The Coleopterists' Bulletin

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

VOLUME 15, 1961

Published by

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

THE COLEOPTERISTS' BULLETIN

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by Ross H. Arnett, Jr. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, Department of Biology, Catholic University of America, Washington 17, D. C.

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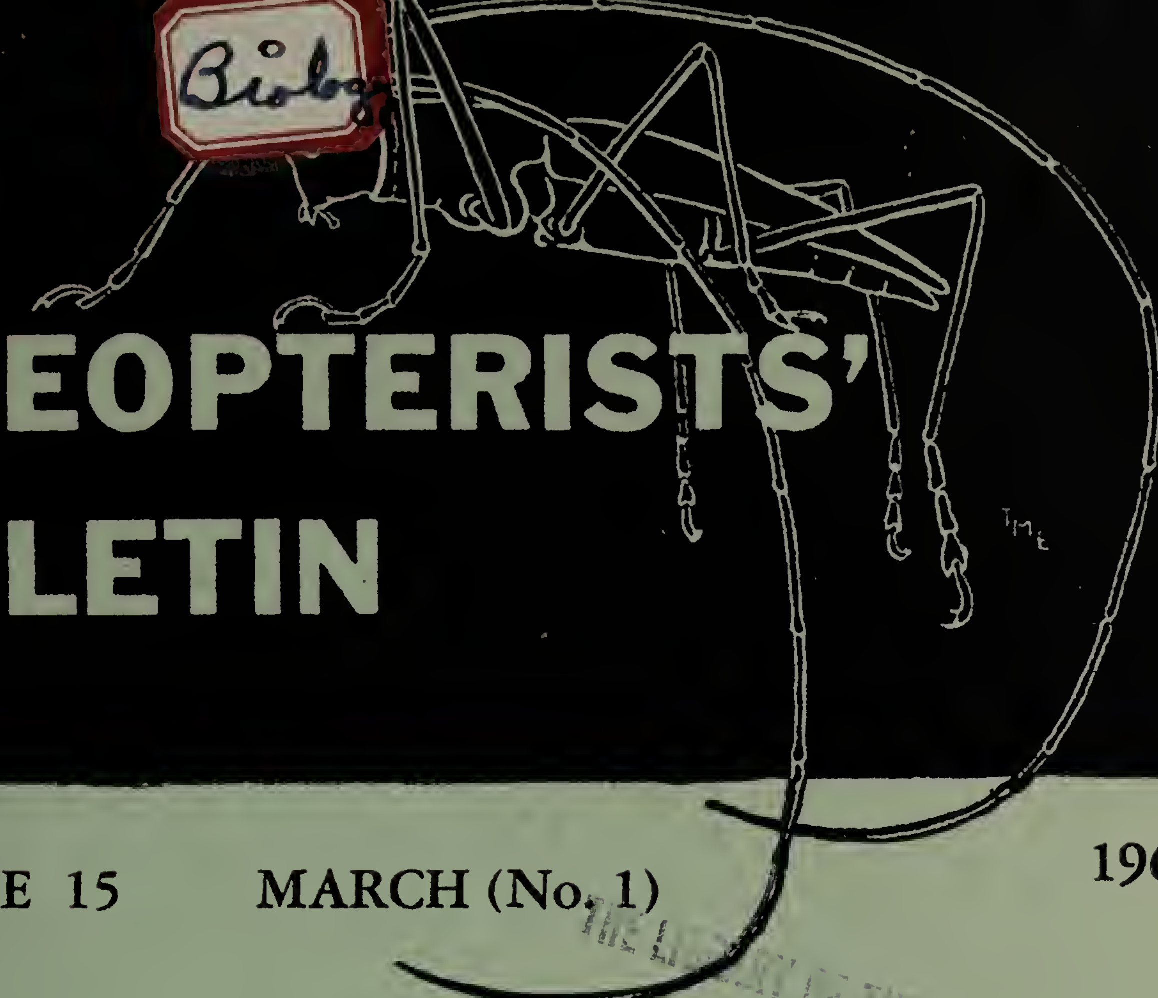

THE COLEOPTERISTS' BULLETIN

VOLUME 15 MARCH (No. 1) 1961

ARTICLES

NOTES

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The Coleopterists' Bulletin

Volume 15 March (No. 1) 1961

NOTES ON *ONYCHYLIS* LECONTE WITH DESCRIPTIONS OF TWO NEW SPECIES (CURCULIONIDAE)

By HORACE R. BURKE[1, 2]

The following notes and descriptions of new species are presented as a contribution to the knowledge of the little known curculionid genus, *Onychylis* LeConte. The genus, distributed in North and Central America, now contains ten species, two of which are described herein as new. Specimens of all species assigned to *Onychylis,* except *meridionalis* Champion described from Guatemala and *cretatus* Champion from Mexico, have been seen. Type material of the remaining species, except *nigrirostris* (Boheman), has been examined. A more complete study of this group of weevils must await the accumulation of additional material, especially from Mexico and Central America.

Onychylis LeConte may be characterized as follows. Similar in general habitus to *Lissorhoptrus* LeConte. Rostrum moderately and evenly curved, slightly shorter to distinctly longer than pronotum. Scrobes short, descending to underside of rostrum. Suprascrobal groove on each side of rostrum extends from above antennal insertion posteriorly to front margin of eye. Antenna inserted just before middle of rostrum; funicle 6-segmented; club elongate-oval, pubescent. Prothorax slightly to distinctly wider than long, feebly to rather strongly constricted before apex. Ocular lobes prominent. Alternate intervals of elytra each with a row of recurved setae which may be either prominent or small and inconspicuous. First abdominal suture broadly arcuate in middle. Inner margin of each tibia with a furrow densely clothed with elongate, plumose scales; each tibia with apical spine. Third tarsal segment deeply emarginate, wider than second; fourth tarsal segment elongate, projecting well past lobes of third. Tarsal claws simple, divergent.

Measurements of the length of the rostrum were made as indicated in figure 1,C. Body length was measured along a dorsal line from the front margins of the eyes to the apices of the elytra. Other structures are meas-

[1] Technical Contribution No. 3443, Department of Entomology, Texas Agricultural Experiment Station, College Station.

[2] ACKNOWLEDGMENTS.—I am indebted to Mr. John Kingsolver for the loan of most of the Mexican and Central American material upon which this study is based; to Miss Rose Ella Warner, Entomology Research Division, U.S.D.A., and Dr. H. F. Howden, Canadian National Collection, for arranging the loan of material under their care; to Dr. V. M. Tanner for the donation of a paratype of *Onychylis essigi* Tanner for study; and to Dr. P. J. Darlington, Jr. for making facilities available for my study of LeConte types and other material in his care at the Museum of Comparative Zoology.

ured at the greatest width or length. The male may be recognized most easily by the rather distinct impression in the middle of the first abdominal sternum; this segment is more or less convex in the female. The antennae of the male are inserted nearer the apex of the rostrum than in the female; however, this difference is often so slight that both sexes must be available for comparison before the character can be used for their separation.

Although not including all species of *Onychylis* (*meridionalis* Champion and *cretatus* Champion are omitted), the following key will aid in the identification of those occurring in America north of Mexico, and will point out the essential characteristics of the two new species described here.

1. Tibiae each with a row of denticles along inner margin; suprascrobal grooves bare, not filled with scales; rostrum slender (fig. 4) -------------------------------- 2
   Tibiae without denticles along inner margins; suprascrobal grooves filled with plumose scales; rostrum stouter (figs. 1, 2, 3)-------------------------------------- 3

2(1). Sides of prothorax parallel, or almost so, in basal half; rostrum of female distinctly longer than pronotum (3.8:2.7); length of body, 3.3-4.4 mm.; Texas----TEXANUS Burke
   Sides of prothorax more rounded; rostrum of female only slightly longer than pronotum (2.8:2.5); length of body, 2.7-3.3 mm.; Mexico and Guatemala------SETIGER Champion

3(1). Body elongate-oval; prothorax slightly wider than long, sides usually parallel in basal two-thirds (sometimes feebly rounded); (fig. 6)---------------------------- 4
   Body more robust; prothorax distinctly wider than long, sides usually strongly rounded, never parallel in basal two-thirds (figs. 5, 7)------------------------------ 5

4(3). Rostrum rather slender (fig. 1), distinctly longer than pronotum in female, slightly so in male; dark patterns of scales on pronotum and elytra; Texas to Virginia------ -- LONGULUS LeConte
   Rostrum stouter (fig. 2), about same length as pronotum in either sex; scales rather uniformly gray throughout, no dark patterns above; El Salvador and Guatemala---- ---SECUNDUS n. sp.

5(3). Alternate intervals strongly elevated; setae on these intervals recurved and conspicuous; prothorax very coarsely punctured, strongly constricted before apex (fig. 5); Texas --ALTERNANS LeConte
   Alternate intervals scarcely, if at all, elevated; setae on these intervals minute; prothorax less strongly constricted before apex, never coarsely punctured----------- 6

6(5). Fourth segment of hind tarsus distinctly longer than third (fig. 8); legs slender; scales dark gray, not entirely obscuring deep black color of derm; California------ESSIGI Tanner
   Fourth segment of hind tarsus stouter, little if any longer than third (fig. 9); legs stouter; dense, agglutinated scales completely obscuring derm----------------- 7

7(6). Tarsal claws slender, not strongly curved (fig. 13); apical spine of hind tibia stout (fig. 11); smaller and more robust; length of body, 2.2-2.4 mm.; Texas----PARVULUS n. sp.
   Tarsal claws stouter, usually more strongly curved (fig. 12); apical spine of hind tibia slender (fig. 10); larger; length of body, 2.8-3.2 mm.; Eastern U. S., Ontario, Canada -- NIGRIROSTRIS (Boheman)

Onychylis texanus Burke

Onychylis texanus Burke, 1959, Coleopt. Bull. 13: 36.

As indicated in the preceding key, this weevil and *O. setiger* Champion are readily distinguishable from all other species of *Onychylis*. On the basis of these differences the two species may eventually have to be removed from the genus. However, at the present it appears expedient to treat them under *Onychylis*.

One specimen before me from Tehuantepec, Oaxaca, Mexico agrees well with *texanus*, except that it has the sides of the prothorax much more strongly rounded. Additional material is needed to determine whether or not it is conspecific with *texanus,* a species now known only from Anderson and Walker counties, Texas.

Onychylis setiger Champion

Onychylis setiger Champion, 1902, Biol. Centrali-Americana, Col. 4: 134.

Described from "Mexico, Amula in Guerrero." Three specimens are at hand from Chaparion, Jutiapa, Guatemala (D. Lauck).

Onychylis longulus LeConte

Onychylis longulus LeConte, 1876, Proc. American Philo. Soc. 15: 179.

Described from Michigan. Specimens have been examined from Kansas, Louisiana, Virginia and Texas. I have collected specimens of this weevil in fairly large numbers on *Pontederia cordata* L. near College Station, Texas, from March through September.

Onychylis alternans LeConte

Onychylis alternans LeConte, 1876, Proc. American Philo. Soc. 15: 179.

Very easily separated from all other species of *Onychylis* by characters presented in the key. Known only from Texas.

Onychylis essigi Tanner

Onychylis essigi Tanner, 1954, Great Basin Nat. 14: 77.

A paratype specimen from the type locality, Saratoga Springs, Death Valley, California, was examined. To my knowledge this species has not been reported to occur elsewhere.

Onychylis nigrirostris (Boheman)

Notiodes nigrirostris Boheman, 1843, Schön. Curc. 7, Pt. 2, 184.

Onychylis nigrirostris (Boheman), LeConte, 1876, Proc. American Philo. Soc. 15: 178.

This is the most common species of *Onychylis.* Specimens have been seen from Florida, Virginia, Pennsylvania, Massachusetts, North Carolina, Illinois, Wisconsin, and Ontario, Canada.

Blatchley (1916, Rhynch. N.E. America, p. 226) records *nigrirostris* as occurring abundantly on *Pontederia cordata* L. in Florida, and on *Sagittaria* near New York City. Specimens bearing the host label, *"Decodon verticillatus,"* from Ottawa, Ontario have been examined.

Considerable variation exists among the specimens treated here as *nigrirostris.* Although none of these variations in the small number of specimens available for study from each locality appears to warrant additional segregates, a more extensive investigation might reveal that a complex is actually involved.

Onychylis secundus NEW SPECIES

(FIGURE 2)

Closely related to *Onychylis longulus* LeConte from which it may be separated by the characters set forth in the key.

Elongate-oval; derm reddish-black; scape and funicle of antenna testaceous, club darker, tarsi and apex of rostrum reddish-brown; body and legs covered with a dense coating of rather uniformly gray, agglutinated scales.

Holotype male: Length, 2.7 mm.; width (across elytra), 1.3 mm.; width of pronotum, 0.77 mm.; length of pronotum, 0.70 mm.; length of rostrum 0.70 mm.

Rostrum stout, distinctly curved, as long as pronotum; basal two-thirds with dense coating of scales; apical third clothed with plumose scales and suberect, flattened setae on area immediately below origin of antenna, extreme apex glabrous, shining. Suprascrobal groove densely clothed with plumose scales, opening posteriorly against upper two-thirds of front margin of eye. *Antenna* inserted immediately before middle of rostrum; scape rather slender, abruptly clavate in apical third, apex not reaching eye; funicular segment 1 conical, segment 2 as long as 3 + 4, segments 3-6 very nearly equal in length, each as wide as long; club elongate-oval, densely pubescent and with scattered, erect setae, club as long as preceding five funicular segments combined. *Eyes* oval. *Head* with a few decumbent setae on frons adjacent to upper anterior margin of eye. *Prothorax* slightly wider than long, sides parallel in basal two-thirds converging to a feeble subapical constriction; coarse punctures obscured thence by thick covering of scales; pronotal disc bearing a few scattered, decumbent setae. *Elytra* 2.7 times longer than prothorax, 1. 6 times wider; base emarginate; humeri oblique, rounded behind; sides of elytra parallel to about three-fifths distance from base then converging to rounded apex; alternate intervals more strongly elevated, each bearing a row of slender, recurved setae; some of the setae on intervals 3, 5 and 7 borne on summits of slight elevations along intervals; striae, beneath scales, deeply impressed; strial punctures deep. Ventral side of body with irregular-shaped to rounded, plumose scales on and around coxae and on last three abdominal sterna, elsewhere clothed with agglutinated scales like those above. First abdominal sternum with a distinct median impression which extends between the hind coxae onto posterior margin of metasternum. *Femora* gradually clavate, covered with a dense coating of scales and scattered, decumbent setae. *Tibiae* stout, middle ones slightly more curved near apex than others, each tibia with a slender apical spine. *Tarsi* slender; third segment deeply emarginate, only very slightly wider than 2, segment 4 equal in length to 3. Claws long, moderately curved, divergent.

Female allotype: Length, 3.1 mm.; width (across elytra), 1.5 mm.; width of pronotum, 0.88 mm.; length of pronotum, 0.74 mm.; length of rostrum, 0.77 mm.

Resembles male holotype except in size and the usual sexual characteristics.

Type material: Male holotype, San Antonio, La Union, EL SALVADOR, Jul. 28-1957, (D. Lauck); female allotype, Candeloria, St. Ana, EL SALVADOR, Jul. 28-1957, (D. Lauck); and one male paratype, same data as holotype, all to be deposited in Collection of Illinois Natural History Survey. One additional male paratype, Jutiapa, Jutiapa, GUATEMALA, Jul. 30-1957, (D. Lauck); to be deposited in Collection of Entomology Department, A. & M. College of Texas.

Onychylis parvulus NEW SPECIES

(FIGURES 3, 7, 11, 13)

Similar to *Onychylis nigrirostris* (Boheman), but may be separated from that species by the characters presented in the key.

Oval, robust; derm dull black; antennae, tarsi and apex of rostrum dark reddish-brown; body and legs covered by a dense coating of light gray to brownish scales.

Holotype male: Length, 2.2 mm.; width (across elytra), 1.1 mm.; width of pronotum, 0.81 mm.; length of pronotum, 0.63 mm.; length of rostrum, 0.63 mm.

Rostrum stout, moderately curved, as long as pronotum, expanded past antennal insertions, basal two-thirds covered with a dense coating of scales, apical third bare except for a few minute, recumbent setae borne in punctures immediately below origin of antennae; suprascrobal groove on each side of rostrum thickly clothed with plumose scales, upper margin sinuate, extending from above antennal insertions posteriorly to open against middle third of front margin of eye. *Antenna* rather stout; scape not reaching eye, abruptly enlarged in apical third; funicle three-fourths as long as scape, segment 1 conical, almost as wide as long, 2 as long as 3+4, segments 3-5 equal in length, 6 wider and slightly longer; club elongate-oval, as long as preceding five funicular segments combined, basal segment more thinly clothed than others. *Eyes* oval. *Prothorax* distinctly wider than long, sides moderately rounded, feebly constricted before apex; pronotum densely but finely punctate, derm between punctures finely granulate; a dark, broad, median vitta present on disc of pronotum flanked on each side by a gray, sublateral vitta. *Elytra* oval, 2.3 times longer and about 1.4 times wider than prothorax; base emarginate; humeri rounded; sides of elytra parallel in basal half thence rounded into slight emargination before apex; intervals feebly convex, alternate ones bearing a few inconspicuous setae; strial punctures beneath dense scales, deep; no definite color pattern, gray and brown scales intermixed. Underside with rounded to irregular-shaped, plumose scales on and around coxae and on last three abdominal sterna. First abdominal sternum with distinct median impression which extends between widely separated hind coxae onto posterior margin of metasternum. *Femora* strongly clavate, bearing scattered, recurved setae. *Tibiae* stout, each with a rather short apical spine. *Tarsi* setose; segment 3 emarginate, dilated, slightly wider than 2; segment 4 a little longer than 3. Claws slender, not strongly curved, divergent.

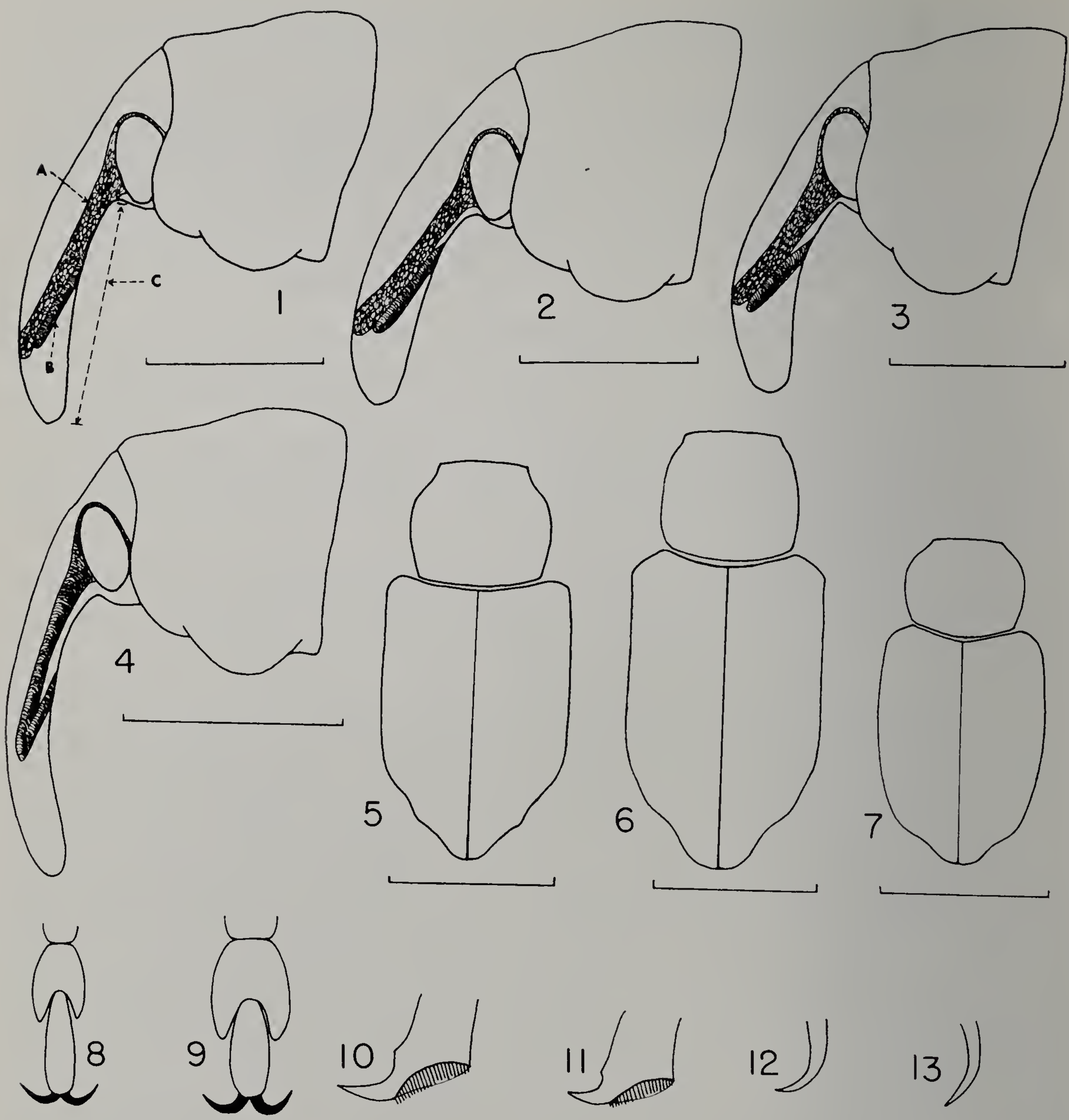

FIGURE 1.—Side view of rostrum, head and prothorax of *Onychylis longulus* LeConte, male, A = suprascrobal groove; B = scrobe; C = line along which length of rostrum is measured. FIG. 2.—Side view of rostrum, head and prothorax of *O. secundus* n. sp., holotype male. FIG. 3.—Same of *O. parvulus* n. sp., holotype male. FIG. 4.—Same of *O. texanus* Burke, male. FIG. 5.—Dorsal outline of prothorax and elytra of *O. alternans* LeConte. FIG. 6.—Same of *O. longulus* LeConte. FIG. 7.—Same of *O. parvulus* n. sp. FIG. 8.—Dorsal view of third and fourth hind tarsal segments of *O. essigi* Tanner. FIG. 9.—Same of *O. nigrirostris* (Boheman). FIG. 10.—Apex of hind tibia of *O. nigrirostris* (Boheman). FIG. 11.—Same of *O. parvulus* n. sp. FIG. 12.—Side view of hind tarsal claw of *O. nigrirostris* (Boheman). FIG. 13.—Same of *O. parvulus* n. sp. (FIGS. 1-3, line = 0.5 mm. FIGS. 4-7, line = 1 mm. FIGS. 8-13, greatly enlarged.)

Allotype female: Length, 2.4 mm.; width (across elytra), 1.3 mm.; width of pronotum, 0.88 mm.; length of pronotum, 0.70 mm.; length of rostrum, 0.66 mm.

A deep median groove is present in the apical portion of the fifth abdominal sternum. Other than this and the usual sexual differences it agrees with the male holotype.

Type material: Male holotype, female allotype and four paratypes, Lange's Mill, Gillespie Co., Texas, V-3-1959 (S.D. & H.R. Burke), to be deposited in Collection of Entomology Department, A. & M. College of Texas. The type series was collected while sweeping vegetation along the banks of a small stream. The paratypes agree well with the holotype and allotype; they range from 2.2 to 2.4 mm. in length.

A ONE-STEP CLEARING AND MOUNTING TECHNIQUE FOR MALE GENITALIA IN COLEOPTERA

In most groups of Coleoptera an examination of the male genitalia has become mandatory for acquiring a clear understanding of the proper taxonomic position of the various species. Mechanical barriers to copulation between externally similar populations of beetles are sometimes revealed by this approach. In certain large, complex genera the structure of the genitalia often leads to the most satisfactory arrangement of species groups.

Methods of preparation of male genitalia for study range from the rather crude to the rather complex, and no one method is necessarily the best for all groups. For larger specimens which have been relaxed (or killed with ethyl acetate vapor, as recommended by Valentine, 1942,[1] and Lindroth, 1957[2]), it is often possible to grasp and evert the aedeagus with iris forceps, and thus mount and dry the specimen with its genitalia extruded. In an alternative procedure the aedeagus can be dissected out, either through the dorsum as recommended by Lindroth (1954, pp. 119–120[3]), or through the posterior end of the abdomen, and mounted with glue on a cardboard or plastic point on the same pin as the specimen. If internal structures are not important, such simple methods usually suffice.

In certain groups, however, the structures within the tegmen of the median lobe require examination. This is especially true in the carabid tribe Trechini, the group of Coleoptera with which the writer is most familiar. The genus *Pseudanophthalmus* Jeannel, a very large, externally homogeneous group of eyeless cave trechines, can be satisfactorily distributed into species groups only on the basis of the structure of the transfer apparatus. The aedeagi of such groups must consequently be cleared and mounted in some way for microscopic study.

The usual clearing technique involves gentle boiling in 10–15% potassium hydroxide solution, followed by treatment in clove oil or some other clearing agent (Lindroth, 1954, 1957). The cleared genitalia are subsequently mounted on slides in Canada balsam or sandwiched between thin sheets of plastic (Valentine, 1942) and attached to the specimen pin. Some workers who prefer temporary mounts customarily run the specimen pin through the cork of a small vial in which the cleared aedeagus is stored in glycerin.

