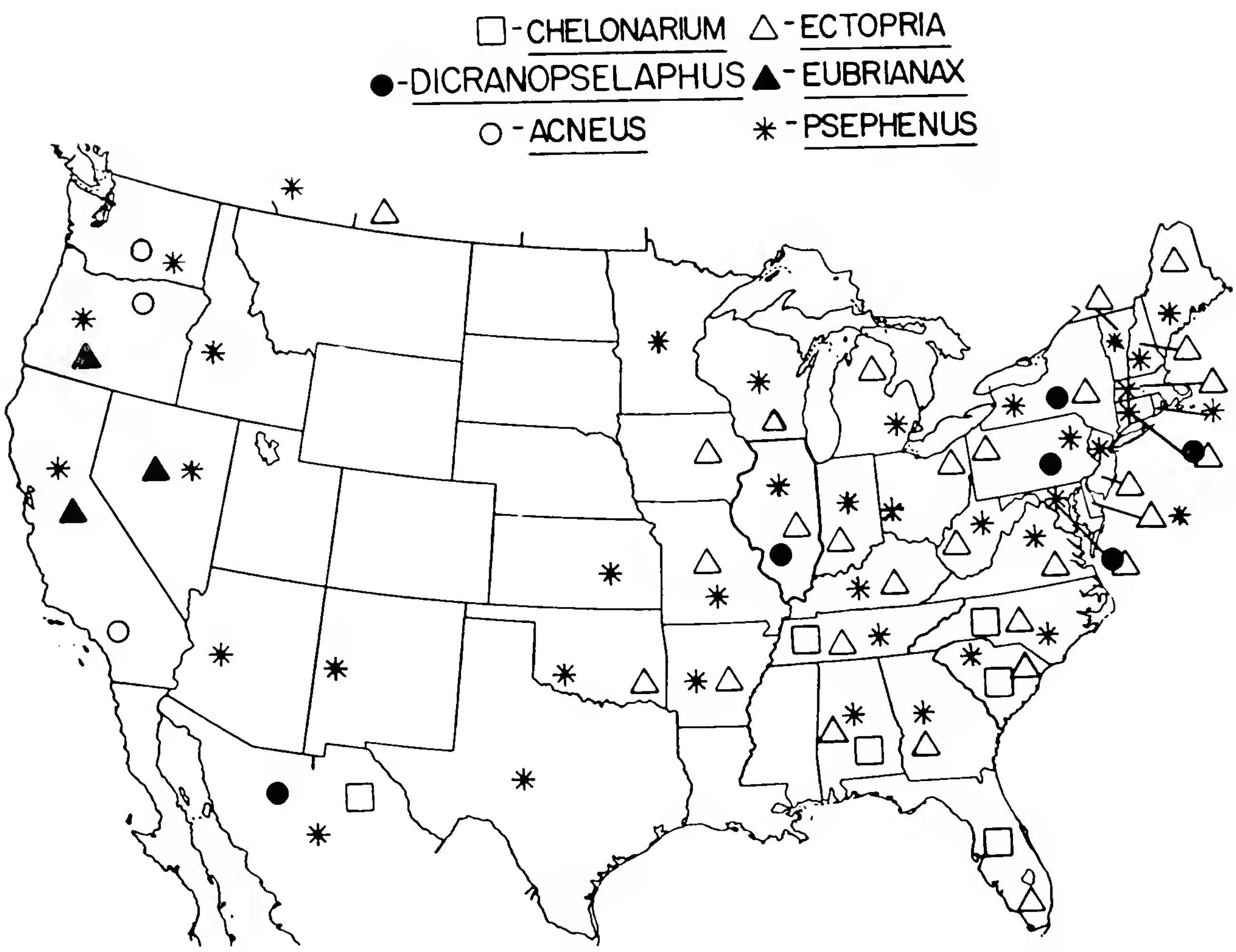

Fig. 6. Distribution of Dryopoidea. Chelonariidae: *Chelonarium.* Psephenidae: *Acneus, Dicranopselaphus, Ectopria, Eubrianax, Psephenus.* In Canada and Mexico, symbols indicate only occurrence within the country.

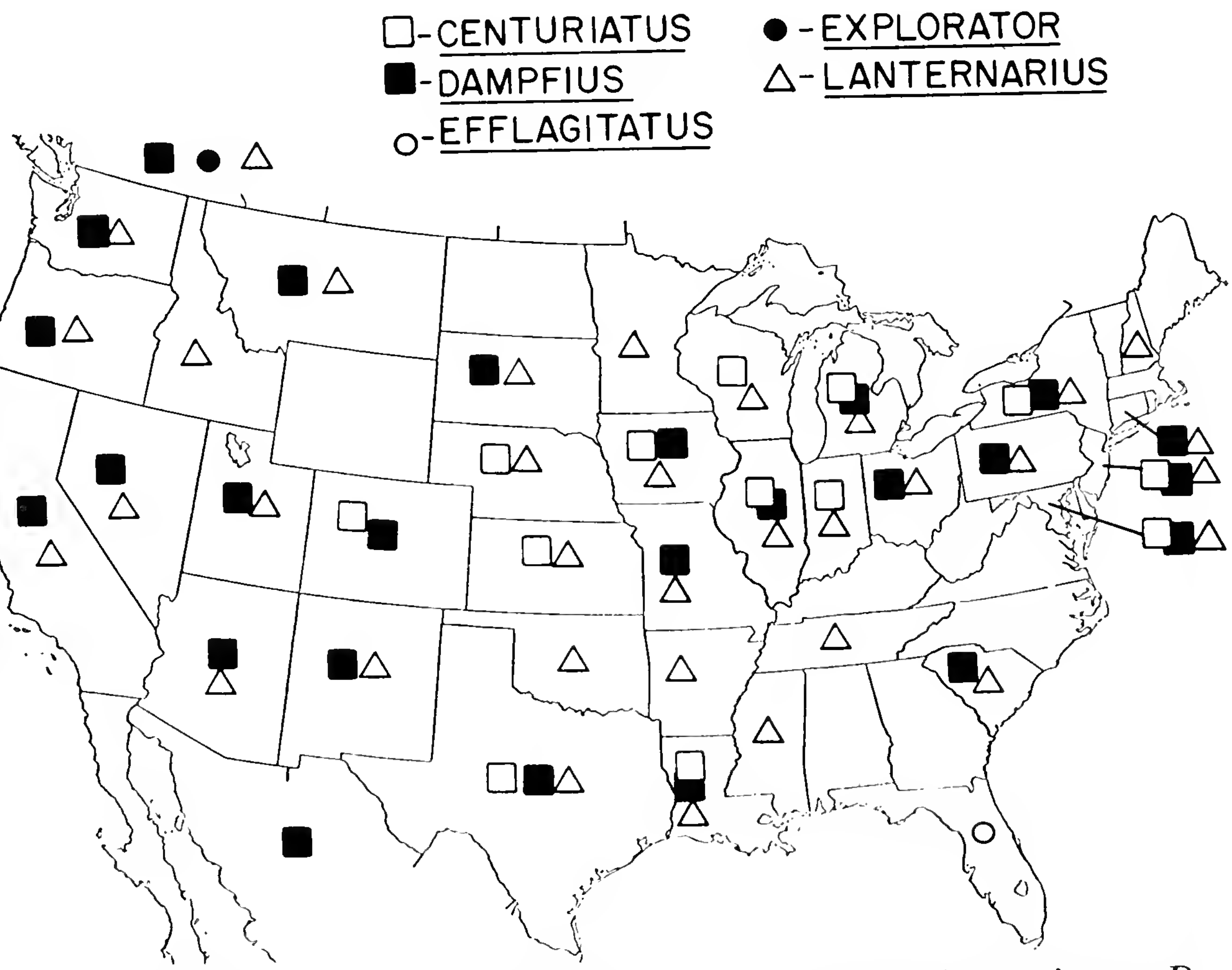

Fig. 7. Distribution of Dryopoidea. Heteroceridae: *Centuriatus, Dampfius, Efflagitatus, Explorator, Lanternarius.* In Canada and Mexico, symbols indicate only occurrence within the country.

as well as North America. *Lara, Ampumixis, Atractelmis, Heterlimnius, Narpus,* and *Rhizelmis* probably evolved (arose) in our western states. *Ancyronyx, Gonielmis,* and *Promoresia* presumably evolved in the eastern states. *Dubiraphia* is also indigenous, but the region of origin is less apparent—perhaps midcontinental. Further collecting should not only fill in the apparent gaps in distribution, but should extend the range of several genera (e.g., we may expect *Ancyronyx* in Ohio and Kentucky, *Optioservus* and *Zaitzevia* in the mountains of Mexico just below southeastern Arizona).

Among the dryopids: in this hemisphere, *Dryops* is common in tropical and subtropical regions; it extends upward into southern Arizona and the Rio Grande valley; the Canadian records represent an alpine European species, *D. viennensis* (Heer), introduced in the rather recent past and now established along the St. Lawrence River in Quebec. Many of the Old World species of *Dryops* occur in temperate zones. *Helichus,* which is almost cosmopolitan, is easily our most widespread and common genus. One of our western species, *H. suturalis* LeConte, extends as far southward as Panama. *Pelonomus* is primarily Neotropical; our single species is common in southern Florida, being progressively less common toward Illinois and Kansas. The note in my key indicating that *Pelonomus* occurs in the Old World (Brown 1970 b) is in error. (The error stemmed from the fact that a Brazilian species was erroneously described as from Portugal.) Increased use of blacklight trapping will probably extend the known range of this genus; it is not collected in streams, where *Helichus* is so prominent.

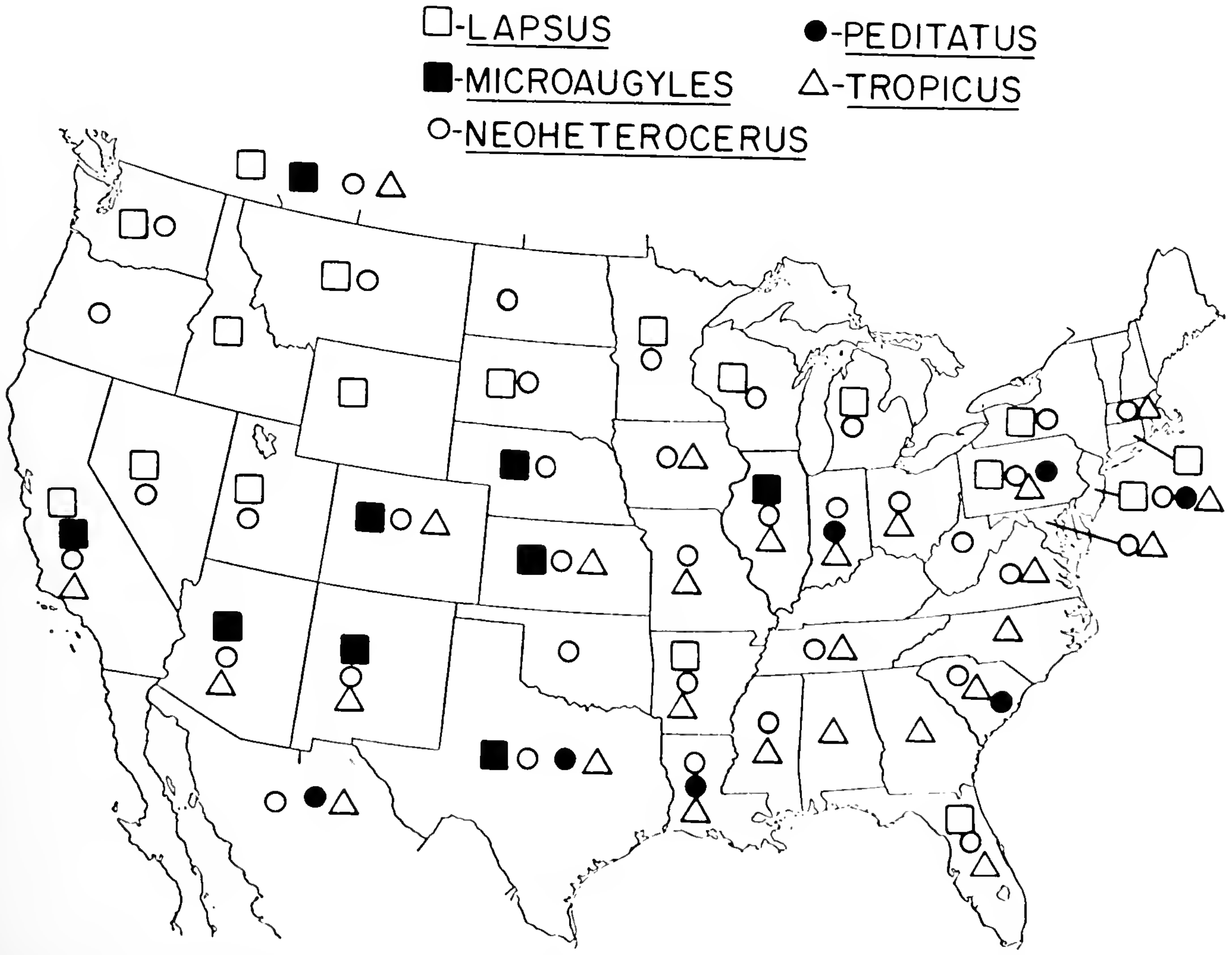

Fig. 8. Distribution of Dryopoidea. Heteroceridae (continued): *Lapsus, Microaugyles, Neoheterocerus, Peditatus, Tropicus.* Symbols in Canada and Mexico indicate only occurrence within the country.

Among the limnichids: since most species readily pass through the mesh of the average net and since most are not bonafide riffle beetles, the present records are probably quite incomplete. A further problem is that few entomologists have attempted to identify them; this applies especially to *Limnichus,* which was subdivided into several genera by Casey. No one has published on this group in North America since Casey (1912), but for convenience I here follow Leech and Chandler (1956) in retaining all our species within the broader genus. David Wooldridge is presently revising the group. Although *Limnichus* is virtually world-wide in distribution, the remaining genera here listed appear to be essentially Neotropical.*Physemus* is southwestern, occurring on wet mud. *Lutrochus* thrives in rapid streams high in calcium content, the adults of our single eastern species being more riparian than aquatic; the genus ranges from South America northward only to Arizona in the west, but northeastward as far as the Potomac River. *Throscinus* seems essentially confined to ocean beach flats in Mexico, California, and Texas. However, since it also occurs in the West Indies, it might be expected in Florida and perhaps along the remainder of the Gulf coast.

Although there are many species of *Chelonarium* in Asia, Central, and South America, it is probable that our sole species was derived from the West Indies.

Of the psephenids, *Acneus* and *Dicranopselaphus* seem rare. In fact, although *Dicranopselaphus* has been reported from Illinois and several eastern states, no one has yet reported its larva in the United States. The larva figured by Brown (1972b) was taken near Acapulco, Mexico, where

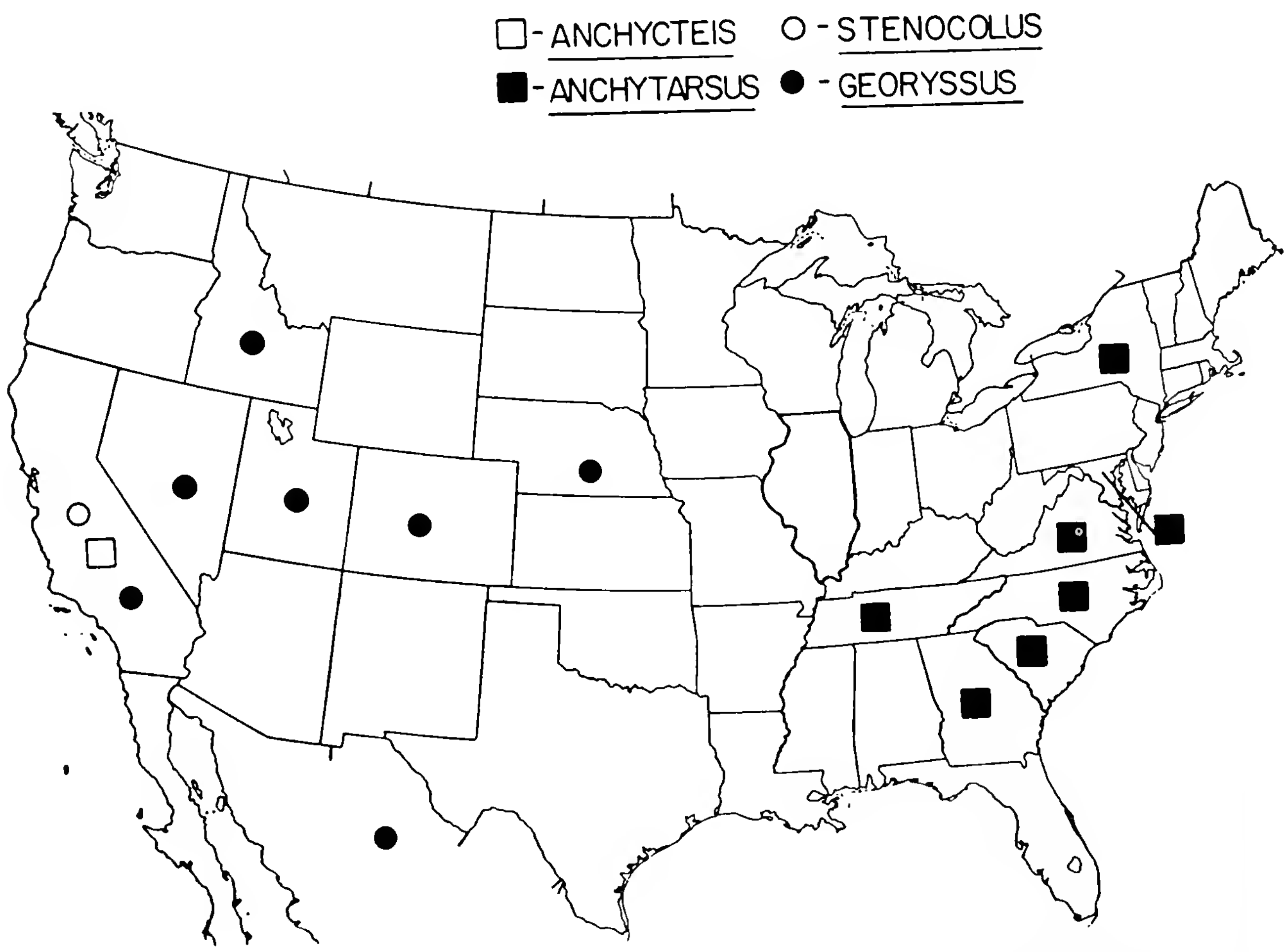

Fig. 9. Distribution of Dryopoidea. Aquatic Ptilodactylidae: *Anchycteis, Anchytarsus, Stenocolus.* Also distribution of Hydrophiloidea: Georyssidae: *Georyssus.* The symbol in Mexico does not indicate the states in which *Georyssus* occurs.

he found 2 such specimens. *Dicranopselaphus* is represented by several Central American and Mexican species, as well as the 1 in the United States. *Acneus* is known only from certain portions of California, Oregon, and Washington. *Ectopria* is relatively common in the eastern half of the United States, the "false water penny" larvae often being taken along with common water pennies (*Psephenus*). *Eubrianax* is an Old World genus of Africa and Asia also known from the western portions of North and South America. In California and Oregon it is apparently much commoner and more widespread than *Acneus*. It also occurs in the mountainous western edge of Nevada. *Psephenus* is easily the most successful of our psephenids, with 1 species occupying the eastern half of the nation, another the western coastal states and Idaho, a third Arizona and points southward, and a fourth Texas and adjacent Mexican states. Three additional species are being described by Brown and Murvosh from Arizona and New Mexico. Other species, some yet to be described, occur in Mexico and Central America.

Our many species of Heteroceridae are widely distributed and often common. Pacheco (1964, 1969) is the only recent worker who has devoted much attention to the family. Pacheco (1964) subdivided the heterocerids into 5 tribes: Elythomerini in Australia, Micilini in the Palaearctic, Augyliini in the Nearctic and Palaearctic, Heterocerini in Europe and the Americas, and Tropicini in Nearctic and Neotropical regions. Of the Augyliini, *Explorator* is known only from Alaska and Canada, *Centuriatus* and *Microaugyles* from Canada and the United States. *Microaugyles* must also occur in Mexico, since 1 species is in El Paso, Texas, southern Arizona, and

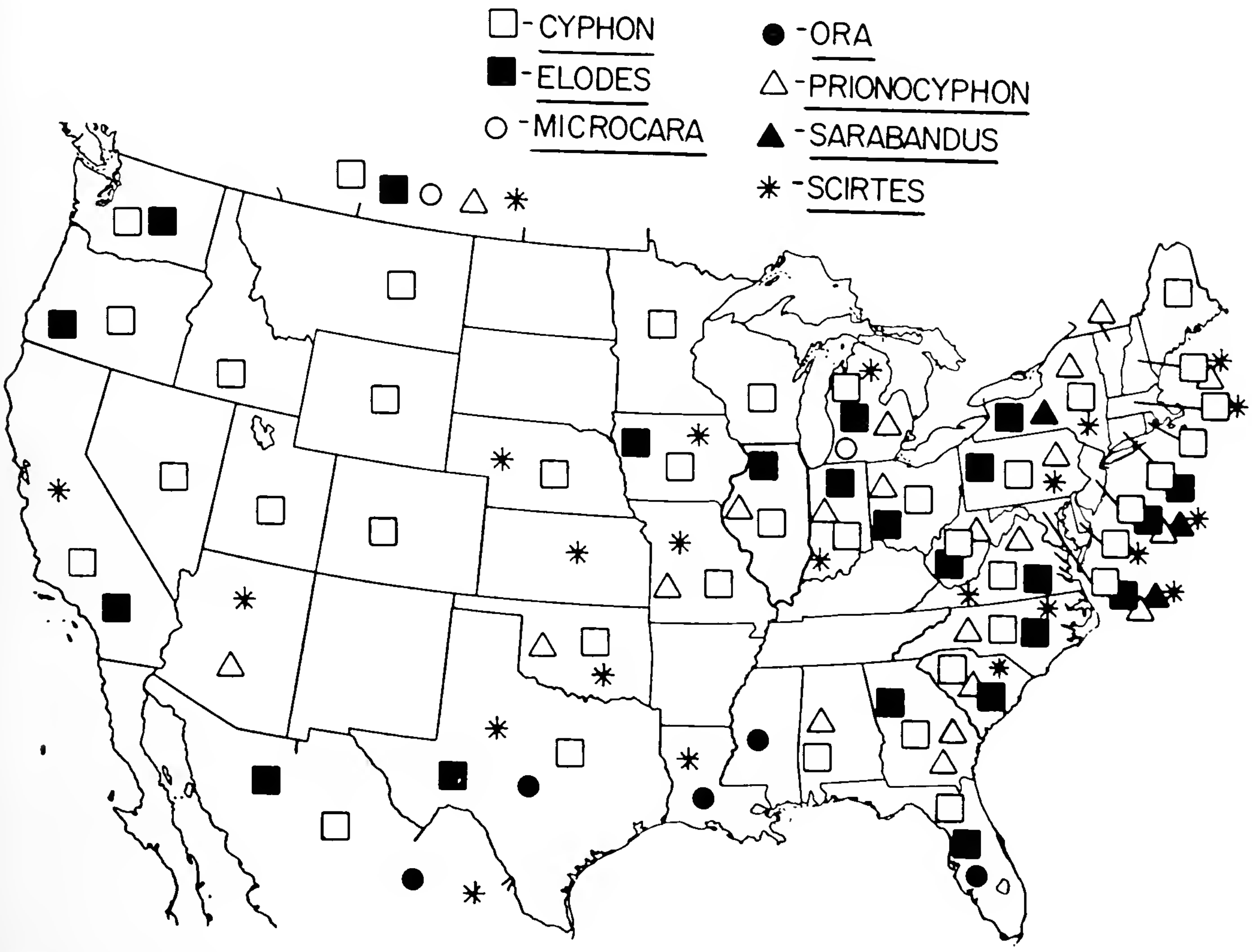

Fig. 10. Distribution of Dascilloidea. Cyphonidae (=Helodidae): *Cyphon, Elodes, Microcara, Ora, Prionocyphon, Sarabandus, Scirtes.* Symbols in Canada and Mexico indicate only occurrence within the country.

New Mexico. Of the Heterocerini, *Heterocerus* is restricted to a single European species; the remaining genera are New World forms: *Erus* and *Gradus* in South America, *Efflagitatus* in South America except for 1 species in Florida; *Filiolus* in Cuba; *Neoheterocerus* in the Antilles and North America; *Olmedous* in Mexico; *Culmus* in Guatemala and Mexico; *Dampfius* from Guatemala to Canada; *Peditatus* in Mexico and the United States; *Lapsus* and *Lanternarius* in Canada and the United States. *Lanternarius* is also to be expected in Mexico. The tribe Tropicini includes 1 genus, *Tropicus,* with 2 species in the United States and 11 Neotropical species.

Of the ptilodactylids, as previously mentioned, only those associated with water are included here. *Anchycteis* and *Stenocolus,* like the elmids *Atractelmis* and *Rhizelmis,* perhaps evolved in California, since they are known only from that state. In contrast, *Anchytarsus* is known both from some of our eastern states, and from scattered records in Mexico, Central America, and even Peru.

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APHODIUS FROM BURROWS OF A POCKET GOPHER IN BRAZOS COUNTY, TEXAS (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

Five species of *Aphodius* were found living as inquilines in the nesting and refuse chambers of a pocket gopher, *Geomys bursarius brazensis* Davis, at College Station, Brazos County, Texas. Two of these species have not heretofore been reported in association with pocket gophers in Texas.

Although a large and varied arthropod fauna is known to occur in the burrows of many rodents, little attention has been given to the burrows of the various genera of pocket gophers, probably because the disproportionate amount of effort that must be expended to obtain relatively few specimens. However, Criddle (1930) studied the biology of the prairie pocket gopher, *Thomomys talpoides rufescens* Wied-Neuweid, in Manitoba, Canada, and found several species of *Aphodius* that were subsequently described by Brown (1928, 1929a, and 1929b). Also, Hubbell and Goff (1940), working in Florida, reported on the arthropods associated with the pocket gopher, *Geomys floridanus* A. and B. (now known as *Geomys pinetis floridanus* Audubon and Bachman), and Cartwright (1939) described the species of *Aphodius* found in these burrows. Likewise, the burrows of the pocket gopher, *Geomys breviceps atwateri* Merriam (now recognized as *Geomys bursarius texensis* Merriam), found in Bexar County, Texas, were studied by Ross (1944), and the several species of *Aphodius* taken from these burrows were described by Cartwright (1944). Robinson (1948) noted the collection of one species of *Aphodius (A. haldemani* Horn) in nests of pocket gophers at College Station, Texas. For the nomenclature and distribution of pocket gophers, the reader is referred to Hall and Kelson (1959).

During the course of laboratory experiments with dung beetles at the Veterinary Toxicology and Entomology Research Laboratory, College Station, Brazos County, Tex., large quantities of sandy loam soil, ca. 6 cu m, are piled at random near the laboratory. (The surface soils in this area are Tabor fine sandy loams about 20 cm thick over a subsoil of very slowly permeable mottled clay-pan.) It was soon apparent that pocket gophers native to the area, *Geomys bursarius brazensis* Davis, were utilizing these masses of soil for construction of nesting, storage, and refuse chambers. This apparently unusual behavior may be, in fact, a modification of the construction of "winter mounds" by pocket gophers that inhabit shallow, poorly drained soils (Davis 1960). During April and December 1973 and January 1974, the piles of soil were disturbed to obtain material for laboratory use, and the burrows were broken into and subsequently completely excavated. All beetles found in the nesting or refuse chambers or in the soil immediately surrounding these chambers were collected. They appeared to have been living as inquilines in this habitat.

Species collected were as follows (number of specimens in parentheses): *Aphodius atwateri* Cartwright, 9-IV-73(3), 13-IV-73(1); *Aphodius haldemani* Horn, 9-IV-73(3), 30-IV-73(1), 6-XII-73(4), 18-I-74(10); *Aphodius insolitus* Brown, 9-IV-73(7), 13-IV-73(4), 30-IV-73(1), 18-I-74(12); *Aphodius kirni* Cartwright, 9-IV-73(15), 30-IV-73(14); *Aphodius n.* sp. ? (near *atwateri* Cartwright), 18-I-74(6).

All specimens of *A. haldemani* were found in nesting chambers or in the soil surrounding these chambers; the other species were found in about equal numbers in the nesting and refuse chambers or in the soil around these chambers.

Two species, *A. insolitus* and *A.* sp. (possibly undescribed), have not been reported previously as associated with pocket gopher burrows in Texas. The collection of the possibly undescribed species increases the possibility that additional species may yet be found in association with pocket gophers and other burrowing animals.

Specimens obtained in the study were deposited in the collections of the U. S. National Museum, Department of Entomology, Texas A&M University, and the senior author.

We thank Dr. R. D. Gordon, U. S. National Museum, who identified all material and Drs. W. B. Davis and D. J. Schmidly, Wildlife and Fisheries Sciences, Texas A&M University, for valuable suggestions concerning the distribution, nomenclature, and habits of pocket gophers.

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DISTRIBUTION OF FOUR INTRODUCED *CONODERUS* SPECIES IN CALIFORNIA (COLEOPTERA: ELATERIDAE)

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Abstract

The present distribution in California is discussed for 4 introduced species of *Conoderus,* the larvae of which are destructive pests of vegetable crops in other areas.

Since 1950 adults of 4 imported species of *Conoderus* have become increasingly abundant in California as indicated by their recovery at lights and their presence in State and University collections. Two species, namely *Conoderus falli* (Lane) and *Conoderus amplicollis* (Gyll.), have been destructive for years in the southeastern States and presently are under investigation to determine their biology and importance (Day et al. 1971 and Cockerham et al. 1936). *Conoderus exsul* (Sharp) was described from New Zealand and has been present in Hawaii since 1916; it was first reported from California by Graves (1938).

Little is known of the potential destructiveness of these introduced wireworm species in California. Nevertheless, in view of their already widespread distribution and the fact that Day et al. (1971) found that *C. falli* had become resistant to certain soil insecticides in the South, emphasizes the importance of checking reports of wireworm injury to vegetable and potato crops. Growers in the western States for over 50 years have been well aware of the destructiveness of the sugar-beet wireworm (*Limonius californicus* (Mann.)) to beans, sugar-beets, potatoes, corn, and many root crops (Stone 1941). In the last 20 years damage has been greatly reduced due to the use of soil insecticides and soil fumigants.

The purpose of this paper is to present the known distribution of these *Conoderus* species in California based on information accumulated to date.

Conoderus falli (Lane)

Heteroderes vagus Candeze, 1893, Argentina (nec *Monocrepidius vagus* Candeze 1888).
Monocrepidius difformis Fall, 1927, Georgia (nec *M. difformis* Fleuteaux, 1920).
Monocrepidius falli Lane, 1956.
Conoderus falli (Lane) 1956.

Dean and Cuthbert (1955) found the southern potato wireworm *Conoderus falli* (Lane) to be most destructive to potato and vegetable crops in southeastern U. S. The pest was introduced into the U. S. from South America and was collected for the first time near Savannah, Georgia in 1927. Their surveys showed that it had spread along the south Atlantic and Gulf coasts from North Carolina to Louisiana. Lane (1954) also reported on the distribution of this species; later it was given the common name, southern potato wireworm. This species was described from Argentina (as *vagus*).

DISTRIBUTION IN CALIFORNIA

A. Conoderus amplicollis
B. Conoderus exsul
C. Conoderus falli

May 1974

In California, *Conoderus falli* was first collected in May 1963 by E. L. Schlinger in Deep Canyon near Palm Springs. Its spread was rapid, much larger numbers being collected at Indio and Riverside in 1966. In 1973 at Riverside I collected 302 adults at a blacklight at intervals from 15 May to 15 October, the peak collections being obtained in September when day temperatures reached 95 to 100° F. Except for a single adult collected in Fresno County in 1970 it appears to be restricted to Riverside and Orange counties.

Conoderus amplicollis (Gyllenhal)

Conoderus amplicollis (Gyllenhal) 1808 (Island of St. Bartholemy, south of Puerto Rico)
Conoderus laurentii (Guerin-Meneville) 1838
Heteroderes nichols; Notman, 1922 (Florida).
Conoderus fuscosus (Blatchley) 1925.
Conoderus planidiscus (Fall) 1929 (Georgia)

Heteroderes laurentii Guer., now known as *Conoderus amplicollis* (Gyll.) or Gulf wireworm, was first noted as a pest of potatoes and vegetable crops in southeastern U. S. in 1927. Cockerham and Deen (1936) studied its distribution and biology. Lane (1954) reported that it was distributed along the Gulf Coast from Florida to Houston, Texas and north along the Atlantic Coast to Charleston, South Carolina. *Conoderus amplicollis* is widely known in South America and the West Indies.

In California, adults were first collected 10 July 1938 by E. S. Herald at Huntington Park, adjacent to Los Angeles. He also recovered larvae feeding on grass roots. My attention was called to wireworm injury to pansies in the same area, and the larvae reared to adult were identified by E. C. Van Dyke as *Conoderus amplicollis* (Gyll.). Adults were collected at South Gate in 1942 and at San Marino, both Los Angeles County, in 1944. Many specimens were collected at light in Riverside in 1947 by P. H. Timberlake. In the San Joaquin Valley, specimens were collected at Porterville July 1951 and at Fresno in 1967; and at Bard (Imperial County) in 1959.

In April 1957 I observed young cabbage plants damaged by larvae in a field near Buena Park, California. When reared these larvae transformed to adult *C. amplicollis* in July. Adults have now been collected in 25 locations in 13 counties in California. The counties now infested are shown in Figure I.

Conoderus exsul (Sharp)

Conoderus exsul (Sharp 1877) (New Zealand)
Conoderus bicarinatus Van Dyke 1932 (Arizona) (nec *C. bicarinatus* Reitter 1891)
Conoderus arizonicus Van Dyke 1939 (proposed as a new name)
Conoderus duplicatus Van Dyke 1943 (proposed as a new name)

An adult of the sugarcane wireworm, *Conoderus exsul* (Sharp), was collected by H. W. Graves in Alameda, California in July 1937. Larvae were also found feeding on grass roots. Williams (1931) reported that the insect is largely carnivorous but feeds on sugarcane shoots in the Hawaiian Islands. Lane (1954) reported that adults of this species were collected in Sacramento, Fresno, Los Angeles, Riverside, and San Diego counties.

Adults have now been collected in all counties of southern California and in addition, in San Joaquin and Tuolumne counties in central California. In the southern portion of the State the first adult was collected at Anza in Riverside county 25-VI-1949. Numerous specimens were collected in San Diego in 1954, in Ojai (Ventura Co.) in 1955, and in Santa Barbara in 1961. Sizeable collections were made in Orange Co. in 1966 by J. Wilcox. At Riverside in 1973 I collected adults periodically at a blacklight from July through October, the peak collection of 38 adults between July 1 and 15. Figure 1 shows California counties in which *Conoderus exsul* adults have been collected.

Conoderus bellus Say

Lane (1954) reported that *Conoderus bellus,* a pest of tobacco east of the Mississippi, had been collected at lights at Riverside in 1953 and at San Diego in 1952. Also he had a series collected in 1924 from Los Angeles which he thought may have been mis-labeled. I have collected this species at Riverside every year since 1965 and also have specimens from Orange, Los Angeles, Yolo, Sacramento and Fresno counties. Specimens have also been obtained from Tempe and Tucson, Arizona and from various locations in Mexico. This species is generally unnoticed because of its smallness, and its damage may be mistaken for injury by larvae of flea beetles.

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BOOK REVIEW

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Die Käfer Mitteleuropas, edited by H. Freude, K. W. Harde, and G. A. Lohse. Band 5. 1974. Staphylinidae II (Hypocyphtinae und Aleocharinae) Pselaphidae. Price about $25.00 U.S. Goecke and Evers, Krefeld, Germany.

I hate to admit to my colleagues that I am a "closet German taxonomic key reader," but there it is. If you must be such a key reader, I can think of no better work than *Die Käfer Mitteleuropas.* It has the same soothing quality of the book, *Käfer und Pilze,* in the series "für Jugend und Volk", and furthermore, the keys work. This particular volume continues the general series and is a companion volume to volume 4 which contains the remainder of the Staphylinidae. Middle Europe was defined in volume 1 as Germany, Denmark, Holland, Luxemburg, the "German-speaking part of Switzerland", Austria, Czechoslovakia, and the western part of Poland. Species found in France, Belgium, eastern Poland, and southern and western Switzerland were included if the authors thought that they could be found eventually in middle Europe.

Volume 5 is the product of 5 men: Dr. G. A. Lohse wrote the general section on the Aleocharinae including 2 keys to the tribes, both of which work for the European tribes included. Lohse also wrote the sections on tribes Deinopsini through Falagriini and tribes Schistogeniini-Aleocharini. Drs. G. Benick and Lohse wrote the section on the tribe Callicerini and Z. Likowsky wrote the section on the genus *Aleochara.* Dr. Claude Besuchet wrote the section on the Pselaphidae.

In general, the volume is well written and well illustrated. This is particularly true of the section on the Pselaphidae where the facies of each genus is shown, and many of the male genitalia are neatly illustrated. I am not qualified to make any further comments on the pselaphid treatment, as I am not familiar with the intricacies of the classification of the European fauna.

Staphylinid workers will find many changes in the higher classification of the Aleocharinae. These are summarized in Table 1. Many of these have been in use for some time. Kistner (1972) recognized the Falagriini. Lavasseur (1965) used the term Zyrasini, etc. What makes the changes look so numerous is the fact that this is the first comprehensive work on the Aleocharinae since the Coleopterorum Catalogus and we can see the magnitude of the quiet revolution that has been occurring. In general, I agree with all the changes that have been effected. We will have to see what this does to all the more specialized and non-European tribes, of course. The radical change of the name Athetini to Callicerini is rendered necessary because *Callicerus* Gravenhorst (1802) is the oldest genus included. Changing Myrmedoniini to Zyrasini is not mandatory according to the international rules since family-group names may be based on synonyms but in another generation most biologists will wonder what *Myremedonia* was. Shifting to Zyrasini is probably both logical and timely. This is especially so since with the restricted structure of the tribe, only *Zyras*-related genera are now included.

A brilliant move was to remove the Dinardae, Oxypodae, and Caloderae from the Aleocharini. Now the Aleocharini are clearly defined by the 5-segmented maxillary palpi and the often 4-segmented labial palpi. *Aleochara* is pretty isolated this way but not for long as genera now included elsewhere will soon be moved into the Aleocharini (e.g., *Termitohospes* and *Discoxenus*). It remains to be seen whether combining the Oxypodae and the Caloderae into one tribe will stand further investigation.

One troublesome aspect of separating the Callicerini, Falagriini, and the Zyrasini has been to find adequate characters to separate these large groups of genera. Lohse has done this on the basis of the structure of the mouthparts. He separates the Callicerini and the Falagriini from the Zyrasini by the structure of the lacinia which is either toothed or extensively spined in the first 2 and with many fine setae in the Zyrasini. Falagriini and Callicerini are separated from each other by abdominal, head, and hind tarsal characters.

I can only fault the book for the use of so many abbreviations for morphological structures. This was probably done to save typesetting costs, but I wonder if it really

TABLE 1. Changes in the higher classification of the Aleocharinae proposed in *Die Käfer Mitteleuropas*.

Status in the Coleopterorum Catalogus	Proposed Usage
Tribe Hypocyptini	Subfamily Hypocyphtinae
Subtribe Gyrophaenae	Tribe Gyrophaenini
Subtribe Homalotae	Tribe Homolotini
Subtribe Siluae	Tribe Silusini
Subtribe Phytosi Subtribe Bolitocharae	Tribe Bolitocharini
Subtribe Autaliae	Tribe Autaliini
Subtribe Falgriae	Tribe Falagriini
Subtribe Athetae	Tribe Callicerini
Subtribe Schistogeniae	Tribe Schistogeniini
Subtribe Myrmedoniae	Tribe Zyrasini
Subtribe Dinardae	Tribe Dinardini
Subtribe Oxypodae Subtribe Calodera	Tribe Oxypodini
Subtribe Aleocharae	Tribe Aleocharini

saved much money. Certainly it would increase manuscript preparation costs and proofing costs. Much of the space so saved has been wasted in other ways, i.e., in page construction by leaving much white space around many figures and not starting new subjects in the middle of a page, etc. Perhaps these abbreviations are very natural to workers whose native language is German, but I think not. Users are well advised to Xerox the list of abbreviations at the end of the book and keep it handy for many references.

In spite of this drawback, the book is excellent. The keys work. The figures are accurate and attractively done. There are some notes on the ecology and habits of the species—I wish there were more. And it is the first comprehensive work on European Aleocharinae in about 50 years. Would that we could produce a similar volume for the Aleocharinae of the United States.

I recommend the volume to all serious coleopterists and fellow "closet German taxonomic key readers". May there be legions of them.

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A NEW SPECIES OF *POLYCESTA* FROM MEXICO (COLEOPTERA: BUPRESTIDAE)

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College of Osteopathic Medicine, Kansas City, Missouri

Abstract

A new species of Buprestidae, *Polycesta barri,* is described from the states of Michoacan and Oaxaca, Mexico.

A remarkably slender *Polycesta* was collected in Mexico on the dead limbs of mesquite in the state of Michoacan and on an unidentified broadleafed tree in the state of Oaxaca. It is named in honor of a colleague and friend, Dr. W. F. Barr, University of Idaho, who has done much to advance our knowledge of this genus. He examined specimens and agreed that it is new.

Polycesta barri Nelson, **new species**
(Fig. 1-6)

Body extremely slender; antennae serrate from fourth segment; lateral margins of pronotum rounded; second interval of elytra a strongly elevated costa, scutellar costa absent; elytral apices serrately truncate; color cupreous-black above and below, variegated with ferruginous above.

Male: Head with front slightly convex but flattened in center; coarsely, rugosely punctate with irregular shaped callus on upper part, and moderately clothed with erect curved white setae; vertex with punctures smaller and with hairline median sulcus; clypeal margin transverse with slight arcuate emargination at middle; antennae short, segments serrate from fourth apically, segments 8 to 10 wider than long (Fig. 1).

Pronotal width to length ratio 1.6 to 1; front narrower than base; lateral margins rounded, widest at middle; anterior margin weakly lobed at middle; posterior margin truncately lobed before scutellum; surface coarsely densely punctate throughout; disk with median depression stronger at base, extending to anterior fourth; surface between punctures in part reticulated, in part shining; with few short inconspicuous white setae laterally.

Scutellum oval with middle of disk depressed.

Elytra 4.5 times longer than pronotum; at base narrower than greatest width of pronotum, then lateral margins expanded and remaining parallel to posterior of middle and converging toward apex where margins almost truncately turn toward suture; lateral margins serrate from middle, with several larger teeth nearer apex; epipleural fold with strong evenly arcuate lobe anteriorly; disk without scutellar costa; second interstrial space strongly elevated as costa from base to apex; interstrial space 4 weakly costate from base to apex, 6 from base to near apex, and 8 in apical half; each stria with single row of large closely set punctures; white setae inconspicuous, short, semirecumbent and sparse, a little longer along lateral margins.

Ventral surface with punctures fine and sparse medially, larger and more dense laterally; sparsely clothed with short, semirecumbent white setae which are more numerous laterally; prosternum swollen anterior to procoxae, anterior margin feebly bilobed; hind margin of first abdominal sternite broadly, truncately lobed at middle; hind margins of sternites 2, 3, and 4 strongly prolonged at sides; last visible sternite broadly triangular with lateral margins slightly arcuate (Fig. 2); tarsal segments 3 and 4 each with broad membranous lobe beneath.

Male genitalia (Fig. 4, 5) with lateral plate-like structures of penis numerous, parameres similar in shape to many of the species from the United States.

Length: 13.5mm; width: 4.0mm.

FEMALE: Similar in most respects to male but differs as follows: slightly more robust; and last visible abdominal sternite more elongate and arcuately rounded (Fig. 3).

Length: 16.5mm; width: 4.7mm.

Holotype, male [California Academy of Sciences, Entomology, San Francisco], **allotype, female** [G. H. Nelson coll.] and **paratypes,** 2 males, 1 female, Mexico, Michoacan, 9 mi. S. Cuatro Caminos, 13-VII-72, G. H. Nelson; 2 males, same data except 12-VII-72; 1 male, same place, 20-VII-66, D. S. Verity; 7 males, 11 females, Oaxaca, 7 mi. W. Tehuantepec, 1-VII-72, G. H. Nelson; 1 female, Oaxaca, 5 mi. W. Tehuantepec, 3-VII-72, G. H. Nelson. The material from near Cuatro Caminos was on the dead limbs of *Prosopis juliflora* (Sw.) D.C., while the material from near Tehuantepec was on the dead limbs of an unidentified broad-leaf tree. Paratypes are

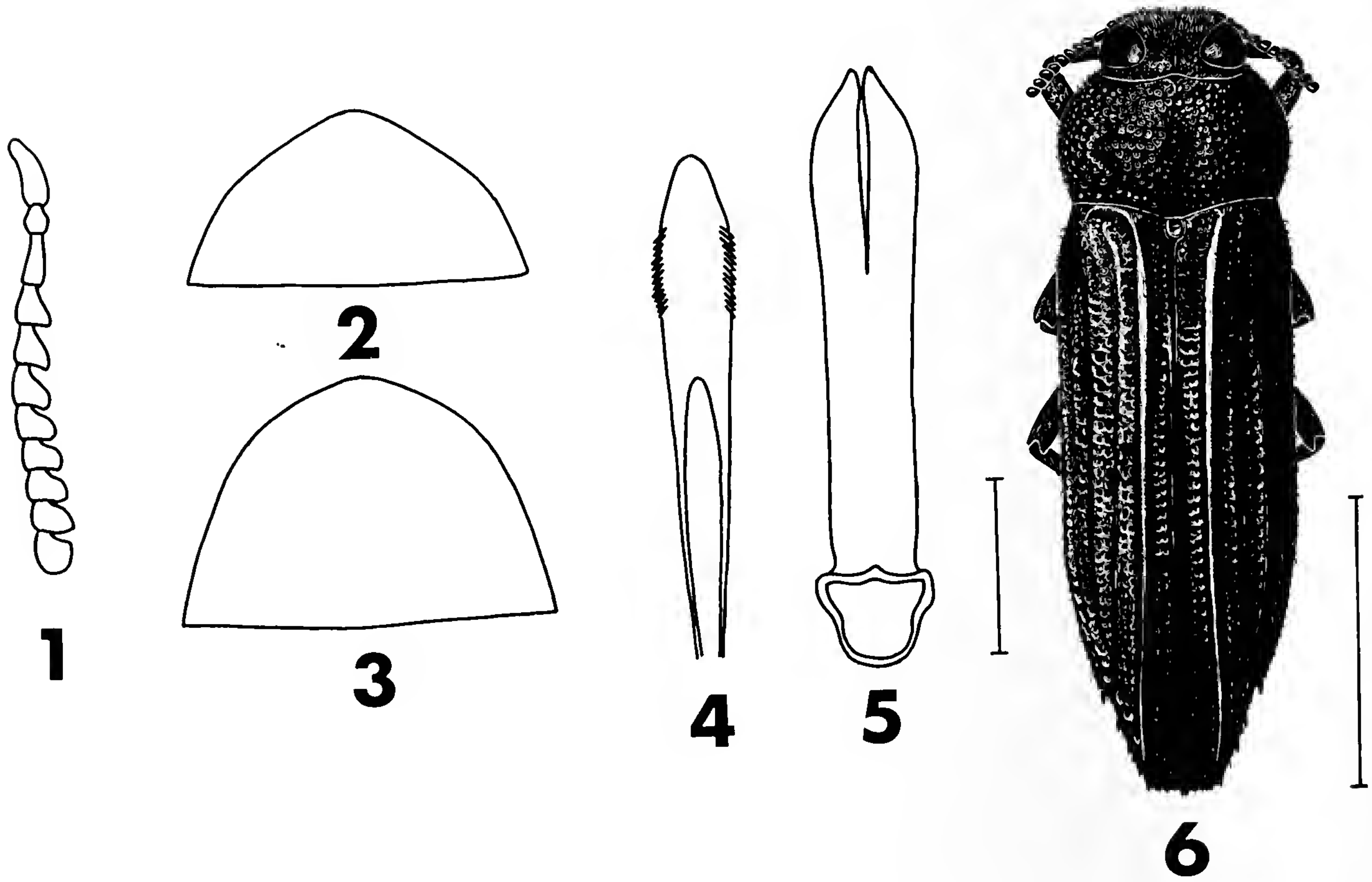

Fig. 1-6. *Polycesta barri* new species: 1) antenna of holotype; 2) last visible abdominal sternite of holotype; 3) last visible abdominal sternite of allotype; 4) dorsal view, penis of holotype; 5) dorsal view, parameres of holotype (line = 1mm for Fig. 1-5); 6) dorsal view, holotype (line = 5mm).

placed in the following collections: United States National Museum, W. F. Barr, F. M. Beer, G. H. Nelson, D. S. Verity, G. C. Walters, and R. L. Westcott.

There is variation in the distinctness of the ferruginous areas, and in some of the females the lobe of the first abdominal sternite is less distinct. The males vary from 13.0 to 17.0mm in length and from 4.0 to 5.0mm in width; the females from 13.7 to 19.0mm in length and from 4.2 to 6.0mm in width.

It appears most similar to *P. variegata* Waterhouse and *P. bicolor* Kerremans, but the extremely narrow form, rounded lateral margins of pronotum, squared apices and one pair of conspicuous discal carinae of elytra are features that will distinguish *P. barri* Nelson from other described species.

A NOTE ON THE OCCURRENCE OF *SPAERIDIUM SCARABAEOIDES* L. NEAR MEXICO CITY (COL., HYDROPHILIDAE)

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Late in 1974 (22-XI), when the dry season had started and the vegetation of the open fields in the Valley of Mexico was quite withered, a series of Hydrophilidae (8 males and 6 females) was found in fresh cow dung on artificially flooded pasture land. A few days later (1-XII-74) a thorough search was made in the surroundings, and a few scattered specimens (3 males and 4 females) were gathered in adjacent fields and ravines as far as 1.5 Km, also in fresh cow dung. The locality is part of the Delegación de Cuajimalpa, D.F., 18 Km to the southwest of downtown Mexico City; the altitude is 2550 m (8360 feet) and has an average temperature of 14°C. After collecting 35 years in the Valley of Mexico and 7 years in this particular area, it is the first time that I have found this attractive black beetle with red and orange spots. I determined it as *Spaeridium scarabaeoides* L. by using: H. Vogt (1971) Die Käfer Mitteleuropas, III:128-129.

This European species has been known from North America for many years; Edwards (1949) stated that it was quite common in the eastern U.S., and Hatch (1953) recorded it from Washington since 1913. He also listed *S. lunatum* F. (1926) and *S. bipustulatum* F. (1928) from the Pacific Northwest. Blackwelder (1944) listed *Spaeridium scutellatum* Sturm from Brazil, but no other species from Latin America. *S. scarabaeoides* L. probably was introduced into Mexico in all areas where dairy cattle were imported from the U.S.A., but it has been able to survive only where the climate is temperate.

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A NEW *SERICA* FROM NEVADA (COLEOPTERA: SCARABAEIDAE)

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Abstract

A new species, *Serica humboldti*, from Winnemucca, Nevada is described. The genitalia and other morphological details are illustrated, and affinities to previously described species are discussed.

The North American species of *Serica* have been treated by Dawson in a series of papers dating from 1919 to 1967. He published illustrations of the male genitalia for all North American species described, making it possible to identify the species at least from the males. He did not propose species groupings nor keys to species.

I recently received a large series of a *Serica* species from Winnemucca, Nevada, from R. C. Bechtel, Nevada Department of Agriculture, which, after comparison with Dawson's illustrations of genitalia, is undescribed. It has genitalia similar to the following coastal or southern California species; *S. scaphia* Dawson, *ventura* Dawson (and subspecies), *deserticola* Dawson, *senta* Dawson, *acicula* Dawson, *caliginosa* Dawson, *chaetosoma* Dawson, *elongatula* Horn, *mixta* LeConte, *solita* Dawson, and *abdita* Dawson. When the genus is revised, these species, plus a few others, will probably form a discrete group.

The Scanning Electron Microscope time for this paper was supported in part by the University of Maryland Center of Material Research, Department of Mechanical Engineering and Electron Microscope Central Facility, College Park, Maryland.

Serica humboldti Gordon, **new species**

Holotype: Male, length 8.0mm, greatest width 4.0mm. Form elongate, nearly parallel sided, widest posterior to middle of elytra. Color dull brown with pruinose sheen dorsally, clypeus and frons shiny reddish brown; ventral surface shiny yellowish brown. Head (fig. 1) with frontal area and clypeus coarsely, densely punctured, punctures separated by less than half their diameter; anterior margin of clypeus abruptly reflexed, nearly truncate, feebly sinuate medially in frontal view, clypeal suture marked by notch at anterolateral angle and a row of widely spaced, erect setae across disc; vertex extremely dull, strongly alutaceous, mostly impunctate except some coarse seta-bearing punctures immediately behind frontal suture; antenna 9-segmented, 6-segmented scape two-thirds as long as 3-segmented club, 6th segment flattened, somewhat leaflike. Pronotum distinctly narrower than base of elytra (fig. 2), surface dull with pruinose sheen, punc-

[1]Mail address: c/o U. S. National Museum, Washington, D. C. 20560.

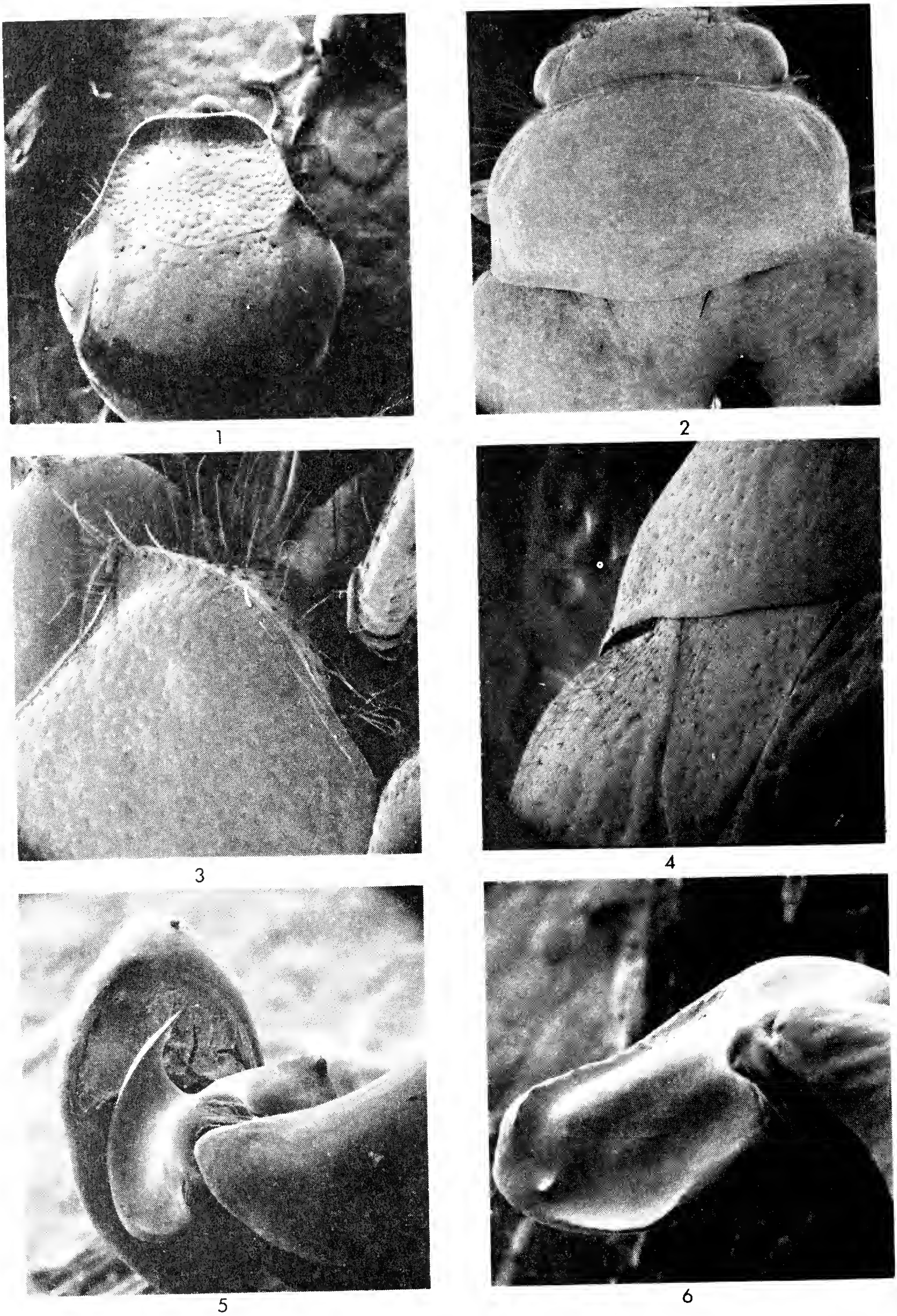

Fig. 1-6 *Serica humboldti,* new species: 1) head; 2) dorsal view of pronotum; 3) lateral view of pronotum; 4) scutellum and base of elytra; 5) male genitalia right lateral lobe; 6) male genitalia, left lateral lobe.

tures finer than on head, separated by less than to twice their diameter; anterolateral angle depressed internally, apex of angle feebly explanate, with long, erect setae (fig. 3); lateral margin beaded, with long erect setae, strongly protuberant medially; abruptly curved inward to posterolateral angle; posterolateral angle flattened, rounded, not beaded, feebly explanate; basal margin not beaded; a feeble, more densely punctured depression present on each side of scutellum. Scutellum triangular, apex rounded, fine, dense, seta-bearing punctures present except medially (fig. 4). Elytron dull with pruinose sheen, striae feebly impressed; first interval impunctate except an irregular row of fine, dense punctures present on sutural border and a single, posteromedian central puncture bearing a coarse, erect seta; second, fourth, sixth, eighth and tenth intervals broad, flat, with irregular punctures not bearing setae; third, fifth, seventh and ninth intervals narrow, feebly convex, mostly impunctate but with some widely separated punctures bearing erect setae; epipleuron and submarginal stria with dense, long, semi-decumbent, golden setae. Anterior tibia with 2 teeth, anterior tooth long, bluntly pointed, posterior tooth widely separated from anterior tooth, pointed, apical spur long, slender, nearly as long as first 2 tarsal segments combined; middle tibia with apical spur less than half as long as first tarsal segment, separated by coarse, irregular spinules; hind tibia with outer apical spur slender, curved, pointed, as long as first tarsal segment, apex fringed with short, coarse, irregular spinules. Anterior tarsus about as long as tibia, segments 1 to 4 subequal in length, 5th segment as long as 3 and 4 combined; middle tarsus long, slender, nearly twice as long as tibia, segments 2 to 4 subequal, segments 1 and 5 noticeably longer; hind tarsus slightly longer than tibia, segments 1, 2, and 5 subequal, segments 3 and 4 distinctly shorter. Claws on all legs equal with distinct subapical tooth. Genitalia asymmetrical, right lateral lobe small, flattened, with strongly narrowed, sharp apex; left lateral lobe oval, flattened, a small, pointed tooth present at apex of outer margin (fig. 5, 6): *spiculum gastrale* slender, rodlike, as long as phallobase.

Female: Not known.

Variation: Length ranges from 6.7 to 8.1mm, width from 3.4 to 4.2mm. Dorsal color varies from yellowish brown to dark brown, the pale specimens are not as mature as the dark ones.

Type-material: Holotype, 10 mi. N. Winnemucca, Humboldt Co., NEVADA, VII-9-1963, R. C. Bechtel (USNM 73024). Paratypes, 78 males, same data as holotype, deposited in U. S. National Museum collection, collection of the Nevada Department of Agriculture, and the Henry Howden collection, Ottawa, Canada.

Remarks: The male genitalia of *acicula* and *humboldti* are very similar, the major differences being in the size and shape of the basal piece which is robust and quite straight in *acicula*, short and curved in *humboldti*. In external appearance these species are quite different; the smallest specimen of *acicula* examined was 8.7mm in length, the largest *humboldti* was 8.1mm. In addition, the lateral pronotal margin of *acicula* is evenly rounded from base to apex, not abruptly restricted at the base as in *humboldti*; the base of the pronotum of *acicula* also lacks the depressions on each side of the scutellum possessed by *humboldti*.

The entire type series is composed of males, indicating that females are probably not attracted to light or this is associated with a flight period.

The type locality of *humboldti* is considerably east of the known distribution of any species with similar genitalia. The other species are from California and almost without exception from the coastal region of southern California.

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PSYDRUS PICEUS LeCONTE FROM ARIZONA (COLEOPTERA: CARABIDAE)

To my knowledge the following are the first published records of *Psydrus piceus* Lec. from Arizona: Cochise County, Chiricahua Mountains, Rustler's Park, 7-VIII-48, G. E. Ball, 8500′ (1); Apache County, 3 miles north of Alpine on U. S. Highway 666, 8-9-VIII-69, G. E. and K. E. Ball, 8100′ (3); Navaho County, Pinetop, 3-VIII-73, Scott McCleve, 7000′ (1). All 5 specimens were found under the bark of pine logs. I thank Dr. Ball for permission to include and publish his records with mine.—Scott McCleve, 2210 13th Street, Douglas, AZ 85607

A REVISION OF THE NEW WORLD SPECIES OF THE GENUS *ERICHSONIUS* FAUVEL (COLEOPTERA: STAPHYLINIDAE)

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ABSTRACT

Ten new species of the genus *Erichsonius* (Coleoptera: Staphylinidae) are described and illustrated. Seven of the 8 previously-described species from North America are recognised as valid and 1, *E. loxatus* (Horn), is identical with *E. patella* (Horn). A key is provided to distinguish the adults. In the New World, the genus is known only from America north of Mexico.

INTRODUCTION

Whilst resident in Jamaica, I collected a number of examples of 2 species of staphylinid which keyed to the genus *Erichsonius* in Blackwelder (1943). He recorded only 1 species from Jamaica, and its description fitted 1 of the 2 species I had collected. In trying to identify the other species, I became familiar with the characters of the genus *Erichsonius* in order to compare the species occurring in Jamaica with those of surrounding islands and continental areas. I found that not only neither of the 2 Jamaican species, but also none of the species recorded from America south of the United States, belonged to the genus *Erichsonius,* but rather to *Neobisnius* Ganglbauer. When I had examined a quantity of material, very little of which could be identified by means of existing keys, I thought it worthwhile to attempt to revise both genera as represented in the entire New World. This paper concerns only the genus *Erichsonius.* I shall deal with *Neobisnius* in a later paper.

MATERIAL AND METHODS

The material basic to this study was that of G. H. Horn's collection, now located in the Museum of Comparative Zoology (MCZ) at Harvard University. At the time the work preliminary to writing this paper was done, the majority of Horn's collection was in transfer between the Philadelphia Academy of Sciences and MCZ. Only one syntype (in each case labelled "lectotype" but never validly designated) of each of the species described by Horn, from Horn's collection was available to me. This has limited my selection of lectotypes for Horn's species. No new North American species properly belonging to the genus *Erichsonius* have been described since the paper by Horn (1884). Because I recognise more than twice the number of species recognised by Horn, distributional records published since 1884 and based only on Horn's key and descriptions may be misleading. Therefore I

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have ignored all published distributional records; the records given here are based entirely on material I have examined.

Individuals who loaned material of *Erichsonius*, either from their personal collections or from their institutional collections, are acknowledged below. Abbreviations are those used in the text for each collection and the name(s) of the individual(s) making the loans:

(AFN) A. F. Newton, Cambridge, Massachusetts;
(CAS) California Academy of Sciences; P. H. Arnaud;
(CNC) Canadian National Collection; J. M. Campbell;
(FSC) Florida State Collection of Arthropods; R. E. Woodruff;
(IM) Ian Moore, Riverside, California;
(INHS) Illinois Natural History Survey; M. W. Sanderson;
(JHF) J. H. Frank, Vero Beach, Florida;
(MCZ) Museum of Comparative Zoology; J. F. Lawrence, A. F. Newton, J. C. Scott;
(SMKU) Snow Museum, University of Kansas; P. D. Ashlock;
(TAMU) Texas A. & M. University; H. R. Burke;
(USNM) United States National Museum; T. L. Erwin;
(ZMN) Zoological Museum, Helsinki; T. Laitinen.

Approximately 750 adult *Erichsonius* were examined, including type material of all of the species described from North America. Nevertheless, the distribution of several species is broad, and there are obvious gaps in the distributional records. This situation contrasts with that in Africa, where Levasseur (1969) stated that the species are very localized in distribution. At least 1 male of every species was available, and this enabled me to illustrate the aedeagus of each species. For several species, examination of the aedeagus is essential to accurate identification, and its characters are helpful in all instances. Females of some species cannot be distinguished with confidence.

Cards of 3 × 10mm were used to remount specimens which had been dissected, in place of the more usual card points. Water-soluble glue (preferably ‘Permapaste’, a clear glue available in Jamaica) was used to fix the specimen and aedeagus securely to the card. This method of mounting specimens is not only very effective in preventing damage to and loss of parts of specimens, but facilitates preparation of drawings.

Drawings were made while viewing specimens through a stereoscopic dissecting microscope with zoom objective and a linear scale in 1 ocular. Specimens, or parts of specimens, were drawn on squared paper using measurements obtained from the linear scale. These pencil drawings were traced onto white card and completed in ink.

Considerable attention was paid to providing accurate distributional records naming: a) country, b) state or province, c) county, parish, or district, in addition to specific locality. Because a minority of the (frequently several decades old) labels gave all this information, particularly of category c), time was spent examining maps to obtain it; although several individuals provided help at various times, any errors are entirely my responsibility. Some of the labels, particularly older ones, gave only an abbreviation for the name of the state or province; lack of further information is unfortunate, but specimens bearing such labels provide, in several cases, the only records for certain states or provinces and have been listed in the text.

Erichsonius Fauvel

Erichsonius Fauvel, 1874:427 (not *Erichsonius* Schubert, 1911:32; not *Erichsonia* Westwood, 1849:210; not *Erichsonia* Dana, 1849:427; not *Erichsonia* Robineau-Desvoidy, 1863:481) (some originally-included species later transferred to *Neobisnius* Ganglbauer, 1895:464) in original sense, including *Neobisnius*: Blackwelder, 1943:440; Blackwelder, 1944:131; in restricted sense, excluding *Neobisnius*: Blackwelder, 1952:151; Smetana, 1958:140; Arnett, 1960:276; Lohse, 1964:172; Smetana, 1965:11; Coiffait, 1965, 843; Levasseur, 1969, 881.
SYNONYMS: *Actobius* Fauvel, 1876:72; in original sense, including *Neobisnius*: Horn, 1884:223; Sharp, 1885:457; in restricted sense excluding *Neobisnius*: Ganglbauer, 1895, 465; Leng, 1920:106; Hatch, 1957:174.
Type species: *Staphylinus cinerascens* Gravenhorst, fixed by subsequent designation (Lucas, 1920:73) for the objective synonym *Actobius*.
Description: Body linear, not depressed; length (measured from the base of the labrum to the apex of sternum VIII of the abdomen) varying from 3.0 to 5.7mm. Head more or less quadrate, variably punctate, microsculpture more or less evident depending upon closeness of punctation and strigulose to rather squamous; without infra-orbital ridge; eyes moderately large and prominent; when comparing their length with that of the head, I have taken the length of the head as the distance between the nuchal constriction and the base of the labrum; labrum bilobed; antennae inserted in front of eyes, of 11 articles, with basal articles I and II distinctly broader than III, with distal articles IV to XI densely pubescent; maxillary palpus of 4 articles, all elongate, the last longer than the penultimate and subulate; labial palpi similar to maxillary but of only 3 articles; gular sutures posteriorly parallel and very close, but not united.

Pronotum scarcely broader than head, parallel-sided or broader at a point between 0.25 and 0.5 of length from anterior margin, slightly elongate, the surface variably punctate and with microsculpture which is strigulose to rather squamous; lateral margin of pronotum double, the lines united just behind the anterior angle; anterior coxal cavities open behind; anterior coxae large, exserted; mesosternum without transverse carina; mesocoxae larger, more flattened; posterior coxae almost triangular, contiguous; femora somewhat pilose, but not armed with strong setae; tibiae pilose and armed with strong setae, the setae of meso-tibiae most strongly developed; all tibiae with a ctenidium at inner edge of apex; anterior tarsi of male expanded, of female not expanded; posterior tarsi with article I shorter than article V.

First and second abdominal sterna absent; first abdominal tergum absent, second short, frequently hidden under elytra in normally-mounted specimens; intersegmental membranes of abdomen with a pattern of small, scelotised areas arranged in longitudinal bands; sternum VIII of male with U- or V- shaped notch at apex, sternum VIII of female rounded. Aedeagus with biramous paramere.

Remarks

Adults of *Erichsonius* may be distinguished from those of *Neobisnius* by the absence of a transverse mesosternal carina, by the distinct habitus, and by the aedeagus with biramous paramere; the paramere of *Neobisnius* is simple or bifurcate, never fully biramous. The difference in width between article II and article III of the antenna, a character used by other authors to distinguish the genera, is a condition not very useful because some species of *Neobisnius* share it to some extent. Adults of the 2 genera may be distinguished from other genera (*Cafius, Philonthus*) by the distinctly subulate form of the last article of the maxillary palpus. The sparsely punctate species (*E. crescenti, E. patella, E. brachycephalus, E. parcus, E. texanus, E. pusio,* and *E. puncticeps*) (*E. patella* species group) have more widely-separated parameral rami and might be considered to form a distinct subgenus; of the remaining species, *E. fraterculus, E. inutilis,* and *E. rusticus* form a natural group based on aedeagal characters (*E. fraterculus* species group) whilst the remaining 6 species are closely related to each other (*E. cinerascens* species group).

Unlike *Neobisnius,* adults of *Erichsonius* are never brightly-coloured, at least in the North American species. Like *Neobisnius,* they are generally hygrophilous. Their more cryptic colouration is the most likely reason for the comparative paucity of material in collections (cf. *Neobisnius*) but this may also be indicative of a more secretive habit. Adults of at least some species are attracted to light, but light-trapping does not seem to have produced as much material of *Erichsonius* as it has of *Neobisnius.* I know of no published descriptions of the immature stages of any species of *Erichsonius.*

In the following key extensive use has been made of characters of the aedeagus, and for this reason it is not possible to key out females. A key based only on external characters would have been both longer and less accurate, as well as open to individual interpretation.

Key to New World species of *Erichsonius*

1. Head sparsely punctate; rami of paramere of aedeagus widely separated (fig. 1-8) (*E. patella* species group) 2

1.′ Head densely punctate; rami of paramere of aedeagus approximate and parallel (fig. 9-18) 9

2(1). Length 3.0 to 3.5mm 3

2′. Length 4.5 to 5.5mm 4

3(2). Piceous; eyes larger, 0.45 length of head and head narrowed behind; (aedeagus fig. 7) .... 7. *E. pusio* (Horn)

3′. Castaneous; eyes smaller, 0.33 length of head and head broadened behind; (aedeagus fig. 6) .... 4. *E. parcus* (Horn)

4(2′). Apex of median lobe of aedeagus simply spatulate (fig. 4, 5, 8); from Texas and westwards 5

4′. Apex of median lobe of aedeagus with ridge or protuberance (fig. 1-3); from Texas and eastwards 7

5(4). Rami of paramere of aedeagus broadened and truncate at apex (fig. 4); elytra short (fig. 22); (eyes small, 0.27 length of head) .... 6. *E. pomonae* sp.n.

5′. Rami of paramere of aedeagus narrow at apex (fig. 5, 8); elytra seldom short 6

6(5′). Rami of paramere of aedeagus simple (fig. 8); from California .... 8. *E. puncticeps* (Horn)
6′. Rami of paramere of aedeagus lobed laterally (fig. 5); from Texas .... 5. *E. texanus* sp.n.

7(4′). Head transverse; apical notch of sternum VIII of male shallow, less than 0.5 as deep as broad; (aedeagus fig. 1) .... 3. *E. brachycephalus* sp.n.
7′. Head not transverse; apical notch of sternum VIII of male at least as deep as broad 8

8(7′). Head narrowed behind eyes; (fig. 19); (aedeagus fig. 3) .... 1. *E. crescenti* sp.n.
8′. Head not narrowed behind eyes; (aedeagus fig. 2) .... 2. *E. patella* (Horn)

9(1′). Rami of paramere of aedeagus broad at base (fig. 9-11); (*E. fraterculus* species group) 10
9′. Rami of paramere of aedeagus slender at base (fig. 12-18); (*E. cinerascens* species group) 12

10(9). Elytra 0.05 shorter than pronotum (fig. 24); (length 3.25 to 3.6mm) (aedeagus fig. 10) .... 10. *E. inutilis* (Horn)
10′. Elytra at least 0.15 longer than pronotum 11

11(10′). Length 3.4 to 3.75mm; head castaneous; elytra 0.15 longer than pronotum; (aedeagus fig. 9) .... 9. *E. fraterculus* (Horn)
11′. Length 4.25 to 4.6mm; head piceous; elytra 0.25 longer than pronotum; (aedeagus fig. 11) .... 11. *E. rusticus* sp.n.

12(9′). Rami of paramere of aedeagus broadened at midpoint of their length (fig. 12); (length 5.3 to 5.7mm; head nearly parallel-sided) .... 12. *E. rosellus* sp.n.
12′. Rami of paramere of aedeagus entirely slender (fig. 13-18) 13

13(12′). Median lobe of aedeagus gradually narrowed to apex, not curved, without protuberance (fig. 18) .... 17. *E. civicus* sp.n.
13′. Median lobe of aedeagus curved near apex, with or without protuberance (fig. 13-17) 14

14(13′). Apex of median lobe of aedeagus recurved, without protuberance (fig. 18) .... 16. *E. nanus* (Horn)
14′. Apex of median lobe of aedeagus not recurved, with protuberance (fig. 13-17) 15

15(14′). Length 5.0 to 5.5mm; head markedly broader behind the eyes; pronotum scarcely narrowed posteriorly (fig. 27); (aedeagus fig. 16) .... 13. *E. alumnus* sp.n.
15′. Length 4.5 to 5.0mm; head parallel-sided or narrowed posteriorly; pronotum distinctly narrowed posteriorly 16

16(15′). Median lobe of aedeagus slender (fig. 15); habitus more slender (fig. 29) .... 15. *E. floridanus* sp.n.
16′. Median lobe of aedeagus stout (fig. 17); habitus stouter (fig. 28) .... 14. *E. smetanai* sp.n.

E. patella species group
(Sparsely-punctate species with widely-separated parameral rami)

1. *Erichsonius crescenti* Frank, **new species**
(fig. 3, 19)

Description: Length 4.75 to 5.5mm. Head, pronotum and elytra castaneous to piceo-castaneous, abdomen fusco-castaneous to piceo-castaneous, with apical margin of each segment paler. Legs, antennae, and trophi ferruginous with last 2 articles of antenna paler.

Head quadrate, slightly narrowed posteriorly, broadest across the prominent eyes which occupy 0.35 of the length of the side of the head. Head shining, sparsely punctate with moderate punctures and strigulose microsculpture. Pronotum somewhat oval, slightly longer than broad, sparsely punctate with moderate punctures; an irregular row of 8 or 9 punctures on either side of impunctate midline, with additional irregular lateral punctures; microsculpture strigulose. Elytra not much wider than pronotum, slightly longer than jointly broad, closely, finely punctate. Abdomen slightly broadened, tapering posteriorly.

Antennae rather slender. Apical notch of sternum VIII of male deep (as deep as broad) and narrow. Aedeagus broad to apex; the parameral rami curved outwards just before their apices (fig. 3).

Types:[2] I have designated as holotype a male from MCZ bearing the following labels: Framingham Mass XI 7-50 C. A. Frost/ sifting/ *Actobius loxatus* Horn/ C. A. Frost Collection 1962/ *Erichsonius crescenti* male J. H. Frank HOLOTYPE. This specimen is mounted on a card point; on a second point on the same pin is a female specimen here designated as paratype to which I have added a label: *Erichsonius crescenti* female J. H. Frank PARATYPE. The specific epithet is derived from Crescent City, Florida, the origin of the first specimen I saw. All examples listed under records are paratypes.

Type locality: Massachusetts, Middlesex Co., Framingham

Distribution: U.S.A.: Massachusetts, Illinois, N. Carolina, Florida, Louisiana

Records: U.S.A.: Massachusetts, Middlesex Co., Framingham, 14-X-1934, sifting, C. A. Frost (1 male, 1 female: MCZ); 22-III-1946, sifting, C. A. Frost (1 male: MCZ); 7-XI-1950, sifting, C. A. Frost (holotype male and paratype female: MCZ); 28-III-1931, C. A. Frost (4:CNC); Tyngsboro, V-1903 (1:MCZ), Natick, 9-IV-1933, sifting, C. A. Frost (2:MCZ); Bristol Co., Dighton, X, N. S. Easton (1:MCZ); [county and locality unspecified, ex Blanchard collection] (6:MCZ); Illinois, [county and locality unspecified] (1:MCZ); N. Carolina, Macon Co., Highlands, VI-1888 (1:MCZ); Florida, Putnam Co., Crescent City, Hubbard and Schwarz (1 male: USNM); Louisiana, Rapides Par., Magnolia Recr. Area, 15 mi. S.W. of Alexandria, 4-X-1973, pine-hardwood leaf litter, stream edge, A. F. Newton (1 male, 1 female: AFN).

Remarks: The distributional ranges of this species, of *E. patella,* and *E. brachycephalus* overlap, but no difficulty should be experienced in separating even the females of the 3 species; the size of the eyes and the shape of the head of *E. crescenti* (fig. 19) provide sufficient diagnostic characters.

[2]All labels contain male and female symbols, but for ease in typesetting these are spelled out in all records reported herein.

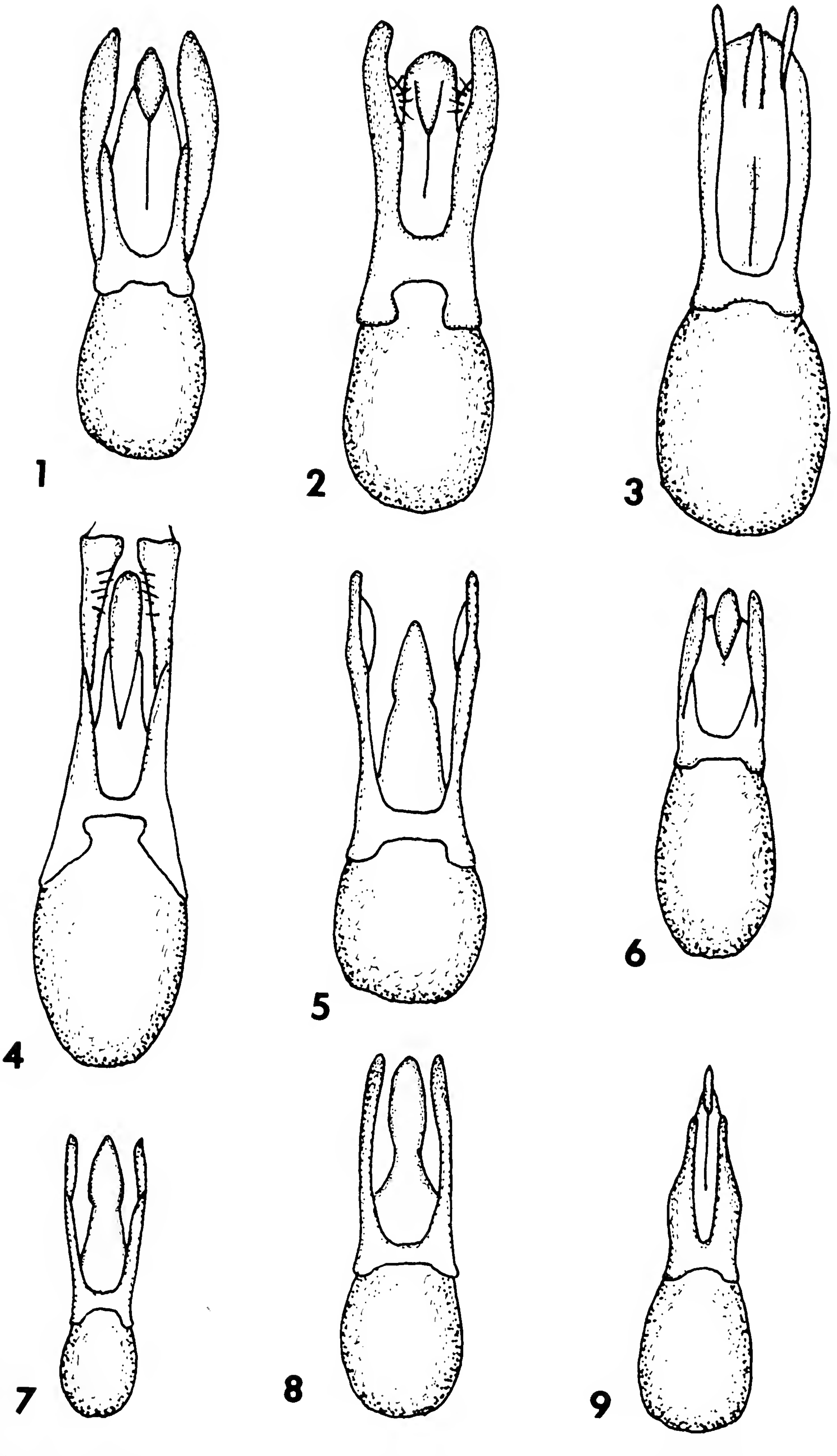

Fig. 1-9 *Erichsonius* aedeagi (ventral views): 1) *brachycephalus,* 2) *patella,* 3) *crescenti,* 4) *pomonae,* 5) *texanus,* 6) *parcus,* 7) *pusio,* 8) *puncticeps,* 9) *fraterculus.* All to same scale.

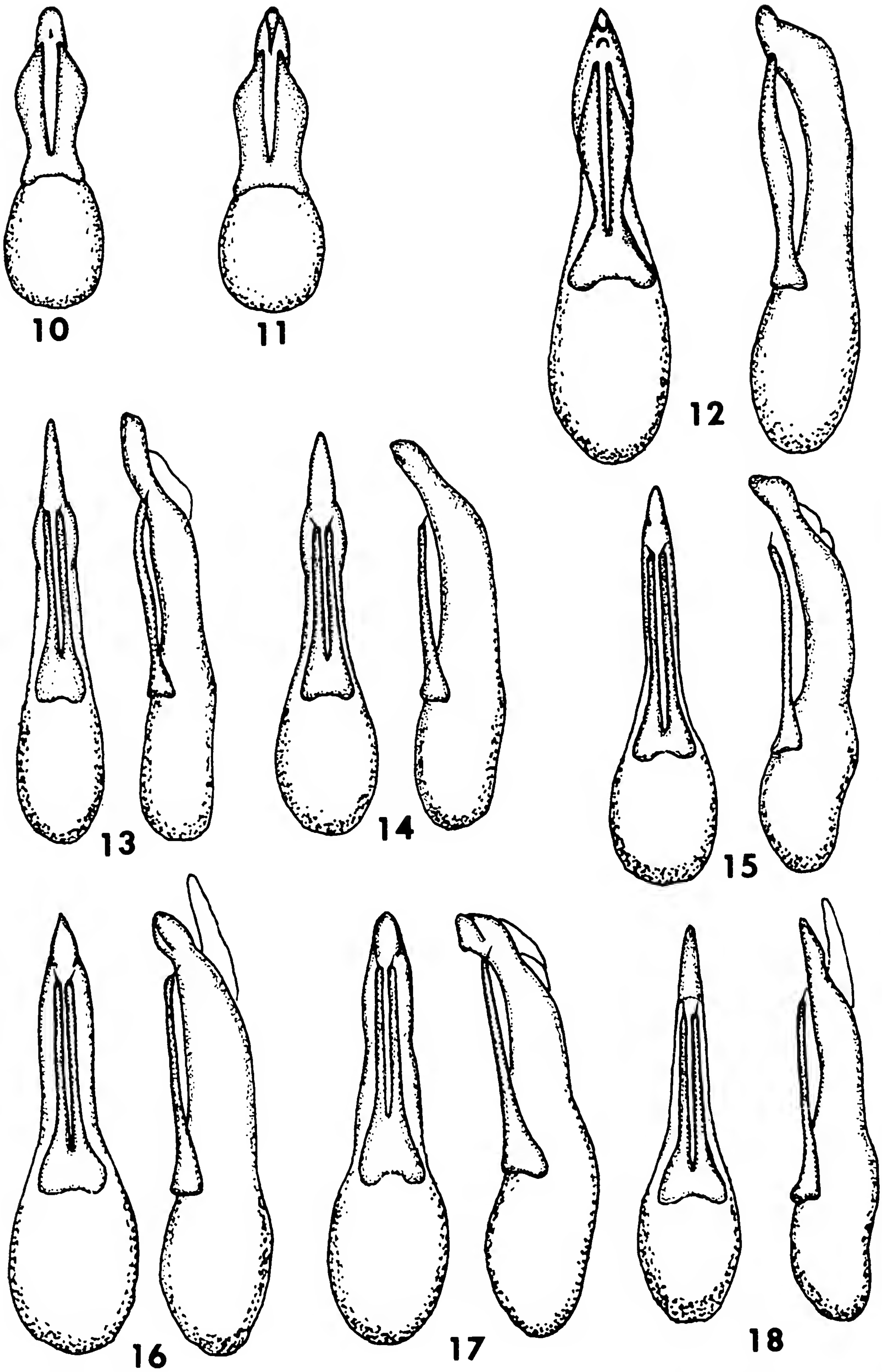

Fig. 10-18 *Erichsonius* aedeagi: 10) *inutilis,* 11) *rusticus,* 12) *rosellus,* 13) *nanus,* 14) *cinerascens,* 15) *floridanus,* 16) *alumnus,* 17) *smetanai,* 18) *civicus*. Fig. 12-18 include lateral as well as ventral views, all to same scale.

2. *Erichsonius patella* (Horn)
(fig. 2)

Actobius patella Horn, 1884:229 (type locality: Michigan); Bernhauer and Schubert, 1914:325; Leng, 1920, 106

New synonymy: *Actobius loxatus* Horn, 1884, 229 (type locality: District of Columbia); Bernhauer and Schubert, 1914:325; Leng, 1920:106.

Description: Length 4.75 to 5.5mm. Very similar to *E. crescenti,* but with eyes slightly smaller (0.31 of length of head) and head not narrowed posteriorly; with pronotum and elytra more distinctly longer than broad. Aedeagus (fig. 2) distinct from that of *E. crescenti* (fig. 3). Apical notch of sternum VIII of male as deep as broad. Coloured as *E. crescenti.*

Types: A male specimen in MCZ bears the following labels: Mic./male/ lectotype 3104 [red]/*A. patella* Horn. I have designated this specimen as lectotype of *Actobius patella* Horn. A male specimen in MCZ bears the following labels: D.C./male/ lectotype 3110 [red]/ *A. loxatus* Horn, I have designated this specimen as lectotype of *Actobius loxatus* Horn.

Distribution: CANADA: Quebec, Ontario; U.S.A.: New Hampshire, New York, Massachusetts, Pennsylvania, Indiana, Illinois, Michigan, New Jersey, District of Columbia, Kentucky, Tennessee, W. Virginia, Virginia, N. Carolina, Louisiana

Records: CANADA: Quebec, Gaspé Ouest Co., Gaspesie Park, Lac du Diable, 12-VII-1972, 1500 ft., J. M. and B. A. Campbell (1 male: CNC); Gatineau Co., Gatineau Park, Ramsay Lake Area, 23-V-1971, J. M. Campbell (4:CNC); Ontario, Renfrew Co., Mt. St. Patrick Mine, 10 mi. S. of Renfrew, 13-X-1970, leaf-wood litter, S. Peck (7:CNC); U.S.A.: New Hampshire, Belknap Co., Three Mile Island, 29-VI-1901, C. Merton (2:MCZ), 8-V-1927 (1:MCZ); Cheshire Co., Marlborough, Mt. Monadnock, 12-14-VI-1970, human dung, S. Peck (1:CNC); New York, Hamilton Co., Piseco Lake, 29-V-1927, C. A. Frost (1:MCZ); Orange Co., West Point, 8-V-1916, W. Robinson (5:USNM); Nassau Co., Sea Cliff, VIII (1:MCZ); Massachusetts, Middlesex Co., Watatic, 8-IX-1888 (1:MCZ), Townsend, 19-IV-1894 (1:MCZ), Natick, 24-VII-1930, sifting leaves, C. A. Frost (2:MCZ), 23-XI-1930, C. A. Frost (1 female: TAMU), Hopkinton, 9-V-1926, at sap, C. A. Frost (1:MCZ), Middlesex Fells, 1-X (3:MCZ), Sherborn, 12-XI-1920, C. A. Frost (4:MCZ), Tyngsboro, 24-IX-1893 (1), X-1893 (1), 22-X-1893 (2), 17-VI-1894 (1), 20-X-1895 (1), V-1897 (1) (all MCZ), Framingham, 6-V-1933, C. A. Frost (2:MCZ), 6-V-1944, sifting, C. A. Frost (2:INHS), 26-XI-1946, C. A. Frost (1:IM), 9-V-1956 (1:CNC); Norfolk Co., Brookline, 23-III-1900 (1:MCZ); Suffolk Co., Dorchester, 2-XI-1902, sifting oak leaves (8:MCZ); Berkshire Co., Gt. Barrington, 8-VIII-1902, N. S. Easton (1:MCZ); Pennsylvania, Franklin Co., Pen Mar, Hubbard and Schwarz (3:USNM); Philadelphia Co., Manayunk, X (1:CNC), Philadelphia, VII (1:CNC), Chestnut Hill, 15-IV (12), 6-V (1), 27-V (3), 24-VI (1) (all MCZ); Indiana, Putnam Co., 17-X-1904 (2:MCZ); Illinois, Cook Co., Palos Park, 14-XI-1932, soil covering sample, Frison and Ross (1:INHS); Ogle Co., White Pines Forest State Park, 14-VII-1944, in ground cover, Frison and Sanderson (5:INHS); Jackson Co., Giant City State Park, 22-VIII-1944, Leighton and Sanderson (4:INHS); Michigan, Oakland Co., Clarkston (1:USNM); Wayne Co., Detroit, winter, Hubbard and Schwarz (1:USNM), IX (1:SMKU); [county and locality unspecified] (lectotype male of *Actobius patella* Horn: MCZ); New Jersey, Morris Co., Boonton, 8-VII-1901 (1:USNM), Mt. Arlington, IX (1:SMKU); District of Columbia, 30-III (1), 1-V (1), 20-IX (1), 28-IX (1) (all Hubbard and Schwarz, USNM), (2:CNC), (lectotype male of *Actobius loxatus* Horn: MCZ); Kentucky, Powell Co., Slade, 25-VIII-1967, ex mushrooms, J. M. and B. A. Campbell (1:CNC); Tennessee, Sevier Co., Gatlinburg, 13-IX-1941, Quirafeld (2:MCZ); W. Virginia, Summers Co., 12 mi. N. of Athens, rte. 20, 16-VI-1971, funnel extract of mixed litter, W. A. Shear (2:CNC); Raleigh Co., Beckley, Grandview State Park, 8-VI-1971, *Rhododendron* litter, W. Platnick (1 male: CNC); Virginia, Albemarle Co., Afton, Hubbard and Schwarz (3:USNM); Lee Co., Cumberland Gap N. P., Skylight Cave, 10-VII-1971, W. A. Shear (3:CNC); Bath Co., Warm Springs (4:CNC); N. Carolina, McDowell Co., Round Knob, 21-VI (1), 23-VI (1), 24-VI (3) (all Hubbard and Schwarz, USNM); Buncombe Co., Black Mt., VIII (3:CNC); Louisiana, Rapides Par., Magnolia Recr. Area, 15 mi. S. W. of Alexandria, 4-X-1973, pine-hardwood leaf litter, stream edge, A. F. Newton (4 males, 4 females: AFN).

Remarks: After I examined the lectotype males of *Actobius patella* and of *Actobius loxatus* I concluded that they are identical in all respects. Horn (1884) stated that *A. loxatus* differed from *A. patella* by the less densely punctured elytra, which are also more shining and by the male sexual characters, implying a supposedly differently-shaped notch of sternum VIII. However, the 2 lectotypes are from Horn's collection and are from the appropriate type localities. I am unable to distinguish them according to the differences mentioned by Horn, and I find the aedeagi to be identical. Further, I cannot separate *E. patella* and the 2 similar species (*E. brachycephalus* and *E. crescenti*) on the basis of the characters as given by Horn. The name *Actobius loxatus* is a synonym of *Actobius patella,* whose description occurs first on page 229 of Horn's publication.

3. *Erichsonius brachycephalus* Frank, **new species**
(fig. 1, 20)

Description: Length 4.75 to 5.5mm. Head dark castaneous, pronotum and elytra castaneous, abdomen infuscate with apical margin of each segment paler. Legs, antennae and trophi ferruginous with articles II-X of antenna somewhat infuscate.

Head transverse, eyes occupying 0.37 of its length; only slightly narrowed posteriorly; sparsely and rather coarsely punctate; microsculpture between coriaceous and squamous. Pronotum slightly broader than head, slightly longer than broad; sparsely and rather coarsely punctate; microsculpture between coriaceous and squamous; an irregular row of 9-10 punctures on either side of impunctate midline and with additional lateral punctures. Elytra longer than jointly broad, broader than pronotum, finely and densely punctate and pubescent. Abdomen slightly broader at segments V and VI, finely and densely punctate and pubescent. Apical notch of sternum VIII of male shallow, less than 0.5 as deep as broad.

Types: I have designated as holotype a male specimen from MCZ bearing the following labels: Anglesea 5-28 [or 29] N. J./ Liebeck Collection/ *Erichsonius brachycephalus* male J. H. Frank HOLOTYPE. All examples listed under records are paratypes.

Type locality: New Jersey, Cape May Co., Anglesea.

Distribution: U.S.A.: Maine, Massachusetts, New Jersey, Illinois, Texas

Records: U.S.A.: Maine, Oxford Co., Bethel (4:MCZ); Massachusetts, Middlesex Co., Lowell (2:MCZ), Tyngsboro (1:MCZ), Framingham, 21-V-1944, C. A. Frost (1 male: CNC); Plymouth Co., Marion (1 male: MCZ), 27-VII-1904 (1:MCZ); Barnstable Co., Hyannis, 24-VIII-1904 (1:MCZ); Illinois ["N. Ill."] (1 male: MCZ); New Jersey, Cape May Co., Anglesea (holotype male and 1 female: MCZ); [county and locality unspecified, ex Blanchard collection] (7:MCZ); Texas, Tarrant Co., Handley, 7-IX-1905, W. D. Pierce (1 male: USNM), F. C. Pratt (1 female: USNM); Kerr Co., Kerrville, 5-IV-1959, light trap, Becker and Howden (1:CNC).

Remarks: *E. brachycephalus* differs from the 2 preceding species by the transverse head, slightly more expanded anterior tarsi of the male, markedly shallower and broader apical notch of sternum VIII of the male and distinct aedeagus (fig. 1) with median lobe with a rhomboidal ridge-like protuberance at the apex and parameral rami rather broad, twisted and slightly curved.

4. *Erichsonius parcus* (Horn)
(fig. 6)

Actobius parcus Horn, 1884:230 (type locality District of Columbia); Bernhauer and Schubert, 1914, 325; Leng, 1920, 106.

Description: Length 3.0 to 3.5mm. Head, pronotum, and elytra castaneous; head somewhat darker than pronotum; elytra indefinitely paler at suture and apical margin. Abdominal segments infuscate at base, broadly paler at apical margin. Legs pale ferruginous; antennae pale ferruginous with articles III-IX infuscate; maxillary palpi very pale ferruginous.

Head quadrate; eyes not very prominent, occupying 0.33 length of head; head broadened behind the eyes, shining, sparsely punctate with moderate punctures; with indistinct strigulose microsculpture. Pronotum broader than head, slightly elongate, oval; sparsely punctate; with indistinct strigulose microsculpture; with an irregular row of 8-9 punctures on either side of impunctate median line and additional irregular lateral punctures. Elytra longer than jointly broad, broader than pronotum; rather sparsely punctate. Abdominal terga finely, densely punctate. Anterior tarsi of male somewhat dilated. Apical notch of sternum VIII of male shallow, scarcely evident. Aedeagus distinct (fig. 6), the apex of the median lobe with a rhomboidal protuberance, the rami of the paramere slightly curved and twisted, similar to that of *E. brachycephalus,* but smaller.

Types: I have designated as lectotype a female specimen from Horn's collection in MCZ bearing the following labels: D.C./ lectotype 3112 [red]/ *Actobius parcus* Horn.

Distribution: U.S.A.: Massachusetts, District of Columbia, Virginia, S. Carolina, Louisiana

Records: U.S.A.: Massachusetts, Middlesex Co., Framingham, 12-III-1910, C. A. Frost (1:USNM), 14-III-1931, sifting, C. A. Frost (1:MCZ), 18-V-1935, sifting, C. A. Frost (2:MCZ), Natick, 23-IV-1933, sifting, C. A. Frost (1:MCZ), Tewksbury (1:MCZ), Dracut, 6-III-1886 (3:MCZ), Sherborn, 15-X-1950, sifting, C. A. Frost (1:MCZ), Tyngsboro, XII-1873 (5:MCZ), 21-IV-1895 (1:MCZ), 1-X-1923 (1:MCZ), Tyngsboro, Merrimack River, 25-IV-1901, drift (4:MCZ); District of Columbia (lectotype female: MCZ); Virginia, Fairfax Co., Greatfalls, VI (1:MCZ); S. Carolina, Florence, 25-I-1928 (1:MCZ); Louisiana, Madison Par., Tallulah, 25-V-1934, J. W. Folsom (1:MCZ); [state, county, and locality unspecified, ex Kaeber collection and Wickham collection] (12:USNM).

Remarks: Horn (1884) gave the distribution as " . . . from Michigan to the District of Columbia," but he did not designate a holotype. The lectotype selected is from Horn's collection, from the District of Columbia and agrees with the original description. The species is related to *Erichsonius* *brachycephalus,* but is considerably smaller and differs in the shape of the head. It is distinguished from the other small, sparsely punctate species, *E. pusio,* by its paler colour (not piceous), smaller eyes (0.33 cf. 0.45 length of head) and head broadened behind the eyes (cf. narrowed).

5. *Erichsonius texanus* Frank, **new species**
(fig. 5, 21)

Description: Length 5.0mm. Head nigrous; pronotum dark castaneous; elytra and abdomen castaneous; legs, antennae and trophi ferruginous, articles III-VI of antenna rather darker.

Head quadrate, very slightly longer than broad, scarcely narrowed behind eyes which occupy 0.37 length of head; sparsely punctate with moderate punctures; microsculpture strigulose to coriaceous; slightly narrower than pronotum. Pronotum oval, longer than broad; sparsely punctate with moderate punctures; an irregular series of 8-9 punctures on either side of impunctate median line and with additional lateral punctures; microsculpture strigulose to coriaceous. Elytra wider than pronotum, longer than jointly broad; finely, densely punctate. Abdomen slightly tapering posteriorly and not noticeably wider at segments IV and V; finely, densely punctate. Anterior tarsi of male somewhat dilated. Apical notch of sternum VIII of male rather broad, not shallow. Aedeagus distinct (fig. 8), the median lobe slightly lobed at the apex, the rami of the paramere almost straight, but lobed near their apex; similar to that of *E. puncticeps* (fig. 8).

Types (localities, distribution, and records): I have designated as holotype a male specimen from MCZ bearing the following labels: N. Braunfels VI-13-27 Tex Darlington/ *Erichsonius texanus* Frank male J. H. Frank HOLOTYPE; as paratype a male specimen from CAS labelled: TEXAS: San Antonio VI-25-1942 E. S. Ross/ *Erichsonius texanus* Frank male J. H. Frank PARATYPE.

Remarks: The species is related perhaps most closely to *E. puncticeps,* but is paler, rather broader, with the punctures of the head and pronotum not as coarse and with the aedeagus distinct (fig. 5 cf. fig. 8); it is distinguished from *E. brachycephalus,* which also occurs in Texas, by the distinct shape of the head (not transverse) and distinct aedeagus (fig. 5 cf. fig. 1) with lobed parameres.

6. *Erichsonius pomonae* Frank, **new species**
(fig. 4, 22)

Description: Length 4.5 to 5.0mm. Head, pronotum, elytra, and abdomen castaneous to fusco-castaneous; legs, palpi and antennae ferruginous, the last 3 to 4 articles of the antenna distinctly paler than the basal 7 to 8.

Head quadrate, hind angles rounded; with rather sparse, large punctures and only a trace of strigulose microsculpture; eye occupying 0.27 length of head. Pronotum scarcely longer than broad, broadest anteriorly and here slightly broader than head; with sparse, large punctures. Elytra jointly no wider than pronotum, scarcely longer than broad, rather sparsely punctate. Abdomen slightly tapering posteriorly, more finely and densely punctate than elytra. Anterior tarsi slightly dilated in both

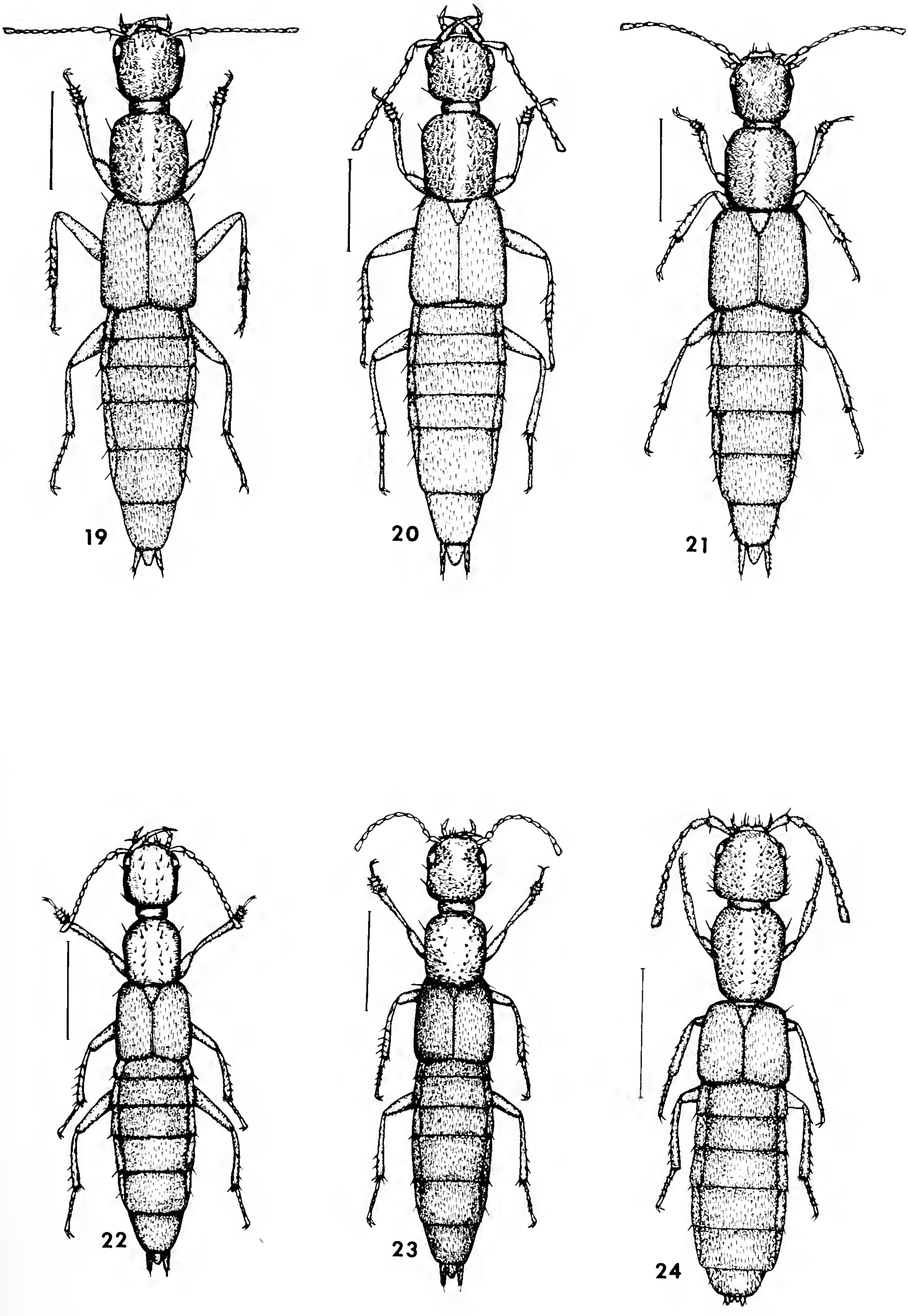

Fig. 19-24 *Erichsonius* adults: 19) *crescenti,* 20) *brachycephalus,* 21) *texanus,* 22) *pomonae,* 23) *puncticeps,* 24) *inutilis.* The scale line represents 1 mm.

sexes but more so in male. Apical notch of sternum VIII of male very small, as deep as broad. Rami of paramere of aedeagus expanded and truncate at the apex (fig. 6).
Types: I have designated as holotype a male specimen from CAS with the following labels: Mt. Wilson Cal. 2000 5-26-18/ J. O. Martin Collection/ *Erichsonius pomonae* Frank male J. H. Frank HOLOTYPE. All examples recorded below are paratypes.
Type locality: California, Los Angeles Co., Mt. Wilson.
Records: U.S.A.: California, Los Angeles Co., Pomona Mts., H. C. Fall (2 males: CAS; 2 males: MCZ), Mt. Wilson, 26-V-1918, 2,000 ft. (holotype male: CAS; 1 female: CNC) [county and locality unspecified] (5:MCZ).
Remarks: This species is similar in appearance to *E. puncticeps,* but it is generally rather paler and with the elytra shorter than typical for *E. puncticeps* and the eyes smaller. The microsculpture of the head and pronotum is more pronounced than in *E. puncticeps,* the head appearing less narrowed posteriorly with punctures deeper and less sparse, the apical notch of sternum VIII of the male is narrower and V-shaped rather than U-shaped. The aedeagus (fig. 6) with parameral rami expanded at the apex is very distinct from that of *E. puncticeps* (fig. 8) with parameral rami simple, even though this may be its closest congener. One of the male specimens from MCZ (county and locality unspecified) is from the Horn collection and was placed under *E. puncticeps*; it thus seems likely that Horn had seen at least 1 specimen of *E. pomonae,* but had taken it to be *E. puncticeps.* The specific epithet is derived from Pomona, even though I have selected a holotype from Mt. Wilson, because the labels of the type provide slightly more information.

7. *Erichsonius pusio* (Horn)
(fig. 7)

Actobius pusio Horn, 1884:230 (type locality Garland, Colorado); Bernhauer and Schubert, 1914:325; Leng, 1920:106.
Description: Length 3.0 to 3.5mm. Similar in appearance to *E. parcus* but darker, more piceous, with eyes larger (0.45 length of head cf. 0.33), head narrowed behind the eyes, pronotum less elongate, aedeagus distinct (fig. 7 cf. fig. 6). Apical notch of sternum VIII of male broad, shallow. Aedeagus (fig. 7) much smaller than that of *E. puncticeps* (fig. 8), but with a marked similarity; these 2 species are distinct in size range.
Types: a male specimen from Horn's collection in MCZ bears the following labels: Garland 25.6. Col./ 198/ Lectotype 3113 [red]/ *Actobius pusio* Horn. I designate this specimen as lectotype of *Actobius pusio* Horn.
Distribution: CANADA: Quebec, Ontario, British Columbia; U.S.A.: Massachusetts, Michigan, Illinois, Colorado, Utah, N. Carolina
Records: CANADA: Quebec, Portneuf Co., St. Augustin, 8-VIII-1963, J.-C. Aubé (1:CNC); Ontario, Hastings Co., Marmora, 10-VII-1952, J. B. Vockeroth (1 male: CNC); British Columbia, E. Kootenay Distr., 10 mi. S. of Canal Flats, 11-VII-1968, Campbell and Smetana (2:CNC); U.S.A.: Massachusetts, Middlesex Co., Dracut, 14-II-1886 (3:MCZ), Cambridge, 11-I-1874 (1 male: MCZ), Natick, 22-IV-1934, sifting, C. A. Frost (1:MCZ); Norfolk Co., Brookline, 19-IV-1894 (1 male: MCZ), III (1 male:MCZ); Barnstable Co., Provincetown, Cape Cod National Seashore, Province Lands, 17-IV-1971, funnel extract of oak-beech leaf litter, S. Peck (1:CNC); N. Carolina [county and locality unspecified] (3:INHS); Michigan ["Ag.

Coll. Mic.", probably Ingham Co., East Lansing] (1:MCZ); Illinois, Marion Co., Kinmundy, 17-V-1967, J. M. Campbell (4:CNC); Lake Co., Lake Zurich, 16-III-1933, in windrow sample, Frison and Mohr (1:INHS); Colorado, Costilla Co., Garland, 25-VI (lectotype male of *Actobius pusio* Horn: MCZ); Utah, Utah Co., Provo, VI-1896, H. F. Wickham (1:MCZ).
Remarks: The lectotype selected is from Garland, Colorado, from Horn's collection and agrees with the original description. The species is not easily confused with any other known North American species because of its small size, dark colour, and sparsely punctate head and pronotum; the eyes are larger and the head more narrowed posteriorly than *E. parcus.*

8. *Erichsonius puncticeps* (Horn)
(fig. 8, 23)

Actobius puncticeps Horn, 1884:230 (type locality southern California); Bernhauer and Schubert, 1914:325; Leng, 1920:106.
Description: Length 4.5 to 5.0mm. Head, pronotum, elytra, and abdomen dark castaneous to piceous. Legs, trophi, and antennae ferruginous to fusco-ferruginous.

Head quadrate, broadly rounded and slightly narrowed behind the eyes which occupy about 0.36 of the length of the head; strigulose microsculpture scarcely evident; punctation sparse. Pronotum not narrowed posteriorly; broadly rounded anteriorly and posteriorly; marginally longer than broad; sparsely punctate; strigulose microsculpture scarcely evident. Elytra only about 0.10 longer than broad; scarcely broader than pronotum; finely and densely punctate. Abdomen almost linear; scarcely narrower than elytra; finely and densely punctate; apical notch of sternum VIII of male very small, U-shaped. Aedeagus (fig. 8) with median lobe spatulate and without ridge or protuberance; with parameral rami simple.
Types: A female specimen from Horn's collection in MCZ bears the following labels: So. Cal./ Lectotype 3111 [red] *Actobius puncticeps* Horn. I designate this specimen as lectotype of *Actobius puncticeps* Horn.
Distribution: U.S.A.: Arizona, California
Records: U.S.A.: California, Contra Costa Co., Marsh Creek Springs, 22-V-1954, H. B. Leech (1 female: CNC); Inyo Co., Argus Mts., V-1891 (4:USNM), Bishop, 15-VI-1905 (1:CAS), Buckhorn Spring, 2-XI-1971, D. Giuliani (2:IM), 29-IX-1971, D. Giuliani (1:IM), IV-1971, in soil near water, D. Giuliani (1:IM), Deep Springs Valley, Deep Spring I-1971, under rocks etc. around springs, D. Giuliani (1:IM), II-III-1971, under rocks etc. around springs, D. Giuliani (1 male: IM), Panamint Mts., IV-1891 (1:USNM); Lake Co., Middletown, 29-V-1949, H. B. Leech (1 male, 1 female: CAS); Los Angeles Co., [locality unspecified] (1:USNM), Burbank, 28-IV-1918 (1:CAS), Los Angeles, 21-IV-1918 (1:CAS), Pomona, 11-I-1893 (1 female: SMKU), Redondo, III (1:CAS), Saugus, 28-IV-1918 (1:CAS); Marin Co., Camp Taylor, 17-VI-1904 (1:CAS), Lagunitas, 27-VI-1893 (3:CAS), San Anselmo, 16-IV-1904 (1:CAS); Mendocino Co., [locality unspecified] (1:CAS); Mono Co., Fish Slough, 6-I-1972, under rock near spring, D. Giuliani (1 male: IM), Hot Creek Hot Springs, 8-IV-1971, under rocks near springs, D. Giuliani (1:IM), Topaz, 4-V-1972, R. Orth (2:IM); Monterey Co., Carmel Valley, 15-VIII-1956, I. Moore (1 male: CNC), Monterey, 24-VI-1916 (2:CAS); San Diego Co., Campo Creek, 15-IV-1951, I. Moore (1 male: CNC), Mission Valley, 5-VII-1950, I. Moore, (1 female: CNC), Pine Valley, 20-IV-1955, I. Moore (1 female: CNC), Potrero, 11-VI-1950, I. Moore (1 male: CNC), San Diego, X, F. E. Blaisdell (1:CAS); San Francisco Co., San Francisco, 16-VII-1908, F. E. Blaisdell (1:CAS); Santa

Cruz Co., Felton, 4-VII-1916 (1:CAS); Siskiyou Co., [locality unspecified] (6:CAS; 1:CNC); Sonoma Co., Duncan Mills, 17-VII-1908, F. E. Blaisdell (1:CAS), Mill Creek, W. of Healdsburg, 15-IV-1950, H. B. Leech (1:CAS); Tulare Co., Kennedy Meadows, 24-I-1972, under rocks, 6,000 ft., D. Giuliani (1 male: IM); [county and locality unspecified] (lectotype female of *Actobius puncticeps* Horn: MCZ; 4:MCZ); Arizona, Coconino Co., Oak Creek Canyon, 28-VI-1950, L. D. Beamer (1 male, 3 females: SMKU).

Remarks: This species might be confused only with *E. pomonae,* but may be distinguished by the characters mentioned under *E. pomonae.* It also bears considerable resemblance to *E. pusio* but is much larger. The 7 examples from Siskiyou County differ from all others in having noticeably shorter elytra, however the aedeagus of these males does not differ from that of examples from the type locality.

E. fraterculus species group
(Densely-punctate species with broadly-based parameral rami)

9. *Erichsonius fraterculus* (Horn)
(fig. 9)

Actobius fraterculus Horn, 1884, 226 (type locality Michigan); Bernhauer and Schubert, 1914:325; Leng, 1920:106.

Description: Length 3.4 to 3.75mm. Head and pronotum castaneous; elytra ferruginous; abdomen fusco-castaneous; apical margins of abdominal segments scarcely paler; trophi, legs, and antennae ferruginous.

Head quadrate, broadened behind the eyes which occupy only 0.25 of the length of the head. Head more closely punctate than in any of the foregoing species and with squamous microsculpture. Pronotum as broad as head, slightly elongate, narrowed behind, with an irregular row of 10-11 punctures on either side of impunctate median line; with squamous microsculpture. Elytra together scarcely broader than pronotum, longer than jointly broad, 0.15 longer than pronotum; closely, finely punctate. Abdomen closely, finely punctate. Anterior tarsal articles of male not much dilated. Apical notch of sternum VIII of male broad, not very deep. Aedeagus distinct (fig. 9).

Types: I have designated as lectotype a male specimen from Horn's collection in MCZ bearing the following labels: Mic./ Lectotype 3105 [red]/ *Actobius fraterculus* Horn.

Distribution: CANADA: Quebec, Ontario; U.S.A.: Maine, New Hampshire, Massachusetts, New York, Michigan, Illinois.

Records: CANADA: Ontario, York Co., Toronto (2:MCZ); [province, county and locality unspecified, head and pronotum missing] (1:MCZ); U.S.A.: Michigan, Wayne Co., Detroit (10:USNM); [county and locality unspecified] (2 males, 1 female: SMKU; lectotype male of *Actobius fraterculus* Horn: MCZ); Illinois, Champaign Co., Urbana, 1-IV-188, in driftwood (1:INHS), 7-IV-1892, about stumps in overflowed land, McElfresh (1:INHS); Jo Daviess Co., Galena, 28-VI-1892, Hart (1:INHS) [the last record is from notes in an accession book, checked against an accession no. on a specimen label, and is not certain].

Remarks: I have no doubt that the lectotype selected from Horn's collection is of *E. fraterculus*; Horn gave the distribution of the species as "northern Illinois and Michigan"; I have seen no examples (paralectotypes) from Horn's collection from northern Illinois.

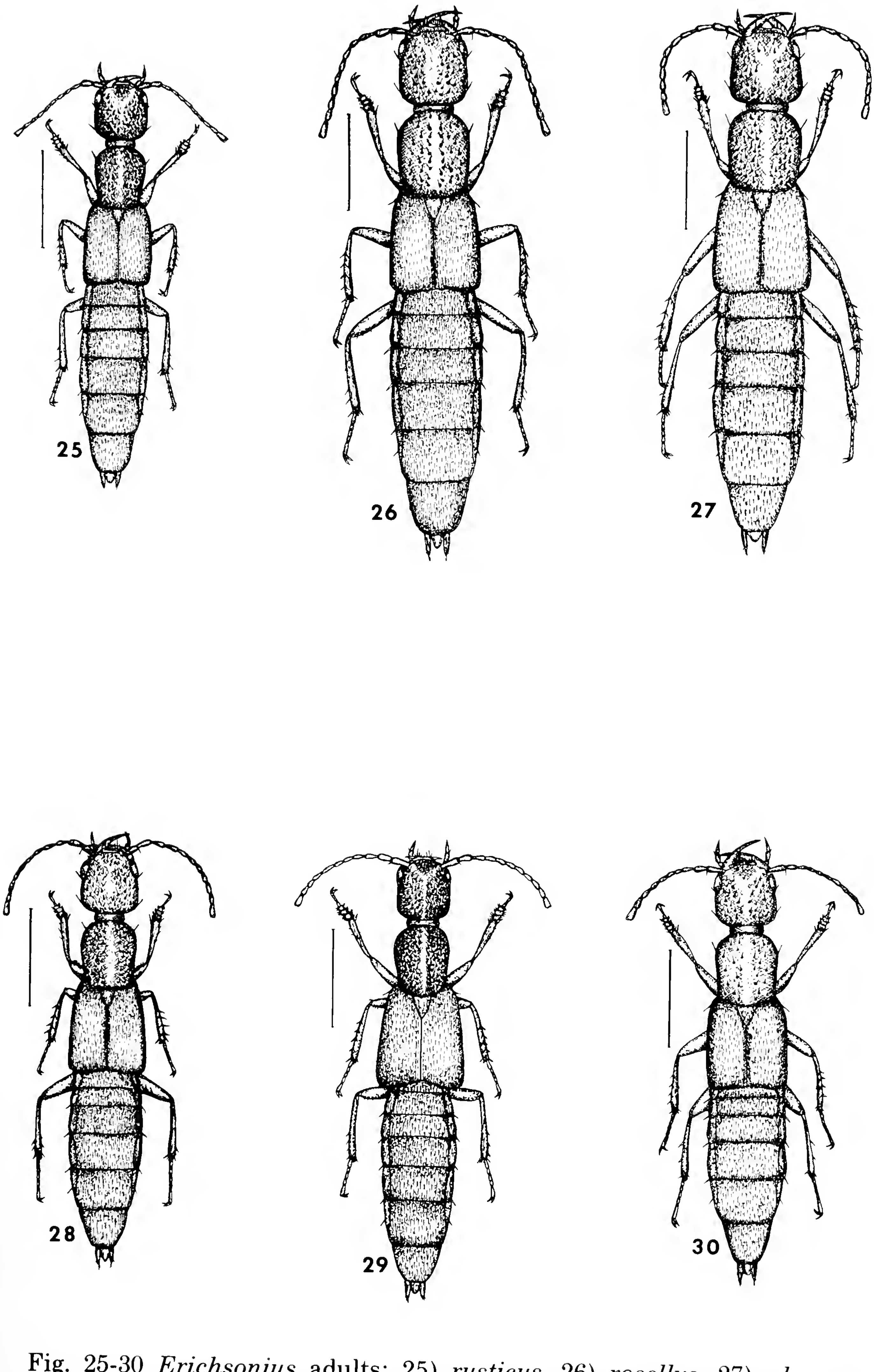

Fig. 25-30 *Erichsonius* adults: 25) *rusticus,* 26) *rosellus,* 27) *alumnus,* 28) *smetanai,* 29) *floridanus,* 30) *civicus.* The scale line represents 1 mm.

10. *Erichsonius inutilis* (Horn)
(fig. 10, 24)

Actobius inutilis Horn, 1884:225 (type locality Michigan); Bernhauer and Schubert, 1914:325; Leng, 1920:106.
Description: Length 3.25 to 3.6mm. Very similar to *E. fraterculus,* but with elytra shorter (by about 0.05) than pronotum, rather less coarsely punctate, slightly darker and with aedeagus distinct (fig. 10).
Types: a female specimen from Horn's collection in MCZ is labelled as follows: Mic./ Lectotype 3104 [red]/ *Actobius inutilis* Horn. I designate the specimen as lectotype of *Actobius inutilis* Horn.
Distribution: CANADA: Quebec, Ontario; U.S.A.: Maine, New Hampshire, Massachusetts, New York, Michigan, Illinois.
Records: CANADA: Quebec, Montreal, 25-VI-1969, E. J. Kiteley (1 male: CNC); Ontario, Russell Co., La Rose Forest, near Bourget, 29-VI-1967, J. M. Campbell (1:CNC); U.S.A.: Maine, Androscoggin Co., Wales, 4-VII-1909, C. A. Frost (1:MCZ); New Hampshire, Belknap Co., Three Mile Island, 7-VI-1904 (1 male: MCZ); Massachusetts, Middlesex Co., Lowell, (2 males, 2 females: SMKU), Dracut, 6-III-1886 (1:MCZ), Tyngsboro, XII-1873 (1:MCZ), Natick, 19-IV-1914, C. A. Frost (1:CNC), 8-V-1932, sifting, C. A. Frost (1:MCZ), 22-IV-1934, sifting, C. A. Frost (1:MCZ), 19-IV-1929, flood debris, C. A. Frost (1:MCZ), 23-IV-1944, swamp grass, C. A. Frost (1:INHS), 1-IV-1945, sifting, C. A. Frost (1 male: MCZ); [county and locality unspecified] (2:MCZ); New York, Chatauqua Co., Celeron, 12-IV-1969, ex nest of *Microtus pennsylvanicus,* A. H. Benton (2 males: CNC); Michigan, [county and locality unspecified] (lectotype female of *Actobius inutilis* Horn: MCZ); Illinois, Lake Co., Antioch, 15-X-1942, tamarack bog, Ross and Sanderson (1:INHS).
Remarks: This species could be mistaken for *E. fraterculus* were it not for the elytra being shorter than the pronotum. The aedeagi of the 2 species are distinct but of similar form, that of *E. inutilis* less acuminate and with the paramere broader apically (fig. 10) compared with *E. fraterculus* (fig. 9).

11. *Erichsonius rusticus* Frank, **new species**
(fig. 11, 25)

Description: Length 4.25 to 4.6mm. Head piceous; pronotum, elytra, and abdomen fusco-castaneous; elytral suture and apical margin as well as apical margins of abdominal segments ferruginous. Legs ferruginous but tibiae infuscate. Antennae and trophi ferruginous.

Head quadrate, slightly broader behind the eyes which occupy 0.35 of the length of the head; densely punctate with a mixture of large and small punctures and with distinct coriaceous microsculpture. Pronotum broader anteriorly; narrowed behind; elongate; more sparsely punctate than head and with punctures of one side; with coriaceous microsculpture. Elytra finely, densely punctate and pubescent; parallel-sided; not much broader than pronotum. Abdomen linear, finely, densely punctate and pubescent. Anterior tarsal articles of male not much dilated. Apical notch of sternum VIII of male broad, shallow. Aedeagus distinct (fig. 11), the rami of the paramere broad, the median lobe with a ridge-like protuberance at the apex; similar to that of *E. inutilis* (fig. 10).
Types: 10 examples, from CNC, each bearing a label as follows are available: Ill. Kinmundy V-13-1967 J. M. Campbell; 7 of these are males (but 1 with abdomen missing, 1 with head and thorax missing) and 3 are fe-

males; to 1 of the males I have added a label: *Erichsonius rusticus* Frank male J. H. Frank HOLOTYPE. All examples mentioned under records are paratypes.
Type locality: Illinois, Marion Co., Kinmundy.
Distribution: U.S.A.: Illinois, Maryland, S. Carolina
Records: U.S.A.: Illinois, Marion Co., Kinmundy, 13-V-1967, J. M. Campbell (holotype male, 6 males, 3 females: CNC) Maryland, Montgomery Co., nr. Plummers Island, 21-IV-1974, T. L. Erwin and D. R. Whitehead, pool-seep (1 female: JHF); S. Carolina, Beaufort Co., Bluffton, 2-VI-1969, R. W. Sanders (1 male, 1 female: FSC).
Remarks: This species resembles *E. smetanai* and *E. floridanus* in form, but the structure of the aedeagus indicates its close relationship to *E. fraterculus* and *E. inutilis,* from which it may be distinguished by its larger size, darker colour and relatively longer elytra as well as by the form of the aedeagus (fig. 11 cf. fig. 9 and 10). It is smaller than most of the species of the *E. cinerascens* species group and may be distinguished from those of similar size by the broad, shallow, apical notch of sternum VIII of the male and by the distinct aedeagus.

E. cincerascens species group
(Densely-punctate species with narrowly-based parameral rami)

12. *Erichsonius rosellus* Frank, **new species**
(fig. 12, 26)

Description: Length 5.3 to 5.7mm. Head piceous; pronotum piceo-castaneous; elytra and abdomen fusco-castaneous with apical margins of abdominal segments paler. Legs ferruginous, tibiae fusco-ferruginous; antennae fusco-ferruginous with article I and article XI paler; trophi ferruginous.

Head quadrate, scarcely broader behind eyes which occupy 0.3 of the length of the head; densely punctate with mixture of large and small punctures and with squamous microsculpture. Pronotum oval, slightly longer than broad, broadest anteriorly and only slightly broader than head; not as densely punctured as head and with large punctures only; with squamous microsculpture. Elytra longer than jointly broad, broader than pronotum; densely, finely punctate and pubescent. Abdomen densely, finely punctate and pubescent. Anterior tarsal articles of male not much dilated. Apical notch of sternum VIII of male broad and shallow. Aedeagus distinct (fig. 12), intermediate in form between that of *E. rusticus* (fig. 11) and that of *E. alumnus* (fig. 16).
Types: A male specimen in USNM bears the following labels: Roselle Pk, N. J. IV-8-1928/ Ernest Shoemaker collection 1956; I designate this specimen holotype and have added the label: *Erichsonius rosellus* Frank male J. H. Frank HOLOTYPE. All examples listed under records are paratypes.
Type locality: New Jersey, Union Co., Roselle Park.
Distribution: CANADA: Quebec, Ontario; U.S.A.: Maryland, Massachusetts, New York, New Jersey.
Records: CANADA: Quebec, Gatineau Co., Gatineau Park, Blind Lake, 8-VII-1969, J. M. Campbell (2:CNC); Ontario, Kenora Distr., 4 mi. E. of Alcona, 18-VI-1973, J. M. Campbell and R. Parry (2:CNC); U.S.A.: Maryland, Montgomery Co., nr. Plummers Island, 21-IV-1974, T. L. Erwin and

D. R. Whitehead, pool-seep (1 female JHF); Massachusetts, Middlesex Co., Framingham, 23-XI-1911, C. A. Frost (1:MCZ), Cambridge, 1-IV-1924 (1:MCZ), Tyngsboro, IV (1:MCZ), Arlington, 20-III-1924 (1:MCZ), 22-III-1924 (1:MCZ); Norfolk Co., Wellesley, 2-VI-1912, P. G. Bolster (1 female: MCZ); Bristol Co., Fall River, 19-XI-1910, N. S. Easton (1:MCZ); New York, Nassau Co., Sea Cliff, IV (1 male: MCZ); New Jersey, Union Co., Roselle Park, 8-IV-1928, E. Shoemaker (holotype male: USNM).

Remarks: The individuals of this species are the largest of those with closely punctate head, and their size will distinguish them from all similar species except *E. alumnus,* which has a more densely punctate pronotum and in which the head is broader behind the eyes. The specific epithet is derived from Roselle Park, the type locality.

13. *Erichsonius alumnus* Frank, **new species**
(fig. 16, 27)

Description: Length 5.0 to 5.5mm. Head piceous; pronotum dark castaneous; elytra and abdomen fusco-castaneous with apical margin of each abdominal segment paler. Legs ferruginous with tibiae infuscate; antennae ferruginous with articles II-XI infuscate; trophi pale ferruginous.

Head quadrate, markedly broader behind the eyes which occupy 0.3 of the length of the head; densely punctate with mixture of large and small punctures and with squamous microsculpture. Pronotum slightly longer than broad; broadest anteriorly but scarcely narrowed posteriorly; not broader than head; with large punctures only; with squamous microsculpture. Elytra broader than pronotum, longer than jointly broad; finely, densely punctate and pubescent. Abdomen with segment VI rather broader than other segments; finely, densely punctate and pubescent. Anterior tarsal articles of male not much dilated. Apical notch of sternum VIII of male about as deep as broad. Aedeagus distinct (fig. 16).

Types: 2 male specimens, both originally on card points, on the same pin, from MCZ, bear the following labels: C. A. Frost V Natick 22 1932 Mass/ banks of stream/ C. A. Frost Collection 1962. I have dissected the uppermost specimen and remounted it on a card rectangle, and I designate this specimen the holotype and the lowermost specimen a paratype. I have added labels: *Erichsonius alumnus* Frank male J. H. Frank HOLOTYPE and *Erichsonius alumnus* Frank male J. H. Frank PARATYPE. All examples listed under records are paratypes.

Type locality: Massachusetts, Middlesex Co., Natick.

Distribution: CANADA: Quebec, Ontario; U.S.A.: Massachusetts, New York, New Jersey, Maryland, District of Columbia, Virginia, N. Carolina, Georgia.

Records: CANADA: Quebec, Vaudreuil Co., Choisy par Rigaud, 25-VIII-1956, Lindberg (2:CNC); Gatineau Co., Old Chelsea, 23-VI-1966, R. de Ruette (1:MCZ); Ontario, Russell Co., La Rose Forest, near Bourget, 29-VI-1967, J. M. Campbell (1 male: CNC); U.S.A.: Massachusetts, Middlesex Co., Natick, 2-VI-1929, treading mud by stream, C. A. Frost (1 male: USNM), 22-V-1932, banks of stream, C. A. Frost (holotype male and 1 male: MCZ), Lowell, 23-IX-1888 (1:MCZ), Framingham, 27-V-1944, on mud by brook, C. A. Frost (1 male: CNC); New York, Tompkins Co., Ithaca, Chittenden (1 male: USNM); Wyoming Co., Pike, 12-VII-1901 (1 male: CNC); [county and locality unspecified] (1 female: MCS); New Jersey, Morris Co., Boonton, 12-V-1901 (2 females: USNM); [county and locality unspecified], M. L. Linnell (1 female: USNM); District of Columbia [locality unspecified] (1 male: MCZ); Maryland, Montgomery Co., Carderock, 20-IV-1974, D. R. Whitehead (2 males, 1 female: JHF), nr. Plummers Island, 21-IV-1974, T. L. Erwin and D. R. Whitehead, pool-seep (1 female: JHF); Virginia, Spotsylvania Co., Fredericksburg, II-V-1891, W. D. Richardson (1 female: USNM); N. Carolina, [county and locality unspecified] (1 male: INHS); Georgia, [county and locality unspecified] (1:MCZ; 1 male, 1 female: INHS).

Remarks: The species is closely related to *E. smetanai* and fairly closely related to *E. floridanus*; its precise relationship to these species, particularly the former, should be examined more closely when additional material is available, because specimens from N. Carolina and Georgia are smaller than those from further north and begin to approach the size of *E. smetanai*. Northern examples are of the size of *E. rosellus* and may be distinguished from that species by the characters mentioned in remarks under *E. rosellus*. It is slightly larger than *E. nanus* and *E. civicus*, with the head broader behind the eyes than either and with the aedeagus distinct (fig. 16 cf. fig. 13 and 18).

14. *Erichsonius smetanai* Frank, **new species**
(fig. 17, 28)

Description: Length 4.5 to 4.75mm. Head piceous, pronotum piceo-ferruginous; elytra fusco-ferruginous with suture and apical margin somewhat paler; abdomen fusco-ferruginous; legs and trophi pale ferruginous, the femora almost luteous, the tibiae, particularly the posterior ones, somewhat infuscate; antennal articles I and XI pale ferruginous, II-X infuscate.

Head quadrate, not narrowed behind eyes which occupy about 0.3 of the length of the head; densely punctate with a mixture of large and small punctures. Pronotum elongate, broadest anteriorly distinctly narrowed posteriorly, not broader than head; with large and rather close punctures and with squamous microsculpture. Elytra broader than pronotum, longer than jointly broad; finely and densely punctate and pubescent. Anterior tarsal articles dilated in male. Apical notch of sternum VIII of male small, about as deep as wide. Aedeagus (fig. 17) similar to that of *E. alumnus* (fig. 11) but with the apex of the median lobe less pointed and more upturned.

Types (distribution and records): I have seen only 2 specimens of this species, both males, from CNC, labelled as follows: LA. St. John the Baptist Par. Manchac, 20.III.68 A. Smetana coll./ *Erichsonius smetanai* Frank male J. H. Frank HOLOTYPE; LA. St. John the Baptist Par. Manchac, 20.III.68 A. Smetana coll./ *Erichsonius smetanai* Frank male J. H. Frank PARATYPE.

Remarks: The species is named for Aleš Smetana, the collector of the only specimens I have seen. It is closely related to *E. alumnus*, with a similarly closely punctate pronotum and very similar aedeagus (fig. 17 cf. fig. 16), is distinctly smaller in size, and the head is not distinctly broader behind the eyes. It is distinguished from *E. floridanus*, which also has a closely punctate pronotum, by the slightly broader facies, slightly less elongate head, generally darker colour, slightly larger eyes and distinct aedeagus (fig. 17 cf. fig. 15). It is rather larger and broader than *E. rusticus*, the male with a narrower and deeper notch in the apical margin of sternum VIII. It is considerably more slender than *E. nanus* and *E. civicus,* with the pronotum markedly more densely punctate.

15. *Erichsonius floridanus* Frank, **new species**
(fig. 15, 29)

Description: Length 4.5 to 5.0mm. Head castaneous to piceous; pronotum ferruginous to fusco-ferruginous; elytra pale ferruginous to fusco-ferruginous, each with its disc infuscate; abdomen ferruginous; legs and trophi pale ferruginous; antennal articles I and XI pale ferruginous, II-X infuscate.

Head slightly longer than broad; parallel-sided; eyes occupying about 0.3 of the length of the head; densely punctate with a mixture of large and small punctures; with squamous microsculpture. Pronotum elongate, broadest anteriorly distinctly narrowed posteriorly; not broader than head; with large punctures; with squamous microsculpture. Elytra broader than pronotum, longer than jointly broad; finely and densely punctate and pubescent. Abdomen linear, finely and densely punctate and pubescent. Anterior tarsal articles somewhat dilated in both sexes. Apical notch of sternum VIII of male small, as deep as broad. Aedeagus distinct (fig. 15), laterally narrowed (compressed) at apex.

Types: The holotype male, from MCZ, bears the following labels: Winter Park Fla. 10-IV E. M. Davis/ *Erichsonius floridanus* Frank male J. H. Frank HOLOTYPE. All examples listed below under records are paratypes.

Type locality: Florida, Orange Co., Winter Park.

Distribution: U.S.A.: Florida

Records: U.S.A.: Florida, Volusia Co., Coronado Beach, 26-II-1939, C. A. Frost (1:MCZ); Sanford, 11-III-1927 (2:MCZ); Edgewater, 28-II-1939, at light, C. A. Frost (1:MCZ); Orange Co., Winter Park, 26-III (1 female), 1-IV (1 male), 10-IV (holotype male) (all MCZ); St. Lucie Co., Capron, 15-IV (1 female: USNM), Lakewood Park, 6-IV-1973, u.v. light trap, J. H. Frank (1 male: JHF); Broward Co., Hollywood, 12-V-1967, D. E. Bright (1:CNC); Dade Co., Homestead, 1-III-1918, A. Wetmore (1 male: USNM), 11-V-1967, D. E. Bright (1:CNC); Highlands Co., Archbold Biol. Sta., 24-IV-1967, D. E. Bright (3:CNC); Lake Istokpoga, 8-III-1968, A. Smetana (1 male: CNC); Putnam Co., Georgetown, C. T. Brues (1 male: MCZ).

Remarks: This species is similar in appearance to *E. rusticus,* but rather paler, larger, and broader, with the head not broadened behind the eyes and with the apical notch of sternum VIII of the male narrower and deeper. It has the pronotum more densely punctate than in *E. nanus* and *E. civicus* and is generally paler and more slender. Several minor differences distinguish it from *E. smetanai,* but the aedeagus is distinctive (fig. 15 cf. fig. 17). The form of the aedeagus may indicate that its phylogenetic position is between *E. nanus* and *E. smetanai.*

16. *Erichsonius nanus* (Horn)
(fig. 13)

Actobius nanus Horn, 1884:225 (type locality Canada); Bernhauer and Schubert, 1914:325; Leng, 1920:106; Smetana, 1965:11.

Description: Length 4.5 to 5.0mm. Head and pronotum piceo-castaneous to piceous, though the head generally slightly darker than the pronotum; elytra and abdomen dark castaneous to fusco-castaneous with ferruginous pubescence; legs ferruginous, the tibiae slightly infuscate; trophi ferruginous; antennae ferruginous with articles III to X infuscate, the last article sometimes pale.

Head quadrate, slightly narrowed behind the eyes which occupy about 0.37 of the length; densely punctate with a mixture of large and small punctures; with a trace of coriaceous microsculpture between punctures. Pronotum elongate, about 0.2 longer than broad; marginally broader posteriorly than anteriorly; about as wide as head behind eyes; with punctures of one size only dispersed quite densely (though much less densely than those of head); with coriaceous microsculpture. Elytra longer than jointly broad; slightly broader posteriorly; finely and densely punctate. Abdomen only slightly narrower than elytra; almost linear; finely and densely punctate; apical notch of sternum VIII of male rather small, U-shaped, about as deep as wide. Antennae rather slender. Aedeagus (fig. 13) rather slender, constricted in two places along its length, the apex flattened and recurved; the rami of the paramere slender and parallel.

Type locality: CANADA

Types: A female specimen in Horn's collection, in MCZ bears the following labels: Can./ Lectotype 3103 [red]/ *Actobius nanus* Horn. Although it is a female, I have little doubt of its identity, and I designate it lectotype here. Horn (1884) gave the distribution of the species as Canada, Michigan, and the New England states. The lectotype selected is the only specimen in Horn's collection (in MCZ) from one of these areas. Four additional examples are present in Horn's collection (J. C. Scott in litt.) but all are from New Jersey and only a female among these is intact.

Distribution: ST. PIERRE & MIQUELON: St. Pierre; CANADA: Newfoundland, Nova Scotia, New Brunswick, Quebec, Ontario, Northwest Territories, British Columbia; U.S.A.: Alaska, New Hampshire, Maine, Massachusetts, New York, New Jersey, Illinois, Wisconsin, Washington.

Records: ST. PIERRE AND MIQUELON, St. Pierre, 7-12 VIII-1951, C. H. Lindroth (1:ZMH); CANADA: Newfoundland, North Distr., Gambo, 25-VIII-1949, E. Palmen (1:ZMH); Fogo Distr., Fogo Is., Fogo, 29-VI-1951, C. H. Lindroth (1:CNC), Fogo Is., Seldom, 3-VII-1951, C. H. Lindroth (1:ZMH; 1 male: CNC); Grenn Bay Distr., Springdale, 20-VI-1951, C. H. Lindroth (1:ZMH); Grand Falls Distr., Badger, 25-VI-1951, E. Palmen (1:ZMH); Twillingate Distr., Twillingate, 5-VII-1951, C. H. Lindroth (3:CNC); St. George's Distr., Stephenville Crossing, Harry's River, 6-VII-1949, E. Palmen (1:ZMH), St. Fintan's, 4-VII-1949, C. H. Lindroth (1:CNC); Burgeo and Lapoile Distr., Rencontre West, 16-VI-1949, C. H. Lindroth (1 male: ZMH), Grand Bruit, 13-VI-1949, E. Palmen (1:ZMH); Nova Scotia, Halifax Co., Sackville, 20-V-1951, C. H. Lindroth (2:CNC), Halifax, 18-V-1951, C. H. Lindroth (1:CNC); Cumberland Co., Westchester, 26-VII-1929, C. A. Frost (6:CNC); Inverness Co., Cheticamp, 25-V-1951, C. H. Lindroth (1:CNC); Colchester Co., Truro, Riversdale, 22-V-1951, C. H. Lindroth (1:CNC); Victoria Co., Cape North, 26-V-1951, C. H. Lindroth (3:CNC), Baddeck, 24-V-1951, C. H. Lindroth (1:CNC); Cape Breton Co., North Sydney, 27-V-1951, C. H. Lindroth (2:CNC); Queens Co., Mdway and vicinity, 13-VIII-1912, sifting sphagnum, C. A. Frost (1:MCZ); New Brunswick, Kings Co., Penobsquis, 21-VII-1927, C. A. Frost (1:CNC); Quebec, Gatineau Co., Gatineau Pk., 1 mi. S.W. of Meach Lake, 22-V-1967, funnel extract from deserted beaver lodge, J. M. Campbell (1:CNC), Gatineau Pk., Blind Lake, 8-VII-1969, J. M. Campbell (3:CNC), Gatineau Pk., Ramsay Lake area, 17-VI-1971, J. M. Campbell (2:CNC), Aylmer, 30-VII-1931, L. J. Milne (1:CNC); Montreal, 30-VI-1973, E. J. Kiteley (1:CNC); Vaudreuil Co., Choisy par Rigaud, 25-VIII-1954, Lindberg (1:CNC); Ontario, Carleton Co., Mud Pond area, 3 mi. W. of South March, 12-V-1969, R. C. Lawrence (7:CNC), Constance Bay, 17-VI-1967, J. M. Campbell (4:CNC), Bell's Corners, 20-IX-1966, J. M. Campbell (14:CNC), Kinburn, 11-X-1967, J. M. Campbell and A. Smetana (1:CNC), Ottawa, Mer Bleue, 3-VII-1973, Smetana and Davies (3:CNC), Ottawa, J. Horn (4:CNC); Northumberland Co., Trenton, 23-XI-1904, in moss, Evans (3:CNC); Essex Co., Pt. Pelée, 6-VI-1929, L. J. Milne (1:CNC); Hastings Co., Marmora, 30-VII-1952, J. B. Vockeroth (2:CNC); Niagara Co., Ridgeway (1 male: SMKU); Cochrane Distr., Moosonee, 2-VII-1973, Parry and Campbell (1 male: CNC); Kenora Distr., Ignace, 16-VI-1973, Campbell and Parry (1 male: CNC), Moose Creek, 10 mi. S. of Sioux Lookout, 17-VI-1973, Campbell and Parry (11:CNC), Butterfly Lake, 13 mi. S. of Sioux Lookout, 17-VI-1973, Campbell and Parry (5:CNC), Lake of the Woods, 1-VIII-1972, D. E. Bright (5:CNC), 4 mi. E. of Alcona, 18-VI-1973, J. M. Campbell and R. Parry (10:CNC), 109 mi. N. of Pickle Lake, 21-VI-1973, Campbell and Parry (1:CNC); Thunder Bay Distr., 47 mi. S. of Pickle Lake, 22-VI-1973, Campbell and Parry (2:CNC), 52 mi. S. of Armstrong, 27-VI-1973, R. Parry and J. M. Campbell (6:CNC), 42 mi. N. of Hurkett, Black Sturgeon Lake, 26-VI-1973, R. Parry and J. M. Campbell (16:CNC), 4 mi. S. of Savant Lake, 23-VI-1973, Campbell and Parry (2:CNC), 9 mi. E. of Terrace Bay, 14-VI-1973, Campbell and Parry (1:CNC); Algoma Distr., Montreal River Harbour, 7-VI-1973, Campbell and Parry (1:CNC); [county and locality unspecified, "E. Ont."], 1884 (2:CNC); [province, county and locality unspecified] (lectotype female of *Actobius nanus* Horn: MCZ); Northwest Territories, MacKenzie District, by highway, 3.5 mi. S.E. of Ft. Simpson, 21-VI-1972, A. Smetana (5:CNC), Martin River, 10 mi. N.W. of Ft. Simpson, 14-VI-1972, A. Smetana (2:CNC), by highway, 2 mi. S.E. of Ft. Simpson, 11-VI-1972, A. Smetana (3:CNC), Ft. Smith, 5-VII-1950, J. B. Wallis (1:CNC); British Columbia, Vancouver N. Distr., 7 mi. N. of Garibaldi, 29-V-1968, Campbell and Smetana (9:CNC), 6 mi. S. of Whistler's Mt., 29-V-1968, Campbell and Smetana (2:CNC), Comox-Alberni Distr., 48 mi. W. of Alberni, 24-V-1968, Campbell and Smetana (9:CNC), W. Kootenay Distr., 4 mi. W. of Rossland, 9-VI-1968, Campbell and Smetana (13:CNC), E. Kootenay Distr., 10 mi. E. of Rogers Pass, Glacier National Pk., 17-VI-1968, Campbell and Smetana (15:CNC), Skeena Distr., 5 mi. E. of Prince Rupert, 30-VI-1968, Campbell and Smetana (3:CNC), Fraser Valley Distr., 12 mi. E. of Hope, 2-VI-1968, Campbell and Smetana (1:CNC); U.S.A.: Alaska, Anchorage Distr., 15 mi. N. of Anchorage, 9-VII-1955, C. H. Lindroth (1 female: MCZ); Maine, Oxford Co., Paris, 10-VII-1937, C. A. Frost (1 male: CNC); Kennebec Co., Monmouth, 27-VI-1916, C. A. Frost (2:MCZ), 16-VII-1915, C. A. Frost (2:MCZ); Piscataquis Co., Greenville, 17-VI-1921, C. A. Frost (3:MCZ); York Co., Kittery Pt., IX-1909, R. Thaxter (1 male: MCZ); [county and locality unspecified, ex Kaeber collection and Wickham collection] (1:USNM); New Hampshire, Belknap Co., Three Mile Island, 9-VI-1907 (3:MCZ); Massachusetts, Middlesex Co., Framingham, 15-II-1909, C. A. Frost (1 male:MCZ), 15-XI-1941, sifting humus, C. A. Frost (1 female: USNM), 22-III-1946, C. A. Frost (1:CNC), 15-X-1946, C. A. Frost (1 female: IM), Natick, 16-XI-1941, sifting humus, C. A. Frost (1 male: USNM), 23-II-1930, sifting, C. A. Frost (1 female: SMKU), 12-X-1941, sifting humus, C. A. Frost (1 male: MCZ), Arlington, 20-III-1924, P. J. Darlington (1:MCZ), 22-III-1924, P. J. Darlington (2:MCZ), 2-II-1924, P. J. Darlington (1 male: MCZ), Brookline, X (1:MCZ), Tewksbury (1:MCZ), 16-III-1889 (1 male: MCZ), Tyngsboro (2:MCZ), 13-I-1874 (1:MCZ), XII-1873 (4:MCZ), 15-VII-1903 (1:MCZ), 15-XI-1903 (1:MCZ), Tyngsboro, Merrimack River, 25-IV-1901 (1:MCZ), Lowell (1:MCZ), Sherborn, 18-IV-1926, sifting, C. A. Frost (1:MCZ), Cambridge, XII-1873 (3:MCZ; 3:INHS), I-1872 (1 male: MCZ), 22-XI-1873 (1 male: MCZ), 9-I-1874 (1:MCZ), 11-I-1874 (1:MCZ), I-1874, G. R. Crotch (3:MCZ); Suffolk Co., West Roxbury, 2-V-1920, P. G. Bolster (1:MCZ); Bristol Co., Fall River, 24-VI-1905, N. S. Easton (1:MCZ) [county and locality unspecified] (3 females: SMKU; 3 females: INHS); New York, Orange Co., West Point, 4-VI-1916, W. Robinson (1 male: USNM); Kings Co., Brooklyn, 31-III-1912, E. Shoemaker (1 female: USNM); New Jersey, Cape May Co., Anglesea (1:MCZ); Illinois, Lake Co., Antioch, 15-X-1942, tamarack bog, Ross and Sanderson (1 female: INHS); Wisconsin, Dane Co., 20-IV-1898 (1 male: MCZ); Washington, Whitman Co., Pullman, C. F. Piper (1 male: MCZ).

Remarks: I have seen several specimens of the European *E. cinerascens,* from Germany and England, in USNM; this species is extremely similar to *E. nanus,* and I can find no good characters to distinguish the 2 except the form of the aedeagus. The aedeagus of *E. nanus* (fig. 13) is recurved and more acuminate at the apex than that of *E. cinerascens* (fig. 14). I have seen no males from North America with an aedeagus of the form of fig. 14, so I am inclined to believe that all records of the occurrence of *E. cinerascens* in North America are the result of misidentification. The aedeagi of the 2 species were figured by Smetana (1955); although I find his figures to be rather simplified, I do not doubt the locality records given by him for *E. nanus,* many (but not all) are repeated above as the result of specimens I have examined.

17. *Erichsonius civicus* Frank, **new species**
(fig. 18, 30)

Description: Length 4.5 to 5.0mm. Head piceous; pronotum, elytra, and abdomen piceo-castaneous; legs fusco-ferruginous, tibiae darker; trophi ferruginous; antennae ferruginous with each article except the last somewhat infuscate distally.

Head quadrate, somewhat broader behind the eyes, which occupy slightly more than 0.3 of the length of the head; densely punctate with a mixture of coarse and finer punctures and with coriaceous microsculpture. Pronotum slightly broader than head, slightly longer than broad; with coarse punctures only and with coriaceous microsculpture. Elytra broader than pronotum, longer than jointly broad, finely and densely punctate and pubescent. Abdomen linear, somewhat narrowed apically; finely and densely punctate and pubescent. Anterior tarsal articles somewhat dilated in both sexes. Apical notch of sternum VIII of male as deep as broad. Aedeagus distinct (fig. 18), the apex of the median lobe simple, without protuberance, not upturned.

Types: The holotype male in MCZ bears the following labels: Wellesley, Mass. 23-VI '12. Bolster/ Percy Gardner Bolster Coll'n *Erichsonius civicus* Frank male J. H. Frank HOLOTYPE. All examples listed under records, except the female from California, are paratypes.

Type locality: Massachusetts, Norfolk Co., Wellesley.

Distribution: CANADA: Ontario; U.S.A.: New Hampshire, Massachusetts, Rhode Island, New York, Michigan, Illinois, Wisconsin, Maryland, N. Carolina, Georgia, Louisiana.

Records: CANADA: Ontario, Russell Co., La Rose Forest, near Bourget, 29-VI-1967, J. M. Campbell (3:CNC); U.S.A.: New Hampshire, Grafton Co., Rumney, 22-IV-1926, P. J. Darlington (2:MCZ); Massachusetts, Middlesex Co., Newton, 1905 (1:MCZ); Lincoln, 14-19-VI-1970, human dung, beech-maple forest, S. Peck (1 male: CNC), Stoneham, Middlesex Fells, 29-V-1970, S. Peck (1:CNC) Norfolk Co., Wellesley, 2-VI-1912, P. G. Bolster (1 male, 1 female and 1 ex. with abdomen missing; MCZ), 23-VI-1912, P. G. Bolster (holotype male: MCZ); Suffolk Co., Dorchester, 8-IV-1906 (1 male: MCZ); [county and locality unspecified] (4:MCZ); Rhode Island, Newport Co., Tiverton, 10-IV-1946, N. S. Easton (1 male: MCZ), 12-XI-1949, N. S. Easton (1:MCZ); New York, Nassau Co., Hewlett, 4-V-1924, E. Shoemaker (1 male, 1 female: USNM); [county and locality unspecified] (1 female: USNM); Michigan, Midland Co., 28-VIII-1943, R. R. Dreisbach (1 female: IM); Illinois [county and locality unspecified, "southern Illinois", head missing], V-1891 (1 male: USNM); Union Co., Pine Hills Field Station, 15-22-V-1967, J. M. Campbell (3:CNC); Lake Co., 2 mi. N. of Volo, 29-III-1968, A. Smetana (1:CNC); Maryland, Montgomery Co., Carderock, 20-IV-1974, D. R. Whitehead (1 male: JHF), nr. Plummers Island, 21-IV-1974, T. L. Erwin and D. R. Whitehead, pool-seep (1 female: JHF); Wisconsin, Bayfield Co., Bayfield, H. F. Wickham (1 female: USNM); N. Carolina, Swain Co., Smoky Mts., Bryson City, Deep Creek, 27-VIII-1930, 2,000 ft, P. J. Darlington (1 male, 1 female: MCZ); Georgia, [county and locality unspecified], F. C. Bowditch (1 male: MCZ); Louisiana, Madison Par., Tallulah, 21-III-1934, J. W. Folsom (2 females: MCZ), 19-VI-1934, J. W. Folsom (1 female: MCZ).

Remarks: This species is most likely to be confused with *E. nanus,* but typically is stouter in appearance, and the head is broader behind the eyes. Males may be distinguished easily by the form of the aedeagus (fig. 18), but I have seen a number of examples which might have been confused with *E. nanus* by appearance alone, so that identification of some females may not always be made with confidence. The records from Wisconsin and Louisiana are based only on female examples and would be better with verification by collection of male specimens. A female example labelled "S. Cal"/ "F. C. Bowditch Coll." in MCZ is very tentatively ascribed to this species.

Acknowledgements

In addition to those individuals who loaned collections to me and are acknowledged in the introduction, I would like to thank Milton Campbell and Aleš Smetana for criticizing the manuscript and D. R. Whitehead for the gift of 8 specimens from Maryland. Thanks are due to numerous individuals, especially my wife, for checking the names of localities in various atlases and maps.

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ADDENDUM

Specimens were recently submitted by R. E. Woodruff, as a part of a survey of the insects of the proposed cross Florida barge canal survey, with the following data: FLORIDA, Marion Co., Lake Eaton, 8-IV-75, blacklight trap, P. C. Drummond.

Erichsonius floridanus Frank. 80 specimens; the largest series seen.

Erichsonius rusticus Frank. 1 male only; the first record for Florida.

LECTOTYPE DESIGNATION OF *CONOSOMA CARINULA* BLATCHLEY (=*COPROPORUS LAEVIS* LeCONTE) (COLEOPTERA: STAPHYLINIDAE)

J. M. Campbell

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I recently had the opportunity, through the kindness of Mr. Arwin Provonsha of Purdue University, to examine the type specimens of the species of *Conosoma* (now *Sepedophilus* Gistel) described by W. S. Blatchley from Indiana.

Blatchley (1910) described *Conosoma carinula* from an undesignated number of specimens from Vigo Co., Indiana. However, the species was assigned to the wrong genus and is, in fact, a junior synonym of *Coproporus laevis* LeConte. **(New synonymy).**

I hereby designate a female with following labels as the lectotype: "Type/Vigo Co., Ind. W.S.B., 10-6-94/Purdue Blatchley Collection/Conosoma carinula sp. nov. 4711/Coproporus laevis Lec. det. 1975, J. M. Campbell/Lectotype Conosoma carinula Blatchley, des. 1975, J. M. Campbell;" Blatchley collection at Purdue University, Lafayette, Indiana.

The specimen is mounted on a triangular point and is in poor condition with the abdomen contracted, one antenna missing, and the entire underside obscured by glue. However, it agrees well with Blatchley's (1910:451) description, and there is no doubt about the identification of the species.