Not only is such individual treatment tedious and time-consuming, but there is danger that extremely small aedeagi may be accidentally lost during the procedure. For type and other valuable specimens the aedeagi of which are stored in a glycerin vial, there is always the danger of loss or damage to the genitalia whenever they are examined on temporary mounts. Accompanying the KOH method, especially when used in combination with temporary slide preparation, there is the normal tendency on the part of the investigator to prepare as few aedeagi as possible. Although the aedeagus is the least variable of species characters in the Trechini, experience has indicated that it is hazardous to base diagnoses between taxa (especially subspecies or closely related species) on relatively minor differences between one aedeagus each prepared from two supposedly different samples. When the sample size is large enough, the writer tries to examine from 3 to 6 aedeagi of each sample to be compared, though even 6 preparations may be far too few if statistical treatment of aedeagal characters is indicated. In the Trechini a rapid and effective method of clearing and mounting male genitalia is an absolute necessity.

The method described below, which has been employed in the study of aedeagi of various Trechini and Agonini (Carabidae), is a comparatively simple, direct, one-step process in which the genitalia are placed in a water-soluble mounting medium which contains its own clearing agent. The specimen is relaxed in boiling water and transferred to a small dish of Barber's fluid. The aedeagus is removed and cleaned of excess muscle and connective tissue, then is pipetted onto a slide and covered with two or three drops of Down's medium. It is then oriented within the drop of medium by means of insect pins and a cover slip is applied. Enough medium is added so that a small amount runs out at the edges of the cover slip on all sides. Both slide and specimen are labeled with an accession number. After 48 hours at room temperature the genitalia are usually sufficiently cleared to permit detailed examination of the copulatory pieces at high magnification.

Down's medium (Downs, 1943[4]) is one of several formulas employing polyvinyl alcohol, lactic acid, phenol, and water. The original formula calls for Grade RH 349 polyvinyl alcohol, obtainable in powder form at low cost from E. I. DuPont de Nemours Company, under the trade name "Elvanol". To make up this medium a stock solution of 15 gm of "Elvanol" is dissolved in 100 gm of distilled water at 80°C. The working formula is prepared from 56 parts of the stock, 22 parts of lactic acid, and 22 parts of phenol. Aedeagi mounted in this medium in April, 1957, are in a perfect state of preservation, nearly three years later, and there is no indication of decomposition or crystallization of the medium. Remounting is facilitated by the fact that the medium is water soluble, though it is usually necessary to immerse the slide of the specimen to be remounted in a dish of water for several hours.

Downs (1943) reports this medium satisfactory for clearing and mounting mosquito larvae, and the present writer has used it for small coleopterous larvae with excellent results.

Communications from other workers would be appreciated regarding the advantages, disadvantages, and further applications of this technique in the study of male beetle genitalia.—Thomas C. Barr, Jr., *Department of Biology, Tennessee Polytechnic Institute, Cookeville.*

[1] Valentine, J. Manson. 1942 On the preparation and preservation of insects, with particular reference to Coleoptera. Smithsonian Misc. Coll., vol. 103 (6): 1–16.

[2] Lindroth, Carl H. 1957. The best method for killing and preserving beetles. Coleopterists' Bulletin 11: 95–96.

[3] Lindroth, Carl H. 1954. Random notes on North American Carabidae (Coleoptera). Bull. Mus. Comp. Zool., Harvard, 111 (3): 117–161.

[4] Downs, Wilbur G. 1943. Polyvinyl alcohol: a medium for mounting and clearing biological specimens. Science 97: 539–540.

A TENTATIVE CLASSIFICATION OF AND A KEY TO THE NORTH AMERICAN GENERA OF THE FAMILY BYRRHIDAE (NEW SENSE) AND FAMILY SYNCALYPTIDAE (NEW STATUS)

(COLEOPTERA, POLYPHAGA, BYRRHOIDEA)

By ALY ALY EL MOURSY[1, 2]

INTRODUCTION

The present account is a synopsis of a revision of the North American representatives of the family Byrrhidae (*auctorum*). This study, suggested by George E. Ball, was begun over a year ago at the University of Alberta.[3] A detailed illustrated monograph will be prepared for publication in the near future.

The following key may be used to distinguish between the two families discussed in this paper:

1. Prosternum V-shaped; eyes not visible in front view; antennae clavate, the club formed abruptly by enlargement of terminal three articles------------------SYNCALYPTIDAE

   Prosternum T-shaped; eyes visible in front view; antennae various, if clavate, then club formed by gradual enlargement of the last six or seven articles-----------BYRRHIDAE

Byrrhidae Leach, 1815

Description.—Body form oval, convex, minute to moderate in size; smallest individuals are found in the genus *Exomella,* the largest in *Byrrhus.* Integument either glabrous or covered with clavate bristles, erect hairs, or with a dense coat of decumbent hairs, giving to the integument a velvety appearance. Color gray, dark brown or black, or integument green or castaneous with a pronounced luster.

Head deflexed, convex. Eyes oval or slightly emarginate, situated on sides and partly hidden when head is retracted into prothorax. Labrum usually notched. Antenna of 11 articles, usually clavate, with club formed by gradual enlargement of fifth or sixth to eleventh article, or filiform or subfiliform. Mandibles with a variable number of teeth, variously arranged, with a deep notch at middle, provided with a leathery lobe. Maxillary palpus of three articles; labial palpus of two articles, terminal article pear-shaped or hatchet-shaped.

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[3] The manuscript of the paper was reviewed by me, at the author's request, and some changes were made in it. Dr. El Moursy's period of study in Canada was interrupted by the steadfast refusal of the government of the United Arab Republic to grant to the author a temporary deferment from military service.—G. E. BALL.

Pronotum convex; prosternum T-shaped, broad anteriorly between coxae, received posteriorly into an emargination of mesosternum; anterior coxal cavities broadly open behind. Mesosternum short, broad in front, narrow behind. Metasternum much broader and longer than pro- and mesosternum, usually with a median longitudinal suture. Legs with anterior coxae transverse, separate; middle coxae less transverse, flat, separate; hind coxae usually transverse, nearly contiguous in mid-line, nearly attaining elytral epipleura laterally; trochanters triangular, large; femora of average length and proportions, usually somewhat flattened; tibiae slender or stout, usually flattened and expanded apically, densely covered with hairs or spines; tarsal formula 5-5-5, tarsomeres usually ascendingly larger from first to third article, fourth small, fifth long, third sometimes lobate, remaining articles with pubescent pads beneath; claws simple. Elytra covering abdomen dorsally, strongly convex, surface finely or coarsely punctate, or smooth; epipleural fold variously formed, extending to end of elytron, or usually shorter. Metathoracic wings of normal proportions or atrophied.

Abdomen with five sterna normally exposed, these punctate, glabrous or hairy. Male genitalia of the trilobed type; median lobe with apex flattened, pointed or hook-shaped, and short basal struts; lateral lobes well developed, contiguous basally; basal piece more or less triangular. Retractile plates of female symmetrical, with well developed styli on coxites.

Ecology and habits.—Byrrhids are herbivorous insects living on moist soil or dry sand, in moss, or under stones and logs. Some species are known to injure young trees in forest nurseries or plantations, some eat roots of wild grasses, weeds, oats and clover. A species of *Amphicyrta* has been reported as damaging various vegetables, and more especially, lilies (Doucette, 1953).

When disturbed, these beetles are able to retract their appendages and remain motionless for some time. When a byrrhid does this, it appears to be nothing more than a small pebble, or ball—hence the common name "pill beetle."

Classification.—The Leng Catalogue (1920) lists 72 species of Byrrhidae in 14 genera for America north of Mexico. As a result of a study of byrrhid material and examination of the type specimens,[4] I have concluded that eight of the species belonging to two genera should be removed from the family Byrrhidae and placed in a group of their own. Of the remaining 64 names, 31 must be listed as synonyms. Following is a summary of my classification.

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[4] Study of type material was made possible through the generous cooperation of Dr. P. J. Darlington, Jr., Museum of Comparative Zoology, Harvard University; Mr. T. J. Spilman, United States Department of Agriculture, and Dr. J. F. Gates Clarke, United States National Museum, Washington, D. C.; and Dr. W. J. Brown, Entomology Research Institute, Department of Agriculture of Canada, Ottawa, Ontario. Financial support for visits to the above institutions was obtained through a grant from the General Research Fund, University of Alberta, held by Dr. G. E. Ball.

Byrrhinae

Total length 3.0-9.0 mm.; body oblong, oval, rounded or elongate; antennae clavate; integument with or without clavate hairs; legs in repose closely retracted into grooves in undersurface; elytra with or without striae; metathoracic wings normally developed or atrophied.

Simplocarini

Length 3.0-4.0 mm.; body elongate, light brown to dark brown in color; elytra shining, very weakly sculptured, with fine, feebly impressed striae.

Simplocaria Stephens, 1830

Morychini, New Tribe

Length 4.0-6.0 mm.; integument covered with fine, erect or decumbent, hairs; elytra not striate; crural depressions of abdomen small.

Morychus Erichson, 1847

Tylicus Casey, 1912

Pedilophorini

Body narrowed strongly from middle to elytral apex; abdomen densely and coarsely punctate beneath, with crural depressions occupying greater part of first visible abdominal sternum; elytra not striate; metathoracic wings atrophied.

Listemus Casey, 1912

Eusomalia Casey, 1912

Byrrhini

Length 4.0-9.0 mm.; body strongly convex, almost hemispherical; integument with or without clavate bristles; elytra striate.

Cytilus Erichson, 1847

Byrrhus Linnaeus, 1767

Porcinolus Mulsant, 1869

Amphicyrtinae

Total length 1.0-9.0 mm.; antennae filiform, subfiliform, or clavate; underside usually without grooves for reception of legs, when present, not well developed; elytra usually finely punctate, epipleura long or short.

Amphicyrtini

Length 5.0-9.0 mm.; color light brown to almost black, with or without a strong metallic luster; antennae filiform or subfiliform, not hidden in repose on underside of body, hind coxae long, almost contiguous in mid-line, and almost reaching epipleura laterally; tibiae long and slender; third tarsomere bilobed; elytra finely punctate, not striate.

Amphicyrta Erichson, 1843

Lioonini

Length about 3.0 mm.; body elongate or globular; metasternum narrow; hind coxae globular, widely separated, not extending almost to epipleura laterally; third tarsomere not bilobed; elytra finely punctate.

Lioligus Casey, 1912

Lioon Casey, 1912

Exomellini

Length about 3.0 mm.; pronotum convex, rest of body forming another convexity; integument covered with long, curved hairs; mesosternum very narrow, occupied wholly by a deep transverse pit which receives obtuse apex of prosternal process; legs closely retractile, hind coxae slightly separated from one another; elytra with deep punctures arranged in longitudinal rows; epipleura of elytra broad anteriorly, narrowed posteriorly and disappearing near middle of body.

Exomella Casey, 1914

KEY TO THE GENERA OF NORTH AMERICAN BYRRHIDAE

1. Elytra striate ---------- 2
   Elytra not striate ---------- 6

2(1). Crural depressions of abdomen (grooves in first visible abdominal sternum for reception of hind femora) large, occupying more than half the first sternum ---------- 3
   Crural depressions of abdomen small, occupying less than half the first sternum ---------- 4

3(2). Integument with clavate hairs (one species from northeastern and central United States and the adjacent portion of Canada) ---------- PORCINOLUS
   Integument with simple hairs (six species whose aggregate range in North America includes Alaska, all of Canada, and northern United States) ---------- BYRRHUS

4(2). Epipleura of elytra broad, integument with curved hairs; length about 1.0 mm.; hind wings atrophied (one species from British Columbia) ---------- EXOMELLA
   Elytral epipleura narrow, integument with simple hairs; length more than 3.0 mm., hind wings normal ---------- 5

5(4). Tibia with a row of spines on external margin (one, possibly two, species whose range includes southern Canada and northern United States, with extensions southward along the Rocky Mountains) ---------- CYTILUS
   Tibia without spines on external margin (three species whose aggregate range includes Alaska, all of Canada, and montane areas in United States) ---------- SIMPLOCARIA

6(1). Crural depressions of abdomen large, body narrowing strongly from middle toward apex of elytra ---------- 7
   Crural depressions of abdomen small or absent, body narrowing gradually toward apex of elytra ---------- 8

7(6). Elytra appearing vittate, punctures denser and larger in alternate rows (one species from Idaho and British Columbia) ---------- EUSOMALIA
   Punctures on elytra not arranged to form vittae (two species from Alaska and northern California) ---------- LISTEMUS

8(6). Elytral epipleuron unusually broad, extending to extremity of elytron, narrowing gradually toward apex (two species, from Alaska, British Columbia, and California) ---------- LIOON

Elytral epipleuron narrower, about two-thirds the length of elytron-------------- 9

9(8). Tibia with outer face convex, not grooved for reception of tarsus; hind coxa without a lateral grooved portion for reception of hind femur (three species from Alaska, British Columbia and Idaho)--LIOLIGUS

Tibia with outer face grooved for reception of tarsus; hind coxa with a lateral extension with a deep depression for reception of hind femur-------------------------- 10

10(9). Dorsal integument glabrous, punctate; antennae filiform; hind wings atrophied (three species from California and western Nevada)-------------------------AMPHICYRTA

Dorsal integument covered with long hair; antennae clavate or moniliform; hind wings normal -- 11

11(10). Body with green or aeneous luster; middle tibia about as broad as middle femur (seven species whose aggregate range includes central Canada and all of United States but the southeast) ---MORYCHUS

Body black, without metallic luster; middle tibia slender, about half the width of middle femur (two species from northern Michigan, Alberta and British Columbia) -- TYLICUS

Syncalyptidae Portevin, 1931 (NEW STATUS)

The genera *Syncalypta* Stephens, 1830 and *Curimopsis* Ganglbauer, 1902 have always been included in the Byrrhidae (see, for example, Dalla Torre, 1911; Erichson, 1843; Ganglbauer, 1904; Jacquelin du Val, 1857; Lacordaire, 1854; LeConte, 1862; LeConte and Horn, 1883; Reitter, 1882 and 1911; and Leng, 1920). Portevin (1931) put these two genera in a separate tribe, the Syncalyptini. Crowson (1955), however, recognized that the systematic position of this group was questionable, and he stated that the larvae of *Syncalypta* should be found and studied to determine if this group really belonged in the Byrrhidae. It seems to me that these genera and the Australian *Microchaetes* Hope, 1834 differ in so many characters from the typical Byrrhidae that the few superficial similarities may be ascribed to convergence. Therefore, I propose that the Syncalyptini, including *Microchaetes,* be elevated to the rank of family.

Description.—Size small to minute; body with scales or clavate hairs of various shapes.

Head deflexed, convex in front, curved laterally; eyes on sides of head, completely concealed when latter is retracted. Antennae of 11 articles, the last three progressively larger, forming together an abrupt club.

Prothorax convex, attenuate anteriorly; prosternum V-shaped; tarsal formula 4-4-4 or 5-5-5.

Abdomen with five visible sterna, broad at base, strongly narrowing from second sternum, first sternum broadly grooved to receive hind legs in repose. Male genitalia with basal piece cylindrical, median lobe long and curved; lateral lobes lacking. Retractile plates of female symmetrical with long, hairy styli.

The characters shared by the Byrrhidae and Syncalyptidae are: grooves on underside of body for the reception of the legs on contraction, and the possession of clavate hairs. However, the clavate hairs which occur in the Palaearctic *Curimus* and the Holarctic *Porcinolus* are simple, and are arranged in alternate light and dense rows, while those of the Syncalyptidae have different shapes and are scattered all over the body, sometimes arranged in clusters carried on elevated portions of the elytra.

The genera which are presently included in this family may be distinguished as follows:

KEY TO THE GENERA OF THE FAMILY SYNCALYPTIDAE

1. Tarsal formula 5-5-5, clavate hairs with longitudinal ridges, those on elytra borne on projections; length of body about 4.0 mm. (seven species, from Australia) ---------- MICROCHAETES

   Tarsal formula 4-4-4, clavate hairs of elytra not on projections---------- 2

2(1). Frons without two oblique grooves; integument with scales of various forms, and clavate hairs of various shapes; length 2.0-3.0 mm. (a Holarctic genus, in North America represented by eight species, ranging throughout United States, and northward to central Alaska)---------- CURIMOPSIS

   Frons with two oblique grooves; integument without scales, but with simple clavate hairs; length about 1.2 mm. (a Holarctic genus, represented in North America by a single species, which ranges throughout Canada and probably northern United States) ---------- SYNCALYPTA

REFERENCES

CASEY, T. L.
1908. A new genus of Byrrhidae. Canadian Ent., 40: 281-282.
1912. Descriptive catalogue of the American Byrrhidae. Mem. Coleop., 3: 1-69.
1914. Miscellaneous notes and new species. Mem. Coleop., 5: 355-378.

CROWSON, R. A.
1955. The natural classification of the families of Coleoptera. London, 187 pp., 213 figs.

VON DALLA TORRE, K. W.
1911. *Nosodendridae, Byrrhidae, Dermestidae.* Coleop. Cat., 14(33): 1-96.

DOUCETTE, C. F.
1953. *Amphicyrta chrysomelina* as a pest of lilies. Jour. Ec. Ent., 46(5): 914.

ERICHSON, W. F.
1843. Versuch einer systematischen Eintheilung der Nitidularien. Zeit. Ent., 4: 225-361.
1847. Naturgesch. der Insecten Deutschlands. Erste Abtheilung. Coleoptera, 3(1): 801-968.

GANGLBAUER, L.
1902. Die generische Zerelegung der Byrrhiden Gattung *Pedilophorus.* Verhandlungen der kaiserlich-königlichen zoologischen-botanischen Gesellschaft in Wien.
1904. Die Käfer von Mitteleuropa. (4) first half. Dermestidae, Nosodendridae, Georyssidae, Dryopidae, Heteroceridae, Hydrophilidae, 286 pp., 12 text-figs.

HOPE, F. W.
1834. Descriptions of some hitherto uncharacterized exotic Coleoptera, chiefly from New Holland. Trans. Royal Ent. Soc. London, 1: 11-20, 2 plates.

JACQUELIN DU VAL, P. N. C.
1857. Manuel Entomologique. Genera des Coléoptères d'Europe. Vol. 2, pp. 1-285, 334 figs.

LACORDAIRE, T.
1854. Historie naturelle des Insectes. Vol. 2, pp. 1-548.

Leach, W. E.
1815. [Entomological article.] Edinburgh Encyclopaedie. Edinburgh, 9, part 1: 57-172. [From Horn and Schenkling.]

LeConte, J. L.
1862. Classification of the Coleoptera of North America. Smithsonian Misc. Coll., No. 136, pp. 209-286.

LeConte, J. L. and Horn, G. H.
1883. Classification of the Coleoptera of North America. Smithsonian Misc. Coll., 26(4), No. 507, i-xxxvii, 1-567.

Leng, C. W.
1920. Catalogue of the Coleoptera of America North of Mexico. Mount Vernon, 470 pp.

Linnaeus, C.
1767. Systema Naturae, vol. 1, par. 2, *editio duodecima reformata,* pp. 533-1327.

Mulsant, E. and Rey, C.
1869. Histoire naturelle des Coléoptères de France. Vol. XXI. Tribu des Piluliformes. Ann. Sci. Phys. Nat. Agric. Ind., 17: 201-378, pls. 1 and 2.

Portevin, G.
1931. Histoire naturelle des Coléoptères de France. Encyclopedie entomologique, Paris. Series A, 13, vii, 542 pp., 5 pls., 553 figs.

Reitter, E.
1882. Bestimmungs-Tabellen der europäischen Coleopteren. IV. Enthaltend die Familien, Cistelidae, Georyssidae, und Thorictidae. Verhandlungen kaiserlich-königlichen zool.-bot. Gesellsch. Wien, 31: 67-96.
1911. Fauna Germanica. Stuttgart, vol. III, pp. 1-436, 146 text-figures, 48 colored plates.

Stephens, J. F.
1830. Illustrations of British entomology. Mandibulata. London, vol. 3, pp. 1-374, pls. 16-19.

REVIEW

A MANUAL OF COMMON BEETLES OF EASTERN NORTH AMERICA, *by* Elizabeth S. and Lawrence S. Dillon. Row, Peterson and Co., Evanston, 884 pp., clothbound, $9.25.

It takes a long time to write a book; but it takes even longer to decide what is to be included in a book and what is to be left out. Those of us who have known of the Dillon and Dillon book have wondered just what would be left out. The advanced student of beetles is well aware of the tremendous task tackled by the Dillons. He knows that the word "common" must be used with extreme care. So it is no surprise that our ears pick up faint sounds from across the country as the mails are opened and exclamations of "at last" are heard. Those of you who have not yet seen the book can relax. The Dillons have accomplished what they set out to do. In fact, they have exceeded their original goal by this production, and have given us a carefully selected set of species descriptions, illustrations, and keys which will be of great value to each and everyone of us whose main interest is beetles.

But the book will not do for us what you might think a reviewer has in mind when he makes the above sort of statements. Each specialist will pick up the book and moan about the omission of his favorite species. This is to be expected. He will never complain, however, when he goes into the local book store and sees a stock of this book. He will be pleased to see his name listed in the bibliography and happy at last to be able to defend his interest in beetles to the general public on the same footing with the ornithologist, the malacologist, and the botanist. The public can now know what a beetle is and be aware of the aesthetic value of beetle study. In fact, I shall go farther, and predict that this book is the one single factor that will mark the turning point in the study of beetles in the New World.

The Old World has long ago put aside such immature notions that the study of beetles is to be confined to the odd and idle rich, or to psyco-ceramic Generals. They have long had an abundance of manuals for all levels of study of this subject. We never have had such a book before; we will never be without such a book again. This is the beginning. Many more will follow. The date 1961 marks for beetle study what 1934 marks for bird study. For this, we shall all be ever grateful to the Dillons!

To do my duty as a reviewer, I must turn now to a critical analysis of the book for the Coleopterist, whom I have not yet addressed in this review. First, I am not hunting for the errors. These, of course, should be searched out and brought to the attention of the authors and their public so that the next edition can be improved. I am sure that many can be found; no book of this nature can be without them.

The general format and binding is well done and shows the careful consideration of professional bookmakers. The organization of the book is logical. There is a brief introduction dealing with collecting methods, collection techniques, morphology, beetle larvae (which are not otherwise considered due to obvious space limitations), and a general discussion of beetle ecology. The bulk of the book is the systematic descriptions, keys, and illustrations, followed by a carefully selected bibliography which proceeds from general works to specific family bibliographies. The index is complete for families, genera, species, and common names. There is also a glossary of terms. The cover papers also illustrate the principle anatomical features of beetles.

The keys in this book have been simplified. The family key is to the 64 families treated in the book, only. There is no complete list of the families. The introduction is the only place that points out that many families and many species are omitted. Perhaps a checklist of the families, and some further indication of the omissions would have helped, without using much additional space. The authors have avoided as many technical terms as possible, and have written their keys solely to the beetles included, so the beginner will always get an answer. We hope he will soon become aware that reliable determinations cannot be made in this manner.

The keys to genera and species draw heavily on color characters and on size. The generic and specific descriptions offset this feature by including more morphological features. We hope the student will make use of this before labelling his specimens.

When we turn to particular features, we see that the book suffers from a lack of critical review by specialists prior to publication. Just one example: in the description of the family Oedemeridae, it is stated that the tarsal claws are rarely dentate basally, yet, of the three genera included, two have toothed claws. This will be misleading to the user. We don't expect the authors to be acquainted with these details outside of their special groups. The specialists would have helped them, I feel sure. But these are the sorts of things the next edition will correct.

There is one very bad feature in this book. The authors have NOT used the correct generic names for many of the species. In their desire to simplify matters for the beginner, they have, by their own admission, lumped genera. This they have done on the basis of ease of recognition on sight by the beginner. They have not distinguished between genera that require the use of genitalic characters, for instance, or often between what might be called "close genera." For example, three genera are lumped under the name "Silpha." It is for this reason, then, that the book cannot be considered as a contribution to taxonomic literature. It should NOT be cataloged by revisers, nor should *Zoological Record* attempt to record this synonymy. We hope that the next edition will rectify this. Meanwhile we suggest that a complete checklist of the species be published, reflecting the proper and correct name for each.

Despite the above remarks addressed to the Coleopterists, we hope the book will be endorsed by all, and that full cooperation will be given to the Dillons by the specialists. Finally, we are happy to see that the book is dedicated to Dr. Henry Dietrich of Cornell University, a great tribute to a friend of all Coleopterists.

EDITOR

A NEW FAMILY OF BEETLES FOUND IN THE CANTHAROIDEA

By George William Miskimen[1]

The superfamily Cantharoidea has been subjected to less concerted critical examination than most groups of beetles. This may be due to a number of reasons: these insects are often secretive in habit; they do not make particularly spectacular museum specimens, being soft and unmanageable, therefore not lending themselves to arrangement in martial ranks within a box; and that so many species are found in tropical areas where collecting tends to be more superficial than the more thorough canvass of areas such as Europe and United States.

Familial components of the superfamily have been open to considerable debate in the past and remain in a state of flux today. Many species of Cantharoidea have been described based on single specimens and occasionally it seems that specific differences are too slight to warrant that designation. In brief, the entire group appears to be in a rather nebulous state of alpha-taxonomy.

Leng (1920) considered the North American families of Cantharoidea to include Lycidae, Lampyridae, Phengodidae, Cantharidae, Drilidae, Melyridae, Cleridae, and Corynetidae. In his 1933 supplement the latter three families were removed to a new series, Cleroidea, in response to findings presented in Bøving and Craighead's synopsis of larval Coleoptera (1931). The change appears valid, as Cleroid adults have only 6 abdominal segments unlike Cantharoids which have either 7 or 8. Peyerimhoff (1933) and Blackwelder (1944) concurred with Bøving and Craighead, Blackwelder also recognizing a family, Karumiidae, as a member of Cantharoidea. Brues and Melander (1932) had used a system similar to that of Peyerimhoff and Blackwelder but erected a family, Rhagophthalmidae, which was later placed with the Lampyridae in their 1954 bulletin. Other modifications in 1954 by Brues and Melander were placement of Phengodidae with Cantharidae; Karumiidae with Drilidae; and formation of two new families, Atroctoceridae and Telegeusidae, apparently distinguished from their parent superfamily, Lymexyloidea, which has eight abdominal segments instead of six as well as major larval differences. Members of the superfamily have in common generally recognized primitive morphological features such as 7 or 8 abdominal segments, eleven antennal joints, and five tarsal segments on each leg.

Bøving and Craighead (1931) had divided the Cantharidae into four subfamilies because of larval characteristics. These were designated as Cantharinae, Malthinae, Malthodinae, and Chauliognathinae. The European system of classification of the Cantharidae, outlined in *Coleopterorum Catalogus—pars 165* (1939), treats various elements of the family as tribes, namely, Omethini, Podabrini, Cantharini, Silini, Ichthyurini, Malthini, and Chauliognathini. When considering the family on a world-wide

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basis this classification is perhaps to be preferred, since Bøving and Craighead's analysis of Cantharidae does not seem to include sufficient examples from localities outside of North America to draw positive conclusions. Again, zoogeographic evidence appears to support Delkeskamp's classification in *Coleopterorum Catalogus*. Therefore, in this paper, the European system will be followed. For correlative purposes, American authorities generally include the tribe Ichthyurini in Bøving and Craighead's subfamily Malthinae while the tribe Chauliognathini and their subfamily, Chauliognathinae, are synonymous.

During the past few years I have made an effort to determine relationships between the taxa of Cantharoidea considering as a major premise that as many factors as possible should be correlated before drawing sweeping conclusions. Previous studies of this type seem to place undue reliance on one or a few diagnostic features. This project has proved to be an unexpectedly difficult task. In the early stages of the study, "conservative" characters demonstrating taxonomic relationship among families were sought. Wing venation was soon found to be constant in a general way within a given family, being variable only in degree and no greater between genera than among species. Venational differences gave the first hint of unnatural elements among the familial taxa belonging to Cantharoidea. This was particularly manifest in the family Cantharidae. The wing venation of the Chauliognathini and Ichthyurini have patterns similar to one another but unlike those of the remaining elements of Cantharidae.

Following this discovery, these tribes were considered in detail for factors confirming their alliance and separating them from the remainder of the family. This study resulted in an abundance of morphological evidence suggesting that they are closely related and unlike Cantharidae.

Chauliognathidae, NEW FAMILY

Male genitalia of Chauliognathini and Ichthyurini are characterized by asymmetry in contrast to Cantharids, thus supporting my general impression that the new group is more specialized.

The median lobe (penis) is twisted nearly ninety degrees dextrally, necessitating lateral copulation. The tegmen, composed of a basal piece with right and left parameres fused to it, is separated from the median lobe by a wide membranous area except at a narrow point of union near the base of the right paramere. This paramere and median lobe presumably serve as claspers during copulation. The left paramere is much reduced or may be lacking in some species. The internal sac everts through the distal end of the penis.

Cantharid genitalia differ markedly, being entirely symmetrical. Some *Cantharis* retain the primitive tergum of the ninth abdominal segment as a genitalic segment. The basal piece of most Cantharidae forms a tubular structure through which the median lobe slides. Parameres are fused only to the basal piece which also has one or more paired ventral apophyses.

Using Lindroth and Palmen's (Tuxen, 1956) terminology, genitalia of both groups belong to the annulate group. Cantharid genitalia are clearly the classical annulate type. Chauliognathids are more difficult to explain.

The asymmetric condition may indicate a link to the Adephaga and Staphylinoidea. I believe coalescence of right paramere and median lobe to be secondarily acquired rather than being simply extensions of the condyle of the articulate form, since the basal piece is a well sclerotized tubular structure. Associated with the asymmetric aedeagus of Chauliognathini is a greatly inflated eighth abdominal sternal plate which is at least quite uncommon in Coleoptera (Figure 1).

The structure of the Chauliognathid abdomen is radically different from that of Cantharidae. In Chauliognathids the lateral edge is formed by the tergum whereas in Cantharidae the sternum forms the lateral edge (Figure 2). The pleural membrane in Cantharids is evident from the proximal to distal border of each segment. In dried specimens of Chauliognathini, the pleural membrane may be seen only at the extreme distal boundary while in Ichthyurini it is somewhat more extensive. The spiracles are located two-thirds forward from the distal edge of the pleural membrane of each abdominal segment in Chauliognathids. Cantharid spiracles are more variable in position, being one-fourth back from the proximal edge of the pleural area of each segment in *Cantharis,* one-half way from the proximal edge of the tergal area in *Podabrus,* and almost to the distal tergal edge but not at the extreme lateral edge in *Silis* and *Polemius*. Another point of familial differentiation is that Chauliognathid spiracles are concealed in dried specimens except for those located on the penultimate segment. In life, distention of the abdomen allows spiracles to be observed directly. Cantharid spiracles may easily be seen in dried specimens. These relationships of tergum, pleural membrane, sternum, and spiracles are not unduly surprising since it is well known that the limits of the definitive tergum and sternum are not necessarily similar to those of the primitive dorsal and ventral areas.

Chauliognathids have another abdominal structure useful in separating the group. Each extreme lateral distal tergal border bears a prominent round spiracle-like depression. Upon dissection, this seems to be glandular. The function is not known at this time.

Cantharoid wings have undergone considerable structural modification, making interpretation of venation difficult. Classical venational arrangements advanced by Comstock and Needham (1898-99) seem unsatisfactory to me so far as the very difficult Coleoptera are concerned. Forbes' (1922) system would, with some modification, appear to be more applicable, and will be used in this paper. Venational reductions which I believe to represent a more specialized and advanced condition occur in the new group. Figure 3 illustrates typical wing patterns of Cantharids, and figure 4, those of Chauliognathids. These families may easily be delimited using general wing venational patterns. Minor venational dissimilarity of several types may be discerned among genera and species: (1) fading of untracheated veins, (2) slightly different contact points, and (3) varying proximity to adjacent veins. A general trend toward further reduction is quite apparent. Australian Chauliognathids, for example, are in a much more advanced stage of vein fading than their western hemisphere counterparts.

Costa (C) is the leading vein in both Cantharids and Chauliognathids as well as all other Coleopterous families. It runs fully basad where an articulation with the metathorax may be found. A narrow membranous strip precedes the costa for its basal one-third.

The strong concave tracheated subcostal vein (SC) is similar in each taxon. Basally it unites with the anterior axillary sclerite which in turn forms an articulation with the metathorax, then runs very close to the costa after which a shift in direction results in union with the radius.

Radius (R) is a prominent tracheated convex vein arising from the same sclerite as does SC although these two veins are not united directly. R_1 continues nearly to the wing tip, uniting there with C in both groups. The vein elements in what is usually regarded as the radial stem (R_s) region are somewhat problematical to me. Forbes (1922) states that R_s is atrophied basally leaving an outer radial recurrent (R_r). Then, as the part of R_s crossing the wing fold atrophies, the second radial cross vein (2r) swings into this portion of R_s and is considered a part of R_r.

After examining a series of Cantharoids, I noted a progression of venational changes which do not seem to fit the hypothesis insofar as this superfamily is concerned. The swing of the 2r occurs prior to atrophy of R_r as may be particularly noted in Cantharidae. Here, although degenerate, R_r is still visible following juncture of 2r with r-m and R_s + 1r. Forbes considered the vein in question to be R_s + 2r while I feel that expressing it simply as 2r more accurately fits the situation in Cantharoidea. Chauliognathids have completely lost R_r but aside from this the radial system is similar to that of Cantharidae.

The medial vein (M) is virtually identical in both taxa being free basally, fusing with cubitus near the wing margin, and extending thence to the edge as M_4 + CU. Medius appears to have captured cubitus, then atrophied basally. An r-m cross vein is present which is obscured at wing fold points.

Cubitus (CU) is a strong convex tracheated vein similar in all Cantharoidea. Basally it unites with a pre-axillary sclerite that also receives the second anal vein. The pre-axillary sclerite then articulates with the posterior axillary sclerite. Distally, union with M_4 has already been mentioned.

The principal diagnostic differences between Chauliognathids and Cantharids may be found among the anal veins which are vastly reduced in the former group. Interpretation of the anal vein group is difficult at best. Chauliognathids exhibit the greatest reduction of anal veins in the superfamily while Cantharids occupy a comparatively intermediate position.

The first anal vein (1st A) base has been captured by CU in both taxa but union with that vein has been lost due to the presence of a longitudinal wing fold. Chauliognathids have a simple 1st A unconnected with the balance of the anal vein system. Cantharid 1st A is complex being united in part with the second anal vein.

The second anal vein (2nd A) is well tracheated in each group. Chauliognathid 2nd A bifurcates to form what I take to be 2nd A_2 and 2nd A_3. This represents a reduction from the situation found in Cantharids. There, 2nd A bifurcates twice. The first division gives rise to 2nd A_3 and a second anal trunk (2nd A_t). The anal trunk quickly divides again forming 2nd A_2 which is completely free and 2nd A_1 which unites for a short distance with 1st A, then separates and extends nearly to the wing margin. The 2nd A_1 appears similar to a cross vein immediately prior to its connection with 1st A but close examination demonstrates its true nature.

The course of the third anal vein (3rd A) is easily ascertained after considering its development throughout the Cantharoid series. The third anal is captured by 2nd A which extends as a strong 2nd A_3 to the wing border in both Chauliognathids and Cantharids. Basally, 3rd A unites with the posterior axillary sclerite which also receives the simple fourth anal vein (4th A). This axillary sclerite then forms the principal articulation with the metathorax.

Elytra of most Cantharidae entirely cover the abdomen, the notable exception being found in Malthini where they are considerably abbreviated. This is also the situation in Ichthyurini and no doubt accounts for placement of this group with Bøving and Craighead's Malthinae in the past. The Chauliognathini have longer elytra which cover the abdomen completely in species of the Australian region and all but the terminal two or three abdominal segments in Neotropical and Nearctic forms. Full abdominal coverage would seem to be the primitive condition.

The thorax of Cantharoidea seems fundamentally conservative in structure as might be anticipated in a portion of the body utilized for the rather fundamental processes of walking and flying. However, even here we find some constant structural differences between the new group and Cantharidae.

Chauliognathid prosterna have a ventro-lateral flattened wing-like sclerotized projection just below the point of articulation with the head. This may vary somewhat in magnitude but is entirely lacking in Cantharidae. The metathoracic episterna narrows rapidly posteriomedially forming an obtuse angle in Chauliognathids while in Cantharids the medial border of the episternum does not become narrowed being simply sinuate throughout its entire length. The metapleural post-alar bridge is considerably reduced in width and reflexed laterally in Cantharidae and is larger and rounded laterally in Chauliognathids.

The legs do not appear to have fundamental differences consistent enough to apply to either group as a whole. One feature was found, however, which seems diagnostic of Chauliognathids. They lack two distal tibial spurs which are prominent in Cantharidae. Observable tarsal peculiarities are apparently on specific or generic levels and are coupled with habits of the taxa involved. It was noted that most forms generally considered to be more or less quiescent have the fourth tarsal segments split longitudinally resulting in a two-fingered appearance. This condition presumably would be useful in grasping flower petal or leaf edges. The fifth tarsal joint is inserted very near the proximal end of the fourth. More vagile species lack split fourth tarsal segments and usually have more distally inserted fifth joints. Most Chauliognathids and *Polemius* have split tarsal segments while *Podabrus* and *Cantharis* generally have entire segments. Again, this feature seems to be associated with habits rather than demonstrating affinities.

The head structure of Chauliognathids is very interesting. In its study, a major difficulty lay in ascertaining which features were truly diagnostic of the family and which were in response to environmental conditions (Figure 5).

Strictly diagnostic characteristics appear to include foreshortened second antennal joints less than one-fourth the length of either the basal or third segment. Cantharid gular sutures range from fully divided in *Cantharis* to united in *Podabrus*. In Chauliognathids gular sutures are also united but lack the noticeable sulcus found in *Podabrus*. The terminal segment of the maxillary palpi of Cantharidae is sharply angular medially forming a rough triangle while in Chauliognathids it is essentially oblong with no sharp angulation.

Other Chauliognathid head structures are useful in diagnosis although when not considered from an adaptation standpoint may seem of questionable importance. Food habits are no doubt responsible for a large measure of the variation found in Chauliognathid mouth parts. Adult Nearctic and Neotropical *Chauliognathus* apparently are strict nectar and pollen feeders, the Ichthyurini are essentially carnivorous, and Australian *Chauliognathus* are more or less adapted to omnivorous habits. Ichthyurini do not possess the accessory protrusible labral lip and maxillary tongue found in Chauliognathini. Both structures are utilized in the rather specialized feeding of this tribe. The labral lip articulates with the clypeus and is moveable. In addition, the clypeus itself is articulated to the frons by a narrow unsclerotized area allowing some movement. The protrusible maxillary tongue is at least rare in the class Insecta. This structure is apparently used for "lapping" up nectar and pollen. The post labium of the highly specialized American hemisphere *Chauliognathus* is undivided forming a completely sclerotized spindle-shaped plate with a median longitudinal raised rib. The balance of Chauliognathids have a divided post labium forming a mentum and submentum connected by a flexible unsclerotized area. Cantharids also have a divided post labium but the submentum itself is again articulated transversely.

It is my opinion that New Guinea and Australian Chauliognathids are closest to the ancestral type. These forms, although presently placed with *Chauliognathus,* have foreshortened heads similar to Ichthyurini. Mandibular and maxillary dimensions follow head structure and are much less elongate in Australian forms ascribed to *Chauliognathus* and in Ichthyurini.

Finally, the Chauliognathid vestiture is of a finer shorter sort than Cantharid. Also, as a rule, Cantharidae are more cryptic in pigmentation.

The zoogeographic distribution of Chauliognathini and Ichthyurini is rather suggestive. These taxa are strongest in South America, Australia, and New Guinea, all of which are recognized refuges of relict species. One could logically assume the new group to have been once widespread and then later replaced elsewhere by other species. I do not wish to infer a process of being driven into these areas by superior competitors. Instead, cold intolerance of the vast majority of species in Chauliognathini and Ichthyurini points to range restriction during the late Tertiary followed by replacement in unoccupied areas. Further zoogeographic implications will be treated in another paper soon to be published.

The Chauliognathini as a group have a marked discontinuity of distribution. Over four-fifths of the known species are found in South America with but 28 in United States and Mexico north of the Mexican plateau (only 2 of these 28 extend beyond the reaches of southwestern United States). The remaining Chauliognathini are concentrated in New Guinea and Australia.

Ichthyurini are somewhat more widespread but as a group occur, as do Chauliognathini, in localities usually adjudged by zoogeographers to be "relict" areas. Over one-half of the known species inhabit the Oriental or Australian regions while one-fourth occur in the Neotropics. Twenty-four of thirty-one Ethiopian forms are found in the West African relict area. Five species have been described from Japan and nine species live in United States. The relict southwestern part of United States is the habitat of most North American species.

After consideration of the evidence it is therefore indicated and proposed that the taxa generally known as Chauliognathini and Ichthyurini, formerly classed with Cantharidae, be separated and included in a new family which, in accordance with the rules of priority, should be known as Chauliognathidae. The type genus is *Chauliognathus* as erected by Nicholas Hentz in 1830. I feel that differences in ecology and habits of

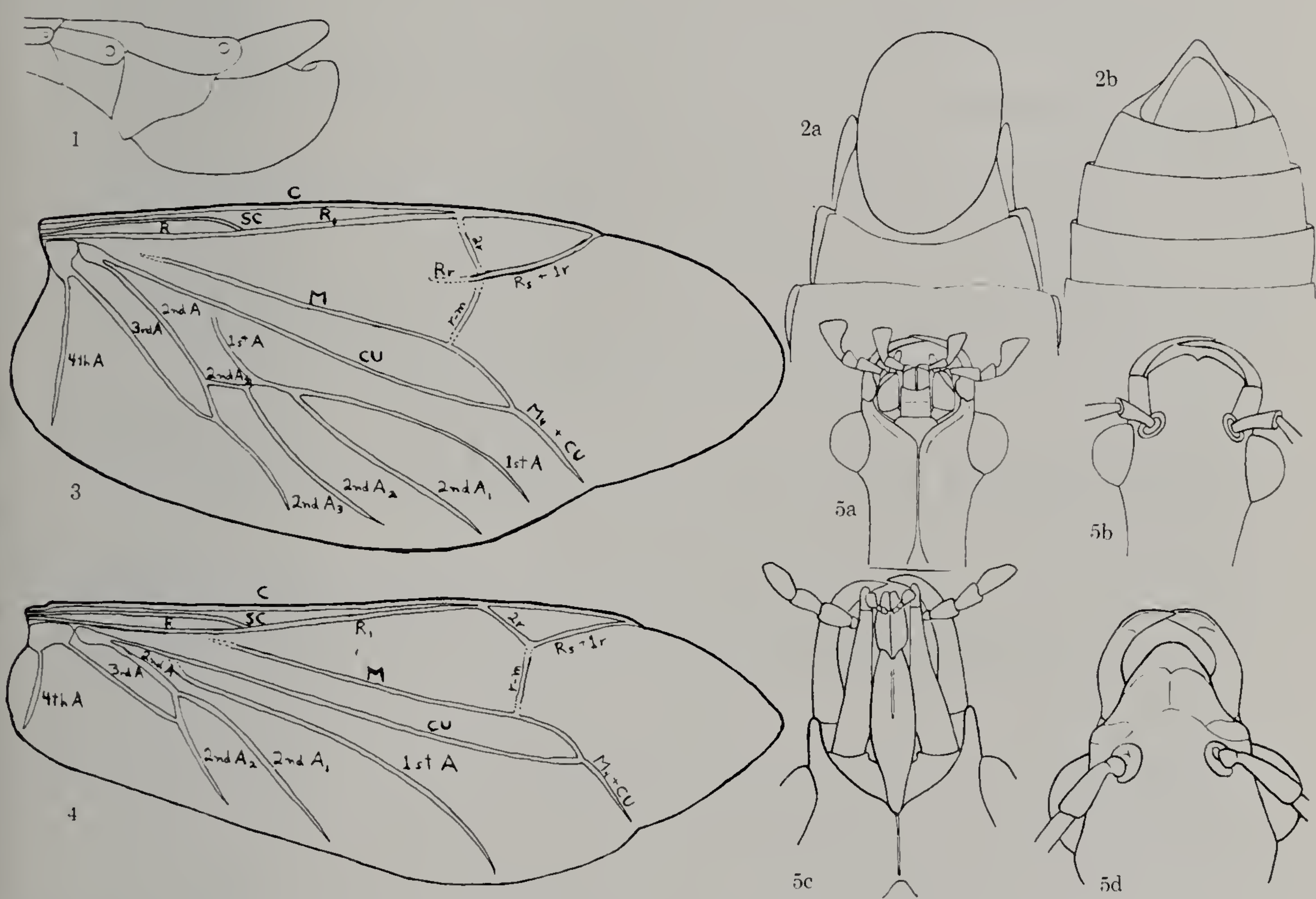

FIG. 1, Chauliognathid terminalia, lateral view; FIG. 2a, Chauliognathidae, abdomen, ventral view; FIG. 2b, Cantharidae, abdomen, ventral view; FIG. 3, Cantharidae, wing venation; FIG. 4, Chauliognathidae, wing venation; FIG. 5a, Cantharid (*Podabrus* sp.), mouthparts, ventral view; FIG. 5b, Cantharid (*Podabrus* sp.), mouthparts, dorsal view; FIG. 5c, Chauliognathid (*Chauliognathus* sp.), mouthparts, ventral view; FIG. 5d, Chauliognathid (*Chauliognathus* sp.), mouthparts, dorsal view.

the two main elements of the new family warrant retention of their status as tribes, namely Chauliognathini and Ichthyurini.

Previously described and new taxa included in Chauliognathidae are:

Chauliognathini LeConte

Chauliognathus Hentz (285 sp.)
South America
Central America
Mexico
United States
New Guinea
Australia

subgenus *Meloicantharis* Pic (1 sp.)
Brazil

Daiphron Gorham (33 sp.)
South America
Central America

subgenus *Microdaiphron* Pic (8 sp.)
Brazil

Psilorhynchus Blanchard (3 sp.)
Amazon-Orinoco Valley

Molychnus Motschulsky (1 sp.)
Colombia

Ichthyurini Champion

Ichthyurus Westwood (173 sp.)
Central America
Mexico
United States
West Central Africa
Eastern Asia
Philippines
Indonesia

subgenus *Microichthyurus* Pic (13 sp.)
Philippines
Indonesia
Malaya
Indochina

Malthoichthyurus Pic (3 sp.)
South America
Central America

Selenurus Fairmaire (14 sp.)
Australia
Tasmania

Maronius Gorham (30 sp.)
South America

Macromalthinus Pic (1 sp.)
French Guiana

Belotus Gorham (22 sp.)
South America
Antilles
Central America
United States

Lobetus Kiesenwetter (9 sp.)
South America (Northwest)

Pseudolobetus Champion (1 sp.)
Panama

Trypherus LeConte (17 sp.)
South America
Central America
United States
Eastern Asia
Philippines

The number of species indicated in each group is based on *Coleopterorum Catalogus* of 1939. Since this publication date a substantial number of species, especially New Guinea members of the genus *Chauliognathus,* have been described. In addition, it is anticipated that certain other genera scattered throughout the family Cantharidae will probably be more correctly placed with Chauliognathidae. Study material is scarce in museum collections and far larger series than now exist must be assembled before any of these genera can be placed with assurance. Therefore, until a major revision of the Chauliognathidae is made the changes will be deferred.

BIBLIOGRAPHY

Blackwelder, R. E.

1944. A checklist of the Coleopterous insects of Mexico, Central America, the West Indies, and South America. United States Nat. Mus. Bull., 185(1): 1-3.

Bøving, A. G. and Craighead, F. C.

1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. Ent. Americana, 11: 1-351.

Brues, C. T. and Melander, A. L.

1932. Classification of Insects. Bull. Mus. Comp. Zool., vol. 73, 672 pp.

Brues, C. T., Melander, A. L., and Carpenter, F. M.

1954. Classification of Insects. Bull. Mus. Comp. Zool., vol. 108, 917 pp.

Comstock, J. H. and Needham, J. G.

1898-1899. The wings of insects. American Naturalist, 32-33.

Delkeskamp, K.

1939. Cantharidae. Coleopt. Cat., pars. 165, 357 pp.

Forbes, W. T. M.

1922. The wing-venation of Coleoptera. Ann. Ent. Soc. America, 15: 328-352.

Leng, C. W.

1920. Catalogue of the Coleoptera of America north of Mexico, pp. 140-145. J. D. Sherman, Mount Vernon, N. Y.

Leng, C. W. and Mutchler, A. J.

1933. Supplements to the catalogue of Coleoptera of America, 2 and 3, 1925-1932, pp. 6 and 22. J. D. Sherman, Mount Vernon, N. Y.

de Peyerimhoff, P.

1933. Les larves de Coléoptères d'après. A. G. Bøving et F. C. Craighead et les grands critériums de l'ordre. Ann. Soc. Ent. France, 102: 77-106.

Tuxen, S. L.

1956. Taxonomist's glossary of genitalia in insects. Part 16: Coleoptera, Carl H. Lindroth and Ernst Palmen, pp. 69-76. Copenhagen.

NOTES ON COLLECTING CARABIDAE AT AN OATMEAL TRAIL IN OHIO[1]

The technique described herein was first used successfully by Hubbell (1956)[2] for collecting camel crickets of the genus *Ceuthophilus*. He mentions that certain beetles, especially Carabidae, were also attracted to a bait trail of oatmeal or rolled oats.

On the evening of August 24, 1955, the writer placed a trail of rolled oats in a dense hardwood forest in Blendon Woods, Franklin County, Ohio. This bait trail was placed along a path through the woods consisting mainly of beech, hickory and white oak. The rolled oats were distributed sparsely by hand, but were found very easy to follow with the aid of a headlight. There seemed to be a somewhat luminescent quality to these whitish flakes.

Many insects were collected along this trail, but of greatest interest were the 33 specimens of Carabidae representing 12 species. Although none of the species are extremely rare in Ohio, this method represents a very easy method of collecting specimens.