It agrees in all respects with the type of *Coproporus laevis* (see Campbell 1975:198) and must be considered a synonym of this species.

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FIELD TRIP TO JAMAICA

Following the annual meeting of the Entomological Society of America in New Orleans, a field trip for coleopterists to the Blue Mountains of Jamaica is planned. The group attending will leave New Orleans on December 4 and return on December 9. The approximate cost is $190.00 for the return air fare to New Orleans and $70.00 for transport, accommodation, and food in Jamaica. The group attending will be limited to a maximum of 24 persons.

For further details please write, as soon as possible:

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NEW WORLD GYMNETINI: AN ATTEMPT AT CLARIFICATION (COLEOPTERA: SCARABAEIDAE)

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In recent years a number of papers have been published on the Gymnetini, mainly dealing with generic concepts and nomenclature. Unfortunately, the result of these disconnected, and often obscure, papers has been confusion as to which names are valid, and which taxa are placed where. The following is an attempt to trace the history of these publications, and to present a summary of the status of the generic concepts involved.

Casey (1915) in his treatment of the genus *Gymnetis* MacLeay described the subgenus *Gymnetina* (based upon *G. cretacea* LeConte) and indicated type species for *Cotinus* and *Gymnetis*. Leng (1920) listed 3 North American species of *Gymnetis (sallei* Schaum, *argenteola* Bates, *cretacea* LeConte). Schürhoff (1937) published a revision of *Gymnetis* in which he divided the "traditional" *Gymnetis* into a number of genera (*Gymnetis, Paragymnetis, Maculinetis, Cineretis, Jansonia,* and *Astroscara*).

Blackwelder (1939) included in his list some of the changes made by Schürhoff (i.e., *G. argenteola* transferred to *Cineretis*) and reported *Gymnetis chevrolati* G. & P. from Arizona. Blackwelder later (1944) cited all of the Schürhoff generic changes for the Latin American species.

In 1949 Martinez noted that the type species of *Gymnetis (Scarabaeus nitidus* L., by monotypy) was placed by authors in *Cotinus,* and that the concepts of the 2 genera were incorrect. He further stated that the genera created by Schürhoff must be considered "*Nomen nulum*", the result of Schürhoff's failure to designate type species. Martinez then placed *Cotinus* in synonymy with *Gymnetis*; elevated *Gymnetina* Casey to generic status for the species formerly considered *Gymnetis* (and proposed a new subgenus of *Gymnetina, Gymnetoides,* with *Paragymnetis* Schürhoff as a synonym); described a new genus, *Gymnetosoma*; resurrected *Marmarina* Kirby 1827 for the species formerly in *Maculinetis* Schürhoff; and proposed *Hologymnetis* as a replacement for *Cineretis* Schürhoff, designating type species for all.

Goodrich (1965) resurrected *Balsameda* Thomson from *Cotinus,* revised *Cotinus* (1966), and appealed to the Commission of Zoological Nomenclature to preserve earlier concepts of *Cotinus* and *Gymnetis.*

In Opinion 806 (1967) the Commission acted upon Goodrich's appeal by: 1) accepting Casey's (1915) designation of *Gymnetis mutabilis* G. & P. as type species of *Cotinus* and 2) designated *Scarabaeus lanius* L. as type species of *Gymnetis* under the Plenary Powers. Since, at the time of the Commission's action, *Scarabaeus lanius* L. was not in *Gymnetis,* but was the type species of *Gymnetoides* Martinez, this further changed generic nomenclature and concepts.

The net result of these actions has been a nearly complete change in the nomenclature of many important New World genera. In an attempt to clarify the generic concepts in the Gymnetini, I have presented below a listing of the genera and their synonyms, and where there have been substantial changes, of their type species and other included species. In other cases, citations to existing species lists are noted. In some cases, species removed to other genera are noted. Where there are no citations to species lists, the reader should refer to Blackwelder (1944) for included species and their synonymies.

ACKNOWLEDGMENTS

I thank E. I. Schlinger, University of California, Berkeley; M. S. Wasbauer, Department of Food and Agriculture; C. Sabrosky, United States National Museum, for their advice in unraveling the knotty problems outlined here; and Fred G. Andrews, California Department of Food and Agriculture, for reading the manuscript and making suggestions.

A Summary of the New World Gymnetini

Blaesia Burmeister 1842
Tiarocera Burmeister 1842
Allorrhina Burmeister 1842
Argyripa Thomson 1878
Chiriquiba Bates 1889
Cotinus Burmeister 1842. Type species *Gymnetis mutabilis* Gory & Percheron 1833 (by Casey 1915, reaffirmed by Opinion 806 of International Commission of Zoological Nomenclature).
=*Latemnis* Thomson 1880. Type species *Cotinus antonii* Duges.
=*Cotinorrhina* Schoch 1895. Type species *Cotinus columbica* Burm.
Subgenus *Cotinus* Burmeister
17 species. See Goodrich 1966 for species treatment.
Subgenus *Criniflava* Goodrich 1966. Type species *Cotinus producta* Bates. (by original designation)
2 species. See Goodrich 1966.
Balsameda Thomson 1880. Type species *Cotinus pulverulenta* Burmeister. (by monotypy)
2 species. See Goodrich 1965.
Heterocotinus Martinez 1948. Type species *Cotinus semiopaca* Moser. (by original designation)

semiopaca (Moser)	(from *Cotinus*)
terminata (Gory & Percheron)	(from *Cotinus*)
=*klugi* (Gory & Percheron)	
smaragdina (Gory & Percheron)	(from *Cotinus*)
nitidicollis (Moser)	(from *Cotinus*)

Hadrosticta Kraatz 1892
Guatemalica van de Poll 1886
Badelina Thomson 1880
Amithao Thomson 1878
=*Desicasta* Schoch 1895
=*Hologymnia* Schoch 1895
=*Melasictes* Thomson 1880
Desicasta Thomson 1878
=*Moscheuma* Thomson 1880
Gymnetis MacLeay 1819. Type species *Scarabaeus lanius* Linnaeus (by Plenary Powers)
=*Gymnetoides* Martinez 1949. Type species *S. lanius* Linnaeus (by original designation)
=*Paragymnetis* Schürhoff 1937. Type species not designated

chalcipes (Gory & Percheron)
flavomarginata (Blanchard)
hebraica (Drapeaux)
hieroglyphica (Vigors)
lanius (Linnaeus)
punctipennis (Burmeister)
strigosa (Olivier)
subpunctata (Westwood)
see Blackwelder 1944:263 for species synonymy. (cited as *Paragymnetis*)

Gymnetosoma Martinez 1949. Type species *Cetonia flaveola* Fabricius (by original designation)
(= *Gymnetis* of Schürhoff and Blackwelder)
bajula (Olivier)
chevrolati (Gory & Percheron)
coturnix (Burmeister)
flaveola (Fabricius)
holosericea (Olivier)
margineguttata (Gory & Percheron)
marmorea (Olivier)
pantherina (Blanchard)
pardalis (Gory & Percheron)
rufilateris (Illiger)
stellata (Latreille)
see Blackwelder 1944:262 for species synonymy. (*Gymnetis,* in part)

Marmarina Kirby 1827. Type species *Cetonia maculosa* Olivier (by Martinez 1949)
= *Maculinetus* Schürhoff 1937. Type species not designated
argentina (Moser)
maculosa (Olivier)
tigrina (Gory & Percheron)
see Blackwelder 1944:263 for species synonymy. (cited as *Maculinetis*)

Hologymnetis Martinez 1949. Type species *Cetonia undulata* Vigors (by original designation)
= *Cineretis* Schürhoff 1937. Type species not designated
argenteola (Bates)
cinerea (Gory & Percheron)
undulata (Vigors)
see Blackwelder 1944:263 for species synonymy (cited as *Cineretis*)

Gymnetina Casey 1915. Type species *Gymnetis cretacea* LeConte (by monotypy)
cretacea (LeConte)

Jansonella Blackwelder 1944. Type species *Gymnetis anceps* Janson (by original designation)
= *Jansonia* Schürhoff 1937 (nec. Bates 1891)
anceps (Janson)

Astroscara Schürhoff 1937. Type species *Gymnetis flavoradiata* Moser (by original designation)
flavoradiata (Moser)

Hoplopyga Thomson 1880

Hoplopygothrix Schürhoff 1933

Macrocranius Schürhoff 1935. Type species *Macrocranius similis* Schürhoff (by monotypy)
similis Schürhoff

Corvicoana Strand 1935
= *Heteropodia* Schürhoff 1933 (nec. Loriol 1887)

Present Names of the U.S. Species of Gymnetini

Hologymnetis argenteola (Bates)
Gymnetina cretacea (LeConte)
Gymnetis flavomarginata Blanchard (=*sallei* Schaum)

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NOTICE

The North American Beetle Fauna Project (NABFP) announced in its latest release that the "Yellow Version" of the Checklist of Beetles of North America is nearing completion. Copies can be obtained in the 4 following ways: 1) as a Fellow ($30 per yr.) or a Contributing (Life) member; 2) by advance subscription ($200); 3) by purchase of parts ($25 ea.) if available from overruns; 4) as an Associate, gratis copy of your specialty. Orders should be made to NABFP, Box 108, Rensselaerville, N.Y. 12147.

(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

An abstract should be a concise statement of the facts presented, not *that* they are presented (e.g. list names of organisms, not just that they were discussed or described as new). These abstracts are the key to how your article will be cited in the abstracting journals and should be carefully written.

NOTICES

Notices to appear on this page are a free service to members and subscribers. Such copy will be limited to the back page, the older notices being moved up and replaced with the newest ones at the bottom. The editor reserves the right to reword such notices for brevity, consistency, and clarity.

FREE PUBLICATION: If you are not now receiving "Progress Reports", the newsletter of the North American Beetle Fauna Project, send your name, address, and interest in beetles statement to: Dr. R. H. Arnett, NABF Project, Dept. Biol., Siena College, Loudonville, NY 12211.

PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

EXCHANGE: I am interested in trading Colorado beetles for Meloidae and/or Scarabaeidae. I prefer Meloidae. D. Hartman, P. O. Box 444, Frederick, Colorado 80530.

CARABUS, CARABIDAE, CERAMBYCIDAE: Will purchase or exchange Albert Sermet, Pres du lac 17.1400, Yverdon, (Suisse) Switzerland.

LUCANIDAE: World revision of most genera; prefer exchange for lucanids or other beetles; will identify loans, will buy if necessary. Hughes E. Bomans, 39 Avenue Charles Verhaegen, 1950 Crainhem, Belgium.

MICROPEPLIDAE: Working toward a world monograph of the entire family. Specimens, praeimaginal stages, distribution and/or ecological records needed from all areas of the World, by loan, or general exchange, correspondence invited. **SILPHIDAE:** Presently revising the genus ***Agyrtes*** for World. Request loan of adults and/or larvae & pupae. Distribution and ecological records welcome. **STAPHYLINIDAE:** Revising the genus ***Bryocharis*** (subfam. Tachyporinae). Request loan of New World and East Asiatic material especially. Petr Nohel, Botany Inst., Czech. Acad. Sci., 25243-Pruhonice nr. Prague, Czechoslovakia.

EXCHANGE: Curculionidae, Buprestidae, and Carabidae. Massimo Heregalli, C. A. Picco 27, 10131 Torino, ITALY.

CICINDELIDAE: Need specimens of following genera for morphological studies of family: ***Eucallia, Nickerlea, Rhysopleura, Langea, Opisthencentrus, Iresia, Oxygonia, Ctenostoma, Pogonostoma, Caledonomorpha, Caledonica, Distipsidera, Aniara, Prothyma.*** Wish to exchange, borrow, or purchase and can use poorly labelled or damaged material. R. D. Ward, Dept. Ent., Michigan State Univ., East Lansing, Mich. 48823.

FOR SALE: Exotic beetles from Malaysia, New Guinea, Africa, Brazil, etc. Send $1.00 for 64 p. catalogue. Prospect Biological, P. O. Box 307, Round Lake, Illinois 60073.

PHILIPPINE BEETLES: Leonard L. Lengyel, c/o Mrs. Manuela R. Ablan, Rizal St., Laoag City, Ilocos Norte, Rep. Philippines.

LITERATURE DESIRED: Donations of reprints, journals, and reference works are solicited to build up library. Wau Ecology Institute, Box 77, Wau, PAPUA, NEW GUINEA.

SCARABAEIDAE: Want to purchase ***Dynastes tityus*** and ***Plusiotus*** from North and Central America or trade for ***Psalidognathus superbus*** and French Scarabaeidae. T. D. Haas, 97 Barnes St., Long Beach, N. Y. 11561.

BUPRESTIDAE: Buy, exchange, determine Central American Agrilinae for revisionary studies. Henry A. Hespenheide, Dept. Biology, Univ. California, Los Angeles, California 90024.

CERAMBYCIDAE & HISTERIDAE: Respectively wish *Eburia* (regional studies) and *Plegaderus* (World revision); all stages. Robert H. Perry, 118 Pilgrim Ct., Bolingbrook, Ill. 60439.

SCARABAEIDAE: Would like to purchase or trade for various species of *Plusiotus, Megasoma joergenseni, M. janus* v. *argentina, Dynastes hercules* v. *equatoriana, D. satannae, Parachrysina truquii, Chrysina karschi, C. modesta, Homoiosternus beckeri, Heterosternus ludeckei, H. oberthuri.* T. W. Taylor, 8529 Norwood Pl., Rosemead, CA 91770.

WANTED: Carabidae *larvae*. Studying the phylogeny of the tribes Morionini, Pterostichini, Agonini, and Amarini as a thesis problem. Request loans, will sort. Contact for further information and/or send to Raymond G. Thompson, Dept. Ent., Univ. of Arkansas, Fayetteville, AR 72701. 501/575-2451.

STAPHYLINIDAE: If anyone wishes to send us unsorted Staphylinidae in 70% alcohol we will *eventually* return 1 or 2 specimens mounted, labeled and identified to the nearest possible taxon. Ecological data particularly desired. Ian Moore, Div. Biological Control, Univ. of California, Riverside, CA 92502.

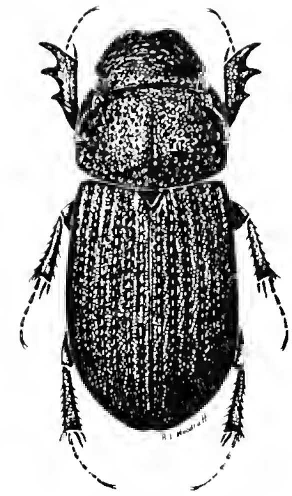
IDAHO ANTS: A guide to Idaho ants is being prepared by Nicholas P. Yensen & William H. Clark. Request loan or gifts of Idaho ant specimens (or collection data) & pertinent literature. W. H. Clark, 1614 W. Jefferson St., Boise, Idaho 83702.

SCARABAEIDAE: Studying myrmecophilous and termitophilous Aphodiinae. Request loan of New World material especially. Will sort from general scarab collections or from light trap samples. Robert E. Woodruff, Fla. Dept. Agr., P. O. Box 1269, Gainesville, FL 32601.

FOR SALE: 6m × 2.5m linear MALAISE TRAPS. Collecting heads utilize cyanide &/or alcohol. Proven design used worldwide. Additional information & prices write D. A. Focks, P. O. Box 12852, Gainesville, FL 32604.

EXCHANGE: Fernando Angelini, Via Imperiali "Villa Italia" n. 189/1B,72021 Francavilla Fontana (Brindisi), ITALY, wishes to receive Haliplidae, Dytiscidae, and Gyrinidae of North & South America in exchange for Coleoptera of same or other families from Italy.

EXCHANGE: Coleoptera of all Families from Arizona; ask for List and send yours. Dr. Rudolph Lenczy, 126 Los Robles, Green Valley, Arizona 85614.



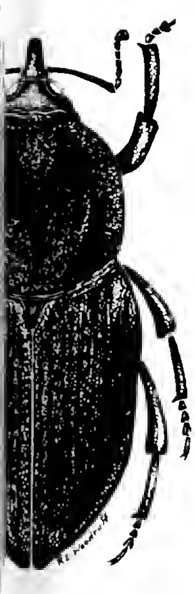
THE COLEOPTERISTS BULLETIN

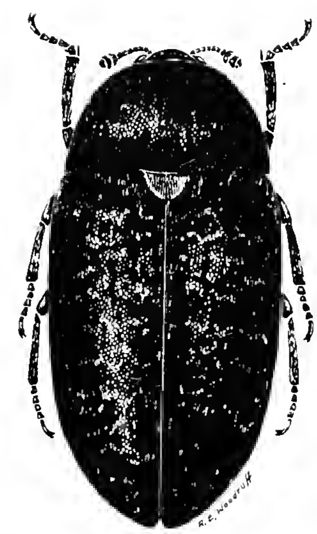
AN INTERNATIONAL JOURNAL DEVOTED TO THE STUDY OF BEETLES

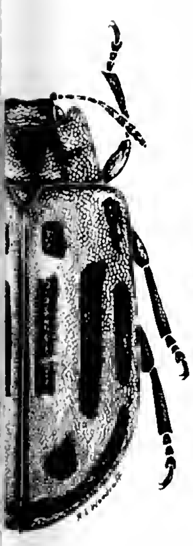
Volume 29, No. 4 December, 1975

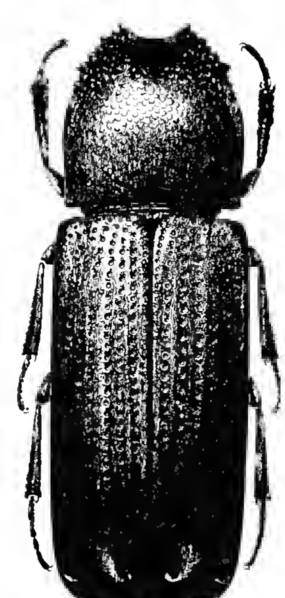
EDITORIAL: WOODRUFF 209-210
LAGRIIDAE: PARSONS 211-226
SCARABAEIDAE: GHORPADE 226-230
PHENGODIDAE: WITTMER 231-250
MALACHIIDAE: WITTMER 250
SCARABAEIDAE: BARFIELD & GIBSON 251-256
CARABIDAE: DAVIDSON 256
CURCULIONIDAE: DeLOACH 257-265
CARABIDAE: ERWIN 267-268
ELATERIDAE: BECKER 269-273
NITIDULIDAE: PARRY & HOWDEN 275-279
STAPHYLINIDAE: FRANK 279-280
TRENDS: WHITE 281-295
CARABIDAE: ERWIN 297-300
PSELAPHIDAE: CHANDLER 301-316
BUPRESTIDAE: MANLEY & WELLSO 317-318
SCARABAEIDAE: FINCHER 319-320
BRUCHIDAE: JOHNSON & KINGSOLVER 321-331
ENDOMYCHIDAE: STROHECKER 333-337
TENEBRIONIDAE: TRIPLEHORN 338
LAMPYRIDAE: WILKERSON & LLOYD 339-348
SCARABAEIDAE: FINCHER & WOODRUFF 349-350
CARABIDAE or RHYSODIDAE: BELL 351-352
CARABIDAE: KIRK 353-354
C. T. PARSONS: J. F. LAWRENCE 355-356
LITERATURE NOTICES 266, 274, 296, 332

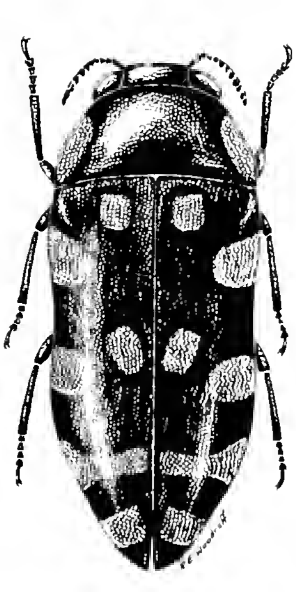
Edited By: Robert E. Woodruff
Mailing date for this issue: January 10, 1976

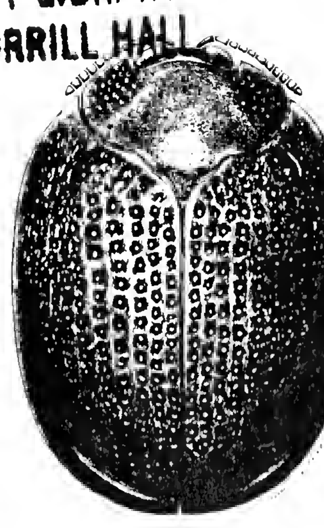












THE COLEOPTERISTS BULLETIN

(FOUNDED 1947 BY ROSS H. ARNETT, JR.)

The **Coleopterists Bulletin** is published quarterly, beginning in March, by the Coleopterists Society. All manuscripts, editorial questions, or business matters should be sent to the editor: Dr. Robert E. Woodruff, Florida Dept. Agr., Div. Plant Ind., P. O. Box 1269, Gainesville, Florida 32602.

Subscriptions: Each annual volume consists of 4 numbers, and subscriptions are for the calendar year. Back issues will be supplied for subscriptions taken out anytime during the year.

Society Membership (without subscription, but includes **Coleopterists Newsletter**)	$ 5.00
Individual Subscription (including Society membership)	8.00
Institutional Subscription	10.00

Back Issues: At the present time the Society maintains no supplies of back issues prior to Volume 25. Earlier volumes may be supplied by previous publishers:

Vol. 1-3 out of print
Vol. 4-20 Catholic University Press, Washington, DC 20017.
Vol. 21-24 Dept. Entomology, Purdue Univ., Lafayette, IN 47907.

Missing Issues: Subscribers failing to receive issues may notify the editor within a year and receive a free replacement. Please notify the editor immediately of any address changes.

Separates: All articles will be arranged to begin on a right hand page. Because of economics, copies will be supplied to authors as separates rather than reprints. These will be supplied from additional copies of the issue, based on the maximum order of separates and cannot be supplied with covers nor free of extraneous matter. Twenty-five tear sheets are provided free to authors of notes of less than one printed page. Costs of separates with the estimated number of printed pages, will be supplied with the galley proof and an order form for separates.

NOTICE TO AUTHORS

Manuscripts will be considered from any authors, although those from members of the Coleopterists Society will be given priority. It is suggested that all prospective authors join the Society. All manuscripts should conform to instructions in the **Style Manual for Biological Journals** (3rd Ed.) prepared by the Committee on Form and Style of the Conference of Biological Editors, and published by the American Institute of Biological Sciences, 2000 P Street NW, Washington, DC 20063.

The following exceptions are noted: 1) all geographical names are to be spelled out, 2) use words, not symbols, for male and female, 3) use numerals throughout, except to begin a sentence, 4) entomology, -ical, -ist, etc. are to be abbreviated Ent. in literature citations.

Specimen label data should be listed in the following manner: MEXICO: State of Veracruz, Fortin de las Flores, 10-VIII-70, I. B. Jones, under bark of **Pinus moctezumae,** 7000ft. [USNM] (2). The number in parentheses indicates the number of specimens. Geographical names are listed in order with largest units first, with states,

Continued inside back cover

(Mailed under second-class permit at Gainesville, Florida. Postmaster: send form 3579 to editorial office—Dr. R. E. Woodruff, Florida Dept. Agr., Div. Plant Industry, P. O. Box 1269, Gainesville, FL 32601).

THE PAST FIVE YEARS

R. E. WOODRUFF

Florida Dept. Agr., Div. Plant Industry,
P. O. Box 1269, Gainesville, FL 32602

After 5 years of editing *The Coleopterists Bulletin,* I have tendered my resignation following this issue. I have considered writing an editorial numerous times during this period, but there were always too many papers, too many deadlines, and always the next issue for which I could write it. Following a personal commitment to keep the editor's job no longer than 5 years, this last issue makes it now or never.

Rather than take up precious time (evening) at the Coleopterists Society meeting in New Orleans (1 Dec. 1975), I forewarned the members present of this editorial in lieu of a lengthy editor's report. This was done partially because only a small percentage of our membership can attend such meetings, and also because it is not an easy report to give or write.

I have mixed emotions about resigning. There have been many enjoyable aspects—the academic challenge, the satisfaction of seeing the journal grow and hopefully improve, and the many friends (mostly) made during the handling of 151 different author's articles. There have also been many frustrations because of the time consuming nature of the job and the resultant neglect of personal correspondence and research. If the membership feels as rewarded as I, then I will be repaid and look forward to resuming some semblance of normalcy and order in my office and home, with a renewed vigor for beetle work again.

I initially accepted this job through the able coercion of Dr. Ross H. Arnett, Jr., the founder of *The Coleopterists Bulletin* (30 years ago), and who personally kept it going for many years at the sacrifice of his own resources (time, energy, and money). When I began this job I had his expertise close at hand to rely upon, and many decisions were based on his sound advice and counsel. I previously had only 2 years editorial experience as Associate Editor of *The Florida Entomologist.* This was also a crucial time because *The Coleopterists Bulletin* was still being published by Purdue University and had not been formally transferred to the Coleopterists Society, pending financial considerations.

It was therefore with great trepidation that I accepted the editor's job and proceeded with the first issue of 1971. It was not until late March that the final transfer was made, so we were proud to be able to mail it on March 31. I have tried to make the publishing schedule of utmost priority, and with 2 exceptions, have mailed before the end of the month for which it was due.

During these 5 years I have made many decisions, some of which related directly to this time schedule. Most of these were judgment decisions, and I hope most resulted in a better journal. As we all know from watching the referee's judgment calls during TV football, they are not always correct as shown on the instant replays. I hope those judgment errors I have made were minimal and are forgiven by those affected or offended.

Many changes have also transpired during the last 5 years, some of which directly affect the format, appearance, and overall production of the *Bulletin.* Some of these are of little interest to the membership, but I would like to mention a few that are not general knowledge. I believe there are many authors, not just graduate students and amateurs, who know little or nothing about the "magical process" between manuscript and finished printed product.

Printing has undergone phenomenal changes, and many decisions relate to these changes. The first issue of 1971 was "set in hot type" which was then used to produce a proof, which was photographed, and an offset plate made for final printing. Currently all our type is punched on a tape, the operator viewing or proofing an image of the last few lines as it is printed out on a TV-like screen, corrections being easily made at this time. The finished tape is then used to "tell" a computer, with discs of various type sizes and styles, what and how to print-out a justified version. This is the

Contribution No. 358, Bur. of Entomology, Div. Plant Ind., Florida Dept. Agr. & Consumer Serv., Gainesville, FL 32602.

basis for a xeroxed galley, the original being fixed photographically and stored until all corrections are made and then it is photographed for the offset plate. The advent of high quality offset printing has greatly improved the speed and versatility of the printed product.

Because of paper sizes and printing efficiency, journals of our size are usually printed in 8 or 16 page "signatures". This requires that the total number of pages be divisible by 8 or 16. Thus each issue must be pieced together as a jig-saw puzzle. It costs little more to print a page full of type than one with only a few lines. This is the reason for short articles and fillers appearing at the end of other articles. For instance, as a result of starting major articles on a right hand page, an article of 2.25 pages requires 1.75 pages as fillers, a fact not known in galley, but only after a "dummy" is made for page make-up.

It is now possible, with minor adjustments and minimal cost, to take an article which was originally set in 9 point type on 10 point spacing and have the computer re-set it a different size or spacing (e.g., 8 on 8), so that more economical use of space can be made. This was done with the book review by Kistner that appeared in Vol. 29, No. 3, 1975, so that it would result in 2 rather than 2.5 pages.

I have kept detailed statistical records for the 5 years, only a few of which are thought to be of general interest. As of this writing, 272 manuscripts were received, of which 212 will be published with this issue. The number of pages has varied from the first issue of 1971 with 40 pages, to 88 pages, except for the current 148 page issue. The total printed pages is 1,229, with 4 pages per issue devoted to covers, leaving 1,149 text pages. The subscribers varied from 370 in 1971 to 650 at present. Mailing costs (under second class permit) have varied from $7.89 (Mar., 1971) to $20.62 (Sept., 1975). Printing costs varied from $602 (700 copies, Mar., 1971) to $1,734.60 (1100 copies, June, 1975), the current issue naturally is expected to exceed this.

One of the major contributions to the success of our journal is the high quality of printing and the cooperative nature of our printer—The Storter Printing Co., of Gainesville, Florida. I am especially indebted to Jim and Morris Storter and Pete Beckett, but their entire staff has contributed: Jack Jenkins (the best typesetter in the World!), Nell Slean, Francis Dekle, Bozena Brown, Betsy Haibach, Laura Cook and Margaret Stallings.

There are so many people to thank for assistance during these 5 years, I know I will inadvertently omit some, but I thank them as well as the following: my family (Evelyn, Cheri, and Kris) has been most patient and involved in all aspects of its production; the past 5 presidents, R. H. Arnett, G. E. Ball, E. C. Becker, J. H. Lawrence, and P. O. Ritcher; treasurers J. E. Lloyd and T. L. Erwin; secretaries T. Allen and R. D. Gordon; my own secretaries Irene Ayres and Pamela Zwerski; administrators of the Florida Dept. Agriculture, Div. of Plant Industry: H. L. Jones (Director), and H. A. Denmark (Chief Entomologist); Richard Fall of the Bio-Quip Co. and Gene Gerberg of American Biological Supply Co., for the most productive free advertising inside their catalog covers.

I also thank all the authors and contributors for their patience, understanding, and hopefully their forgiveness for delays, lack of correspondence, and errors of omission, commission, and judgment. An editor has one of the most engrossing, time consuming, frustrating, and thankless jobs in existence, but, along with the contributors, usually governs the direction, reputation, and success or failure of a scientific journal. I feel very fortunate in being able to turn over this job to a friend (at least till now), Dr. Donald Whitehead. I know *The Coleopterists Bulletin* is in good hands, and I hope the membership, authors in particular, will show him the same goodwill and understanding that I have enjoyed. I leave him my best wishes and a sobering quote from the *Capital Chemist*: "If you ever see an editor who pleases everybody, he will be neither sitting (n)or standing—there will be a lot of flowers around him."

A KEY TO NEARCTIC *STATIRA* AND *ARTHROMACRA* (LAGRIIDAE)

Carl T. Parsons[1]

Abstract

The Nearctic species of *Statira* (composed of 18 species including 1 new species from Texas) and *Arthromacra* (composed of 3 species, one of which has 5 subspecies, of which 1 from Georgia, North Carolina, South Carolina, West Virginia, Tennessee, and Pennsylvania is described as new. Keys are provided to subfamilies of Lagriidae, and to species of Nearctic *Statira* and *Arthromacra*.

This brief account summarizes current knowledge of Nearctic *Statira* and *Arthromacra*. In addition there are several species of *Statira* which cannot be described until a larger sample is available. Traditionally Nearctic Lagriidae is composed of these 2 genera, but the genera *Anaedus, Prataeus,* and *Paratenetus* should be transferred from the Tenebrionidae and placed in the Lupropinae.

Acknowledgments

Specimens in the collections of the following individuals and institutions were studied and are referred to by abbreviations as follows: American Museum of Natural History [AMNH], Academy of Natural Sciences Philadelphia [ANSP], British Museum [BM], C. A. Frost in MCZ [CAF], California Academy of Sciences [CAS], Carl T. Parsons in MCZ [CTP], Canadian National Collection [CNC], Cornell University [CU], Field Museum of Natural History [FMNH], Florida State Collection of Arthropods [FSCA], G. H. Nelson [GHN], H. C. Fall in MCZ [HCF], H. F. Howden [HFH], Illinois Natural History Survey [INHS], Karl Stephan [KS], Kansas State University [KSU], Los Angeles County Museum [LACM], Museum of Comparative Zoology [MCZ], Ohio State University [OSU], Southwest Research Station of the AMNH [SRS], University of Arizona [UA], University of California, Riverside [UCR], United States National Museum [USNM].

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[1]Carl Parsons, of Manchester Depot, Vermont, died 31 December 1973. Reprints of this article are available from T. J. Spilman, Systematic Entomology Laboratory, c/o U. S. National Museum, Washington, D. C. 20560.

[2]The head of the holotype was missing when Parsons returned the specimen to the USNM. He then intended to select another holotype from the type-series, but he died before he could do it. I have selected another male with the same measurements and the same locality data. The only changes made in Parsons' description are in the numbers of setigerous punctures on the elytral intervals.—T. J. Spilman.

Key to the Subfamilies of the Lagriidae

1. Penultimate segment of tarsi feebly lobed and not spongy beneath; front coxae globose, not projecting from cavities; apical antennal segment less than twice as long as 10th segment, often clavate; a visible membrane along hind margin of visible sternites 3 and 4 .... **Lupropinae**

1′. Penultimate segment of tarsi distinctly lobed and spongy beneath; front coxae conical, moderately exserted; apical antennal segment at least twice as long as 10th segment in Nearctic and most exotic genera; no visible membrane along hind margins of sternites 3 and 4 2

2(1′). Anterior coxae subcontiguous; prosternal process depressed, not raised, between the coxae (in exotic genera the prosternal process may be lacking) .... **Lagriinae**

2′. Anterior coxae separated by the prosternal process raised to a level about equal with the apices of the coxae; apex of prosternal process strongly deflexed .... **Statirinae**

Key to Nearctic *Statira* (Statirinae)

1. At least middle and hind tibiae distinctly sulcate along nearly entire outer edge; disc of pronotum rugulose 2

1′. Tibiae on outer edge rounded or flat (rarely feebly sulcate distally) as in *defecta*; disc of pronotum variably punctate, intervals between punctures usually alutaceous, rarely smooth 6

2(1). First elytral interval with not more than 6, 3rd interval with not more than 11, 5th interval with not more than 8, 7th interval with not more than 2, and 9th with not more than 5 setigerous punctures 3

2′. First elytral interval with not less than 8, 3rd interval with not less than 13, 5th interval with not less than 12, 7th interval with not less than 10, and 9th interval with not less than 11 setigerous punctures 4

3(2). Lateral margin of prothorax obliterated anteriorly, becoming distinct posteriorly; pronotum finely densely irregularly pitted, surface granular, rich dark brown; labrum, base of antennae, and legs paler; subopaque; female apical antennal segment equal to next 2.5 segments, in male equal to next 3 segments .... *subnitida*

3′. Lateral margin of prothorax obliterated or evanescent anteriorly but just discernible; pronotum more finely and obsoletely irregularly pitted, surface more or less smooth; opaque; piceous, except prothorax, scutellum, legs, and basal 2 antennal segments rufo-testaceous; female apical antennal segment equal to next 2.5 segments, in male equal to next 3-3.5 segments .... *colorata*

4(2′). Setigerous punctures on 1st elytral interval 8-16, on 3rd interval 14-21, on 5th interval 12-20, on 7th interval 10-17, and on 9th interval 12-20; lateral margin of prothorax almost always obliterated anteriorly but starting at the middle becoming distinct posteriorly, rarely the margin continuing obsoletely to the anterior angles; margins of sulcus on fore and middle tibiae similar; head and prothorax dark rufous, elytra piceous black; pronotum finely rugulose; female apical antennal segment equal to next 2.75 segments, in male equal to next 3.25 segments .... *pluripunctata*

4′. Setigerous punctures on 1st elytral interval more than 19, on 3rd more than 20, on 5th more than 21, on 7th more than 16, and on 9th more than 21 5

5(4′). Lateral margin of prothorax obliterated anteriorly, becoming distinct posteriorly; margins of sulcus on fore and mid tibiae similar; female apical antennal segment equal to next 2.5 segments; elytral setae as long as 1st antennal segment; setigerous punctures on 1st elytral interval 23-33, on 3rd interval 26-39, on 5th interval 21-28, on 7th interval 18-26, and on 9th interval 18-30. Length 9.5-11.2mm .... *dumalis*

5′. Lateral margin of prothorax entire and distinct; either anterior or posterior margin of sulcus on fore and mid tibiae raised to form a blackish carina; female apical antennal segment equal to next 2.5 segments, in male equal to next 3 segments; elytral setae as long as first 2 antennal segments; setigerous punctures on 1st elytral interval 20-28, on 3rd interval 21-26, on 5th interval 22-26, on 7th interval 22-28, and on 9th interval 22-35. Length 7-8.5mm .... *hirsuta*

6(1′). Elytra testaceous to rufous with brown to black markings; no setigerous punctures on 5th elytral interval (except rarely 1 at apex) 7

6′. Elytra unicolorous, usually dark (testaceous in teneral examples); several setigerous punctures on 5th elytral interval 8

7(6). Female apical antennal segment equal to next 3.5-4 segments, in male equal to next 5 segments; testaceous to rufous, elytra slightly paler, with large blackish scutellar spot and transverse fascia slightly behind middle and wider at sides than at middle; setigerous punctures on 1st elytral interval 0-1 at base, on 3rd interval 4-6 from base to apex, on 7th interval 2 at base, on 9th interval 4 along apical fourth.... .... *pulchella*

7′. Female apical antennal segment equal to next 3-3.25 segments, in male equal to next 4-4.2 segments; rufotestaceous, median black spot on each elytron not reaching the suture; setigerous punctures on 1st elytral interval 1-2 at base, on 3rd interval 5-9, on 7th interval 2 at base, and on 9th interval 3-4 along apical fourth .... *nigromaculata*

8(6′). Setigerous punctures on 1st elytral interval 19-26, on 3rd interval 18-33, on 5th interval 17-23, on 7th interval 8-13, and on 9th interval 8-24 9

8′. Setigerous punctures on 1st elytral interval 2-5, on 3rd interval 1-15, on 5th interval 1-11, on 7th interval 1-8, and on 9th interval 4-11 10

9(8). Setigerous punctures on 1st elytral interval about 25, on 3rd interval 26-33, on 5th interval 17-23, on 7th interval 8-13, on 9th interval 8-17; setigerous punctures about as large as strial punctures; pronotum opaque; female apical antennal segment equal to next 3-3.25 segments, in male equal to next 4.25 segments. Length 9-11mm .... *opacicollis*

9′. Setigerous punctures on 1st elytral interval 19-25, on 3rd interval 18-21, on 5th interval about 18, on 7th interval about 8, and on 9th interval about 24; setigerous punctures at least twice as large as strial punctures; pronotum subopaque; female apical antennal segment equal to next 3, in male equal to next 3.75-4. Length 12.5-14mm .... *huachucae*

10(8′). Fore and middle tibiae rounded on outer edge; female apical antennal segment equal to next 2.5-4 segments 11

10′. Fore and middle tibiae flat on outer edge (rarely feebly sulcate distally); female apical antennal segment equal to next 2-2.25 segments, in male equal to next 2.5-2.75 segments; disc of pronotum very densely and finely punctate, the punctures less than their diameters apart, surface finely alutaceous; setigerous punctures on 1st elytral 4-5, on 3rd interval 3-6, on 5th interval 3-5, on 7th interval 1-3, and on 9th interval 5-6 .... *defecta*

11(10). Disc of pronotum with punctures on the average at least 3x their diameters apart or finely rugulose as in *latitator*; elytra testaceous to black (except bluish in *croceicollis*) 12

11′. Disc of pronotum with punctures separated by about their diameter; rufous, legs testaceous, abdomen piceous, elytra black with metallic bluish-green lustre; setigerous punctures on 3rd elytral 5-7, on 5th interval 4-5, on 7th interval 2 at base, and on 9th interval about 6; female apical antennal segment equal to next 3.25 segments, in male equal to next 5.5-5.75 segments. Length 9-10mm .... *liebecki*

12(11). Setigerous punctures on 3rd elytral interval 7-18 13

12′. Setigerous punctures on 3rd elytral interval 1-5 14

13(12). Length 10.5-12.5mm; female apical antennal segment equal to next 2.5-3 segments, in male equal to next 3.75-4.3 segments; brown to piceous black, head blackish; setigerous punctures on 3rd elytral interval 10-18, on 5th interval 11-17, on 7th interval 5-6 on basal 0.6 and on 9th interval 8-11 .... *robusta*

13′. Length 7-10.5mm; female apical antennal segment equal to next 3-3.5 segments, in male equal to next 4.75-5 segments, prothorax and legs testaceous or rufous, head piceous, elytra piceous or black, the elytra with a distinct bluish lustre; setigerous punctures on 3rd elytral interval 7-14, on 5th interval 7-12, on 7th interval either 2 at base or 6-8 all along, and on 9th interval 5-13 .... *croceicollis*

14(12′). Setigerous punctures of elytra about the same size as the largest strial punctures; larger, 8-11.5mm 15

14′. Setigerous punctures of elytra about twice as large as strial punctures; smaller, 6.5-9.5mm 16

15(14). Posterior margin of fifth ventral segment produced around a distinct fovea; female apical antennal segment equal to next 3.6-3.75 segments, in male equal to next 4.6-5 segments, color paler, tending to brown rather than piceous, elytra tending to brown especially along sutural margins .... *dolera*

15′. Posterior margin of fifth ventral segment simple, without fovea; female apical antennal segment equal to next 4 segments or slightly less, in male equal to next 6.5-7 segments; color darker tending to piceous black, elytra sometimes slightly more pale and with very narrow brown sutural margins, rarely the prothorax may be bright rufous .... *basalis*

16(14′). Color dark brown to black; female apical antennal segment equal to next 3-3.3 segments, in male equal to next 5-6.5 segments 17

16′. Color testaceous, head and antennae fuscous, basal 6-8 antennal segments tending to piceous, elytra dusky laterally and posteriorly; surface of pronotum very finely obsoletely rugulose; prothoracic lateral line obliterated anteriorly becoming distinct posteriorly; female apical antennal segment equal to next 2.25 segments, in male equal to next 2.6 segments. Setigerous punctures on 1st elytral interval 0-1 at base and 1-3 at apex, on 3rd elytral interval 0-1 at base and 1-3 at apex, on 5th elytral interval 1-2 at base, 0-1 near apex, on 7th elytral interval 1-2 at base, and on 9th elytral interval 2-3 at apex. Length 7.9-9.5mm .... *latitator*

17(16). Setigerous punctures on 1st elytral interval 2-4, on 3rd interval 1-4, on 5th interval 0-1, on 7th interval 0-1 near base, and on 9th interval 4-5; pronotum opaque due to distinctly granular surface and indistinct shallow punctures; female apical antennal segment equal to next 3.25 segments, in male equal to next 5 segments. Length 6.5-8.7mm .... *erina*

17′. Setigerous punctures on 1st elytral interval 2-3, on 3rd interval 4-5, on 5th interval 3-5, on 7th interval 1 at base, and on 9th interval 4-6; pronotum more or less shining with very obsolete granular surface and sparse fine punctures; female apical antennal segment equal to next 3-3.3 segments, in male equal to next 5.5-6.5 segments; color brown to black, rarely with testaceous prothorax. Length 6.5-8.8mm .... *gagatina*

To achieve brevity the present account of *Statira* is a supplement to my 1965 paper which should be consulted for references to original descriptions, types, type locations, habitats, and distribution in more detail.

Statira subnitida Leconte

Distribution: restricted to BAJA CALIFORNIA; 15-VII-38, 6 mi. N. of Triunfo; 13-VII-38, 5 mi. W. of San Bartolo; 8-X-41, San Venando; 27-VII-38, 45 mi. N. of San Ignacio; 23-VII-38, 20 mi. N. of Comondu; 10-VII-38, 3 mi. S. of Miraflores, all in [CAS]; 2-IX-59, 4 mi. N. of Todos Santos [UA]; Santa Rosa [HCF]; Cape San Lucas [MCZ].

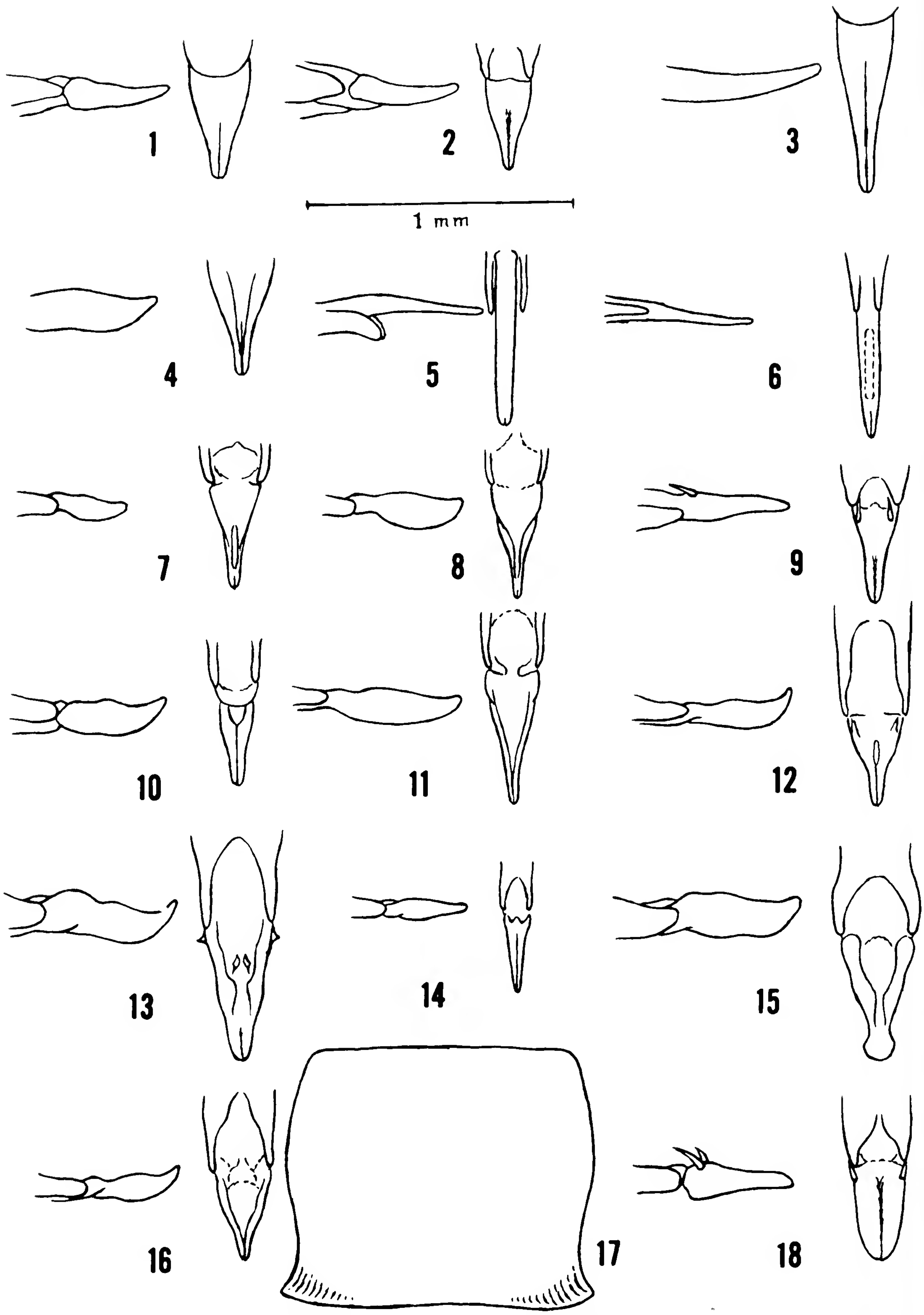

Fig. 1-18: Nearctic *Statira,* drawn to same indicated scale except Fig. 1, 3, 4, 18. Lateral and dorsal views of apices of genitalia. 1) *colorata,* holotype. 2) *pluripunctata.* 3) *hirsuta,* lectotype, Iguala, Guerrero. 4) *sulcricrus,* lectotype, Chilpancingo, Guerrero. 5) *pulchella,* Brownsville, Texas. 6) *nigromaculata.* 7) *opacicollis.* 8) *huachucae.* 9) *defecta.* 10) *liebecki.* 11) *robusta.* 12) *croceicollis.* 13) *dolera.* 14) *erina,* holotype. 15) *basalis.* 16) *gagatina.* 18) *latitator.* 17) *erina,* dorsal view of prothorax of holotype.

Statira colorata Fall
(Fig. 1)

H. B. Leech, *in litt.*, informed me that I was in error (1965) in stating that Charles Fuchs collected the type; he merely gave the specimen to Fall.

Distribution: restricted to BAJA CALIFORNIA; the following with identical San Jose del Cabo label; 1 male [ANSP], 2 males [Casey Coll. USNM], 1 male [HCF], 1 male [Hubbard & Schwarz Coll. USNM]; 7-VII-38, Triunfo [CAS], 15-VII-38, 6 mi. N. of Triunfo [CAS].

Statira pluripunctata Horn
(Fig. 2)

In my 1965 paper I made *sulcricrus* Champ. a synonym of *pluripunctata*. On examining the male type of *sulcricrus* from Chilpancingo, Guerrero [BM] I find that it differs in the pronotum being less rugulose and with more or less distinct fine punctures of various sizes. The color is uniform rich brown although 1 of 2 female syntypes has a paler prothorax. Also the genitalia (Fig. 4) is entirely distinct. Therefore *sulcricrus* is a valid species. The type of *sulcricrus* agrees with Champion's description (1889) but not with his key where each elytral interval is stated to have setigerous punctures.

Distribution: 3(TX, NM, AZ, CA, SO, CH); 4(UT, NV); also Durango and Guerrero, MEXICO.

Statira dumalis Parsons

Statira dumalis Parsons, 1973, Pan-Pacific Entomologist, 49(1):1-2.

Type: female from Imperial County, CALIFORNIA [CAS]; paratypes females from Imperial and Riverside Counties, CALIFORNIA [CAS] [LACM] [CTP].

Distribution: 3(CA).

Statira hirsuta Champion
(Fig. 3)

Statira simulans Schaeffer, 1905, Journ. New York ent. Soc. 13:180.

Distribution: 3(TX, TA, NL); also Sinaloa, Vera Cruz, Distrito Federal, Guerrero, Chiapas, MEXICO and NICARAGUA.

Statira pulchella Mäklin
(Fig. 5)

Distribution: 3(TX, TA); also Vera Cruz and San Luis Potosi, MEXICO.

Statira nigromaculata Champion
(Fig. 6)

Distribution: 3(TX, AZ, CH); also Vera Cruz, Morelos, Oaxaca, MEXICO and GUATEMALA.

Statira opacicollis Horn
(Fig. 7)

Distribution: 3(AZ). Known from the Galiuro, Sierra Ancha, Santa Catalina, Baboquivari, Santa Rita, Dragoon, and Chiricahua Mts., ARIZONA.

Statira huachucae Schaeffer
(Fig. 8)

My 1965 paper mentioned the possibility that *huachucae* might be the same as *alternans* Champ, but on examination I find that the male holotype of *alternans* from Tepamacoalco, Oaxaca [BM] has the apical antennal segment equal to the next 4.5 segments, setigerous punctures on 1st elytral interval 19, on 3rd interval 17, on 5th interval 17, on 7th interval 10, and on 9th interval 14. Thus *alternans* is distinct in having slightly longer apical antennal segment and in having fewer setigerous punctures except on the 7th elytral interval.

Known from the Santa Catalina, Santa Rita, Huachuca, and Chiricahua Mts., ARIZONA and 16-VIII-68, Skeleton Canyon, Hidalgo Co., NEW MEXICO [UCR].

Distribution: 3(AZ, NM).

Statira defecta Schaeffer
(Fig. 9)

Distribution: 3(AZ, NM).

Statira liebecki Leng
(Fig. 10)

In my 1965 paper I suspected that *liebecki* might be the same as var. a of *Statira mexicana* Champ. from Jalapa, Mexico [BM]. But Champion's var. a differs from *liebecki* in having a broader thorax, pronotum much more finely punctate, elytral intervals more flat, finer strial punctures, and the median lobe more broad when viewed from above.

An additional record for this very rare species is 16-V-39, Sebring, FLORIDA [OSU].

Distribution: 2(FL, AL).

Statira robusta Schaeffer
(Fig. 11)

In my 1965 paper I suggested that *robusta* might be identical with *tuberosa* Champion. But the former differs from *tuberosa* in being much larger, more robust, darker, pronotum shining although granular and distinctly finely punctate, the punctures separated by about 5x their diameters, and the elytral intervals are finely irregularly punctate; whereas *tuberosa* is dull, very finely and obsoletely punctate, with granular surface, the female apical antennal segment equal to the next 3.5 segments, and the 3rd elytral interval with 10 setigerous punctures.

Distribution: 3(TX, NM, AZ); 5(CO).

Statira croceicollis Mäklin
(Fig. 12)

Distribution: 1(MD); 2(SC, GA, FL, MS).

Statira dolera Parsons
(Fig. 13)

The first record from outside of FLORIDA is 5-V-30, St. Simon's Island, GEORGIA [USNM].

Distribution: 2(GA, FL).

Statira basalis Horn
(Fig. 15)

P. W. Fattig collected at Atlanta, GEORGIA 2 typical *basalis* on 21-V-37 and 21-IV-36. He also collected on 12-V-36 and 21-V-37 at Atlanta 2 *basalis* each with bright rufous prothorax. At Kennesaw Mt., Georgia, Fattig took 1 on 10-V-34 with rufous prothorax and 1 with typical black prothorax. There are no other differences, in genitalia, etc. This variation duplicates what has been called *resplendens* under *gagatina*.

Distribution: 2(NC, SC, GA, FL, AL, MS, LA, AR); 3(TX); 5(MO).

Statira erina Parsons, **new species**
(Fig. 14, 17)

Color piceous to piceous black, somewhat more pale beneath, legs and basal antennal segments brown to piceous. Vertex slightly narrower than labrum in both sexes, surface distinctly granular and with irregular dense punctures. In the male the eleventh antennal segment as long as 10th, 9th, 8th, 7th, and 6th segments; in the female 11th antennal segment as long as 10th, 9th, 8th, and 0.25 of 7th segments. Prothorax with width to length as follows: holotype male 1/1.12, allotype 1/1.21 (range for males: 1/1.12-1/1.20; range for females: 1/1.20-1/1.22). Anterior margin of prothorax distinctly truncate, posterior margin emarginate at middle; prothoracic lateral line distinct and entire; surface of pronotum opaque due to being distinctly granular and having fine indistinct shallow punctures separated on average by 3x their diameters. Scutellum finely granular, sparsely punctate and with an irregular row of punctures around margin.

Elytra striate, with unusually fine punctures closely placed along the striae; intervals moderately convex and more obsoletely granular than pronotum so that the surface is more shining. Setigerous punctures at least twice as large as unusually fine strial punctures. In presenting the numbers of setigerous punctures along the elytral intervals the first figure is for the left elytron and the second for the right elytron and figures are given for the holotype, allotype, and range among the paratypes. First elytral interval: holotype 1,1 at base, 2,2 near apex; allotype 1,1 at base, 2,2 near apex; paratypes 1, 0-1 at base, 2, 2-3 near apex. Third elytral interval: holotype 1,1 at base, 1,1 at three-fifths, 0,1 near apex; allotype 1,1 at base, 3,2 at apical fourth; paratypes 0-2, 0-1 at basal third, 1-3 near apex. Fifth elytral interval: holotype 1,1 at base; 1,1 at apical fourth; allotype 1,0 at base, 1,1 at apical fourth; paratypes 1-1, 0-1 at base, 0-1, 0-1 at apical fourth; paratypes 0-1, 0-1 near base. Ninth elytral interval: Holotype 4,3 along apical fourth; allotype 4,5 along apical fourth; paratypes 4,5, 4,5 along apical fourth. All femora very sparsely and finely pubescent; all tibiae rounded on outer edge. Medium lobe as figured.

Holotype[2] male: length 7.3mm, width of prothorax 1.3mm, width of elytra at humeri 1.9mm; **allotype female**: length 9.5mm, width of prothorax 1.6mm, width of elytra at humeri 2.5mm; paratypes: length 6.5-8.7mm.

Type material: holotype male, 9-10-IV-1969, Brownwood Lake State Park, Brown County, TEXAS, A. & M. E. Blanchard. Allotype, 7-V-1970, Bastrop State Park, Bastrop County, TEXAS, A. & M. E. Blanchard; 5 male and 1 female paratypes same data as holotype; also 1 female paratype 6-V-1970, Belton Reservoir, Bell County, TEXAS, A. & M. E. Blanchard. All of the above types in the USNM, except 1 pair of paratypes in the author's collection. Also at Ohio State University are 2 female paratypes, 5-IV-1953 and 6-V-1946, Gillespie County, TEXAS, D. J. & J. N. Knull. At Field Museum of Natural History 1 female paratype, 22-27-IV-1950, 2.5 mi. S.W. of Forestburg, Montague County, TEXAS.

This species is distinctive in having fewer setigerous punctures than any North or Middle American species. Also the opaque anteriorly truncate pronotum is diagnostic.

Statira gagatina Melsheimer
(Fig. 16)

Statyra resplendens Melsh., 1846, Proc. Acad. Nat. Sci. Philadelphia, 2:311.
Statira gagatina resplendens Melsh. of Parsons, 1965:253, **New Synonymy.**

It seems best to drop *resplendens,* which is discussed in my 1965 paper. The rarely testaceous prothorax is a variation similar to that found in *basalis.*

Distribution: 1(VT, MA, CT, NY, NJ, PA, OH, IN, IL, MI, WI, DC, MD, DE); 2(KY, TN, NC, AL, AR); 5(KS, IA).

Statira latitator Parsons
(Fig. 18)

Statira latitator Pars., 1973, Pan-Pacific Entomologist, 49(1):3-4, fig. 1, 2.

This very local species is known only from Deep Canyon, Riverside County, CALIFORNIA and Puertocito, BAJA CALIFORNIA.

Distribution: 3(CA, BJ).

Key to Nearctic *Arthromacra* (Lagriinae)

1. Eleventh antennal segment of female as long as 10th, 9th, and 0.25-0.66 of 8th segments combined; of male as long as next 2-3.5 segments combined. Disc of pronotum usually rugose or alutaceous or both 2

1′. Eleventh antennal segment of female as long as 10th, 9th, 8th to 7th segments combined; of male as long as next 4th to 6th segments combined. Disc of pronotum not rugose, very rarely alutaceous 5

2(1). Disc of pronotum finely sparsely punctate, punctures separated by 3-6 times their diameters. Disc of pronotum usually shining, not alutaceous. Eleventh antennal segment of female as long as next 2.6-2.66 segments, of male as long as next 3.5 segments. Upper surface appears glabrous at 60x magnification. Mesepimeron very finely and sparsely punctate 3

2′. Disc of pronotum coarsely, densely punctate, punctures separated by 1-2 times their diameters or partially confluent. Disc of pronotum usually opaque, alutaceous. Upper surface feebly pilose, usually visible at 60x magnification. Mesepimeron moderately coarsely and densely punctate 4

3(2). Disc of pronotum more or less strongly transversely rugose. Eleventh antennal segment of female as long as next 2.6 segments. Mesepisternum usually granular between the punctures. Color above almost always without cupreous tinge. Femora and tibiae usually piceous .... *aenea rugosecollis*

3′. Disc of pronotum not or only moderately transversely rugose. Eleventh antennal segment of female as long as next 2.66 segments. Mesepisternum usually smooth between the punctures. Color above usually with more or less of a cupreous tinge. Femora and tibiae usually rufous .... *aenea glabricollis*

4(2′). Eleventh antennal segment of female as long as next 2.66 segments, of male as long as next 3.25 segments .... *aenea lengi*

4′. Eleventh antennal segment of female as long as next 2.25-2.33 segments, of male as long as next 2.75-3 segments .... *aenea appalachiana*

5(1′). Eleventh antennal segment of female as long as next 3.5-4 segments, of male as long as next 5-6 segments 6

5′. Eleventh antennal segment of female as long as next 2.9-3.1 segments, of male as long as next 4 segments. Pronotum appears glabrous at 60x magnification .... *aenea aenea*

6(5). Eleventh antennal segment of female as long as next 3.5 segments, of male as long as next 5 segments. Upper surface distinctly but sparsely pilose, much more pilose than any other species. Color above usually bright metallic bronze green .... *pilosella*

6′. Eleventh antennal segment of female as long as next 4 segments, of male as long as next 6 segments. Upper surface appears glabrous at 60x magnification except elytra where pilosity is more apparent. Color above of females usually vivid metallic green, of males greenish blue or green, both sexes with aeneous tinge .... *robinsoni*

I have spent much time attempting to solve speciation in *Arthromacra*. A clue was given to Leng (1914) by Col. W. Robinson who captured abundantly at the same time and place both *robinsoni* and *aenea* in copulation. But in no cases were examples of *aenea* seen mating with *robinsoni*. Therefore these 2 species are considered distinct. But among our other *Arthromacra* the following apparent intergrades turn up in collections: *aenea* x *glabricollis, glabricollis* x *rugosecollis, aenea* x *lengi,* and *aenea* x *apalachiana*. One solution is to include these names under the single species *aenea*. As will be seen by the following key and figures such lumping would create a very variable "species". Also these names have geographical significance with intergrades occurring along common boundaries. Therefore trinomials are used to indicate their close relationship. The terminal abdominal segments and genitalia of both sexes show such variability that figures would only be confusing.

Arthromacra aenea aenea (Say)
(Fig. 19, 27)

Lagria aenea Say, 1824, Narrative of an Expedition to the Source of St. Peter's River, etc. vol. 2:287-8. LeConte edition, 1869, 1:191.
Arthromacra donacioides Kirby, 1837, Fauna Boreali-Americana, 4:238.
Statira aenea var. c. *viridis* Melsh. (*Lagria viridis* Melsh. Cat.), 1846, Proc. Acad. Nat. Sci. Philadelphia, 2:311, **New Synonymy.**
Types: type of *aenea* from the "United States" is lost. Since Say stated that the thorax is "sometimes with transverse abbreviated wrinkles" his types included more than typical *aenea*. His single definite locality is the Red River near Lake Winnipeg, Manitoba. This locality would preclude any

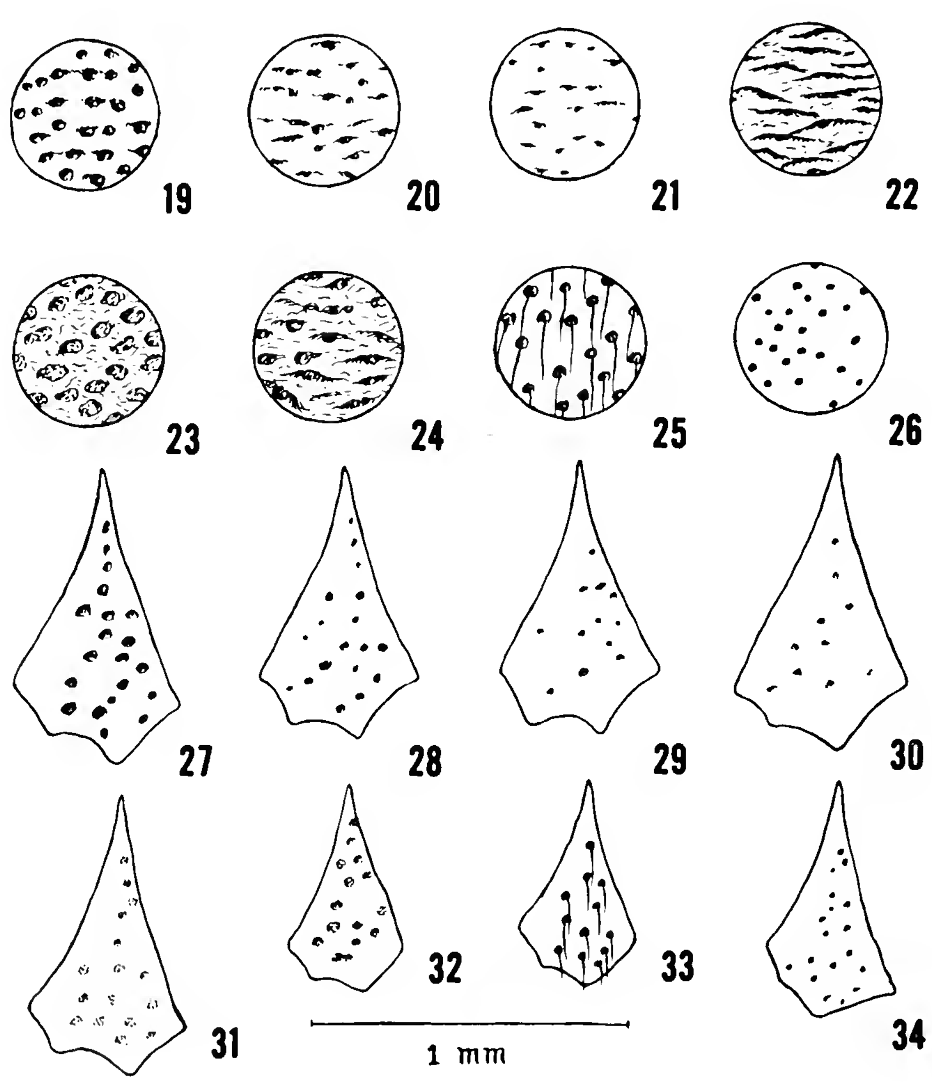

Fig. 19-34: Nearctic *Arthromacra*. Fig. 19-26: surface of part of pronotum near center. Fig. 27-34: left mesepimeron. 19, 27) *aenea aenea*. 20, 28) *aenea* x *glabricollis*. 21, 29) *glabricollis*. 22, 30) *rugosecollis*, holotype. 23, 31) *aenea lengi*, holotype. 24, 32) *appalachiana*, "cotype". 25, 33) *pilosella*, "cotype". 26, 34) *robinsoni*, paratype (26), allotype (34).

forms but *glabricollis* but most of the description applies to typical *aenea* as here defined. Syntypes of *donacioides* were collected near Lake St. Clair, Ontario and Massachusetts [BM]. Type of *viridis* not found in the MCZ and because it is said to be brilliant green and slender it is more likely *appalachiana* or *robinsoni* rather than a male *aenea*. No locality is stated.

Distribution: 1(QU, ON, ME, NH, VT, MA, CT, NY, NJ, MD, DC, DE, PA, OH, MI); 2(VA, WV, NC, TN); 5(MB).

Arthromacra aenea rugosecollis Leng, **new status**
(Fig. 22, 30)

Arthromacra aenea var. *rugosecollis* Leng, 1914. J. New York Ent. Soc. 22: 287.**Type**: female collected by C. W. Leng in July in the mountains of Rabun County, GEORGIA in the author's collection.

The holotype has the appearance of an unusually large *aenea*. Often specimens are vivid metallic green as in *robinsoni*. Mesepimeron very finely and sparsely punctate as in *glabricollis*. Mesepisternum coarsely punctate, intervals obsoletely granular or smooth. The character of the pronotal rugosity tends to appear in *glabricollis*. Two females June 9, Frankfort, Kentucky [USNM] are possible intergrades approaching *rugosecollis* in their piceous black femora and feebly rugose pronotum. Also 2 *glabricollis* (Fig. 20, 28) from Illinois [CTP] have pronotum feebly to moderately rugose and in 1 the pronotum finely punctate as in *rugosecollis*.

Distribution: in addition to the holotype 1 female 24-VI-1930, 2000 ft., Monteagle, TENNESSEE [AMNH]; 1 male 7-IV Retreat, NORTH CAROLINA [USNM], 1 female 18-VI-1937, Head River, GEORGIA [CAF]; 9-VI-63, 29-VI-61, Clinton County, OHIO [OSU].

Arthromacra aenea glabricollis Blatchley, **new status**
(Fig. 21, 29)

Arthromacra glabricollis Blatchley, 1910, Coleoptera of Indiana, p. 1285, Fig. 570.

Type: 4 June Posey Co., INDIANA [USNM], paratypes, same data [USNM] [FMNH].

Having the appearance of typical *aenea* although sometimes larger, often cupreous above, femora often more pale, and to be looked for among *aenea* from Ohio westward. Mesepimeron very finely and sparsely punctate as in *rugosecollis* but not as in *aenea*. Mesepisternum coarsely punctate, intervals usually smooth, rarely transversely granular. A female from Kentucky and a male from Virginia intergrade with *rugosecollis* and a female from Illinois intergrades with *aenea*.

Distribution: 2 females OHIO [Leconte Coll. M.C.Z.]; 18-VI-26, Mohahala, OHIO [CU]; 12-VI-61, 27-VI-61, 9-VI-63, Clinton County, OHIO [OSU]; Posey County, INDIANA [USNM] [FMNH]; ILLINOIS: many localities [AMNH] [CTP] [HCF] [INHS]; 1 female Frankfort, KENTUCKY [USNM]; MISSOURI [USNM]; 1 male VIRGINIA [HCF]; WISCONSIN [INHS]; 15-VI-41, Indian Creek, PENNSYLVANIA [INHS]; 4-VI-92 Allegheny County, PENNSYLVANIA [CU]; 30-V-18, Homestead, IOWA [LACM].

Arthromacra aenea lengi Parsons **new subspecies**
(Fig. 23, 31)

Having the general appearance of typical *aenea* and to be looked for in collections as *aenea* from North Carolina southwards. Color blackish with purplish greenish caste and underside more blackish with an aeneous tinge, femora piceous or black, tibiae slightly paler, and tarsi testaceous to brown; antennae rufous except basal and apical segments may be piceous. Vertex with intervals between punctures more or less granular and alutaceous, therefore not smooth as in *aenea,* the punctures more sparse than in *appalachiana.* Apical antennal segment in both sexes a little longer than in *appalachiana* and a little shorter than in *aenea*; female eleventh antennal segment as long as next 2.66 segments, in the male as long as next 3.25-3.33 segments. Pronotum very sparsely pilose (often evident only at the sides), pilosity easily visible at 60x magnification, as in *appalachiana* but not as in *aenea.* Disc of pronotum with punctures mostly less than their diameters apart, more shallow and coarse than in *aenea* (except in some males) and more fine and sparse than in *appalachiana.* Surface of pronotum variably rugose, more than in *aenea* but less than in *appalachiana*; intervals between punctures more or less granular or alutaceous as in *appalachiana* but not smooth as in *aenea.*

Elytra very densely punctate, the intervals between punctures alutaceous as in *appalachiana,* not smooth as in *aenea.* Mesepimeron moderately coarsely densely punctate but finer than in *aenea,* intervals opaque; mesepisternum coarsely punctate, intervals transversely granular.

Holotype female: length 13.5mm, width of pronotum 2.2mm, width of elytra at humeri 3.2mm. **Allotype male**: length 11mm, width of pronotum 1.7mm. Typical male paratype: length 10mm, width of pronotum 1.7mm, width of elytra at humeri 2.5mm.

Type material: holotype female, VI-1909, 2000-3700 ft., Clayton, GEORGIA, C. W. Leng [CTP]; allotype, NORTH CAROLINA [HCF]; Paratypes: 1 female July, Rabun County, GEORGIA [CTP]; 1 female NORTH CAROLINA [HCF]; 2 males, 4 females 1-VI-1933 and 26-VI-1934, Rocky Bottom, Pickens County, SOUTH CAROLINA [USNM]; 1 female 12-VI-34, Mountain Rest, SOUTH CAROLINA [USNM]; 1 female 31-V Retreat, NORTH CAROLINA [USNM]; Smokemont, NORTH CAROLINA [CU]; 1 male 27-V 1 female VI, Black Mts., NORTH CAROLINA [AMNH]; 1 female Lake Toxaway, NORTH CAROLINA [AMNH]; 1 male 17-VI Graybeard Mt., NORTH CAROLINA [CTP]; 2 males 14-VI-31, Neel Gap, GEORGIA [USNM]; 1 female 17-VI-55, Haywood County, NORTH CAROLINA [FSCA]; 1 male 3-VI-55, Cranberry Gls., WEST VIRGINIA [FSCA]; 21-VII-47, Cove Forest, Gatlinburg, TENNESSEE [INHS]; VI-1938, Somerset, PENNSYLVANIA [INHS]; 22-VI-41, 2-VII-40, Indian Creek, PENNSYLVANIA [INHS].

This subspecies has antennae which are intermediate between *aenea* and *appalachiana* and can be separated reliably from the latter only on the basis of antennae. It agrees with *appalachiana* in being feebly pilose and having the surface alutaceous or granular but tends to have the pronotum more finely and sparsely punctate with the rugae less transverse, more irregular, and more obsolete. There are 2 males and 1 female from Rocky Bottom, South Carolina [USNM] which are not made paratypes because the pronotal sculpture approaches that of *aenea.* Another male, 5-VI-27, Whiteside, North Carolina [USNM] approaches *aenea* in having slightly longer apical antennal segment, being equal to the next 3.5 segments. Also a male from Saluda, North Carolina [USNM] differs in having the pronotal punctures fine and obsolete.

Arthromacra aenea appalachiana Leng
(Fig. 24, 32)

Arthromacra appalachiana Leng, 1917, Bull. Brooklyn Ent. Soc. 12:18.
Type: male, no. 21149, June 30, Pennington Gap, Virginia [USNM].

Paratypes (labelled "cotypes" by Leng): June 20, Black Mts., North Carolina [CTP]; June 25, Graybeard Mt., North Carolina [AMNH].

Usually distinctly more slender and more brightly bluish green than *aenea*. In both sexes the apical antennal segment is shorter than in any other American *Arthromacra*. Mesepimeron finely obsoletely punctate, intervals alutaceous. Mesepisternum coarsely obsoletely punctate, intervals distinctly alutaceous.

Distribution: in addition to the above types, 1 female 21-VII-34, Blounts, TENNESSEE [MCZ]; 2 males 2-VII-47, Grassy Bald, Gatlinburg, TENNESSEE [INHS]; 3 males VI-1939, 4-6000 ft., Mt. Mitchell, SOUTH CAROLINA [MCZ] [CTP]; 1 male 30-VI-35, Sunburst, SOUTH CAROLINA [MCZ]; 1 female 9-14-VI-40, 5000 ft., Catalooche Divide, SOUTH CAROLINA [MCZ]; 1 male, 1 female April-May and June 21, 3-5000 ft., Highlands, NORTH CAROLINA [USNM]; June 6, 3-4000 ft., Blowing Rock to Linville, NORTH CAROLINA [MCZ].

Arthromacra pilosella Leng
(Fig. 25, 33)

Arthromacra pilosella Leng, 1917, Bull. Brooklyn Ent. Soc. 12:18-19.
Type: male June 20, Nashville, TENNESSEE, no. 21150 [USNM].

Paratypes: from type locality and Frankfort, KENTUCKY [USNM] [AMNH] [CTP ex C. W. Leng].

Distribution: 20, 26-VI Nashville, TENNESSEE [USNM] [CTP]; 1 male 18-VI Clarksville, TENNESSEE [USNM]; 1 male, 2 females Evansville, INDIANA [USNM]; 7-V Frankfort, KENTUCKY [USNM] [CTP]; VII Mammoth Cave, KENTUCKY [CU].

Arthromacra robinsoni Leng
(Fig. 26, 34)

Arthromacra robinsoni Leng, 1914, J. New York Ent. Soc. 22:286-7.
Type: male and allotype, 13-VI-1913, Nelson County, VIRGINIA stated by Leng to be in his collection, now in author's collection.
Paratypes: same locality [USNM] [CTP].

Leng quotes Col. Robinson's statement that "when fresh, the males are brilliant green, the females a red gold with greenish tinge; but after a while the females change to green like the males".

Distribution: a large series collected over several years at the type locality, Nelson County, VIRGINIA from 20-V-8-VII, mostly on 20 and 30-VI [USNM] [MCZ] [AMNH] [CU] [CTP] Kansas State University and 16-VI-65, Wake County, NORTH CAROLINA [FSCA].

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A REMARKABLE PREDACIOUS CETONIID, *SPILOPHORUS MACULATUS* (GORY & PERCHERON), FROM SOUTHERN INDIA (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

A peculiar cetoniid beetle, *Spilophorus maculatus* (Gory & Percheron), belonging to the tribe Cremastocheilini, is reported feeding in nature on the nymphs of a membracid bug, *Oxyrhachis tarandus* (Fabr.), near Bangalore in southern India. This is the first record of a cetoniid feeding on an insect other than an ant. A redescription of the cetoniid is included together with a short summary of the feeding habits of adult Scarabaeidae.

The large beetle family Scarabaeidae, of which the Cetoniinae is thought to be only a subfamily (Mikšić 1971), is almost entirely phytophagous, the larvae living in soil and feeding on plant roots and decaying matter, the adults attacking foliage, flowers, and fruit. Adult cetoniids are usually brightly coloured, fly by day, and feed on flowers of a variety of plants. According to Imms (1963) their " . . . mouthparts are adapted for dealing with soft or liquid food and the labrum is membraneous and concealed; the mandibles, with few exceptions, are thin and incapable of biting, and the maxillae are invested with long hairs."

Writing about the only known fully carnivorous cetoniid, Wilson (1971) stated that certain North American species of the genus *Cremastocheilus* were recently discovered by Dr. Mont A. Cazier and his colleagues to be obligate predators of the larvae of ants of the genus *Myrmecocystus;* the ants treated the beetles sometimes as synechthrans and sometimes as symphiles but they mostly had the status of synoeketes.

Adult cetoniids, apart from their well-known habit of feeding on plant juices, pollen and nectar of flowers, have also been found to be associated with ants and termites, as well as in nests of passerine birds. Besides the above record of species of *Cremastocheilus* preying on ant larvae, no other cetoniid is known to feed on any other insect.

In October 1970, I found a cetoniid, *Spilophorus maculatus* (Gory and Percheron), feeding on nymphs of a tree-hopper, *Oxyrhachis tarandus* (Fabricius) (Homoptera: Membracidae), attacking *Acacia concinna* DC., near Bangalore in southern India. A solitary beetle was noticed near a colony of the membracid on a stem of the tree. On closer observation, I saw it grasp a tree-hopper nymph in its fore legs and commence to chew it slowly and methodically, devouring the posterior end of the nymph first. The movements of the cetoniid were extremely slow and laboured, and the membracid nymphs made no attempt to escape. Large red ants attending the tree-hoppers took no notice of the beetle, and it appeared that its dull black-and-white coloring and sluggish movements assist in concealing its presence from the membracids and their ant attendants. The cetoniid was brought to the laboratory where it was maintained on a diet of nymphs of *O. tarandus* supplemented with diluted honey solution for a month, before it was killed and mounted for study. The beetle was noted, in addition, to feed on the honeydew produced by the tree-hoppers both in nature and in the laboratory. This constitutes the first record of a non-formicid host of a cetoniid. A redescription is provided below since available descriptions are brief and unsatisfactory.