Following is a list of the Carabidae collected in less than one hour at the above location: *Amphasia interstitialis* (Say) (1), *Bembidion variegatum* Say (2), *Calathus gregaria* Dej. (3), *Cymindis neglecta* Hald. (12), *Dicaelus dilatatus* Say (2), *Dicaelus politus* Dej. (1), *Euferonia stygica* (Say) (1), *Gastrosticta obscura* (Say) (1), *Harpalus erythropus* Dej. (2), *Harpalus vagans* Lec. (1), and *Pristodactyla impunctata* (Say) (1). I am indebted to Dr. W. C. Stehr, Ohio University, for determination of these specimens. Numbers in parenthesis represent the number of specimens collected.

Most members of the Carabidae are considered predators, and possibly some of these specimens were attracted to the trail because of the other insects that were present. However, a great percentage of the beetles were noted carrying large flakes of oats in their mandibles. It was not possible to ascertain whether the beetles were actually feeding on the rolled oats. To the human senses, dry rolled oats have little or no odor. However, judging from the number of insects attracted, there must be a definite odor which is attractive to a wide variety of insects.

This method of collecting is very simple, yet quite effective, and it is hoped will prove useful to coleopterists in other areas.—R. E. WOODRUFF, *Department of Entomology, State Plant Board of Florida, Gainesville.*

[1]Contribution No. 8, Entomology Department, State Plant Board of Florida.

[2]HUBBELL, T. H. 1956. A new collecting method: the oatmeal trail. Ent. News 67(2):49–51.

NEW RECORD OF A *SPHENOPHORUS* (CURCULIONIDAE) FOR THE LESSER ANTILLES

By PATRICIA VAURIE[1]

A single specimen of *Sphenophorus venatus vestitus* Chittenden, a medium-sized billbug, was collected on the island of Martinique in the Lesser Antilles, on June 10, 1960, by P. and C. Vaurie, at Anse Mitan, across the bay from Fort de France. The weevil was found crawling out of a large crab hole on the edge of a brackish swampy area behind the shore of the bay.

This capture extends the range of the subspecies and the species about 400 miles farther south. The other records for the West Indies are from the Greater Antilles (Cuba, the Dominican Republic, Puerto Rico) and the Bahamas (Grand Bahama, San Salvador, South Caicos, and Long Island). The Caicos and Long Island records have not been published previously; they are represented by two specimens in the American Museum of Natural History collected in February and March, 1953, by

[1] American Museum of Natural History, New York, N. Y.

E. B. Hayden and L. Giovanni on the Van Voast A.M.N.H. Bahama expedition.

In the eastern United States, nominate *venatus* (in the north) and *venatus vestitus* (in the South, and west to Texas) breed principally in *Cyperus esculentus,* or yellow nut grass, also in wheat, Bermuda grass, timothy, and various sedges. The adults may attack corn. In the West Indies I have no record of breeding habits.

The generic name *Càlandra* or *Calendra* has been suppressed in favor of *Sphenophorus* under the plenary powers of the International Commission on Zoological Nomenclature (Bull. Zool. Nomencl., vol. 17, pp. 112-116, Dec., 1959).

A REVISIONAL STUDY OF SOME AUSTRALIAN SPECIES OF *EGESTRIA* (PEDILIDAE)

By Mohammad Abdullah [1, 2]

This work presents a redefinition of the genus *Egestria* Pascoe, designation and redescription of the genotype, *E. taeniata* Pascoe, and one other Australian species, *E. suturalis* Pascoe, presentation of additional information on distribution, and preliminary comments on the systematic position of this genus in the family Pedilidae.

Egestria Pascoe

Egestria Pascoe, 1871. p. 358.

Description.—*Head* with vertex large. *Tempora* prominent. *Eyes* entire or slightly emarginate, finely faceted, small. *Antennae* filiform with eleventh segment longer than preceding segment. *Labrum* with ventral side flat, upper side elevated in middle. *Mandibles* longer than broad. *Maxillae* with galea bigger than lacinia. *Maxillary palpi* four-segmented, first segment smallest, last segment large with lateral excavation. *Labium* with mentum sub-trapezoidal. *Neck* shorter in width than pronotum. *Prothorax* punctulate, longer than broad, sulcated medially in male. *Mesepisterna* meeting in front of mesosternum. *Metasternum* hairy. *Wing* with anal cell closed. *Elytra* hairy, punctate, longer than broad. *Legs* with coxae contiguous, tibial spurs short, tarsi with penultimate segment bilobed, claws each with feeble dentiform dilatation at base, small empodia present, tarsi 5,5,4. *Abdomen* with fifth sternite emarginate in male, entire in female. *Male genitalia* with parameres finely and sparsely spined on sides, aedeagus spinous apically. *Female genitalia* with valvifers slightly hairy on apex.

Genotype: *Egestria taeniata* Pascoe 1871, pp. 358-359.

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[1] University of Illinois, Urbana, Ill.

[2] The author is grateful to Miss C. M. F. von Hayek of British Museum (BM) and Mr. R. L. Wenzel of Chicago Natural History Museum (CNHM) for the loan of specimens.

Egestria taeniata Pascoe

Egestria taeniata Pascoe, 1871, pp. 358-359.

DESCRIPTION.—MALE: *Length*: 6 mm to 8 mm. *Width*: 1.5 mm to 2 mm. *Color*: black to pale rufous. *Head* punctulate, black with rufous long hairs, clypeolabral suture prominent. *Eyes* entire or only feebly sinuate, separated by more than twice their width above. *Antennae* rufous, eleven-segmented: first segment broad, longer and wider than second, second segment smallest, third segment twice as long as second, segments four to ten becoming succeedingly smaller, eleventh segment about as large as three to four preceding segments combined (Fig. 1). *Labrum* slightly broader than long, punctulate, apex fringed with short and long hairs, lower surface flat, upper surface slightly convex in middle. *Mandibles* hairy, twice as long as broad (Fig. 2). *Maxillae* hairy, palpi four-segmented: first segment sub-triangular, smallest; second segment twice as large as third; fourth segment as long as first two segments combined, excavated laterally (Fig. 3). *Labium* with mentum punctulate, palpi three-segmented, third segment as long as two others. *Neck* black, half as wide as pronotum. *Prothorax* black, hairy, margined at base by a sulcus, sides becoming rounded beyond middle, median canal prominent. *Scutellum* punctate, hairy, with a median sulcus, shape as in Fig. 6. *Elytra* pale with brown margins, vittate, more than twice as long as wide, 4 to 6 mm long, 1.5 to 2 mm broad. *Legs* black with portions of tibia and tarsi pale or rufous, tibial apex with a circle of short thick spines, claws with small empodia provided with a pair of long spines. *Abdomen* pubescent, fifth ventral sternite punctulate, hairy, about as long as wide (Fig. 7); sixth sternite entire or slightly emarginate, very narrow, in form of ring (Fig. 9); fifth tergite entire, longer than broad, hairy, punctulate (Fig. 8). *Genitalia*: parameres (lateral lobes) finely and sparsely spined laterally, produced into a narrow process apically (Fig. 10); aedeagus (median lobe) serrate apically (Fig. 11).

FEMALE: *Length*: 9 mm to 11 mm. *Width*: 3 mm to 4 mm. *Antennae* with terminal segment as long as preceding two segments combined. *Maxillary palpi* with last segment as long as second, slightly excavated laterally. *Neck* black or red, more than half as wide as pronotum. *Pronotum* without a distinct median canal. *Elytra* vittate or not. *Abdomen* with fifth sternite entire, broader than long; fifth tergite sub-triangular, broader than long or equal. *Genitalia*: valvifers sparsely punctured and hairy at apex laterally (Fig. 12).

Type Locality: Queensland (Rockhampton).

Specimens Examined: Bogan river, N.S. Wales (BM) 1; Fitzroy river, Victoria (BM) 2; Queensland (BM) 5; Rockhampton (BM) 4; no locality (BM) 3.

Egestria suturalis Pascoe

Egestria suturalis Pascoe, 1871. p. 359.

DESCRIPTION.—MALE: *Length*: 13 mm. *Width*: 3 mm. *Color* black. *Head* black, punctate, hairy, clypeolabral suture prominent. *Eyes* entire or feebly sinuate, separated by more than twice their width above. *Antennae* eleven-segmented: first segment wider and twice as long as second, second segment smallest, third segment less than twice as long as second, last segment slightly tapering beyond middle, only slightly longer than tenth (Fig. 4). *Labrum* longer than broad, punctulate, apex fringed with short and long hairs. *Mandibles* robust and blunt as compared with *E. taeniata. Maxillae* as in *E. taeniata,* bigger in size. *Labial palpi* three-segmented, third segment slightly longer than second. *Neck* black, punctulate, more than half as wide as pronotum. *Prothorax* as in *E. taeninata,* median canal less distinct. *Scutellum* punctured, hairy, shape as in Fig. 5. *Elytra* black, punctured, hairy, more than twice longer than broad, 8 mm long, 3 mm broad. *Claws* with chitinous empodia, provided with a pair of long spines. *Abdomen* with fifth sternite punctulate, hairy, wider than long; sixth sternite entire or only feebly emarginate, very narrow, in form of ring; fifth tergite longer than broad, hairy, punctulate, emarginate. *Genitalia*: parameres finely and less sparsely spined laterally, produced into a narrow process apically; aedeagus spinous on sides apically (Fig. 13).

FEMALE: not seen by the author.

Specimens Examined: Fitzroy river, Victoria (BM) 2; N.S. Wales (BM) 1; Victoria (CNHM) 1; no locality (BM) 2.

SYSTEMATIC POSITION.—*Egestria* Pascoe could be well placed in the tribe Eurygeniini, where it closely resembles *Pergetus campanulatus* in many characters of eye, tempora, maxillary palpi, neck, pronotum, claw, wing, and fifth abdominal sternite, but differs in the following characters: eyes feebly sinuate (in some specimens), labrum with ventral surface flat, dorsal surface convex, excavation of fourth segment of maxillary palpi less prominent (Abdullah, 1960).

REFERENCES CITED

ABDULLAH, MOHAMMAD

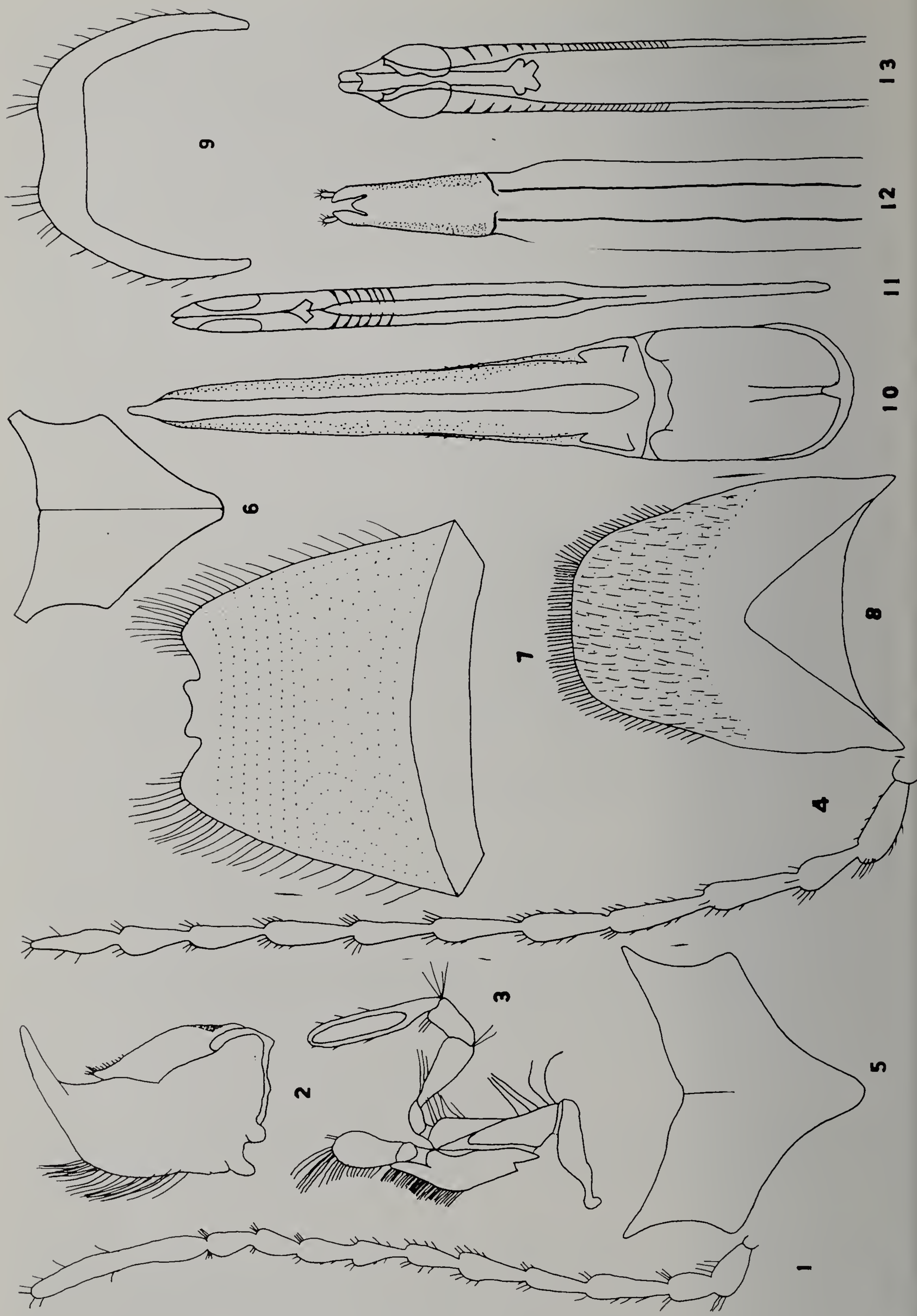
1960. A revision of the genus *Pergetus* (Coleoptera: Pedilidae), Canadian Journ. Zool., 38: 875-878.

PASCOE, F. P.

1871. Notes on Coleoptera, with descriptions of new genera and species Pt. I, Ann. Mag. Nat. Hist. ser. 4, VIII: 358-91.

Egestria taeniata Pascoe: FIG. 1, Male antenna; FIG. 2, Male mandible; FIG. 3, Male maxilla; FIG. 6, Male scutellum; FIG. 7, Male fifth abdominal sternite; FIG. 8, Male fifth abdominal tergite; FIG. 9, Male sixth abdominal sternite; FIG. 10, Male tegmen; FIG. 11, Male aedeagus; FIG. 12, Female genitalia.

Egestria suturalis Pascoe: FIG. 4, Male antenna; FIG. 5, Male scutellum; FIG. 13, Male aedeagus.



See Page 29 for captions.

REVIEW

THE BEETLES OF THE UNITED STATES. *A Manual for Identification. Introduction and Fascicles, 1-9.* Ross H. Arnett, Jr. 1960. Catholic University of America Press, Washington. 210 pp., illus.

This is the first section of what is scheduled to be a key to the families and genera of the Coleoptera of North America north of Mexico. The book is thus in the tradition of LeConte's *Classification of the Coleoptera of North America* (exclusive of the Coccinellidae, Chrysomelidae, and Rhynchophora) (1861-73), of LeConte and Horn's work of the same title (1883), and of Bradley's *Manual of the Genera of Beetles of America North of Mexico* (1930), and there is no doubt but that it will prove as useful and as essential as these books have been. The classification used is a modification of the one devised by Crowson in his *Natural Classification of the families of Coleoptera* (1955).

A 44-page Introduction reviews the external antomy of adult beetles and gives an artificial key to families of the Coleoptera of the World based on adult characters, with families not further treated in the book in parentheses. The area covered by the book is continental United States, but most of the genera of immediately adjacent areas of Canada and Mexico are included.

Each family is covered in a separate fascicle with separate pagination, bibliography, and index, but continuous pagination is likewise provided and we are assured that there will be a cumulative index at the end. For each family there is a general introduction including a nice figure of a typical species, a fairly detailed description, ecology, distribution, etc. This is followed by an artificial key to genera and a list of the subfamilies, tribes, genera, and subgenera in natural sequence. For each genus and subgenus there is given the author of the genus, the date of original description, synonyms, number of North American species, and the North American distribution.

The present 210-page section covers the Cupedidae and the eight families of Adephaga. The 128-page section on Carabidae is by Dr. George E. Ball and carries the classification by keys to subgenera with a short paragraph of discussion devoted to each genus and subgenus. Dr. Ball has provided us with a paper which will rank with George Horn's essay of 1881 as one of the great documents on the North American fauna of this family of beetles.

Since the labor has been assumed of indicating the distribution of the genera, one might wish that it had been a bit more adequately done. Looking at the matter from the viewpoint of the Pacific Northwest fauna alone, I find the following deficiencies in the descriptions of distribution: *Rhysodes,* Wn., Id., Or.; *Clinidium,* B. C., Wn.; *Apteraliplus,* Wn.; *Brychius,* B. C., Wn., Id., Or.; *Hydrotrupes,* Or.; *Agabinus,* B. C., Wn., Or.; *Agabus,* B. C., Wn., Id., Or.; *Lacornis,* B. C., Wn., Id.; *Neoscutopterus,* B. C.; *Cybister,* Wn., Or. I do not suggest that a state-by-state description of the distribution should have been given but that the general descriptions should be formed so as to imply these areas. *Dineutus,* said to be "generally distributed," is virtually unknown from western North America except possibly extreme southern California. In Dytiscidae, *Deronectes* and *Oreodytes* are treated as genera on p. 195, as subgenera on p. 198. On p. 53 no mention is made of the recent attempt of E. Rivalier (Revue Française d'Entomologie 17, 1950: 217-244; 21, 1954: 249-268) to subdivide *Cicindela* into a number of genera and subgenera. These are all trivial matters, however. The book as a whole is a splendid work that puts its author in the forefront of American coleopterists.

The book is issued as separate punched sheets for which the publishers provide, at an extra charge, an efficient loose leaf binder. The printing is by letter press on an excellent quality of thin opaque paper.

Now that this new key to genera is underway, some North American coleopterist or coleopterists should give his, her, or their attention to the preparation of a new catalogue of our beetle fauna.

Melville H. Hatch

WALTER M. KULASH

Dr. Walter M. Kulash, Research Professor of Entomology at North Carolina State College, died at the age of 48, in Raleigh, on September 18, 1960.

Dr. Kulash was born in Haydenville, Mass., on January 8, 1912. He entered the Massachusetts State University, and took his B.S., M.S. and Ph.D. at that institution, finishing in 1942. He joined the staff at N. C. State College the same year and remained there until his death.

Because of his deep interest in both people and insects, it would be difficult to say whether his main contributions were in teaching or research, but both were respectable. He had been teaching courses in Applied Entomology and Forest Entomology in the years preceding his death. His research papers, more than seventy, are indicative of a wide variety of interests—corn insects, tobacco insects, cotton insects, forage insects, insects of stored products, soil insects, and others. Recently, his interests had narrowed considerably and he had begun to intensify his efforts on the biology of elaterids, and his interest in these extended enthusiastically to the taxonomy of the groups he worked with in the field—efforts which he would not live to carry to maturity.

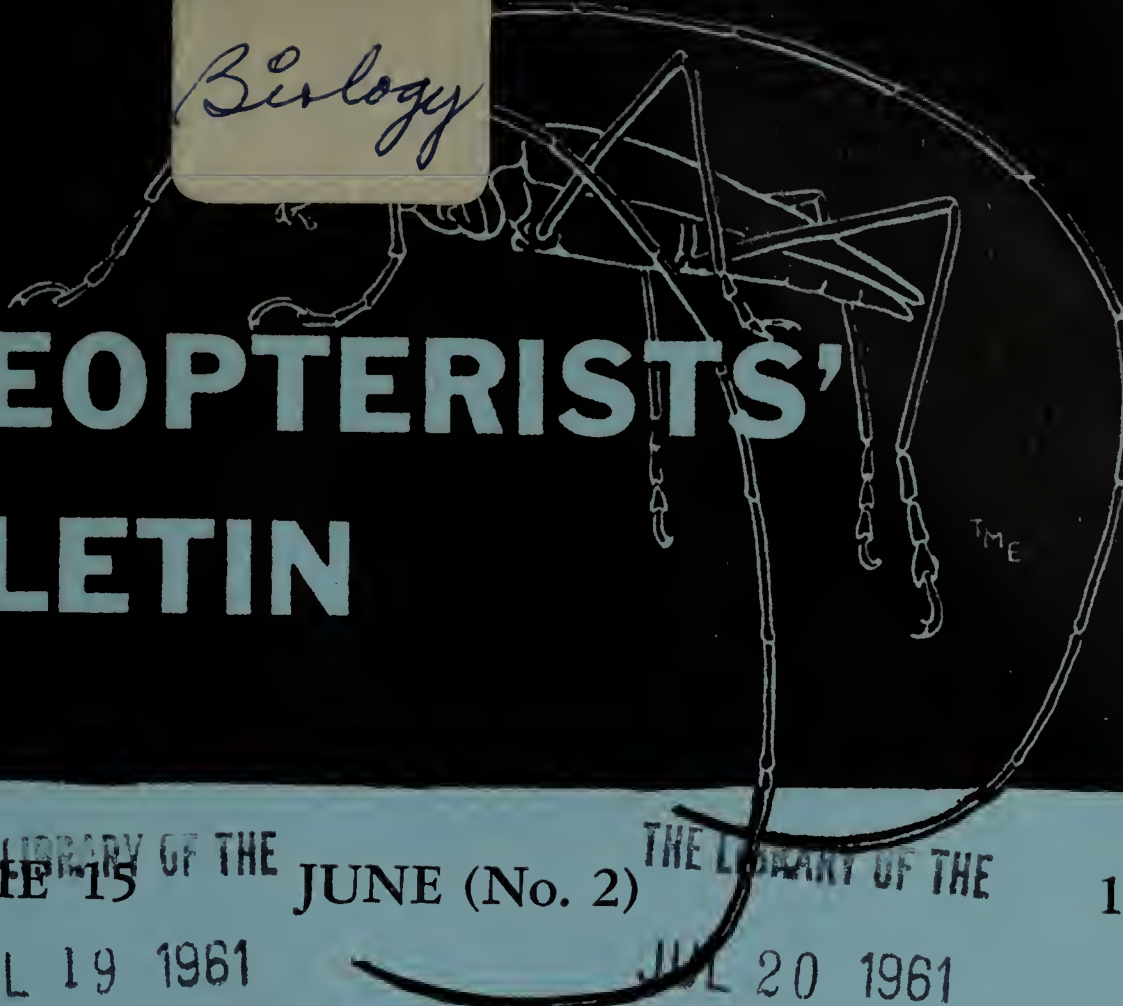
He was a former president of the N. C. State College chapter of the American Association of University Professors, a former secretary of the Zoological Section of the N. C. Academy of Sciences, and a former president of the N. C. Entomological Society. He was a member of the Coleopterists' Society, the Entomological Society of America, the Society of Systematic Zoology, and the Society of Sigma Xi.

Dr. Kulash attended the International Congress of Entomology at Montreal, in 1956, and at Vienna in 1960, where he presented two papers. During the latter trip, he visited entomologists and institutions in England, France, Belgium, Austria, and Poland. He visited Colombia as a consultant in 1956.

Dr. Kulash was keenly intellectually curious. In addition to his accomplishments in Entomology, he was well versed in philosophy and languages. These qualities were well-tempered with a lively, ever-present sense of humor which never gave personal offense. His presence was a welcome asset to any gathering of people. His passing was a grievous loss to his professional colleagues at N. C. State College, his students and former students, and to friends in all walks of life in North Carolina and in other places where he was known.

DAVID A. YOUNG, JR.

THE COLEOPTERISTS' BULLETIN



VOLUME 15 JUNE (No. 2) 1961

ARTICLES

NOTES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by Ross H. Arnett, Jr. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, Department of Biology, Catholic University of America, Washington 17, D. C.

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 15 June (No. 2) 1961

NEW SYNONYMY IN NEARCTIC ANTHRIBIDAE

By BARRY D. VALENTINE[1, 2]

A recent trip to the United States National Museum in Washington gave me the opportunity to study the type specimens of North American Anthribidae deposited there. This collection contains holotypes of all anthribids described by Charles Schaeffer and W. Dwight Pierce (except *Toxotropis sextuberculatus* Schaeffer). Examination of the type material there has revealed that four of the species described by Pierce are synonyms of previously described forms. The synonymy is as follows.

Ormiscus saltator LeConte

Ormiscus saltator LeConte 1876. Proc. American Philos. Soc. 15(96): 397.

Ormiscus angulatus Pierce 1930. Proc. United States Nat. Mus. 77(17): 6. *Nec Ormiscus angulatus* Jordan, 1904-290. NEW SYNONYMY.

Ormiscus piercei Sleeper 1954. Ohio Jour. Sci. 54(2): 117. Nomen novum. NEW SYNONYMY.

The only distinguishing feature given by Pierce is that the transverse pronotal carina is "broadly angulate" in *angulatus* and "more sharply and narrowly angulate" in *saltator*. The degree of angulation of this carina is extremely variable, and Pierce's type from Dallas, Texas is not discontinuously divergent from normal *saltator* (based on specimens compared with LeConte's type series). In view of the extensive carinal variation, the only diagnostic feature for separating the two forms becomes worthless. It is also a temptation to synonymize *O. solidus* Pierce; however I have not yet been able to demonstrate that this brown, long haired form is just another variation of *saltator,* although this might well be so.

[1] Department of Zoology and Entomology, The Ohio State University, Columbus 10, Ohio.

[2] I wish to acknowledge the help of Miss Rose Ella Warner and Dr. William H. Anderson, U. S. Department of Agriculture, during my studies in Washington.

Ormiscus sextuberculatus (Schaeffer)

Ormiscus sextuberculatus (Schaeffer) 1906. Trans. American Ent. Soc., 32: 269.

Toxotropis victoriensis Pierce 1930. Proc. United States Nat. Mus., 77(17): 11. NEW SYNONYMY.

As in *O. saltator* above, Pierce relies on the conformation of the transverse pronotal carina to distinguish his species; this is "broadly rounded" in *sextuberculatus* and "narrowly rounded" in *victoriensis*. There is variation in this feature in most species of *Ormiscus*. A comparison of the Pierce type from Victoria, Texas with a topotype of *sextuberculatus* from Enterprise, Florida in the Schaeffer collection (this specimen may be the missing type of *sextuberculatus,* but it bears no type label) reveals no differences except in minor details of pattern. These are partially due to sexual dimorphism, males having white faces while those of females are mottled brown. Pierce overlooked this feature although he had both sexes before him, the April 5 specimen being male and the other two being female.

Goniocloeus bimaculatus (Olivier)

Goniocloeus bimaculatus (Olivier) 1795. Entomologie 4, genus 80, no. 19.

Tropideres barberi Pierce 1930. Proc. United States Nat. Mus., 77-(17): 13. NEW SYNONYMY.

Pierce says of *barberi,* "the angles of the apical emargination of the beak are never acute, dentiform as in *bimaculatus.*" However, his type specimen has these long acute teeth at the edges of the apical emargination as well developed as any *bimaculatus*. Pierce apparently overlooked them because of the heavy pubescence at the rostral apex. He also says that "sides of prothorax [are] strongly sinuate, due to prominence of lateral prolongation of prothoracic ridge" in *bimaculatus,* and "almost evenly rounded" in *barberi*. This is variable in the series I have studied. However there is a tendency for greater angulation in more northern specimens, Pierce's type series being from Brownsville, Texas. He also states that *barberi* has the "punctuation of the head and thorax much finer"; this is exaggerated but true. I feel that the close similarity between the Brownsville and the more northern and eastern specimens indicates a single species, *barberi* representing one extreme of the variation. I realize that this is subjective opinion; material from Texas north of Brownsville would settle this matter, but I know of no specimens taken in this area.

Tropideres fasciatus (Olivier)[3]

Tropideres fasciatus (Olivier) 1795. Entomologie 4, genus 80, no. 9.

Eurymycter bicarinatus Pierce 1930. Proc. United States Nat. Mus., 77(17): 17. NEW SYNONYMY.

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[3] The genus *Eurymycter,* in which this species was formerly placed, was synonymized with *Tropideres* Schoenherr, 1823, by Valentine, 1960, Trans. American Ent. Soc., 86 (1): 70, after the present paper was in press.

The only feature cited by Pierce that separates these two forms is the tricarinate vs. bicarinate rostrum. The other differences cited in pattern and sculpture concern characteristics that are notoriously variable in the genus. Therefore a closer look at the rostral carinae is of considerable importance in assessing the degree of relationship. Pierce says of *bicarinatus,* "the rostral carinae are close together and very prominent, with no room for a median carina between them as in *fasciatus.*" Despite this statement, his type has a median carina which, although poorly developed, is perfectly visible at the rostral base. Of *fasciatus* he says, "the specimen at hand which most nearly answers the description of this species . . . has . . . two distinct rostral carinae with a less distinct median basal carina." The only difference is one of degree, Pierce's type having higher and closer lateral carinae and a more obscure median one. As a series of *fasciatus* demonstrates the variability of rostral sculpture, it is best to consider *bicarinatus* a synonym representing one extreme of this variability. Pierce's type is from Tenino, Washington; *fasciatus* occurs throughout the Pacific Northwest, specimens having been seen from Washington, Oregon, Idaho, and Utah, as well as eastern United States.

REVIEW

The Zoology of Iceland. Volume III, Part 46. Coleoptera 1. Synopsis. by Sven Gisle Larsson and Geir Gigja. 218 pp., 10 figs. 1952. 2. **General Remarks.** by Sven Gisle Larsson. 85 pp., 13 figs. 1959.

The beetle fauna of Iceland consists of 160 species plus 40 species based on adventitious introductions not likely to be established and 7 species whose records are open to doubt. Not one of the 160 established species is peculiar or even subspecifically peculiar to the Iceland fauna, but all occur in northwestern Europe and establish Iceland as a definite part of the Palaearctic region. 78 or 49 percent of the established species are considered by Larsson as indigenous, i.e., as being established in the island before man's advent. Larsson suggests that these indigenous species are the remnants of a Pre-Glacial or even an Oligocene fauna, that arrived in Iceland when the water barriers were much narrower than at present or even non-existent. They survived the not quite complete glaciation of the country in numerous small refugia, the possible existence of which is considered in some detail. The species introduced by man constitute several categories: 35 species associated with the rural culture, 8 species associated with stables, 5 species associated with human abodes, 19 species associated with stored products, and 14 species associated with horticulture. Several of the adventitious species, the author suggests, are possible candidates for introduction if and when portions of the country are reforested.

The four principal families in the established fauna are Staphylinidae, 59 species (31 indigenous); Carabidae, 19 species (17 indigenous); Curculionidae, 15 species (13 indigenous); Cryptophagidae, 13 species (none indigneous).

The bulk of the book consists of a carefully prepared annotated list containing: (1) a reference to a recent description, (2) Iceland bibliography, (3) Iceland distribution, (4) general distribution, and (5) biology and remarks. Melville H. Hatch, *University of Washington, Seattle.*

PSEUDATTALUS CHAMP. A SYNONYM OF *ABLECHRUS* WATERH. (MALACHIIDAE)

By W. WITTMER[1]

A few years ago I received through the courtesy of the late Dr. M. Y. Marshall several specimens identified as *Attalus granularis* (Er.) which were taken at Brunswick, Ga. June 5, 1952, by Dr. D. G. Kissinger. Examining the specimens I found that they did not belong to *Attalus* but to *Ablechrus* Waterh. In order to ascertain that the insect described by Erichson also belongs to *Ablechrus,* Dr. K. Delkeskamp, Zool. Museum Humboldt Univ., Berlin, was kind enough to examine the holotype. He informed me that Erichson's holotype has 9-jointed antennae, which is characteristic of the genus *Ablechrus.* There can be no doubt, therefore, that *Attalus granularis* (Er.) must be listed under *Ablechrus.*

Pseudattalus Champ. which has the same characteristics as *Ablechrus* Waterh. must be regarded as a synonym of *Ablechrus.* I recently had the opportunity to examine the type of Waterhouse at the British Museum, London, and found its congenerity. As the genus *Ablechrus* was omitted in the Col. Cat. of Junk, Pars 159, I believe the following list will be of interest:

Ablechrus Waterhouse

Ablechrus Waterhouse, Proc. Zool. Soc. London 1877, p. 79.

Tucumanius Pic, Ann. Soc. Ent. Belgique 47. 1903, p. 300—Wittmer, Rev. de Ent. 12, 1941, p. 512.

Pseudattalus Champion, Trans. Ent. Soc. London 1914, p. 79—Wittmer, l.c.

arcuatipes Pic, Mél. exot.—ent. 30, 1919, p. 17 (*Tucumanius*), BRAZIL.

armatus Champion, Trans. Ent. Soc. London 1914, p. 80, t. 2, fig. 17 (*Pseudattalus*), GUATEMALA.

minimus Gorham, Biol. Centr. Americana, Col. III, 2, 1882, p. 121 (part.) (*Ebaeus*).

seminulus Gorham, l.c. (*nec.* Er.) (*Ebaeus*).

bosqui Pic, Rev. Soc. Ent. Argentina 2, 1928, p. 50 (*Attalus*),—Wittmer, Neotropica 1, 1954, p. 31 (*Tucumanius*), ARGENTINA.

cameroni Wittmer, Mitt. Schweiz. Ent. Ges. 30, 1957, p. 157 (*Tucumanius*), HAITI.

flavipes Waterhouse, Proc. Zool. Soc. London 1877, p. 79, GALAPAGOS ISLAND.

[1] Herrliberg-Zürich, Switzerland.

granularis Erichson, Entomogr. I, 1840, p. 112 (*Anthocomus*)—Lec. Smithsonian Misc. Coll., 6, 1863, p. 54 (*Attalus*)—G. H. Horn, Trans. American Ent. Soc. 4, 1872, p. 123—Marshall, Proc. California Acad. Sci. 27, 1951, p. 96, U.S.A.

guadeloupensis Pic, Mél. exot.—ent. 11, 1914, p. 11 (*Ebaeus*)—Lepesme, Col. Antilles 1, 1947, p. 165, fig. 197—Wittmer, Ent. Medd. 26, 1953, p. 528 (*Tucumanius*), GUADELOUPE.

maculatus Wittmer, Neotropica 1, 1954, p. 30 (*Tucumanius*), ARGENTINA.

minimus Erichson, Entomogr. I, 1840, p. 113 (*Anthocomus*)—Gorham, Biol. Centr. Americana, Col. III, 1882, p. 121 (part.) (*Ebaeus*).—Champion, Trans. Ent. Soc. London 1914, p. 80, t. 2, fig. 16, 16a & b (*Pseudattalus*), PANAMA, COLOMBIA.

nigrocoeruleus Gorham, Proc. Zool. Soc. London 1898, p. 323 (*Ebaeus*), ST. VINCENT.

pallidipes Pic, Ann. Soc. Ent. Belgique 47, 1903, p. 300 (*Tucumanius*), ARGENTINA.

punctatus Gorham, Biol. Centr. Americana, Col. III, 1882, p. 321 (*Ebaeus*)—Champion, Trans. Ent. Soc. London 1914, p. 81, PANAMA.

pygidialis Pic, Mél. exot.—ent. 30, 1919, p. 16 (*Tucumanius*), BRAZIL, ARGENTINA.

texensis Marshall, Col. Bull. 9, 1955, p. 45 (*Pseudattalus*), U.S.A. (Texas).

BOOK NOTICE

BIOLOGY AND CONTROL OF THE WESTERN PINE BEETLE, *by* J. M. MILLER and F. P. KEEN, of the Forest Service. U. S. Department of Agriculture Misc. Publ. No. 800, vii and 381 pp., 70 figs. March 1960. Price $2.25.

Here is a book filled with a tremendous amount of information about the life of the scolytid *Dendroctonus brevicomis* LeConte. It is a summary of the first fifty years of research, 1902-1952. The book is concerned with the beetle, the effect of the environment on the beetle, the effect of the beetle on the environment which in this case is mostly western yellow pine, and survey and control methods. The economic importance of this species can be understood when we read that it destroyed trees which would have provided 18 million dollars annually in salaries for employees of sawmills. It is no wonder, therefore, that its competition with the lumberman has earned the beetle the title "The Pine Beetle Logging Company," probably the only instance in which an insect has been called a commercial concern. This report makes good reading for anyone interested in insect biology and methods of study, especially for those who are concerned with tree borers, and taxonomists owe economic entomologists a vote of thanks for such a study. It is important to remember that almost all the really thorough studies on the biology of insect species were made for economic reasons.

ANON.

ON THE IMMATURE STAGES OF NORTH AMERICAN PYROCHROIDAE

By T. J. Spilman and William H. Anderson[1]

If an entomologist in the Eastern United States should lift the loosened bark from a fallen log, the chances are very good that he would find a long, flat, pale yellow larva, having a forceps-like tail. The chances are also very good that this larva would be a pyrochroid, not a cucujid as believed by many collectors. Perhaps such larvae are usually thought to be cucujid because their flat shape is similar to that of the adult *Cucujus clavipes*. Pyrochroid adults are certainly not flat. One characteristic, easily seen in the field with the aid of a low-powered hand lens, will serve to separate the Pyrochroidae from all other flattened larvae with forceps-like tails: the pyrochroids have the ninth sternite with closely set, small spines on the anterior and lateral borders (fig. 1). The ninth sternite is that plate lying just anterior to the anus. Flat larvae in other families may have teeth on the ninth sternite but they are not like those on the pyrochroids.

The larvae of the family Pyrochroidae may be characterized as follows. This description is slightly modified from Peterson's Larvae of Insects, Part 2, 1951, p. 67. Full-grown larvae measure 20 to 35 mm. Head and body segments depressed, orthosomatic, firmly sclerotized, smooth, shiny, and lightly pigmented. A few conspicuous setae may be present on most segments. Head exserted, depressed, subequal in width to prothorax, possessing a lyre-shaped epicranial suture which surrounds a fused frons and clypeus. Labrum is a distinct lobe. Three-segmented antennae are conspicuous, slender, and usually subequal in length to head; with a distinct papilla in membrane between segments 2 and 3. Ocelli present, usually 4 or 5 on each side. Mandibles strong, asymmetrical, sclerotized, usually tridentate at the curved apex; distinct molar areas, especially on left mandible. Each maxilla consists of a bipartite cardo, three-segmented palpus, and a combined stipes and setiferous mala with a distinct spine (uncus) at distomesal corner. Labium with a well-defined submentum, mentum, a slightly elongate ligula, and a pair of two-segmented palpi. Prothorax somewhat longer than the subequal mesothorax or metathorax and about same width as that of head. Three pairs of legs subequal in size and structure, each consisting of 4 segments and a terminal claw-like tarsungulus. Abdomen from dorsal view has 9 segments. Eighth segment is usually twice as long as ninth without urogomphi included. Ninth segment consists largely of 2 large, posteriorly projecting, deeply pigmented, roughened urogomphi, with 2 usually distinct pits on margin between their proximal portions. On venter of ninth segment a continuous arch of small spines (asperities) occurs cephalad of the anus. Spiracles annular or oval; they are located on lateral aspects of mesothorax and abdominal segments

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1 to 7; on eighth segment they are on ventrolateral portion of tergite. Commonly found under the bark of dead deciduous or coniferous trees.

Four genera of Pyrochroidae are known from America, north of Mexico. We have never seen the immature stages of *Ischalia,* a genus which is tentatively included in this family in the Leng Catalogue. The other three genera and as many species as are known to us may be differentiated as follows:

KEY TO THE LARVAE OF PYROCHROIDAE OF AMERICA, NORTH OF MEXICO

1. Urogomphi short and stout, straight or slightly curved, each with obviously coarse projections on inner face (fig. 2); abdominal segment 8 having oval spiracle located approximately equidistant from lateral line and tergo-sternal suture -- NEOPYROCHROA FLABELLATA (F.)

Urogomphi often long and obviously curved, smooth or granulate on inner face (if urogomphi not obviously curved, then the inner face is smooth or granulate); abdominal segment 8 having circular spiracle adjacent to the lateral line ---------- 2

2. Abdominal segment 8 shorter, one and one-half times as long as segment 7; urogomphi and dorsum of segment 9 between bases of urogomphi without granules, or if present not more deeply pigmented than the surrounding integument (fig. 3) --SCHIZOTUS CERVICALIS Newman

Abdominal segment 8 twice or nearly twice as long as segment 7; urogomphi with granules that are obviously darker than the surrounding integument------------- 3

3. Urogomphi nearly straight, short, the length of each, measured from base of curve between them, less than the distance between them at apices (fig. 4)---DENDROIDES CONCOLOR (Newman)

Urogomphi curved, elongate, the length of each, measured from base of curve between them, greater than the distance between them at apices---------------------- 4

4. Abdominal segment 8 near anterior margin with distinct complete transverse ridge; urogomphi with many tubercles (fig. 5)--- DENDROIDES EPHEMEROIDES (Mannerheim) and PICIPES Horn

Abdominal segment 8 with scarcely discernible ridge, the latter broadly interrupted at midline of tergite; urogomphi with few, indistinct granules-- DENDROIDES CANADENSIS Latreille

The pupae of beetles are very poorly known. Many of our most common species are unknown in the pupal stage. This is unfortunate, for the pupal stage could provide valuable characteristics in showing us the relationships of taxa. Experienced coleopterists can identify some pupae even to species because they recognize in the pupae the habitus of the adults. We were able to identify male pupae of *Neopyrochroa* to species because of the distinctively sculptured heads. In addition, if the beetle is in the later part of the pupal stage, one can actually see and identify the ensuing adult stage through the pupal skin. When these methods are not possible, we must rely on structures which are unique to the pupal stage. Such structures are the projections on the middle abdominal segments and pronotum. These projections are usually either in the form of tubercles or broad lobes.

A very brief description of the pupae of the Pyrochroidae follows. Head and dorsum of body with elongate, subcylindrical tubercles, their length quite obviously greater than their width. Each tubercle with a long, slender seta, which may be apically or subapically placed. Tubercles arranged as follows. Pronotum with 3 or 4 on each of the anterior and posterior angles, with 2 pairs on posterior border. Middle segments of abdomen with tergite having 2 or 4 pairs on posterior border near midline, 1 bifurcate or 2 simple ones at posterolateral angle, and one on lateral border; 1 on pleural area below the spiracle, and 2 on each posterolateral corner of sternite, the inner of which is longer.

KEY TO THE KNOWN PUPAE OF PYROCHROIDAE OF AMERICA, NORTH OF MEXICO

1. Tergites of abdominal segments 2 to 6 with one large, apically bifurcate tubercle on the posterolateral angle, and with all tubercles on these tergites having setae arising subapically (fig. 6) -- **NEOPYROCHROA** Blair

   Tergites of abdominal segments 2 to 6 with two slender, apically simple tubercles on posterolateral angle, and with all tubercles on these tergites having setae arising apically (fig. 7) -- 2

2. Metafemur having 7 or more setae visible when viewed ventrally------**SCHIZOTUS** Newman

   Metafemur having 5 or rarely 6 setae visible when viewed ventrally - **DENDROIDES** Latreille

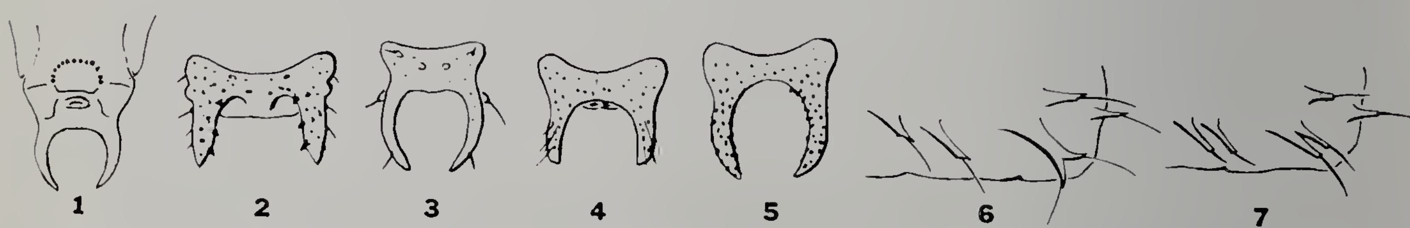

FIGURE 1, ventral view of apex of abdomen of a pyrochroid larva, showing small spines on plate just anterior to anus. FIGS. 2-5, dorsal views of urogomphi of larvae. FIG. 2, *Neopyrochroa flabellata;* FIG. 3, *Schizotus cervicalis;* FIG. 4, *Dendroides concolor;* FIG. 5, *Dendroides ephemeroides;* FIGS. 6-7, Dorsal views of posterolateral quarter of third abdominal tergite of pupae. FIG. 6, *Neopyrochroa flabellata;* FIG. 7, *Dendroides concolor.*

A KEY TO THE NORTH AMERICAN GENERA OF SCOLYTIDAE

By STEPHEN L. WOOD[1, 2]

For the past several years this writer has been engaged in a study of the comparative morphology of Scolytoid and other Rhynchophorous beetles to obtain the necessary background for preparing a natural classification of all Scolytoid genera. Although far from complete, this study has advanced sufficiently that many of the ideas can be utilized in the following preliminary classification.

Bibliographic references to the generic names employed here, their synonymy, and the names of species included in each may be obtained by consulting the Leng Catalogue and its supplements, and Wood, 1951, 1954a and b, 1956, 1957a, b and c, and 1959a and b, with two exceptions. These exceptions are *Thamnophthorus* Schedl (1938), included because one mutilated unidentifiable specimen belonging to this genus was collected in Florida and may also occur in Arizona; and *Dendrocranulus* Schedl (1937). Since its description Schedl has included a number of Central and South American species in *Dendrocranulus,* but to my knowledge has never called attention to its synonymy with *Xylocleptes* of American writers (nec. Ferrari, 1867). Schedl's genus appears to be valid and should be used to designate the New World allies of *Xylocleptes* Ferrari.

All of the genera included here in the tribe Xyleborini are grouped by Schedl into the genus *Xyleborus* Eichhoff. In the absence of any comprehensive review of the tribe and in view of the distinctness of the groups within this tribe in North America, tentative generic recognition is retained for each.

A character not previously described in the subfamily Ipinae suggests a sharp break between the Pityophthorini-Corthylini and other Ipinae. In virtually all other Scolytidae a tubercle at the anterior end of the metepisternum fits into a corresponding groove on or near the inner costal margin at the humeral angle of the elytra. In Pityophthorini and Corthylini this tubercle is absent and is replaced by two subtransverse grooves on the metepisternum; the elytral groove is reduced and modified to match those of the metepisternum. As a result of this shift in position of the mechanism that locks the elytra in the closed position the elytra extend ventrad to a greater degree than in other Scolytidae completely covering at least the posterior two-thirds of the metepisternum. While concealment of the metepisternum is merely a reflection of the more fundamental but obscure morphological change, it is easily observed and serves as a useful key character.

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[1] Department of Zoology and Entomology, Brigham Young University, Provo, Utah. Scolytoidea contribution no. 19.

[2] A key to the Nearctic subfamilies, tribes and genera of Scolytidae is presented below in order that it will be available for use in "The Beetles of the United States," fascicle 110, by R. H. Arnett, Jr.