Spilophorus maculatus (Gory and Percheron)
(Fig. 1-4)

Cremastochilus maculatus Gory and Percheron 1833:119, pl. 16, fig. 8, Monogr. Cet.; Westwood 1874:29, Thes. Ent. Oxon.
Spilophorus bangalorensis Kraatz 1899:63, Dt. Ent. Z.
Spilophorus maculatus: Arrow 1910:201, Fauna of British India, Coleoptera, Lamellicornia, pt. 1.

Female: Length 12.4mm., width 7.0mm., height 4.3mm. Shining black above and below, with white opaque markings on dorsal surface as in Fig. 1. On ventral surface, a white patch on lateral portion of metasternum and on antero-lateral parts of abdominal sternites, and small white spots on the antero-lateral corners of sternites 1 to 4. White markings on pygidium as in Fig. 4, and on head as in Fig. 2. Antennae black, mandibles and most of other mouthparts dark reddish-brown. Legs shining black, with a small white spot on base of each tibia within apical emargination of femora. Hairs on legs amber to reddish-yellow.

Head with primary punctures on frontal region close and well impressed, almost circular, these becoming smaller and less impressed toward clypeus. Frons with a narrow lateral extension over eye, with rounded apex. Clypeus emarginate in centre, with a ridge-like callus on its posterior margin, visible as an angulate projection in profile. Mandibles well-developed, fairly stout, almost cylindrical and gently curved inwards, with a rounded apex. Pronotal contours as in Fig. 1, widely emarginate on posterior margin in centre, with posterior angles smooth and blunt; lateral margin slightly angulate in middle. Punctures obsolete on white portions and on the postero-median area, the rest covered sparsely with similar punctures as on head. Scutellum broadly triangular with apex pointed and basal margin arcuate; punctures as on pronotum and absent in centre, most prominent near the angles. Elytral contours as in Fig. 1, slightly depressed behind scutellum with very irregularly placed arrowhead-shaped punctures with apices directed toward pronotum. Ventral body surface with less impressed punctures, but more uniformly placed than on elytra. Median part of metasternum devoid of punctures. Punctures on sternites small medially and larger laterally. Mesosternal process short, slightly bulbous, not exceeding bases of coxae, with shining, rounded tip. Abdominal sternites subequal in length. Pygidium (Fig. 4) with sparse, less impressed punctures and a median carina obsolete at tip. Legs (Fig. 3) with punctures as on abdominal sternites, hairs short and sparse; tibia with 2 spines at mid-length on outer side and 3 spines at apex of fore tibia and 5 spines at apex of hind tibia; tarsi 5-segmented with claws simple and pointed with a smaller median denticular process.

Material examined: INDIA: State of Karnataka, Doddagubbi nr. Bangalore, X-1970, K. D. Ghorpade, No. KDG 2706, feeding on nymphs of membracid on *Acacia concinna,* 916 m., Ghorpade (1).

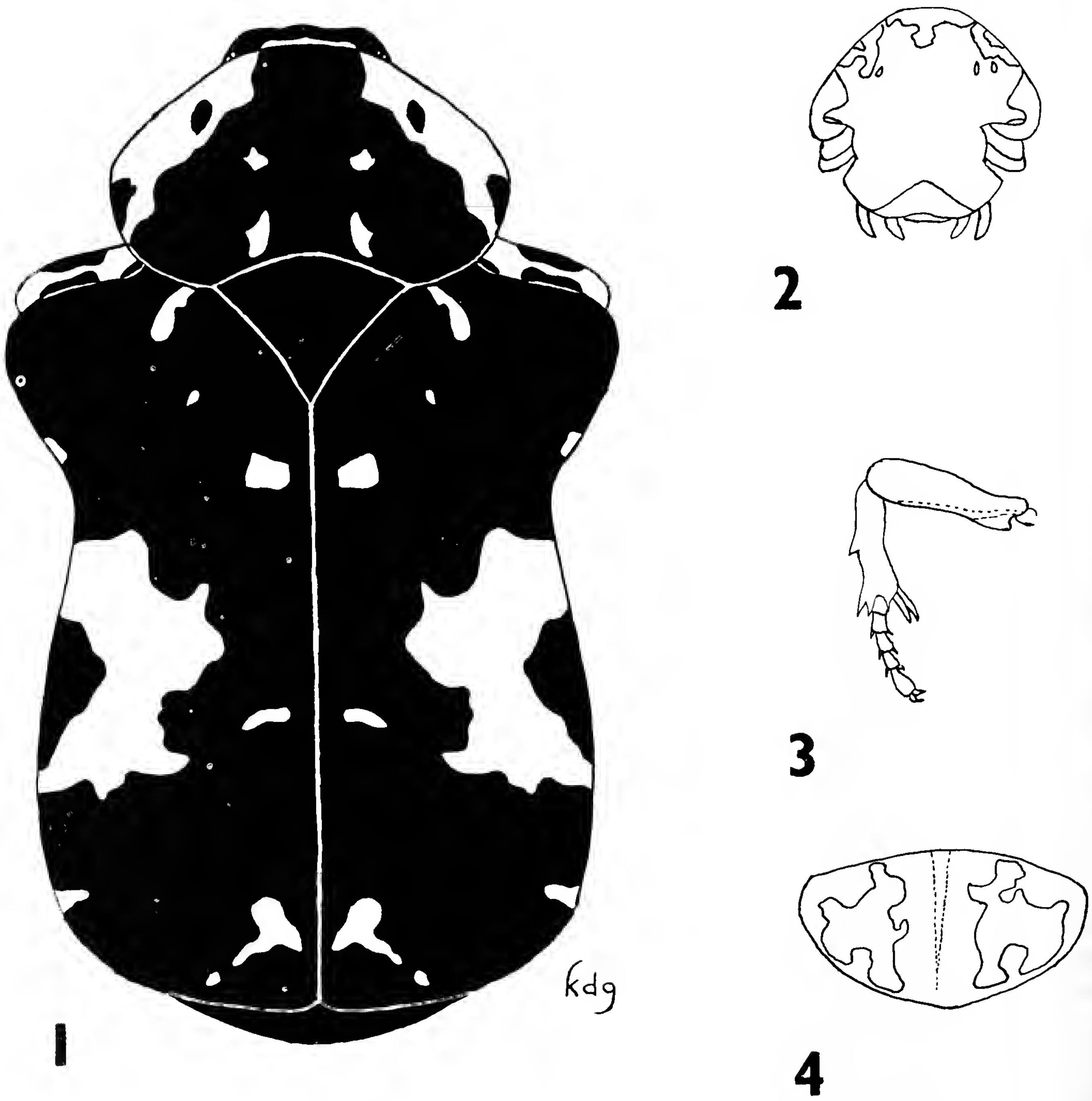

Fig. 1-4: 1) dorsal habitus view of *Spilophorus maculatus* (G. & P.) showing contours and coloration; 2) frontal head view showing contours and outline of markings; 3) lateral view of right hind leg; 4) posterior view of pygidium showing contours and outline of markings.

Distribution: India: Karnataka: Bangalore.

Spilophorus maculatus, originally described from Bangalore and known only from there, belongs to the tribe Cremastocheilini, the members of which " . . . are exceptional in being mostly sombre-colored nocturnal insects, living as larvae and adults in the nests of ants and termites" (Imms 1963). The genus *Spilophorus* Lacordaire occurs in Africa and India, only 2 species having been described from within Indian limits (Arrow 1910). The other species, *S. cretosus* Hope, was found in the nest of a black ant (*Crematogaster* sp.) at Malegaon in Maharashtra by H. Maxwell-Lefroy. In South Africa, a species of this genus is known to live in nests of passerine birds where both adults and larvae feed on nest material and excrement, the black-and-white coloring (in all species of the genus) being a protective assimilation to such an environment (Arrow 1910).

Ritcher (1958), in his review of the biology of the Scarabaeidae, stated that adult Cetoniinae are largely liquid feeders, feeding above ground on plant juices, either sap or the juices of ripening fruit or vegetables. Other species are common on flowers, where they feed on pollen and nectar. Most species of the subfamily are diurnal in habit.

The only known instance of a predacious habit in the subfamily Cetoniinae was reported by Cazier and Statham (1962) and by Cazier and Mortenson (1965), mentioned earlier. Wilson (1971) in his excellent book, **Insect Societies,** stated: "Certain North American species of the scarab genus *Cremastocheilus* . . . were recently discovered . . . to be obligate predators of larvae of the ant genus *Myrmecocystus*—the first recorded case of primarily predatory behaviour within the Scarabaeidae" (p. 390), and " . . . while *Cremastocheilus* has changed from what was almost certainly a herbivorous diet to become the only known fully carnivorous scarabaeid" (p. 402). However, there are stray reports of the predacious habit in other subfamilies of the Scarabaeidae. Ritcher (1958) gave the following examples. In the Scarabaeinae (=Coprinae), *Canthon deplanatus* var. *fastuosus* Harris is predacious on queen ants of *Atta* spp., using the dead body of the queen as a component of the ball in which its larva later develops. *Aphodius porcus* Horn (Aphodiinae) feeds on the eggs of *Geotrupes stercorarius* Linnaeus (Geotrupidae). Larvae of *Trox procerus* Harold and *T. suberosus* Fabricius (Troginae) prey on the eggs of some locusts and grasshoppers and are therefore considered to be of great economic importance. Clausen (1940) mentioned that some dung beetles (Scarabaeinae) indirectly kill dipterous maggots feeding on animal excreta by devouring the dung before the maggots reach maturity.

Numerous genera of the Cetoniinae are associated with ants or termites all over the world, some examples of myrmecophilous genera being *Cremastocheilus, Plagiochilus,* and *Myrmecochilus,* and of termitophilous genera being *Coenochilus* and *Valgus* (Ritcher 1958). This author quotes Wheeler as stating that beetles of the genus *Cremastocheilus* are degenerate symphiles which may have once been of use to the ants but are now persecuted intruders (synechthrans). The larvae of this genus and of certain species of *Euphoria* feed within the vegetative debris of the ant colonies of the genus *Formica.* Species of *Valgus* are found in decaying wood associated with termite colonies, their larvae feeding on the walls of old termite galleries. Wilson (1971:396) listed the genera *Cryptodus* and *Euphoria* as being associated with the ant genera *Camponotus, Formica,* and *Leptomyrmex.*

As examples of termitophilous Scarabaeidae he gave *Afroharoldius, Chaetopisthes, Coenochilus, Corythoderus, Novapus, Ryparus, Termitodius,* and *Termitotrox.*

In the present study, *S. maculatus* was found to be active during the day, contrary to the statement of Imms (1963) that members of the tribe Cremastocheilini are nocturnal. Since species of *Spilophorus* possess fairly well developed mandibles, the newly discovered predacious habit within this genus may actually prove to more or less frequent in it. It is possible, therefore, that more intensive observations on the habits of species of this genus and of others of the tribe Cremastocheilini may reveal more interesting facts regarding their food and feeding habits.

Acknowledgment

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THE GENUS *PHENGODES* IN THE UNITED STATES (COLEOPTERA: PHENGODIDAE)

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Abstract

The species of *Phengodes* occurring in the United States of America are revised. Based on the structure of the maxillary palp, *Phengodes* is divided into *Phengodes* s. str. (type-species *plumosa* Ol.) and *Phengodes (Phengodella)* subg. nov. (type-species *frontalis* Lec.) The author examined 10 species and 4 subspecies. The following are described as new: *arizonensis, fenestrata, fusciceps intermedia, inflata, laticollis meridiana, nigromaculata,* and *mexicana. P. sallei* Lec. (1881) is synonymized under *fusciceps* Lec.

The genus *Phengodes* Ill., wide ranging in the United States, has never been studied in detail. The few specific descriptions are, in most cases, based upon single specimens, some of which have insufficient locality data.

I have examined the types of all species, even that of *Phengodes plumosa* Oliv. (the type-species), with the only exception of *P. floridensis* Blatchley. Even thus it has not in all cases been easy to determine the species. Generally, the species are rather uniform in size, coloration, and shape, especially when specimens from the same locality are compared. The interocular distance and the length of antennal segments 4 to 6 have been useful for distinguishing species. Figure 1 shows how these measurements were obtained. I used a Leitz dissecting microscope, with an 8× ocular and a 4× objective, together with an eyepiece micrometer in which one cm is divided into hundredths of a millimeter. All measurements in the tables are in millimeters.

When the mouthparts were examined, 2 types of galea were found, which made it possible to subdivide the genus. In one group, the galea is short, with a rounded apex (Fig. 9), glabrous or only with scattered short hairs. This type is found in *Phengodes* s. str., with *plumosa* Oliv. as type-species. In the other group, the galea is longer and its apex bears long, dense hairs forming a tuft or brush (Fig. 10). I propose *Phengodes (Phengodella)* subg. n. for this group, with *frontalis* Lec. as type-species. Among the species occurring in the United States, only the following belong here: *frontalis* Lec., *bella* Barber, and *fenestrata* sp. n.; all other species are placed in *Phengodes* s. str.

This paper was stimulated by specimens received for determination from Dr. C. W. O'Brien, Tallahassee, who in 1965 collected a large number of phengodids in Texas. I wish to express my sincere thanks to Dr. O'Brien for allowing me to retain most of the material for my collection.

I further wish to thank the following colleagues for sending me material from the collections under their care (abbreviations are those used in the text):

Preparation of the drawings was supported by a contribution from the Swiss National Council for the Advancement of Scientific Research; drawings were made by Dr. R. Heinertz, Basle.

AMNH	=	American Museum of Natural History, New York (L. H. Herman, Jr.)
BM	=	British Museum, London (C. M. F. von Hayek)
BRI	=	Biosystematics Research Institute, Ottawa, (J. M. Campbell)
CAS	=	California Academy of Sciences, San Francisco (D. H. Kavanaugh)
FM	=	Field Museum of Natural History, Chicago (H. S. Dybas)
FSCA	=	Florida State Collection of Arthropods, Gainesville (R. E. Woodruff)
Hn	=	H. F. Howden, Ottawa
INHS	=	Illinois Natural History Survey, Urbana (J. K. Bouseman)
MCZ	=	Museum of Comparative Zoology at Harvard (J. C. Scott)
MNB	=	Museum für Naturkunde, Berlin (Humboldt-Universität) (F. Hieke)
MP	=	Muséum de Paris (A. Villiers, A. Bons)
USNM	=	United States National Museum, Washington (P. J. Spangler)
UM	=	University of Minnesota, St. Paul, (P. J. Clausen)
WW	=	W. Wittmer, Basel.

Phengodes s. str. *fusciceps* Lec.
(Fig. 2)

Phengodes fusciceps Lec., 1861, Class. Col. North Am.:186.
Phengodes sallei Lec., 1881, Trans. Am. Ent. Soc. 9:39, (**new synonymy**).

Thanks to the kindness of J. C. Scott, Cambridge, I had the opportunity to compare the holotype (typus 2808) of *P. sallei* with the lectotype of *P. fusciceps* Lec. The only slightly wider pronotal margin of *fusciceps* is within the range of variability of this species. Therefore, *sallei* is to be considered as a synonym of *fusciceps*. The interocular distance of *sallei* is 1.27mm., the length of antennal segments 4 to 6 is 0.60mm.

P. fusciceps can be recognized easily by the short antennae, in which especially the stems of segments 5 and 6 are widened on the inner side (Fig. 2). I examined an individual marked as type (MCZ typus 2807); the head is strongly punctured, and smooth between the punctures. The clypeus and labrum are somewhat convex, and not concave as in *plumosa*.

	Interocular distance	Length of antennal segments 4 to 6
Typus (MCZ)	1.27	0.60
Texas Nr. 1 (USNM)	1.23	0.77
Dallas Nr. 2 (USNM)	1.30	0.77
Mc Pherson Nr. 3 (USNM)	1.53	0.77
Mc Pherson Nr. 4 (USNM)	1.33	0.73
Texas Nr. 5 (WW)	1.53	0.77
Mc Pherson Nr. 6 (WW)	1.43	0.70
Stillwater Nr. 7 (MCZ)	1.33	0.73
Douglas Nr. 8 (MCZ)	1.37	0.67
Texas Nr. 9 (MCZ)	1.33	0.73
	1.37	0.72

This species is widely distributed in the United States.

Material examined: ARKANSAS: Hope, 12-VII, Knobel (MCZ); Washington Co., 4-VII-1941 & 6-V-1942, M. W. Sanderson (INHS); KANSAS: McPherson, 8-VII, W. Knaus (USM, FM, & CAS); Topeka, Popenoe, 15-VII-1876 (USNM); Douglas Co., 2-VI-1921, W. J. Brown (MCZ); without locality 4 spec. (CAS). LOUISIANA: Tallulah, 24-V-1910, V. I. Safro (USNM); Lafayette, 31-III-1949, L. T. Graham (USNM); Forest Hill, Rapides Parish, 19-26-VIII-1945, R. L. Wenzel (FM). MISSISSIPPI: Biloxi, Harrison Co., 11-IV-1964, B. Mather (USNM). MISSOURI: Deer Park, Univ. T.V. Sta., 22-VI-1954, P. J. Spangler (USNM). NEW MEXICO: Torrance Co., J. R. Douglass (USNM). OKLAHOMA: Stillwater, 17-V-1939, K. C. Emerson (MCZ); idem 23-VI-1939, L. E. Rozeboom (INHS); UOBS, Lake Texoma (Willis), Marshall Co., 7-28-VII-1968, W. Suter (FM & WW). TEXAS: Western Texas (USNM); Tennessee Colony, Anderson Co., 10-VIII-1963, H. F. Howden (WW); Brazos Co., College Station, 10-VIII-1950, L. S. & E. S. Dillon (FM).

Phengodes (s. str.) *fusciceps floridensis* Blatchley (**new status**)

Phengodes floridensis Blatchley, 1919, Canad. Ent. 51:30.

The type of this species is in the collections of the Department of Entomology, Purdue University, West Lafayette. The Curator, D. A. Provonsha, is not authorized to loan types, but has been kind enough to compare a specimen I sent him (Everglades National Park, Florida, 24-28-III-1972, D. M. Wood, ERI) with the type. He comments as follows: "The longitudinal wrinkles are present on the vertex and the hind angles of the prothorax are identical. The type specimen is the same but the wings of the type are slightly more brown. The labrum of the type is the same color as the rest of the head and is smoother than that of your specimen, which may not be of any significance. I examined both specimens closely and I could detect no other morphological differences. It is my opinion that they are the same species."

The 15 specimens from various parts of Florida before me all agree to a greater or lesser degree with the specimen compared by Dr. Provonsha with the type. The close affinity to *fusciceps* Lec. is remarkable. The antennal segments 5 to 10 are widened on their inner surface toward their apex in both species, but *floridensis* differs from *fusciceps* in many cases by the more lightly colored head which is only narrowly dark around the eyes, and by the anterior portion of the head which is uniformly less strongly punctate than in *fusciceps*. The tergites bear laterally more or less distinct dark spots which are only rarely absent, but in *fusciceps* these spots are absent in most specimens. The interocular distance and the length of antennal segments 4 to 6 is as in the nominal form. The differences mentioned are too insignificant to accept *floridensis* as a separate species; I therefore consider it a subspecies of *fusciceps*.

Material examined: FLORIDA: Crescent City, Hubbard & Schwarz (USNM); Paradise Key, I-VI-1919, C. A. Mosier (USNM); Fisheating Creek, Palmdale, 7-10-V-1964, R. W. Hodges, (USNM); Ft. Myers, VI-1967 (BRI); Homestead, Dade Co., 11-V-1967, D. E. Bright (BRI); Lake Placid, Archbold Biology Station, 4-V-1969 (BRI); Tarpon Springs, 19-III-1950, H. & A. Howden (Hn); Titusville, 11-III-1956, Howden & Howell (Hn), Home-

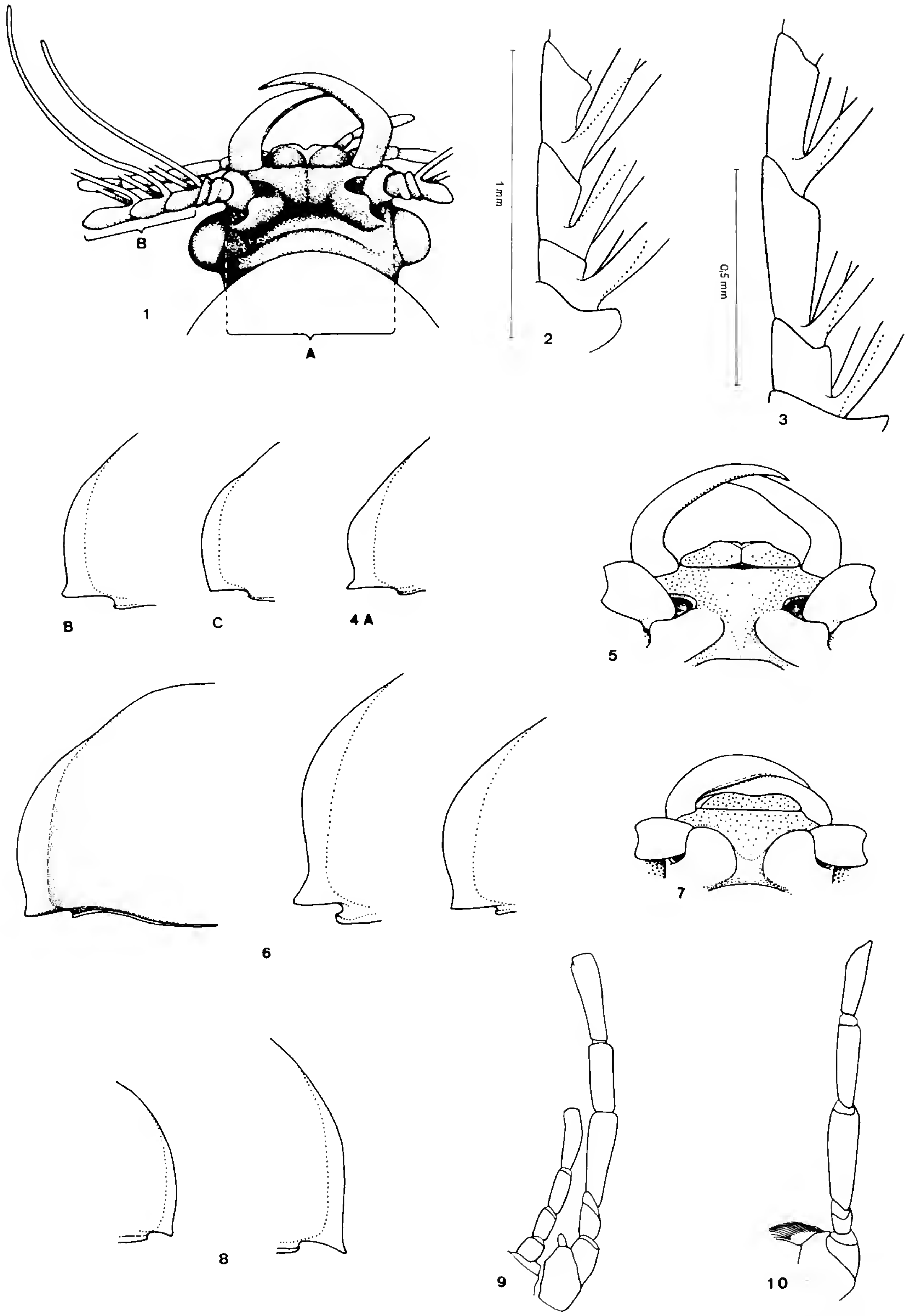

Fig. 1-10 *Phengodes* spp.: 1) (*Phengodella) fenestrata* n. sp. Head with basal antennal segments: A. interocular distance, B. length of antennal segments 4 to 6; 2) (s. str.) *fusciceps* Lec., antennal segments 4 to 6; 3) (s. str.) *plumosa* Ol. idem; 4) (s. str.) *mexicana* n. sp., explanate pronotal margins: A and B, 2 specimens, 10 mi W El Salto, Durango, Mex., C, 1 specimen, Arizona, 4 mi SW Forestdale; 5) (*Phengodella) frontalis* Lec., anterior portion of head; 6) (*Phengodella) frontalis* Lec., explanate margins of pronotum of 3 specimens from Texas; 7) (s. str.) *arizonensis* n. sp., anterior portion of head; 8) (s. str.) *arizonensis* n. sp., explanate margins of pronotum; 9) (s. str.) *laticollis* Lec., maxillary palpus and labial palpus; 10) (*Phengodella) frontalis* Lec., maxillary palpus.

stead, 16-I-1942, O. W. Calkins (FSCA); Plantation Key, 5-IV-1963 & 4-IV-1966, H. V. Weems (FSCA); Matheson, Hamm., 12-III-1959, D. R. Paulson (FSCA); Perrine, 2-VIII-1965, P. Herrmann (FSCA).

Phengodes (s. str.) *fusciceps intermedia* Wittmer, **new subspecies**

Among material from the Field Museum, Chicago, I found 6 specimens from Illinois very similar to the nominal form. They differ by the somewhat more widely explanate and more strongly rounded sides of the pronotum, somewhat as observed in *plumosa.* The antennal segments 4 to 6 are invariably longer (1.00 to 1.30mm.), as compared to 0.60 to 0.77mm. in the nominal form, and 1.17 to 1.60mm. in *plumosa.* The color agrees fully with that of the nominal form, as does the punctation of the anterior portion of the head, clypeus, and labrum.

	Interocular distance	Length of antennal segments 4 to 6
Holotypus Edgebrook (FM)	1.23	1.07
Harvey (FM)	1.43	1.20
Palos Park (FM)	1.40	1.00
No locality (FM)	1.53	1.03
Palos Park (WW)	1.43	1.17
Chicago (WW)	1.33	1.03
Urbana (WW)	1.57	1.30
	1.48	1.11

Material examined: FLORIDA: Torreya State Park, Liberty Co., 9-17-V-1968 & 17-V-1970, H. V. Weems, Jr. (FSCA); Quincy, 4-V-1961, W. B. Tappan (FSCA). ILLINOIS: Edgebrook, 24-VI-1927, E. Ray, Holotypus in Field Museum, Chicago; Harvey, 12-VI-1902, H. Munzner (FM); Palos Park, 30-V-1911 (FM & WW); no locality (FM); Chicago, 8-VI-1946, A. K. Wyatt (WW); Chicago, 24-VI-1943, D. R. Johnson (UM); Urbana, 23-V-1910 (WW) one specimen each; Lacon, 16-VI-1938, 3, 15, and 27-VI-1940, 19-5-1941, R. M. Barnes (INHS); Normal, 9-12-VI-1882 (INHS); Fox Lake, 30-VI-1935, Delong & Ross (INHS); Rockford, VIII-1951, T. B. Blumenbach (FSCA). INDIANA: Beverley Shores, 30-VI & 2-VII-1966, C. E. White (FSCA); Dunes Beach, 9-24-VI-1966, C. E. White (FSCA).

Phengodes (s. str.) *fusciceps picicollis* Horn (**new status**)

Phengodes picicollis Horn, 1891, Trans. Am. Ent. Soc. 18:40.

I have examined the holotype (no. 3594, MCZ), bearing the following locality data: Ramsey County, Minnesota. In the Department of Entomology, University of Minnesota, there is furthermore a series of 14 specimens which agree with the type. The size (interocular distance and length of antennae) does not show any differences with *fusciceps* Lec. The only constant difference is found in the color of the pronotum which has a more or less large black or occasionally dark brown macula. In only 1 specimen is the central macula very small and somewhat evanescent, and in several specimens the macula is very extensive and leaves only the sides narrowly light.

The head, scutellum, and also the abdomen are constantly darker than in the nominal race. Taking into account these constant differences, restricted so far to specimens from the state of Minnesota, *picicollis* can at most be considered a subspecies of *fusciceps.*

Additional localities are: MINNESOTA: Olmsted Co., July, C. N. Ainslie (UM); University Farm, St. Paul, 2-VI-1941, A. E. Pritchard (UM); Rock Co., 24-VI-1938, P. Nicholson (UM); Canden State Park, Lyon Co., 12-VI-1973 (UM); Pipestone Nat. Mon., Pipestone Co., 12-27-VI-1973 (UM); Glacial Lakes State Park, Pope Co., 6-27-VI-1973 (UM); Blue Mounds State Park, Rock Co., 3-VII-1973, E. F. Cook (UM); St. Anth. Park, A. Bolter (INHS).

Phengodes (s. str.) *plumosa* Olivier
(Fig. 3)

Lampyris plumosa Oliv., 1790, Entom. II, No. 28:26, Pl. 3, Fig. 27.

This species has been described from the state of Georgia, and the type should be in the Francillon collection which, according to Horn and Kahle, ought to be deposited in the British Museum or in Oxford. Letters received from both museums indicate that they do not have the type. On the other hand, among material received from the Museum für Naturkunde an der Humboldt-Universität, Berlin, there were 2 specimens of a species of *Phengodes* with the number 52653, one of which bears the following label: "*Plumosa* n. *Lampyris* p.01.F., Georg. Am. Franc." The abbreviation Franc. refers to the Francillon collection, and there is no doubt that these 2 specimens are the types; therefore, I have designated 1 specimen as lectotype, and the other as paralectotype.

	Interocular distance	Length of antennal segments 4-6 (fig. 3)
Lectotypus (MNB)	1.33	1.37
Paralectotypus (MNB)	1.50	1.60
Dorchester, Mass. Nr. 3 (MCZ)	1.27	1.33
Milton, Mass. Nr. 4 (MCZ)	1.37	1.23
Malcolm, Neb. Nr. 5 (MCZ)	1.33	1.17
Fonthill, Ont. Nr. 6 (WW)	1.47	1.40
Wattacoo, SC Nr. 7, (WW)	1.33	1.40
North East, Nr. 8 (WW)	1.43	1.43
Essex Falls, N.J. Nr. 9 (USNM)	1.40	1.33
Clemson College, S.C. Nr. 10 (USNM)	1.47	1.40
	1.40	1.37

P. plumosa is one of the smaller species and measures between 12 and 15mm.; it can be recognized easily by the head and labrum which are densely punctate and dull. The head is in most cases yellow to yellowish brown; I have seen only a few specimens from Canada and Georgia with a darkened head. The labrum is heavily punctate, slightly emarginate at center, and reminds one of *fusciceps.* The antennal segments 4 to 6 are twice or almost twice as long as in *fusciceps.*

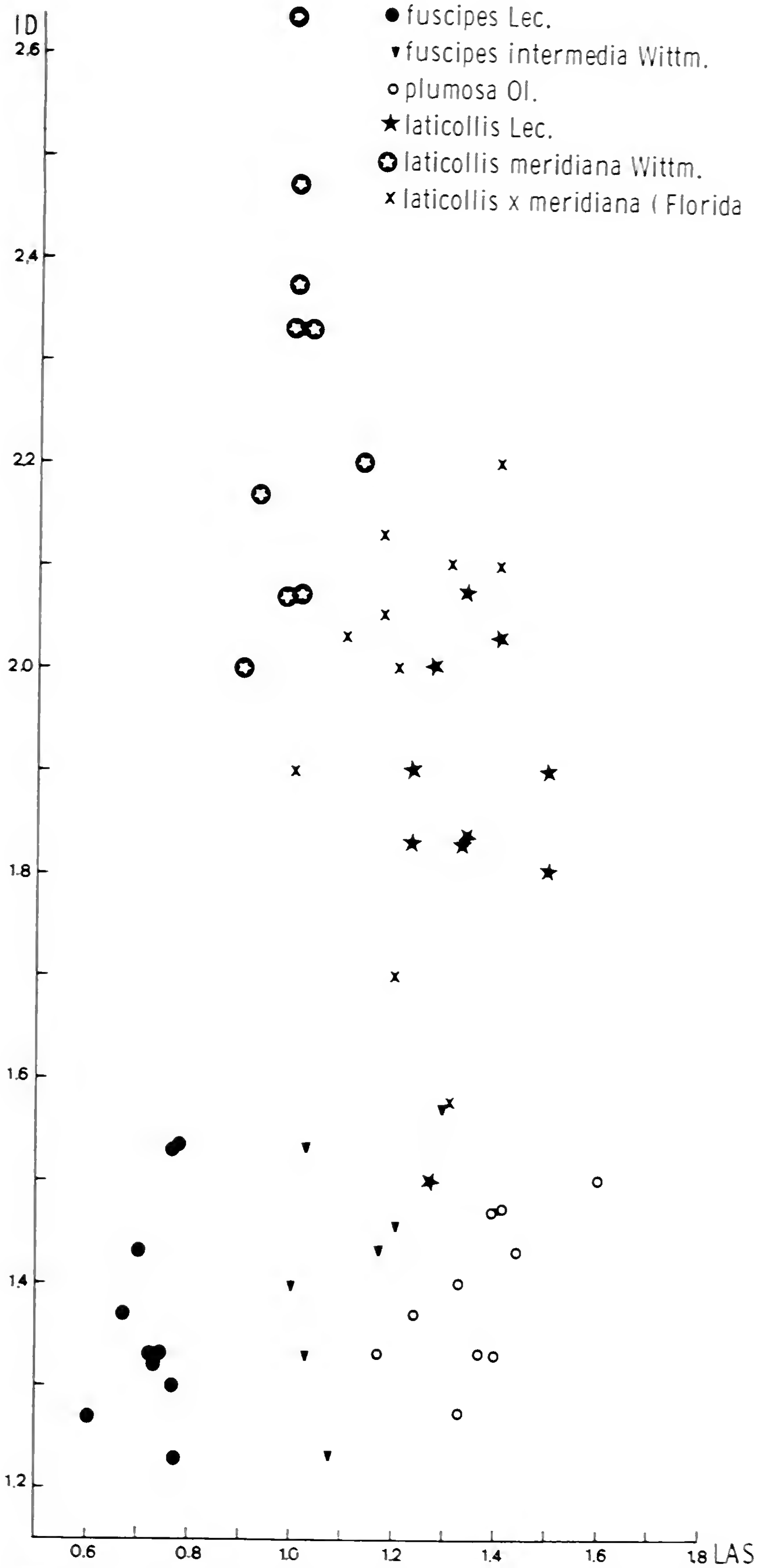

Fig. 11: Measurements of *Phengodes* s. str. *fusciceps* Lec., *fusciceps* ssp. *intermedia* Wittm., *plumosa* Ol., *laticollis* Lec., *laticollis* ssp. *meridiana* Wittm. and *laticollis* X *meridiana* (Florida).

Material examined: ALABAMA: Auburn, 14-V-1908, C. D. Allis (USM); idem, Sherman (CAS). ARKANSAS: Benton, Saline Co., 8 & 12-VI-1950, H. Ramstadt (FM). NORTH CAROLINA: Southern Pines, 2-V-1913, A. H. Manee (USNM); Black Mt., May, N. Fork Swannanoa (USNM & AMNH); Fort Bragg, Cumberland Co., 15-V-1967, J. D. Birchim (CAS). SOUTH CAROLINA: CCC Camp F2, Oconee Co., 6-VI-1938, O. L. Cartwright (USNM); Clemson College, 8-V-1927, 18-V-1933 & 25-IV-1936 (USNM & CAS). CONNECTICUT: New Canaan 5-VI-1950, 30-V-1951, 5-VI-1954 & 29-V-1959, M. Statham (AMNH). GEORGIA: Neel Gap, 28-V-1934, P. W. Fattig (USNM). ILLINOIS: Palos Park, 30-V-1911 (FM). INDIANA: Hessville, 30-V-1914, Alex K. Wiat (FM). MARYLAND: Plummers Is., Schwarz & Barber (USNM). MASSACHUSETTS: Milton, Dr. Kennedy's place, 12-14-IV-1894 (USNM, MCZ & AMNH); Blue Hill, 18-VI-1893, Hubbard & Schwarz (USNM); Nor., Co. (MCZ); Dorchester, 15-VI-1898 (MCZ); Andover (MCZ); Wellesley, 15-VI-1916 (MCZ); Rowley (MCZ); Petersham (MCZ); Lexington, 17-VI-1934 (MCZ); Fall River, VI-1911, N. S. Easton (MCZ). MINNESOTA: Winnebago Creek Valley, 3-4 mi NE Eitzen, Houston Co., 31-V-1941, M. W. Wing (FM); idem (UM); Houston Co., 16-VI-1938, D. Mourray (UM); Mississippi Bluff, 1-2 m N State Line, Houston Co., 30-V-1941, M. W. Wing (UM). MISSOURI: Hattiesburg, 10-VII-1944, C. D. Michener (AMNH). MONTANA: Webster Groves, 22-V-1926, R. C. Lange (USNM). NEBRASKA: Crete, Neb. (USNM); Lincoln, VI, H. Soltan (USNM); Malcolm, VII-1909, R. Oertel (MCZ). NEW JERSEY: Essex Falls, 9-VI-1910, A. Nicolay (USNM); Branchville, 6-VI-1932, C. H. Curran (AMNH). NEW YORK: West Point, 7-VI-1912, W. Robinson (USNM); no locality (USNM & MCZ); Waterworks, Flatbush, 11-VI-1897 (AMNH); Buffalo, 13-VI-1908, M. C. van Duzee (CAS). PENNSYLVANIA: North East Pa., VI-1917, R. A. Cushman (USNM). ONTARIO: Fonthill, 15-VI-1941, S. D. Hicks (BRI); Jordan, 18-VI-1926, G. S. Walley (BRI).

Phengodes (s. str.) *laticollis* LeConte
(Fig. 9)

Phengodes laticollis Lec., 1881, Trans. Am. Ent. Soc. 9:39

This is one of the largest species occurring in the United States, measuring 14-20mm.; this length is only attained by large specimens of *inflata.* It belongs to the group of species which have a medially smoother, generally

	Interocular distance	Length of antennal segments 4 to 6
Holotypus Nr. 2806 (MCZ)	1.83	1.33
N. Carolina Nr. 1 (USNM)	1.90	1.50
Tryon Nr. 2 (USNM)	1.83	1.33
Plummers Isl. Nr. 3 (USNM)	1.80	1.50
Lahaway, N.J. Nr. 4 (USNM)	1.50	1.27
Nelson Co., Va. Nr. 5 (USNM)	1.90	1.23
Savannah, Ga. Nr. 6 (USNM)	2.07	1.33
Forsyth, Ga. Nr. 7 (BRI)	2.03	1.40
Clemson, S.C. Nr. 8 (BRI)	1.83	1.23
Hilton Head Isl., S.C. Nr. 9 (WW)	2.00	1.27
	1.87	1.34

longitudinally impressed and anteriorly emarginate labrum, and therefore resembles *frontalis* Lec. Both species have rounded, widely explanate sides of the pronotum.

Material examined: ALABAMA: Auburn (FM). ARKANSAS: no locality 1 spec. (USNM); S.W. Arkansas (AMNH); Washington Co., 6-VI-1942, M. W. Sanderson (INHS). N. CAROLINA: N. Carolina (MCZ) Holotypus Nr. 2806; Tryon, F. W. Fiske (USNM); Tryon, 18-V-1903 (USNM). Clay Co., Brasstown, 16-VI-1968 (AMNH); Raleigh, 22-V-1952, B. K. Dozier (FSCA). GEORGIA: Savannah, 3-VII-1916, W. J. Hoxie (USNM); Demorest, V-VIII-1939, Valentine (USNM), Atlanta, 4-V-1949, P. W. Fattig (FSCA); Blue Ridge, Fannin Co., 6-12-VII-1955, R. & C. Patton (FSCA). KENTUCKY: Mammoth Cave, 20-V-1957, Stannard & Ross (INHS). LOUISIANA: Baton Rouge, 3-I-1930, J. H. Roberts (USNM). MARYLAND: Plummers Isl., Potomac River, numerous specimens from middle of May to middle of June 1908-1912, H. Barber (USNM). MISSISSIPPI: Hattiesburg, VI-1944, C. D. Michener (AMNH); Ft. Leonard Wood, 29-IV-9-VII-1952, D. Giuliani (CAS). NEW JERSEY: Lahaway, 24-VI (USNM); Orange, VI-1920 (USNM): New Brunswick, 16-VI, J. A. Grossbeck (AMNH). NEW YORK: Bear Mt., 20-VI-1948, C. H. Curran (AMNH). TENNESSEE: Gatlinburg, summer 1957, (1.93 & 1.67mm, USNM); Burrville, Morgan Co., 22-V-1-VI-1951 and 1952, B. Benesh (FM); English Creek at Carson's Spring, near Newport, 3-VI-1946 (INHS), Burrville, 1-VI-1961, B. Benesh (FSCA). VIRGINIA: Potomac River, 25-VI-1926, H. S. Barber (USNM); Nelson Co., 10-VII-1906, W. Robinson (USNM); Blacksburg, Montgomery Co., 20-V-1913.

Phengodes (S. str.) *laticollis meridiana* Wittmer, **new subspecies**

This insect has the same general aspect and color of the nominal form; it is distinguished only by the somewhat wider head and the distinctly shorter antennae. The measurements are as follows:

	Interocular distance	Length of antennal segments 4 to 6
Emory, Ga., Holotypus (Hn)	2.07	1.00
Emory, Ga., (W.W.)	2.07	1.00
Emory, Ga. (W.W.)	2.47	1.00
Emory, Ga. (W.W.)	2.33	1.03
Emory, Ga. (Hn)	2.00	0.90
Emory, Ga. (Hn)	2.17	0.93
Emory, Ga. (BRI)	2.37	1.00
Everglades, Fla. (BRI)	2.33	1.00
Palm Beach, Fla. (USNM)	2.20	1.13
Orlando, Fla. (USNM)	2.67	1.00
	2.27	1.00

Material examined: S. CAROLINA: McClelanville, 19-IV-1952, light trap, R. L. Edwards (W.W.); Charleston, 11-IV-1944, R. L. Wenzel (FM); FLORIDA: Levy Co., 7 and 11 miles NE Cedar Key, 8 & 29-VI-1970, D. L. Bailey (USNM); Orlando, 31-VI-1901, E. L. Worsham (2.67 & 1.00mm, USNM): the first number corresponds to the interocular distance, and the second indicates the length of antennal segments 4 to 6. Palm Beach, IV-1907, W. Robinson (2.20 & 1.13mm, USNM); Belle Glade, 15-VII-1940, J. W. Wilson (2.37 & 1.13mm, USNM); Royal Palm State Park (2.20 & 1.03mm, USNM); L. Worth (2.10 & 1.03mm, USNM); Fisher Island, Miami Beach, 15-VIII-1955 (2.33 & 1.00mm, USNM); Homestead, 30-VII-1957, R. M. Baranowski (2.37 & 1.10mm, MCZ); Florida, 1883, coll. F. A. Eddy (2.27 & 1.13mm 1 spec. & 1.97 & 0.90 mm 1 spec., MCZ); Coconut Grove, 1925, G. B. Pearson (BM); Crescent City, Hubbard & Schwarz (USNM); Port Sewall, 16-22-II-1941 & 5-III-1944, L. J. Sanford (AMNH); W. Palm Beach, 11-VIII-1951, J. E. Porter (INHS). Gainesville, Alachua Co., 15 & 17-IV-1966, F. W. Mead, idem 23-29-III-1960, A. F. Wilson, idem 21-24-VIII-1969, F. W. Mead, idem 14-VIII-1972, K. E. Woodruff (FSCA); Gainesville, Doyle Conner Building, 25-VII-1970, F. W. Mead (FSCA); Big Pine Key, Monroe Co., 27-28-VI-1970, R. E. Woodruff (FSCA); Perrine, Dade Co., 28-VII-1960, J. H. Knowles (FSCA); Dade Co., H. F. Strohecker (FSCA); Ocala, 10-VIII-1962, 24-V & 9-VII-1963, T. R. Adkins (FSCA); Oneco, Manatee Co., P. Dillman (FSCA); Belle Glade, 23-IV-1957, E. D. Harris (FSCA); Miami, 10-VI-1948 & 13-VII-1959 (FSCA). GEORGIA: Emory University Field Sta., Newton, 25-VII-1952 & 22-III-1957, H. Howden, Holotype and 4 Paratypes in coll. Howden, 1 Paratype BRI, 4 Paratypes coll. W. Wittmer, 1 Paratype MCZ.

From the following localities in Florida, specimens were examined which show somewhat aberrant measurements:

	Interocular distance	Length of antennal segments 4 to 6
Crescent City (USNM)	1.58	1.30
Crescent City (USNM)	1.70	1.20
Crescent City (USNM)	1.90	1.10
Crescent City (USNM)	2.10	1.17
Archbold Biol. Station (AMNH)	2.00	1.20
Archbold Biol. Station (AMNH)	2.33	1.17
Archbold Biol. Station (AMNH)	2.03	1.17
Archbold Biol. Station (AMNH)	2.10	1.40
Archbold Biol. Station (WW)	2.20	1.40
Archbold Biol. Station (WW)	2.10	1.20
	2.00	1.22

It cannot be established at this time if the nominal form and the subspecies *meridiana* are intergrading here.

Phengodes (s. str.) *mexicana* Wittmer, **new species**

Fig. 4A, B and C

Male: Brown to reddish brown; stem of antennal segments 4 to 11 darkened for their greatest part, as are the lateral branches; apices of elytra dark brown to piceous, only in one specimen barely darkened.

Head with eyes distinctly narrower than pronotum at its base. Base of frons densely punctate at center, laterally with several curved longitudinal wrinkles; anterior portion of frons between antennal insertions with a few scattered punctures, from there to clypeus smooth at center, laterally again a few scattered punctures. Labrum with rounded and centrally shallowly emarginate anterior border; a feeble longitudinal impression perceptible at middle, punctuation present, but absent at middle. Antennae comparatively long.

	Interocular distance	Length of antennal segments 4 to 6
Durango, Holotypus, Mex. (BRI)	1.60	1.50
Durango, Mexico (BRI)	1.70	1.53
Durango, Mexico (WW)	1.63	1.67
Durango, Mexico (WW)	1.67	1.73
	1.65	1.61

Pronotum (Fig. 4A, B and C) wider than long, somewhat widened at base, sides rounded with basal angles somewhat prominent or almost straight with basal corners not protruding; explanate lateral margin wide; punctures scattered, distinct, median impression shortly indicated near base, or absent. Elytra approximately 3 times as long as pronotum, with portions slightly rugose and others smooth, distinctly punctate in between (64×); 1 or 2 longitudinal ribs indicated.

Length 14-16mm.

Type locality: MEXICO: 10 miles W of El Salto, Durango, 9000 ft., 13-VI, 4-15-VII-1964, J. E. H. Martin, holotype and paratype in BRI, 2 paratypes coll. W.W.

This species is related to *P. arizonensis* Wittm. It is distinguished by the more flattened space between the antennal insertions, the less heavily punctate anterior portion of the frons and the labrum which is furthermore widely emarginate at the center, and the dark apices of the elytra, which in *arizonensis* are uniformly yellowish brown, similar to the rest of the surface of the elytra. The average of the interocular distance is higher in *mexicana* than in *arizonensis*.

The species seems to be rather widely distributed because material from the following localities in the United States has been examined: ARIZONA: Sta. Rita Mts., 25-VII-1925, G. P. Engelhardt (WW); Madera Canyon, N slope Sta. Rita Mts., Sta. Cruz Co., 5380 ft., 31-VII-1948, F. Werner, W. Nutting (USNM); Box Canyon, Sta. Rita Mts., 27-VIII-1965, R. F. Sternitzky (BRI); Sierra Vista, Cochise Co., 21-VII-1966, R. F. Sternitzky (BRI); Graham Mts., Graham Co., 8000 ft., 16-VIII-1952, M. Cazier, R. Schrammel (AMNH); Prescott, Yavapai Co., 25-VII-1948, C. & P. Vaurie (AMNH); Sta. Catalina Mts., 20-VIII-1933, Bryant (CAS); Pine forest, 4 mi. SW Forestdale, Navajo Co., 23-24-VIII-1952, H. B. Leech, J. W. Green (CAS); Chiricahua Mts., 8-9000 ft., Rustler Park, 27-VII-1927, J. A. Kusche (CAS); idem Barfoot Park, 9000 ft., 29-VII-1927, (CAS). NEW MEXICO: McMillan Camp, 13 miles N Silver City, Grant Co., 6800 ft., 14 & 17-VII-1961, F. P. & J. Rindge (AMNH).

The specimens from Arizona and New Mexico do not entirely agree with those from Durango: the sides of the pronotum are straighter, and the basal angles are rarely protruding. It must be noted, however, that 1 specimen from Durango shows a pronotum similar to that of the specimens from Arizona and New Mexico.

Phengodes (s. str.) *arizonensis* Wittmer, **new species**
Fig. 7 and 8

Male: Concolorous, yellowish brown to orange brown, only stems of antennal segments 4 to 11 black or piceous.

Head (Fig. 7) with eyes in most cases slightly narrower than pronotum at level of basal angles. Base of frons rather coarsely punctured at center, laterally with 1 to 4 more or less distinct curved longitudinal wrinkles. Anterior portion of frons centrally between antennal insertions somewhat convex and punctate to and including clypeus; smooth between punctures. Labrum somewhat swollen, divided from clypeus by straight line, anterior border rounded and not or very slightly emarginate at middle, its punctation somewhat more delicate than on anterior portion of frons and on clypeus. Antennae of medium length. Interocular distance and length of antennal articles 4 to 6 subject to great variation; the following are the minimum and maximum (respectively) measurements obtained: interocular distance, 1.20, 1.80; antennal segments 4-6, 0.93, 1.43mm. Following are measurements of 10 specimens:

	Interocular distance	Length of antennal segments 4 to 6
Molino Basin, Ariz. Holotype (CAS)	1.50	1.17
Molino Basin, Ariz. (WW)	1.50	1.17
Molino Basin, Ariz. (WW)	1.80	1.30
Molino Basin, Ariz. (WW)	1.47	1.13
Molino Basin, Ariz. (WW)	1.27	0.97
Huach. Mts., Ariz. (BRI)	1.40	1.40
Huach. Mts., Ariz. (WW)	1.30	1.20
Sonoita, Ariz. (BRI)	1.20	1.33
Sonoita, Ariz. (WW(	1.60	1.40
Huach. Mts. Ariz. (BRI)	1.33	1.33
	1.44	1.24

Pronotum (Fig. 8) wider than long, sides at certain places in many cases almost parallel, or somewhat widened towards basal angles, the latter in most cases conspicuously pointed and somewhat protruding, slightly widened; explanate lateral margin narrow or very narrow. Punctation comparatively dense and conspicuous, denser at center of anterior margin than on remainder of disk. Elytra strongly abbreviated, 2.25 to 2.50 times as long as pronotum, slightly rugose, distinctly punctured (64×) between wrinkles, traces of 2 or 3 longitudinal ribs perceptible.

Length: 12-19mm.

Type locality: ARIZONA: Molino Basin, Sta. Catalina Mts., 4600 ft., 3 & 4-IX-1965, L. & C. W. O'Brien, holotype and 3 paratypes, (CAS); 4 paratypes (FSCA) 4 paratypes (BM), 6 paratypes C. W. O'Brien, further paratypes in coll. W. W.

Further material examined: ARIZONA, Cochise Stronghold, Cochise Co., 4600 ft., 6-IX-1965, 2 spec. L. & C. W. O'Brien; Huachuca Mts., Ramsey Cyn., 6000 ft., 15 mi. S Sierra Vista, 7-VI-1964, 22-VII-1967 & 13-IX-1968, R. F. Sternitzky (BRI, WW); Huachuca Mts., Canelo, 27-VIII-1966, R. F. Sternitzky (BRI); 5 miles SE Sonoita, 16-VIII-1967, R. F. Sternitzky (BRI); Ramsey Cyn.,Huachuca Mts., Cochise Co., 14-IX-1969, R. F. Sternitzky

(BRI); Elgin, Santa Cruz Co., 29-VII- & 22-VIII-1966, R. F. Sternitzky (BRI, WW); Oslar, Huachuca Mts., 8000 ft., 10-VIII-1903 (USNM); 4 miles N Whiteriver, Navajo Co., (White Mts.,), 5140 ft., 20-22-VII-1948, F. Werner & W. Nutting (USNM); Garden Canyon, N slope Huachuca Mts., 5700 ft., 1949, F. Werner & W. Nutting (USNM); Chiricahua Mts., Cochise Co., 5-6000 ft., 30-IX-1927, J. A. Kusche (CAS); Sta. Rita Mts., 5-IX-1933, Bryant (CAS); Southwestern Res. Sta., 5 Mi. W Portal, Cochise Co., 5400 ft., 11-21-IX-1966, P. H. Arnaud Jr. (CAS); Huachuca Mts., Van Dyke (CAS); S.W. Res. Sta., 5-6000 ft., 13 & 16-IX-1958, H. V. Weems, Jr. (FSCA); idem Cochise Co., 10-IX-1958 (FSCA).

This species is superficially very similar to *P. frontalis* Lec., but is distinguished easily by the concolorous yellowish brown elytra and the antennal segments 4 to 6 which are somewhat longer on the average. Additional differences are found in the shape and punctation of the labrum and the pronotum, and the punctation of the head, as shown in the keys.

Phengodes (s. str.) *inflata* Wittmer, **new species**

Male: Concolorous yellowish brown to orange brown; stem of antennal segments 4 to 6 somewhat darkened in many cases.

Head with eyes only little narrower than pronotum at base. Base of frons rather strongly elevated at center between antennal insertions and punctate to and including clypeus, between punctures from smooth to delicately microchagriné (64×). Labrum swollen, anterior margin rounded, its punctures more delicate and denser than on anterior portion of frons. Antennae comparatively short.

	Interocular distance	Length of antennal segments 4-6
Corona, N. Mex. Holotype (BRI)	2.00	1.07
Corona, N. Mex. (BRI)	2.10	1.10
Corona, N. Mex. (WW)	1.83	0.90
Corona, N. Mex. (BRI)	1.77	0.77
Sta. Rita Mts., Ariz. (BRI)	1.80	1.00
Sta. Rita Mts., Ariz. (WW)	1.97	1.07
Huach. Mts., Ariz. (BRI)	1.90	1.00
Huach. Mts., Ariz. (WW)	1.90	1.07
Huach. Mts., Ariz. (BRI)	1.50	0.80
Patagonia, Ariz. (BRI)	1.97	1.10
	1.87	0.99

Pronotum wider than long, slightly widened towards basal angles, explanate lateral margin rather uniformly wide, relatively wide, basal angles somewhat salient. Punctation relatively dense and conspicuous, denser at center near anterior margin than on rest of disk. Elytra strongly abbreviated, about 2.5 times as long as pronotum, slightly rugose, distinctly punctured in between wrinkles (64×); traces of 2 or 3 ribs perceptible.

Length: 15-20mm.

Material examined: New Mexico: 4 miles NW Corona, 6400 ft., 18-IX-1968, D. F. Hardwick, Holotype (BRI), Paratypes (BRI & WW); Arizona: Box Canyon, N of Greaterville, 5800 ft., Sta. Rita Mts., 27-VIII-1965 & 12-VIII-1966, R. F. Sternitzky (BRI & WW); Ramsey Canyon, 15 miles S Sierra

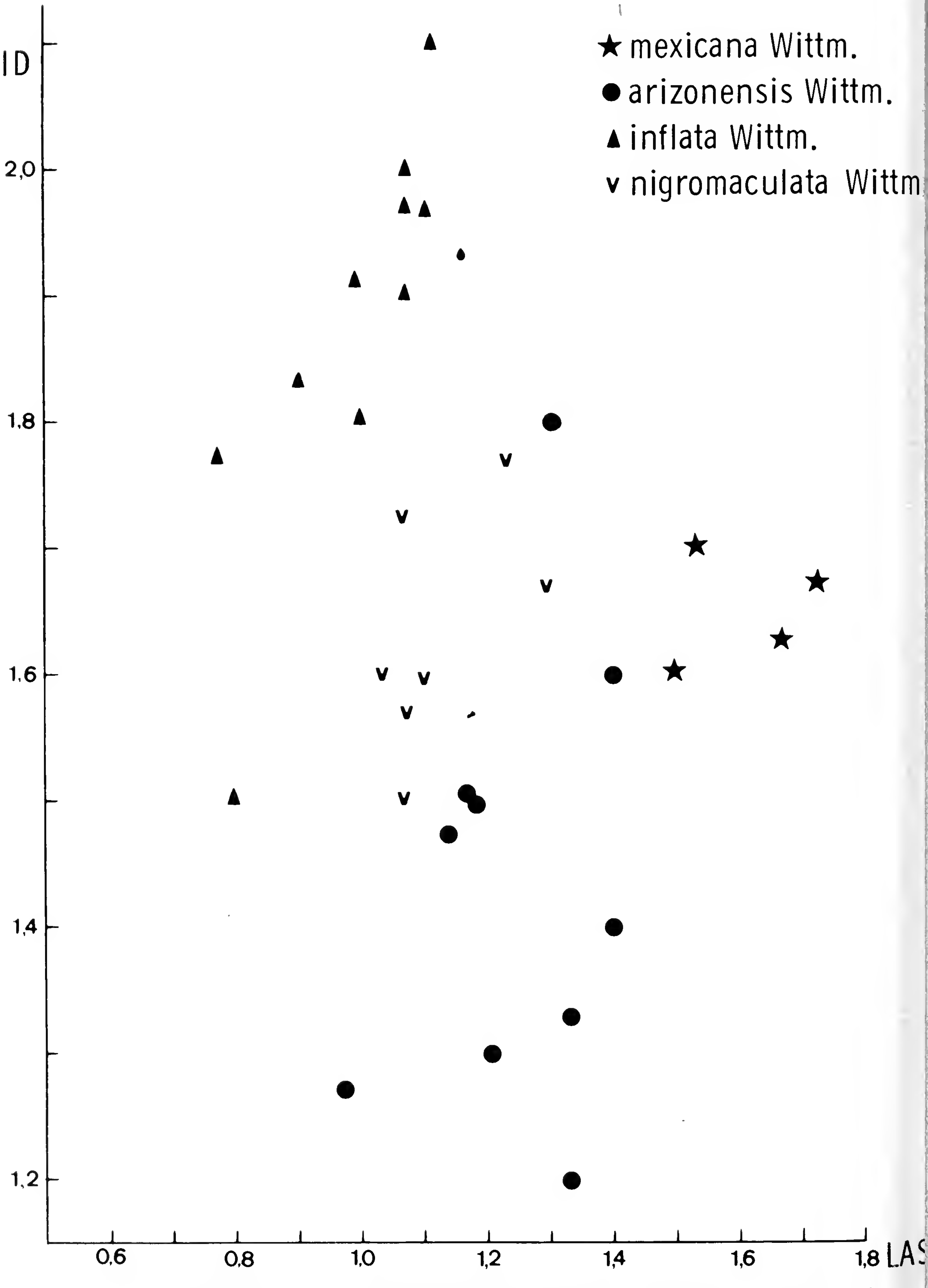

Fig. 12: Measurements of *Phengodes* s. str. *mexicana* Wittm., *arizonensis* Wittm., *inflata* Wittm. and *nigromaculata* Wittm.

Vista, Huachuca Mts., 6000 ft., 20-X-1964 (BRI & WW); Sabino Canyon, Pima Co., 3-4-IX-1961, J. S. Buckett (CAS); Tucson, 26-VIII-10-X-1935, Bryant (CAS); Baboquivari Mts., 18-20-VIII & X-1924, O. C. Poling (CAS); Wickenburg, 2-IX-1961, J. S. Buckett (CAS), Brown's Canyon, E slope Baboquivari Mts., 3800 ft., F. Werner & W. Nutting (USNM). TEXAS: Presidio, 7-X-1953, J. H. Russell (USNM); Mohave Co., 8-15-IX-1933, Wickham (USNM).

This species is closely related to *P. arizonensis* Wittm., together with which it seems to occur occasionally. It is distinct from *arizonensis* by the wider head (interocular distance 1.87mm, as compared to 1.44 in *arizonensis*), the shorter antennae (length of segments 4 to 6 0.99mm, as against 1.24mm in *arizonensis*), and, in most cases, by the more widely explanate pronotum. Furthermore, the labrum is thicker in *inflata,* and the tubercle in the center of the anterior portion of the frons between the antennal insertions is higher than in *arizonensis.* Only larger series from identical localities or the study of reared material will make it possible to establish if these 2 forms represent separate species, or subspecies comparable to those we find, for instance, in *fusciceps* and *laticollis.*

Phengodes (s. str.) *nigromaculata* Wittmer, **new species**

Male: Head, antennae and scutellum brown; mandibles brown with black base; pronotum brown with a wide longitudinal anteriorly somewhat tapered black band, basal margin brown; elytra brown at base, with dark or black coloration beginning at middle or even more basal, and extending all the way to apex. Under surface for the greatest part black, tergites and sternites more or less widely bordered with brown; legs brown, tarsi slightly darkened.

Head with eyes narrower than pronotum, longitudinal wrinkles of base of frons more distinct at sides than at middle, anterior transverse impression smooth, protuberance roundly projecting towards antennal insertions. Labrum widely and shallowly emarginate at center, with a few coarse punctures, anterior portion of frons just behind labrum equally with large, but less dense punctures. Antennae moderately elongate.

Interocular distance and length of antennal segments 4 to 6 measured in 7 specimens:

	Interocular distance	Length of antennal segments 4 to 6
Holotype (BRI)	1.60	1.03
Emory, Ga. (BRI)	1.57	1.07
Emory, Ga. (WW)	1.60	1.10
Emory, Ga. (WW)	1.73	1.07
Gainesville, Fla. (BRI)	1.50	1.07
Bellair, Fla. (USNM)	1.67	1.30
Archer, Fla. (USNM)	1.77	1.23
	1.63	1.12

Pronotum wider than long; sides narrowly explanate; basal angles in most cases pointed, projecting, disk completely smooth and without impressed longitudinal line along middle. Elytra from rugose to almost glabrous, with scattered evanescent punctures.

Length 11-16mm.

Material examined: GEORGIA: Emory University Field Stn., Newton, 1-V-1959 (Holotype BRI); idem 2 Paratypes each (BRI & WW); FLORIDA: Gainesville, 9-V-1957, H. A. Denmark (BRI); Bellair, Mrs. Slossen (USNM); Archer, III-1882 (USNM); Atlantic Beach, (AMNH); Jacksonville, Duval Co., 1-IV-5-V-1957, Dave Ribble; Gainesville, 1-IV-1958, 29-IV-1959, 10-V-1962, 25-V-1964, 27-IV-1966, 2-V-1966, 11-V-1966, 28-III-1967 & 13-IV-1967; J. W. Perry (FSCA); idem 9-IV-1963, R. E. Woodruff (FSCA); idem 23-V-1957, L. A. Hetrick (FSCA); idem 2, 23, & 30-IV-1968, 4-V-1968, 12-VI-1968 & 18-IV-1969, F. W. Mead (FSCA); idem 21-IV & 4-V-1955, H. A. Denmark (FSCA); Pine Hills Estate, Gainesville, 22, 24, & 25-VI-1969, D. Weems & H. V. Weems, Jr. (FSCA); Ocala, 24-V-1963, T. R. Adkins (FSCA).

A species sufficiently characterized by its coloration, and furthermore distinguished by the completely smooth pronotum with its narrowly explanate sides and the smooth head. The species approaches *frontalis* Lec. in the interocular distance and the length of antennal segments 4 to 6, but the latter species has a completely different coloration and the pronotum is distinctively punctate; furthermore, the 2 species belong to different subgenera.

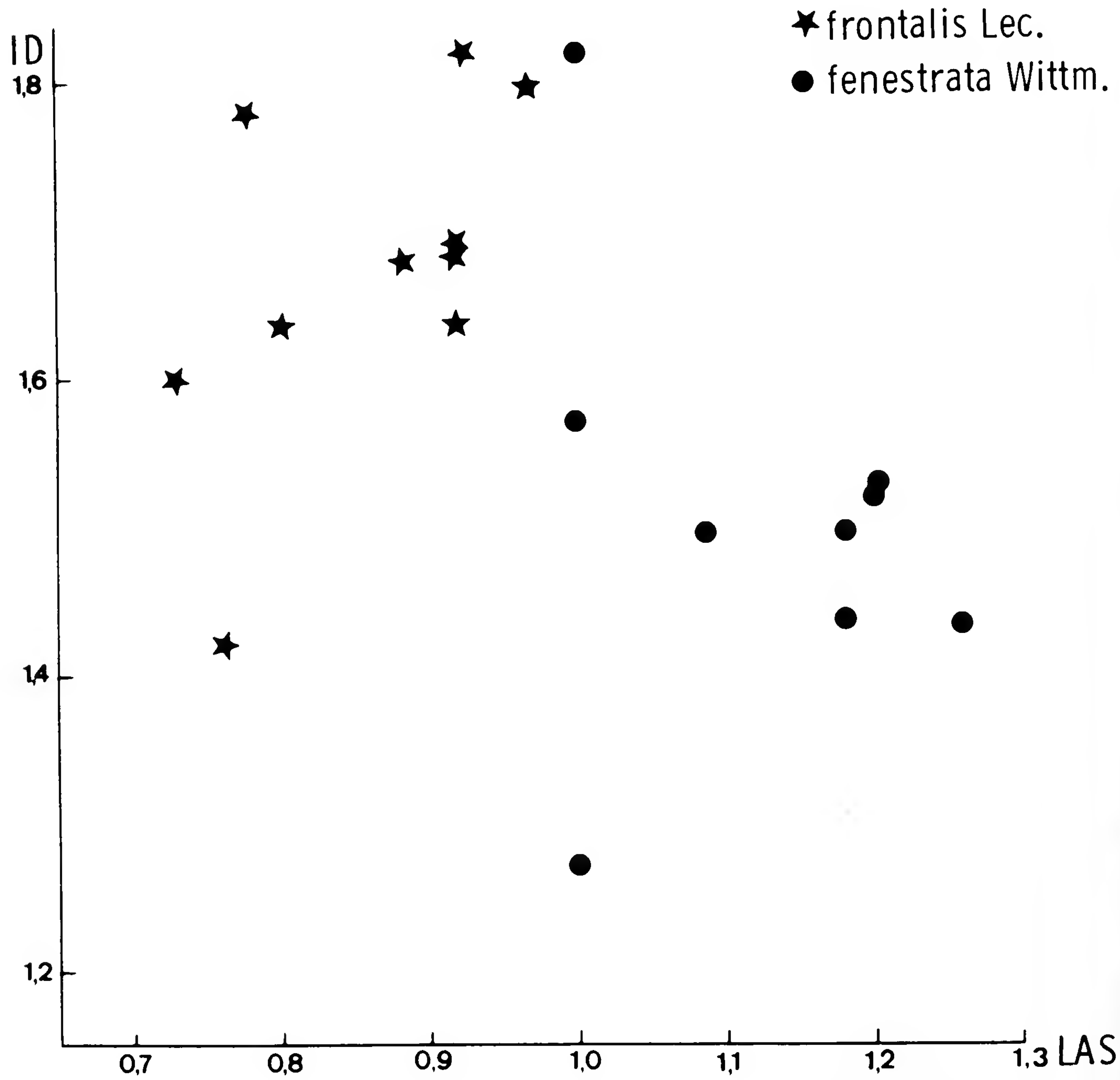

Fig. 13: Measurements of *Phengodes (Phengodella) frontalis* Lec. and *fenestrata* Wittm.

Phengodes (Phengodella) *bella* Barber

Phengodes bella Barber, 1913, Canad. Ent. 45:343.

This and *fenestrata* are the only species with concolorous dark elytra occurring in the United States. The type (no 16332) is in the USNM; it was collected in Southern California, San Bernardino Co., late June or early July, H. G. Klages. An additional specimen should be in the Klages collection, Carnegie Museum, Pittsburgh.

Phengodes (Phengodella) *fenestrata* Wittmer, **new species**

Fig. 1

Male: Black. Mandibles for their greatest part, and anterior portion of frons below the antennal insertion, reddish brown, in some specimens also clypeus and labrum somewhat lightened. Pronotum with 2 reddish brown maculae basally, touching the basal margin only for a short extension on each side of middle; the narrow black longitudinal stripe separating the spots in many cases with 1 short interruption. Abdomen reddish brown.

Head (Fig. 1) with eyes narrower than pronotum. Longitudinal wrinkles on basal portion of frons distinct, somewhat evanescent in parts, anterior transverse impression smooth, with obsolescent, scattered hair punctures. Labrum somewhat emarginate at center, with longitudinal impression, smooth, with coarse obsolescent punctures. Antennae comparatively short.

Interocular distance and length of antennal segments 4 to 6 measured in 10 specimens (see also Fig. 1):

	Interocular distance	Length of antennal segments 4 to 6
Nr. 1	1.77	0.83
2	1.67	0.93
3	1.63	0.93
4	1.67	0.93
5	1.63	0.80
6	1.43	0.77
7	1.60	0.73
8	1.83	0.90
9	1.80	0.97
10	1.67	0.87
	1.67	0.87

Pronotum wider than long, lateral margins broadly explanate (similar to *laticollis* Lec.), basal angles only very slightly projecting. Surface smooth, with a delicate longitudinal linear impression along middle, which does not attain anterior or basal margin; explanate lateral margin with obsolescent punctation.

Length: 12-14mm.

Material examined: TEXAS: Big Bend Nat. Park, Chihuahan desert near Nugent Mt., 10-IV-1967, A. & M. E. Blanchard, holotypes and 148 paratypes. Holotype and 125 paratypes in USNM, 20 paratypes WW and 3 paratypes MCZ. Presidio, at light, 9-IV-1953 & 15-IV-1955, J. H. Russel, one specimen each (USNM). ARIZONA: Sacaton, 19-V-1920, H. F. Loomis, 1 spec. (USNM).

The only known species with a black upper surface, except the 2 basal maculae on the pronotum. It resembles *laticollis* which shows a similarly widened explanate pronotal margin.

Phengodes (Phengodella) *frontalis* Lec.
Fig. 5, 6 & 10

Phengodes frontalis Lec., 1881, Trans. Am. Ent. Soc. 9:39.
I have examined the type (holotype no. 2805, MCZ).

	Interocular distance	Length of antennal segments 4 to 6
Holotype, Tex. (MCZ)	1.53	1.20
New Braunfels, Tex. Nr. 1 (USNM)	1.53	1.20
Brownwood, Tex. Nr. 2 (USNM)	1.50	1.17
Kerville, Tex. Nr. 3 (USNM)	1.47	1.27
The Basin, Tex. Nr. 4 (USNM)	1.27	1.00
Uvalde, Tex. Nr. 5 (USNM)	1.67	1.17
Kingsville, Tex. Nr. 6 (USNM)	1.83	1.00
Kingsville, Tex. Nr. 7 (USNM)	1.57	1.00
Victoria, Tex. Nr. 8 (USNM)	1.50	1.07
Texas Nr. 9 (USNM)	1.47	1.17
	1.53	1.12

The explanate margins of the pronotum are variable (Fig. 6)

The species has only been found in TEXAS, as follows: Welder Wildlife Ref., near Sinton, 4-7-VIII-1963, H. F. Howden (BRI); Big Bend Nat. Park, Chisos Basin, 13-V-1959, Howden & Becker (BRI); New Braunfels, 28-VI, R. C. Shannon (USNM); Brownwood, 17-VI-1919, W. A. Hoffman (USNM); Cypress Mills, 18-VI-1887 (USNM); Kerville, 24-VI-1948 & 20-VI-1947, L. J. Bottimer (USNM); Victoria, 7-VI-1916, J. D. Mitchell (USNM); Basin, Chisos Mts., 10-VI-1948, L. J. Bottimer (USNM); Uvalde, 1-VII-1929, R. A. Roberts (USNM); Kingsville, 1927, C. T. Reed (USNM); Varr, 4-15-VI-1946, G. B. Vogt (USNM); Columbus, 10-VII (USNM); Big Bend Nat. Park, Chihuahuan desert near Nugent Mt., 10-IV-1967, A. & M. E. Blanchard (USNM); Ottine Palmetto St. Pk., 12-13-VIII-1963, P. J. Spangler (USNM); Brownwood, 30-VI-1919 (AMNH); Christoval, Tom Green Co., 29-VI-1918, C. & P. Vaurie (AMNH); Texas (INHS); Sierra Diablo Wildlife Mgt. Area, 26-30-V-1973, A. Blanchard (INHS); Davis Mts., 29-VI & 1-VII-1946, Van Dyke (CAS); San Antonio 7 & 29-VII-1942, E. S. Ross (CAS).

Key to the species of *Phengodes* in the U.S.

1. Galea with apex rounded, latter at most with scattered, isolated setae (Fig. 9) .... *Phengodes* s. str. 2

1′. Galea elongate, apically with long setae forming tuft or brush .... *Phengodella* n. subg. 12

Phengodes s. str.

2(1). Elytra yellow, concolorous 10
2′. Elytra more or less extensively brown only at base, remainder from dark to black 3

3(2′). Pronotum concolorous, yellowish brown to orange brown 4
3′. Pronotum with large macula, its color from piceous to black; in rare instances, macula strongly reduced 11

4(3). Antennal segments 4 to 6 less than 0.9mm long 5
4′. Antennal segments 4 to 6 longer than 0.9mm 6

5(4). All tergites brown. In most cases, only narrowed tips of elytra black, in many cases dark color extending along suture to scutellum. Head always largely black .... *f. fusciceps Lec.*
5′. All tergites dark at sides. In most cases, at least half of surface of elytra black. Head frequently lightened to a larger or lesser degree .... *fusciceps floridensis* Blatchley

6(4′). Entire head including labrum appearing slightly dull (spaces between punctures not smooth) .... *plumosa* Oliv.
6′. Entire head, or much of it, shining (space between punctures almost entirely smooth, especially on anterior portion of frons and on labrum 7

7(6′). Head black, at most somewhat lightened on anterior portion 8
7′. Head yellow, concolorous .... *mexicana* n. sp.

8(7). Smaller species, length 10-13mm. Head smaller, interocular distance averaging less than 1.6mm .. *fusciceps intermedia* n. ssp.
8′. Larger species: length 13-18 mm. Head larger, interocular distance averaging more than 1.8mm 9

9(8′). Antennal segments 4 to 6 longer, their length 1.27-1.50mm. Interocular distance smaller, 1.50-2.07mm .... *laticollis* Lec.
9′. Antennal segments 4 to 6 shorter, their length 0.90-1.13mm. Interocular distance larger, 2.00-2.67mm .. *laticollis meridiana* n. ssp.

10(2). Antennal segments 4 to 6 longer, their length 0.97-1.40mm, average 1.24mm. Interocular distance smaller, between 1.20 and 1.80mm, average 1.44mm. Punctation of clypeus stronger. Labrum less thick. Lateral border of pronotum narrowly explanate .... *arizonensis* n. sp.
10′. Antennal segments 4 to 6 shorter, their length 0.77-1.10mm, average 0.99mm. Interocular distance larger, between 1.50 and 2.10mm, average 1.87mm. Clypeus less strongly punctated. Labrum thicker. Lateral border of pronotum broadly explanate .... *inflata* n. sp.

11(3′). Pronotum with distinct punctation; macula piceous to black. Length of antennal segments 4 to 6 as in *fusciceps* (nominal form) .... *fusciceps picicollis* Horn
11′. Pronotum smooth, at most (at 64× magnification) with isolated fine punctures; macula black. Antennal segments 4 to 6 from 1.03 to 1.30mm long .... *nigromaculata* n. sp.

Subgenus *Phengodella*

12(1′). Elytra and head yellow, concolorous .... *frontalis* Lec.
12′. Elytra concolorous, from piceous to black 13

13(12′). Head, pronotum, and scutellum yellowish orange .... *bella* Barber
13′. Head and scutellum black, pronotum black with 2 light colored spots near base, spots in rare cases confluent........ *fenestrata* n. sp.

The biometric justification to separate the species may be easily understood by consulting Fig. 11 to 13. The species which are closely related, have been grouped in the same Fig. Ordinate shows interocular distance (ID) and length of antennal joints 4 to 6 (LAS) all in mm and is represented on the abscissa.

FIRST RECORD OF THE GENUS *TROGLOPS* ER. (COLEOPTERA: MALACHIIDAE) IN THE UNITED STATES

W. Wittmer

Museum of Natural History, Basel, Switzerland

Mr. Raymond Angelo, Bedford, Mass., sent me a male of a malachiid, which he suspected to be a representative of the genus *Troglops* Er. I eventually identified these as *Troglops cephalotes* Er. The species was described from Central Europe, where it has a wide range, but is rare. It probably has been introduced into the United States in the larval or pupal stage with a shipment of lumber, and it is apparently established there. Mr. Angelo found 1 male 18-V-1974, and a male 20-V-1975 in a room at the window.

The genus *Troglops* is easily recognized by its wide head, which is deeply excavated between the eyes, and the 4-segmented fore tarsi in the male. In my generic key (*in* Arnett, 1963, The Beetles of the United States: 612), which is valid only for males, *Troglops* can be included as follows:

41(40) Head simple in both sexes 41A
Head excavated between eyes in the male .... *Troglops*
41A(41) Head long, first segment of antennae cylindrical .... *Trophimus*
Head short, first segment of antennae with a recurrent process .... *Temnosophus*

OBSERVATIONS ON THE LIFE HISTORY OF *HYPOTHYCE MIXTA* HOWDEN (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

Adult *Hypothyce mixta* Howden were collected in the field, and their eggs and early larvae were reared under laboratory conditions. Adult specimens from a natural population sampled in 2 successive years were measured and compared. The entire mating procedure was photographed on movie film. Adults apparently did not eat and appeared to have a vestigial digestive system.

INTRODUCTION

In 1962, W. W. Gibson observed a unique male scarab beetle in a student's insect collection. He sent the beetle to H. F. Howden, then with the Canadian Department of Agriculture, and received word that it apparently represented an undescribed genus. Later, Howden, Gibson, and L. J. Bottimer returned to the exact locality where the first specimen had been collected (Tennessee Colony area in Anderson County, Texas) and, using a blacklight, collected another male. In June 1967 Gibson found a female digging in loose sand at Camp Whispering Pines, a Girl Scout Camp near Garrison, Texas. This specimen later became the allotype of the species and established a new locality. Howden (1968) published the description of the new genus, with *Hypothyce mixta* as the type species. By this time, specimens (which later became paratypes) had been collected from Nacogdoches, Texas and several other East Texas localities.