KEY TO THE GENERA OF SCOLYTIDAE OF THE UNITED STATES

1. Lateral margin of anterior and posterior tibiae unarmed except for a single curved process at outer apical angle that curves toward and extends beyond process of inner apical angle; lateral line of pronotum sharply elevated; antennal club flattened, the sutures strongly procurved, funicle seven-segmented (subfamily SCOLYTINAE, tribe Scolytini) -- 2

Lateral margin of anterior tibia armed by several toothlike processes none of which curve toward the inner process; lateral line of pronotum raised or not, antennal club and funicle variable -- 3

2(1). Elytral declivity rather steep, descending to meet the horizontal abdomen; scutellum small, flush with surface of elytra; antennal scape at least as long as funicle --**LOGANIUS**

Elytra slightly if at all declivous behind, the abdomen ascending abruptly behind to meet them; antennal scape distinctly shorter than funicle------------------**SCOLYTUS**

3(1). Anterior margins of elytra raised and bearing a series of crenulations; scutellum, if visible, rounded, somewhat depressed and displaced posteriorly causing a slight emargination between bases of elytra; prcnotum usually unarmed; head usually visible from above (subfamily HYLESININAE)------------------------------ 4

Anterior margins of elytra unarmed, usually smooth and either rounded or with a fine raised line; scutellum flush with elytral surface, its anterior margin and elytral bases forming an almost straight transverse line across body; pronotum usually armed by granules or asperites on at least anterior third; head usually concealed from above (subfamily IPINAE) -- 25

4(3). Prothoracic tibia with a curved bifid process, and meso- and metathoracic tibiae with a single curved spine extending beyond spine of inner apical angle; prothorax usually longitudinally strigose; antennal funicle seven-segmented; lateral prosternal area bearing a sharply elevated ridge from coxae to anterior margin; crenulations on elytral bases rather small (tribe Bothrosternini)----------------------------- 5

Tibiae bearing several teeth, none extending beyond tarsal insertion; prothorax never longitudinally strigose; antennal funicle and prosternal area variable------------ 6

5(4). Sutures of antennal club straight; rostrum distinctly wider than distance between eyes; body elongate ---**CNESINUS**

Sutures of antennal club procurved; rostrum width at tip equal to distance between eyes; body oval; frons excavated, with median tubercle just above epistoma --**PAGIOCERUS**

6(4). Lateral prosternal area sharply elevated from coxae to anterior margin; crenulations on elytral bases usually poorly developed; funicle seven-segmented, club conical; head somewhat prolonged, subrostrate; eye entire (tribe Hylastini)------------- 7

Prosternal area without elevated ridge; head not prolonged, the frontal area usually sexually dimorphic; funicle four- to seven-segmented; antennal club more or less flattened; eye variable -- 10

7(6). Crenulations at elytral bases rather well developed, forming a single row of teeth; first and second segments of antennal club subequal in length; body rather stout, length less than 2.5 mm.; in roots of herbaceous legumes -------------**HYLASTINUS**

Crenulations at elytral bases poorly developed, irregularly placed, not forming a definite single row; first segment of antennal club distinctly longer than second; usually larger than 3 mm., very slender if smaller---------------------------------- 8

8(7). Anterior coxae widely separated; general surface of elytra and between punctures on pronotum dull; vestiture sparse, recumbent, yellow; body color reddish brown -- **SCIERUS**

Anterior coxae narrowly separated, almost contiguous; general surface between punctures on pronotum and elytra smooth and shining; the longer hairlike vestiture erect; mature color usually dark brown or black --------------------------------- 9

9(8). Third tarsal segment broad, bilobed; pronotum usually constricted anteriorly, about equal numbers of small and large punctures intermixed on disc------------**HYLURGOPS**

Third tarsal segment narrower, emarginate; pronotum not noticeable constricted anteriorly, punctures uniformly large, intermixed with very few small ones ---- **HYLASTES**

10(6). Scutellum visible, elytral bases notched for its reception; third tarsal segments stout, usually somewhat bilobed (except slender in CHRAMESUS) if slender fore coxae separated --- 11

Scutellum absent, elytra bases only slightly or not at all emarginate at suture; third tarsal segments slender; fore coxae contiguous ---------------------------- 21

11(10). Eye oval, entire; antennal club less strongly compressed, subconical (except DENDROCTONUS); anterior coxae contiguous (except XYLECHINUS); male frons not impressed (tribe Hylurgini) ---------- 12
Eye more elongate, frequently sinuate or emarginate; club more strongly compressed, usually asymmetrical in outline; anterior coxae separated by an intercoxal piece (tribe Hylesenini) ---------- 15
12(11). Antennal club rather strongly flattened; vestiture hairlike; submarginal epistomal process well developed; antennal funicle five-segmented; mesosternum flat, sloping ---------- DENDROCTONUS
Antennal club almost conical, only slightly compressed; vestiture of abundant, short scalelike or stout bristlelike setae and interstrial rows of longer setae; epistomal process obsolete; antennal funicle five- or seven-segmented ---------- 13
13(12). Mesosternum slightly convex, sloping; vestiture of abundant short bristles and rows of longer hair ---------- HYLURGOPINUS
Mesosternum protuberant, anteriorly declivous; short ground vestiture scalelike - 14
14(13). Antennal funicle five-segmented; median rows of longer, erect setae scalelike -- XYLECHINUS
Antennal funicle seven-segmented; median rows of longer, erect setae hairlike ---------- PSEUDOHYLESINUS
15(11). Antennal funicle six- or seven-segmented, club less strongly compressed, the sutures transverse; tibiae more slender, abruptly narrowed apically, the teeth confined to apical one-fourth (except LEPERISINUS) ---------- 16
Antennal funicle five-segmented, club more strongly compressed, the sutures oblique or obsolete; tibiae more strongly dilated, rather gradually narrowed on apical third, the teeth distributed over apical half ---------- 19
16(15). Antennal funicle six-segmented; anterolateral areas of pronotum unarmed and eye shallowly emarginate ---------- CARPHOBIUS
Antennal funicle seven-segmented; anterolateral areas of pronotum armed by a few asperities or else eye not emarginate ---------- 17
17(16). Pronotum unarmed in anterolateral areas; scutellar notch between elytra very deep, acute; elytra extended anteriorly over pronotum, the margins in humeral area angulate, pronotum abruptly grooved to accommodate elytral margins; all coxae very widely separated; costal margins of elytra rather strongly ascending posteriorly, the abdomen ascending to meet them; xylophagous species ------ DENDROSINUS
Pronotum armed by a few asperities in anterolateral areas; scutellar notch obtuse; anterior margins of elytra rather evenly rounded, not strongly extended over pronotum; coxae moderately separated; bark inhabiting species ---------- 18
18(17). Eye entire; costal margins of elytra ascending slightly at apex, abdomen ascending to meet them; vestiture scalelike; hosts FRAXINUS species ---------- LEPERISINUS
Eye shallowly emarginate; costal margins of elytra descending to apex, abdomen horizontal; vestiture hairlike; hosts ALNUS species ---------- ALNIPHAGUS
19(15). Eye deeply emarginate; antennal club with three oblique sutures; pronotum unarmed; hosts Cupressinine trees, rarely other conifers ---------- PHLOEOSINUS
Eye entire; antennal club either deeply divided on one side into three parts, or club solid and unmarked by sutures; prothorax usually armed by a few asperities in anterolateral areas ---------- 20
20(19). Antennal club deeply divided into three units that may be movable on one another; vestiture hairlike ---------- PHLOEOTRIBUS
Antennal club solid, unmarked by sutures, the funicle apparently attached to its side; vestiture mostly scalelike ---------- CHRAMESUS
21(10). Eye sinuate or entire; crenulations on elytral bases restricted to area between fifth interspaces; funicle four- or five-segmented; monogamous species (tribe Hypoborini) 22
Eye deeply emarginate or entirely divided; crenulations on elytra bases more generally distributed, extending lateral to fifth interspace; funicle five- or six-segmented; polygamous species (tribe Polygraphini) ---------- 24
22(21). Antennal funicle four-segmented, sutures of club indicated only by marginal notches; elytra with uniseriate rows of erect, broad interstrial scales and recumbent strial hair of equal length; pronotum armed by three or four pairs of median tubercles, the anterior pair usually marginal ---------- LIPARTHRUM
Antennal funicle five-segmented, sutures of club transverse, distinct; elytral vestiture without conspicuous recumbent hair; pronotum armed by two or three widely separated paired clusters of lateral teeth ---------- 23

23(22). Antennal club broad, only slightly longer than wide, with two sutures; setae on anterior margin of pronotum not specially modified; elytral vestiture of fine, tapering subplumose hair -- CHAETOPHLOEUS
Antennal club usually much longer than wide, with three sutures; anterior margins of pronotum bearing a fringe of specialized setae; elytral vestiture of stout bristle- or scalelike setae -- RENOCIS

24(21). Antennal club marked by sutures; eye emarginate; antennal funicle always five-segmented -- CARPHOBORUS
Antennal club solid, unmarked by sutures; antennal funicle five- or six-segmented, variable; eye completely divided into two parts ---------------------- POLYGRAPHUS

25(3). Metepisternum visible to posterior extremity; antennal club usually thickened basally, obliquely truncate or sutures, if visible, strongly displaced apically on posterior surface; antennal funicle one- to six-segmented -------------------------- 26
Metepisternum largely covered by elytra, visible only in front; antennal club strongly flattened with sutures on both sides, those on posterior surface not strongly displaced apically; tibiae slender, usually bearing about three teeth on apical portion; antennal funicle with from one to five segments -------------------------- 65

26(25). Antennal funicle six-segmented (five-segmented in CACTOPINUS); anterior coxae moderately separated by an intercoxal piece ---------------------------------- 27
Antennal funicle two- to five-segmented; anterior coxae contiguous (except XYLOSANDRUS of the Xyleborini) -- 36

27(26). Outer apical angle of fore tibia armed by a process extending beyond tarsal insertion; lateral margin of pronotum marked by a sharp, finely raised line (tribe Hexacolini) 28
Fore tibia with sides parallel, usually armed only on apical margin by small teeth, never with process on outer apical angle exceeding tarsal insertion; lateral margins of pronotum rounded (tribe Micracini) ------------------------------------ 29

28(27). Anterior area of pronotum transversely rugose; pronotum and elytra subglabrous -- HEXACOLUS
Pronotum uniformly punctured, unarmed; vestiture of pronotum and elytra abundant, consisting of erect, stout, almost scalelike bristles ----------------- PYCNARTHRUM

29(27). Antennal club small, greatest width through basal half, apex narrowly rounded, the sutures straight, transverse -- 30
Antennal club usually larger, the greatest width through apical half, apex broadly rounded, the sutures procurved -- 32

30(29). Prothorax asperate to base in median area, summit on basal third, usually extending behind its basal margin and over scutellum; male frons bearing a very large, long, partly double process which may curve upward and backward over prothorax, sometimes reaching its posterior margin; body usually covered by an incrustation --CACTOPINUS
Summit at or slightly behind middle of prothorax, basal third devoid of asperities; male frons not armed by a large median process -------------------------- 31

31(30). Elytral declivity subvertical, bisulcate, obtusely angulate behind; sutures of antennal club distinctly marked by rows of setae; antennal pedicle and scape about equal in length -- STENOCLEPTUS
Elytral declivity more gradual, evenly convex, rather narrowly rounded behind; sutures of antennal club indicated only by marginal notches; scape distinctly longer than pedicle -- CRYPTOCLEPTES

32(29). Elytra broadly rounded behind; margins of antennal club usually constricted at first suture -- 33
Elytra acuminate behind; antennal club without sutural constrictions at sides------- 34

33(32). Pronotum wider than long, widest near base; summit more prominent; fore tibia more slender, apically obliquely truncate, mucro often bifurcate---------- PSEUDOTHYSANOES
Pronotum longer than wide, widest near middle; summit less prominent; fore tibia rather broad, more nearly truncate apically, mucro undivided------------- THYSANOES

34(32). Sutures of antennal club broadly procurved, the first appearing bisinuate and extending less than one-third length of club; scape club-shaped, with few setae; eye oval, rather small; fore tibia more slender, slightly wider apically, with supplemental tubercles on posterior face -- HYLOCURUS
Sutures of club very strongly, narrowly procurved, the first usually reaching middle of club; scape compressed, subtriangular, with numerous long setae; eye large, elongate; fore tibia broad, sides subparallel, posterior surface devoid of tubercles except for teeth on apical margin -- 35

35(34). Eyes moderately separated beneath, entire; fore tibia with all five teeth on distal margin, mucro broad ---- MICRACIS

Eyes subcontiguous beneath, emarginate; fore tibia with at least one of the five teeth on outer margin, mucro more slender ---- MICRACISELLA

36(26). Antennal club more strongly flattened, with sutures on both faces, those on posterior face strongly procurved and limited to apical half; costal margins of elytra slightly ascending posteriorly; antennal funicle three- to five-segmented (tribe Cryphalini) 37

Antennal club obliquely truncate or at least with sutures of posterior face restricted to less than apical one-fourth; costal margins of elytra descending posteriorly ---- 46

37(36). Pronotum without a fine, raised lateral line (an indistinct line in CRYPHALOMORPHUS); eye sometimes sinuate, never emarginate; costal margin of elytra ascending only slightly posteriorly ---- 38

Pronotum acutely margined at sides, and with a fine, raised line at least on basal one-third; eye emarginate (except TRISCHIDIAS); costal margins of elytra distinctly ascending posteriorly ---- 41

38(37). Antennal funicle five-segmented; antennal club narrow, pointed at tip, sutures straight, not septate; basal half of pronotum without scalelike setae ---- CRYPHALUS

Antennal funicle four-segmented; antennal club broadly rounded at tip, the sutures curved, partly septate or both; basal half of pronotum with scalelike setae ---- 39

39(38). Antennal club not septate, sutures indicated by three strongly procurved rows of setae ---- ERNOPOCERUS

Antennal club with at least part of first suture septate, none of sutures indicated by strongly procurved rows of setae ---- 40

40(39). Sutures of antennal club straight, the first septate; anterior margin of pronotum slightly produced; pronotum with no indication of a fine raised lateral line ---- PROCRYPHALUS

Antennal club with a strongly oblique septum on one side, no other sutures indicated; anterior margin of pronotum broadly rounded; pronotum with an indistinct, fine, raised lateral line ---- CRYPHALOMORPHUS

41(37). Antennal club not septate, with sutures indicated by rather strongly recurved rows of setae; third tarsal segment broad and emarginate ---- TAENIOGLYPTES

Sutures of antennal club straight or procurved; third tarsal segment cylindrical ---- 42

42(41). Antennal funicle five-segmented (male usually four-segmented); eye distinctly emarginate; body size greater than 1.4 mm. (except some STEPHANODERES) ---- 43

Antennal funicle three- or four-segmented; eye sinuate to indistinctly emarginate; body size less than 1.4 mm. ---- 45

43(42). Strial punctures obsolete; posterior half of pronotum finely granulate; antennal club large, not septate; male and female similar in size and appearance ---- HYPOCRYPHALUS

Strial punctures distinct; posterior half of pronotum not closely granulate, usually punctate; male much smaller than female ---- 44

44(43). Antennal club not septate; raised lateral margin of pronotum extending two-thirds of distance from basal margin; elytra glabrous except for a few subcapitate interstrial bristles ---- CRYPTOCARENUS

First sutures of antennal club partly septate; raised lateral margin extending only one-third of distance from basal to anterior lateral margin; elytra clothed by rows of strial and interstrial setae ---- STEPHANODERES

45(42). First suture of antennal club partly septate; body slender, more than 2.4 times as long as wide; striae and strial punctures not as strongly impressed; usually larger than 1.1 mm. ---- HYPOTHENEMUS

Antennal club not septate; body stout, less than 2.3 times as long as wide; striae and strial punctures more strongly impressed; smaller than 1.1 mm. ---- TRISCHIDIAS

46(36). Antennal funicle two- or three-segmented; pronotum unarmed, punctured over entire surface, lateral line not sharply raised; minute size, 2 mm. or less (tribe Crypturgini) 47

Antennal funicle four- or five-segmented; pronotum usually armed anteriorly by granules or asperities, if unarmed lateral line sharply raised; usually larger, mostly over 2 mm. ---- 48

47(46). Antennal funicle two-segmented, club with one obscure suture indicated at tip CRYPTURGUS

Antennal funicle three-segmented; club with three sutures indicated ---- DOLURGUS

48(46). Eye completely divided by an emargination; antennal funicle four-segmented, club without distinct sutures (tribe Xyloterini) ---- 49

Anterior margin of eye sinuate or emarginate, never completely divided; antennal funicle five-segmented (four-segmented in LYMANTOR), club usually with evident sutures 50

49(48). Antennal club with subcorneous basal area strongly, rather narrowly procurved; anterior tibia of female thickened and tuberculate on posterior face, flattened and finely tuberculate in male; male head deeply, broadly excavated, the prothorax subquadrate; female frons convex, anterior margin of female pronotum rounded --**TRYPODENDRON**

Antennal club with subcorneous basal area broadly procurved; anterior tibia flattened and devoid of tubercles on posterior face; frons not excavated in either sex; anterior margin of prothorax rounded in both sexes ------------------------**XYLOTERINUS**

50(48). Pronotum either punctured or else finely granulate over almost entire surface, dorsal profile evenly convex, not strongly declivous anteriorly, anterior margin never armed; tibia usually rather slender and armed by few, coarse teeth; declivity unarmed (tribe Dryocoetini) -- 51

Pronotum more coarsely asperate and more strongly declivous anteriorly, usually punctate at least on posterior third, anterior margin sometimes armed; tibia variable; declivity frequently armed by spinous processes---------------------------- 55

51(50). Prothorax distinctly longer than wide, widest at middle; antennal club compressed or with membranous apical portion extended beyond corneous portion, sutures procurved; scutellum very small--- 52

Prothorax about as wide as long, widest on posterior third, rather strongly narrowed on anterior half; antennal club subtruncate, sutures transverse or recurved; scutellum moderate to large--- 53

52(51). Antennal funicle four-segmented; club compressed, sutures strongly arcuate; pronotum granulate on anterior half, punctured behind; host ACER------------------**LYMANTOR**

Antennal funicle five-segmented; club less strongly compressed, sutures rather broadly procurved; pronotum granulate to base; host CUCURBITA----------**DENDROCRANULUS**

53(51). Basal corneous portion of antennal club reaching beyond middle; declivity short, steep, confined to posterior one-fourth of elytra-----------------------------**DRYOCOETES**

Corneous portion of club not reaching middle in central area; declivity gradual, extending over at least posterior one-third ---------------------------------- 54

54(53). Pronotal asperities very fine, widely separated; pronotum moderately to weakly convex both transversely and longitudinally-----------------------------**POECILIPS**

Pronotal asperities larger, very close, their bases almost touching; pronotum very strongly convex both transversely and longitudinally.------------------**COCCOTRYPES**

55(50). Meso- and metathoracic tibiae rather slender, abruptly narrowed apically, armed by a few rather widely spaced coarse teeth; males and females similar in size and general shape (tribe Ipini)-- 56

Meso- and metathoracic tibiae rather broadly dilated to a point slightly beyond middle then gradually narrowed to apex, and armed by a series of small closely set teeth of more or less uniform size and shape; males rare, usually smaller and radically different in shape (tribe Xyleborini)------------------------------------- 60

56(55). Elytral declivity, rather narrowly bisulcate, margins moderately elevated, rounded and armed by not more than three teeth; lower margin of declivity rounded; usually smaller than 3 mm. --- 57

Elytral declivity broadly, rather deeply excavated, margins acutely elevated and armed by more than three tubercles or teeth; lower margin of declivity provided with an acutely elevated transverse ridge separating declivital excavation from apical margin; usually larger than 3 mm. ------------------------------------- 59

57(56). Prosternal intercoxal piece short, obtuse; female frons deeply, rather narrowly excavated; male declivity with two or three pair of enlarged teeth; antennal club compressed, two sutures visible on distal third of posterior face----------**PITYOGENES**

Prosternal intercoxal piece long and acutely tapered; female frons convex; male declivity more narrowly impressed--- 58

58(57). Antennal club compressed, with two sutures visible on distal fourth of posterior face; elytral declivity less strongly impressed, the lateral teeth minute; vestiture on anterior parts of prothorax and frons not more abundant or longer ----- **ORTHOTOMIDES**

Antennal club obliquely truncate, without sutures on posterior face; elytral declivity more strongly impressed, the lateral teeth larger particularly in male; vestiture much longer and more abundant on anterior portion of prothorax and frons, particularly in female---**PITYOKTEINES**

59(56). Antennal club obliquely truncate, the sutures recurved; elytral declivity less strongly excavated, the third tooth displaced mesally, not on summit of declivited margin --- **ORTHOTOMICUS**

Antennal club flattened, the sutures procurved bisinuate or transverse; elytral declivity broadly excavated, all teeth on summit of lateral margin ---------- IPS

60(55). Anterior coxae widely separated; body stout, elytra less than 1.3 times as long as pronotum ---------- XYLOSANDRUS

Anterior coxae contiguous; body elongate, often slender, elytra at least 1.5 times as long as pronotum ---------- 61

61(60). Antennal club more strongly compressed, corneous area small, near base, its distal margin procurved, distal pubescent portion reaching basal one-fifth at sides; elytra obliquely truncate behind, declivity broadly, concavely excavated and acutely margined on a complete circle at periphery ---------- PREMNOBIUS

Antennal club thickened basally, corneous area larger with its distal margin recurved, pubescent area not reaching basal third; elytral declivity convex, not acutely margined on upper half ---------- 62

62(61). Pronotum wider than long, rather coarsely asperate in front; body stout ---------- 63

Pronotum longer than wide, rather finely asperate in front; body slender ---------- 64

63(62). Pronotum subquadrate, asperate to base, anterior margin unarmed; declivity bearing several granules or rather large teeth, some on second interspace ---- AMBROSIODMUS

Pronotum subcircular, minutely reticulate-granulate and punctured on basal half, anterior margin armed by a series of median teeth; declivital granules small ANISANDRUS

64(62). Scutellum conical; lower margin of declivity, beginning about interspace seven, bearing a series of pointed tubercles, the one nearest suture (at end of interspace two) largest ---------- XYLEBORINUS

Scutellum flat; lower margin of declivity acute or rounded, unarmed ---------- XYLEBORUS

65(25). Posterior oral region including pregula flush with surrounding surface of head, pregula broad, its lateral sutures apparently diverging to run behind oral ridge; pubescence more abundant; antennal club usually smaller, funicle five-segmented, except three- or four-segmented in DENDROTERUS; bark or twig beetles (tribe Pityophthorini) 66

Posterior oral region including pregula depressed below surrounding surface of head or pregula narrow, greatly reduced in size, its sutures extending anteriorly into oral cavity; pubescence less abundant; antennal club usually larger, the funicle one- to five-segmented; ambrosia beetles (tribe Corthylini) ---------- 73

66(65). Basal and lateral margins of prothorax rounded, without a fine raised line; antennal club somewhat larger in size; vestiture shorter and more uniform in length ---------- 67

Basal and posterior portion of lateral margins with a fine raised line; antennal club proportionately smaller; vestiture usually longer on declivity than on disc ---------- 68

67(66). Antennal funicle three-segmented (sometimes four segments in Mexican species); club less than twice as long as funicle; female pronotum without patches of pilose pubescence; elytral pubescence abundant ---------- DENDROTERUS

Antennal funicle five-segmented, club at least twice as long as funicle; female prothorax with a pair of pilose pubescent areas on middle third of lateral areas; elytral pubescence sparse ---------- PITYOBORUS

68(66). Antennal club devoid of sutures except for one strongly oblique septum on anterior half of club only; prothorax evenly rounded in dorsal profile, summit inconspicuous, asperities fine, transition from asperate to punctured area gradual---THAMNOPHTHORUS

Antennal club with at least two complete sutures indicated at least by setae; prothorax usually more strongly declivous anteriorly, summit and arrangement of asperities variable ---------- 69

69(68). Sutures of antennal club not septate; pronotal asperities usually extending behind middle at sides, the transition from asperate to punctured area gradual; body moderately to very stout ---------- 70

First and second sutures of antennal club septate; pronotal asperities usually not reaching middle, the transition from asperate to punctured area usually abrupt, summit usually well developed; body moderately stout to slender ---------- 71

70(69). Usually smaller, 2.0-2.9 mm.; anterior margin of pronotum rather coarsely serrate; pronotum with transverse impression behind summit; ninth interspace weakly elevated; antennal club distinctly longer than funicle; twig beetles, never in cones ---------- MYELOBORUS

Usually larger, 2.6-4.0 mm.; anterior margin of pronotum feebly or not at all serrate; pronotum without transverse impression behind summit; ninth interspace not elevated; club and funicle equal in length; in cones, rarely in twigs, of PINUS--CONOPHTHORUS

71(69). Pronotum and elytra minutely densely punctured; vestiture very short, usually dense; antennal club with first segment shorter than others; greater development of frontal vestiture a male character; hosts QUERCUS, rarely other broadleaf trees -- **PSEUDOPITYOPHTHORUS**

Pronotum and elytra more coarsely, less densely punctured; vestiture usually longer and less abundant; greater development of frontal vestiture a female character ---- 72

72(71). Pregular area greatly enlarged and ornamented by a beardlike growth of long hair -- **PITYOPHILUS**

Pregular area normal and without conspicuous vestiture --------------- **PITYOPHTHORUS**

73(65). Antennal funicle five-segmented, club smaller, less than twice as long as funicle ------ 74

Antennal funicle one- or two-segmented; club very large, more than three times as long as funicle --- 75

74(73). Costal margins of elytra near declivital suture normal, not elevated; pronotal punctures rather coarse, abundant; elytral punctures confused, vestiture rather abundant -- **CONOPHTHOCRANULUS**

Costal margins of elytra near declivital suture strongly elevated, forming a horizontal flange; pronotal punctures minute, rather sparse; elytral punctures in rows, vestiture sparse -- **GNATHOTRICHUS**

75(73). Antennal funicle two-segmented; posterior surface of fore tibia tuberculate; elytra emarginate or divaricate at sutural apex -------------------------- **MONARTHRUM**

Antennal funicle one-segmented; posterior surface of fore tibia smooth; elytra evenly rounded behind, without a sutural notch at apex ----------------------- **CORTHYLUS**

REFERENCES

FERRARI, J. A.

1867. Die Forst-und Baumzuchshädlichen Borkenkäfer. Gerold: Wein., 95 pp.

SCHEDL, K. E.

1937. Scolytidae und Platypodidae-Zentral und Südamerikanische arten. Arch. Inst. Veg., Rio de Janeiro, 3: 155-170.

1938. Die einteilung der Pityophthorinae. Arch. Naturgesch. (n.f.), 7: 157-188.

WOOD, S. L.

1951. Two new species and a new genus of Scolytidae (Coleoptera) from Utah. Jour. Kansas Ent. Soc., 24(1): 31-32.

1954a. A revision of North American Cryphalini (Scolytidae: Coleoptera). Univ. Kansas Sci. Bull., 36(2): 959-1089.

1954b. Bark beetles of the genus *Carphoborus* Eichhoff (Coleoptera: Scolytidae) in North America. Canadian Ent., 86(11): 502-526.

1956. New species of bark beetles (Coleoptera: Scolytidae), mostly Mexican. Part II. Canadian Ent., 88(5): 231-240.

1957a. Ambrosia beetles of the tribe Xyloterini (Coleoptera: Scolytidae) in North America. Canadian Ent., 89(8): 337-354.

1957b. Distributional notes on and synonymies of some North American Scolytidae (Coleoptera). Canadian Ent., 89(9): 396-403.

1957c. New species of bark beetles (Coleoptera: Scolytidae), mostly Mexican. Part IV. Great Basin Naturalist, 17(3-4): 105-110.

1959a. New species of bark beetles (Coleoptera: Scolytidae), mostly Mexican. Part V. Great Basin Naturalist, 19(1): 1-7.

1959b. New records and species of Arizona bark beetles (Coleoptera: Scolytidae). Great Basin Naturalist, 19(2-3): 57-62.

CONTRIBUTION TOWARDS A MONOGRAPH OF THE OEDEMERIDAE 14. A KEY TO AND NOTES ON THE NEW WORLD GENERA[1,2]

By Ross H. Arnett, Jr.[3,4]

Numerous observations on Neotropical Oedemeridae have accumulated during the past several years, the publication of which is necessary before further cataloging and revisionary work are possible. These various studies have resulted in the following revised key to the genera occuring in the New World, and the notes on these genera will lead to a new catalog of the group. A considerable number of species have been generically reassigned, making necessary a new catalog of species which is being prepared and will be published separately.