In an attempt to gain information concerning its life history, 2 students at Stephen F. Austin State University attempted, in 1969, to determine the adult food and to rear the larvae from eggs laid by field-collected adults. Beetles had no interest in foods offered, and eggs failed to hatch. With this background, research was conducted in 1971 to determine the natural history of *H. mixta,* and the results of that research are reported here.

METHODS AND MATERIALS

Adult male *H. mixta* were collected at the Whispering Pines Girl Scout Camp. Many were picked from window screens of a building where they had flown to lights the night before; others were caught during mid to late afternoon with a butterfly net as they flew over the soil surface. Females were collected by hand, following observation of where males landed. However, a few females were spotted as they sat solitary on the ground after emergence from their burrows. Special efforts were made to collect virgin females (i.e., beating the male to a female or separating a pair before mating could occur).

Once captured, specimens were transported in bottles or cans. Although several males were put in a single container, females were always kept solitary. Males were maintained in the laboratory in 5 gallon aquaria which were covered by fine mesh wire or glass. Moisture was provided by moist paper towels in Syracuse dishes in the aquaria. Sandy soil with its usual components of twigs, pine needles and other debris was collected at the site of adult collection and placed in the aquaria as a substrate.

Females were caged individually in pint sized polyethylene freezer boxes and readily burrowed into ca. 3 inches of soil in each box. When the female emerged from the soil, it was assumed that she was ready to mate, and the entire box was transferred to an aquarium containing males. After a male flew into the box and mating had occurred, the box containing both male and female was removed and the male caged separately so as to determine his length of life following mating. Similar longevity data were obtained for the females.

Each box of sand containing a mated female was emptied daily to check for eggs. Eggs were removed, counted, and placed in salve cans with just enough sterilized soil to cover them. (Soil taken from the site of adult collection was placed in a covered coffee can with a small amount of water and heated for 1 hour at 300-400° F. This was considered sufficient to kill fungi or bacteria which might damage the eggs.) One to 4 depressions were made in the sand of each of the salve cans, and 1 egg was placed in each depression. A camel-hair brush was then used to cover the eggs with a thin layer of soil. Records were kept on the development of each female's eggs.

Not all eggs, contained in a given salve can, hatched on the same day; thus, the boxes were checked daily, and the larvae were removed on the day of their hatching. Each larva was moved to a separate salve can, supplied with sterilized, moist soil and given sprouted rye grass as food.

Phylogeny, Habitat, & Biology

Phylogeny: The combination of characters exhibited by *Hypothyce* indicates that it is closely related to *Thyce* LeConte (primarily on the U.S. West Coast) and *Hypotrichia* LeConte (primarily in Florida). However, if the generic limits of either of these genera were to be broadened to include this new beetle discovered in East Texas, it would necessitate the combination of *Thyce, Hypotrichia* and a third genus, *Plectrodes* Horn (a genus from California), into one genus. The combination of these 3 genera plus the widespread genus *Polyphylla* Harris with its variable antennal count, would create an artificial assemblage of some "distinctly divergent" species; therefore, a new monotypic genus, *Hypothyce,* was erected to include *Hypothyce mixta.* (Howden 1968). Hardy (1974) reviewed the phylogenetic status of *Hypothyce* and moved *Thyce osburmi* into *Hypothyce,* making a second species in the genus.

Habitat: *Hypothyce* adults and larvae occur in isolated, sandy areas which are sparsely covered with hardwood, pine, and herbaceous vegetation. The collection site at Camp Whispering Pines consisted of slightly rolling to flat, sandy terrain with scattered pines, hardwoods (sassafras, ash, sweetgum, etc.) and small herbaceous plants. No beetles were found where a thick canopy was present or where trees of any kind were totally absent.

Biology: Measurements of males and females from 2 annual populations collected in 1970 and 1971 from the Girl Scout Camp fell within the extremes for the species as described by Howden. From clypeus to pygidium, a total of 88 males from both populations ranged from 15.1 to 18.0mm with an average of 16.7mm and a standard deviation of 0.527. Body width at the humeral area of these males ranged from 6.1 to 8.0mm with a mean of 7.0mm and standard deviation of 0.108. Only 10 females were collected during both years; thus, no accurate conclusions could be reached as to their mean size. However, the largest and smallest females collected were 21.2 × 9.5mm and 18.5 × 8.1mm, respectively.

Adult beetles were active over a 6 to 8 week period during early June to late July. Regular collection of adults occurred from 6 June to 12 July, 1971 with scattered individuals being collected as late as 25 July, 1971.

Male *Hypothyce* have well-developed wings and fly readily and strongly. Contrastingly, females also have well-developed wings, but were never observed to fly or even to separate the elytra. Manual separation of the female elytra revealed a pair of well-veinated, seemingly strong wings; however, when left in open containers, handled, or dropped from various heights, the females were never induced to fly.

Adult *Hypothyce* did not eat, although many sources of food existing in their natural habitat were offered to them. Dissection of adult specimens showed that both males and females had a digestive system consisting of a narrow, thin-walled, undifferentiated tube running from mouth to anus. The lack of specialized areas in the tube, the extreme thinness of the tube and the lack of feces in cages from any field-collected specimens led to the conclusion that the digestive system was non-functional.

Mating Procedure

Mating of *H. mixta* was observed both in the field and in the laboratory. In the field, males were somewhat active most of any given 24 hour period; however, a large concentration of their activity occurred in a 2 to 3 hour period beginning around 1700 hours Central Daylight Time. During this time, males were observed flying about 1 foot above ground level or sitting on stationary objects well above ground level. The lamellate antennae of the males was open during this time, thus increasing the surface area of the antennae and, accordingly, the capability of receiving any stimulus of a nearby female (assuming that such a stimulus could be received by the antennae). Males sat motionless for hours in such a position. Suddenly, in what appeared to be stimulation from a female, he would wave his antennae, spread his elytra, and quickly fly almost directly to her. He would land, sometimes upside down, and begin a scrambling, hyperactive search for her. Occasionally, several males landed in the vicinity of a female at approximately the same time; however, the first one to find her was the one with which she mated.

Sight apparently played little or no role in finding the female. Often a male would be within a few inches of a female, even facing her, but seemingly could not find her. Often, too, a male would contact the female but in his hyperactive state of trying to mate with her would climb completely over her body. He would then extend his antennae and circle to locate the female, thus leading us to believe that wind direction and scent were important in the ability of a male to locate a female.

Once a male contacted a female, mating proceeded rapidly. First, the male approached the female laterally and moved directly to her posterior or made a 270 degree turn around her. In either case the male usually reached the female's posterior within a few seconds of coming into contact with her. He then crawled onto her dorsal surface, hooked his anterior tarsal claws under the lateral edges of her elytra, extended his aedeagus, and mated with her. Actual copulation time ranged from 35 seconds to just over 2 minutes as observed both in the lab and the field.

Females were also most active during the 2 to 3 hour period mentioned above. They emerged from holes in the ground just slightly larger than their own diameter. Each hole was assumed to be an original emergence hole for 2 reasons: 1) a female was found there, and females apparently do not fly, nor do they walk much, and 2) holes had been dug apparently from below, as evidenced by the lack of loose soil around them. A female would appear at the entrance of the hole, leave it just long enough to turn around, and then, with most of her body above ground level, would begin to pump her abdominal area up and down with much the same motion used in stridulation. Although not proven, it was assumed that the females were releasing a pheromone during this pumping action. This assumption was substantiated by the fact that males would appear and make contact with a female within 30 seconds of her pumping action. In the laboratory, males were observed to fly directly to a female acting similarly from distances up to 3 feet (with negligible wind) in less than 30 seconds.

Almost immediately following the male's insertion of the aedeagus, the female began to crawl back down the hole from which she came. Usually, the male would "ride" on the female into the hole and continue mating but would emerge a few minutes later. Sometimes the male would be loosened from her back as she descended.

Oviposition

Females burrowed through the soil following copulation and deposited their eggs in a scattered fashion as they burrowed. Most eggs were deposited at the bottoms of the containers in which the females were housed perhaps indicating that their pint box habitats kept them from ovipositing as they normally would in nature.

The average number of days which elapsed between copulation and oviposition was 4.7. One female oviposited the first day following copulation, while another oviposited 6 days following copulation. There were 2 females which oviposited on 2 separate days with almost an entire 24 hour period between them. In all, 5 females laid a total of 109 eggs with a range of 9 to 30 and an average of 18.8 per female. One of the 6 collected in 1971, for unknown reasons, did not oviposit following copulation.

Eggs

At the time of oviposition, eggs were dull white in color, elliptical in shape and averaged 3.0mm long. Many darkened to a tan color in the following 24 hours. The usual sticky secretion from colleterial glands was present on the surface, making soil particles stick to the eggs. Hayes (1929) had observed this on other scarab eggs.

Average incubation time was approximately 20 days. After 10 days of incubation, several eggs examined had increased to an average of 4.5mm in length. Very little additional increase in size occurred prior to hatching. During the last 1 to 2 days before hatching, mandibles, head capsules, antennae and eyes were distinctly visible through the shell, and all eggs had discolored to various shades of tan. With few exceptions all the eggs laid by a given female on a single day hatched within a few hours of each other.

First Instar Larvae

The larvae emerged from the eggs head-first following a splitting of the egg shell longitudinally along the dorsal surface of the larva. Within a day after hatching, several larvae were measured and found to average 4.0mm long and 1.5mm wide at the thorax. The antennae, head, and mandibles were brown, while the rest of the body was a dull white with sparse brown pigmented areas. After beginning to eat, the *Hypothyce* larvae, like other scarab larvae, took on a dark coloration in the abdominal area due to a concentration of fecal materials and sand taken in during feeding.

At first many larvae died from unsuitable food. Offerings of moistened oats, cereals, sprouted corn, and freshly sprouted rye grass were made. Of these only the rye grass was accepted, and the larvae accepting it were those which lived the longest.

Larvae fed by lying on their dorsal surface and clutching a rye grass stem or root with their first 2 pairs of legs. The dorsal surface of these larvae were spotted with groupings of hairs, and it was speculated that these hairs were useful in gripping the soil while feeding. However, occasionally a larva would feed in an upright (dorsal up) position. Their heavy elongate mandibles were used to cut food into pieces which were passed to the mouth via the maxillae. Feeding was observed whenever the salve cans were opened, and there seemed to be no increase in consumption when new food was placed in the cans, thus indicating there was no optimum aging of food hosts offered to the larvae.

Larvae dwindled in numbers continuously probably due to lack of our locating their proper food. The last one died at approximately 45 days old. A search was made for larvae at the site of adult collection; however, diggings to a depth of 2 feet into loose sand in locations where mating adults were observed were all unsuccessful in turning up larval stages of the beetle.

Ritcher (1973) wrote the original description for the first 2 larval instars from specimens sent to him by one of us (CSB).

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HARPALUS (OPHONUS) PUNCTICEPS STEPHENS (COLEOPTERA, CARABIDAE) IN NEW YORK AND VERMONT

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ABSTRACT

The palaearctic species *Harpalus (Ophonus) puncticeps* Stephens, previously known in North America only from Long Island, N. Y., is here recorded from Poughkeepsie, N. Y., and Bolton, Vt.

The palaearctic species *Harpalus (Ophonus) puncticeps* Stephens was accidentally introduced in North America, but until now has been reported only from Long Island, New York (Dietrich 1957; Ball 1960b; Lindroth 1968). Six specimens in my possession indicate that this species is spreading in the northeastern United States. Five specimens in my own collection were found by Donald B. Pizzuto in Poughkeepsie, New York, on the following dates: 18-VI-1969 (2 males); 14-VII-1969 (1 female); and 26-VII-1969 (2 females). The sixth specimen is a male in the Ross T. Bell collection at the University of Vermont. It was found by Joyce Bell at Camel's Hump, Bolton, Vermont, on 2-VIII-1972. The specimen was sent to Carl H. Lindroth who confirmed its identification as *Harpalus puncticeps*.

The habitat of this beetle in Europe has been recorded (Lindroth 1945). It lives on bare gravel-loam soil with sparse but high vegetation, often under dried tufts of curly dock (*Rumex crispus*) and Queen Anne's lace (*Daucus*). It has been observed repeatedly on the umbels of Queen Anne's lace. The Vermont specimen was found in a log at 2,800 feet. This unlikely habitat, coupled with its known flying ability (Lindroth 1968), indicate that the Vermont specimen is probably a stray.

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IDENTIFICATION AND BIOLOGICAL NOTES ON THE SPECIES OF *NEOCHETINA* THAT ATTACK PONTEDERIACEAE IN ARGENTINA (COLEOPTERA: CURCULIONIDAE: BAGOINI)[1]

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Abstract

A key is given for the separation of *Neochetina bruchi, N. eichhorniae, N. affinis,* and *N.* n. sp. The major distinguishing characters and the characters for separating the sexes of each species are given, with illustrations. Information is included on the eggs, larvae, and pupae and on oviposition, host range, and behavior of adults.

Many water weevils of the tribe Bagoini have host ranges restricted to a few closely related plant species, and several have potential for biological control of aquatic weeds. Among these is the genus *Neochetina* that occurs on the plant family Pontederiaceae in South America. The members of the genus have recently been subjects of intense study as possible agents for biological control of waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) (Andres and Bennett 1975). The genus *Neochetina* was erected by Hustache (1926) with the description of 2 new species, *bruchi* and *affinis*; he later added a third, *guadelupensis* (Hustache 1929). *N. eichhorniae* was found during the waterhyacinth investigations and was subsequently described by Warner (1970), who also stated that *guadelupensis* probably should not be included in the genus because it has a 7-segmented funicle. I found *Neochetina* n. sp. attacking *Pontederia lanceolata* Nutt. in the upper Río Paraguay watershed in the Mato Grosso area of Brazil in 1973, during the investigations on arthropods attacking waterhyacinth; H. A. Cordo[3] subsequently found it on *P. lanceolata* in Formosa and Chaco provinces of northern Argentina. This species is currently being described by C. W. O'Brien[4].

Some of the species of *Neochetina* are superficially very similar, and several workers have reported difficulty in identifying them, or in separating the sexes. The following notes are supplementary to the original descriptions and are useful in identifying living specimens in the field or in the laboratory.

Hustache (1926:222) characterized the genus as having a 6-segmented funicle, club of antennae finely pubescent, ocular lobes strongly devel-

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[3]Letter April 18, 1975, from Ing. Agron. Hugo A. Cordo, Biological Control of Weeds Laboratory, USDA-ARS, Hurlingham, Buenos Aires Prov., Argentina.

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oped, tibia not grooved beneath, 3rd tarsal segment large and bilobed, anterior coxae very slightly separated, prosternum very short in front of the anterior coxae and strongly arched. The species may be separated as follows:

Key to the Species of *Neochetina*

1. Larger species (males more than 4.9mm, females more than 5.4mm long from anterior vertex to posterior tip of abdomen), slightly more than twice as long as wide, elytral interval 1 without carina (Fig. 7, 8) .... *affinis*

1′. Smaller species (males less than 4.6mm, females less than 5.2mm long), less than twice as long as wide, elytral interval 1 with carina (carina less distinct in n. sp.) 2

2(1′). Antero-medial tubercle of prosternum wide, in the form of a truncate "trough," front coxae widely separated (males 0.66 of or more the narrowest width of the rostrum); with distinct whitish spot at base of elytral suture (Fig. 1, 2, 11, 12, 20) .... n. sp.

2′. Antero-medial tubercle not as above; the 3 tubercles of prosternum behind coxae sub-equal in size and shape, front coxae proximate (0.33 or less the narrowest width of the rostrum), without conspicuous whitish markings 3

3(2′). Carina on elytral interval 1 short (0.33 or less the length of the thorax) and located behind the anterior margin of the elytra a distance sub-equal to the length of the thorax; front coxae moderately separated (0.33 of the narrowest width of rostrum); brown to tan (Fig. 5, 6, 9, 10, 17) .... *bruchi*

3′. Carina on elytral interval 1 long (0.5 or more the length of the thorax) and located behind the anterior margin of the elytra a distance about 0.5 the length of the thorax; front coxae proximate (separated by 0.1 of the narrowest width of the rostrum); dark brown to black (Fig. 3, 4, 13, 14, 18) .... *eichhorniae*

Principal Taxonomic Characters

The principal characters for separating the 4 species of *Neochetina* are 1) the location of the carina and markings on the elytra, 2) the form of the tubercles on the prosternum, 3) the distance between the front coxae, and 4) the size and shape of the rostrum. This latter character alone is sufficient to separate the 4 species and the sexes of each (Table 1, Fig. 9-16). With experience, the species can be identified with the naked eye by the larger size of *affinis,* the white spot at the base of the elytral suture of the n. sp., the lighter color and frequently present tan chevron of *bruchi,* and smaller size and darker color of *eichhorniae.*

N. affinis Hustache

Largest species, length of male 5.33mm (5.0-5.8mm), of female 6.03mm (5.5-6.5mm); uniform brown or with indistinct irregular markings; carina of 1st elytral interval absent, some individuals with 2-3 rows of small tubercles on elytral intervals 3, 5, and 7 (Fig. 7, 8); front coxae proximate (separated by 0.1 the narrowest width of rostrum); antero-medial tubercle of prosternum behind front coxae well developed but the 2 postero-lateral tubercles only slightly elevated (Fig. 19). Rostrum long and slender, that of female rather strongly curved, of male strongly curved and expanded beyond antennae, suprascrobal groove present in female, indistinct in male (Table 1, Fig. 15, 16).

Eggs elongate, large, length 1.01mm (0.90-1.17mm), width 0.50mm (0.47-0.53mm), ratio w:1 = 1:2.01 (30 eggs measured).

Neochetina n. sp.

Medium size, length of male 3.94mm (3.6-4.3mm), of female 4.71mm (3.9-5.1mm); with several conspicuous whitish spots, particularly at the base of the elytral suture, on lateral aspect of the humeri, on posterior aspect of the femora, and the broad dark and white bands on the tibiae; carina on elytral interval 1 short (0.33 length of thorax) and located behind anterior margin of elytra a distance subequal to length of thorax; light tan chevron on elytra present on most individuals (Fig. 1, 2); antero-medial tubercle of prosternum broad and in the form of a truncate "trough," front coxae widely separated (male by 0.66 or female by 0.9 the narrowest width of the rostrum) (Fig. 20). Rostrum stout, very slightly curved, suprascrobal groove present, more distinct in female (Table 1, Fig. 11, 12).

Eggs similar to *bruchi,* 0.92mm (0.80-1.00mm), width 0.61mm (0.57-0.63mm), ratio w:1 = 1:52 (24 eggs measured).

TABLE 1. CHARACTERISTICS OF THE ROSTRUM OF BOTH SEXES OF *NEOCHETINA* SPP.[a].

Rost./	Ant:	Mean length (mm)[b]	Rost./ thorax ratio[c]	Antenna: insert. ratio[d]
N. affinis	male	1.32	1.05	0.96
	female	1.58	1.13	1.48
N. n. sp.	male	1.17	1.11	0.89
	female	1.53	1.21	1.48
N. bruchi	male	1.23	1.04	0.65
	female	1.42	1.11	1.04
N. eichhorniae	male	1.10	1.03	0.66
	female	1.29	1.08	1.19

[a] Mean of 10 individuals of each species and sex.
[b] Measured from apex of epistoma to base of rostrum below eye.
[c] Length rostrum/length thorax at mid-dorsal line.
[d] Distance from apex of epistoma to insertion of antennae/maximum width of rostrum near apex.

N. bruchi Hustache

Medium size, length of male 4.18mm (3.5-4.5mm), of female 4.61mm (4.1-5.0mm); brown, many individuals with light tan chevron on elytra, others with indistinct tan spots on elytral intervals 1, 3, 5, and 7; carina

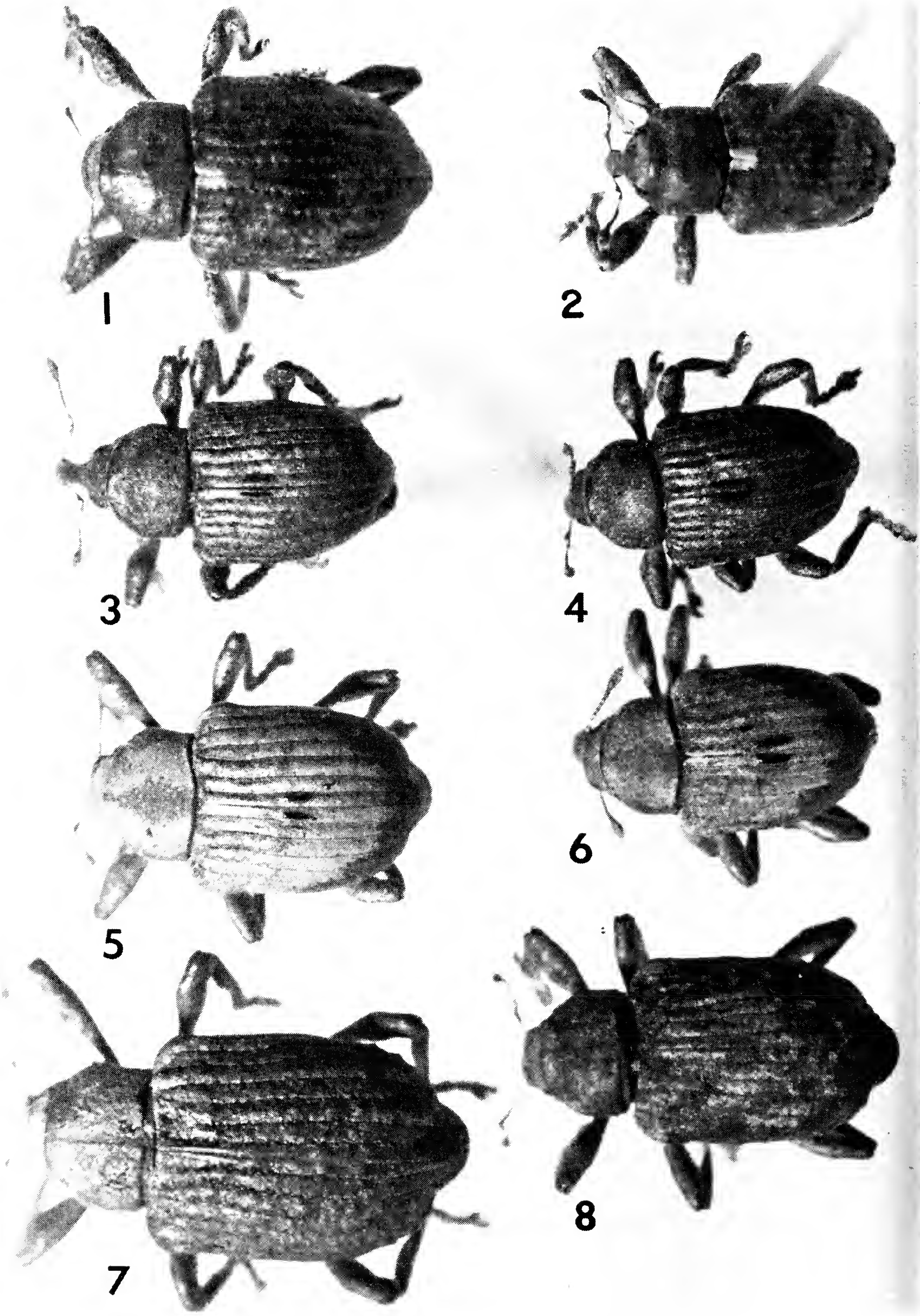

Fig. 1-8: Dorsal view of the 4 species of *Neochetina*; *N.* n. sp. female (1), male (2); *N. eichhorniae* female (3), male (4); *N. bruchi* female (5), male (6); *N. affinis* female (7), male (8).

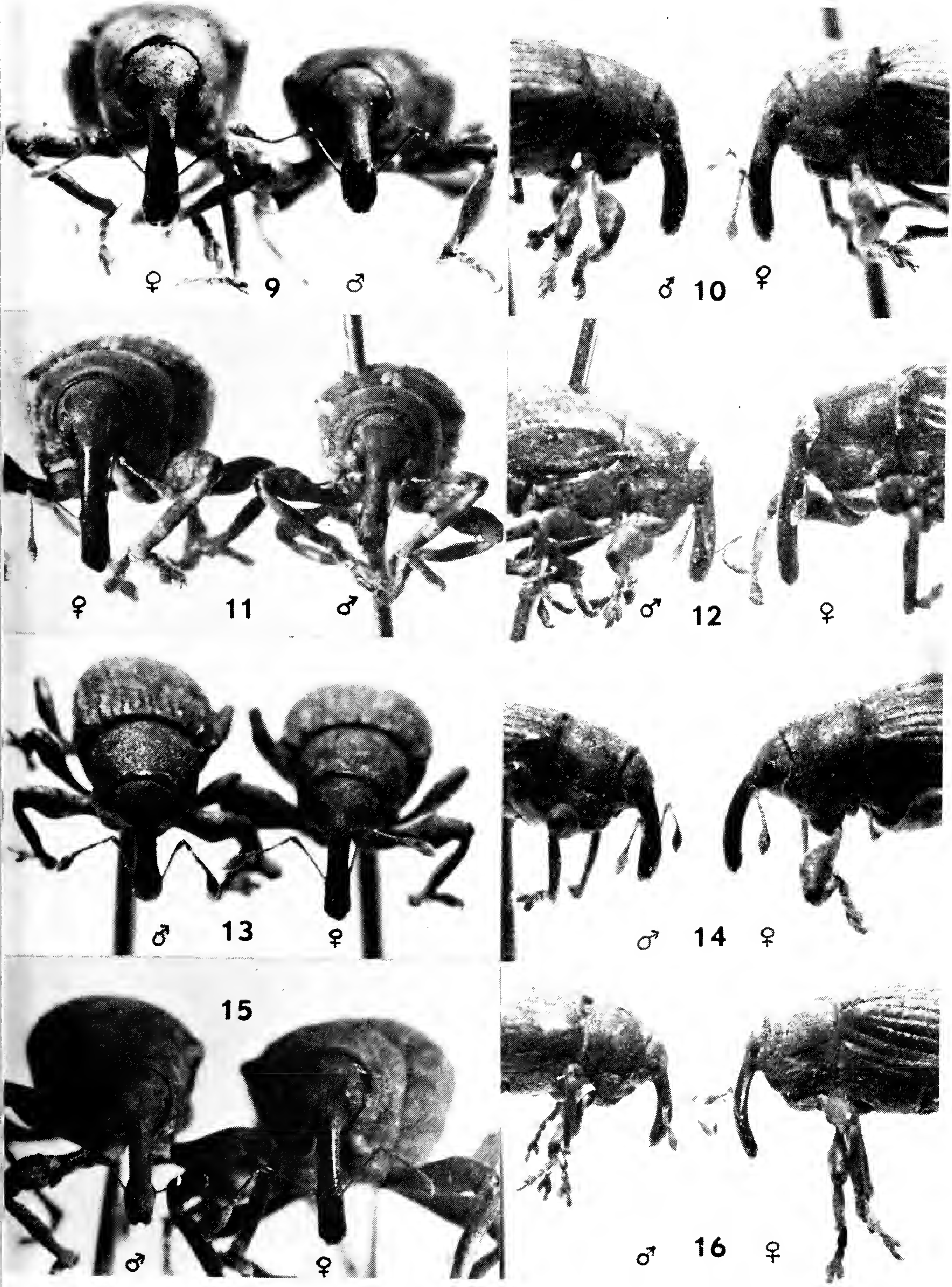

Fig. 9-16: Rostrum of the 4 species of *Neochetina*: (9 and 10) *N. bruchi*; (11 and 12) *N.* n. sp.; (13 and 14) *N. eichhorniae*; (15 and 16) *N. affinis*.

on elytral interval 1 short (0.33 length of thorax) and located behind the anterior margin of the elytra a distance sub-equal to the length of the thorax (Fig. 5, 6); front coxae moderately separated (0.33 of the narrowest width of the rostrum); all 3 tubercles of prosternum behind front coxae well developed and sub-equal (Fig. 17). Rostrum stout, slightly curved, suprascrobal groove indistinct in female, absent in male (Table 1, Fig. 9, 10).

Eggs truncate, length 0.82mm (0.70-1.00mm), width 0.60mm (0.50-0.70mm), ratio w:1 = 1.35 (97 eggs measured).

N. eichhorniae Warner

Small species, length of male 4.06mm (3.4-4.5mm), of female 4.52mm (3.8-4.9mm); dark brown to black, without conspicuous markings; carina of 1st elytral interval long (0.5 or more length of thorax) and located anteriorly (behind the anterior margin of elytra a distance of only 0.5 the length of thorax) (Fig. 3, 4); front coxae approximate (separated by 0.1 the narrowest width of the rostrum); latero-posterior tubercles of prosternum behind front coxae distinct but less developed than antero-medial tubercle (Fig. 18). Rostrum slender, of female strongly curved throughout, of male strongly curved and distinctly expanded on distal 0.33, suprascrobal groove quite deep and prominent in female not present in male (Table 1, Fig. 13, 14).

Eggs elongate, small, length 0.88mm (0.70-1.07mm), width 0.44mm (0.40-0.50mm), ratio w:1 = 1:2.01; (27 eggs measured).

Separation of the Sexes: Sexes of the species can be separated by the shape of the rostrum, which varies only in degree between the species. Sexual dimorphism in *affinis* and *eichhorniae* is generally more pronounced than in *bruchi* and the n. sp. (see Table 1 and Fig. 1-16 for comparative measurements and illustrations).

Males are smaller than females; rostrum shorter than in female, basal 0.66-0.75 nearly straight and cylindrical, wider and thickened from insertion of antennae to apex, slightly compressed and downward curved beyond antennae; antennae inserted at a distance from the apex of the rostrum equal to less than the width of the rostrum at the point of insertion (only 0.66 this distance in *N. bruchi* and *N. eichhorniae*); rostrum shiny dorsally only from about the insertion of antennae to the apex; carinae when present generally shorter than in the female, front coxae generally more approximate than in female.

Females are larger than the males; rostrum longer, uniformly curved, nearly cylindrical throughout, uniformly increasing slightly in width and thickness from base to apex; antennae inserted at a distance from the apex of the rostrum equal to more than the greatest width of the rostrum (about 1.5 × this distance in *N. affinis* and *N. n. sp.*); rostrum shiny and glabrous from a small distance in front of eye to apex, suprascrobal groove more distinct than in male.

Notes on Biology and Host Range

The eggs of the species of *Neochetina* are laid beneath the epidermis in the petioles or lamina of the leaves of the host plant. Eggs of *affinis* and *eichhorniae* are long and slender and can be distinguished from the shorter, thicker eggs of *bruchi* and the n. sp. However, all eggs of *bruchi* cannot be distinguished from all those of the n. sp. because their size ranges overlap. Although the size ranges of *affinis* and *eichhorniae* also overlap, eggs of *eichhorniae* can usually be distinguished because they are soft and flexible for a few days after oviposition, whereas those of the other species are rigid.

The larvae of the species feed inside the petioles, stems, and crowns of the host plants. *N. bruchi* and *N. eichhorniae* have 3 larval instars, *N. affinis* probably has 3 instars, and *N.* n. sp. has not been studied. Mature larvae of *N. bruchi* and *N. eichhorniae* leave their cells inside the crown of the plant and pupate underwater outside among the rootlets. Larvae of *N. affinis*

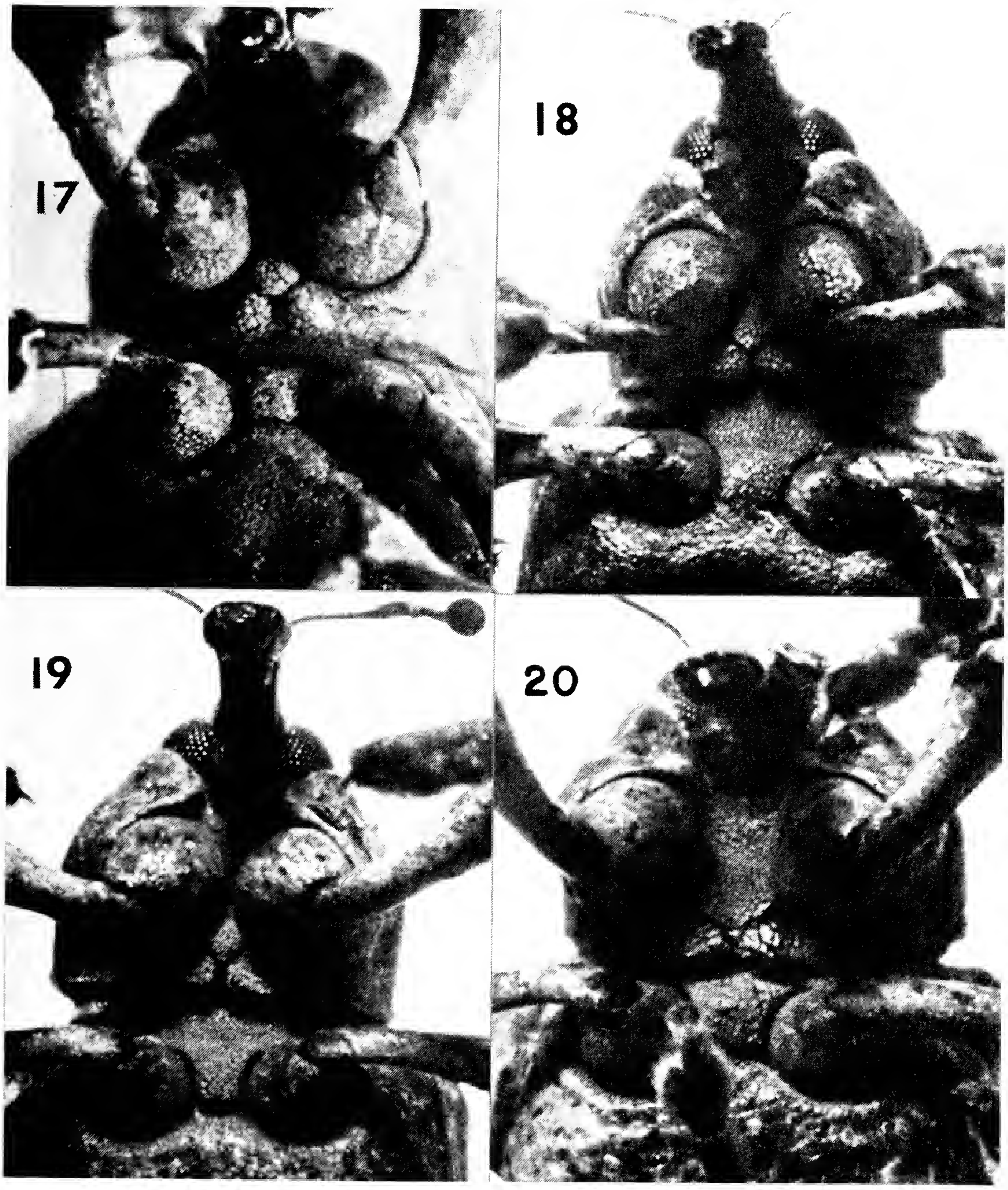

Fig. 17-20: 4 species of *Neochetina,* showing form of the prosternal tubercles and relative distances between front coxae, (17) *N. bruchi,* (18) *N. eichhorniae,* (19) *N. affinis,* and (20) *N.* n. sp.

pupate inside the stem of the host plant. Pupae of *N. pontederiae* have not been observed. Adults of all 4 species were found between the petioles and underneath the basal bracts near the crown during the day; they apparently fed mostly at night. Several attempts were made to collect from black-light traps beside stands of waterhyacinth at Campana, 70 km N of Buenos Aires, but no *Neochetina* adults were collected; however, O'Brien[4] mentioned several such collections. One possible explanation is that adult *Neochetina* fly only at certain seasons or under certain physiological conditions which often preclude their capture in light traps.

In the field, both *N. bruchi* and *N. eichhorniae* were common and often abundant on *Eichhorniae crassipes* and occasionally were found on *E. azurea* (Swartz) Kunth (DeLoach, in press); *N. affinis* was less abundant, and occurred on *E. azurea, Reussia rotundifolia* (L. f.) Castellanos, and to a lesser extent on *Pontederia lanceolata* Nutt. (DeLoach, unpublished reports). These 3 species of *Neochetina* were collected wherever their host plants grew, from Buenos Aires north to Concepción, Paraguay; Warner (1970) reported their occurrence throughout South America.

Neochetina n. sp. was collected only from *P. lanceolata* in the field, but in the laboratory it also fed and oviposited on 3 other species of Pontederiaceae. Several variations in holding conditions were made in an attempt to stimulate egg production, but all were rather unsuccessful. Females laid 6 eggs on *P. lanceolata,* 25 on *E. azurea,* and 5 on *E. crassipes,* but these were not direct comparisons and do not necessarily indicate the degree of host preference.

Several tests were also conducted to measure feeding by adult *N.* n. sp.; they were not consistent in their preference for the 4 species of Pontederiaceae presented in the tests (*E. crassipes, E. azurea, P. lanceolata,* and *R. rotundifolia*). In the 1st test, a group-plant test comparing 16 test plants, the beetles strongly preferred *E. crassipes,* and did not feed on any plants outside the family Pontederiaceae; they produced 281 feeding spots on *E. crassipes,* 35 on *E. azurea,* 3 on *R. rotundifolia,* and 7 on *P. lanceolata.* When the 4 species of Pontederiaceae were presented together in 1 cage, the weevils slightly preferred *E. azurea* and *R. rotundifolia,* producing 46 feeding spots on *E. crassipes,* 84 on *E. azurea,* 77 on *R. rotundifolia,* and 48 on *P. lanceolata.* When the 4 species of Pontederiaceae were presented separately in no-choice tests over a 2-month period, they preferred to feed on *E. azurea,* and fed least on *P. lanceolata,* producing 521 feeding spots on *E. crassipes,* 854 on *E. azurea,* 410 on *R. rotundifolia,* and 258 on *P. lanceolata.* Although the weevils were originally collected on *P. lanceolata,* it was the least favored host in nearly every test. *Neochetina* n. sp. is probably specific to the family Pontederiaceae as are the other 3 species of the genus. However, it may not be as specific to a single plant species as *N. bruchi* and *N. eichhorniae* are specific to *E. crassipes*; it may be more similar to *N. affinis,* which occurs commonly on 3 species of Pontederiaceae.

Several observations have been made on the host specificity, biology, and ecology of the 4 species of *Neochetina* (DeLoach in press, DeLoach and Cordo[5],[6]), that may have phylogenetic significance. *N. affinis* has a more

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[5]DeLoach, C. J., and H. A. Cordo. In Press. Life cycle and biology of *Neochetina bruchi,* a weevil attacking waterhyacinth in Argentina, with notes on *N. eichhorniae.* Ann. Ent. Soc. Amer.

[6]DeLoach, C. J., and H. A. Cordo. In Press. Ecological studies of *Neochetina bruchi* and *N. eichhorniae* on waterhyacinth in Argentina. Hyacinth Control J.

generalized host range on the emergent hydrophyte (*Pontederia*) and the floating-leaved hydrophytes (*Reussia* and *E. azurea*), it pupates inside the stem of the host plant, and it is larger and less active than the other species. *Neochetina* n. sp. is less well known than the other species, but it has been collected only from *Pontederia*, and laboratory tests indicate that it has a more generalized host preference similar to that of *N. affinis*. *N. bruchi* and *N. eichhorniae* have a narrower host range that generally restricts their development to *E. crassipes* (a free-floating hydrophyte) and they have developed a method of pupating underwater that requires an intricate relationship with the suspended roots of the host plant. *N. eichhorniae* is smaller, has greater sexual dimorphism, greater activity and rate of feeding, and a lower reproductive rate than *N. bruchi*; also, its eggs are soft for a day or 2 after oviposition which differs from the rigid eggs of the other species and is probably an adaptation to conditions inside the host plant.

The hypothesis is made that the general trend of specialization has been in the direction of restricted host range, specialized host-plant relationships, smaller size, and greater activity of the weevils. The phylogenetic development of the 4 species of *Neochetina* appears to have paralleled the development of the free-floating trait in the Pontederiaceae. The more generalized species (*N. affinis*) developed on the emergent and floating-leaved hydrophytes (*Pontederia, E. azurea,* and *Reussia*) and the more advanced species (*N. bruchi* and *N. eichhorniae*) on a free-floating hydrophyte (*E. crassipes*). *Neochetina* n. sp. occupies an intermediate position; it is morphologically more similar to *N. bruchi* and *N. eichhorniae* but its host plant is the emergent hydrophyte, *Pontederia*.

Acknowledgements

I express appreciation to George E. Allen, Department of Entomology and Nematology, University of Florida for providing travel funds for the collecting trip; to Rose Ella Warner, Systematic Entomology Laboratory, ARS, Washington, D. C. and Horace Burke, Department of Entomology, Texas A&M University for critically reviewing the manuscript; and to Manuel Viana, Museo Argentino de Ciencias Naturales Bernardino Rivadavia for assisting in the identifications.

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LITERATURE NOTICE

The latest issue (Vol. 26) of **Entomologische Arbeiten aus dem Museum G. Frey** was issued 1 Nov. 1975. The table of contents is listed below. Copies are available on exchange from the museum 8132 Tutzing bei Munchen, W. Germany.

Endrödi, S.: Monographie der Dynastinae (Col. Lamellicornia, Melolonthidae). 4. Tribus: Pentodontini der äthiopischen Region, II 321
Frey, G.: Eine neue südamerikanische Gattung und Tribus der Melolonthiden 84
Frey, G.: Neue afrikanische und indische Sericinen (Col. Melolonthidae) 181
Frey, G.: Neue südafrikanische Onthophagini gesammelt vom Dung beetle research unit, Pretoria (Col. Scarabaeidae) 191
Frey, G.: Neue Onthophagen aus Südindien und Afrika (Col. Scarabaeidae) 198
Frey, G.: Bestimmungstabelle der südamerikanischen Arten der Gattung Phyllophaga Harris und ihrer Untergattung Phytalus Er. (Col. Melolonthidae) 201
Frey, G.: Neue Macrodactylini (Col. Melolonthidae) 252
Frey, G.: Neue Melolonthiden und Ruteliden aus den Beständen der Zoologischen Staatssammlung München 256
Frey, G.: Zwei neue Anomala-Arten (Col. Melolonthidae Rutelinae) 275
Frey, G.: Eine neue Lepidiota Sumatra (Col. Melolonthidae) 277
Frey, G.: Neue Coprophagen aus dem Zentralafrikanischen Museum in Tervuren (Belgien) und aus meinem Museum 292
Frey, G.: Neue madegassische Sericinen und Coprinen vom Zentralafrikanischen Museum in Tervuren bei Brüssel 297
Frey, G.: Neue indische Ruteliden 314
Frey, G.: Zwei neue Holotrichia-Arten aus Ceylon und Südindien (Col. Melolonthidae) 316
Mandl, K.: Neue Carabus-Arten aus China (Col. Carabidae) 278
Martínez, A.: Contribución al conocimiento de los Pachydemini neotropicales (Col. Scarabaeidae, Melolonthidae) 227
Martínez, A.: Cyclocephala sudamericanas nuevas o poco conocidas (Col. Scarabaeidae Dynastinae) 263
Martínez, A.: Una nueva Especie de Aspidolea de Ecuador (Col. Scarabaeidae, Dynastinae) 307
Nelson, G. H.: A revision of the genus Dicerca in North America (Coleoptera: Buprestidae) 87
Tomov, V.: Eine neue Luperus-Art aus Südjugoslawien (Coleoptera, Chrysomelidae, Galerucinae) 188
Würmli, M.: Gattungsmonographie der altweltlichen Hispinen (Coleoptera: Chrysomelidae: Hispinae) 1
Würmli, M.: Eine neue Art der Gattung Monrosiella Bechyne, 1945 (Chrysomelidae, Eumolpinae) 319
Literaturbesprechungen 362
Hans Kulzer 363

THE GROUND BEETLE TYPES OF MAX LIEBKE IN THE SMITHSONIAN INSTITUTION, WASHINGTON, D. C. (COLEOPTERA: CARABIDAE)

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Abstract

The carabid collection of Max Liebke was partially destroyed in World War II. That which survived was fragmented and is now found in several museums. An annotated list of Liebke's type specimens, housed in the Smithsonian Institution's National Museum of Natural History, is provided. For the most part, Liebke used syntypes for his descriptions. These are selected as lectotypes where appropriate in the USNM.

According to Horn and Kahle (1935) the carabid collection of Max Liebke was placed in the Zoological Museum in Hamburg, Germany, in 1932. According to Reichardt (1974 and in litt.) at least some of Liebke's material was destroyed in World War II, however, much of it was saved and is now in Warszawa, Poland [IZWP] in the Institute of Zoology of the Polish Academy of Sciences (Mroczkowski, 1960). Other material, borrowed and studied by Liebke, was returned to various lenders before the war and also remained safe. Some material that Liebke borrowed was from the Nevermann Collection; this collection is now housed in the Smithsonian Institution [USNM], Washington, D. C.

The purpose of this paper is to list those specimens labeled as types by Liebke which are in the USNM and select lectotypes from the various syntype series where necessary. This task was undertaken at the request of Hans Reichardt, São Paulo, Brazil, who is attempting to bring order to the chaos in South American Carabidae and who is in need of knowing where Liebke's material has ended up after the unfortunate fragmentation of the collection.

Lebia costaricensis Liebke 1935:167.

Five paratypes, USNM number 54417, all from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica. Liebke specifically declared a type in this case and stated that it was from Turrialba, C. R. The holotype and 3 paratypes are in IZWP. According to Liebke (1935:168), additional material was placed in Paris.

Lebia reventazonica Liebke 1936:127.

One syntype, male, herewith selected as lectotype, USNM number 54419, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica. An additional specimen is in IZWP.

Lebia hexasticta Liebke 1936:127.

One syntype, male, herewith selected as lectotype, USNM number 54418, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica. Liebke (1936:128) mentioned that he saw 2 specimens and that he retained 1; Mroczkowski (1960) did not mention the second as being in IZWP.

Heraldinium nevermanni Liebke 1927:101.

Two syntypes, both males, the first herewith selected as lectotype, USNM number 54408, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica. Reichardt (1964) pointed out that this species belongs in the genus *Otoglossa* Chaudoir. Liebke (1927:104) mentioned he had 4 specimens; 2 of these are unaccounted for even though 1 was supposed to have been returned to Nevermann.

Epikastea limonae Liebke 1936:125.

One syntype, female, herewith selected as lectotype, USNM number 54416, from Waldeck Farm, Limon Province, Costa Rica. An additional specimen is in IZWP. This genus is related to *Euproctinus* and *Plochionus.*

Calophaena nevermanni Liebke 1930:714.

Two syntypes; the male herewith selected as lectotype, USNM number 54405, from Las Mercedes, Limon Province, Costa Rica.

Calophaena costaricensis Liebke 1930:715.

Fourteen syntypes; a male labelled 07 Nov 24 herewith selected as lectotype, USNM number 54406, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica.

Calophaena sexmaculata Liebke 1930:719.

Three syntypes; a female labelled 15 Sept 22 herewith selected as lectotype, USNM number 54407, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica.

Pseudaptinus schmidti Liebke 1936:126.

One syntype, a male, herewith selected as lectotype, USNM number 54413, from La Caja, near San Jose, Costa Rica. One additional specimen is in IZWP.

Pseudaptinus nevermanni Liebke 1936:126.

One syntype, a female, herewith selected as lectotype, USNM number 54412, from Hamburg Farm, Rio Reventazon, Limon Province, Costa Rica. One additional specimen is in IZWP.

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TWO WEST INDIAN SPECIES OF *CONODERUS* OCCURRING IN FLORIDA (COLEOPTERA: ELATERIDAE)

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Abstract

Conoderus bifoveatus (Palisot de Beauvois) and *C. rufidens* (Fabricius) are reported from Florida for the first time, although some specimens were collected there as early as 1875. The pertinent features of these species are tabulated and figured and the species are compared with the native *lividus* (DeGeer).

For several years I have found specimens of a species of *Conoderus,* usually confused with the common and widespread *lividus* (DeGeer), in collections from Florida. More recently I discovered that these specimens actually represented 2 closely allied species. Both species are known in Florida only from the southeastern coastal areas, therefore it seems very likely that they are West Indian in origin.

The West Indian as well as the other neotropical species of *Conoderus* are poorly known. Without revisionary studies, it is practically impossible to be sure of the correct identities of the species. Obviously it is beyond the scope of this paper to make such a comprehensive study. About 35 years ago, J. M. Valentine started a revision of the Conoderini. His notes and illustration are on file at the Systematic Entomology Laboratory, USDA, Washington, D. C. Although I have not seen these, I did borrow the specimens used by Valentine, which included both West Indian and Floridian material of the 2 species in question. He considered the West Indian specimens to be either *Conoderus bifoveatus* (Palisot de Beauvois) or *C. rufidens* (Fabricius) and he assigned manuscript names to both of the Floridian species. My studies do not indicate any material differences between the West Indian and Floridian specimens, but perhaps a comprehensive study will indicate differences or even a change in the names used here.

As far as I can determine, neither *bifoveatus* nor *rufidens* has been reported from the United States, although Fleutiaux (1947:118) did include the United States in the distribution of *rufidens.* Adults of both of these species were taken by Hubbard and Schwarz, *rufidens* at Capron in 1875 and *bifoveatus* at Lake Worth and at Biscayne in 1887, as evidenced by specimens in the United States National Museum of Natural History. These specimens were included in the material studied by Valentine. Schwarz (1878) apparently confused these specimens with those of the common and widespread *lividus,* however, he did make the statement (p. 353): ". . . the ocean and lagoon beaches of the eastern shore, especially at Capron, are rich in peculiar forms, and as the Gulf Stream here flows only six or eight miles off the coast, it is quite possible that many of these species are direct importations brought in the West Indian seeds and drift-wood constantly being thrown upon this low and sandy coast."

At least 2 neotropical species of *Conoderus* are now considered as pests in the southern states: the Gulf wireworm, *C. amplicollis* (Gyllenhal), and the southern potato wireworm, *C. falli* (Lane). Both are widespread from South Carolina to California (see Stone 1975, for the California records). Specimens of *bifoveatus* and *rufidens* were first taken in Florida in 1875 and 1887 respectively and nearly a century later their distribution is still restricted to the coastal areas from Indian River County to Key West. Therefore it seems doubtful that either will develop into a pest species as did *amplicollis* and *falli.*

Specimens of the common *lividus* are readily distinguishable from those of either *bifoveatus* or *rufidens* by the characters of the mesosternal cavity. In *lividus* the sides of the cavity (Fig. 10) gradually slope between the middle coxae and the posterior edge is on the same level as the adjoining metasternum. In the other 2 species the sides of the cavity (Fig. 11, 12) abruptly slope between the middle coxae. In *bifoveatus* the posterior edge is rounded anteriorly (oblique ventral view) and noticeably raised above the adjoining metasternum, but in *rufidens* the posterior edge is not rounded and is only slightly raised.

Less obvious differences between *lividus* and the other 2 species are that in *lividus* the prothorax has the sides more converging near the anterior margin and it is less convex transversely, also the punctation is conspicuously of 2 sizes (not to be confused with the double punctation such as found in *amplicollis*); this latter character is frequently more noticeable on the prosternum and proepisternum. In specimens of *bifoveatus* and *rufidens* the prothorax has the sides more parallel and is more convex transversely (more like in *parallelus* (LeConte)) and the punctures are nearly uniform in size.

The male genitalia (Fig. 1) of *lividus* are very distinct because of the asymmetry of the bases of the lateral lobes on the dorsal side; the other 2 species have symmetrical genitalia (Fig. 2, 3).

The external differences between specimens of *bifoveatus* and *rufidens* are much more subtle. Rather than formal description, I have tabulated the average differences between them. There is some overlap in the external characters, therefore the only reliable characters are found on the male genitalia.

Conoderus lividus (DeGeer)

This species was originally described from specimens from Pennsylvania. It is commonly found throughout eastern United States from southern New York to central Texas and Kansas. It is not known from Canada except for 1 specimen taken at Fossambeault (Portneuf County), Quebec (47° 22′ N, 71° 19′ W). Although considerably removed from the usual distribution, I have no reason to doubt the collector's data.

Conoderus bifoveatus (Palisot de Beauvois)

This species was originally described from specimens from Saint Dominque. Blackwelder (1944) recorded it from various islands in the West Indies. *Conoderus bifoveatus* appears to be more common than *rufidens* and, as far as I know, it is restricted to the West Indies and southern Florida.

I have seen 84 specimens from the following localities in Florida: Bahia Honda Key; Big Pine Key; Dry Tortugas; Flamingo, Monroe Co.;

Fort Lauderdale; Homestead; Jupiter; Key Biscayne; Key Largo; Key West; Lake Worth; Miami; Miami Beach; Paradise Key, near Everglades Nat. Pk. Hdqts.; Plantation Key; Rivieria Beach; Stock Island; Summerland Key.

Specimens of *bifoveatus* have been taken along the southeastern coast of Florida from Jupiter (extreme northeast corner of Palm Beach Co.) to Flamingo (southeast corner of Monroe Co.) and to Key West and the Dry Tortugas.

There are 2 specimens of *bifoveatus* in the United States National Museum of Natural History labelled "Coll Hubbard and Schwarz, Lake Worth, Fla., 6/5 [June 5]" and "Coll Hubbard and Schwarz, Biscayne, Fla., 5/11 [May 11]." In a letter to Mrs. Slossen (see Sherman 1929:273), Schwarz

Table of differences between *C. bifoveatus* & *C. rufidens*

bifoveatus	*rufidens*
Size smaller, 9.5-13.5mm (males); 10.5-14.5mm (females).	Size larger, 13.0-14.0mm (males); 13.5-17.5mm (females).
Body less robust.	Body more robust.
Mesosternal cavity (Fig. 14) with sides abruptly sloping between middle coxae, produced and rounded (side view) near posterior margin; cavity narrower, minimum width equal to width of 1st antennal segment.	Mesosternal cavity (Fig. 15) with sides abruptly sloping between middle coxae, but not as produced near posterior margin; cavity wider, minimum width greater than width of 1st antennal segment.
Prosternal spine bent slightly inwardly, definitely curved between front coxae (side view); spine not sharply pointed at apex.	Prosternal spine nearly in line with rest of prosternum (side view); spine quite sharply pointed at apex.
Antenna longer, extending about 1 segment beyond apex of hind angle of pronotum (males) or nearly to apex (females); 3rd segment slightly but not too obviously longer than 2nd (Fig. 5).	Antenna shorter, extending to apex of hind angle of pronotum (males) or failing to reach apex by about 2 segments (females); 3rd segment intermediate in length between 2nd and 4th, very obviously longer than 2nd (Fig. 6).
Tarsal lobe (Fig. 8) less than half length of 5th segment; about 2 times wider than 5th segment.	Tarsal lobe (Fig. 9) more than half length of 5th segment; about 3 times wider than 5th segment.
Prothorax with hind angle more slender.	Prothorax with hind angle stouter.
Pubescence not as prominent.	Pubescence more prominent.
Male genitalia (Fig. 2) shorter and more robust; median lobe wider, gradually tapering to apex; lateral lobe with inner margin straight, outer margin sinuate, apex very blunt, and with spines concentrated nearer to apex.	Male genitalia (Fig. 3) longer and not as robust; median lobe narrow, sides sinuate; lateral lobe with apical part curved inwards, apex rounded and with spines extending a considerable distance from apex.

noted that he collected at Lake Worth in 1887; Howard et al. (1928:165) noted that Schwarz first collected at Key West and Biscayne Bay also in 1887. Neither of these reports mention that Hubbard was on this trip, yet his name is on the labels. These specimens represent the earliest known records for *bifoveatus* from Florida.

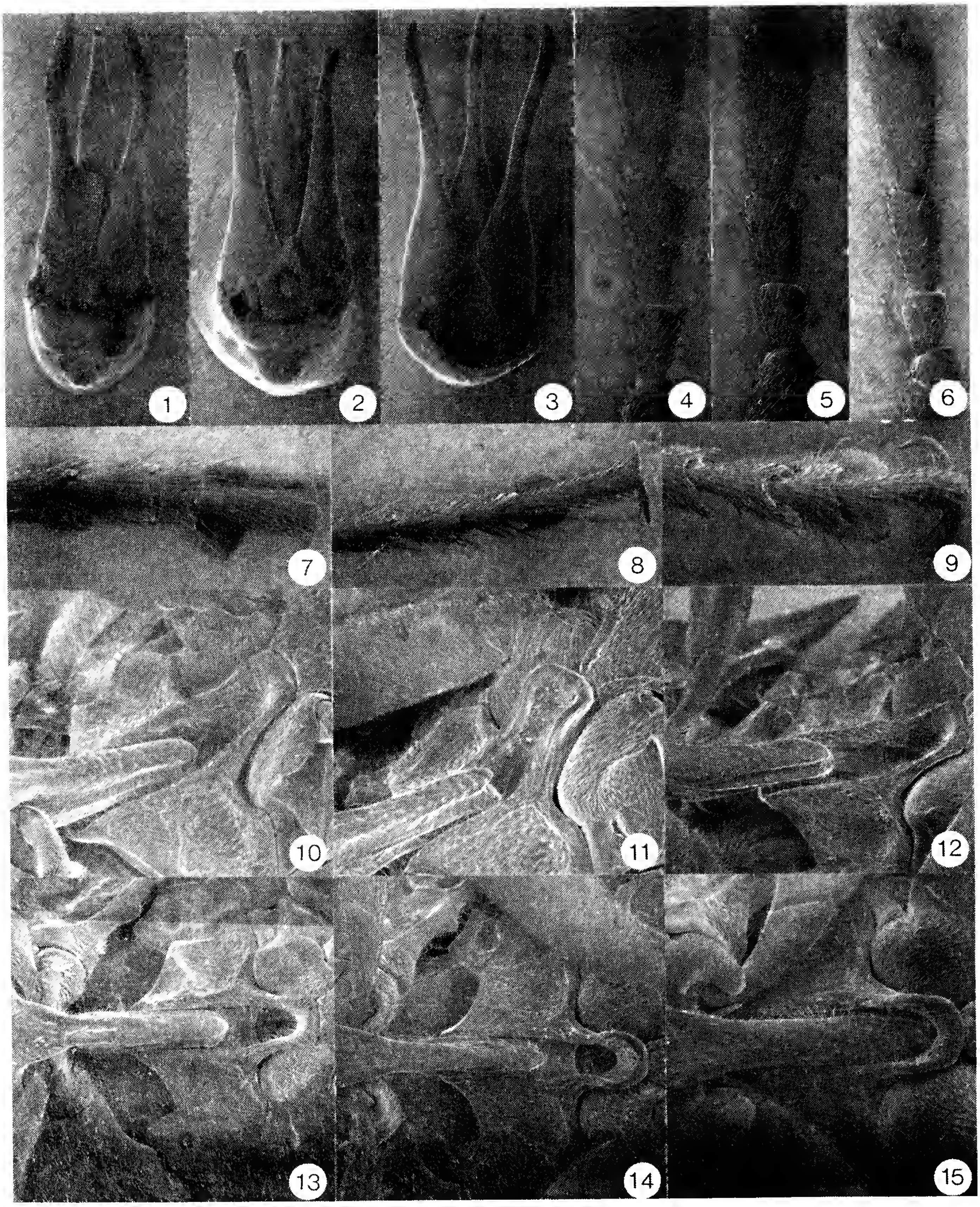

Fig. 1-15, *Conoderus* spp. 1, 4, 7, 10, 13, *lividus*; 2, 5, 8, 11, 14, *bifoveatus*; 3, 6, 9, 12, 15, *rufidens*. 1-3, male genitalia, dorsal view; 4-6, antenna; 7-9, tarsus; 10-12, prosternal spine and mesosternal cavity, oblique ventral view; 13-15, prosternal spine and mesosternal cavity, ventral view.

Conoderus rufidens (Fabricius)

This species was described from specimen(s) taken by Smidt from "America meridionalis." According to Papavero (1971:21) Smidt "visited, besides several West Indian islands, certain places on the South American mainland, such as Essequibo and Demerara in the present British Guiana; therefore, all of the South American species cited as having been collected by Smidt can with certainty be considered as coming from the vicinity of the named localities." Blackwelder (1944) listed *rufidens* from Brazil and Guadeloupe. Fleutiaux (1947:118) recorded *rufidens* from "Guadeloupe, Désirade, Etats-Unis, Cuba, Sainte-Dominque, Mexique, Amérique méridionale." I am unaware of why he listed the United States among the other neotropical localities. I have also seen specimens from Palisadoes and Duncans in Jamaica. The species is probably fairly widespread throughout the Caribbean coastal regions.

I have seen 13 specimens from the following localities in Florida: Bahia Honda Key; Big Pine Key; Capron (near Vero Beach); Key Largo; Key West; Miami; Miami Beach; Palm Beach. These localities extend along the coast from Capron (near Vero Beach) to Key West.

Hubbard and Schwarz collected a male at Capron on 15 April. According to Schwarz (1878:353) he and Hubbard were at Fort Capron from 26 March to 28 April 1875. This is the earliest known specimen of *rufidens* from Florida.

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—R. E. Woodruff

A NEW SPECIES OF *COLOPTERUS* FROM FLORIDA (COLEOPTERA, NITIDULIDAE).

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ABSTRACT

A new species (*Colopterus floridanus*) from central Florida is described and figured. A key to the species of *Colopterus* occurring in America north of Mexico is included along with illustrations of some of the key characters.

In Parsons' "Revision of Nearctic Nitidulidae" (1943) 6 species of *Colopterus* Erichson are keyed and described. A seventh species from the southwestern United States was described by Gillogly in 1969. The species described below is not closely related to any of the described species, having a very distinctive fore tibia (Fig. 5). The key to the 8 United States and Canadian species is adapted from Parsons (1943). We suspect that *gerhardi* Dodge may simply be an aberrant *niger* (Say), and that "*truncatus* (Randall)" as keyed here may represent a complex of several close species (see Parsons 1943:158).

Colopterus floridanus Parry and Howden, **new species**
(Fig. 3, 4, 5, 8, 10, 11)

Holotype: Male, length 3.5mm, greatest width 1.8mm. Shape elongate oval (Fig. 3), not strongly depressed (Fig. 8). Color uniformly light reddish-brown; antennal club pale brown. Dorsal pubescence golden, fine, and recumbent; dorsal punctures anteriorly each with a seta arising from a small raised granule.

Head with vertex and clypeus moderately punctate; punctures contiguous, slightly oblong; surface appearing rugose. Terminal segment of antenna obtusely angled at apex.

Pronotum (Fig. 4) with greatest width to length ratio 1.7 to 1; base very feebly bisinuate, almost truncate; sides arcuate, strongly convergent only in apical one-third; hind angles broadly rounded, not projecting backward. Marginal pronotal setae contiguous, approximately 0.08mm in length. Pronotal disc densely punctate; punctures of moderate size, larger than on head, shallow, separated by approximately one-half diameter; surface between punctures finely reticulate.

Scutellum (Fig. 3, 4), except for apical one-sixth, densely punctate; punctures very shallow, appearing oblong, indistinctly delimited but with seta-bearing granules prominent; apex evenly, abruptly rounded.

Elytra (Fig. 3) densely, irregularly punctate, more finely punctate than pronotum; punctures as on scutellum; surface between punctures finely reticulate; lateral margins ciliate as in pronotum except setae slightly shorter; apex of each elytron arcuate.

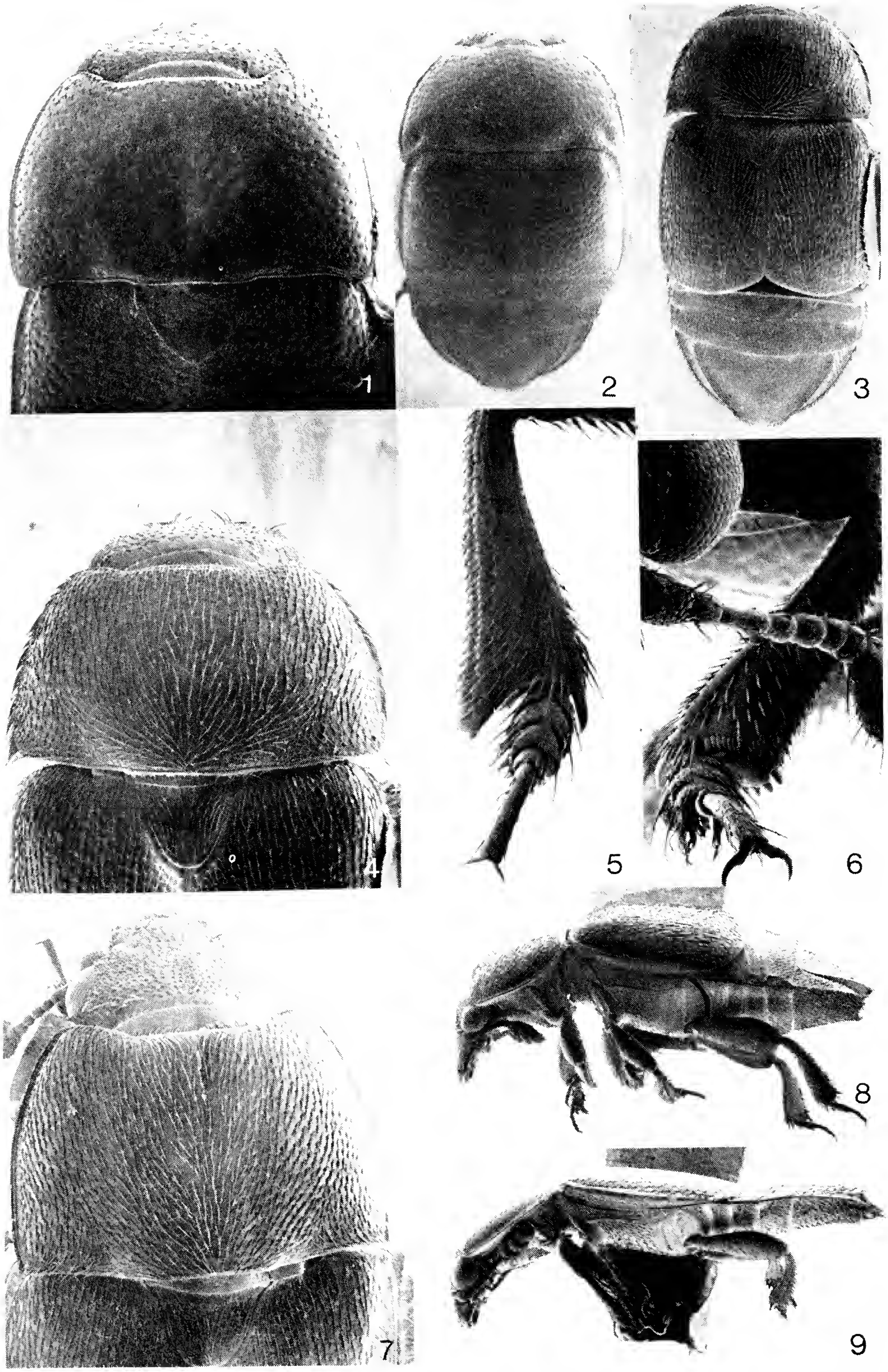

Fig. 1-9. *Colopterus* spp.: 1) *semitectus* (Say), dorsal view of head, pronotum and scutellum; 2) *niger* (Say), dorsal view; 3-5) *floridanus* n. sp., holotype male: 3) dorsal view; 4) dorsal view of head, pronotum and scutellum; 5) dorsal surface of right fore tibia and tarsus; 6) *unicolor* (Say), anterolateral view of left fore tibia and tarsus; 7) *unicolor* (Say), dorsal view of head, pronotum and scutellum; 8) *floridanus* n. sp., holotype male, left lateral view; 9) *semitectus* (Say), left lateral view.

Abdominal terga (Fig. 3) densely punctate, more finely, indistinctly punctate than scutellum and elytra; seta-bearing granules on last 2 segments prominent; surface between punctures finely reticulate; pygidium almost truncate at apex, very shallowly emarginate at middle of hind margin.

Prosternum smooth, sparsely, obsoletely punctate; surface very finely alutaceous. Abdominal sterna indistinctly shallowly punctate, densely setose, each seta arising from a small raised granule; surface between granules very finely reticulate; hypopygidium with apical emargination distinctly bisinuate, sides feebly, indistinctly denticulate.

Fore tibia expanded outwardly at apex into a slender apically toothed projection (Fig. 5).

Genitalia as in Fig. 10-11.

Allotype: Female, length 4.0mm, greatest width 1.9mm. Differs from holotype in the following respects: pronotal punctures more crowded; scutellum entirely punctate; apex of pygidium broadly rounded; hypopygidium with a broad, shallow longitudinal median depression, not emarginate apically.

HOLOTYPE: Male, Florida, near Clarksville, 21-III-54, malt, H. Howden (Howden). ALLOTYPE: Female, same data as holotype (Howden). PARA-

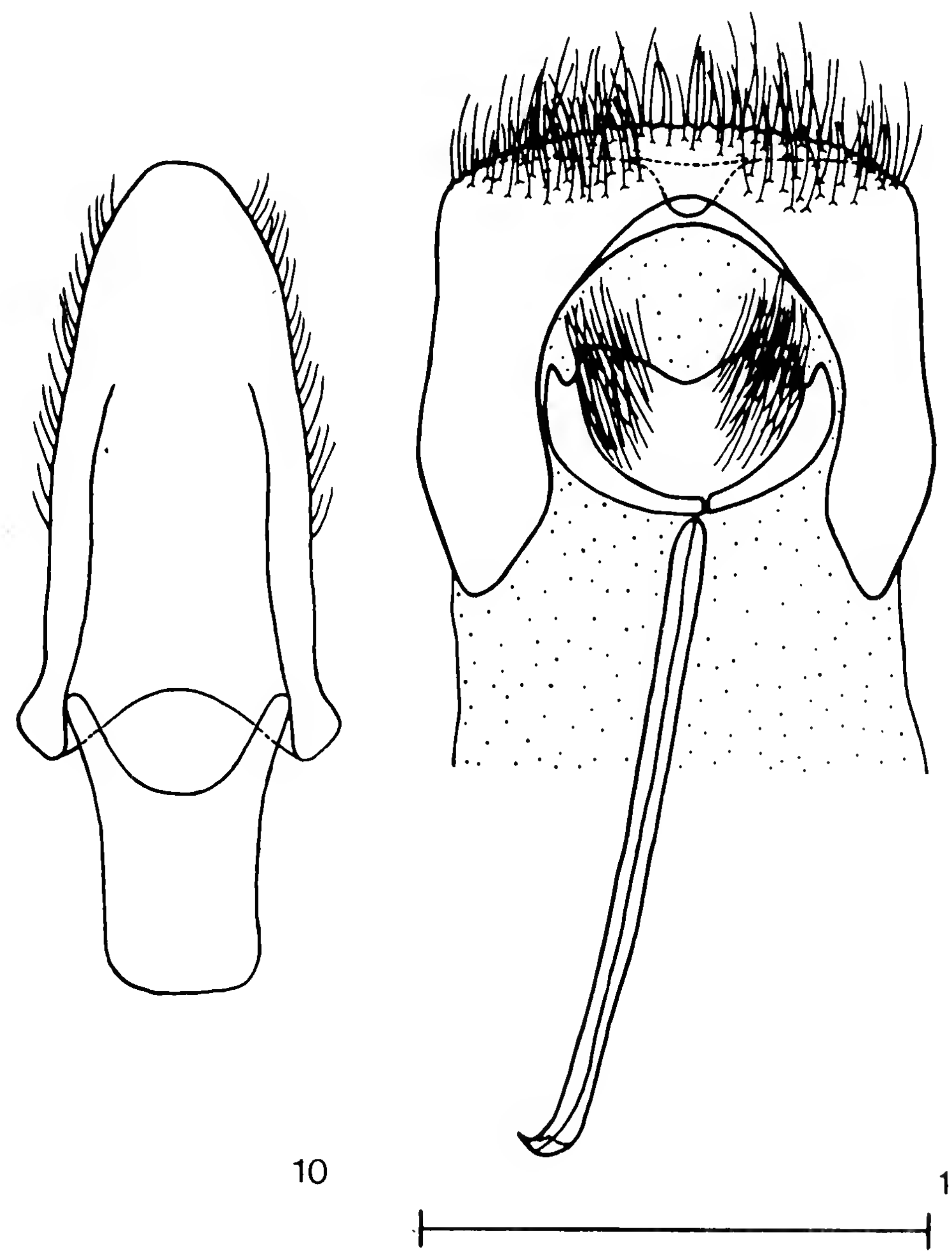

Fig. 10, 11. *Colopterus floridanus* n. sp., paratype male: 10) ventral view of phallobase; 11) ventral view of eighth sternite and tergite.

TYPES (6): Florida: 1 male, 1 female, same data as holotype and allotype; 1 male, 1 female, Walton Co., 5 mi. east of Mossy Head Tower, 11-15-X-59, malt can trap, R. E. Woodruff; 1 female, 4 mi. north of High Springs, 19-III-53, light, Howden and Dozier; 1 female, 3.6 mi. north of O'Brien, 17-III-56, malt, Howden and Howell.

Paratypes are deposited in the Florida State Collection of Arthropods, Howden, and Parry collections.

Discussion: Variation in the series is slight. Males range in length from 3.4 to 3.8mm and in greatest width from 1.8 to 1.9mm. The females range in length from 3.7 to 4.0mm and in greatest width from 1.8 to 2.0mm. Color varies generally from light to medium reddish-brown, some of the paratypes having the outer diagonal half of the elytron from behind the humeral umbone to the sutural apex and the terminal 2 abdominal terga dark brown. The setae of the pronotal margins range in length from 0.06 to 0.08mm. Females have the scutellum entirely punctate and the pronotal punctures slightly more crowded than in males.

The broadly rounded, obtuse hind angles of the pronotum separate *floridanus* from all other North American species of *Colopterus* except *testaceus* Gillogly and the *truncatus* (Randall) complex. The conspicuous outward projection at the apex of the fore tibia (Fig. 5) and the relatively convex body (Fig. 8) will separate *floridanus* from both *truncatus* and *testaceus*. *C. floridanus* also differs from *truncatus* and relatives in its larger size and from *testaceus* in having the elytral punctures and setae irregularly placed.

Key to species of *Colopterus* Erichson
(of America north of Mexico)

1. Fore tibia without outward prolongation at apex (Fig. 6); body moderately to strongly depressed (Fig. 9) 2
1′. Fore tibia with toothed outward prolongation at apex (Fig. 5); body not strongly depressed (Fig. 8) .... *floridanus* n. sp.

2(1). Hind angles of pronotum obtuse, rounded (Fig. 4) 3
2′. Hind angles of pronotum right-angled or acute, projecting backward (Fig. 7) 4

3(2). Elytra serially punctate and setose; length 2.9 to 4.4mm .... *testaceus* Gillogly
3′. Elytra irregularly punctate and setose; length 1.5 to 2.7mm .... *truncatus* (Randall)

4(2′). Scutellum smooth at tip 5
4′. Scutellum densely punctate (Fig. 7); uniformly colored .... *unicolor* (Say)

5(4). Form broadly oval (Fig. 2) 6
5′. Form oblong, much depressed (Fig. 9) .... *semitectus* (Say)

6(5). Pronotum with an oblique sulcus in each hind angle (Fig. 2) 7
6′. Pronotum without sulcus; elytra maculate .... *maculatus* (Erichson)

7(6). Length 3.6 to 5.0mm; black; each elytron depressed .... *niger* (Say)
7′. Length 3.5mm; testaceous; each elytron broadly convex .... *gerhardi* Dodge

ACKNOWLEDGMENTS

We thank Dr. Robert Woodruff, Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Bureau of Entomology, Gainesville, Florida, for the loan of material. We would also like to thank Mr. L. E. C. Ling, Carleton University, for assistance with the scanning electron microscope pictures.

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NEW RECORDS OF *OLIGOTA* MANNERHEIM (STAPHYLINIDAE) IN FLORIDA

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I am aware of only 1 published record of the occurrence of the genus *Oligota* in Florida; Notman (1920) recorded examples of *O. parva* Kr., collected at Enterprise (Volusia Co.), in the American Museum of Natural History.

Based on my examination of additional material, *O. parva* is not the only *Oligota* species present in Florida. *O. chrysopyga* Kr., *O. zonata* Brg., and *O. testaceorufa* Bernh. are recorded as new not only for Florida, but also for the United States. Examples of these species may be identified by means of the key given by Frank (1972).

Records are as follows, all examples in my collection except where stated.

O. chrysopyga: Florida, Indian River Co., Vero Beach, 18-XII-1973, Berlese funnel extract of chicken guano, J. H. Frank and W. G. Guthrie (4 males, 5 females).

O. zonata: Florida, Indian River Co., ca. 4 mi. South of Vero Beach, 13-III-1973, Berlese funnel extract of old pack rat (*Neotoma floridana* Ord) nest, J. H. Frank (1 male).

O. testaceorufa: Florida, (Brevard Co.), Lake Poinsett, 1-V, Hubbard and Schwarz (7), (Flagler Co.), Haw Creek, 11-VI, Hubbard and Schwarz (9, including at least 2 males), (Volusia Co.), New Smyrna, VI, Hubbard and Schwarz (1) (all 17 in United States National Museum).

O. parva: Florida, Indian River Co., Vero Beach, 18-XII-1973, Berlese funnel extract of chicken guano, J. H. Frank and W. G. Guthrie (11 males, 7 females), 5-XII-1974, Berlese funnel extract of chicken guano, J. H. Frank, (12 males, 11 females).

Three of the female *O. chrysopyga* were crudely dissected in order to discover whether a sclerotized spermatheca is present, the shape of which might be used as an additional taxonomic character; if a spermatheca is present it is a soft, unsclerotized structure. Williams (1970) reported that female *O. parva* do not have a sclerotized spermatheca; this was confirmed. The condition of the labium of a male and of a female *O. chrysopyga* was examined (thus destroying the examples) to reveal that this has 2 minute lobules characteristic of the subgenus *Oligota* s. str. Thus *O. chrysopyga* and probably *O. cadaverina* Brg. (whose aedeagus appears very similar) should be repositioned in the arrangement given by Frank (1972) so as to lie after *O. parva* and not before *O. hypocyptina* Bernh. S. A. Williams (in litt.) has also pointed out to me that *O. chrysopyga* belongs to *Oligota* s. str. and not to *Holobus*.