The present catalogs of the New World species, namely my revision of the Nearctic species (1951), and Blackwelder's checklist of the Neotropical species (1945) should be referred to for complete citations for the genera and species discussed below, unless otherwise indicated. Other bibliographic references are given in previous papers of this series and will not be repeated here. For quick reference, the following proposed changes in Blackwelder's checklist are listed below. These are discussed further in the text in each case, except for the genera which are removed from the family.

Changes in Blackwelder's checklist.—An examination of specimens of *Cycloderus* Solier, 1851, including holotype and paratype specimens, confirms the placing of this genus in Salpingidae, probably near *Polypria* Chevrolet (see Seidlitz, 1917). It is not a member of the family Oedemeridae. *Copidita* LeConte does not occur in South America. The species placed in this genus in the Checklist, with one exception, are to be variously assigned in the genera: *Oxacis, Oxycopis, Paroxacis,* and *Ananca.* (See under *Copidita* below for a discussion of the exception.) *Sessinia* Pascoe does not occur in the New World. The species assigned here in the Checklist belong in *Ananca* and *Oxycopis. Oxacis* LeConte includes species that have been assigned below to *Paroxacis, Oxycopis,* and *Alloxacis. Meloeditylus*

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[1] The previous part of this series, no. 13, was published in 1960, Coleopt. Bull., 14: 33-44.

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[4] This research has been supported in part by grant no. 14272 from the National Science Foundation. This help is herewith gratefully acknowledged. The loan of material is acknowledged in previous parts of this series. In addition to these, I would like to acknowledge thankfully, the help given me by Mr. T. J. Spilman, United States Department of Agriculture. The Instituto Miguel Lillo, Tucuman, thru the late Dr. F. Monrós, Dr. G. Kuschel, Universidad de Chile, and Dr. A. da Costa Lima, Instituto Oswaldo Cruz, have lent many specimens upon which much of this study is based.

Pic, 1926 is to be placed in Pedilidae near *Copobaenus* Fairmaire and Germain. *Sisenopiras* Pic, 1923 belongs in the Nacerdinae, not in the Asclerini. *Rhopalobrachium* Boheman, 1858 is placed in the Salpingidae temporarily (see Crowson, 1955, p. 173). It is not an oedemerid. *Loboglassa* Solier, 1851 is placed in Salpingidae near *Lacconotus* following Blair, 1928, Col. Cat., pars 99, p. 33. No further reference will be made herein to the genera removed from the family.

The following key is a complete revision of my previous keys to the genera of Oedemeridae found in the New World (see previous numbers of this series). This key is based on representatives of each genus and is not compiled from descriptions. In the case of the genera described by Pic, it cannot be absolutely certain that the material in front of me actually represents the species described by Pic, but in all cases this material fits the Pic descriptions. Until the Pic types can be studied, this seems to be a practical approach, and unless Pic was grossly wrong in his descriptions, I do not anticipate that there will be any generic changes as a result of an examination of his types. Because his specific descriptions are so brief and based almost entirely on color patterns, the identification of his species can be no more than a logical guess until type material is available. Nevertheless, I feel that redescription of species, using Pic names, is practical, and I shall do so with the full knowledge that nomenclatorial changes may be necessary when my material is compared with the types. However, unless such a procedure is followed, further systematic work on this family will be delayed for many years.

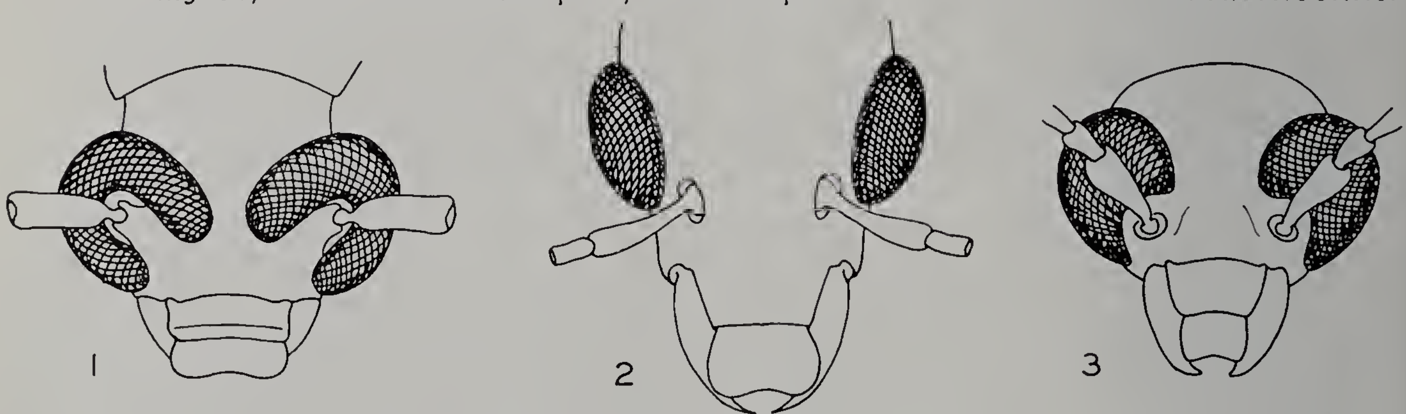
KEY TO THE NEW WORLD GENERA OF OEDEMERIDAE

1. Antennal base situated within deep emargination of eye (fig. 1); mandibles bifid or entire; claws simple (Calopodinae)-------------------------------------- 2
   Antennal base situated in front of eyes which may be emarginate or entire-------- 3

2(1). Mandibles bifid at apices (in New World species); antennae of male elongate, serrate, of female elongate, simple; basal central apodeme of eighth abdominal sternite of male short, not projecting beyond base---------------------------------CALOPUS
   Mandibles entire; antennae of both sexes simple, filiform; basal central apodeme of eighth abdominal sternite of male long, projecting beyond base----------SPAREDRUS

3(1). Front tibia with single apical spur (Nacerdinae)------------------------------ 4
   Front tibia with two apical spurs (Oedemerinae)------------------------------ 8

4(3). Distance between eyes in dorsal view more than twice width of one eye in dorsal view (fig. 2) -- 5
   Distance between eyes in dorsal view less than twice width of one eye in dorsal view (fig. 3); mandibles bifid at apices; claws simple---------------------XANTHOCHROA


1 2 3

FIGURES 1-3. FIG. 1, *Calopus angustus* LeConte, head, dorsal view; FIG. 2, *Micronacerdes atricollis* Pic, head, dorsal view; FIG. 3, *Xanthochroa erythrocephala* (Germar), head, dorsal view.

5(4). Eyes entire, protruding from side of head (fig. 2) ---------- 6
Eyes emarginate, reniform, only slightly protruding; mandibles bifid; claws simple NACERDES

6(5). Claws toothed at base; mandibles bifid at apices; terminal four segments of antennae pale in color (in the two known species available for study) ---------- MICRONACERDES
Claws simple at base; mandibles bifid ---------- 7

7(6). Head obviously elongate, approximately twice as long as wide; eyes hemispherical, placed on extreme lateral sides of head (as in fig. 2); pronotum more or less quadrate, laterally somewhat sinuate; antennal segments extremely long, 6 to 8 times as long as broad, antennae extending to or beyond apex of elytra ---- SISENOPIRAS
Head not elongate; pronotum cordate, laterally more or less evenly arcuate; antennal segments short, two to two and one-half times as long as broad, antennae not extending beyond middle of elytra ---------- DITYLOIDEA

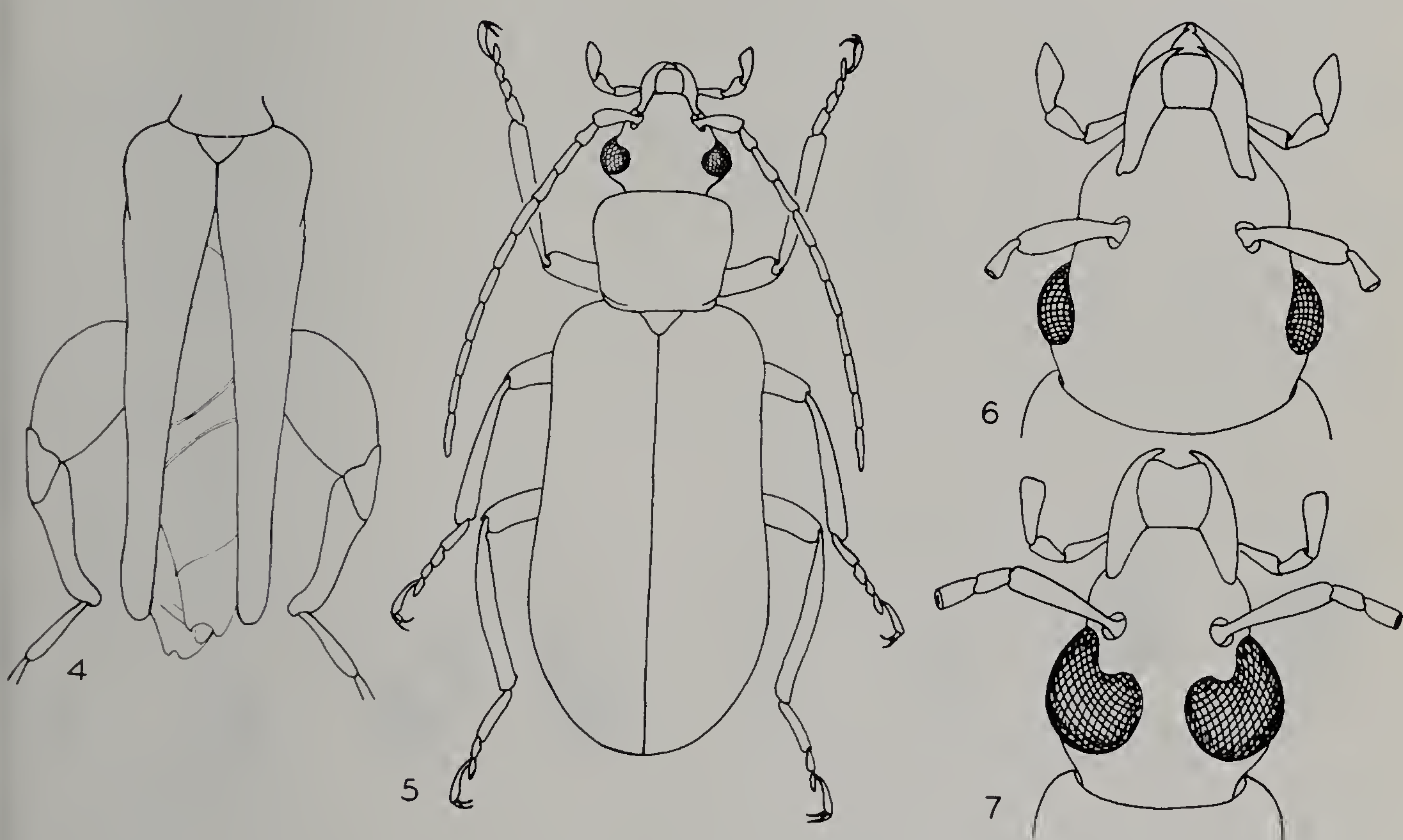
8(3). Elytra often narrowed behind and somewhat shortened (fig. 4), and/or males with strongly enlarged hind femora (Oedemerini, not in the New World).
Elytra entire, not narrowed or shortened; if male with enlarged hind femora (rarely), this enlargement is slight and hardly noticeable ---------- 9

9(8). Body stout, broad, carabidform, somewhat rounded in cross-section (fig. 5); eyes small; antennae short and moderately stout, not flattened, inserted some distance from eyes (Ditylini) ---------- 10
Body narrow, subdepressed, not carabidiform; eyes sometimes small, usually prominent and reniform; antennae usually long and slender, or flattened (Asclerini) ---------- 11

10(9). Eyes very small, oval, only very slightly emarginate; head, including eyes, definitely wider than pronotum at widest dimension; body carabidiform, very much so in some males; only third segment of hind tarsi broad and definitely tomentose beneath ---------- DITYLONIA
Eyes small, reniform; head definitely narrower than pronotum at widest dimension; body less carabidiform; second and third segments of hind tarsi broad and tomentose beneath ---------- DITYLUS

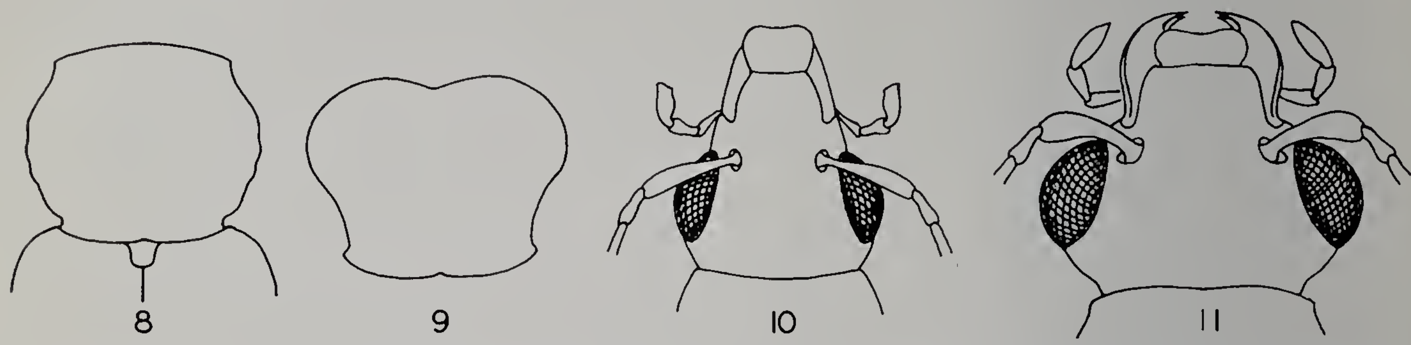
11(9). Eyes small to moderate, round or oval, at most only very slightly emarginate (fig. 6); mandibles bifid at apices ---------- 12
Eyes moderate to large, definitely emarginate, usually reniform (fig. 7); mandibles bifid at apices, or entire ---------- 16

12(11). Pronotum with dense erect hairs ---------- 13
Pronotum at most with fine (rarely coarse) depressed hairs ---------- 14



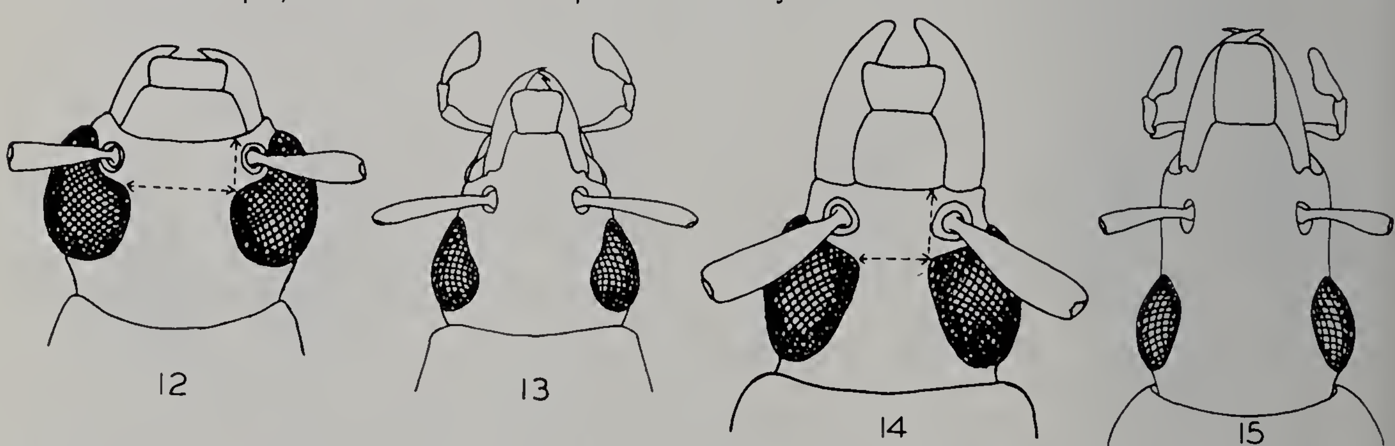
FIGURES 4-7. FIG. 4, *Oedemera nobilis* (Scopoli), elytra and hind legs, dorsal view; FIG. 5, *Ditylus quadricollis* LeConte, dorsal view; FIG. 6, *Heliocis repanda* (Horn), head, dorsal view; FIG. 7, *Diplectroides longicornis* Champion, head, dorsal view.

13(12). Pronotum broadest at middle (fig. 8); epipleural fold distinct anteriorly--MECOPSELAPHUS
Pronotum distinctly cordate (fig. 9); epipleural fold lacking ---------------PLATYLYTRA
14(12). Claws toothed or distinctly quadrate at base; head short (fig. 10)------------VODOMARUS
Claws simple, never appearing distinctly quadrate------------------------- 15
15(14). Head somewhat elongate; eyes partly dorsal; antennae inserted in front of eyes (fig. 6); body compact---HELIOCIS
Head definitely short, eyes lateral, antennae inserted between eyes (fig. 11); body elongate ---SISENECANTHARIS



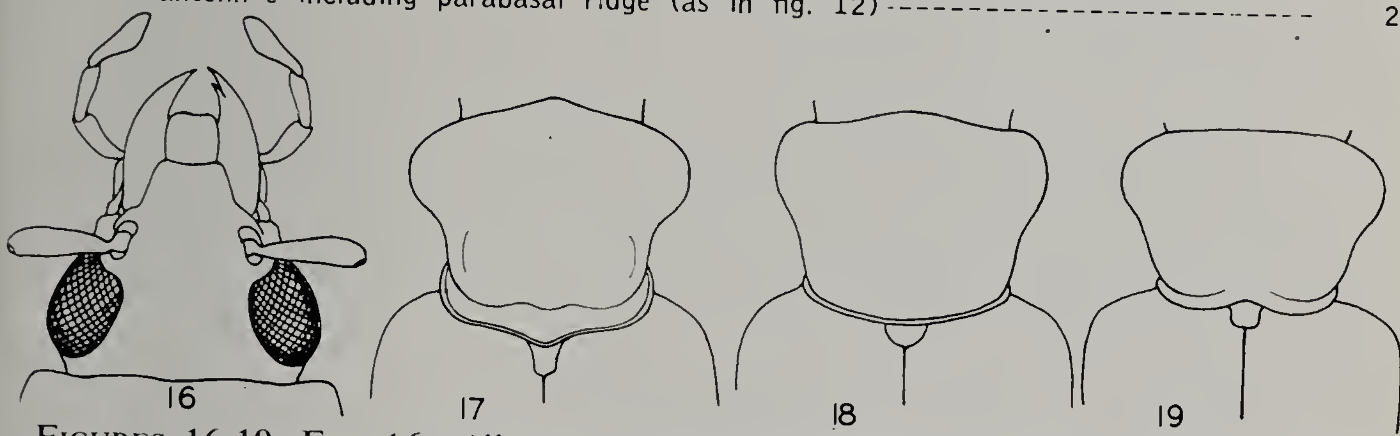
FIGURES 8-11. FIG. 8, *Mecopselaphus maculicollis* Solier, pronotum, dorsal view; FIG. 9, *Platylytra vitticollis* Fairmaire, pronotum, dorsal view; FIG. 10, *Vodomarus foveolatus* Champion, head, dorsal view; FIG. 11, *Sisencantharis chilensis* (Fairmaire), head, dorsal view.

16(11). Both mandibles entire-- 17
Both mandibles bifid at apices--- 22
Right mandible with small, subapical tooth, left mandible entire---------------- 21
17(16). Claws simple, at most slightly quadrate at base------------------------------ 18
Claws with distinct basal tooth------------------------------------- PROXACIS
18(17). Eyes large, closer together in dorsal view than bases of antennae (fig. 7)-- DIPLECTROIDES
Eyes somewhat smaller, farther apart in dorsal view, nearly as far, or farther apart than bases of antennae (fig. 12)------------------------------------- 19
19(18). Eyes moderate, round, only slightly emarginate; head short, front from inner anterior corners of eyes to epistomal ridge much shorter than distance between eyes (fig. 12) --XANTHOCHROINA
Eyes larger, emarginate; head moderate to elongate in length; front from inner anterior corners of eyes to epistomal ridge as long as or longer than distance between eyes --- 20
20(18). Head elongate, at least twice as long as broad (fig. 15)----------------RHINOPLATIA
Head about as broad as long, exclusive of mandibles which may be elongate (fig. 14) ---OXACIS
21(16). Head elongate in front, longer than wide; pronotum elongate, subcordate; eyes transverse, slightly emarginate (fig. 13)------------------------------------PIRAS
Head about as long as wide (fig. 16); pronotum about as long as broad, cordate; eyes reniform ---ALLOXACIS
22(16). Claws toothed at base--- 23
Claws simple, at most somewhat quadrate basally---------------------------- 25



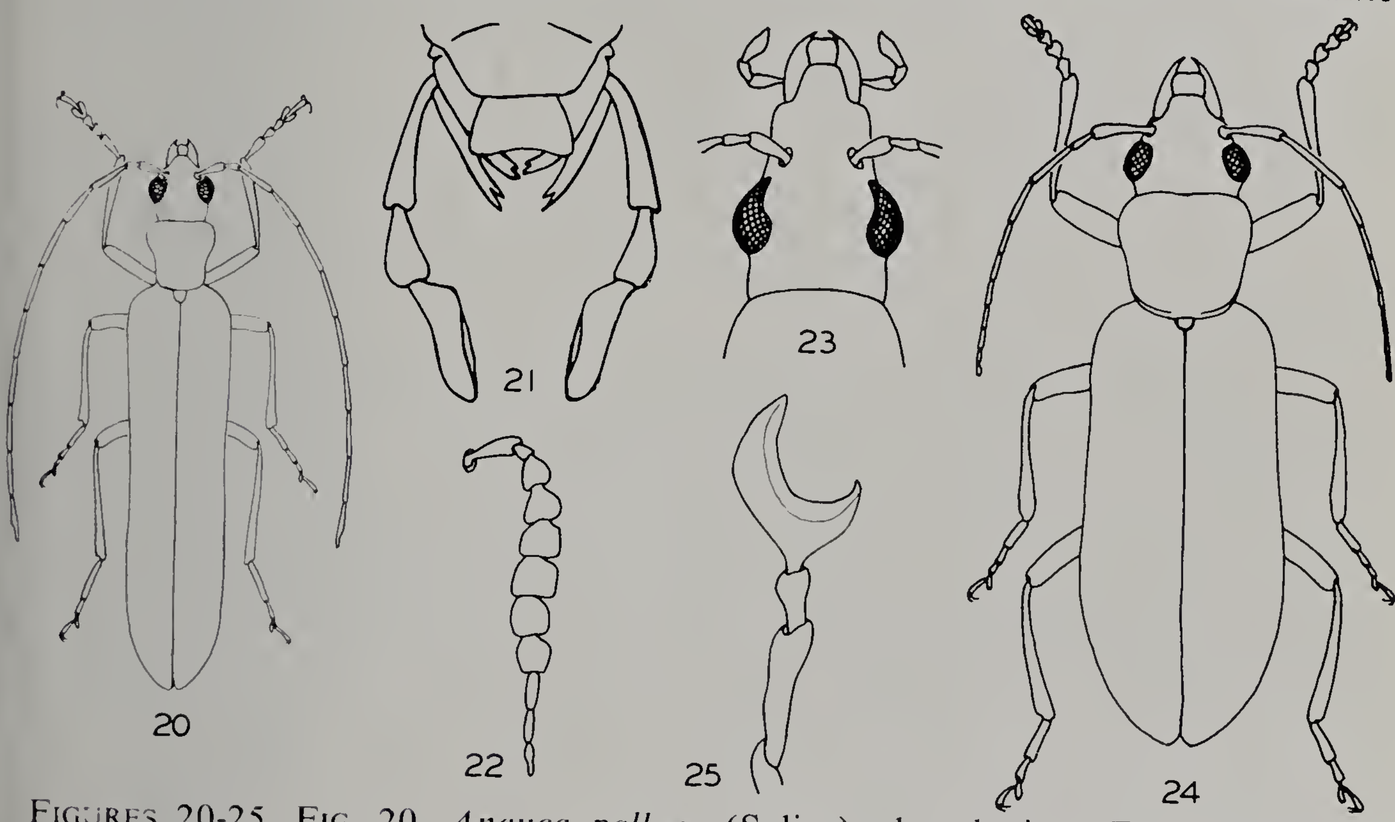
FIGURES 12-15. FIG. 12, *Xanthochroina bicolor* (LeConte), head, dorsal view; FIG. 13, *Piras nasalis* Champion, head, dorsal view; FIG. 14, *Oxacis trimaculata* Champion, head, dorsal view; FIG. 15, *Rhinoplatia ruficollis* Horn, head, dorsal view.

23(22). Each elytron with three complete costae; pronotum with two anterior lateral, and one median posterior impressions; male genitalia with furcate paramere ---------- ASCLERA
Elytra with vague, incomplete costae; pronotal impressions irregularly formed; male genitalia with large, trough-like paramere, apically acute ---------------------- 24
24(23). Pronotum with very prominent, elevated basal margin (fig. 17) -------- MIMODIPLECTRUS
Pronotum without noticeable basal elevation (fig. 18) ------------------ MATUSINHOSA
25(22). Eyes much closer together in dorsal view than bases of antennae including parabasal ridge (as in fig. 7) -- DIPLECTRUS
Eyes farther apart in dorsal view, nearly as far, or farther apart than bases of antennae including parabasal ridge (as in fig. 12) ---------------------- 26



FIGURES 16-19. FIG. 16, *Alloxacis dorsalis* (Melsheimer), head, dorsal view; FIG. 17, *Mimodeplectrus cyanipennis* Pic, pronotum, dorsal view; FIG. 18, *Matusinhosa reitteri* Pic, pronotum, dorsal view; FIG. 19, *Eumecomera obscura* (Horn), pronotum, dorsal view.