Both the pack rat nest and the chicken guano contained very large numbers of mites (Acari); this is of interest because several species of *Oligota* are recorded by Frank (1972) to prey on mites. I infer from Schwarz (1878) that the examples of *O. testaceorufa* were collected in 1875 or 1876.

I am indebted to T. L. Erwin for arranging the loan to me of the examples of *O. testaceorufa*.

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TREND CURVES OF THE RATE OF SPECIES DESCRIPTION FOR CERTAIN NORTH AMERICAN COLEOPTERA

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ABSTRACT

Trend curves of the rate of species description are presented for some families of Coleoptera, and a resumé curve is given for 36% of the North American beetles described to 1970. There is a discussion of the characteristics of trend curves and the methods used in this paper. For each trend curve the years for approximate end-point of species description are given with an estimate of the final total number of species. The resume curve allows an estimate of the final total number of described species for North America (27,400).

INTRODUCTION

An estimate of the final total number of living species for a group in which species tabulation is unfinished has very often been little more than an educated guess. Though these estimates are of great general interest, there is the uncertainty of accepting nonconfirmable figures arrived at by unknown methods. Fortunately, there is now a means of estimating final species totals that promises reliability and which allows the results to be verified. This means is the trend curve technique developed by Steyskal (1965) for the rate of species description. This very useful statistical tool affords a relatively precise means of estimating final species totals.

TREND CURVE CHARACTERS

A trend curve plotted for the rate of species description for a group well-known taxonomically (for example, birds or butterflies of North America) is a smooth sigmoid curve, as shown in Steyskal (1965:880). In rate of climb this curve starts slowly, gradually increases until there is a nearly straight-line ascent, then slows, with the curve arching over, and finally leveling off. Such a curve in which the upper end has leveled off and nearly or quite ceased to climb shows that the finite number of species in nature is essentially known, and the end-point of species description is attained or very near.

In a trend curve there is a very strong tendency for the top half of the curve to match closely the bottom half. Thus a curve of an incompletely known group bears a predictive value that can be used to estimate the final species total. To make use of this predictive value, the curve must be well past the mid-point with the rate of ascent clearly having slowed so the end-point can be plotted. By transposing the bottom of this curve over the top,

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one can arrive at a prediction of the species total for the group. When a partial curve is still on the ascent with the rate of climb not yet having slowed, there is no way of accurately plotting the end-point of the curve.

Methods and Application

In plotting a trend curve of the rate of species description, use graph paper and fix the years by decades along the bottom of the graph (x-axis),

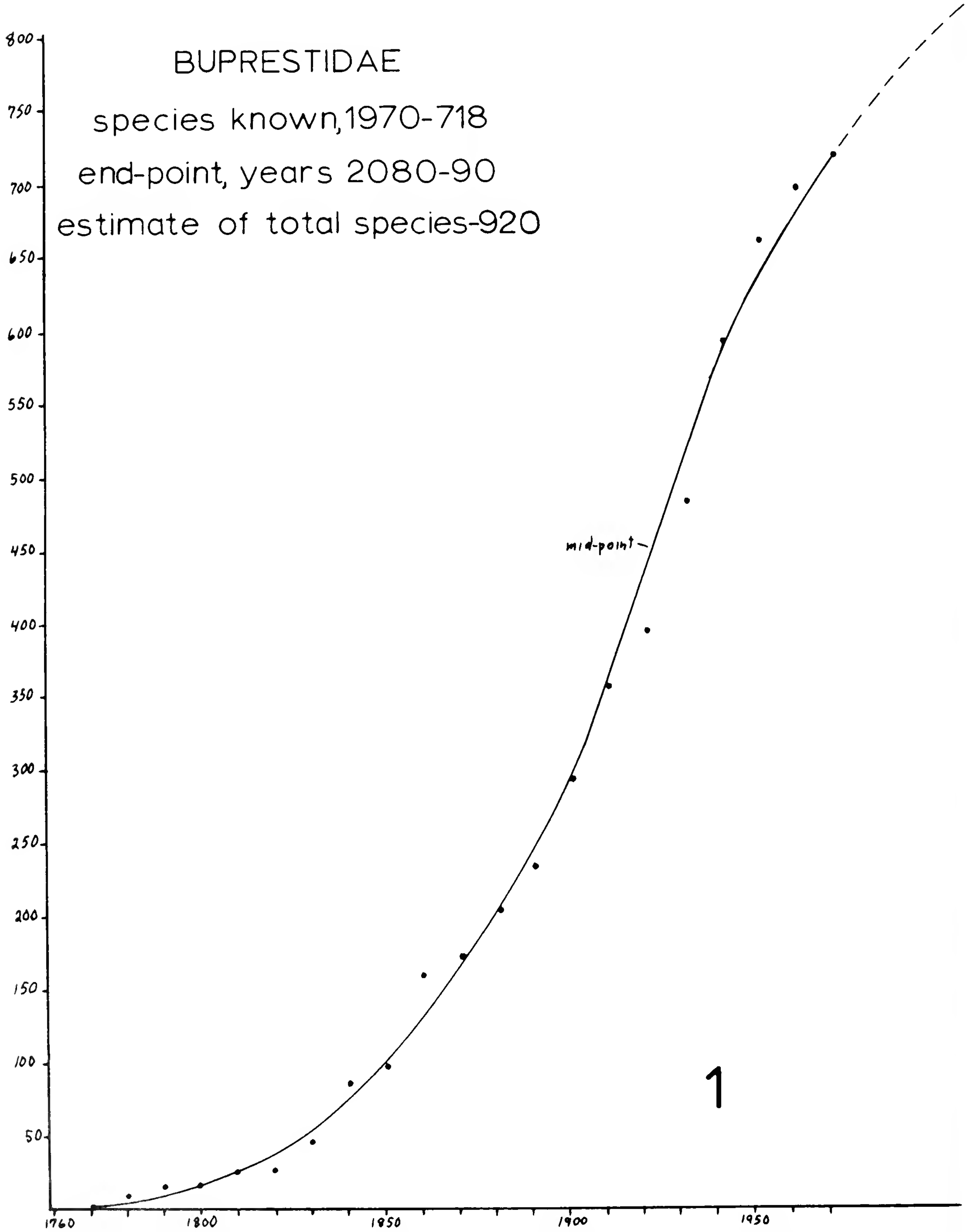
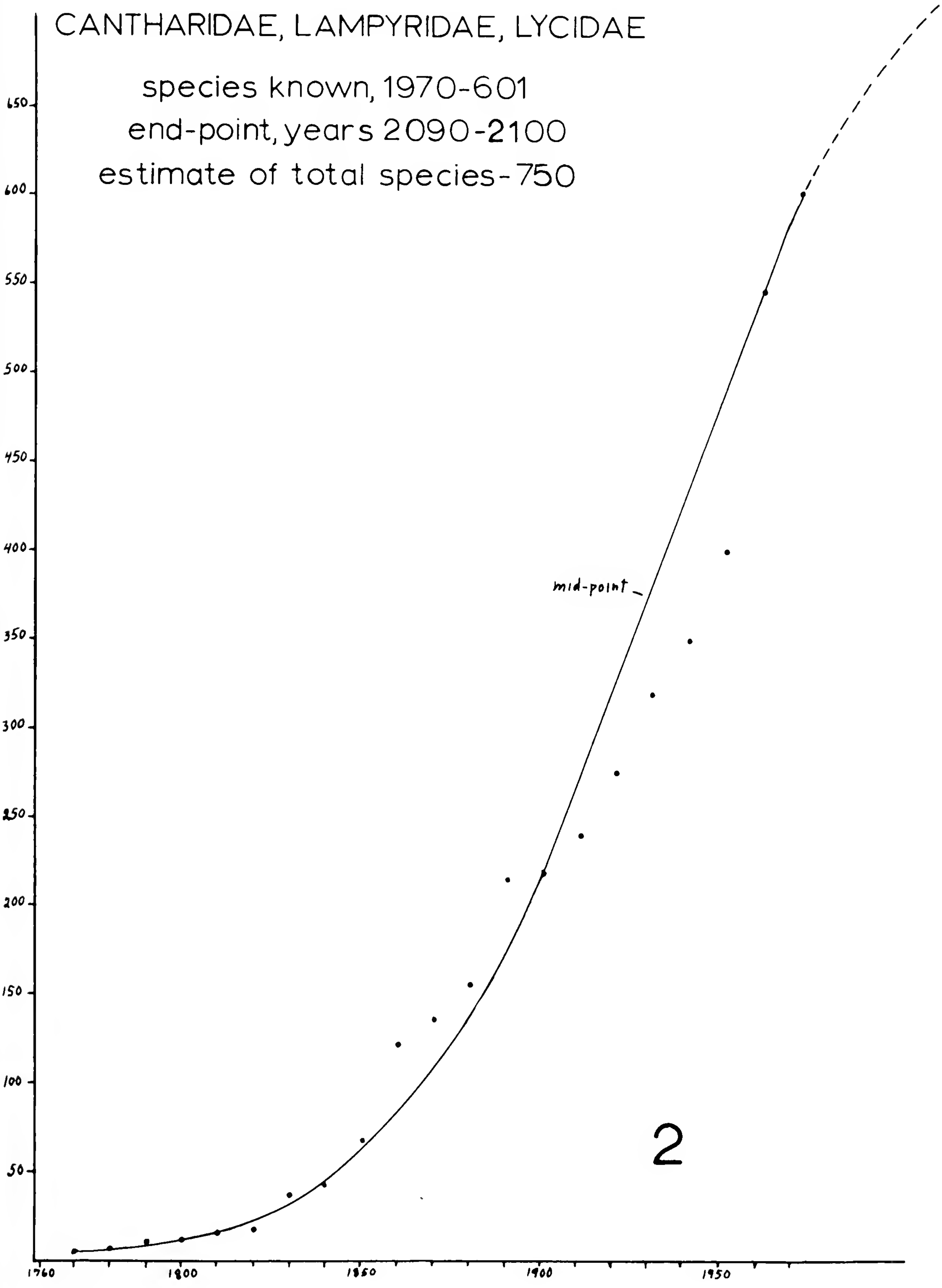


Fig. 1-12. Trend curves for indicated families. Fig. 13. Resumé trend curve.

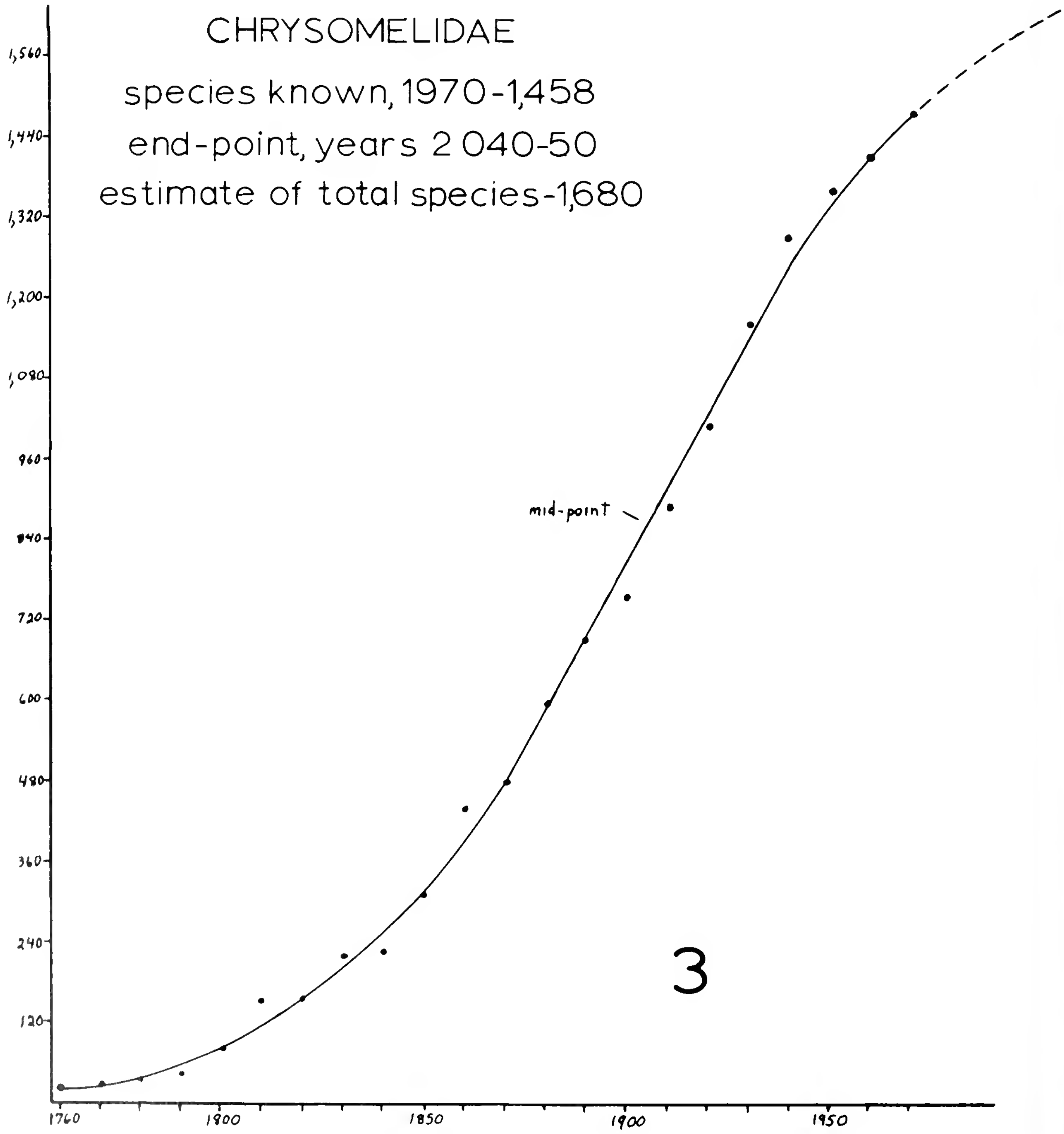
and the numbers of described species along the left, vertical side of the graph (y-axis). Place points on the graph for the accumulated number of presently valid species at the end of each 10-year period. Placement of the points on the graph must be done with great care, especially around the upper end of the graph. The latter area is critical because misplacement of a point in this area can easily distort a curve and produce unreliable re-



sults. To draw the curve connect the first point to the last while joining the maximum number of points and leaving an equal or nearly equal number of points on each side of the curve. A French curve is useful for drawing a smooth curve.

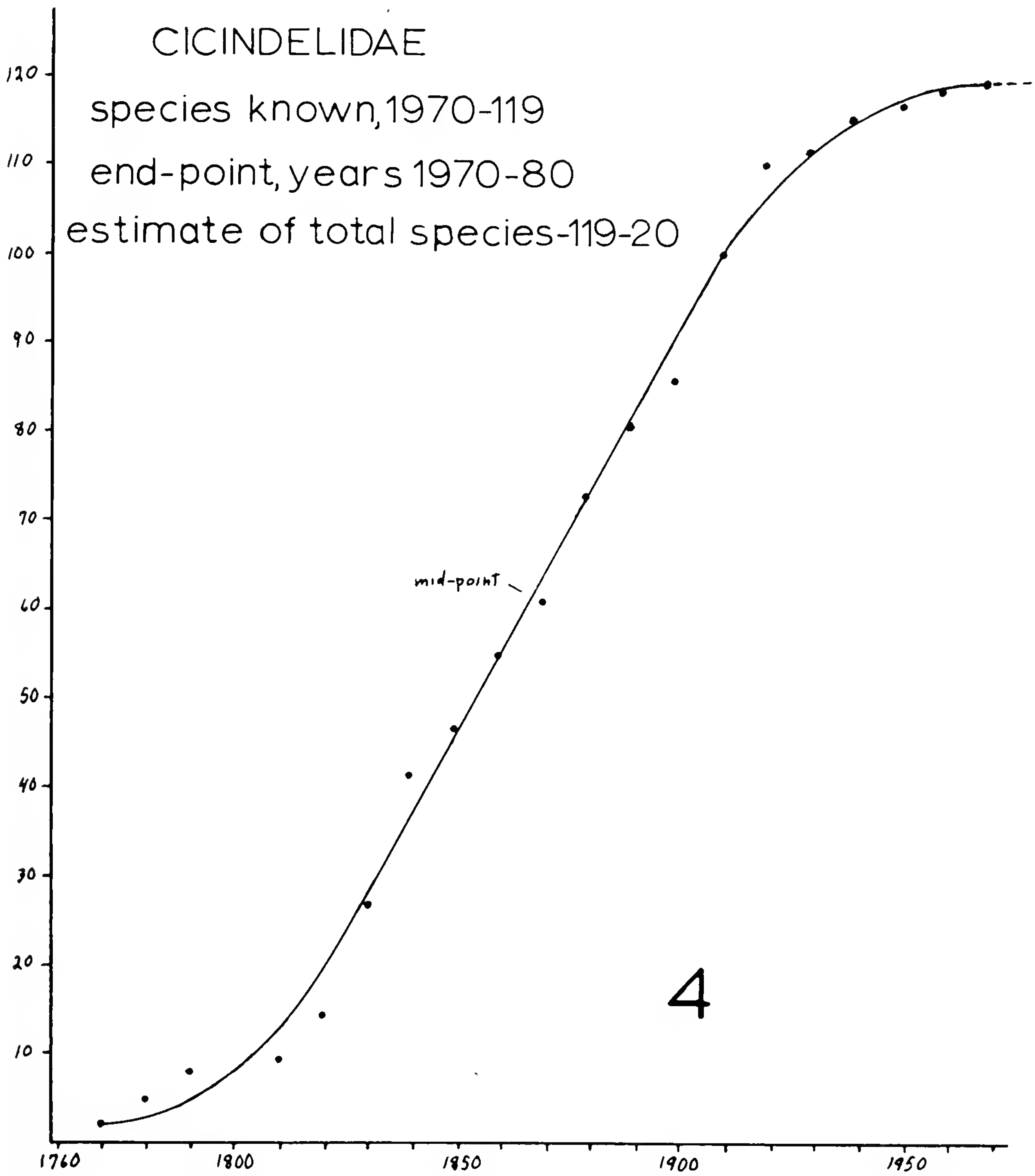
From the starting point for our knowledge of species numbers (1758) the acceleration of a curve is gradual with the chief limiting factors being the small number of working taxonomists and the small size of collections. Increase in the number of taxonomists, the size and number of collections, and improvement of techniques result in acceleration of the rate of climb, with finally, a nearly straight-line ascent. As the final total number of species in nature is approached, the rate of climb slows, and with description of the last few species of very small populations, cryptic habits, or those very difficult to discriminate, the curve levels off to remain level once species descriptive work is finished.

An obvious basic requirement essential to assure accuracy in use of this technique is that the described species be valid. If wholesale, undetected



synonymy exists, once this synonymy is discovered, the estimate of final species total will be found to be meaningless, because the numbers used in plotting the curve were excessively high. A trend curve of a family in which appreciable undetected synonymy exists would thus give a final estimate of species in excess of a reasonably accurate number. Because of these facts, I have avoided the families in which Thomas L. Casey described numerous species, because re-examination of his work has frequently resulted in a large percentage of his species being synonymized. Some of the groups in which he labored have been re-examined since his time, but many have not been. My avoidance of the families in which Casey worked leaves 4 of the 7 largest families of beetles in North America (Carabidae, Staphylinidae, Curculionidae, and Tenebrionidae) out of this study. Though, in compiling these trend curves, I have avoided the families in which Casey worked extensively, the results of his work still introduce a possible source of error in some conclusions reached as discussed below under results.

Application of the trend curve technique to a relatively small family is not as likely to produce significant results as is application to a large family. The rate of species description for a small or obscure family is too



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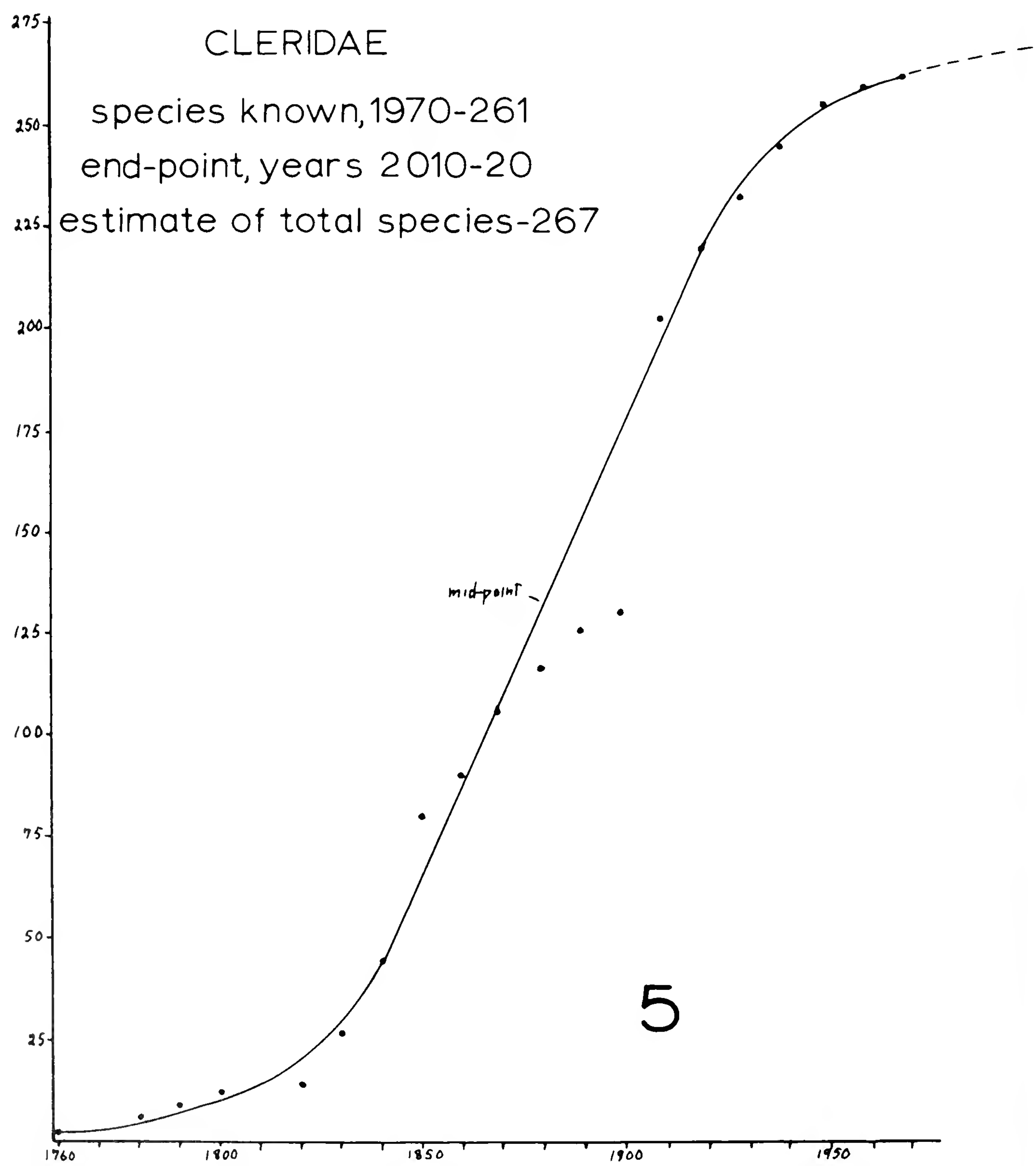
readily affected by irregular taxonomic progress. This very irregular progress in such a family makes it difficult or impossible to plot a meaningful curve. As a general guideline about 200 species should be the optimum minimum size of a group to insure production of significant results. Between 150 and 200 species may provide good results, between 100 and 150 species are generally not sufficient, and less than 100 species will rarely suffice. The difficulty in trying to establish more precise guidelines than the above rather hazy ones can be shown by the Cicindelidae (Fig. 4), a family of 119 species that gives a smooth and apparently reliable curve. Almost certainly the popularity of the Cicindelidae with collectors and taxonomists accounts largely for the steady rate of progress in species description and good curve results.

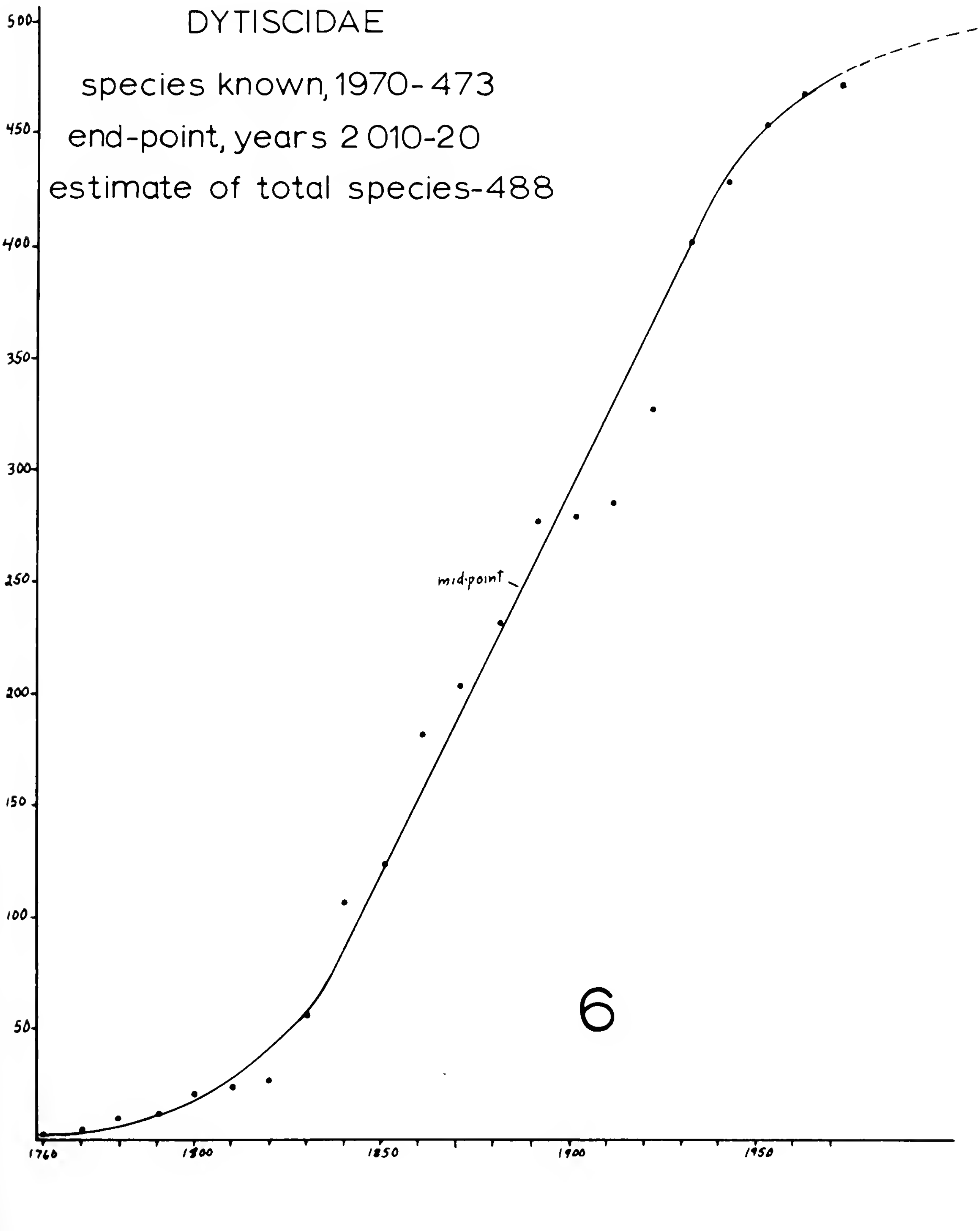
In compiling numbers of species for the curves, I relied on the Leng catalog and its supplements to 1948, and from there to 1970 I used the Zoologi-



cal Record. In the supplements and the Zoological Record where revalidation of former synonyms about equaled the new synonymy, I did not alter my figures in accordance with these changes. When new synonymy clearly out-numbered revalidations, I changed my figures accordingly. An up-to-date catalog is a tremendous aid for work of this sort. When one is available for the Coleoptera it will enable close checking of the results herein and with much less effort than I have expended.

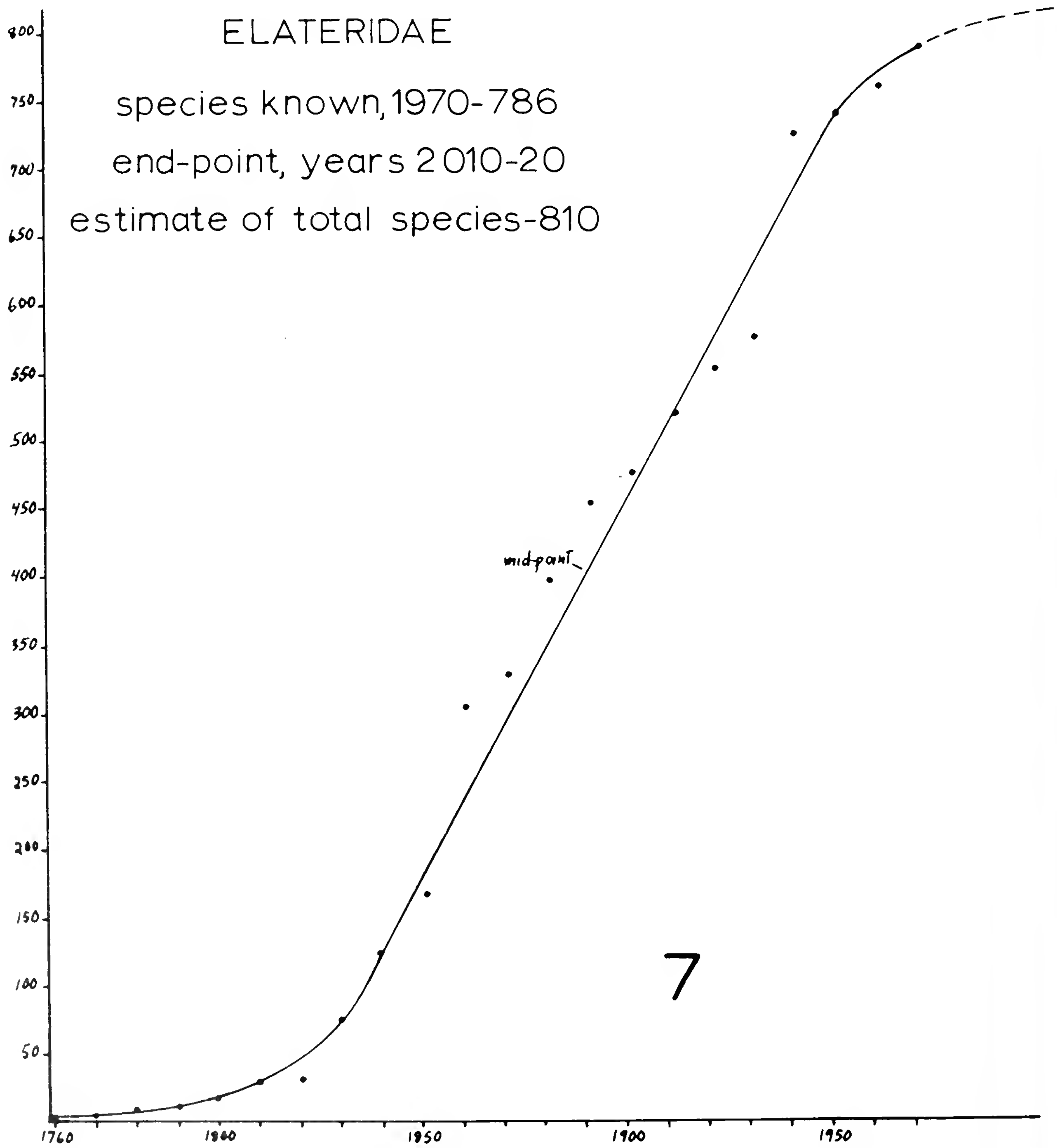
Results

A large beetle family that is reasonably popular with taxonomists and/or economically important often gives a very good agreement of



points with a sigmoid curve, as shown on the graph for the Chrysomelidae, Fig. 3. With about 1458 species as of 1970 this is one of the 4 or 5 largest families of beetles in North America. Small or even moderate-sized families that are not highly attractive to taxonomists are often subject to irregular progress in species description, and thus may show less than good agreement of points with a sigmoid curve, as for Melyridae (Fig. 10), Hydrophilidae (Fig. 8), and Meloidae (Fig. 9).

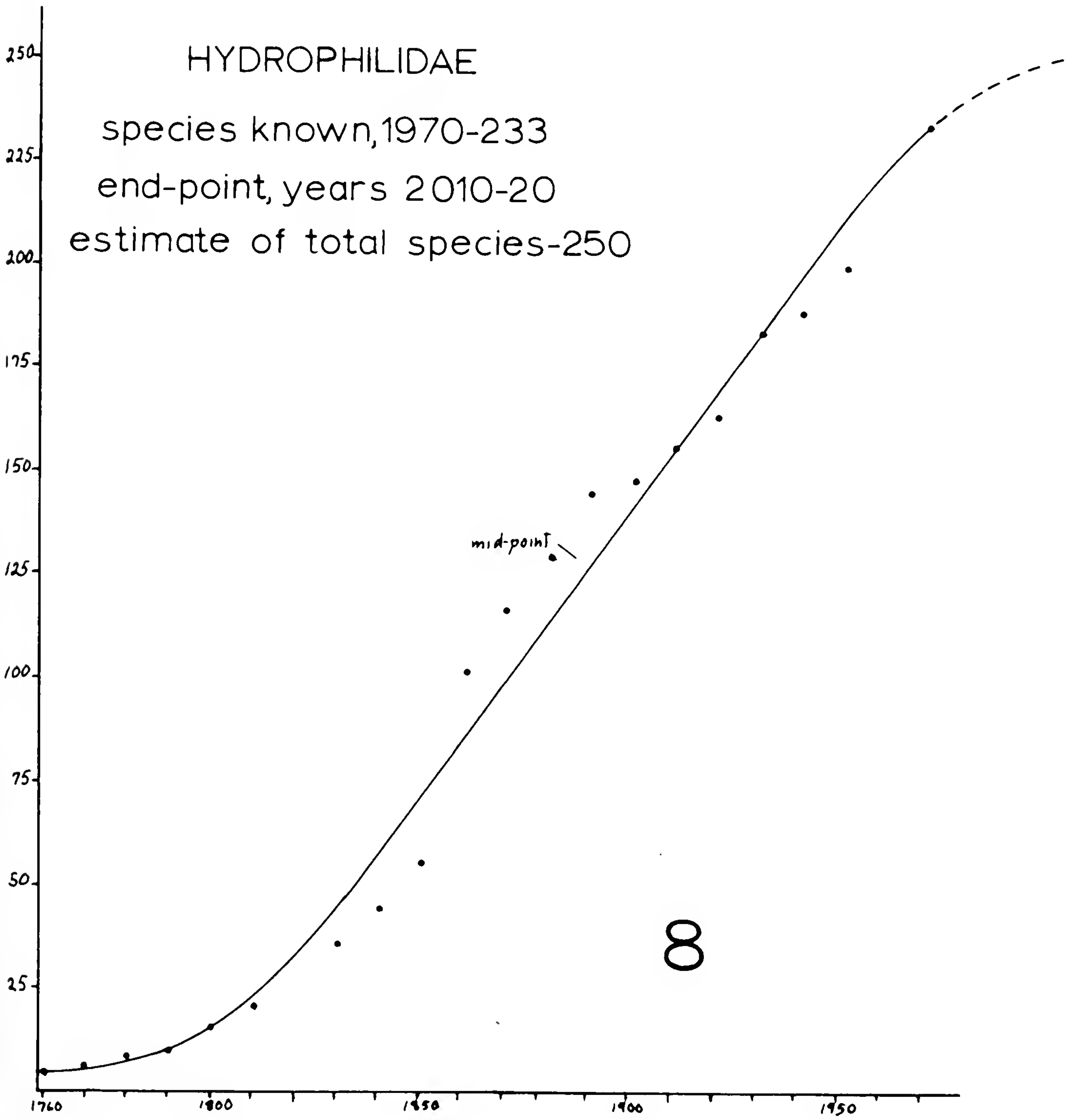
A small beetle family that is quite popular with collectors and taxonomists can show a good agreement of points with a sigmoid curve, and provide a curve of apparent high reliability; an example (mentioned previously) is the Cicindelidae, Fig. 4. The 119 species as of 1970 could be all, or nearly all that will be described, hence my estimate of 119-120. Of those families for which I have prepared trend curves, the Cleridae (Fig. 5) follow the Cicindelidae in being nearest the end-point. The curve for the Cleridae is notable for the very close agreement of the last 7 points with the curve



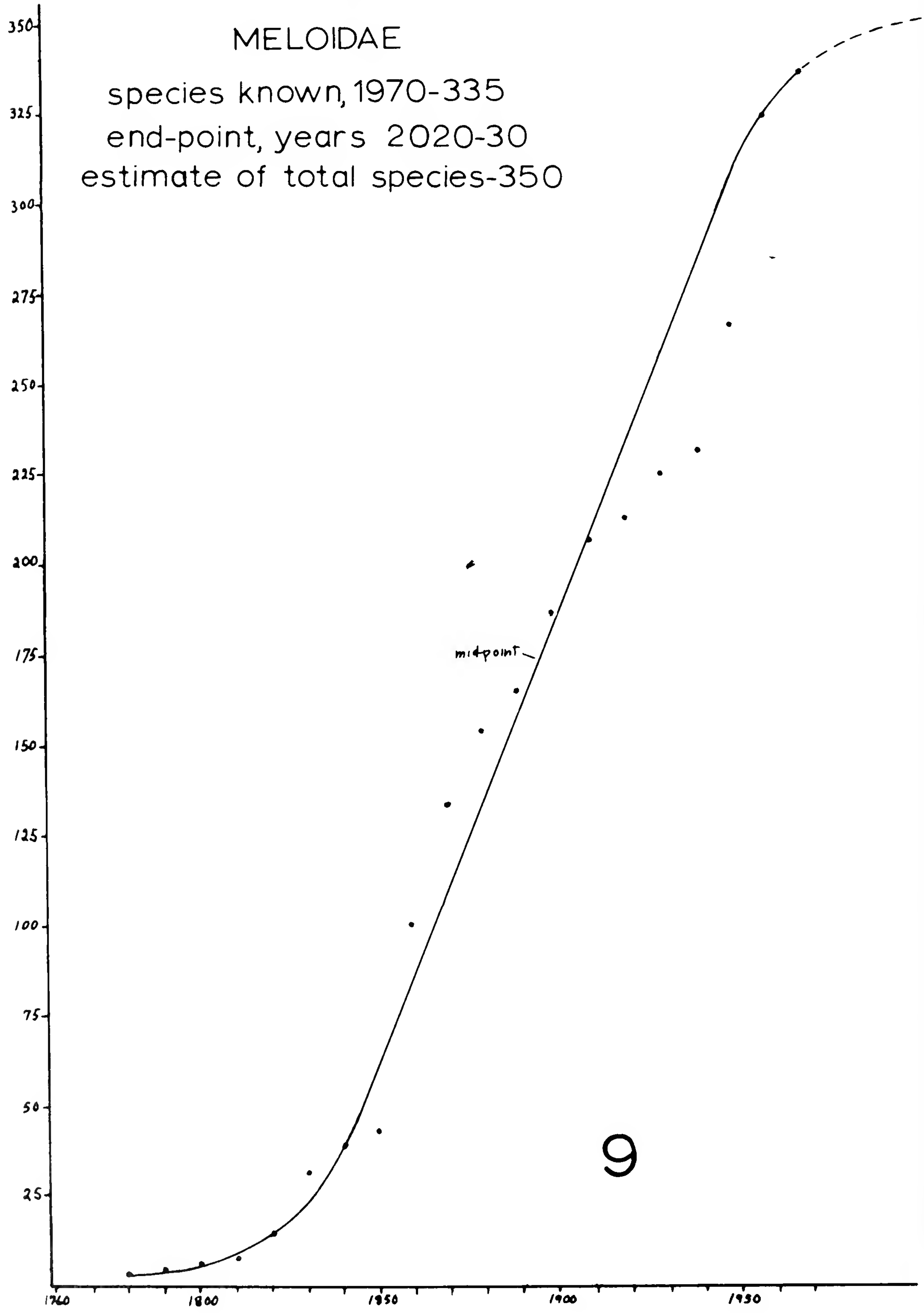
I have drawn. Similarly, the curve for the Scolytidae (Fig. 12) gives good agreement of the last 5 points with the curve.

An example of the effect that improvement of technique can have on the rate of species description is shown by Fig. 2 that jointly includes Cantharidae, Lampyridae, and Lycidae. On this graph note the great increase in species number from 1950 to 1960; this was largely due to use of male genitalia in distinguishing species. Had this curve been drawn with only the data available to 1950, it clearly would have given a far different result than that which it gives here.

The results for the families Buprestidae (Fig. 1) and Scarabaeidae (Fig. 11) deserve discussion. As theory requires, I have transposed the bottom half of each curve over the top half to arrive at predictions for each graph. However, if one ignores the curves I have drawn and examines the last 4 points on each graph, in each case these points appear to inscribe a curve that is abruptly slowing in rate of climb, and which departs greatly from the form of the curve inscribed by the points at the bottom of each graph. Both of

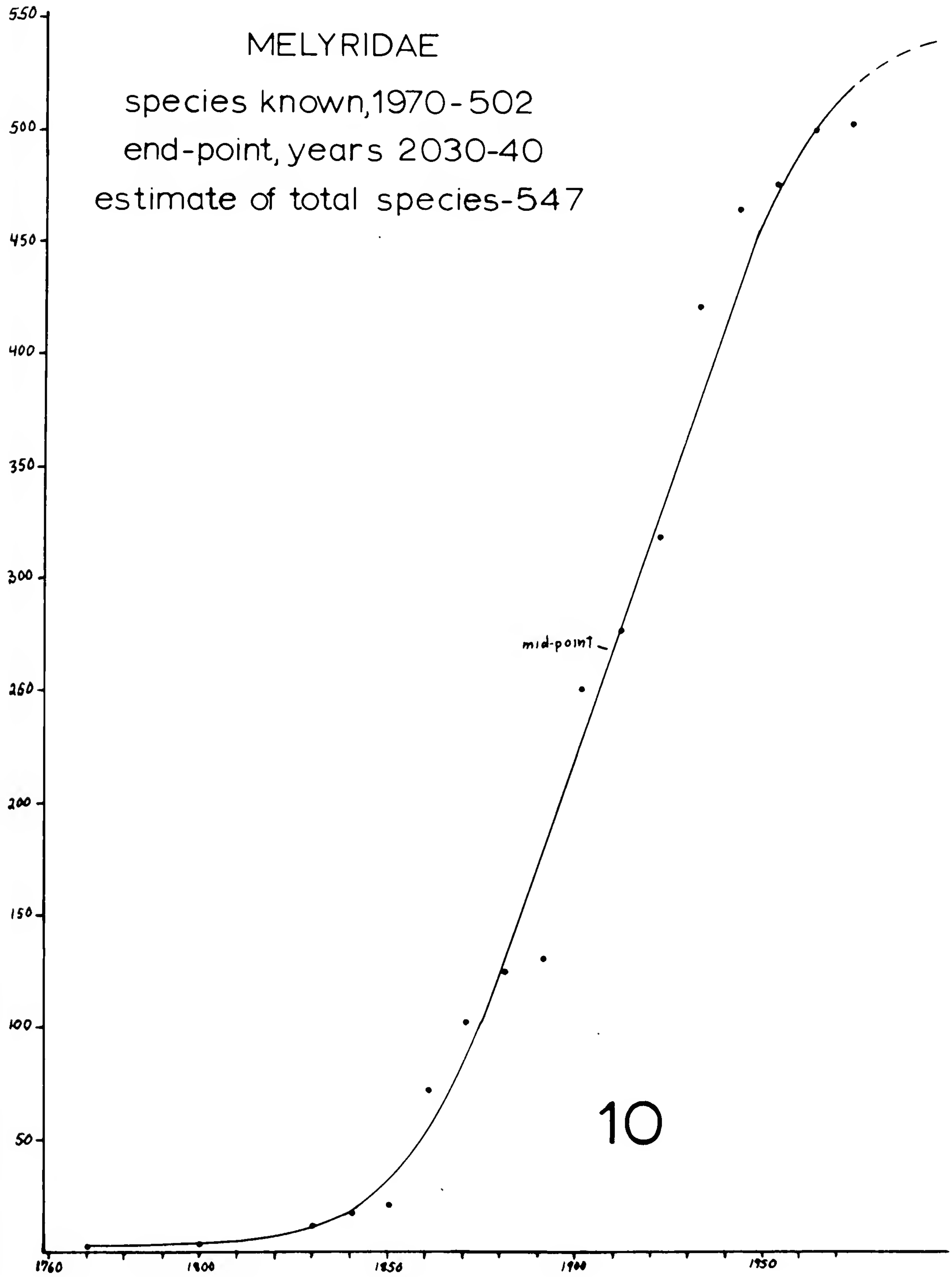


these families are popular with collectors and taxonomists, and the possibility arises that due to this popularity taxonomists are describing the remaining species at a greater rate than would normally be expected and thus causing each curve to deviate from its anticipated form. As a test, I have followed the more abrupt curvature of the last 4 points for each of my graphs, and for the Buprestidae this has led to a final species total of 785 (as con-

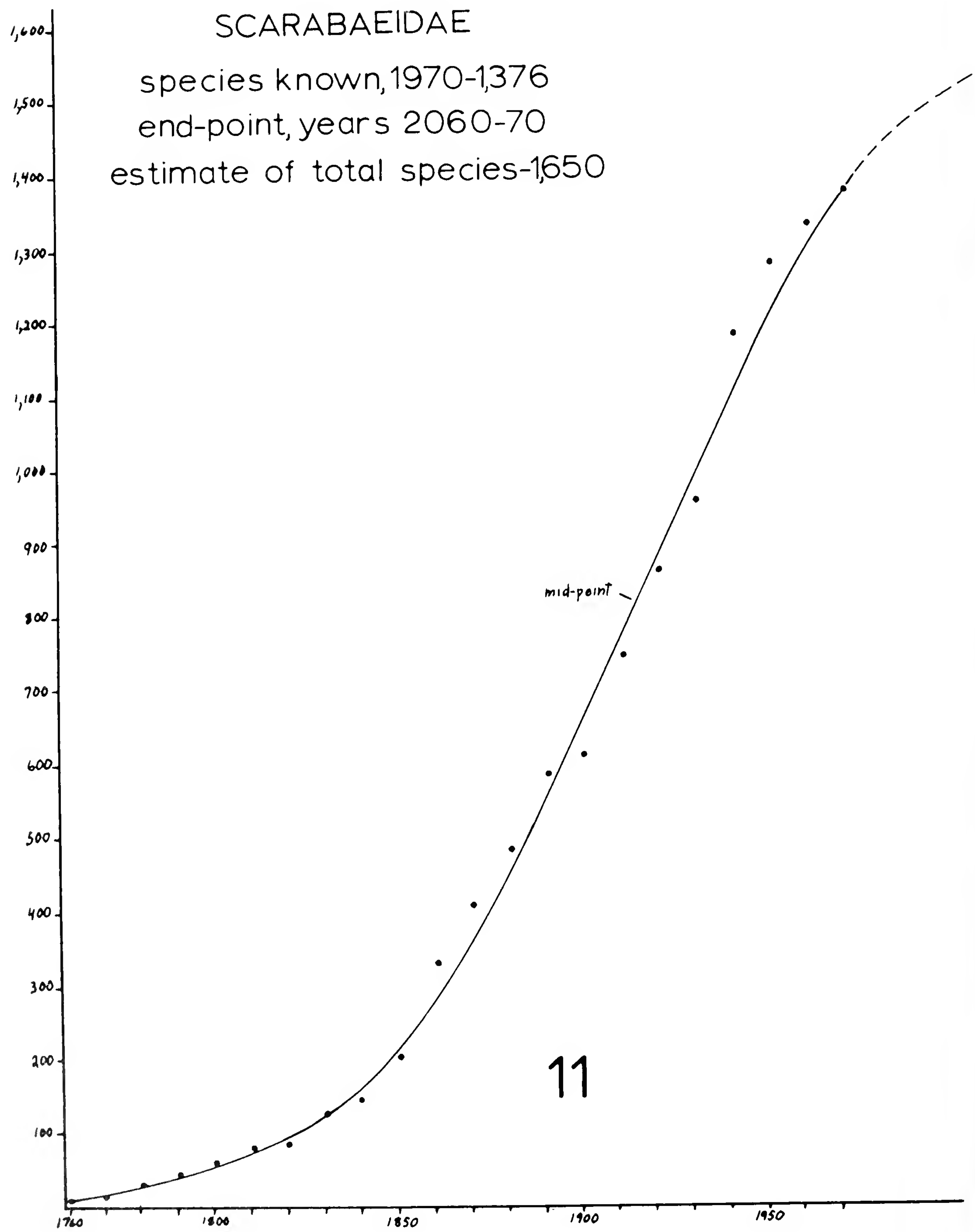


trasted to the prediction by theory of 920 species) and for the Scarabaeidae a final species total of 1,500 (as contrasted to the prediction by theory of 1,650 species). The new species totals for the next 2 or 3 decades should clarify the situation for each of these families and provide commentary on the predictive value of trend curve graphs for groups with characteristics similar to those of these 2 families.

In drawing a curve I feel that interpretation of the significance of the trends on graphs is sometimes essential. If Fig. 10 (Melyridae) is examined,

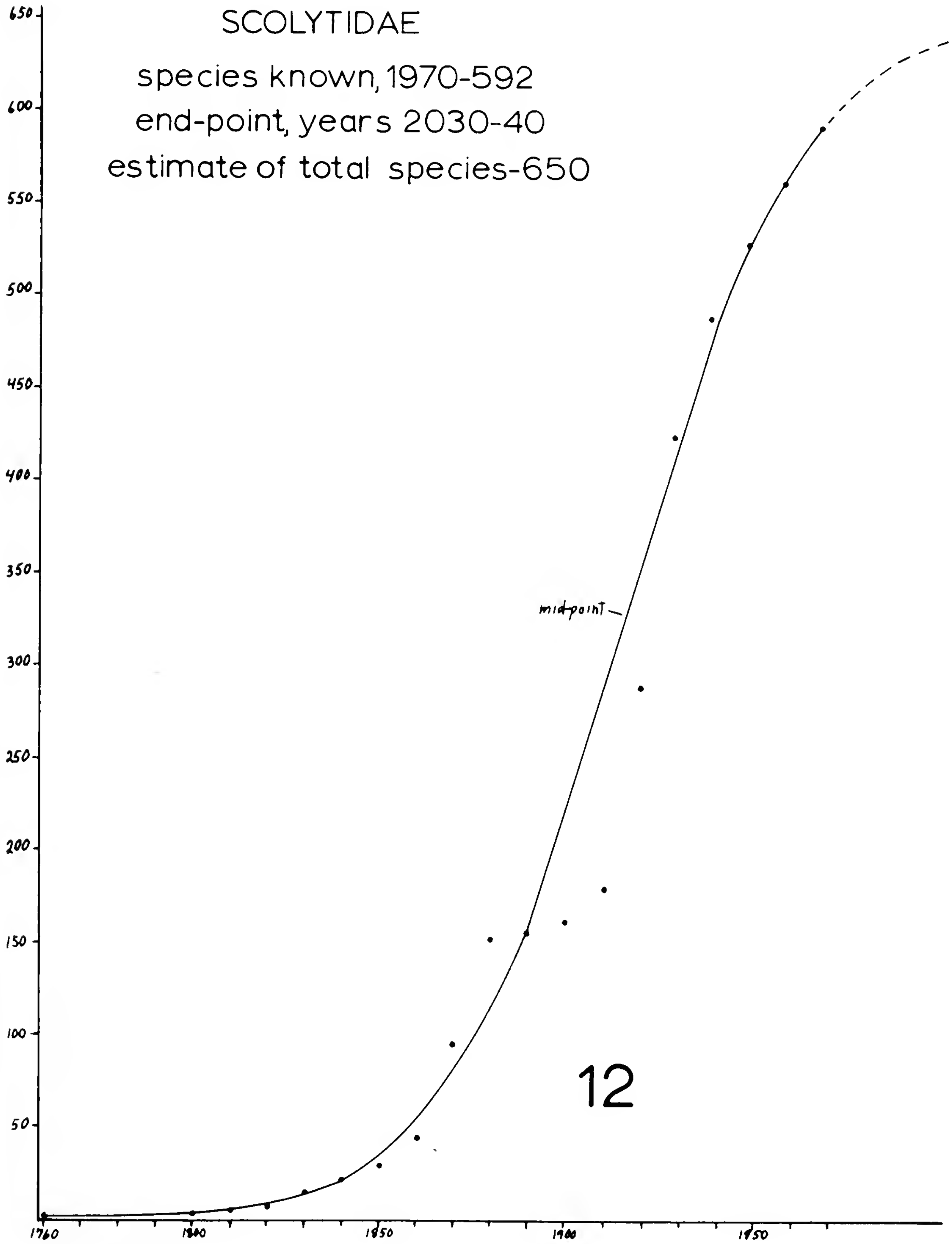


it will be seen that I have not connected the curve with the last point for 1970, but rather with that for 1960. I interpret the small number of additional new species for the period of 1960-70 (a total of 2) as representing lagging taxonomic progress and not an indication that the end-point of species description for the family is near. The nature of the history of species description in this family indicates that the family is susceptible to periods of slow progress in species description followed by accelerated rate of species description. Note that there are 4 decades in the early development of the curve in which no species were described, and note also the 3 periods of

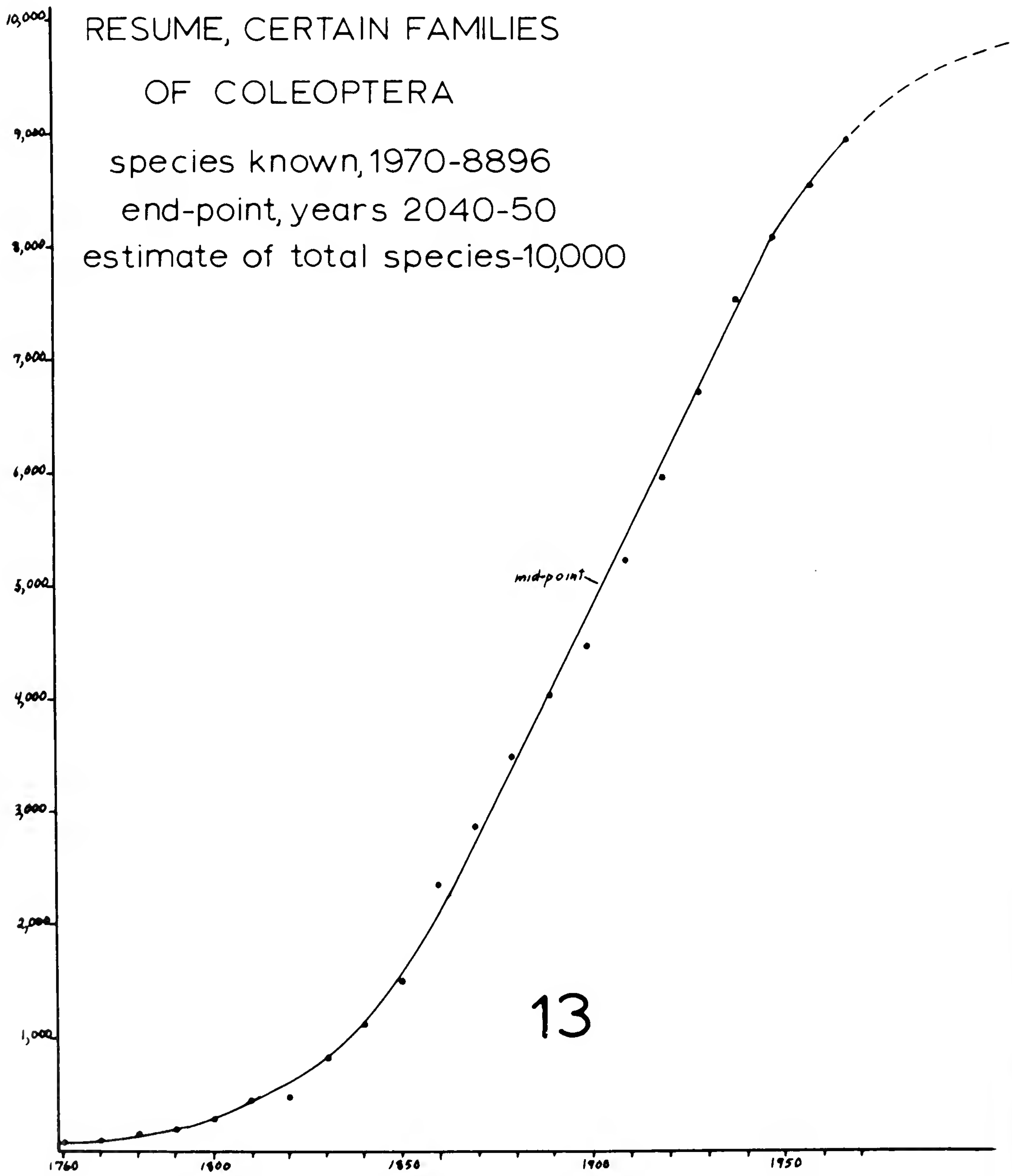


11

slow growth in species number followed by great increase in this number. It is even possible that there could occur another decade of great increase in species number as occurred from 1850-60, 1890-1900, and 1920-30. If this should occur, my estimate could turn out to be too low. For the Dytiscidae (Fig. 6) I have again connected the curve to the next-to-last point rather than to the last, for I believe that the last point again represents lagging taxonomic progress. Elateridae (Fig. 7) are another family that exhibits irregular taxonomic progress, though this is less extreme than that shown for the Melyridae.



Extension of the curves I have made to the point where they level off gives the range of years for the approximate end-point of species description for most families of about 2,010 to 2,020. It can thus be expected that species description in most North American beetle families will be essentially completed at about that time with relatively few additional species described thereafter. These end-points for the families I have plotted on curves vary from 1970-80 for the Cicindelidae to 2,080-90 for the Buprestidae, and 2,090-2,100 for the Cantharidae, Lampyridae, and Lycidae (I have grouped these 3 families). The more advanced dates for the latter families of the anticipated end of species description might be an indication that these families contain many sibling species that will take considerable effort to discover. The final curve (Fig. 13) gives an end-point in the range of 2040-50. I in-



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terpret this to mean that for those families I have plotted, 99% or more of the species of beetles in North America will by that time be known, with continued species description of any extent only in certain families in which taxonomic work has lagged, or in which collection of species is especially difficult because of small populations or cryptic habits, or in which many species are so similar that their separation requires considerable study.

A recent attempt to estimate the numbers of beetles in North America was made by Arnett (1967). By considering various factors, he estimated the final total of species for each family of beetles in North America, and from these figures arrived at a total for all North American beetles. In general there is a good agreement between his figures and those herein presented, but in the case of some families, differences between his figures and mine are considerable. The greatest discrepancy occurs in the Dytiscidae. Arnett gave 329 species to 1948; I have 453 species described to 1950, and 473 to 1970. The final species total for Dytiscidae estimated by Arnett is 350; mine is 488. Another large discrepancy occurs in the Elateridae; Arnett estimated the final total of 950 whereas my estimate is 810. In one instance our estimates agree exactly; both of us arrive at the figure of 350 total species for the Meloidae.

Arnett's estimate of the total number of species of beetles in North America to 1966 was 24,128. By accepting this figure and applying it to my graph of final species total (Fig. 13), I arrive at the figure of 88% of all species being known to 1966. The curve on my graph then gives the final total species in North America of about 27,400, as compared with Arnett's estimate of 28,600. My graph was compiled from a total of 8,896 species, about 36% of the total number of species of beetles known to 1970.

It must be recognized that, because of the nature of the taxonomic work of Thomas L. Casey, any tabulation of described species of beetles in North America unavoidably contains Casey names that will likely in the future be synonymized. Unfortunately, we cannot now know the exact extent of the undetected synonymy, so any species totals for the Coleoptera, including those given above, are possibly greater than the actual number in North America.

I have used the species totals of 29 families of beetles in compiling data for the final curve (Fig. 13). These families are as follows: Anobiidae, Anthribidae, Bostrichidae, Bruchidae, Buprestidae, Cantharidae, Chrysomelidae, Cicindelidae, Ciidae, Cleridae, Colydiidae, Dytiscidae, Elateridae, Erotylidae, Eucnemidae, Hydrophilidae, Lampyridae, Languriidae, Lycidae, Lyctidae, Meloidae, Melyridae, Mordellidae, Nitidulidae, Oedomeridae, Ptiliidae, Scarabaeidae, Scolytidae, and Trogositidae.

In acknowledgment I wish to recognize the assistance of George Steyskal (U. S. Department of Agriculture), and Paul Spangler (Smithsonian Institution).

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—R. E. Woodruff

RELATIONSHIPS OF PREDACEOUS BEETLES TO TROPICAL FOREST WOOD DECAY. PART I. DESCRIPTIONS OF THE IMMATURE STAGES OF *EURYCOLEUS MACULARIS* CHEVROLAT (CARABIDAE: LEBIINI)[1]

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ABSTRACT

In preparation for a discussion elsewhere of the natural history of *Eurycoleus macularis* Chevrolat (Carabidae: Lebiini), the immature stages are described, including the egg, 4 larval instars, and pupa. Figures are provided which illustrate the larval habitus (4th instar), dorsal and ventral aspect of head capsule (2nd instar), pygopod (1st instar), and pupa.

INTRODUCTION

During studies of tropical forest wood decay and the role of predaceous beetles in the process, the natural history of *Eurycoleus macularis* Chevrolat was discovered. Repeated observations spanning 3 years allow discussion of that natural history and its ramifications in the evolution of ectoparasitoidism, mimicry, and wood decay. This discussion will appear elsewhere as Part II of the wood decay study. The purpose of this paper is to provide detailed descriptions and illustrations of the immature stages of *E. macularis.*

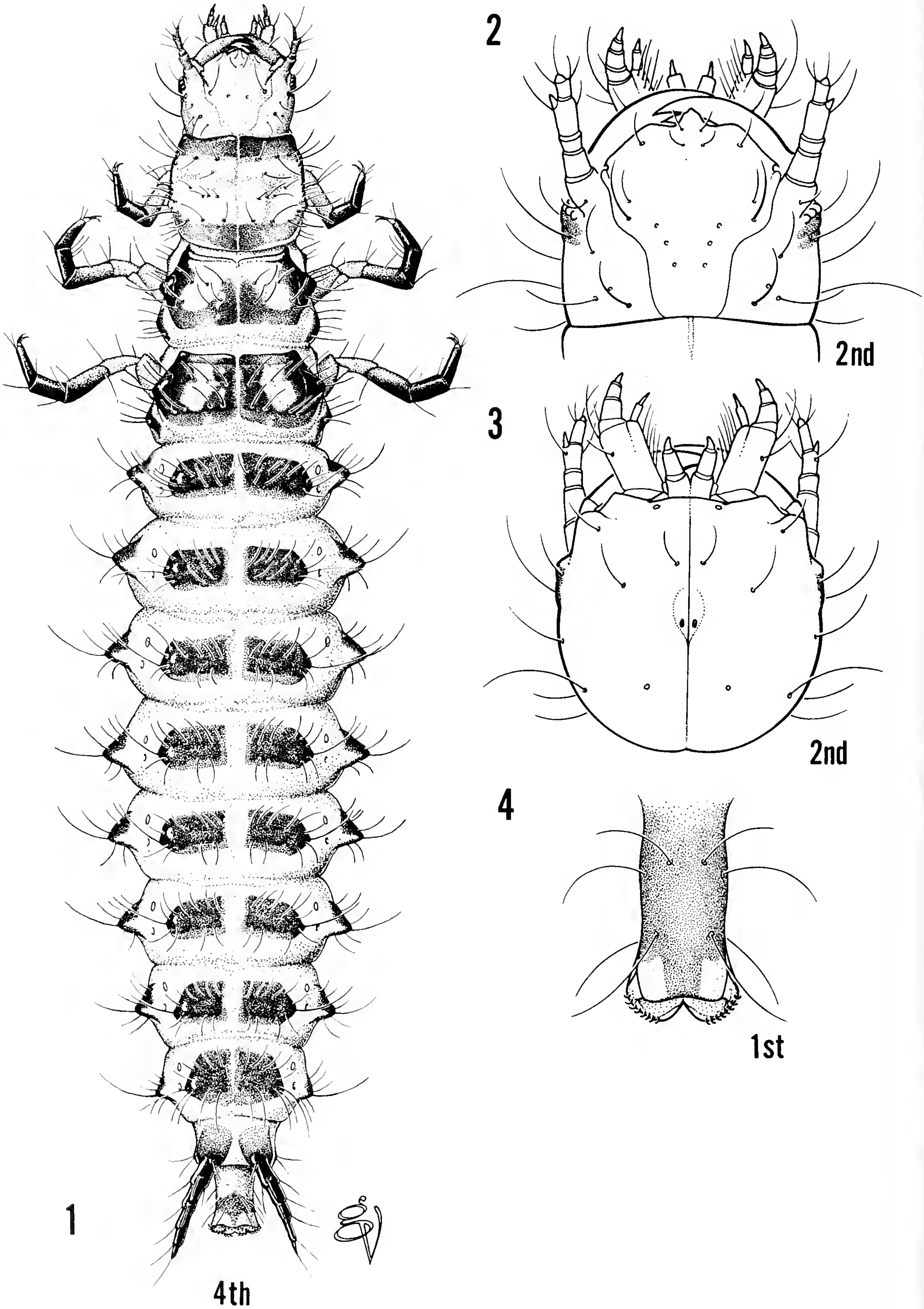
The immature stages of the carabid tribe Lebiini are very poorly known in general, and until now, those of *Eurycoleus* were unknown. In Van Emden's (1942) key to genera of carabid larvae, specimens of *E. macularis* will key to Lebiini, and in the lebiine key, to Coptoderina. Van Emden did not have available enough specimens of Coptoderina, therefore his key is highly inadequate beyond subtribe. Our knowledge of carabid larvae is still sufficiently primitive that no key written today would be adequate. Therefore, I have not attempted to align *Eurycoleus macularis* with Van Emden's key.

IMMATURE STAGES OF *Eurycoleus macularis*

Egg: Size, length (1 specimen) 1.38mm, width 0.60mm. White, elipsoid, with slight acumination at one end. No surface structure visible 120X.

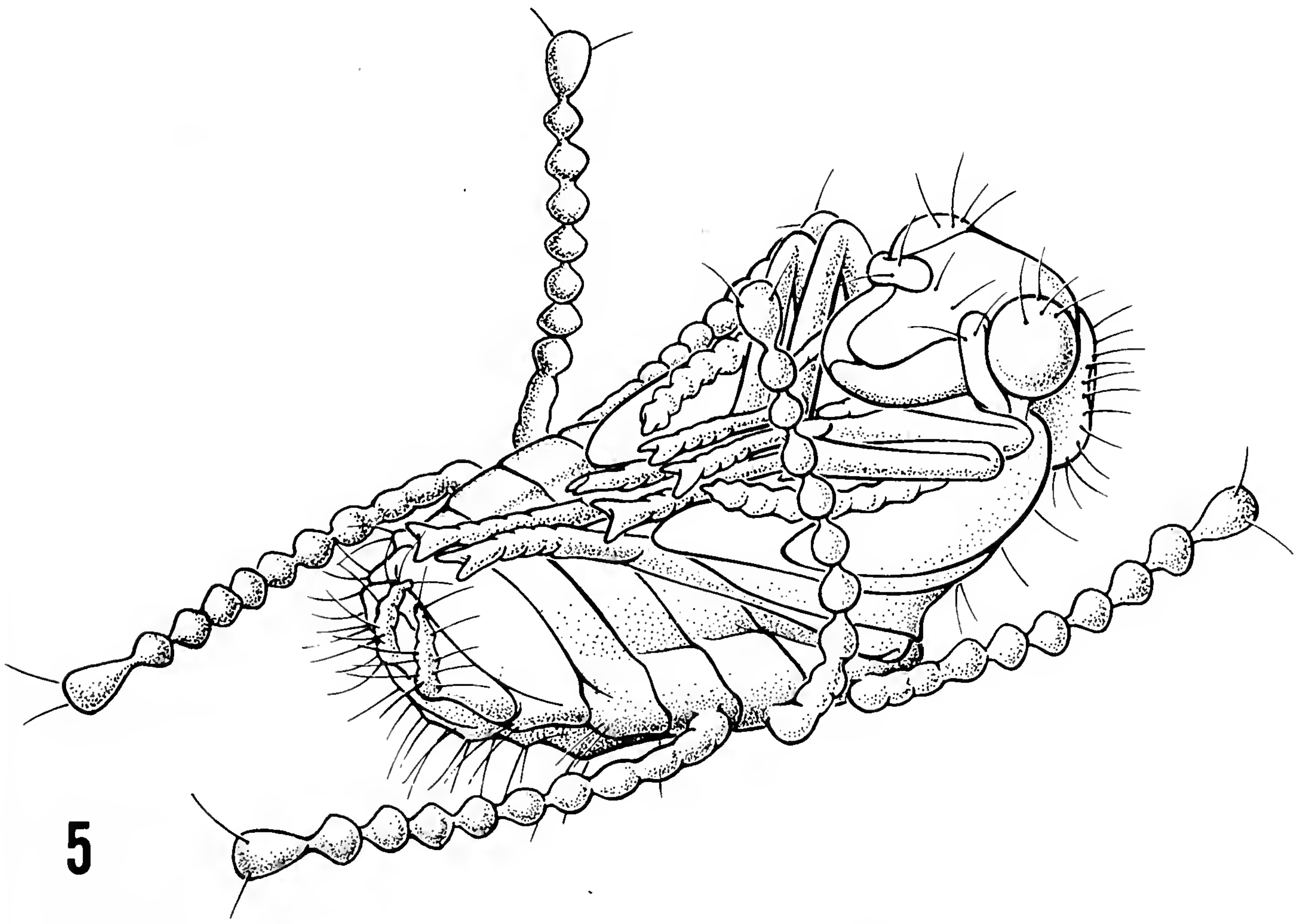
First instar larva (Fig. 4): Total length (1 specimen) 3.5mm, from mandible to apex of urogomphus. Head capsule piceous; antennae, meso- and metathorax, abdominal terga, urogomphi and legs grey; mandibles and palpi yellowish; prothorax, trochanters, and coxae white and strongly con-

[1]This study was supported in part by the Walter Rathbone Bacon Scholarship of the Smithsonian Institution through funds provided for field work on wood decay in Central America and in part by the Environmental Sciences Program of the Smithsonian Institution through funds provided for field work on Barro Colorado Island, Canal Zone.



1-4. *Eurycoleus macularis* Chevrolat, all Barro Colorado Island, Canal Zone; 1) fourth larval instar, dorsal aspect; 2) head capsule, second larval instar, dorsal aspect; 3) head capsule, second larval instar, ventral aspect; 4) Pygopod, first larval instar, dorsal aspect.

trasting with rest of body. Setae of various sizes and lengths on various parts of body and head capsule. HEAD: Large, ovoid, depressed, and prognathous. Epicranial suture lyre-shaped (Figure 2). Nasale with large truncate tooth at middle. Front slightly concave between antennal bases. Egg bursters 2, each on elongate carina longitudinally aligned on front between frontal arms of epicranial suture. Cervical region slightly constricted and slightly inserted under pronotum. Mandible broad and flat, sickle-shaped, with large, median, curved tooth and inner edge about one-third the distance from apex; molar region with pensillus; outer margin with single seta near base of curved portion of mandible. Antenna 4-segmented with 3rd and 4th articles apically setiferous, 3rd with 3 long setae, 4th with 3 long setae and several short apical seta-like sensillae. Third article dilated and bearing small transparent bubble apico-laterally. Labium with very small bisetose tubercle-like ligula between 2 small 2-segmented palpi; palpi without setae, sides each with 2 long setae and dorsum with 2 short paramedian setae. Maxillae well developed, each with basal cardo, long robust stipes, 4-segmented palpus and long, 2-segmented mala. Cardo without setae. Stipes with 2 latero-ventral setae, 1 apico-lateral seta, and numerous medial setae. Basal article of mala with 1 ventral seta. Mala two-thirds length of palp. Organs of vision consist of 6 stemmata on each side of head capsule, arrange in 2 verticle rows of 3 stemmata per row. THORAX: Prothorax much narrower than head capsule and about equal to it in length; meso- and metathorax as wide as prothorax and each half as long. LEGS: Long and robust, each with 2 claws of unequal size, the anterior slightly longer and thicker at base. ABDOMEN: 10-segmented, with darkly pigmented terga. Urogomphi fused to segment IX, unjointed, 3-nodose, each node unisetose, apex bisetose. Pygopod well devel-



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5. *Eurycoleus macularis* Chevrolat, pupa, oblique aspect, Barro Colorado Island, Canal Zone.

oped, ended apically with 2 groups of hook-shaped crochets, about 13 in number. Spiracles small, simple, and annular.

Second instar larva (Fig. 2, 3): Total length (1 specimen) 5.5mm, from mandible to apex of urogomphus. Color as in first instar except head and antennae orange, pronotum orange with infuscated anterior and posterior margins, and meso- and metanotum with lateral orange spots. Chaetotaxy as in first instar, setae generally shorter throughout. HEAD: As in first instar, except egg bursters absent. THORAX: Prothorax as wide as head capsule and partially enclosing it; sides with margins convergent posteriorly, slightly flanged throughout their length; base broadly lobed. Mesothorax as wide as head capsule, half the length of prothorax. Metathorax wider than head capsule, half the length of prothorax. LEGS AND ABDOMEN as in 1st instar.

Third instar larva: Total length (2 specimens) 8.1mm, from mandible to apex of urogomphus. All character states and proportions as in 2nd instar except urogomphi multinodose and all colors more intense, orange, black, and white. Abdominal segment IX orange, urogomphi black.

Fourth instar larva (Fig. 1): Total length (5 specimens, and 1 cast skin) 12.5-13.2mm, from mandible to apex of urogomphus. As in 3rd instar. Easily recognized as 4th instar because all other instars have developing setae of subsequent instar showing through the transparent cuticle, whereas 4th instar does not. Pupal setae, if present and seen beneath 4th instar integument, have different arrangement.

Pupa (Fig. 5): Total length (2 specimens and 1 cast skin) 7.0-7.3mm, from crest of head to abdominal apex. Typically caraboid, except abdominal appendages attached laterally to segments II, III, IV. Each appendage of 7 to 9 nodes, apical node of each appendage bisetose. Segment II with appendages directed anteriorly past head; segment III with appendages extended ventrally past most ventral part of pupa; segment IV with appendages extended posteriorly past abdominal apex. All dorsal segments with long stiff setae arranged bilaterally in patches.

MATERIAL EXAMINED: In addition to the numerous specimens photographed and left in the field, or which succumbed to mold or predators in laboratory rearings, there are preserved in the USNM the following: 1 egg; 1, 1st instar; 2, 2nd instars; 3, 3rd instars plus 3 exuvia; 10, 4th instars plus 1 exuvium; 2 pupae plus 1 exuvium.

ACKNOWLEDGMENTS

I thank my wife, LaVerne, for aid in finding *Eurycoleus macularis* larvae, W. Donald Duckworth, Ginter Ekis, and Donald R. Whitehead for reading the manuscript, George L. Venable for the excellent illustrations, and Joan B. Miles for typing the manuscript.

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A REVISION OF THE GENUS *CACCOPLECTUS* (COLEOPTERA: PSELAPHIDAE)

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Abstract

The genus *Caccoplectus* is removed from the Faronini and placed back in the Holozodini. This placement is based on the presence of the typically Macrosceline aedeagus and mesotrochanters, although the tarsal lengths indicate placement in the Faronini. Due to the reduction of the number of maxillary palpal segments to 3, the reduced teeth on the mandibles and their collection at light in Arizona with 2 species of myrmecophilous pselaphids (*Ctensis raffrayi* with *Veromessor juliana* and *Pilopius ocularis* with *Novomessor albisetosus*), the genus is presumed to be myrmecophilous. The genus is divided into 3 groups with 6 new species. The *spinipes*-group contains *spinipes* Schaeffer from Texas, *nuttingi* n. sp. from Arizona, *incultus* n. sp. from Baja California Sur and *sentis* n. sp. from Arizona. The *celatus*-group contains *celatus* Sharp from Central America, *bellingeri* Park from Jamaica, *inornatus* n. sp. from Panama and *pectinatus* n. sp. from Arizona. The *orbis*-group contains *orbis* n. sp. from Panama. Characters are shown in 46 figures.

The genus *Caccoplectus* is currently composed of 3 species: *celatus* Sharp from Panama, *spinipes* Schaeffer from Texas, and *bellingeri* Park from Jamaica. Each of these was described from a single holotype. This rarity of specimens is reflected in this study with 2 of the 6 new species described being known from single specimens. Almost all of the specimens were collected by blacklight traps, and in only one case was there more than 1 specimen collected the same night. Each catch of a single *Caccoplectus* at the Santa Rita Range Reserve in Arizona was accompanied by large catches of *Pilopius ocularis* (Casey) and *Ctensis raffrayi* Casey. The following new records indicate that these 2 species are myrmecophilous: *P. ocularis* with *Novomessor albisetosus* (Mayr) at Vail, Arizona (Karl Stephan Collection), and at Carr Canyon, Huachuca Mountains, Arizona (Los Angeles County Museum); *C. raffrayi* with *Veromessor juliana* (Pergande) at Santa Rosalia, Baja California Sur (Los Angeles County Museum). *Caccoplectus* possesses finely serrate mandibles and reduced maxillary palpi which are adaptations of many myrmecophilous pselaphids. It is probable that the genus is myrmecophilous and only flies during the most optimum conditions.

Caccoplectus presents problems in its placement at the suprageneric levels. Sharp (1887), using Reitter's classification of the family, placed the genus in the subfamily Bryaxinae, group Bryaxina. Raffray (1903, 1904) removed the genus to the new tribe Holozodini, group Macroscelia, of the Pselaphinae. Here it remained (Raffray 1908, Park 1942, 1943) until the revision of the subfamilies by Jeannel (1949). Jeannel's rearrangement was based on the relative lengths of the tarsal segments and the form of the male genitalia. In this paper *Caccoplectus* was placed in the Faronini of the Faroninae. The Faroninae are characterized as having the first 2 tarsal segments short and the last much longer, the mesotrochanters short and the genitalia with the median lobe reduced or absent. The group Macroscelia of the Pselaphinae have the first tarsal segment short with the other 2 long, mesotrochanters long and the genitalia with a well-developed median lobe and 2 ventral styles (the other group of the Pselaphinae, the Brachyscelia, has short trochanters and similar genitalia without the styles). *Caccoplectus* was placed in the Faroninae solely on its tarsal form; however, the long mesotrochanters and the genitalia are clearly typical of the Macroscelia, not the Faroninae.

It appears that the genus must have been derived from the main pselaphid lineage at a time when the 2 subfamilies were not separated. Since that time the group has become specialized and probably acts as synoeketes in ant colonies. Based on the above characters and the general appearance of the genus, head and pronotum with large sulci and foveae, it is evident that the genus is a distinct and isolated group. The problem is its placement in the classificatory scheme. Since the universality of Jeannel's division by tarsal form does not appear to be consistent, and taking into account the greater number of shared characteristics with the Macroscelia, *Caccoplectus* is placed back in the Holozodini. From the written description of the other genus in the tribe (*Holozodus* from Madagascar) it appears that *Caccoplectus* is reasonably similar to it. Considering my unfamiliarity with the world fauna, I believe this is the better placement, at least for the moment, rather than describing a new tribe or subfamily.

One interesting note pertaining to the evolution of the family is that *Caccoplectus,* which combines certain characters of the Faroninae and Pselaphinae, and *Speleobama* which combines certain characters of the Brachyscelia and Macroscelia (Park 1953), are both found in North America. This indicates that the current major divisions within the family might have originated in the New World.

Caccoplectus is defined as those Pselaphidae with: head with deep vertexal sulci, antennae mounted on prominent tubercles, 2 gular foveae, small, 3-segmented maxillary palpi, antennae 11 segmented; pronotum with deep antebasal sulcus, lateral longitudinal sulci running from antebasal sulcus to anterior of pronotal angles and then ventrally to procoxae; elytra with 4 basal foveae; prepectus with lateral prepectoid foveae on posterior margin, median mesosternal fovea at junction with prepectus, median fovea behind mesosternal coxal cavities; mesolegs with femora distant from coxae; first 2 tarsal segments short, third much longer, 1 tarsal claw; aedeagus with median lobe, 2 ventral styles; 5 visible abdominal tergites, first sternite long from apex of elytra, 6 visible sternites, squamous pubescence in foveae, in mesosternopleural groove and often in sulci.

Caccoplectus can be divided into the *spinipes-, celatus-* and *orbis*-groups. The *spinipes*-group has: vertexal sulci hooked ventrally from vertex toward eyes, spinose armature on pro- and mesofemora, pro- and mesotibiae with ventral spines near apex, median longitudinal sulcus between base and antebasal sulcus. The *celatus*-group has: vertexal sulci not hooked ventrally, pro- and mesotibiae without spines, median longitudinal sulcus between base and antebasal sulcus. The *orbis*-group has: vertexal sulci not hooked ventrally, pro- and mesotibiae with ventral protuberance near apex, no median longitudinal sulcus, antennal tubercles flatly depressed from vertex.

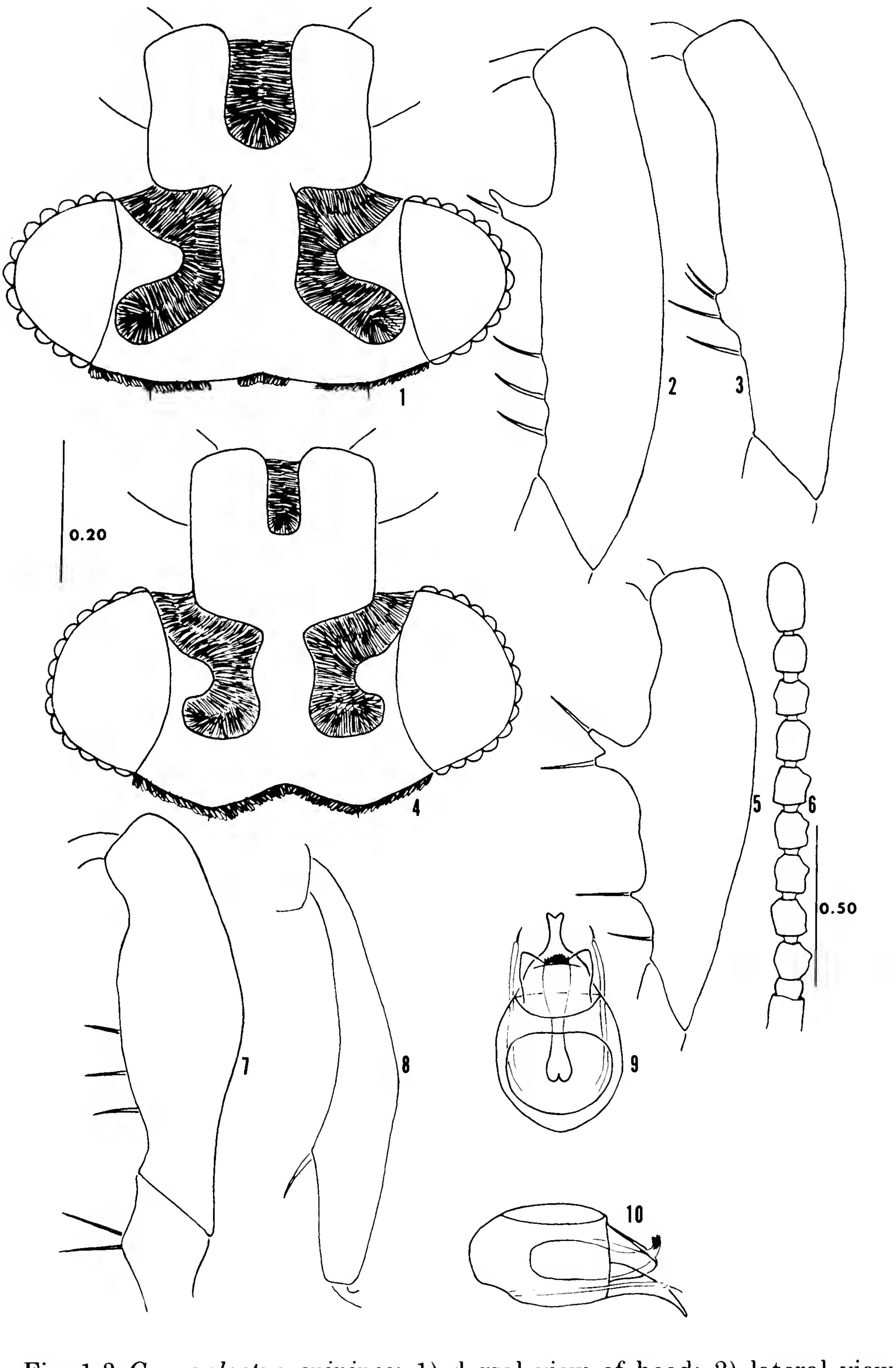


Fig. 1-3 *Caccoplectus spinipes*: 1) dorsal view of head; 2) lateral view of profemur; 3) lateral view of mesofemur.

Fig. 4-10 *Caccoplectus nuttingi*: 4) dorsal view of head; 5) lateral view of profemur; 6) lateral view of antenna; 7) lateral view of mesofemur and trochanter; 8) lateral view of mesotibia; 9) dorsal view of genitalia; 10) lateral view of genitalia.

All measurements in species descriptions are in millimeters. When pubescence is referred to in descriptions, it refers only to squamiform pubescence. Holotypes are placed in glycerin capsules. Drawings were made from specimens on slides. Antennal drawings were made at the same magnification. All other drawings except those of genitalia were made at the same magnification. Abbreviations for collections where specimens are deposited are those of Arnett and Samuelson (1969) where possible. Other abbreviations are: DSC, private collection of the author; KS, private collection of Karl Stephan, Tucson, Arizona; and MWS, private collection of Milton W. Sanderson, Illinois Natural History Survey, Urbana, Illinois.

Key to the Species of *Caccoplectus*

1. Vertexal sulci hooked ventrally toward eyes (Fig. 1), spines near apex of pro- and mesotibiae (Fig. 8) (*spinipes*-group) 2

1′. Vertexal sulci not hooked ventrally (Fig. 24); without spines near apex of pro- and mesotibiae (Fig. 31, 42) 5

2(1). Mesofemur ventrally with rounded tubercle near base bearing 3 of the 4 large spines near base (Fig. 3); Texas .... *spinipes* Schaeffer

2′. Mesofemur without rounded tubercle (Fig. 7) 3

3(2′). Antennal segments III and IV without spinose projections ventrally or laterally (Fig. 6); with large ventral tubercle on mesofemur forked between spines (Fig. 5); Arizona .... *nuttingi* n. sp.

3′. Antennal segments III to IV with spinose projections ventrally or laterally, large ventral tubercle on mesofemur not forked between spines (Fig. 12) 4

4(3′). Antennal segments III and IV with double ventro-lateral spinose projections (Fig. 22); Baja California Sur .... *incultus* n. sp.

4′. Antennal segments II and IV with single ventral spinose projection (Fig. 15); Arizona .... *sentis* n. sp.

5(1′). Pro- and mesotibiae with ventral protuberance near apex (Fig. 42); antennal tubercles depressed from vertex; antennal segments disk-like; without median longitudinal sulcus at base of pronotum; Panama (*orbis*-group) .... *orbis* n. sp.

5′. Pro- and mesotibiae without such a protuberance; median longitudinal sulcus at base of pronotum; antennae more quadrate (Fig. 26) (*celatus*-group) 6

6(5′). Protibiae with ventral face flattened and posteriorly expanded; antennal segments III to V concave ventrally; Jamaica .... *bellingeri* Park

6′. Protibiae not modified, antennal segments III to V subquadrate 7

7(6′). Mesofemora not dilated at middle (Fig. 32); pro- and mesofemora with 3 to 4 small setae between middle and base; Panama .... *inornatus* n. sp.

7′. Mesofemora dilated at middle (Fig. 25); spinose at apex of dilation 8

8(7′). Both pro- and mesofemora ventrally dilated at middle, numerous long spines on dilations; metatrochanter with 4 short spines (Fig. 40); antennal segments relatively long and narrow (Fig. 37); Arizona .... *pectinatus* n. sp.
8′. Only mesofemora ventrally dilated, spines at apex small and curved; male with U-shaped notch at apex of mesosternum (Fig. 27); no spines on metatrochanter; Mexico to Panama...... .... *celatus* Sharp

Caccoplectus Sharp

Caccoplectus Sharp 1887:22 (genotype *Caccoplectus celatus* Sharp, fixed by monotypy). Raffray 1903:491, 1904:317, 1908:316. Schaeffer 1906:263, Bowman 1934:125. Park 1942:288, 1943:212, 1953:312-3, 1955:101. Jeannel 1949:16-7.

Caccoplectus spinipes Schaeffer
(Fig. 1-3)

Caccoplectus spinipes Schaeffer 1906:263-4 (Type loc.-Texas). Bowman 1934:125. Park 1953:312.

The holotype was briefly examined and sketched while visiting the United States National Museum. The following information is intended to supplement Schaeffer's description.

Pubescence encircling base of head broken for short distance a slight distance to either side of vertex; antennae resembling those of *sentis*; profemur with large tubercle near middle, tubercle with rounded lobe extending past origin of spine, 3 spines between tubercle and base; mesofemur with rounded tubercle at first third of length, with 3 spines arising from tubercle; tergite II with 2 areas of pubescence to either side of middle.

At the time I was comparing the holotype with a specimen of *sentis* and concluded the 2 were closely related due to the overall similarity.

Distribution: only 1 specimen examined. Holotype, TEXAS, Dietz. U.S.N.M. Type #62324.

Caccoplectus nuttingi Chandler, **new species**
(Fig. 4-10)

Brunnescent; head with pubescence in unbroken line around base, covering basal half of venter; median crest highest anterior to eyes, descending to flattened antennal tubercles; eyes large, approximately 50 facets; antennae with segment II transverse, segments III-X same length, IV-XI with slight ventral angulation, X-XI cylindrical, XI half again as long as X. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base, pubescence filling median sulcus and antebasal sulcus to basal lateral foveae, with short bare area slight distance to either side of median sulcus; lateral longitudinal sulci with pubescence for short distance from antebasal sulcus, pubescence on anterior margin of prosternum between lateral pronotal angles, also from lateral foveae to base. Elytra with medial 3 basal foveae with striae reaching apex of elytra, outer fovea without stria; apex with band of pubescence.

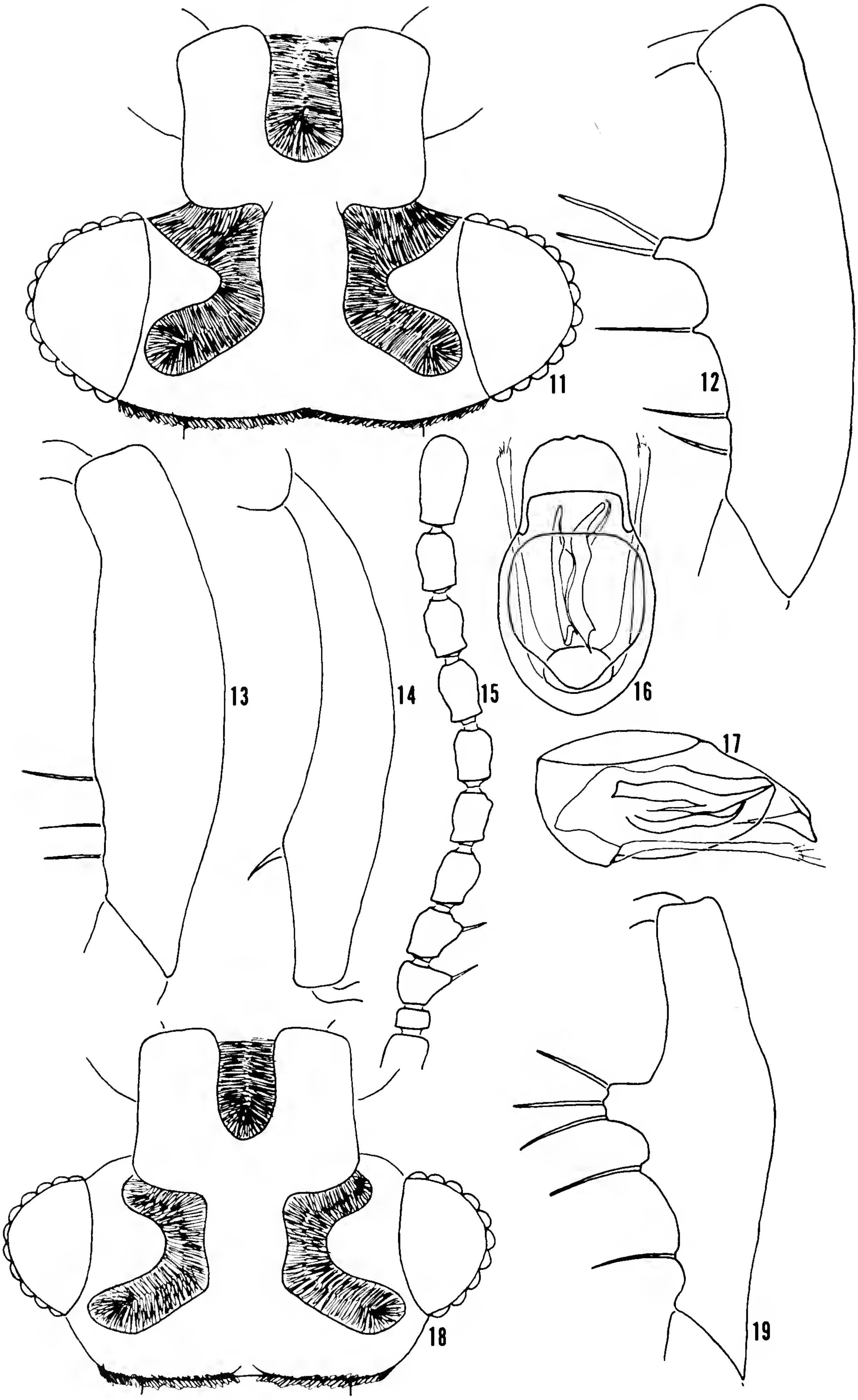


Fig. 11-17 *Caccoplectus sentis*: 11) dorsal view of head; 12) lateral view of profemur; 13) lateral view of mesofemur; 14) lateral view of mesotibia; 15) lateral view of antenna; 16) dorsal view of genitalia; 17) lateral view of genitalia.

Fig. 18-19 *Caccoplectus incultis*: 18) dorsal view of head; 19) lateral view of profemur.

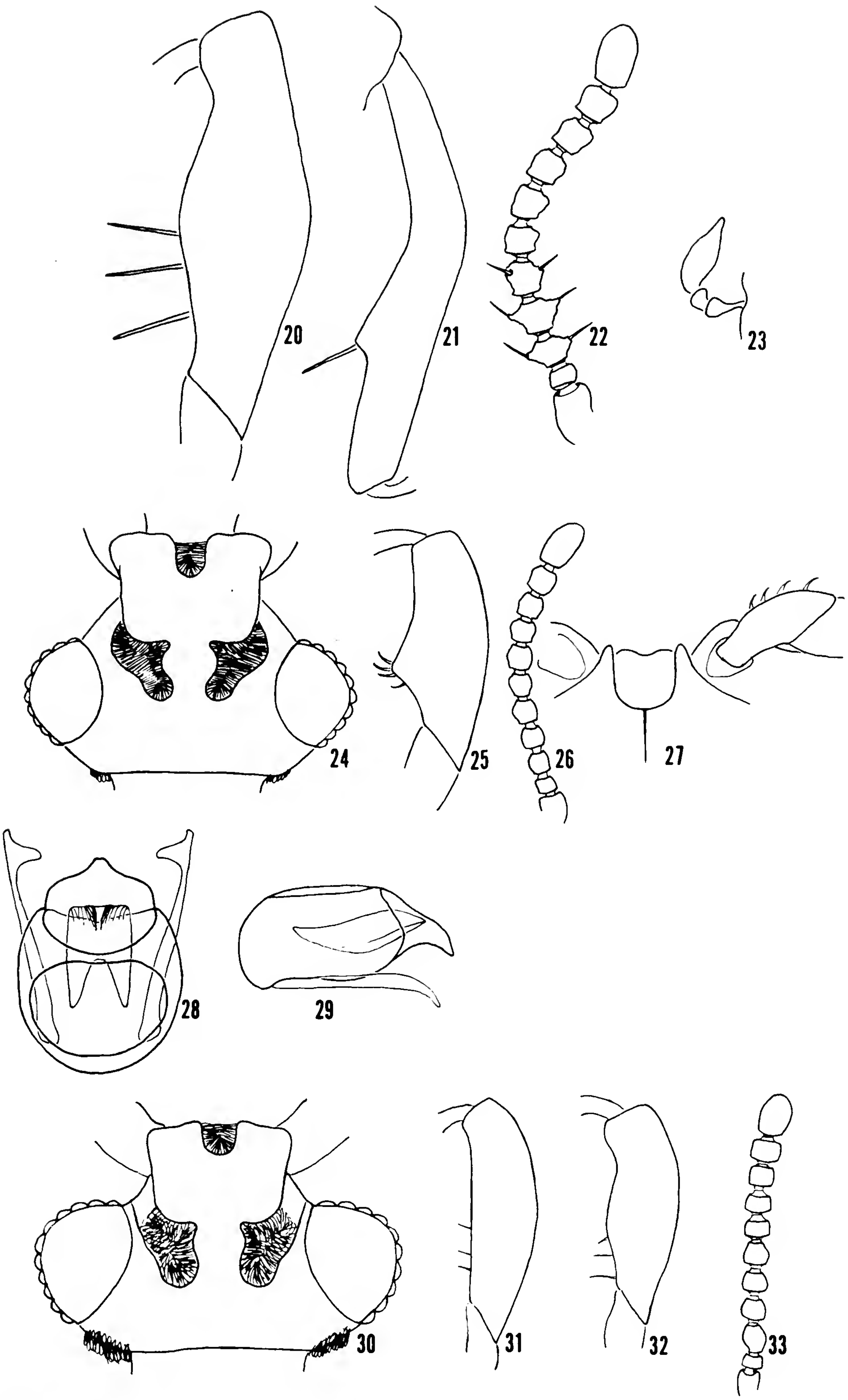
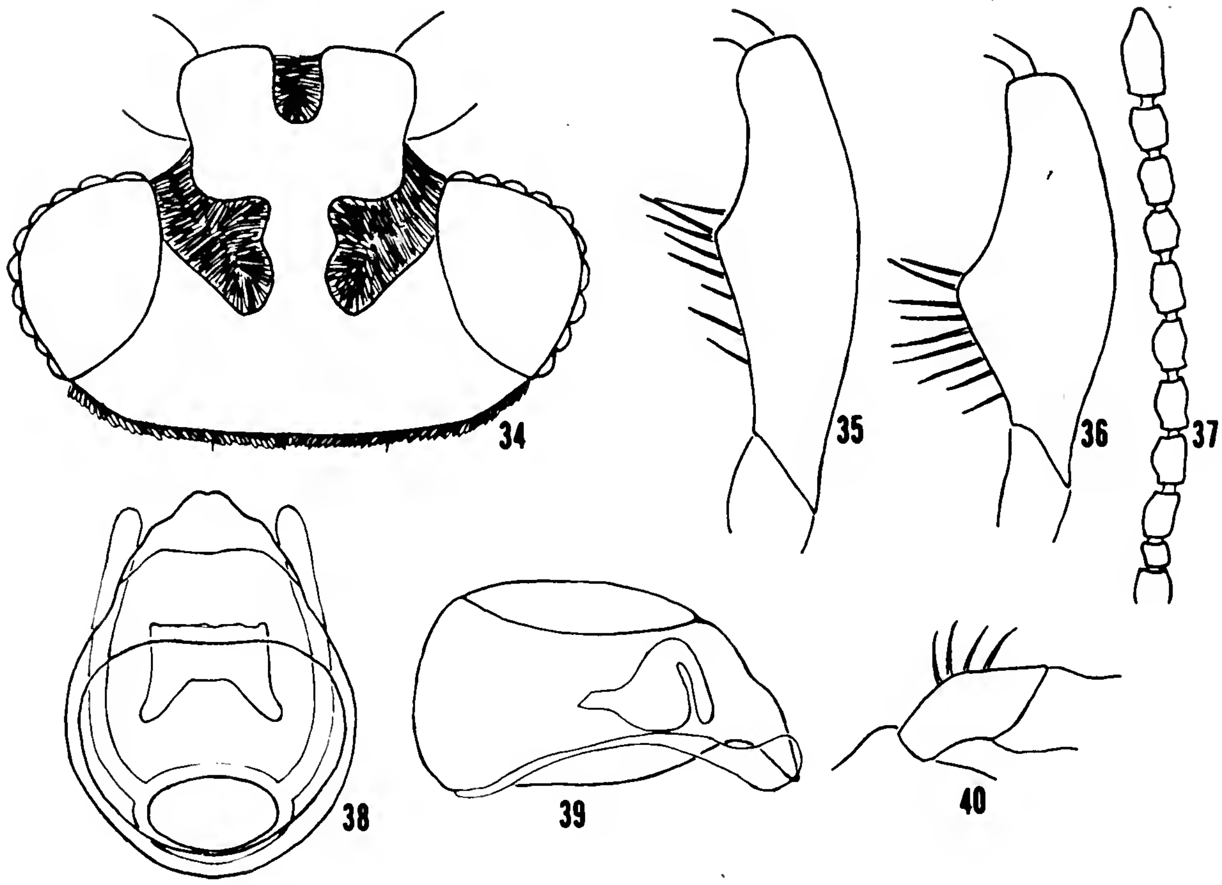


Fig. 20-23 *Caccoplectus incultis* 20) lateral view of mesofemur; 21) lateral view of mesotibia; 22) ventral view of antenna; 23) right maxillary palpus.

Fig. 24-29 *Caccoplectus celatus*: 24) dorsal view of head; 25) lateral view of mesofemur; 26) lateral view of antenna; 27) ventral view of apex of metasternum; 28) dorsal view of genitalia; 29) lateral view of genitalia.

Fig. 30-33 *Caccoplectus inornatus*: 30) dorsal view of head; 31) lateral view of profemur; 32) lateral view of mesofemur; 33) lateral view of antenna.



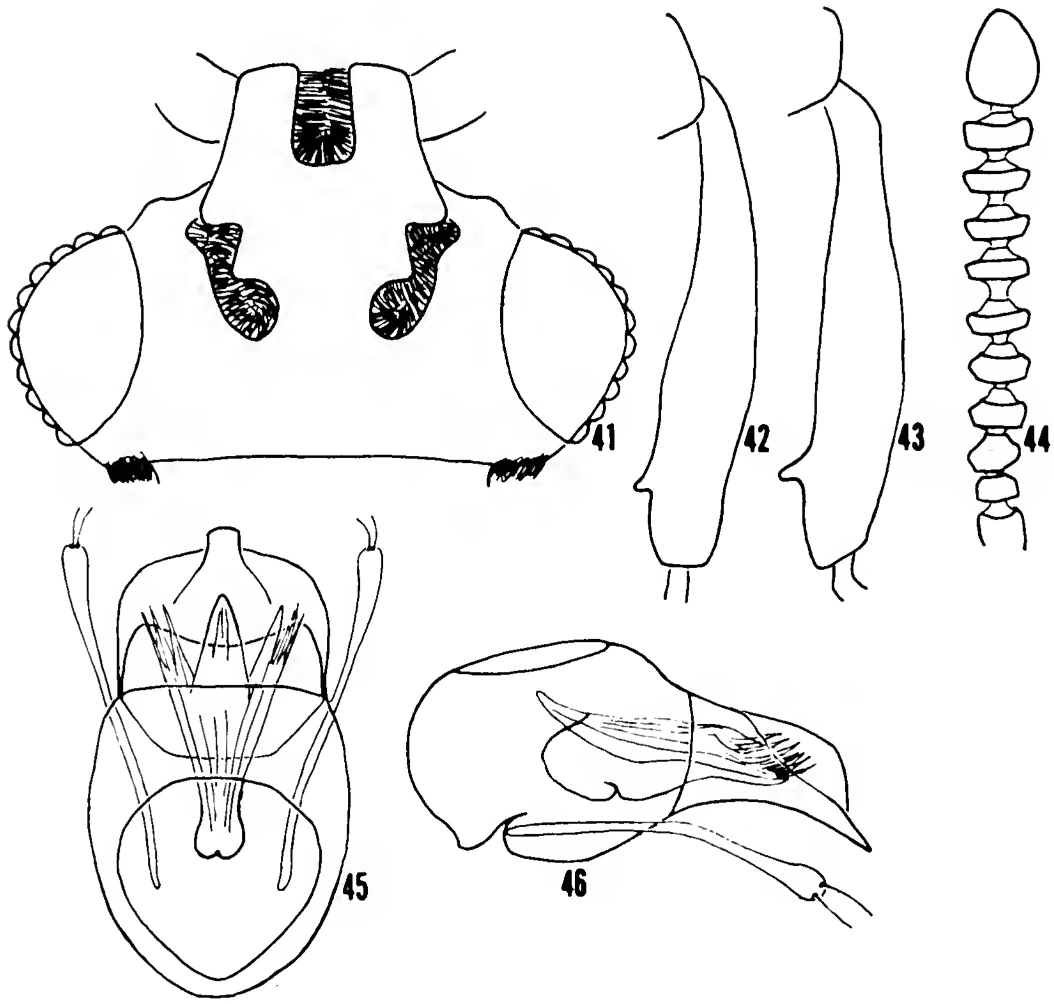


Fig. 34-40 *Caccoplectus pectinatus*: 34) dorsal view of head; 35) lateral view of profemur; 36) lateral view of mesofemur; 37) lateral view of antenna; 38) dorsal view of genitalia; 39) lateral view of genitalia; 40) ventral view of metatrochanter.

Fig. 41-46 *Caccoplectus orbis*: 41) dorsal view of head; 42) lateral view of protibia; 43) lateral view of mesotibia; 44) lateral view of antenna; 45) dorsal view of genitalia; 46) lateral view of genitalia.

Band of pubescence separating prepectus from mesosternum. Profemur with prominent forked ventral tubercle, each fork with large spine, 2 or 3 large spines between tubercle and base, usually equidistant, first spine near base; protibia with curved spur near middle; mesofemur with 3 equidistant, large spines, mesotrochanter with 2 long spines in male, 4 shorter spines in female, mesotibia with curved spur at two-thirds of length.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI evenly rounded at apex, anterior margin of sternites II-V with bands of pubescence, sternites I-III with bands of pubescence at apex, band on II-III widely interrupted at center; tergite I with 2 lateral foveae on each side, II-IV with 1 lateral fovea on each side, I-IV with complete band of pubescence on anterior margins, extending across lateral margins, tergites I-II with pubescence at apex, broadly interrupted at middle; length 2.57-2.76mm.

Male holotype: International Biological Program Site, Santa Rita Range Reserve, ARIZONA. Length 2.76. Head 0.50 long, 0.65 across eyes, 0.29 wide across base of antennal tubercles, median antennal sulcus 0.13 long, length antennal segments I-XI: I 0.15, II 0.08, III 0.15, IV 0.15, V 0.15, VI 0.15, VII 0.15, VIII 0.16, X 0.16, XI 0.23. Pronotum 0.53 long, 0.47 wide at base, 0.34 wide at apex, median longitudinal sulcus 0.08 long, width of pubescence at median portion of antebasal sulcus 0.15, break-in pubescence 0.06 wide. Elytra 0.78 long at median suture, 0.61 wide across humeri. Lengths from base to spines on profemur, spine 1 0.03, spine 2 0.11, 0.28 to first spine on tubercle, this spine 0.09 long; protibia with spur 0.38 from base; length from base to spines on mesofemur, spine 1 0.10, spine 2 0.15, spine 3 0.20, mesotibia with spur 0.38 from base; spines on mesotrochanter 0.08 long. Genitalia with penis fringed at apex.

Female with 4 short spines on mesotrochanter, with 3 spines between tubercle and base on profemur.

Distribution: south-central Arizona. Holotype male: International Biological Program Site, Santa Rita Range Reserve, Pima County, 12-15-VII-1973, W. L. Nutting, UV trap. Paratypes: 2 males, same data except 27-29-VII-1973 (UAIC) and 3-5-VIII-1973 (DSC). 1 female not designated paratype is associated with this species, Organ Pipe Cactus National Monument, Pima County, 6-VIII-1968, G. D. Butler & F. G. Werner (DSC). The holotype is to be deposited at the Field Museum of Natural History, Chicago.

Caccoplectus sentis Chandler, **new species**
(Fig. 11-17)

Brunnescent; head with pubescence in unbroken line around base, covering basal half of venter; median crest highest anterior to eyes, descending to flattened antennal tubercles; eyes large, approximately 54 facets; antennae with segment II very short and transverse, III with bulge anteriorly and prominent ventral projection with terminal spine, IV with less prominent ventral projection and spine, V-IX slightly protruding ventrally, segments III-IX equal in length, X slightly smaller, cylindrical, XI slightly longer, cylindrical. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base, pubescence filling median sulcus and antebasal sulcus to basal lateral foveae, short bare area slight distance to either side of median sulcus; pubescence filling lateral longitudinal sulci short distance anteriorly from antebasal sulcus, present in band between lateral pronotal angles across prosternum, running from lateral foveae to base. Elytron with medial three basal foveae with striae reaching apex, outer fovea without stria; apex with band of pubescence.

Band of pubescence separating prepectus from mesosternum. Profemur with prominent ventral tubercle near middle, 2 to 3 large spines between base and tubercle, equidistant from base and each other, tubercle with 2 to 3 spines at apex, often with another spine rising from base of tubercle or more slightly medial, protibia with slightly curved spur at two-thirds of length, mesofemur with 3 spines near base, equal distances apart and from base, often with fourth spine at middle, mesotibia with ventral short, thick, slightly curved spur at three-fourths of length.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI with small indentation at middle on posterior edge, anterior margin of II-V with bands of pubescence, I-III with pubescence at apex, II-III with pubescence widely broken at center; tergite I with 2 lateral foveae on each side, II-IV with 1 lateral fovea on each side, I-IV with complete band of pubescence on anterior margins, extending across lateral margins, I-II have patches of pubescence at apex, 2 smaller patches at the middle and 2 larger ones near abdominal margins; length 2.88-3.28mm.

Male holotype: Cochise Stronghold, ARIZONA. Length 3.05. Head 0.55 long, 0.73 wide across eyes, 0.34 wide across base of antennal tubercles, median antennal sulcus 0.15 long; length antennal segments I-XI: I 0.18, II 0.08, III 0.14, IV 0.20, V 0.18, VI 0.18, VII 0.20, VIII 0.20, IX 0.19, X 0.18, XI 0.30. Pronotum 0.55 long, 0.55 wide at base, 0.35 wide at apex, median longitudinal sulcus 0.13 long, width of pubescence at median portion of antebasal sulcus 0.18, break in pubescence 0.03 wide. Elytron 0.95 long at median suture, 0.83 wide across humeri. Lengths from base to spines on profemur, spine 1 0.08, spine 2 0.16, spine 3 0.26, 0.32 to first spine on tubercle, this spine 0.10 long, protibia with spur 0.43 from base, lengths from base to spines on mesofemur, spine 1 0.08, spine 2 0.13, spine 3 0.19, mesotibia with spur 0.40 from base. Genitalia with penis in from of distinct spines.

Female unknown.

Distribution: intermediate elevations in eastern Arizona. Holotype male: Cochise Stronghold, Dragoon Mountains, Cochise County, Arizona, 27-30-VII-1970, R. J. Shaw, Ultraviolet light trap. 6 Paratypes: 2 males, same data except 1 each on 21-24-VII-1970 and 3-6-VIII-1970 (DSC, UAIC); 1 male, same locality 29-VII-1957, C. W. O'Brien, at light (UCDC); 1 male, same locality, 13-VIII-1958, C. W. O'Brien, light trap (UAIC); 1 male, Canelo, Santa Cruz County, 12-VIII-1959, G. D. Butler (UAIC); 1 male, Graham Mountains, Noon Creek, Graham County, 1-VIII-1957, G. D. Butler (UAIC). The holotype is to be deposited at the Field Museum of Natural History, Chicago.

Caccoplectus incultis Chandler, **new species**
(Fig. 18-23)

Brunnescent; head with pubescence around base barely broken at vertex, covering basal half of venter; low median crest highest between eyes, descending to flattened antennal tubercles; eyes moderate, approximately 30 facets; antennae with segment II short and transverse, II-IV with paired ventro-lateral projections, with spines at apex of projections, V with projections reduced, with spines at apex, IV-V same length, VI-X slightly shorter, XI half again as long as X. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base, pubescence filling median sulcus and antebasal sulcus to lateral foveae, short bare area to either side of median sulcus; pubescence filling lateral longitudinal sulci a slight distance from base, present on prosternum between lateral pronotal angles, running from lateral basal foveae to base. Elytron with medial 3 basal foveae with striae reaching apex, outer fovea without stria; apex with band of pubescence.

Band of pubescence separating prepectus from mesosternum. Profemur with prominent ventral tubercle tipped with three large spines, 2 large spines between tubercle and base, protibia with large ventral spur at two-thirds of length, mesofemur with 3 large spines in basal half, mesotibia with large ventral spine at two-thirds of length.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI evenly rounded at apex, anterior margin of II-V with bands of pubescence, I-III with band of pubescence at apex, band on II-III broadly interrupted at center; tergite I with 2 lateral foveae on each side, II-IV with 1 lateral fovea on each side, I-IV with complete band of pubescence on anterior margins, extending across lateral margins, I-II with band of pubescence at apex.

Female holotype: La Burrera, BAJA CALIFORNIA SUR. Length 2.88. Head 0.45 long, 0.54 across eyes, 0.40 wide across base of antennal tubercles, median antennal sulcus 0.13 long, length of antennal segments I-XI: I 0.19, II 0.08, III 0.11, IV 0.14, V 0.14, VI 0.13, VII 0.13, VIII 0.13, IX 0.14, X 0.13, XI 0.21. Pronotum 0.50 long, 0.34 wide at base, 0.23 wide at apex, median longitudinal sulcus 0.10 long, width of pubescence at median portion of antebasal sulcus 0.13, break in pubescence 0.03 wide. Elytra 0.70 long at median suture, 0.62 wide across humeri. Lengths from base to spines on profemur, spine 1 0.06, spine 2 0.16, 0.24 to first spine on tubercle, this spine 0.11 long, protibia with spur 0.36 from base, length from base to spines on mesofemur, spine 1 0.07, spine 2 0.13, spine 3 0.17, mesotibia with spur 0.35 from base.

Male unknown.

Distribution: single specimen, holotype female: La Burrera, Baja California Sur, MEXICO, 17-X-1968, E. L. Sleeper. The holotype is to be deposited at the Field Museum of Natural History, Chicago.

Caccoplectus celatus Sharp
(Fig. 24-29)

Caccoplectus celatus Sharp 1887:22, Pl. 1, Fig. 11 (Type loc.-Zapote, Guatemala, type in British Museum of Natural History). Raffray 1904:317, 1908:316. Park 1942:288, 1943:209.

Brunnescent; head with pubescence at base only in small bands behind eyes on venter; median crest slightly elevated above eyes, descending to flattened antennal tubercles; eyes moderate, approximately 35 facets; antennae with segment II short and transverse, segments III-X submoniliform, same length, truncate basally, XI as long as IX and X together. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base, pubescence only in areas of median and lateral basal foveae and extending posteriorly for short distance in median sulcus. Elytra with medial three basal foveae with striae reaching apex of elytron, outer fovea without stria; apex with band of pubescence.

Pubescence filling prepectoid and mesosternal foveae. Metasternum with 2 long, blunt projections near apex, forming U-shaped notch; tibiae and profemora unmodified, mesofemur medially angulate ventrally, with 4 short, curved setae about the apex, metatrochanter with 4 short, curved setae on posterior edge.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI evenly rounded at apex, anterior margin II-V with band of pubescence in female, in male with complete band on sternite I, restricted to small lateral patches on III-V, I with band of pubescence at apex; tergite I with 2 lateral foveae on each side, II-IV with 1 lateral fovea on each side, I-IV with band of pubescence on anterior margins, I with band complete, following tergites with increasing width of break at center, no pubescence on posterior margins, male with sternite II with 2 small, indented depressions at center of apex, more densely setose with short setae than rest of margin, area behind these depressions on sternite III bare, with emargination on anterior margin; length 2.12-2.16 mm.

Redescribed male: Albrook Forest Site, Canal Zone, PANAMA. Length 2.12. Head 0.33 long, 0.40 wide across eyes, 0.19 wide across base of antennal tubercles, median antennal sulcus 0.06 long, length antennal segments I-XI: I 0.11, II 0.05, III 0.08, IV 0.08, V 0.09, VI 0.09, VII 0.09, VIII 0.09, IX 0.09, X 0.09, XI 0.18. Pronotum 0.50 long, 0.31 wide at base, 0.26 wide at apex, median longitudinal sulcus 0.08 long, length of pubescence in sulcus 0.02, width of pubescence at middle of antebasal sulcus 0.08, width of break between pubescence in median and lateral foveae 0.10. Elytra 0.56 long at median suture, 0.59 wide across humeri. Lengths from base to setae on mesofemur, seta 1 0.04, seta 4 0.10, length seta 4 0.03, setae on metatrochanter 0.02 long, width between tips of projections on metasternum 0.10. Genitalia with penis blunt at apex, styles abruptly widened near apex.

Female without metasternal projections, lacking setate depression at apex of sternite II and smooth medial area of sternite III.

Distribution: throughout Central America. Two specimens examined: 1 male, Albrook Forest Site, Fort Clayton, Canal Zone, PANAMA, 6-7-XII-1967, R. Hutton, black light trap (MWS). 1 female, Tampico, Tamaulipas, MEXICO, 16-XII, E. A. Schwarz (USNM). The type locality is Zapote, Guatemala, and Raffray (1890) mentioned a specimen from the "tubacs" of Mexico.

Caccoplectus inornatus Chandler, **new species**
(Fig. 30-33)

Brunnescent; head with pubescence at base extending from behind eyes across venter, vertex between eyes smoothly confluent with flattened antennal tubercles; eyes large, approximately 47 facets; antennae with segment II short, quadrate, IV-IX obconical, same length, X quadrate, slightly larger, XI shorter than IX and X together. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base; pubescence in sulcus and in area of median and lateral basal foveae, present in bands on lateral portions of prosternum, widely separated at center. Elytron with medial three basal foveae with striae reaching apex, outer fovea without stria; apex with band of pubescence.

Pubescence filling prepectoid and mesosternal foveae. Profemur with 3 short setae between middle and base in male, 4 similar setae in female, mesofemur with 3 setae between middle and base, 4 such setae in female.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI angularly emarginate at apex, anterior margin of II-V with bands of pubescence, band on V broken at center, I with band of pubescence at apex; tergites I-IV with 1 lateral fovea on each side, I-IV with bands of pubescence on anterior margins, band on IV widely interrupted at center, I-II with patches of pubescence at apex. Length 1.70-1.90mm.

Male holotype: Albrook Forest Site, Canal Zone, PANAMA. Length 1.90. Head 0.29 long, 0.41 wide across eyes, 0.15 wide across base of antennal tubercles, median antennal sulcus 0.05 long, length antennal segments I-XI: I 0.09, II 0.05, III 0.10, IV 0.09, V 0.09, VI 0.09, VII 0.09, VIII 0.09, IX 0.09, X 0.10, XI 0.16. Pronotum 0.33 long, 0.30 wide at base, 0.25 wide at apex, median longitudinal sulcus 0.07 long, width of pubescence at median fovea 0.05, 0.10 wide between pubescence in lateral and median foveae. Elytra 0.53 long at median suture, 0.40 wide across humeri. Lengths from base to setae on profemur, seta 1 0.04, seta 3 0.09, length from base to setae on mesofemur, seta 1 0.10, seta 3 0.06. Genitalia lost.

Female with approximately 30 eye facets, profemur and mesofemur with 4 short setae between middle and base, antennae slightly more disc-like with apical ends more drawn out, band of pubescence at apex of sternite I broken at center, as wide as distance between metacoxae.

Distribution: both records from Panama. Holotype male: Albrook Forest Site, Fort Clayton, Canal Zone, PANAMA, 1-2-VI-1967, Hutton & Llaurado, black light trap. Paratype, 1 female, same data except 8-9-VI-1967 (MWS). Holotype to be deposited at the Field Museum of Natural History, Chicago.

Caccoplectus pectinatus Chandler, **new species**
(Fig. 34-40)

Brunnescent; head with pubescence in unbroken line around base, covering basal half of venter; median crest barely higher than flattened antennal tubercles, highest between eyes; eyes large, approximately 63 facets; antennae with segment II short and transverse, segments IV-X slightly angulate ventrally, XI almost pointed at apex, III-VIII same length, VIII-X gradually decreasing in length. Pronotum with short median longitudinal sulcus running from antebasal sulcus to base, pubescence filling sulcus to just short of base, bare area to either side of median fovea, breaking band of pubescence in antebasal sulcus, pubescence extending short distance up lateral longitudinal sulci, not extending posteriorly from basal lateral foveae to base, band on anterior margin of prosternum. Elytron with medial 3 basal foveae with striae reaching apex; apex with band of pubescence.

Pubescence in prepectoid and mesosternal foveae. Profemur with ventral angulation, 6 to 7 spines arising between base and apex of angulation, protibia and mesotibia without spines, mesofemur with prominent ventral angulation, 7 to 9 spines arising between base to just past apex of angulation, metatrochanter with 4 posterior spines.

Visible sternites I-V with 1 lateral fovea on each side, sternite VI evenly rounded at apex, anterior margin of II-V with bands of pubescence, I-III with pubescence at apex, II-III with pubescence interrupted at center; tergite I with 2 lateral foveae on each side, II-IV with 1 lateral fovea on each side, I-IV with complete band of pubescence on anterior margins, extending across lateral margins, I-II with bands of pubescence across apex; length 2.22-2.43mm.

Male holotype: Tucson, ARIZONA. Length 2.33. Head 0.44 long, 0.48 wide across eyes, 0.19 wide across base of antennal tubercles, median antennal sulcus 0.07 long, length antennal segments I-XI: I 0.15, II 0.06, III 0.13, IV 0.13, V 0.13, VI 0.14, VII 0.14, VIII 0.13, IX 0.13, X 0.13, XI 0.22. Pronotum 0.41 long, 0.47 wide at base, 0.26 wide at apex, median longitudinal sulcus 0.16 long, pubescence in sulcus 0.14 long, width of pubescence at median portion of antebasal sulcus 0.07, break in pubescence 0.08 wide. Elytra 0.63 long at median suture, 0.49 wide across humeri. Length from base to spines on profemur, spine 1 0.07, spine 8 0.18, length from base to spines on mesofemur, spine 1 0.05, spine 9 0.13, length spine 9 0.14, length spines on metatrochanter 0.05. Genitalia with penis smoothly curved at apex.

Female unknown.

Distribution: central ARIZONA. Holotype male: Tucson, Pima County, Arizona, 21-VIII-1968, K. Stephan. 3 paratypes: 2 males, eutopotypical (DSC, KS); 1 male, Boyce Thompson S. W. Arboretum, Superior, Pinal County, 15-IX-1949, B. W. Benson, light trap (INHS). The holotype is to be deposited at the Canadian National Collection, Ottawa.

Caccoplectus orbis Chandler, **new species**
(Fig. 41-46)

Dark brunnescent; head with pubescence at base extending from behind eyes across venter, median crest before eyes descending to oblique, flattened antennal tubercles; eyes large, approximately 63 facets; antennae with segment II short, quadrate, III-X expanded medially, disc-like, XI obconical, as long as IX and X together. Pronotum without median longitudinal sulcus, two small swellings at center of basal margin, pubescence only in minute median and large lateral basal foveae, pubescence on anterior margin of prosternum broken at center and again laterally. Elytron with sutural stria reaching apex, middle two foveae with striae only half length of elytron, outer fovea without stria; apex with pubescence.

Pubescence filling prepectoid and mesosternal foveae; pro- and mesotibiae with projection on ventral side near apex, no modifications of femora.

Visible sternites I-V with 1 lateral fovea on each side, VI evenly rounded at apex, anterior margin of II-V with bands of pubescence, I with band of pubescence at apex; tergites I-IV with one lateral fovea on each side, I with thin band of pubescence on anterior margin, separated at middle, II-III with small patches of pubescence near lateral abdominal margins, IV with small dorsal projections at center of lateral margins.

Male holotype: Albrook Forest Site, Canal Zone, PANAMA. Length 2.38. Head 0.40 long, 0.51 across eyes, 0.20 wide across base of antennal tubercles, median antennal sulcus 0.06 long, length antennal segments I-XI: I 0.12, II 0.07, III 0.09, IV 0.10, V 0.11, VI 0.10, VII 0.10, VIII 0.10, IX 0.10, X 0.10, XI 0.20. Pronotum 0.35 long, 0.43 wide at base, 0.31 wide at apex, width between pubescence of median fovea and lateral foveae 0.15. Elytra 0.63 long at median suture, 0.58 wide across humeri; spur on protibia 0.30 from base, spur on mesotibia 0.33 from base. Genitalia with penis fringed and at apex.

Female unknown.

Distribution: only known from PANAMA. Holotype male: Albrook Forest Site, Fort Clayton, Canal Zone, PANAMA, 3-4-VIII-1967, Hutton & Llaurado, black light trap. The holotype is to be deposited at the Field Museum of Natural History, Chicago.

Caccoplectus bellingeri Park

Caccoplectus bellingeri Park 1955:101-105 (Type loc.-Morce's Gap Trail, St. Andrew Parish, Jamaica, type in Field Museum of Natural History, Chicago).

I have seen no examples of this species. The male holotype has antennal segments III-V concave ventrally, metasternum with U-shaped notch as in *celatus,* profemora medially expanded to long, blunted, triangular tooth, protibiae with ventral face flattened and posteriorly expanded.

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A NEW SPECIES OF *CHRYSOBOTHRIS* (COLEOPTERA: BUPRESTIDAE) FROM AMERICAN PLUM (*PRUNUS AMERICANA* MARSH.)[1]

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ABSTRACT

A new species, *Chrysobothris sloicola,* is described from American plum (*Prunus americana* Marsh.) from Michigan. Male genitalia, protibia, clypeus and the last abdominal sternite of both sexes are illustrated.

A new species of *Chrysobothris* is described which may be confused in collections with specimens of *C. femorata* (Olivier).

Chrysobothris sloicola Manley and Wellso, **new species**
(Fig. 1A-F)

Holotype male. Form of *Chrysobothris femorata,* shining bronze-black dorsally with foveae appearing metallic gold in color; more shining ventrally than above. **Head** greenish bronze with clypeus and antennae greenish. Occiput with a broad, smooth, grooved longitudinal carina which forms a Y anteriorly; frons nearly flat, its surface coarsely, confluently punctate and clothed with long, erect, white hairs. Clypeus semicircularly rounded on each side of the median notch. Antennae slightly narrowed to apex, intermediate segments compact, about as long as wide; third segment nearly as long as the following 2 segments united; second segment small. **Pronotum** about twice as wide as long, widest at anterior and posterior one-third, sides sinuately concave at middle; apical margin sinuate; basal margin strongly sinuate; median lobe strongly produced and broadly rounded in front of scutellum; disk convex, slightly uneven with a longitudinal median depression running full length; surface irregularly punctate with slightly elevated smooth spaces. Scutellum small, triangular. **Elytra** distinctly wider than pronotum, sides rounded in front, then subparallel to behind middle, lateral margin arcuately serrulate with the serrulations largest on apical half; surface glabrous with irregular, longitudinal, smooth costae connected to one another by small transverse, irregular, smooth ridges, and interrupted by irregular densely punctured depressed areas; transverse foveae shallow and indistinct, appearing goldish. **Abdomen:** beneath strong shining magenta; sparsely, irregularly punctate and sparsely clothed with short, semierect, white hairs; lateral edges of abdominal sternites with slightly raised smooth areas which are purplish; last visible sternite emarginate at apex with a serrate submarginal ridge and coarsely serrate lateral margins. Prosternum irregularly punctured, densely pubescent with long white hairs. **Legs:** anterior femur with a large obtuse tooth, serrulate on outside. Anterior and middle tibiae reddish-

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purple on lateral margins, strongly arcuate with many small spines on the inner margin, posterior tibiae rubineus; all tarsi black. **Size:** length 10.1mm, width 4.3mm.

Allotype female. Similar to male in size and form but differing in the following characters: head brownish, with only sparse hairs; antennae entirely metallic brownish; prosternum sparsely clothed with hairs; all legs reddish-purple in color; last abdominal segment only slightly emarginate. Length 10.0mm, width 4.3mm.

Types: Holotype male: MICHIGAN: Shiawassee County (T5NR1E Sec. 35) 29-VI-74, G. V. Manley, sweeping American plum (*Prunus americana*) [USNM]. **Allotype female:** Emerged from caged American plum wood collected in Shiawassee Co. (T5NR1E Sec. 21). Wood collected XII-73, emerged 13-VI-74 [G. V. Manley Collection (GVMC)]. **Paratype males:** One male emerged from American plum wood collected in Shiawassee Co. (T5NR1E Sec. 21) in 1971. One male emerged from American plum trunk about 3.5 inches in diameter collected in Shiawassee Co. (T5NR1E Sec. 21) in 1973 [GVMC and SGWC]. **Paratype female:** collected in Shiawassee Co. (T5NR1E Sec. 35) on 9-VII-74 from tanglefoot on the trunk of an American plum tree [SGWC].

This species keys to *C. femorata* (Olivier) in Fisher (1942) but can be separated from other North American species by the shape of the male genitalia. The species has a shining dorsal surface and the foveae on elytra are shallow, appearing goldish. Only slight differences in size were noted in the 5 specimens; males ranged from 9.7 to 11.0mm long and 3.9 to 4.3mm wide, females from 10.1 to 10.6mm long and 4.2 to 4.3mm wide.

Acknowledgment: We thank Marian Mahler for the illustrations.

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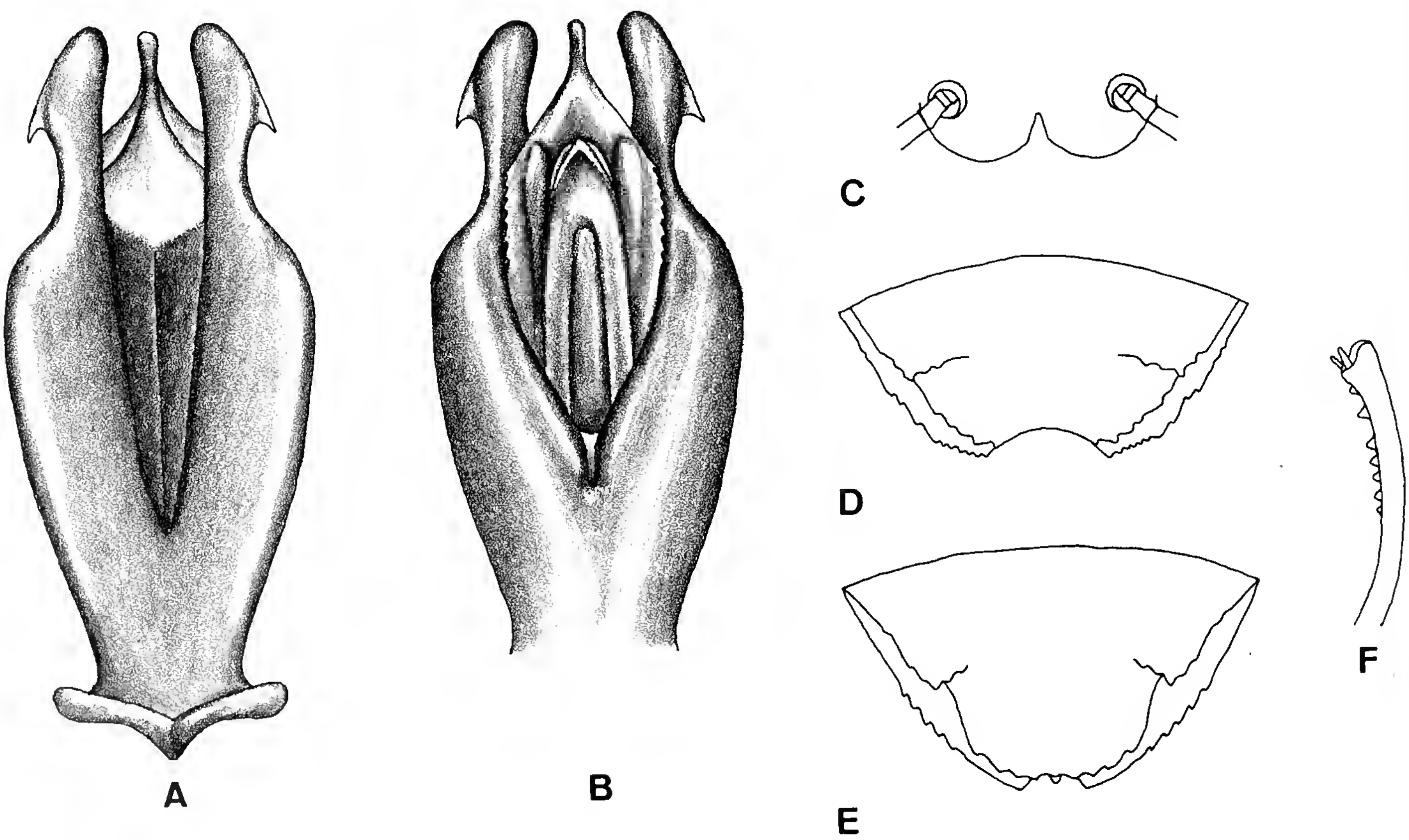

Fig. 1. *Chrysobothris sloicola,* n. sp.: Dorsal (A) and ventral (B) surface of male genitalia; male clypeus (C); 5th sternite, male (D); 5th sternite, female (E); and protibia, male (F).

DUNG BEETLES OF BLACKBEARD ISLAND[1] (COLEOPTERA: SCARABAEIDAE)

G. TRUMAN FINCHER[2]

ABSTRACT

Nineteen species of dung beetles were captured on Blackbeard Island, Georgia, with feces-baited pit traps. A comparison of the dung beetles captured on the island with beetles captured on the adjacent mainland indicates that the 2 populations are separate and distinct.

THE ISLAND

Dung beetles were collected on Blackbeard Island during the summer of 1970. Blackbeard is a National Wildlife Refuge located off the coast of Georgia in McIntosh County and comprises 2,275 ha. It is bounded on the south and east by the Atlantic Ocean and on the north and west by Sapelo Sound and Sapelo Island. Blackbeard Island consists of a series of long, low, parallel ridges, forested mainly with live oaks, with numerous ponds and savannas between the ridges. Large parts of the island contain virgin stands of slash pine, live oak, cabbage palmetto, holly, and magnolia. Saw palmetto dominates much of the understory in the northern half. On the landward side are extensive salt marshes, and on the ocean side at the south end of the island, the wide sandy beach is backed by a large area of low vegetated dunes.

Blackbeard has an abundance of raccoons and deer but lacks domestic animals, opossums, squirrels, and other wildlife that are common on the adjacent mainland and Sapelo Island. Several species of birds common on the mainland, such as the blue jay and tufted titmouse, are absent on Blackbeard.

THE FAUNA

Ninety-six feces-baited pit traps were placed throughout the island near roadways during the first visit (July 6-9), and 50 traps were placed during the second visit (September 21-24). Swine feces was used as bait, and the traps were emptied and baited twice daily.

The species and number of dung beetles captured are as follows: *Phanaeus igneus* MacLeay (2777), *P. vindex* MacLeay (8), *Canthon chalcites* (Haldeman) (1254), *C. pilularius* (L.) (250), *Deltochilum gibbosum* (Fab.) (335), *Boreocanthon depressipennis* (LeConte) (1081), *Melanocanthon bispinatus* (Robinson) (131), *M. granulifer* (Schmidt) (4), *Ateuchus lecontei* (Har.) (4946), *Onthophagus pennsylvanicus* Har. (4064), *O. hecate* (Panz.) (3853), *O. oklahomensis* Brown (209), *O. tuberculifrons* Sturm (60), *Copris*

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[2]Animal Parasite Research Laboratory, Agricultural Research Service, U. S. Department of Agriculture, Tifton, Georgia 31794.

minutus Drury (21), *Geotrupes egeriei* Germar (7), *Aphodius campestris* Blatchley (156), *A. lividus* (Olivier) (44), *Ataenius imbricatus* (Melsheimer) (2), and *A. platensis* (Blanchard) (1).

Ateuchus lecontei was the most common species of dung beetle captured on the island, followed by *O. pennsylvanicus* and *O. hecate. Phanaeus igneus* was the most common large species captured, followed by *C. chalcites.*

An interesting color spectrum was observed within the *P. igneus* population. Colors ranged from a "new penny" copper to a dark blue-black color with varying degrees of green between. The 3 color groups were as follows: blue-black made up 68%; green comprised 18%; and copper-green accounted for 14%. Only the copper-green color has been noted within the *P. igneus* population on the adjacent mainland. The blue-black color has been seen on Jekyll Island and St. Simons Island and probably occurs on other Georgia Islands, but none has been captured on the adjacent mainland.

Only 8 specimens of *P. vindex* were captured on Blackbeard, whereas they are abundant on the mainland. In addition, 5 species of dung beetles found on the adjacent mainland were not seen on the island: *Dichotomius carolinus* (Linnaeus), *Copris howdeni* Matthews and Halffter, *Onthophagus concinnus* Laporte, *Boreocanthon probus* (Germar), and *Ataenius erratus.* However, more trapping needs to be done before stating that these species are absent on the island.

Dung beetles serve as intermediate hosts of certain helminth parasites of domestic and wild animals as well as being beneficial in removing livestock feces from pasture surfaces. A difference in parasite fauna of dung beetles from Blackbeard and the adjacent Mainland was found (manuscript in preparation). The beetles on Blackbeard, with the exception of a single nematode specimen, had a fauna consisting of 2 species of nematodes and 1 species of tapeworm; whereas, the beetles on the mainland had 5 species of nematodes, 1 species of tapeworm, and 1 species of *Acanthocephala.*

The difference in parasite fauna between the 2 populations of dung beetles and the failure to capture 5 species of beetles on the island which were captured on the adjacent mainland indicates that the dung beetle population on Blackbeard is isolated from that of the mainland. This assumption is strengthened by the absence of the blue-black color phase within the *P. igneus* population on the mainland.

Blackbeard Island would be an excellent area for ecological studies on dung beetles, because the beetle population does not appear to be contiguous with other populations.

Acknowledgments

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ECOLOGY AND REDESCRIPTION OF THE ARIZONA GRAPE BRUCHID, *AMBLYCERUS VITIS* (COLEOPTERA)

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ABSTRACT

A synonymy and redescription are provided for *Amblycerus vitis* (Schaeffer). Eggs of *A. vitis* are attached to mature fruits of *Vitis arizonica* by a unique peripheral flange with adhesive at its margin. Similar eggs have been described for 6 other bruchids, most of which are in the Amblycerinae. A larva usually enters the fruit directly, consumes the contents of a single seed, and pupates inside that seed. *A. vitis* apparently has 1 generation per year, is confined to 1 host, and its distribution is limited to central and southeastern Arizona. Because of its low rate of infestation of the seeds of the Arizona grape (less than 1%), it is doubtful that it has much effect on the host's population dynamics. A species of *Urosigalphus* (Braconidae) is a parasite of *A. vitis*. Figures are provided of the dorsal and lateral habitus of the adult, scutellum, pronotum, male genitalia, method of attachment of the egg, dorsal and ventral surfaces of the egg, cross section through the egg, and a dried fruit of *V. arizonica* showing an adult exit hole.

Most species of seed beetles feed in seeds of the Leguminosae, but about 28 other plant families are also known to be hosts for them (Zacher 1952; Johnson 1970). While most genera of seed beetles which feed in seeds of non-legumes are relatively host specific (i.e., palms, morning glories, etc.), members of the genus *Amblycerus* feed in a wide diversity of host plants, often showing no particular preferences. Many feed in seeds of the Leguminosae, but several non-legume families are infested as well. *Amblycerus vitis* is 1 of these species that feeds in non-legumes.

Schaeffer (1907) described the Arizona grape bruchid as *Spermophagus vitis* and reported that it was found exclusively on grapevines in Arizona, but he did not report it as breeding in the seeds of grapes. Essig (1958) did report it as breeding " . . . in the seeds of wild grape in Arizona," although no report of its host had appeared to that time in the primary literature.

The species is rare in collections and is only occasionally collected by sweeping. It was not until 1956 that L. J. Bottimer reared a specimen from a grape seed, thus firmly establishing *Vitis arizonica* as its host. In 1971 we learned of this rearing and during 1972 and 1973 seeds of Arizona wild grapes were collected to reaffirm that they are indeed host for a bruchid. As specimens were reared it was evident that the ecology of this bruchid was of interest and should be studied more intensively. The results of that study are reported here.

Because few specimens of *A. vitis* have been available for study, no redescription has appeared in the literature. We now have adequate specimens and present below a detailed description of its external morphology and the male genitalia.

Amblycerus vitis (Schaeffer)
(Fig. 1-6)

Spermophagus vitis Schaeffer 1907:293 (Huachuca Mts., Arizona; Location of type: U. S. National Museum of Natural History); Cushman 1911:505; Leng 1920:306; Essig 1958:487.
Amblycerus vitis: Johnson 1968b:1269; Bottimer 1968:1012, 1038.

Adult

Length (pronotum-elytra): 2.6-3.7mm; width: 1.6-2.5mm; thoracic depth: 1.25-1.75mm.
Color dark reddish brown, eyes black. Vestiture of fine yellowish setae evenly distributed over body, not mottled. Body broadly ovate, convex above, elytra widest at middle (Fig. 2); pronotum trapezoidal, sides perceptibly curved, apex truncate, base sinuate, basal lobe broad. Head subtriangular; eyes prominent (Fig. 1), coarsely faceted, widely separated;

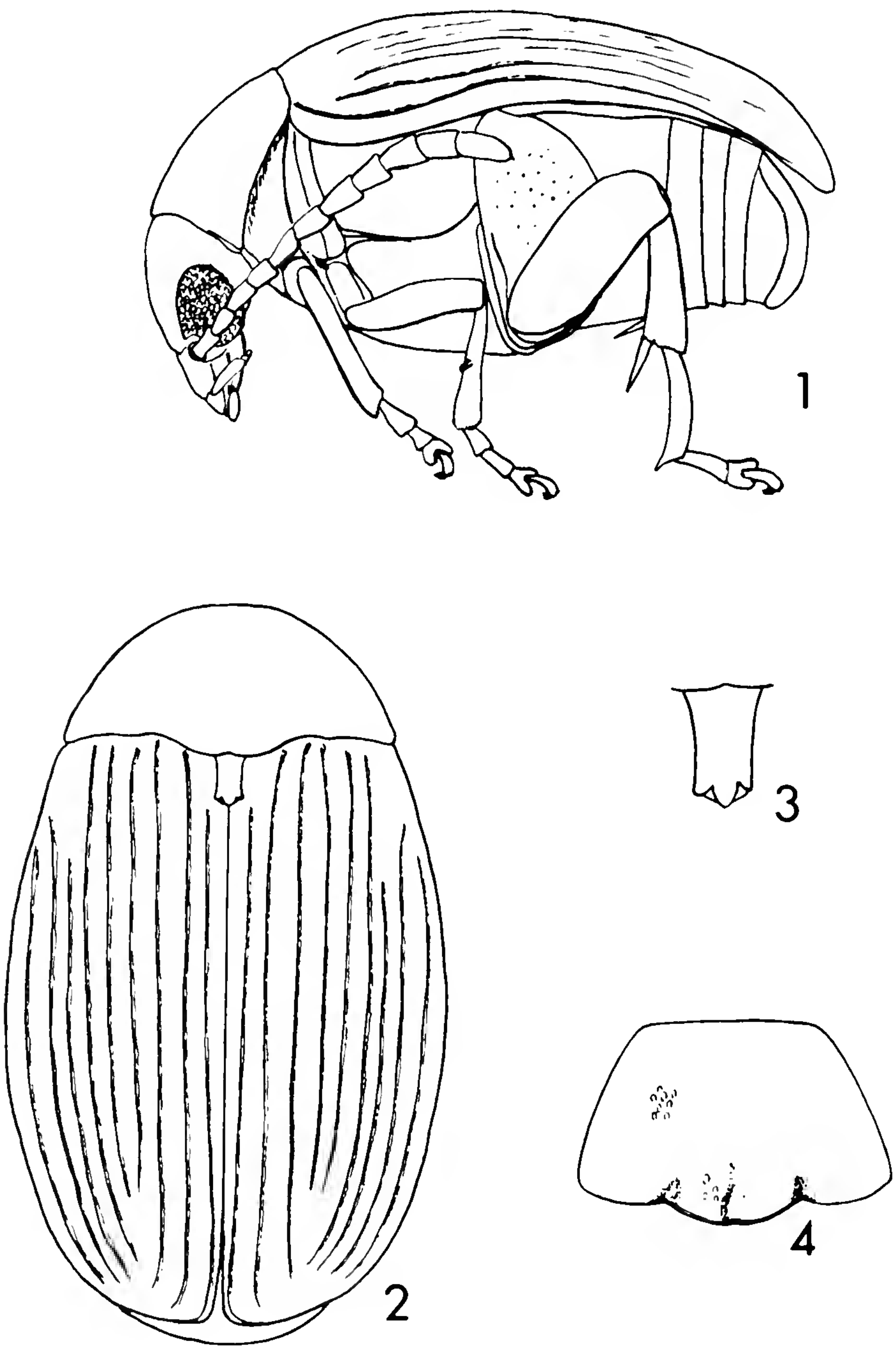

Fig. 1-4, *Amblycerus vitis*: 1) habitus, lateral; 2) habitus, dorsal; 3) scutellum; 4) pronotum, dorsal, showing approximate spacing of foveolae.

frons trapezoidal, convex, finely, evenly punctulate, without median carina or impunctate line, clypeus irregularly punctulate; antennae long, slender, reaching anterior margin of hind coxa, flagellar segments except terminal subserrate (Fig. 1). Pronotum (Fig. 4) trapezoidal, convex above, disk finely, evenly, densely foveolate, the foveola discrete, not merging, separated by 0.5 diameter to 2 diameters of a foveola; submarginal sulcus traceable at basal lobe but absent in lateral portion of basal margin, traceable along each lateral margin joining cervical sulcus at anterio-lateral corner of pronotum, cervical sulcus interrupted at middle 0.33 of apical margin; cervical setae 2; pleural region of pronotum strongly concave beneath for reception of front femur; intercoxal piece narrow, constricted at middle. **Elytra** (Fig. 2) widest at middle, evenly convex above, apical margin evenly arcuate; striae regular, moderately deep, nearly concealed by vestiture, 4th and 5th striae abbreviated by convergence of 3rd and 6th striae, intervals transversely striolate. **Scutellum** (Fig. 3) about 2 times as long as wide, flat, trilobed apically. Mesosternal lobe not prominent; metasternum with postcoxal sulcus prominent, complete at middle, continuous laterally with parasutural sulcus, the latter extending to hind coxal cavity, disk of metasternum finely punctulate; metepisternum sparsely punctate with parasutural sulcus reaching half-way along pleural suture, extending dorsad anteriorly about 0.66 along intersegmental suture. Hind coxal face pubescent and sparsely foveolate in lateral 0.75, proximal 0.25 glabrous except for anterior marginal row of fine setae, cluster of about 16 punctures near trochanteral insertion; hind tibia with outer calcar 0.33 as long as basitarsus, inner calcar 0.66 as long as outer calcar. **Abdominal** sterna with scattered fine punctures along dorsal margin, last sternum slightly emarginate in both sexes, apex of 8th tergite usually visible in male. **Pygidium** evenly convex in lateral aspect, disk evenly, finely punctate, without spots of lines.

Male genitalia: (Fig. 5, 6.) Median lobe constricted at middle; ventral valve broad at base, attenuate to acute apex; internal sac with large, pointed median sclerite flanked by clusters of fine spicules, and a pair of curved, denticulate sclerites, sac near apex with an X-shaped sclerite in a cluster of very fine spicules, apex bulbous and sparsely lined with fine spines. Lateral lobes (Fig. 6) strap-like, expanded apically, shallowly emarginate on apical margin, emargination flanked by dense tufts of setae.

Host Plants

Old Record: Essig 1958: "wild grape".

New Records: *Vitis arizonica* Engelm.: Arizona. Cochise Co.: S. W. Research Station, Chiricahua Mts., 24-27-VIII-55, L. J. Bottimer #95w; Carr Canyon, Huachuca Mts., 28-IX-56, L. J. Bottimer #99a; Carr Canyon, ca. 5500′, Huachuca Mts., 2-VIII-72, #43-72 and 6-X-72, #110-72, C. D. Johnson; Miller Canyon, ca. 5600′, Huachuca Mts., 14-VI-72, #20-72, 2-VIII-72, #47-72 and 6-X-72, #116-72, C. D. Johnson; Coronado National Memorial, Huachuca Mts., 14-VI-72, #21-72, C. D. Johnson; Ash Canyon, ca. 2.5 mi from Hwy. intersection, Huachuca Mts., 2-VIII-72, #44-72, C. D. Johnson; Ramsey Canyon, ca. 5400′, Huachuca Mts., 6-X-72, #105-72, C. D. Johnson; Cochise Stronghold, ca. 5100′, Dragoon Mts., 14-VI-72, #23-72, and 14-X-73, #552-73, C. D. Johnson; Cochise Spring, ca. 1 mi W Cochise Stronghold, 15-X-73, #558-73, C. D. Johnson; ca. 6100′, 1 mi W Bisbee, 6-

X-72, #122-72, C. D. Johnson. Santa Cruz Co.: 6 mi E Ruby, 5-X-72, #102-72, C. D. Johnson; Madera Canyon, Santa Rita Mts., ca. 5400′, 12-VI-73, #513-73, C. D. Johnson. Pima Co.: Bog Springs Camp., Madera Canyon, Santa Rita Mts., 7-X-72, #130-72, C. D. Johnson; ca. 5500′, Box Canyon, Santa Rita Mts., 7-X-72, #123-72, C. D. Johnson. Yavapai Co.: Clear Creek Campground, ca. 8 mi SE Camp Verde, 15-IX-73, #542-73, C. D. Johnson.

The Host: The family Vitaceae is a close relative of the Rhamnaceae (Takhtajan 1969), a family whose seeds are also utilized by bruchids. But while 4 genera of the Rhamnaceae (*Barcena, Condalia, Rhamnus, Ziziphus*) are fairly reliably reported to have bruchids infesting their seeds, the genus *Vitis* has only 2 records reported for a bruchid (Zacher 1952; Essig 1958). Essig's report may have been a misinterpretation of Schaeffer's original record of *A. vitis* being collected *on* grapevines.

According to Kearney and Peebles (1969), canyon grape (*Vitis arizonica*) is common in streams and canyons throughout most of Arizona and is found from southern Utah to western Texas and northern Mexico. The juicy, few-seeded berries are eaten both fresh and dried by Indians, are readily eaten by birds, and are of good quality for jelly and grape juice. According to McDougall (1973) the berries are from 8 to 10mm in diameter but, those collected for this study were smaller (ca. 6.5 to 8mm ripe to 5.0 to 6.0mm dried). When ripe, pulp surrounding the large seeds is about 1.5 to 2.0mm thick. The grapes ripen to a very dark blue, almost black, then the pulp dries and shrivels, leaving a tough coat surrounding the seeds. Very little

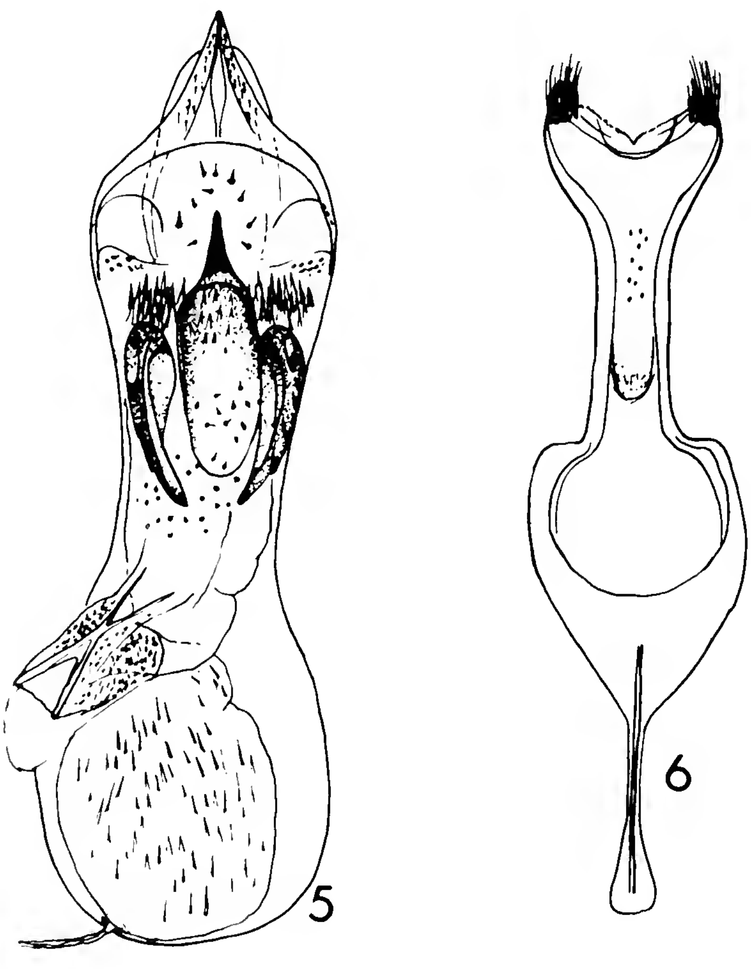

Fig. 5-6, *Amblycerus vitis* male genitalia: 5) median lobe, ventral; 6) lateral lobes, ventral.

pulp remains in these "raisins". Some dried grapes remain attached to the vines, but many fall to the ground.

The grapes examined during this study had from 1 to 4 hard seeds in them, but most had only 1 or 2 seeds. Seeds from fruits with 1 or 2 seeds were rounded on 1 side and flat on the other. Seeds from fruits with 3 or 4 seeds were wedge-shaped on 1 side and rounded on the other.

As with most plants, the amount of fruit produced by individual vines varied considerably. Some vines were very heavily laden with grapes while others had hardly any. Apparently because of the longer growing season, vines in southern Arizona produced more mature fruits than those in northern Arizona.

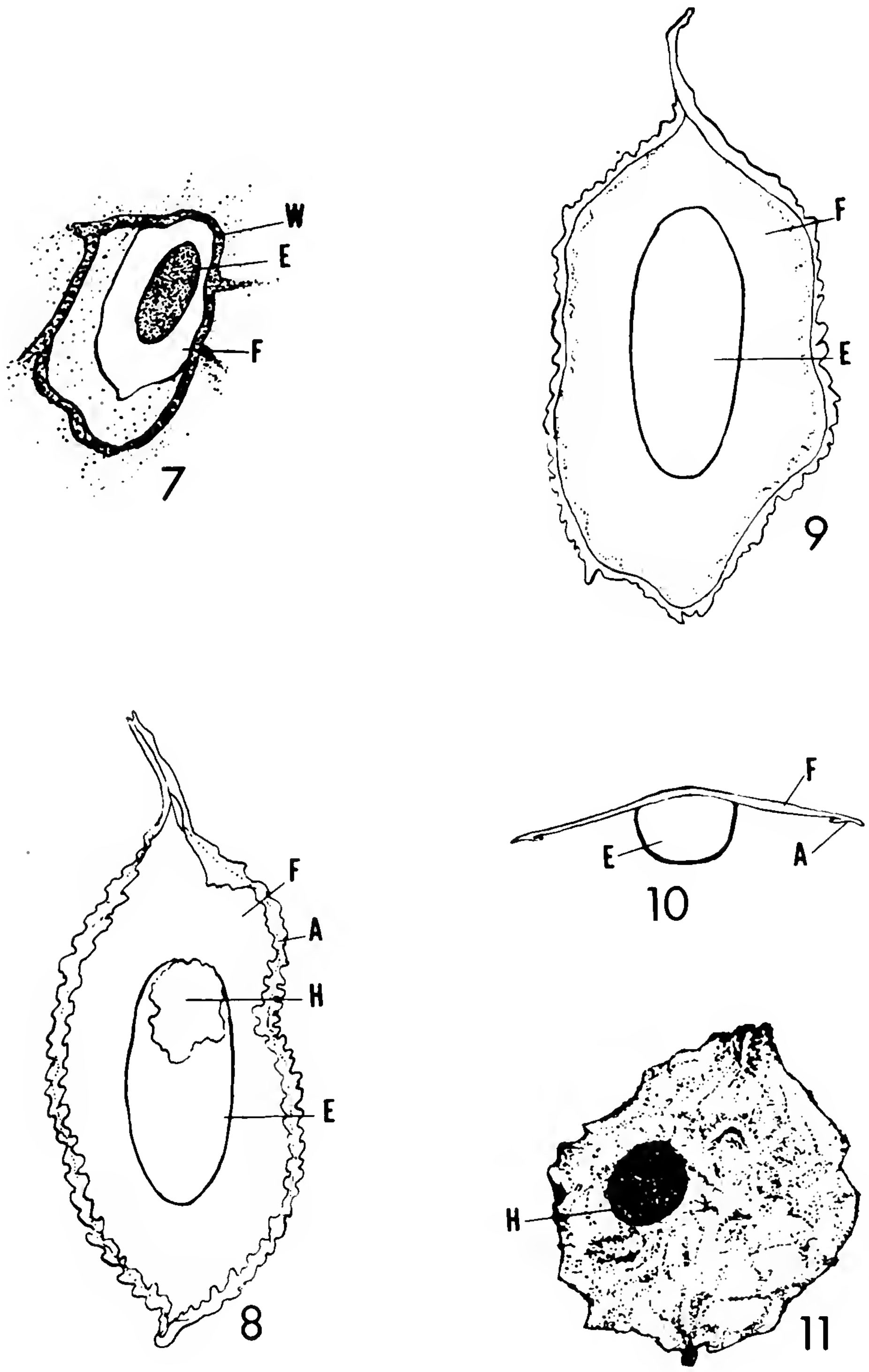

Fig. 7-11, *Amblycerus vitis* [E) egg; F) flange of egg; A) adhesive surface]: 7) egg attached to surface of grape; W) wrinkle on surface of grape; 8) ventral surface of egg; surface on periphery of flange (H=exit hole of larva); 9) dorsal surface of egg; 10) diagrammatic cross section through egg; 11) H, exit hole of adult *Amblycerus vitis* in dried fruit of *Vitis arizonica*.

TABLE 1. Collection and emergence data, *Amblycerus vitis* in *Vitis arizonica.*

Culture # (see text)	Date Collection	Date Emerged by	Number Emerged
# 20-72	14-VI-72	3-VII-72	1
		30-V-73	1
# 21-72	14-VI-72	5-VII-73	1
# 23-72	14-VI-72	30-V-73	1
# 43-72	2-VIII-72	7-VIII-72	3
		18-IX-73	4
		24-X-73	5
		14-I-74	3
		15-IV-74	1
# 44-72	2-VIII-72	1-XI-73	2
# 47-72	2-VIII-72	1-IX-73	1
		18-IX-73	1
		11-XII-73	1
#102-72	5-X-72	14-I-74	2
#105-72	6-X-72	18-IX-73	1
#110-72	6-X-72	30-V-73	1
		31-V-73	1
		11-VII-73	1
		7-VIII-73	1
		18-IX-73	1
		1-XI-73	1
#116-72	6-X-72	30-V-73	1
		31-V-73	1
		2-VII-73	1
		18-IX-73	1
#122-72	6-X-72	7-VIII-73	1
		18-IX-73	3
		1-XI-73	1
		14-I-74	2
		6-III-74	1
#123-72	7-X-72	29-V-73	2
		30-V-73	1
		30-VII-73	3
		18-VIII-73	1
		18-IX-73	2
#130-72	7-X-72	29-V-73	2
		30-VII-73	2
		18-IX-73	1
#513-73	12-VI-73	2-VII-73	1
#542-73	15-IX-73	1-VII-74	3
#552-73	14-X-74	16-IV-74	3
		22-V-74	1
#558-73	15-X-73	22-IV-74	20
		24-IV-74	1
		22-V-74	9
		12-VI-74	1

Methods

Collecting and laboratory procedures of Johnson (1968a, 1970) were followed during this study. Cultures were examined every 3 weeks to 1 month unless large numbers of emerging bruchids were noted; then they were examined daily.

During 1972 both green and mature grapes were collected while they were still attached to vines. In 1973 only mature grapes attached to vines were collected. We consider mature grapes to be those that have turned blue and are still juicy or have dried. Thirty-one lots of grapes from Arizona were collected during the course of this study.

The newly emerged adults used for ovipositional studies were placed in a jar containing dried, mature grapes.

Results and Discussion

Bruchids were reared from 17 of the 31 lots (Table 1). All of these lots had at least some mature grapes in them. Twelve of the 14 cultures which did not yield bruchids consisted of immature to very immature grapes. Of the other 2 unproductive cultures, 1 consisted of intact grapes and exposed grape seeds collected from the ground beneath grapevines, while the other (same locality as #542-73) consisted of at least 50% mature grapes.

The 2 cultures that yielded by far the greatest numbers of *A. vitis* were #43-72 and #558-73. When collected, most of the fruits in #43-72 were juicy and mature, while those in #558-73 were dried and mature.

The above results indicate to us that most *A. vitis* that breed successfully in seeds of *V. arizonica* oviposit on mature fruits. Because the greatest

TABLE 2. Rates of infestation of *Vitis arizonica* fruits by *Amblycerus vitis* and *Urosigalphus* sp.

Culture #	# *A. vitis* emerged	# fruits	% infestation	# *Urosigalphus* emerged
20-72	2	82	2.44	
21-72	1	532	.19	
23-72	1	156	.64	
43-72	16	2127	.75	
44-72	2	43	4.65	
47-72	3	234	1.28	
102-72	2	414	.48	
105-72	1	152	.66	
110-72	6	2034	.295	
116-72	4	269	1.49	1
122-72	8	290	2.75	1
123-72	9	213	4.23	2
130-72	5	307	1.63	1
513-73	1	9	11.11	
542-73	3	803	.37	
552-73	4	337	1.19	
558-73	31	385	8.05	5
TOTAL	99	8378	1.18	10

number of *A. vitis* was reared from seeds that were mature and dried when collected, and because beetles oviposited freely on mature, dried grapes in the laboratory, we feel that it probably oviposits preferentially on this aged fruits in nature. However, Bottimer (in litt.) indicated oviposition also occurs on green not yet full size grapes, and the bruchids complete their development in them.

Oviposition and Eclosion

Female *A. vitis* usually place their eggs where the peduncle attaches to the fruit, although they occasionally oviposit anywhere on the surface of the fruit. Usually only 1 egg (sometimes 2) is placed on a fruit (Fig. 7). When confined to culture jars, as many as 5 eggs may be oviposited per fruit. Each egg is covered and surrounded by a unique flange (Fig. 7-9). The outer ventral surface of this flange secures the egg to low areas between wrinkles on the grape (Fig. 7). The undulate edge of the flange has an adhesive material on its ventral surface and is the only portion of the egg apparatus that is glued to the substrate (Fig. 8, 9). The egg hangs beneath this cover (Fig. 10). The length of the flange is 1.3-1.7mm and the width is 0.7-0.9mm. The egg is 0.7-0.8mm long and 0.3-0.4mm wide and has the typical shape of a bruchid egg (Fig. 7-9). One end of the flange always has an elongate point.

Eclosion occurs through the lower surface of the egg chorion (Fig. 8). Because this surface is not glued to the surface of the fruit, the larva may travel a short distance to the substrate after it ecloses. Most larvae emerge and enter the fruit just beneath the egg. Sometimes the larva leaves the egg and travels to the edge of the flange before entering the fruit. In most instances whitish frass is pushed back into the egg (and sometimes also beneath the flange) when the fruit is entered. Several empty egg choria contained frass which was stained dark blue, indicating that some of the dark pulp had extruded into the egg. We have no evidence that the extrusion of pulp is an effective device to push larvae of *A. vitis* out when they attempt to enter grapes. Occasionally larvae may burrow through the edge of the flange and leave this covering. We have no evidence that they successfully enter the fruit after leaving.

In laboratory cultures the 1st instar burrows almost directly beneath the egg, through the skin, pulp, and into the seed through the hard, bony covering. We were not able to determine the paths of entry of all of the 1st instars hatching from eggs oviposited on fruit in the field, however, because the subsequent feeding of later instars destroyed these paths.

The covering and flange around the egg of *A. vitis* is not unique to this species. Bondar (1937) described similar eggs for *Amblycerus longissimus* (Pic) and *A. nigromarginatus* (Motschulsky) as did Teran (1962) for *Pseudopachymerina lallemanti* (Marseul) (now *P. spinipes* (Er.)) and *Caryedes* (now *Penthobruchus) germaini* (Pic); the eggs of *Pygiopachymerus lineola* (Chevrolat) as described by Janzen (1972) appear also to be similar to *A. vitis,* as do those of *Caryedon fasciatum* Prevett as described by Prevett (1966). An almost identical egg to that of *A. vitis* was described by Prevett (1967) for *Spermophagus* new species near *gossypii* Chevrolat. Differences are that the egg of *A. vitis* is completely covered by the flange and the flange itself does not have a seam down the center. Prevett suggested that an advantage of an egg attached in this way is that the danger of the egg becoming detached during the emergence of the larvae is less than when the egg is attached in the usual way (i.e., lower surface glued to the substrate).

Apparently the host seeds or pods of the species mentioned above are all smooth or relatively so. The wrinkled fruit used by *A. vitis* is certainly not smooth (Fig. 11). We agree that Prevett's explanation for the function of this type of egg is probably correct. We also suggest that this egg type would also serve well if the egg is laid on a smooth surface (i.e., ripe grape) that later wrinkles and shrivels. Therefore, we believe the structure of the egg of *A. vitis* has 2 primary functions: 1) for attachment during eclosion and 2) attachment during shriveling of the fruit of its host.

Because *Amblycerus longissimus, A. nigromarginatus, A. vitis,* and a near relative in the genus *Spermophagus* (all subfamily Amblycerinae) all have eggs with a similar structure, it is possible that this kind of egg is indicative also of their close phylogenetic relationships.

Larval Feeding and Pupation

Nineteen fruits of *V. arizonica* that had been fed upon by *A. vitis* were dissected. Of these, 15 had 1 seed, 2 had 2 seeds, and 2 had 3 seeds. A larva apparently consumes the entire contents of a seed because many of the seeds had holes chewed completely through the hard seed coat but not through the pulp and skin. Pupation occurs inside the hollowed out chamber and emergence is through a typical bruchid exit hole (Fig. 11). About 0.25 of the pupal chamber is filled with frass and exuviae.

In both of the fruits containing 2 seeds, and in 1 containing 3 seeds, only 1 seed had been fed upon, while the other seeds remained completely intact and presumably viable. All 3 seeds had been almost completely devoured in 1 of the fruits with 3 seeds. Neat round holes, slightly larger than adult exit holes, had been chewed between each of the seeds. Apparently the inside of only 1 seed was used as a pupal chamber, however.

Generations per Year and Rates of Infestation

According to the data presented in Table 1, *A. vitis* probably spends at least 6 or 7 months inside a seed before emerging. In most instances the larval life is much longer (i.e., #43-72, #122-72). In only 2 instances (#20-72, #513-73) did an adult emerge from a seed shortly after it was collected. In both these cases where the seeds were collected in June, the seeds were obviously from the previous year's crop, and the emergent adults had spent the winter inside seeds.

We reconstruct the life history of *A. vitis* probably as follows: Eggs are laid by adults that begin to emerge in the spring, but since only seeds from the previous year are available, few bruchids are successful until the new crop ripens beginning in late July. Most adults probably emerge and then oviposit on dried seeds in September and October. It probably takes about 1 year for them to mature.

Rates of infestation are presented in Table 2. The overall infestation rate of the 17 cultures is misleading, because some of the fruits in almost all the cultures were immature. For the most part those fruits that had the greatest infestation rates were those cultures that were composed of mostly mature fruits. Then, the rate of infestation is a reflection of the time when the seeds were collected and the maturity of the fruit. Obviously, if the fruits remain on the vines for several months there is a greater chance that *A. vitis* will oviposit on them. Many of the fruits naturally fall to the ground and presumably are not attacked by bruchids. Therefore, the infestation rate in Table 2 represents mostly those grapes that have remained on the vines. We believe that *A. vitis* destroys far less than 1% of the total seed crop of *Vitis arizonica*. In any case, with the low rate of infestation, it is doubtful that this bruchid has much effect on the population dynamics of its host.

Distribution

Amblycerus vitis is most abundant in southeastern Arizona (Table 1). Apparently the conditions other than availability of host seeds are most suitable for its survival there because there is an abundant seed crop in the canyons surrounding the Verde Valley in north-central Arizona and, although several seed lots have been collected, only 3 bruchids have been reared from them.

It has been collected as far west in southern Arizona as 6 miles east of Ruby, Santa Cruz County and as far north as Clear Creek Campground, Yavapai County. An emergence hole has been found in a grape collected in Buckhorn Canyon, and specimens collected from the Southwestern Research Station, both Chiricahua Mountains, Cochise County, are the easternmost verified records. One specimen of *A. vitis* in the Canadian National Collection bears the labels "Davis Mts. Tx, VII-9, J. W. Green collector". This record must be verified before it can be considered valid. Although we have no records for this species from Mexico, it probably is found there because *A. vitis* has been collected in Coronado National Memorial on the Mexican border as well as other localities close to Mexico (Ruby, Bisbee).

Associated Hymenoptera

Ten specimens of the braconid wasp, *Urosigalphus* sp., emerged from 5 of the lots. Some seeds from which they emerged were dissected, and exuviae of larval bruchids and parasites were found.

Acknowledgments

We are grateful to R. Medina and M. Johnson for assisting with collections, rearing bruchids, and preparing specimens for study; and D. E. Bright, Canadian National Collection of Insects, for providing us with the records gathered by Bottimer. We are also grateful to the Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture, for grant #12-14-100-9970(33) which provided funds for this research.

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—R. E. Woodruff

A REVIEW OF THE GENUS *EPHEBUS* (COLEOPTERA: ENDOMYCHIDAE)

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ABSTRACT

A synopsis of *Ephebus,* based on study of type specimens, is given. Three new species are described, while *E. chontalesianus* Gorham is synonymized with *E. piceus* Gor., and *E. depressus* and *E. ignobilis* Gor. are transferred to *Anidrytus.* The 3 new species are: *E. sulcatus* (Mexico and northern South America), *E. longulus* (northern Brazil), *E. exclusus* (Guatemala).

Genus *Ephebus* Gerstaecker

Ephebus Gerstaecker 1858:293; Gorham 1889:131; Strohecker 1953:61.
Type-species: *Ephebus cardinalis* Gerstaecker (by Strohecker 1953).

Although this generic name was listed by Dejean, it was first validated by Gerstaecker, who used it in combination with 5 specific names. Gorham added 4 specific names, but of these 1 must be synonymized and 2 transferred. The genus comprises 9 species of small (3-6 mm.) endomychids of similar appearance. All are rust-red with long and semi-erect coppery pubescence, antenna mostly black. The genus may be easily differentiated from *Stenotarsus* in having sides of pronotum but narrowly margined, and from *Epipocus, Anidrytus,* and *Epopterus* in the symmetrically widened antennal club, rather than having articles 9-10 transversely triangular.

The rather sparse material of this study is in the Academy of Natural Sciences, Philadelphia (ANSP), British Museum of Natural History (BM), Bayerische Staatssammlung (BS), California Academy of Sciences (CAS), Florida State Collection of Arthropods (FSCA), Muséum d'Histoire Naturelle (PM), Zoological Museum of Humboldt-Universität (ZMB), Instituto de Zoologia Agricola at Maracay (VIZ).

With the small amount of material and great external similarity among the species, I have not felt able to make a worthwhile key. Determinations must, for the present, be based on male specimens, and the figures will be more helpful than a key.

Partial Key to Species of *Ephebus*

1.	Larger (5 mm.); 11th antennal segment as long as 9 and 10 combined	*cardinalis*
1′.	Less than 5 mm.; 11th antennal segment shorter than 9 and 10 combined	2
2(1).	Base of pronotum with transverse impression	3
2′.	Base of pronotum without such impressed line	4
3(2).	Transverse impression of pronotum narrow	*longulus*
3′.	Transverse impression wide	*sulcatus; hirtulus*
4(2′).	Antennal segment 11 wholly pale	*terminatus*
4′.	Antennal segment 11 black, tip may be paler	5

5(4′). Antennal segments 1-2 red .... *pumilus*
Antennal segments 1-3 or 4 red .... *convexiusculus; piceus; exclusus*

Ephebus cardinalis Gerstaecker
(Fig. 4, 11)

Ephebus cardinalis Gerstaecker 1858:294.

Antennal articles 1-2 red, 3 and 4 much longer than wide, 11 almost rectangular, about as long as 9-10 combined. Pronotum slightly more than 2X as wide (base) as long (mid-line), finely densely punctate. Elytra with distinct shoulders, nearly 3.5X as long as pronotum, regularly oval in outline, finely and very densely punctate. Length 4.5-6mm.

Monotype male from Colombia in Thomson coll. (PM). A large and abraded female from Colombia (BM) has been determined by Gorham as

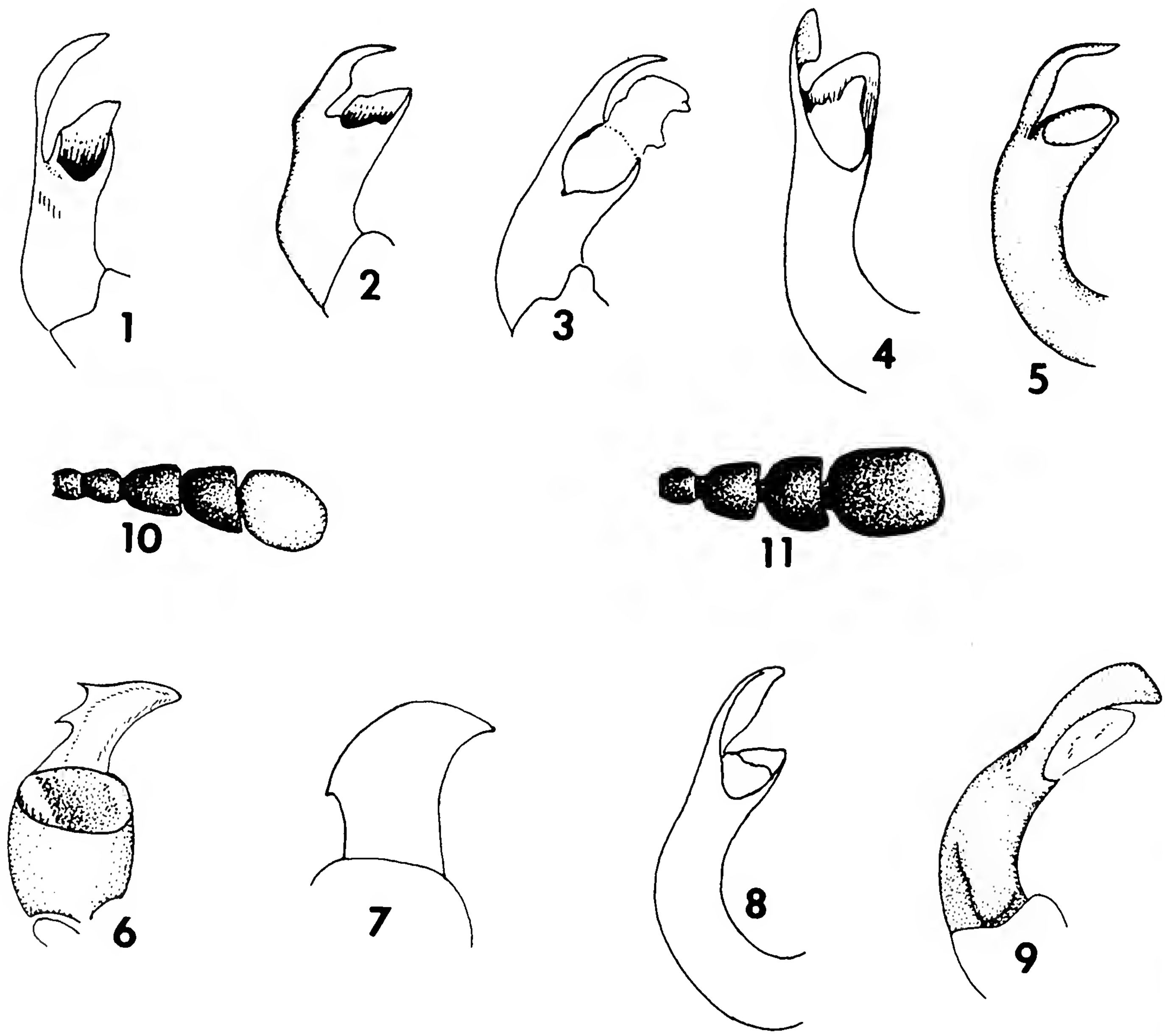

Fig. 1-11. 1) *Ephebus terminatus,* aedeagus, Caracas; 2) *E. pumilus,* aedeagus, lectotype; 3) *E. convexiusculus,* aedeagus, holotype; 4) *E. cardinalis,* aedeagus, holotype; 5) *E. piceus,* aedeagus, Sta. Marta Mts.; 6) *E. hirtulus,* aedeagus, Para; 7) *E. sulcatus,* aedeagus, holotype; *8) *E. exclusus,* aedeagus, holotype; 9) *E. longulus,* aedeagus, holotype; 10) *E. terminatus,* antennal club, holotype; 11) *E. cardinalis,* antennal club, holotype.

*The fine truncation of tip may be due to breakage.

cardinalis and carries another label "*Ephebus auropilosus* Reiche", an unestablished name.

Ephebus convexiusculus Gerstaecker
Fig. 3

Ephebus convexiusculus Gerstaecker 1858:296

Antenna black, articles 1-3 and tip of 11 rust-red; articles 4 and 5 each longer than 3, 11 short, oval, about 1.5X as long as 10. Pronotum 2.5X as wide as long, sides parallel in basal half, rounded in front to half basal width, disc finely and densely punctate. Elytra as wide at base as pronotum, short, oval, finely and densely punctate. Length 4mm. The unique type is a male, not female as cited by Gerstaecker. It is the only specimen I have seen.

Monotype male from Brazil, Sello (ZMB no. 21838).

Ephebus terminatus Gerstaecker
Fig. 1, 10

Ephebus terminatus Gerstaecker 1858:295.

Antenna black, articles 1-3 rust-red, 11 pale yellow; articles 3 and 4 of equal length, those following progressively shorter, 8 quadrate. Pronotal disc finely and rather sparsely, lateral areas rugosely punctate. Elytra subequal in basal width to pronotum, 3.5X as long as pronotum, finely and densely punctate. Length 4.5mm.

Monotype female from Colombia (ZMB no. 21837). This museum has also 2 males, 1 female from Carácas (O. Thieme) and 2 females from Venezuela are in BM.

Ephebus pumilus Gerstaecker
Fig. 2

Ephebus pumilus Gerstaecker 1858:297.

Antenna less than half body length, very stout, each of articles 3-7 little longer than wide, 8 quadrate, wider than 7, club almost as long as 3-8 combined, its articles subequal in length; articles 1-2 red, the others black. Pronotum with sides gradually convergent from base forward, little rounded to front angles, hind angles acute. Elytra 3.3X as long as pronotum and as wide at base, widened in anterior third thence gradually narrowed to rounded apex. Length 3-4mm. Although Gerstaecker cited only the female and the specimen with his label is female, registration numbers indicate that he had a series of 6 specimens, at least 1 of which is male.

Lectotype male from Colombia, Moritz (ZMB no. 21839). There are 5 paralectotypes with the same number.

Ephebus exclusus Strohecker, **new species**
Fig. 8

Ephebus piceus Gorham 1889:131 (in part).

Form short, oval, roundly convex, rust-red with coppery pubescence. Length 3.5mm, max. width 2.3mm. Antenna about half as long as body, articles 3-6 subequal, each 1.5X as long as wide, 7-8 somewhat shorter and wider than 6, 11 hardly longer than 10, its apex rounded; first 4 articles red (probably immature), others black. Pronotum with sides feebly convergent from base, moderately rounded to front angles, disc evenly convex, rather coarsely and densely punctate, lateral sulci deep. Elytra widest in front half, densely punctate, pubescence long and semi-erect (but much abraded).

Holotype: male from Guatemala: Vera Paz, Teleman, Champion (BM).

Ephebus piceus Gorham
Fig. 5

Ephebus piceus Gorham 1889:131, Pl. 7, Fig. 1-2. Holotype (by original designation): male from Guatemala: Zapote, Champion (BM).
Ephebus chontalesianus Gorham 1889:132, Pl. 7, Fig. 2. Holotype: male from Nicaragua: Chontales, Janson (BM).

Closely similar in appearance to *E. exclusus*. Gorham described the antenna as having 4 basal articles red but apparently in mature coloration only the first 2 are red.

Colombia: Cundinamarca, Finca Bella Vista nr. Sasaima, 7-IV-1965, P. R. Craig (CAS; FSCA).

Ephebus longulus Strohecker, **new species**
Fig. 9

Form long, oval. Color rust-red with coppery pubescence, last 6 antennal articles black. Length 2.9mm. Antenna 1.3mm long, articles 2-5 subequal, 6 a little longer than 5, 7, and 8 each about as long as 6 but sequentially wider; with 8 the broad, compact club appears 4-jointed; article 11 somewhat rectangular, about as long as 9-10 combined. Pronotum with basal width 2.2X median length, disc finely sparsely punctate, lateral sulci deep, long-triangular, base with marginal impressed line. Elytra almost 3.5X as long as pronotum, widest in anterior third, sides continuously but weakly curved.

Holotype male from Brazil: Amazonas, Miss. Cauaburi am Canal Maturaca (70 m.), 16-I-1963, C. Lindemann (BS).

Ephebus sulcatus Strohecker, **new species**
Fig. 7

Short, oval, moderately convex, rust-red with brassy or coppery pubescence, last 7 antennal articles black. Length 3.3-3.5mm. Antenna 1.8mm long, article 2 quadrate, 3 about 2X as long as wide, 4-6 shorter than 3 but each longer than wide, 7 ovoid, 8 globose; club abruptly formed, articles 9 and 10 slightly transverse, 11 ovoid-truncate, 1.5X as long as 10. Pronotum with basal width 2X median length, sides finely crenulate, parallel behind, rounded to front angles; lateral sulci deep and long-triangular, base with deep transverse sulcus, disc finely, sparsely punctate. Scutellum very large, triangular. Elytra but little longer than their combined width, sides continuously rounded from base to apex.

Holotype male from Mexico: Vera Cruz, Coyame, Lake Catemaco, under bark, 1-15-VII-63, D. R. Whitehead (FSCA).

Allotype female with same data as male (FSCA).

Paratypes: female with same data as holotype (FSCA). Colombia: Magdalena, Sierra de San Lorenzo, Cincinnati Trail, 4-6000′, 20-VII-20,

F. R. Mason, 2 males, 2 females (BM), 6 males, 10 females (ANSP; FSCA). El Salvador: Quezaltepeque, 500 m., July, Cavagnaro and Irwin, 2 females (CAS).

Ephebus hirtulus Gerstaecker
Fig. 6

Ephebus hirtulus Gerstaecker 1858:297.

Among external features only the coarser puncturing of pronotum appears to differentiate this species from *sulcatus*. Until topotype males are available for study some question as to identity of *hirtulus* must remain, but the male specimens noted here agree well with the type female. To avoid possible future problems I shall not name a plesioallotype.

Monotype female from Brazil: Bahia (ZMB no. 21840). Other specimens examined are: Brazil: Santarem, female; Para, male, female (BM); Amazonas, Tucano, series, J. & B. Bechyné (VIZ; author).

Two specific names must be transferred from *Ephebus* to *Anidrytus*.

Anidrytus depressus (Gorham)

Ephebus depressus Gorham 1875:17.
Anidrytus depressus, Arrow 1920:46.

Holotype female from Brazil: Rio de Janeiro (BM).

Anidrytus ignobilis (Gorham), **new combination**

Ephebus ignobilis Gorham 1875:17.

Holotype female from French Guiana: Cayenne (BM).

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NEW LOCALITY RECORDS FOR *ELEODES BARBATA* WICKHAM (COLEOPTERA: TENEBRIONIDAE)

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In September 1916, H. F. Wickham found a small, exceedingly abundant species of *Eleodes* in the bean-growing district near Willard, New Mexico. Numerous specimens were taken under dried dung among short brush in fine sandy soil. This species he subsequently described (Wickham 1918) as *Eleodes barbata,* assigning it to the subgenus *Tricheleodes.*

Tanner (1961) reviewed the species of *Tricheleodes,* describing a new species, but in his checklist mentioned only the Willard, New Mexico locality for *E. barbata.* I can now add 2 new locality records, considerably extending its known range: ARIZONA: Coconino County, 4.5 miles east of Moenkopi, 19-VI-1967, J. H. Davidson, J. M. Davidson, M. A. Cazier, at night (26 specimens); UTAH: Grand County, southern outskirts of Moab, 26-VII-1968, C. A. Triplehorn, on horse dung at night (4 specimens).

It seems incredible that a half century has elapsed between reports of this interesting species. About the only differences between the populations that I could detect were that the erect setae of the dorsal vestiture in those from Moenkopi and Moab are golden rather than black as stated by Wickham and that the mucro of the prosternal process is more acutely prominent in those from Moenkopi and Moab. As Wickham pointed out, the resemblance to the genus *Amphidora* is striking.

I thank Frank F. Hasbrouck, Arizona State University, for making the Monekopi specimens available to me and T. J. Spilman, United States Department of Agriculture, for the loan of paratypes of *E. barbata* in the U. S. National Museum. The specimens upon which the new records are based are deposited in the collections of Arizona State University and The Ohio State University.

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THE APPLICATION OF PAPER CHROMATOGRAPHY OF FLUORESCENT COMPOUNDS TO THE SYSTEMATICS OF FIREFLIES (COLEOPTERA, LAMPYRIDAE)

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ABSTRACT

The fluorescent compounds of 13 species in 5 genera of fireflies have distinctive generic, specific, and population variation, as revealed by 2-dimensional paper chromatography. Spectrophotofluorometry of the fluorescent compounds was not useful for typifying the chemicals.

INTRODUCTION

The chemical constituents of organisms are potentially useful in taxonomy. Proteins, amino acids, and pigments have been used by previous workers (Leone 1964). Of interest here are the fluorescent chemicals, especially those comprising the largest group, the pteridines. Pteridines have been extensively studied biochemically and have been used in previous taxonomic work (Cockayne 1924; Rawson 1968; Waywell and Corey 1970). They were first discovered by Hopkins (1895) in the wing (hence the origin of the term) of a pierid butterfly, and were later named by Weiland and Schöpf (1925). The chemical structures of many have been determined, and others have been synthesized. Their biological role has been reviewed by Ziegler and Harmsen (1969). In insects they occur as metabolic end products and function as cofactors in hydroxylation reactions and as pigments. They are localized in the cuticle, wing scales, hypodermis, compound eyes, nervous system, light organ (of Lampyridae), and numerous other structures (Ziegler and Harmsen 1969; Table IV). The kinds and quantities of pteridines found in insect tissues vary with developmental stage (Ziegler and Harmsen 1969).

There are other fluorescing compounds detected by the same tests that are used for pteridines, and these may also have taxonomic value. These include tyrosine, phenylalanine, xanthine, hypoxanthine, uracil, and uric acid (J. Nation, personal communication, 1972).

Cockayne (1924) used a mercury vapor lamp to detect fluorescent compounds in intact specimens of Lepidoptera in 21 families. He found some families to have diagnostic fluorescent colors, and noted intra- and interspecific variation, as well as consistent sexual differences.

Rawson (1968), using paper chromatography on ground, whole specimens, found 19 different compounds in 13 species of Lepidoptera. He used 2 independent solvent systems, each producing a characteristic grouping of pteridines and other fluorescent compounds, and concluded that the occurrence of the fluorescent compounds correlated with confirmed morphological groupings. Rawson found fluorescent pigments to be of little use in separating groups larger than genera, except in the family Pieridae.

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Waywell and Corey (1970) did similar work with crayfish. They used 9 species from 2 genera. Five males and 5 females of each were homogenized and "run" on cellulose thin-layer chromatographic plates. Fifteen distinct spots were distinguished. Each species had its own chromatographic pattern, and the genera (*Cambarus* and *Orconectes*) could be distinguished by a single spot. Sexual differences occurred in only 1 of the 9 species. *Orconectes propinquus* and *O. rusticus* differed by only 1 spot, thus supporting the morphological evidence of field-collected intermediate hybrids that these 2 are closely related. Hybridization between *O. propinquus* and *O. obscurus* had been suggested, but, since they differed by 3 spots, Waywell and Corey concluded hybridization was probably not occurring. The presence of a single band consistently separated 2 other species, whereas morphological characters did not.

Methods and Materials

Fireflies used in this study were collected in Gainesville, Hines, and Cedar Key, Florida; Athens, Tennessee; Ann Arbor and Pellston, Michigan; and Oneida, New York. Specimens were held in pint jars containing damp vegetation and slices of apple for not less than 24 hours. Males were used, since only they could be identified with certainty.

Specimens to be analyzed were washed individually in distilled water and macerated with a Pyrex 16 × 150mm No. 7725 tissue grinder in sufficient distilled water to yield 1-1.5ml homogenate.

Each specimen was processed individually using 2-dimensional chromatography. Approximately 0.5ml of homogenate from a single specimen was placed 2.5cm from each margin in a corner of a 20 × 20cm sheet of Whatman No. 3 chromatography paper (the resulting spot was 1.2 to 2.5cm in diameter). The paper was then rolled into a cylinder and fastened with staples without allowing the abutting margins to come together. Before treatment with the second solvent system the sheet was dried at least 12 hours in room conditions. The solvent systems used were 1) 1-propanol, ammonium hydroxide and water (in proportions 8:3:1) and 2) butanol, acetic acid, and water (12:3:5). Large-mouth gallon jars were used for chromatographic chambers. They were covered with glass plates and sealed with stopcock grease to maintain a saturated atmosphere. Sufficient solvent to cover 1.2cm of the chromatogram was maintained. Solvents were renewed weekly or after about 6 separations. Chromatograms were left in the solvent systems approximately 4 hours or until the solvent front had moved to about 1.2cm from the top of the paper. Temperature during separation was $25 \pm 3°$ C. Chromatograms were exposed to normal room lighting throughout the procedure but not to direct sunlight.

The chromatograms were read, after drying at room temperature with a UVSL multi-band Mineralight® ultraviolet lamp with wavelengths of 254 mμ and 365 mμ. Fluorescent areas were circled with pencil, and a subjective evaluation of the color recorded. R_f values were calculated for each migrated fluorescent area.

The same chromatographic procedures were performed on known compounds: xanthopterin (0.5 μg), pterin-6-carboxic acid (0.5 μg), 2-amino-6, 7-dimethyl-4-hydrox pteridine (1 μg), xanthine (2 μg), hypoxanthine (2 μg), and uric acid (2 μg). This gave an indication of R_f value variability.

To further typify the fluorescent spots, excitation and emission spectra were determined for a total of 320 knowns and unknowns using an Aminco-Bowman spectrophotofluorometer. Spectral analyses were not consistent in the unknowns tested. Spectra of known compounds were consistent and repeatable only if concentrations were high enough to overcome the effects of scatter and extraneous fluorescence. Spectrophotofluorometric analysis is a potentially useful tool in work of this type, but was not effective in this study (See Wilkerson 1973, for details).

Results

The first step in compound recognition was to compare all the chromatograms of a species. All spots of like color occurring in nearly the same position were used for the study.[2] Some spots were diffuse or small, but consistency dictated their use.

Chromatogram summary graphs were then made for each species by tracing all consistent spots on onion-skin paper. Graphs were compared in order to recognize overlap of compounds of like color and similar position. The same compound number could then be assigned to compounds in different species. Some compounds not overlapping in R_f value range but nevertheless spatially close were subjectively placed in the same compound group. This was done since the possible range of R_f overlap was not statistically determined.

The following is an evaluation of the 51 spots which were recognized. Graphic representation of all spots is found in the Figures. Table 1 contains color evaluations of the compounds.

No precise evaluations of relative intensity or size were made; thus the following descriptions of single compounds or groups of compounds are subjective.

Generic Differences:

Spots which appear exclusively in a given genus range from 8% (*Micronaspis*) to 58% (*Pyropyga*) of the total spots in that genus. Only 3 of these unique spots are common to all species within a genus, 1 each in *Photuris, Micronaspis,* and *Photinus* (compounds 18, 37, and 2 respectively).

Photuris (5 species examined).

Compound 18 in *Photuris* is shared by all 5 species. It is found, however, in a relatively low percentage of specimens (40-70%), is of pale intensity, and is not easily detected. The other compounds unique to the genus (19, 21, 22, 16) are also found in low percentages (31-57%).

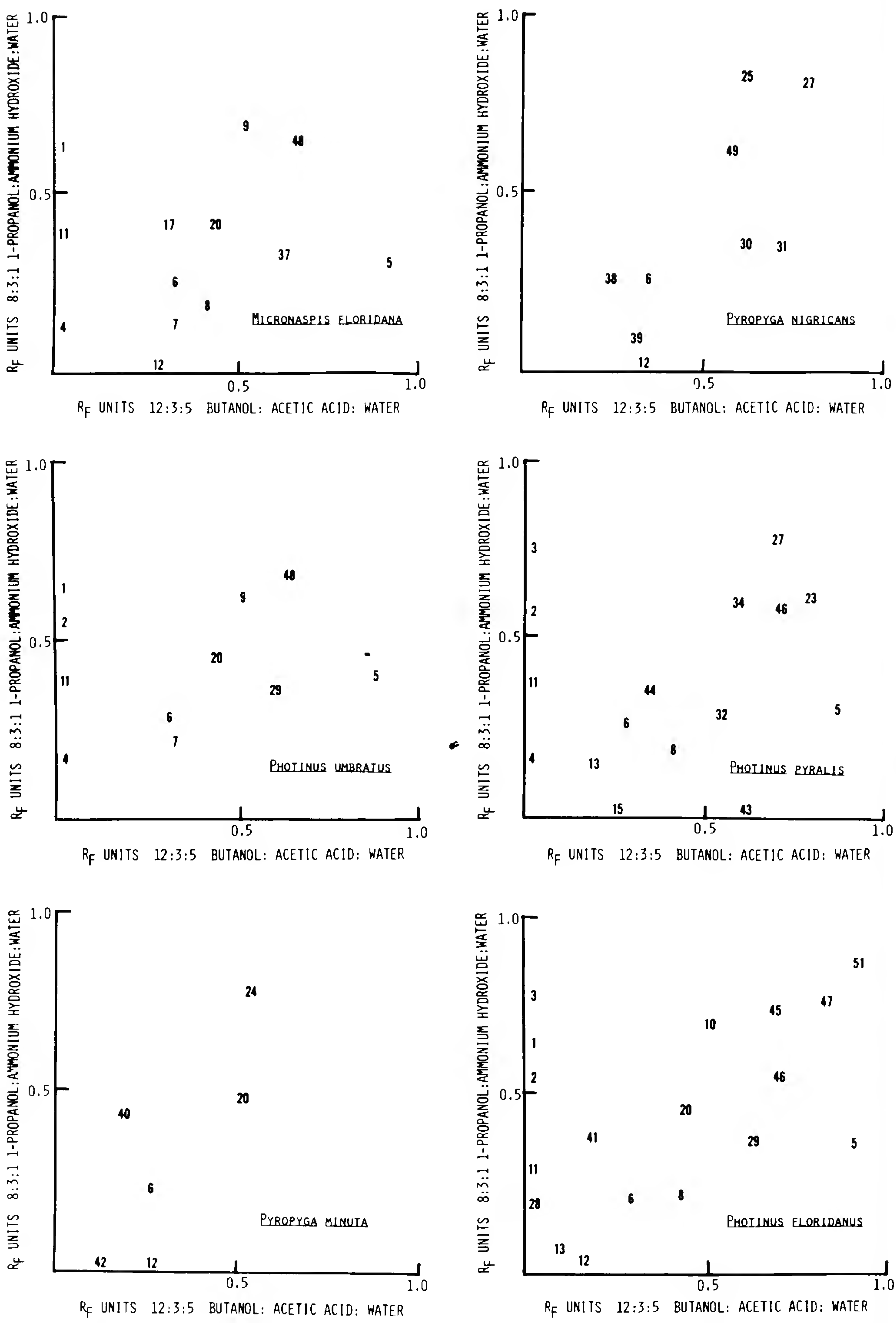
Pyractomena (2 species examined).

Spots unique to this genus (26, 33, 35, 36, 50) are nearly always present and easy to recognize. However, none of these are common to both species.

Micronaspis (monotypic genus).

Micronaspis floridana Green has an easily seen, unique spot (37) in 100% of the specimens.

[2]Ranges of R_f values and percent occurrence in each species are given in Wilkerson, 1973.



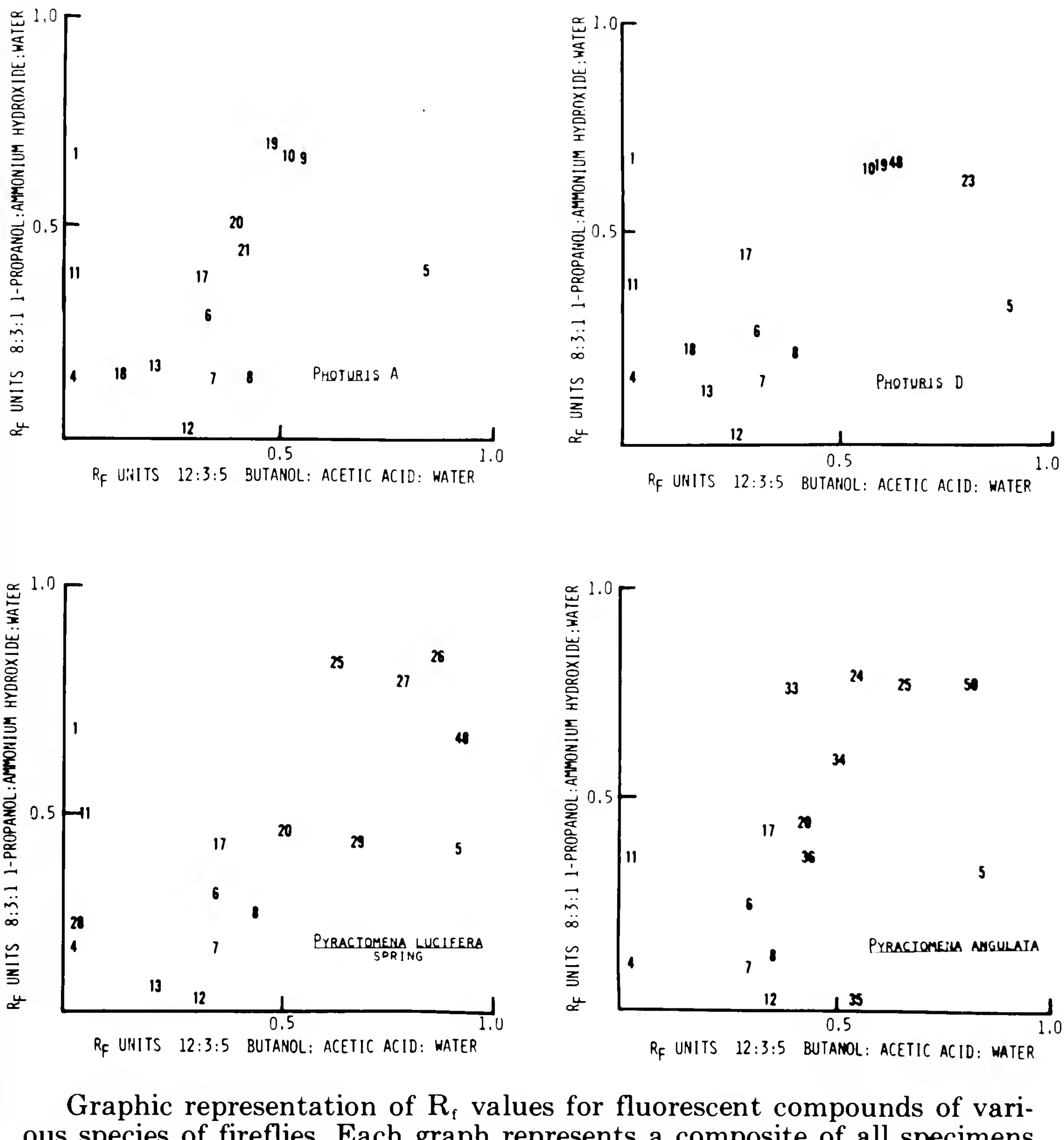
Graphic representation of R_f values for fluorescent compounds of various species of fireflies. Each graph represents a composite of all specimens processed for that species. Compounds were recognized on the basis of R_f value and color.

Pyropyga (2 species examined).

There are no spots common to both species yet absent in other genera, although 7 of the 13 spots present in the 2 species are found in no other genus (30, 31, 38, 39, 40, 42, 49). This is the highest percentage (58%) of unique spots in a genus. These spots are generally easily recognized (except 38 and 39 which are difficult to see) and occur in fairly high percentages (100, 100, 50, 75, 67, 100, and 80% respectively).

Photinus (3 species examined).

Ten of the 29 total spots in *Photinus* (2, 3, 15, 32, 41, 43, 44, 45, 46, 47) are found only in this genus, and numbers 2, 5, and 11 are common to all species within the genus. All of the above spots are distinct and easily recognizable except number 15.



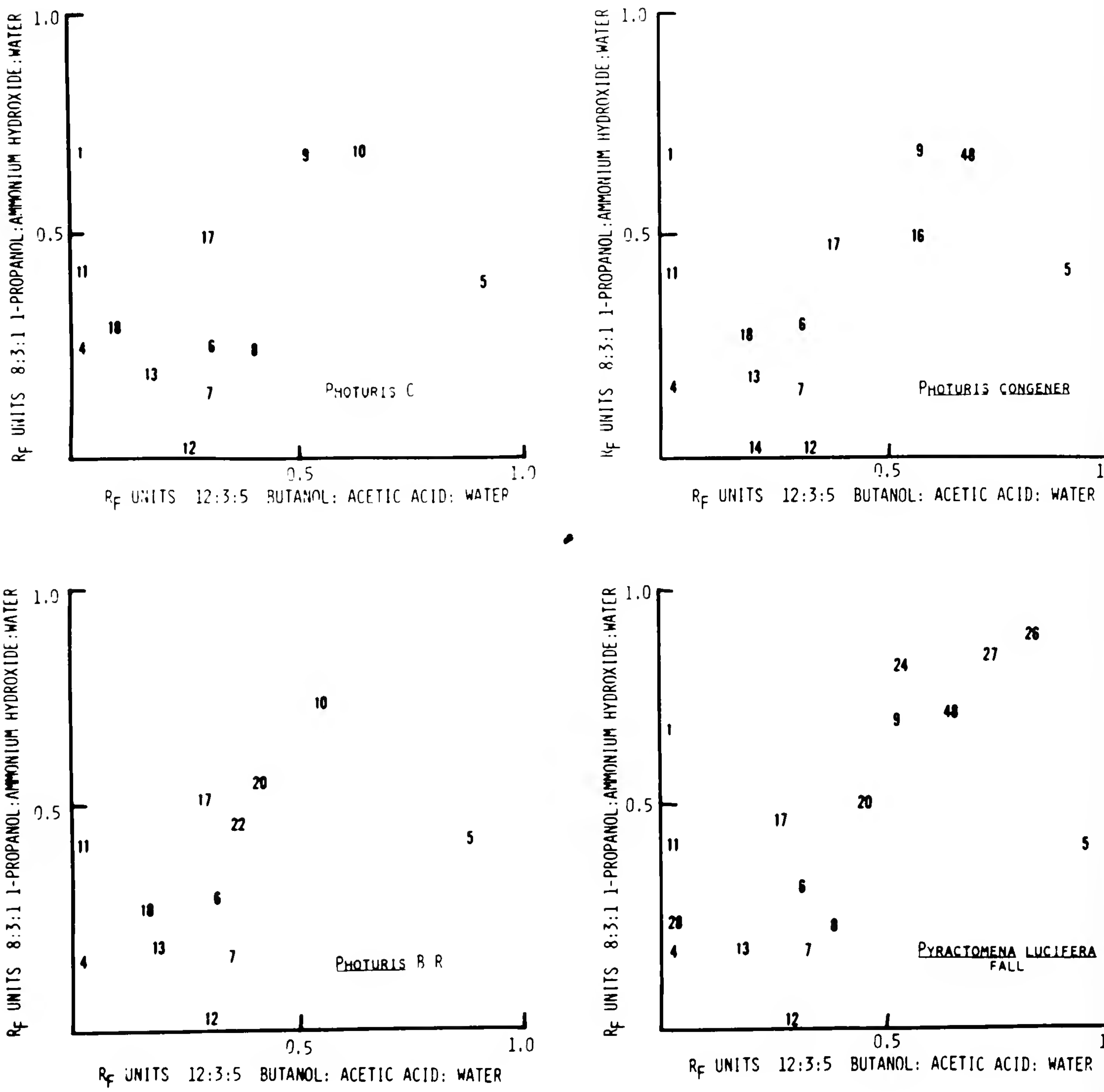
Graphic representation of R_f values for fluorescent compounds of various species of fireflies. Each graph represents a composite of all specimens processed for that species. Compounds were recognized on the basis of R_f value and color.

Species Differences:

No 2 species exhibited identical combinations of fluorescent compounds. Since allochronic populations of *Pyractomena lucifera* exhibited some differences, the reliability of this test as a basis for species separation must be considered.

Photuris[3]

Many fluorescent compounds were common to all 5 species. Nine of 21 spots (43%) are alike in all species indicating a high degree of homogeneity



Graphic representation of R_f values for fluorescent compounds of various species of fireflies. Each graph represents a composite of all specimens processed for that species. Compounds were recognized on the basis of R_f value and color.

[3]The species designated "C", "A", "D", and "BR" in the genus *Photuris* are undescribed and will be assigned binomens later by JEL.

within the genus. Good species differences are seen in a group of compounds (9, 10, 19, 48) found in various combinations.

Photuris "C" (n = 5) has compounds 9 and 10 (compounds 19 and 48 are absent).

Photuris congener Le Conte (n = 6) has numbers 9 and 48 plus 2 spots (14, 16) found in none of the other 12 species.

Photuris "A" (n = 13) has 9, 10, and 19 forming a rather complicated grouping separated by color (9-green, 10-blue and light, 19-purple). Compound 21 is unique to this species.

Photuris "D" (n = 7) has 9, 10, and 48. Spot 23 is found in only 1 other species (*Photinus pyralis*).

Photuris "BR" (n = 6) has compounds 10 and 22. Compound 22 is unique to it.

Pyractomena.

Nine of 24 (38%) of the spots are common to all species. This shows a relatively high degree of homogeneity.

Pyractomena lucifera (Melsheimer) was studied in 2 groups; 1 from a spring population, the other from a fall population collected at the same locality. For purposes of analysis the 2 were treated as different "species".

P. angulata (Say) (n = 5) is distinguished by a pattern of spots (33, 24, 25, 50, 34). Three spots are unique; 35 and 36 are found in all specimens, and 50 in 40% of the specimens.

P. lucifera (spring) (n = 9) is recognized by a pattern consisting of compounds 29, 48, 25, 27, and 26. Spot 29 is unique to *P. lucifera* within the genus but is also found in 2 *Photinus* species.

P. lucifera (fall) (n = 5) has a pattern similar to the spring group if the chromatograms are viewed subjectively but the R_f values of spot 25 (spring) do not correspond with spot 24 (both are yellow) found in nearly the same position in the fall group. In the absence of spectral data, we therefore assumed these to be different chemicals. In addition, spot 9 is present only in the fall group and spot 29 only in the spring group. This produces a 24, 27, 26, 9, 48 combination.

These 2 groups of *P. lucifera* are similar except for the 4 spots (9, 29, 24, 25) mentioned above. Compound 26 was found in all specimens of both populations and is therefore an excellent indicator; number 28 was found in only 20% of the fall and 44% of the spring individuals, and elsewhere only in *Photinus floridanus*. Compound 28 would seem less reliable because of incidence in fewer specimens, but when present it is distinct.

Photinus.

Photinus has only 4 of 29 total spots (14%) which are common to all 3 species studied; the 3 species belong to 3 different species groups.

Photinus umbratus Le Conte (n = 11) has 2 spots (9, 48) which are unique to it within the genus. Spot 9 is found only in 27% of the specimens. There are no spots occurring only in this species.

P. pyralis (Linnaeus) (n = 7) has a sequence of easily-seen spots (34, 46, 23, 27) and 4 spots (15, 32, 43, 44) which are unique.

P. floridanus Fall (n = 5) has a sequence of spots (46, 10, 45, 47, 51) indicative of this species and 4 (41, 45, 47, 51) found in no other species.

Paper Chromatography With Knowns:

R_f value variation around the means of both known and unknowns is ± 0.05 R_f units or more. F tests (Mendenhall 1971:245) comparing 5 selected sets of R_f values of unknowns to the 10 sets of R_f values from known compounds revealed only 4 of the 50 tests as showing variation in the unknown compound greater than in the known. This shows variation caused by contamination of whole processed insects is probably of little importance in introducing error.

Uric acid was difficult to detect in first-direction separation and could not be detected at all in second-direction separation.

Xanthopterin and 2-amino-6, 7-dimethyl-4-hydroxypteridine left a trace of fluorescence at the origin of second-direction separation. The cause of this "ghost" is not known. It is suspected that some of the unknown compounds behaved in this way also since spots remained at the origin in several species (compounds 1, 4, 11). It is not definitely known if in fact these spots are the result of the "ghost" effect.

Color changes were noted after separation in the 2 solvent systems for xanthopterin and pterin-6-carboxylic acid. This may be chemical interaction with the solvents or a function of the pH of the 2 systems.

Discussion

The chromatographic methods used in these experiments can be improved in a number of ways to produce a better systematic tool. Many of the problems encountered in chromatography are discussed by Heftmann (1967).

We encountered 2 major problems, R_f value variation (± 0.05 R_f units or more) and spreading of the developed spot. Variation of R_f values and spot spreading may be controlled by choice of solvent systems. Only those compounds with R_f values between 0.12 and 0.90 R_f units are considered reliable (Heftmann, 1967). Since each solvent will affect each compound

TABLE 1. Fluorescent compound color evaluation.

Color	Compound Number
Blue	1, 2, 3, 4, 5, 7, 10, 16, 17, 20, 23, 26, 27, 29, 30, 31, 32, 34, 36, 38, 40, 41, 43, 44, 45, 46, 47, 48, 49, 51
Dark Blue	19
Light Blue	1, 9, 10, 17, 23, 26, 48
Blue-Green	1, 9, 17, 26, 28, 39, 48
Purple	6, 12, 13, 21, 22, 42, 19
Green	1, 8, 9
Yellow-Green	1, 8, 28
Yellow	1, 5, 8, 11, 14, 15, 18, 24, 25, 28, 33, 35, 37, 39, 50
Pink	5

In a few cases spot size, position, intensity, shape and/or consistency indicated that a single compound was involved, yet there was considerable color variation (e.g. no. 1; see figures). A number of causes seem possible, and we chose to assign a single number.

differently, it may be possible to find solvents to place all spots within the proper range.

Experimental conditions which are rigidly controlled will also give more consistent results. Heftmann (1967) listed factors that are applicable to this study.

In conjunction with the above it may be desirable to increase the sensitivity (resolving power) of the test. Whatman No. 1 (or a comparable paper) gives much better resolution than the thicker Whatman No. 3. Thin-layer chromatography is 10-100 times more sensitive than paper. There are 2 parameters not utilized in this work which could give useful data. These are spot size measurement and spot brightness. Spot brightness could be compared to standard concentrations of known fluorescent compounds.

The limits of predictive capabilities for fluorescent compound analysis as a systematic tool must be investigated. These limits can be tested by answering the following questions: 1) What sample size will be required for good statistical analysis? 2) What is the range of variation in the numbers of possible compounds and their frequency of occurrence within a population? This range is necessary to compare species. 3) What variations exist among populations collected from different points in a species' range? 4) What effect does specimen age have on the test? Laboratory rearing may be required for definite age determination. 5) Does larval or adult diet affect the spots found? 6) Will gut content affect the occurrence of spots? If the answer to this question is affirmative, it may also be asked, will it be possible to determine what species of firefly a female *Photuris* aggressive mimic (Lloyd 1965) has recently eaten? 7) Do differences occur in temporally separated populations? 8) Is it possible to use dried or preserved specimens? The work by Cockayne (1968), reviewed earlier, suggested this may be possible for dried specimens. Schmidt (1969) separated 38 fluorescent compounds from *Formica* ants preserved in 70% ethanol, suggesting alcohol preservation may be possible also. 9) Can parts of a specimen be used? Also which (e.g., leg, light organ, head) will give the most information? This is important to know if valuable museum specimens are used. 10) What sex differences exist?

Conclusions

Paper chromatography of fluorescent compounds could be an effective means of generic and specific determination in the family Lampyridae. Refinements of technique and more comprehensive sampling are needed to determine the full potential of this procedure as a systematic tool in fireflies and in other insect groups.

The need for new parameters in insect systematics is great. The use of fluorescent compounds as systematic characters holds much promise as a new and relatively unexplored means to aid in the complex process of insect classification and identification.

Acknowledgments

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A EUROPEAN DUNG BEETLE, *ONTHOPHAGUS TAURUS* SCHREBER, NEW TO THE U.S. (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

Onthophagus taurus Schreber 1759, a common European dung beetle, is recorded from the U. S. for the first time from northwestern Florida, central and southwestern Georgia, and southeastern Alabama. No information is available on the method of introduction, but the earliest recorded specimen is from Santa Rosa County, Florida in 1971.

In May 1974, Fincher collected numerous specimens of an unknown dung beetle in areas of Georgia where previous bait traps had not produced the same species. A photograph was sent to Woodruff for identification some time later. He had on hand 3 single specimens from 3 Florida localities. It was immediately recognized as a species not known from the U. S., but it was suspected to be a Mexican species. When a well-developed male was available for study, comparisons were made with all the species present in the Florida State Collection of Arthropods. After detailed study it appeared indistinguishable from the European *Onthophagus taurus* Schreber.

It is the purpose of this paper merely to record the species for the U. S., especially since it is one of the species under consideration for intentional introduction. A more detailed paper is in preparation with complete literature citations, drawings, and distribution maps.

The species appears to have a wide distribution in the Old World, Balthasar (1963:550-551) listing: all of south and middle Europe, North Africa, Syria, Mesopotamia, Iran, Afghanistan, "Transcaucasien, Kleinasien, Zentralasien". The following U. S. records are listed in approximate chronological order by state: FLORIDA: Santa Rosa Co., Blackwater R., FAMU Biol. Sta., 7-VIII-71, W. L. and J. G. Peters (1 female); Madison Co., Madison, 30-XI-74, C. A. Boyles, cowdung (1 female); Jefferson Co., Monticello, 2 mi. E., III-75, R. B. Baker (1 male). GEORGIA: Dougherty Co., 15-V-74, G. T. Fincher, pit traps baited with swine feces (230 specimens) [dung beetle trapping for the past 7 years in the area produced none]; Tift Co., Tifton, VII-74, G. T. Fincher, swine feces bait traps [dung beetles had been trapped yearly at this site for the past 18 years with no previous specimens of this species]; Turner Co., (10 mi. N. of Tift Co. site), VII-74, G. T. Fincher (3 specimens); Baker, Calhoun, and Early Counties (20-30 miles west of the Dougherty Co. site) produced numerous specimens in late 1974; in 1975 the following Counties were added: Harris, Muscogee, Talbot, Taylor, Peach, Houston, Dooly, Crisp, Colquitt, Grady, Berrien, Irwin, Coffee, Bacon, Wayne, Pierce, Ware, Atkinson.

Contribution No. 343, Bur. of Entomology, Div. Plant Industry, Florida Dept. Agr. & Consumer Serv.

In 1975 it was found in almost every county surveyed in southwest Georgia, southeast Alabama, and the adjacent Florida panhandle. In company with F. Shalaby, a visiting scarab worker from Cairo, Egypt, the authors hand collected it in cow dung at the following Florida localities on 13-VIII-1975: Bay Co., Hiland Park, Rt. 231; Calhoun Co., 1 mi. W. Clarksville; Wakulla Co., Medart, Rt. 98; Leon Co., Tall Timbers Res. Station. Fincher's surveys in Alabama produced specific records as follows: Coffee Co., nr. Jack; Pike Co., Troy and Spring Hill; Barbour Co., nr. Clio and Blue Springs; Henry Co., nr. Abbeville, nr. Shorterville, Haleburg, and Columbia.

The species is highly variable, resulting in several named varieties in Europe, based mostly on color or male horn development. Twenty one synonyms are listed in the Junk Catalogue (Boucomont and Gillet 1927). Two curved head horns on major males easily distinguish it from any U. S. species. In Howden and Cartwright's revision of U. S. *Onthophagus* it will key to either *batesi* Howden and Cartwright, a completely shining rather than alutaceus species known from Texas to Panama; or *subtropicus* Howden and Cartwright, but that species has no cephalic horn in the male and the female has the frontal carina elevated each side into a sharp tubercle (a rare species known from 3 specimens from Laguna Madre, 25 mi. SE of Harlingen, Texas). Since Balthasar (1963) listed the size variation from 6 to 11.5 mm, it is difficult to proceed beyond couplet 4 (where it is either more or less than 7.5 mm) in their key.

No direct knowledge is available as to where or how this species was introduced. During surveys it seemed that the number of specimens decreased as the distance increased going north and east from the southwestern corner of Georgia. Since the first specimen was found in Santa Rosa Co., Florida, we suggest that the introduction took place at some coastal locality in the Florida panhandle (e.g., Pensacola). Another foreign (African) dung beetle, *Onthophagus depressus* Harold, was apparently accidentally introduced into Georgia and Florida several years ago (Woodruff 1973), but is not known from the Florida panhandle.

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OMOGLYMMIUS GANGLBAUER, A SEPARATE GENUS (COLEOPTERA: CARABIDAE OR RHYSODIDAE)

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ABSTRACT

Omoglymmius Ganglbauer 1892 was described as a subgenus of *Rhysodes* Dalman 1823. It is here recognized as a separate genus. It includes 2 North American species, which become *Omoglymmius americanus* (Laporte) and *O. hamatus* (Leconte).

Rhysodidae have generally been regarded as a separate family, though there is good evidence that they are actually an aberrant tribe of Carabidae (Bell and Bell 1962). The group has generally been divided into 2 genera, *Rhysodes* Dalman 1823 and *Clinidium* Kirby 1830. Grouvelle (1903), Arrow (1942), Hincks (1950), and Bell (1970) all used this classification. I am currently engaged in a study of the phylogeny of the Rhysodini of the world. It is already apparent that the Genus *Rhysodes,* as usually recognized, is polyphyletic. I am not yet ready to publish a new classification for the entire tribe, but 2 North American species must be removed from the Genus *Rhysodes,* and it is desirable to make the change before the checklists and handbooks of the North American Beetle Project reach their final form.

Ganglbauer (1891) created the Subgenus *Omoglymmius,* with *Rhysodes germari* Ganglbauer (1891) as the type species. This European form is closely related to the 2 North American species, *Rhysodes americanus* Laporte and *R. hamatus* Leconte. *Omoglymmius* should be raised to the rank of genus. It can be diagnosed as follows:

Omoglymmius Ganglbauer 1891

Median lobe of head short; temporal lobes closely approaching one another posterior to median lobe; eye large, flat, lateral, usually deeper than long; eleventh antennal segment blunt, without terminal stylet; pronotum with paramedian grooves complete or nearly so; elytra with shallow, coarsely punctate striae, the seventh being marginal; intervals flat or slightly convex, never carinate; first interval not at all depressed anteriorly; hind wing fully developed; middle and hind tibia each with a single spur, that of middle tibia curved; male with calcars on both middle and hind tibiae.

Omoglymmius as limited by Grouvelle is itself polyphyletic. Certain species from the Oriental Region and Madagascar do not belong to the genus as defined above.

Rhysodes differs from *Omoglymmius* in having a long median head lobe, which extends backwards to the neck, separating the temporal lobes. There is no spur on the middle tibia; instead, there is a curved rigid process arising at the same point on the tibia. The male has a calcar on the hind tibia, but lacks one on the middle tibia. The type species, *R. sulcatus* (Fabricius), is

European, but the genus is otherwise limited to southeast Asia and the islands of the western Pacific. It is unknown in the Western Hemisphere or Africa.

Clinidium resembles *Omoglymmius* in the form of the head lobes and the calcars, but has a small, usually elongate, dorsally-directed eye, a stylet on the eleventh antennal segment, a first elytral interval which is deeply depressed anteriorly, 2 spurs each on the middle and hind tibiae, and hind wings reduced to minute vestiges. The key in Bell (1970) can be modified by substituting the name *Omoglymmius* for *Rhysodes.*

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IDENTIFICATION OF THE LARVA OF *ANISODACTYLUS SANCTAECRUCIS*, A GROUND BEETLE FOUND IN SOUTH DAKOTA CROPLANDS (COLEOPTERA: CARABIDAE)[1]

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ABSTRACT

A drawing of the larval head capsule and a description of the apical margin of the frontal piece are given as a supplement to a previously published aid in identification of carabid larvae of cropland.

Research on the biology of carabids of cropland has been stimulated by interest in potential predators of soil insects. An important part of this research involves the activities of the larvae of these carabids. However, the larvae of only a few have been described, and suitable keys for identification of the larvae of most species are lacking. I have published drawings of the head and apical margin of the frontal piece of larvae of 29 species found in South Dakota (Kirk 1972).

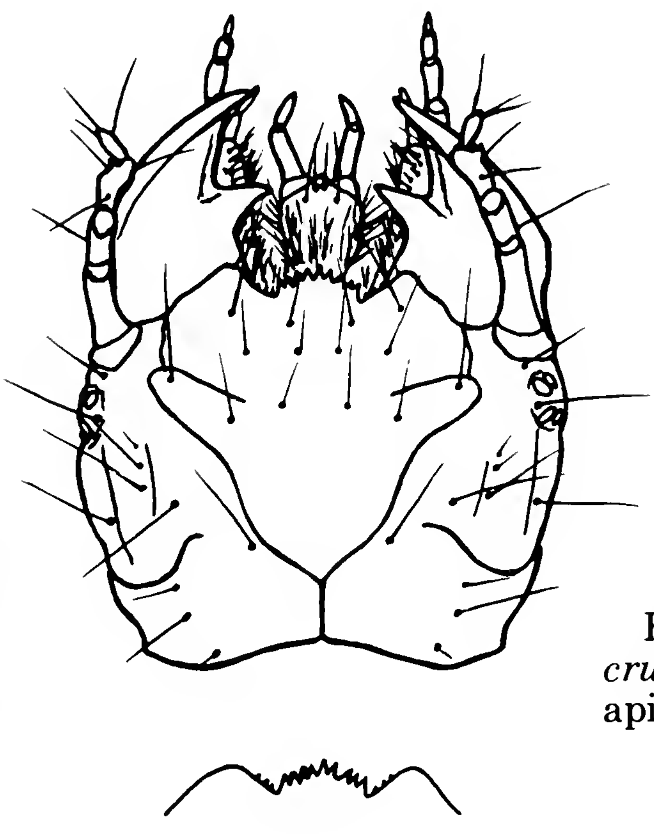

Fig. 1. Head of *Anisodactylus sanctaecrucis* larva, dorsal view, and outline of apical margin of the frontal piece.

Although *Anisodactylus sanctaecrucis* F. is among the less frequent carabids in South Dakota (Kirk 1971), D. D. Folts (personal communication; Sr. Biologist, FMC Corporation, Middleport, New York) found it to be one of the most numerous carabids of corn fields in Niagara County, New York. I have successfully reared this species in the laboratory and present the following material as a supplement to that published earlier.

[1]In cooperation with the South Dakota Agricultural Experiment Station.

G. E. Ball, Department of Entomology, University of Alberta, identified representative adults of the species, and Betty J. Dupraz, formerly laboratory technician here, aided in rearing the specimens in the laboratory.

Anatomical features of the apical margin of the frontal piece

Anisodactylus sanctaecrucis F. Nasale with 9 subequal teeth in a slight arc, equally spaced, or sometimes with several of the teeth paired; adnasale projecting forward about as far as teeth of nasale; inner slopes of adnasale denticulate. Examined: 36. Width: 1.0-1.2; 1.5-1.6; 1.8-2.1mm.

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NECROLOGY & BIBLIOGRAPHY OF C. T. PARSONS

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Dr. Carl T. Parsons was born at Rye, New York 30 Aug. 1914, and died at Dorset, Vermont, 30 Dec. 1973. He graduated from Harvard University in 1937, with a Ph.D. in 1941. He was a student of F. M. Carpenter with his thesis on Nearctic Nitidulidae. He is survived by his wife Harriet and sons Tom and William. He assisted Nathan Banks at the M.C.Z. for a short time

after getting his Ph.D. He was drafted into the Army in 1942 where he was in charge of Malaria Survey Unit in the Pacific and involved in the occupation of Korea and invasion of Okinawa. After discharge, he went to work for Connecticut Agricultural Experiment Station and wrote extension bulletins, helping in the editing of the "Diptera of Connecticut". He became a professor at the University of Vermont, from 1948 to 1955. He managed an apple orchard in Dorset, Vermont, until 1966, when he gave the business up and bought a bookstore in Manchester. In 1968 he sold the bookstore and retired to work on Coleoptera. Through the years, he worked on his large collection of nitidulids and other Coleoptera, and he identified thousands of specimens for individuals in various parts of the world. His collection and library were bequeathed to the M.C.Z., except for a synoptic collection of Vermont insects, which went to the University of Vermont. He was particularly interested in the families Nitidulidae, Rhizophagidae, Cucujidae, Mycetophagidae, and Lagriidae, and he also worked in the dipteran family Conopidae. In addition to his collection of Vermont insects, he was building up a collection of insects from the islands of southern Massachusetts, and also insects associated with fungi.

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(*continued from inside front cover*)

departments, provinces, parishes, and/or counties listed. Dates are listed by day, month (in Roman numerals), and last 2 digits of the year. Listing of ecological data is encouraged. Location of specimens should be shown in brackets; if the data is extensive these should be abbreviated as shown and the abbreviations listed in the text.

Any article concerning Coleoptera will be considered. Descriptions of new taxa must contain keys (or be correlated with existing keys) and illustrations. All manuscripts should be typed on 8½×11" opaque white paper with 1 inch margins. They should be typed on one side only and double spaced throughout (including title, footnotes, tables, figure legends, and references). All scientific names should be underlined. Use the following order: title, author, author's address, abstract, body of text, references cited, and figures. All footnotes, tables, and figure legends should be provided on separate sheets and double spaced. Indicate approximate figure and table locations in pencil in the margin of the manuscript.

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PSEPHENIDAE (including EUBRIINAE, EUBRIANACINAE, and PSEPHENINAE): Revising the family in the Western Hemisphere. Request loan of any material from the New World. Dr. Harley P. Brown, Zoology Dept., Univ. of Oklahoma, 730 Van Vleet Oval, Norman, Oklahoma 73069.

EXCHANGE: Curculionidae, Buprestidae, and Carabidae. Massimo Heregalli, C. A. Picco 27, 10131 Torino, ITALY.

CICINDELIDAE: Need specimens of following genera for morphological studies of family: ***Eucallia, Nickerlea, Rhysopleura, Langea, Opisthencentrus, Iresia, Oxygonia, Ctenostoma, Pogonostoma, Caledonomorpha, Caledonica, Distipsidera, Aniara, Prothyma.*** Wish to exchange, borrow, or purchase and can use poorly labelled or damaged material. R. D. Ward, Dept. Ent., Michigan State Univ., East Lansing, Mich. 48823.

FOR SALE: Exotic beetles from Malaysia, New Guinea, Africa, Brazil, etc. Send $1.00 for 64 p. catalogue. Prospect Biological, P. O. Box 307, Round Lake, Illinois 60073.

PHILIPPINE BEETLES: Leonard L. Lengyel, c/o Mrs. Manuela R. Ablan, Rizal St., Laoag City, Ilocos Norte, Rep. Philippines.

LITERATURE DESIRED: Donations of reprints, journals, and reference works are solicited to build up library. Wau Ecology Institute, Box 77, Wau, PAPUA, NEW GUINEA.

SCARABAEIDAE: Want to purchase ***Dynastes tityus*** and ***Plusiotus*** from North and Central America or trade for ***Psalidognathus superbus*** and French Scarabaeidae. T. D. Haas, 97 Barnes St., Long Beach, N. Y. 11561.

BUPRESTIDAE: Buy, exchange, determine Central American Agrilinae for revisionary studies. Henry A. Hespenheide, Dept. Biology, Univ. California, Los Angeles, California 90024.

CERAMBYCIDAE & HISTERIDAE: Respectively wish *Eburia* (regional studies) and *Plegaderus* (World revision); all stages. Robert H. Perry, 118 Pilgrim Ct., Bolingbrook, Ill. 60439.

SCARABAEIDAE: Would like to purchase or trade for various species of *Plusiotus, Megasoma joergenseni, M. janus* v. *argentina, Dynastes hercules* v. *equatoriana, D. satannae, Parachrysina truquii, Chrysina karschi, C. modesta, Homoiosternus beckeri, Heterosternus ludeckei, H. oberthuri.* T. W. Taylor, 8529 Norwood Pl., Rosemead, CA 91770.

WANTED: Carabidae *larvae*. Studying the phylogeny of the tribes Morionini, Pterostichini, Agonini, and Amarini as a thesis problem. Request loans, will sort. Contact for further information and/or send to Raymond G. Thompson, Dept. Ent., Univ. of Arkansas, Fayetteville, AR 72701. 501/575-2451.

STAPHYLINIDAE: If anyone wishes to send us unsorted Staphylinidae in 70% alcohol we will *eventually* return 1 or 2 specimens mounted, labeled and identified to the nearest possible taxon. Ecological data particularly desired. Ian Moore, Div. Biological Control, Univ. of California, Riverside, CA 92502.

SCARABAEIDAE: Studying myrmecophilous and termitophilous Aphodiinae. Request loan of New World material especially. Will sort from general scarab collections or from light trap samples. Robert E. Woodruff, Fla. Dept. Agr., P. O. Box 1269, Gainesville, FL 32601.

FOR SALE: 6m × 2.5m linear MALAISE TRAPS. Collecting heads utilize cyanide &/or alcohol. Proven design used worldwide. Additional information & prices write D. A. Focks, P. O. Box 12852, Gainesville, FL 32604.

EXCHANGE: Fernando Angelini, Via Imperiali "Villa Italia" n. 189/1B,72021 Francavilla Fontana (Brindisi), ITALY, wishes to receive Haliplidae, Dytiscidae, and Gyrinidae of North & South America in exchange for Coleoptera of same or other families from Italy.

EXCHANGE: Coleoptera of all Families from Arizona; ask for List and send yours. Dr. Rudolph Lenczy, 126 Los Robles, Green Valley, Arizona 85614.

LATHRIDIIDAE: Want specimens from entire world; exchange specimens, literature, and experiences. Jurgen Otto, 4006 Erkrath Kirchstr. 36—West Germany.

PUERTO RICAN COLEOPTERA: Building reference collection; need determiners (can keep duplicates). Will also exchange. Julio Micheli, 14 Baldorioty St., Mariani, Ponce, Puerto Rico 00731.

LUCANIDAE: Buy, sell, exchange all species. Also want collection data and world literature on the family. Bill E. Gavin, 981 N. W. Circle Blvd. # 1, Corvallis, OR 97330.

CARABIDAE: Have *Calosoma (Carabominus) asper* Jeannel & *C. (Blapstoma) chihuahua* Gidaspow for exchange. I want *Carabus*, Cychrini, or *Calosoma* not represented in my collection. B. Rotger, Pagosa Springs, Colo. 81147.

RHYSODIDAE: Wanted, for world-wide revision. Willing to identify and return or exchange for U. S. Carabidae. Ross T. Bell, Zoology Dept., University of Vermont, Burlington, VT 05401, U.S.A.

SCARABAEIDAE: Working toward a general revision of the Anomalinae of Mexico, Central, and South America. Specimens and records needed by loan, purchase, or exchange. Identifications by arrangement. Robert W. L. Potts, California Acad. Sci., Golden Gate Park, San Francisco, CA 94118.