26(25). Second antennal segment short, one-third or less length of third segment ---------- 27
Second antennal segment long, one-half or more length of third segment ---------- 29
27(26). Pronotum broad (fig. 19); eyes reniform --------------------------- EUMECOMERA
Pronotum narrow, cordate (fig. 20); eyes emarginate ------------------------ 28
28(27). Galea apically bifid, large, usually visible from above; maxillary palpi large, longer than head (fig. 21) --- COPIDITA
Galea apically tufted, small, usually not visible from above; maxillary palpi not noticeably large; body slender, antennae long and delicate (fig. 20) ---------------- ANANCA



FIGURES 20-25. FIG. 20, *Ananca pallens* (Solier), dorsal view; FIG. 21, *Copidita quadrimaculata* (Motschulsky), mouthparts, dorsal view; FIG. 22, *Uroplatosisenes depressicornis* (Pic), antenna; FIG. 23, *Sisenes championi* Horn, head, dorsal view; FIG. 24, *Anisomallus cinerascens* (Fairmaire and Germain), dorsal view; FIG. 25, *Thelyphassa* sp., maxillary palpus of male.

29(26). Second antennal segment, small, broad and somewhat flattened, segments 3-8 enlarged and flattened, segments 9-11 filiform (fig. 22) ------------------ UROPLATOSISENES
Second antennal segment small, round; following segments at most somewhat flattened, never enlarged -- 30
30(29). Second antennal segment nearly as long as third; body slender; metallic or semi-metallic -- VASACES
Second antennal segment approximately one-half length of third ------------------ 31
31(30). Eyes protruding, widely separated dorsally, laterally placed (fig. 23); body a satin texture -- SISENES
Eyes not prominent, dorsally placed -- 32
32(31). Body subdepressed -- 33
Body noticeably rounded in cross-section; pronotum large, head large (fig. 24) ANISOMALLUS
33(32). Pronotum quadrate; apical segment of maxillary palpi of male greatly enlarged, C-shaped (fig. 25) -- THELYPHASSA
Pronotum cordate; apical segment of maxillary palpi of male not modified ------ OXYCOPIS

NOTES ON THE GENERA AND SPECIES.—The following genera, all of which are included in the preceding key, are now known to occur in the New World.

CALOPODINAE

Calopus Fabricius, 1775

One species only, *C. angustatus* LeConte, 1851, occurs in the New World in the Pacific Northwest in fair numbers. Ten old specimens collected in Quebec, Maine, and Pennsylvania have been seen, but the presence of this species in Northeastern United States and Canada needs to be authenticated by an examination of additional specimens. The preceding key to genera makes use of bifid mandibles to separate this genus from *Sparedrus*. There is a specimen in the United States National Museum Collection from Tibet, apparently an undescribed species, which has both mandibles entire so that this characteristic is not usable outside of the New World. However, the characteristics of the male genitalia are valid for all species of this genus.

Sparedrus Dejean, 1821

Seven species are included here. The five New World species are confined to Texas and Central America. It appears that not all of these are distinct species, but not enough material is available at present to confirm this.

The subfamily Calopodinae appears to be an ancient branch of the family, based on larval and adult characteristics. Although these insects are very different from other Oedemeridae, there are no reasons for associating them with another family or giving them family status. They meet all of the requirements for inclusion within the Oedemeridae as now defined. Crowson (1955) has pointed out valid affinities of this group with other heteromerous families, however, and if our assumption that these are ancient species is correct, these affinities indicate the possible origin of the family.

NACERDINAE

Xanthochroa Schmidt, 1846

The New World species in this genus are confined to the Nearctic Region and were revised by me in 1951. *Xanthochroa bogotensis* Kirsch, 1866, is transferred to *Nacerdes* (see below).

Nacerdes Dejean, 1834

Four species of this genus apparently occur in the New World. One is introduced, the other three are endemics. The following changes in the catalogs are necessary:

Nacerdes melanura (L., 1758)

Nacerda particularis Pic, 1924, Mél. Exot.-Ent., 42: 17. NEW SYNONYMY.

This species is common in North America along both coasts and along major drainage systems. I have seen only one specimen from South America, that from Chile, but a number of specimens are available from the West Indies. It has also been reported from Baja California, Mexico, Costa Rica, and Argentina. Pic's *N. particularis* from Colombia is obviously this species and is placed in synonymy above. The apical black spots on each elytron are not mentioned in his description, but these are frequently reduced or absent as may be seen in long series.

Nacerdes bogotensis (Kirsch, 1866) NEW COMBINATION

This species is transferred from *Xanthochroa* and is known to me from Panama. The widely separated eyes and other features make this new generic assignment necessary.

The other two species assigned here, *N. brevipennis* Fairmaire, and *N. cinerea* Laporte are unknown to me, but I suspect that they should be assigned elsewhere.

Dityloidea Fairmaire and Germain, 1863

Dityloidea janthina (Fairmaire and Germain), the only species in this genus, is well represented in collections and is abundant. It can be easily separated by the key to genera above.

Micronacerdes Pic, 1923

Pic has described six species and two varieties in this genus. Two specimens have been identified by me as belonging to this genus. The genus was placed in the Asclerini in Blackwelder's catalog (1945), but Pic's description makes it clear that the genus should be in the Nacerdinae following *Nacerdes*. The assignment of *Asclera suturalis* Fleutiaux and Sallé, 1889 to this genus by Pic is not correct. This species is *Alloxacis simplex* Waterhouse (see below under *Alloxacis*). The two species known to me are: *M. atricollis* Pic, 1923, from Peru (length 5.2 mm.; Monson Valley, Tingo Maria, Nov. 29, 1945, E. I. Schlinger and E. S. Ross, colls., California Acad. Sci. Coll.), and *M. latefasciatus* Pic, 1923, from Bolivia (length 6.5 mm.; Rurrenabaque Beni, W. M. Mann, coll., United States Nat. Mus. Coll.). Both specimens have broken antennae, but they show that the apical two segments are pale, a feature not mentioned by Pic in his brief descriptions. The small size and quadrate pronotum, plus characters given in the key will serve to separate members of this genus until more material is available for better descriptions.

Sisenopiras Pic, 1923

Six species are included in this genus by Pic, all from Brazil. The genus belongs in the Nacerdinae near *Nacerdes,* but is very distinct. An undescribed species in the United States Nat Mus. collection also occurs in British Guiana.

Redescription of the genus.—Body elongate, length 9.5 to 13.5 mm. Head elongate, twice as long as wide exclusive of the eyes. Eyes placed at the extreme lateral margin of the head, round, entire, bulging, hemispherical. Antennae inserted near eyes, distant from base of mandibles; long and slender, as long as, or longer than the body giving the insect a decided cerambycid appearance. Mandibles both bifid at the apices. Apical segment of the maxillary palpus elongate, apically obliquely truncate. Pronotum elongate, quadrate, widest subapically. Legs long and slender; tarsal formula 5-5-4; fore tibia with a single apical spur; hind tarsi with the penultimate segment bilobed, and tomentose beneath, other segments without such a tomentose pad. Elytra elongate, apically rounded, entire. Abdomen of male with the fifth visible sternite emarginate, the genitalia exposed.

Further description and characterization of the species will be presented in a revision of the genus in a later paper.

Oedemerinae

The division of this subfamily into tribes, supplemented by characters of male genitalia and larvae, will be the subject of a later paper. Rozen (1960) has shown that certain changes are necessary. Before a firm classification can be offered, a better study of the Old World genera is necessary. The Ditylini and Asclerini are fairly well defined. It appears that the Oedemerini might not occur in the New World, but the tribe has not been properly defined on adult characters, so for the present Rozen's definition will obtain. I have allowed no New World genera to remain in the Oedemerini, but this is very unsatisfactory because of the lack of a proper definition of the tribe.

Ditylini

The genus *Ditylini* remains as in my 1951 revision. The genus *Ditylonia* Seidlitz, 1899 should also be included in this tribe, and contains the six Central American species described by Champion in *Ditylus.*

Asclerini

The remaining New World genera of the family are members of this tribe. They should be arranged in the following order.

Mecopselaphus Solier, 1849

Two species are included here. *M. maculicollis* Solier is abundant in Chile. I am not familiar with *M. lycoides* Kirsch, 1873 from Peru.

Platylytra Fairmaire and Germain, 1863

The single species *P. vitticollis* Fairmaire and Germain from Chile is all that is included here. This genus is similar to the preceding genus, but may be easily recognized by the characters given in the key.

Matusinhosa Pic, 1923

Seven species and a variety are included in this genus by Pic. A mistake in Blackwelder's catalog lists all but one from French Guiana, and omits one species. Actually all but one occur in Brazil. I have before me all of the species except *M. minuta* Pic, 1923, the only one from French Guiana. I suspect that this species is really not a member of this genus, but more material is necessary before this can be certain. The genus is best defined on the basis of the characters of the male genitalia. Further definition must await a revision of the genus.

Mimodiplectrus Pic, 1923

This genus is monobasic. It appears to be merely an aberrant species of the preceding genus, with very similar male genitalia, but must be studied further before this can be verified.

Diplectrus Kirsch, 1866

This large genus, with 21 species, is badly in need of revision. Some species assigned here may eventually prove to be misassigned, and some of the species in *Sisenes* probably fall here. All species occur in Central or South America.

Eumecomera Arnett, 1951

There are no changes necessary here (see Arnett, 1951).

Vodomarus Champion, 1889

This genus contains two species, one from Mexico and Guatemala, and an apparently undescribed species from Panama. It is possible that the latter has been described in another genus, so description will be postponed pending further study. *V. chilensis* (Fairmaire, 1863) is transferred to *Sisenecantharis* (see below).

Heliocis Arnett, 1951

This monobasic genus remains as described. The record of one male from Arizona is very doubtful (as in Arnett, 1951). This is a Horn paratype (*Chrysanthia repanda* Horn, 1896) and should be considered as mislabeled. The species is abundant in Florida and in Texas. There are differences between these two populations which may or may not be sufficient to consider them separate species. Only after considerably more study can the significance of the differences be determined. The Florida specimens have been found on *Rubus* sp., *Ptelea trifoliata,* and *Erigeron quercifolius.*

Xanthochroina Ganglbauer, 1881

The New World species in this genus, *X. bicolor* (LeConte, 1851) remains the only described species for this area. Two other species occur in Brazil, which may belong here, but again, these may well be described in another genus, e.g., *Oxacis* or *Copidita,* so further comments must wait until this can be clarified. The North American species is widely distributed throughout the western mountain region where it is associated with dying pine.

Alloxacis Horn, 1896

This is another genus badly in need of revision. Many species are to be included here which were placed in *Oxacis* by Champion due to a lack of definition prior to 1896. Pic failed to realize that *Alloxacis* also occurs in the Neotropical Region. In addition to those species treated in my Nearctic Region revision (1951) and the species described since then, the following species are included here. All known species occur in the New World except two species, *Alloxacis flavipes* Kôno, 1937 from Saipan, and *Alloxacis geniculata* Kôno, 1937 from Okinawa, both of which belong to this genus. It is likely that other Old World species also will be assigned to the genus.

Alloxacis hoodi VanDyke, 1953

Alloxacis hoodi VanDyke, 1953. Occ. Pap. California Acad. Sci., no. 22, p. 43. (Galapagos Islands).

Alloxacis simplex (Waterhouse, 1879) NEW COMBINATION

Copidita simplex Waterhouse, 1879. Trans. Ent. Soc. London, p. 308. (St. Barthelemy).

Asclera suturalis Fleutiaux and Sallé, 1898. Ann. Soc. Ent. France (6) 9: 434 (Guadeloupe) NEW SYNONYMY.

Micronacerdes suturalis var. *dufaui* Pic, 1929. Échange, 45: 8 (Guadeloupe) NEW SYNONYMY.

Alloxacis tropicalis Champion, 1890, NEW COMBINATION

Oxacis tropicalis Champion, 1890. Biol. Centrali-Americana, Coleopt. 4(2): 157 (British Honduras and Honduras).

Alloxacis flavicollis (Kirsch, 1866) NEW COMBINATION

Hypasclera flavicollis Kirsch, 1866. Berliner Ent. Zeitschr., 10: 213 (Colombia).

Alloxacis binotaticeps (Pic, 1934) NEW COMBINATION

Oxacis binotaticeps Pic, 1934. Mél., 63: 25 (Costa Rica).

This is probably a synonym of *A. tropicalis* Champion.

Piras Champion, 1889

Only a few specimens of this genus representing two species are known. Aside from the somewhat elongate head, there is little to separate it from *Alloxacis*.

Oxacis LeConte, 1886

This is one of the largest genera of the family. It is confined to the New World; all Old World species belong in other genera, and are transferred to other genera below. Some species of "Copidita" as described by Pic belong here, and many species are removed to other genera. This genus is being revised by the author and will be the subject of an extensive paper elsewhere. In each case the species removed lack the characteristics of *Oxacis, sensu stricto* Arnett, 1951. All of the species below have been described in, or have been later assigned to *Oxacis*. All species not listed here remain in the genus as they are listed in the Junk catalog (Schenkling, 1915). The result of this action leaves only New World species in the genus.

Oxacis debilis Horn, 1896 to *Paroxacis* (Nearctic)

Oxacis falli Blatchley, 1928 to *Oxycopis* (Nearctic)

Oxacis lucana (LeConte, 1866) to Paroxacis (Nearctic)

Oxacis notoxoides (Fabricius, 1801) to *Oxycopis* (Nearctic)

Oxacis thoracica (Fabricius, 1801) to *Oxycopis* (Nearctic)

Oxacis suturalis (Horn, 1896) to *Oxycopis* (Nearctic)

Oxacis mimetica (Horn, 1896) to *Oxycopis* (Nearctic)

Oxacis fuliginosa LeConte, 1866 to *Oxycopis* (Nearctic)

Oxacis (Oxycopis) luteostriata Arnett, 1951 to *Oxycopis* (Nearctic)

Oxacis (Oxycopis) mcdonaldi Arnett, 1951 to *Oxycopis* (Nearctic)

Oxacis (Oxycopis) dietrichi Arnett, 1951 to *Oxycopis* (Nearctic)

Oxacis (Oxycopis) mariae Arnett, 1951 to *Oxycopis* (Nearctic)

Oxacis (Xanthochroina) bicolor (LeConte, 1851) to *Xanthochroina* (Nearctic), NEW COMBINATION

Oxacis (Paroxacis) recendita Arnett, 1951 to *Paroxacis* (Nearctic)

Oxacis (Paroxacis) interrita Arnett, 1951 to *Paroxacis* (Nearctic)

Oxacis holosericea Champion, 1890 to *Alloxacis* (Nearctic and Neotropical)

Oxacis femoralis Champion, 1890 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis mandibularis Champion, 1890 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis pleuralis (LeConte, 1866) to *Alloxacis* (Nearctic and Neotropical)

Oxacis litoralis Champion, 1890 to *Paroxacis* (Neotropical) NEW COMBINATION

Hypasclera flavicollis Kirsch, 1866 to *Alloxacis* (Neotropical) NEW COMBINATION

Oxacis limbata Champion, 1890 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis carinicollis Lewis, 1895 to *Asclera* (Palearctic)

Oxacis pallidicolor Pic, 1934, to *Ananca* (Ethiopian) NEW COMBINATION

Oxacis vittipennis Lea, 1917 to *Sessinia* (Australian) NEW COMBINATION

Oxacis apicicollis Lea, 1917 to *Sessinia* (Australian) NEW COMBINATION

Oxacis concaviceps Blackburn, 1899 to *Sessinia* (Australian)

Oxacis majorina Lea, 1917 to *Sessinia* (Australian) NEW COMBINATION

Oxacis caloptera Lea, 1917 to *Sessinia* (Australian) NEW COMBINATION

Oxacis picticeps Lea, 1917 to *Sessinia* (Australian) NEW COMBINATION

Oxacis geayi Pic, 1935 to *Oxycopis* (Neotropical) NEW COMBINATION

Oxacis alternata Pic, 1927 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis latecincta Pic, 1927 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis poirieri Pic, 1935 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis discoidalis Pic, 1934 to *Oxycopis* (Neotropical) NEW COMBINATION

Oxacis binotatipennis Pic, 1934 to *Oxycopis* (Neotropical) NEW COMBINATION

Oxacis binotaticeps Pic, 1934 to *Alloxacis* (Neotropical) NEW COMBINATION

Oxacis geniculata Chevrolet, 1877 to *Paroxacis* (Neotropical) NEW COMBINATION

Oxacis galapagoensis Linell, 1898 to *Paroxacis* (Neotropical) NEW COMBINATION

Rhinoplatia Horn, 1868

In addition to the two species known from Southwestern United States, there is a third species, undescribed, from Chile. The single specimen is a female with prominent markings. I cannot be certain that this is congeneric with the species of *Rhinoplatia* until I see a male; therefore, formal description will be delayed until more material is available.

Paroxacis Arnett, 1951

This genus was described as a subgenus of *Oxacis* but was elevated to generic rank because the features are as distinct as those used for other genera in the family, a fact not obvious at the time of its description. Many South American species belong here, some of which have been assigned in the listing under *Oxacis*, above. The complete list will be shown in the catalog to be published later.

Diplectroides Champion, 1889

The four species listed in Blackwelder's catalog (1945) are before me in very small series. I doubt the validity of *D. pectoralis* Pic, 1923, but the limited number of specimens makes it impossible to know the variation of color pattern used to separate this from *D. flavicollis* Champion, 1890.

Copidita LeConte, 1866

Only two species are included in this genus, *C. quadrimaculata* (Motschulsky, 1853), a litoral species along the western coast of the United States, and *Copodita* (sic) *Lycopodita lyciformis* Pic, 1924. This second species almost certainly does not belong here. But because of the peculiar problem it presents, it is kept here until this can be solved. Like most all of the other species Pic and other authors have assigned to *Copidita, C. lyciformis* probably belongs in *Oxycopis*. However, in a footnote Pic erected the subgenus *Lycopodita* for this species. All catalogers, including Zoological Record, have overlooked this name, as is easy to do in such cases. The following is the reference:

Lycopodita Pic, 1924. Mél. Exot.-Ent., 42: 21 (note 1).

Type species: *Copodita* (sic) *Lycopodita lyciformis* Pic, 1924, l.c., p. 21 (monbasic).

I have identified in some material from Brazil, specimens which seem to fit the description of the subgenus *Lycopodita*. If these are correctly identified, then this is a senior synonym of *Oxycopis,* but in view of the number of name changes again necessary, I do not deem it advisable to make this synonymy until the holotype of the type species can be studied. Therefore, it is necessary for present cataloging purposes to keep this as a subgenus and species of *Copidita* LeConte, 1866.

Ananca Fairmaire and Germain, 1863

I have examined the type species of both *Ananca* and *Sessinia* and find these species to be generically distinct. *Ananca* has been treated by all recent authors as a junior synonym of *Sessinia*. This incorrect synonymy has caused great confusion in the literature. Among other things, *Sessinia* has the mandibles entire, while *Ananca* has them both bifid at the apices. This alone is of sufficient value to separate the two as genera. Moreover, the two species of these genera have a different habitus and other features which make them distinct. *Ananca* is confined to the New World and *Sessinia* to the Old World. Unfortunately, most of the Old World species recently described in *Sessinia* belong in the genus *Eobia,* a situation requiring still further nomenclatorial changes. Many of the New World species described in *Sessinia* belong in *Oxycopis* rather than *Ananca*. These New World changes will be reflected in the pending catalog.

Oxycopis Arnett, 1951

This genus was also described as a subgenus of *Oxacis,* but subsequently elevated to generic rank because the distinctive features are sufficient to warrant such action in the light of what is now known about oedemerid genera. Most of the species assigned to *Copidita* and many species in *Sessinia* belong here.

Anisomallus Fairmaire and Germain, 1863. Ann. Soc. Ent. France, ser. 4 3: 276.

Type species: *Ditylus cinerascens* Fairmaire and Germain, 1861, Coléoptères du Chile, 2: 6 (monobasic).

Type specimen: British Museum (Natural History).

This genus and species has been overlooked since the Gemminger and Harold catalog (Catalogus Coleopterorum, 7: 2166, 1870). It is related to *Oxycopis*. The single female type is known from San Antonio, Chile (Central Chile). I have a very large number of specimens of this species from Chile.

Vasaces Champion, 1889

There are no changes here since my revision of the genus in 1953. Since then, however, I have seen additional material of each of the species which helps to confirm their specific rank.

Sisenecantharis Pic, 1942. Échange Num. Spéc. (Opusc. Mart. VIII), p. 14.

Type species: *Sisenecantharis ruficeps* Pic, l.c., p. 14 (monobasic).

Pic described this genus for his species from Chile. The type species is a synonym of *Oedemera chilensis* Fairmaire, which does not belong in the genus *Oedemera*. A corrected catalog is given below.

Sisenecantharis chilensis (Fairmaire, 1863) NEW COMBINATION

Oedemera chilensis Fairmaire, 1863. Ann. Soc. Ent. France, ser. 4, 3: 282.

Sisenecantharis ruficeps Pic, 1942. Échange, Num. Spéc. (Opusc. Mart. VII), p. 14. NEW SYNONYMY.

This species occurs in Chile in fair abundance. It has been placed in the *Oedemera* subgenus *Stenaxis* Schmidt, 1846, but is not congeneric with the type species of that subgenus.

Sisenecantharis vittata (Kirsch, 1873) NEW COMBINATION

Stenaxis vittata Kirsch, 1873. Berliner Ent. Zeitschr., 17: 416.

This species is described from Peru (from Sarayaxu), but is not available to me. However, the description and the generic placement in *Stenaxis* indicate that it should belong here.

There is a third species, from Chile, which appears to be undescribed, but may be one of the species described in *Ananca* or *Sessinia*. Until these are worked out, it is best not to describe this species as new.

Sisenes Champion, 1889

Many species have been described in this genus. Through an unfortunate mistake, I designated an obscure species as the type species of this genus. (This is one of the weaknesses of preparing type species catalogs without knowing the species in each case.) This will result in a name change for the more familiar species because not all of those species now assigned to the genus are congeneric with the type of the genus. More material is needed from Mexico before this classification change can be effected.

Uroplatosisenes Pic, 1934

Pic described this genus as a subgenus of *Sisenes*. However, the antennal structure is sufficient, along with some other body features exhibited by the specimens before me, to consider these species separate and generically distinct from the type species of *Sisenes*. *Uroplatosisenes* is therefore given generic rank.

Thelyphassa Pascoe, 1876

It is no surprise that an Australian and New Zealand genus is represented in Chile. One specimen sent to me by Dr. Kuschel belongs in this genus. It appears to be distinct from all of the Old World species of this genus known to me. It has the generic characters of the type species of the genus, and is a male. It is in too poor a condition, I believe, to describe as the holotype specimen of a new species, so I prefer to wait pending the receipt of more material.

Asclera Dejean, 1834

This genus is well represented in both the Old World and the New World faunas. The Nearctic species were treated by me in 1951. *Oedemera vestita* Say, 1823, sometimes referred to *Asclera* properly belongs in *Stereopalus* of Pedilidae. The Leng catalog lists this species in both the Pedilidae and Oedemeridae. Pic has described eight species from the Neotropical Region which appear to belong here and will be treated in a later revision.

Postscript.—Many changes have been suggested throughout the body of this paper which have not been documented. I am fully aware of the situation this creates from the standpoint of catalogers wishing to record these findings, especially if for some reason, I am unable to complete the work alluded to herein. My excuse is threefold: 1) I lack sufficient material to make the kind of descriptions and classifications demanded by modern systematics. 2) The extremely difficult situation created by the brief and perhaps incorrect descriptions of Pic has made it impossible to present a classification based on the material at hand. Of the approximately 163 species listed from South America, Pic has named all but 37. Very few of the 37 species not described by Pic have ever been mentioned since their original description in the mid 1800's, which is a situation that prevails in a great many beetle families in the Neotropical region. The Pic types are not readily available, although I have been fortunate to have had some paratypic material available. Although it appears that this study is premature, I wish to offer it at this time with the hope that it will permit further studies made possible by this skeleton classification of the genera.

Further documentation will be published as time and material permits. 3) It is my belief that the key to the genera is valuable, and even this key would not be possible if I were not to make the changes mentioned above. We are ultimately interested in the relationships of the natural species. The classification and nomenclature are merely means of filing information to make the study of these species possible. Even our crude beginning of biological studies is hampered by our nomenclatorial system based on priority, though this is the only way we can now work. If we accept the system, we must be content with its limitations.

Literature cited

ARNETT, R. H., JR.
1951. American Midland Nat., 45: 257-391.
1953. Proc. United States Nat. Mus., 103 (no. 3317): 87-94.

BLACKWELDER, R. E.
1945. United States Nat. Mus. Bull. no. 185, pp. 489-492.

CROWSON, R. A.
1955. The natural classification of the families of Coleoptera, London, p. 130.

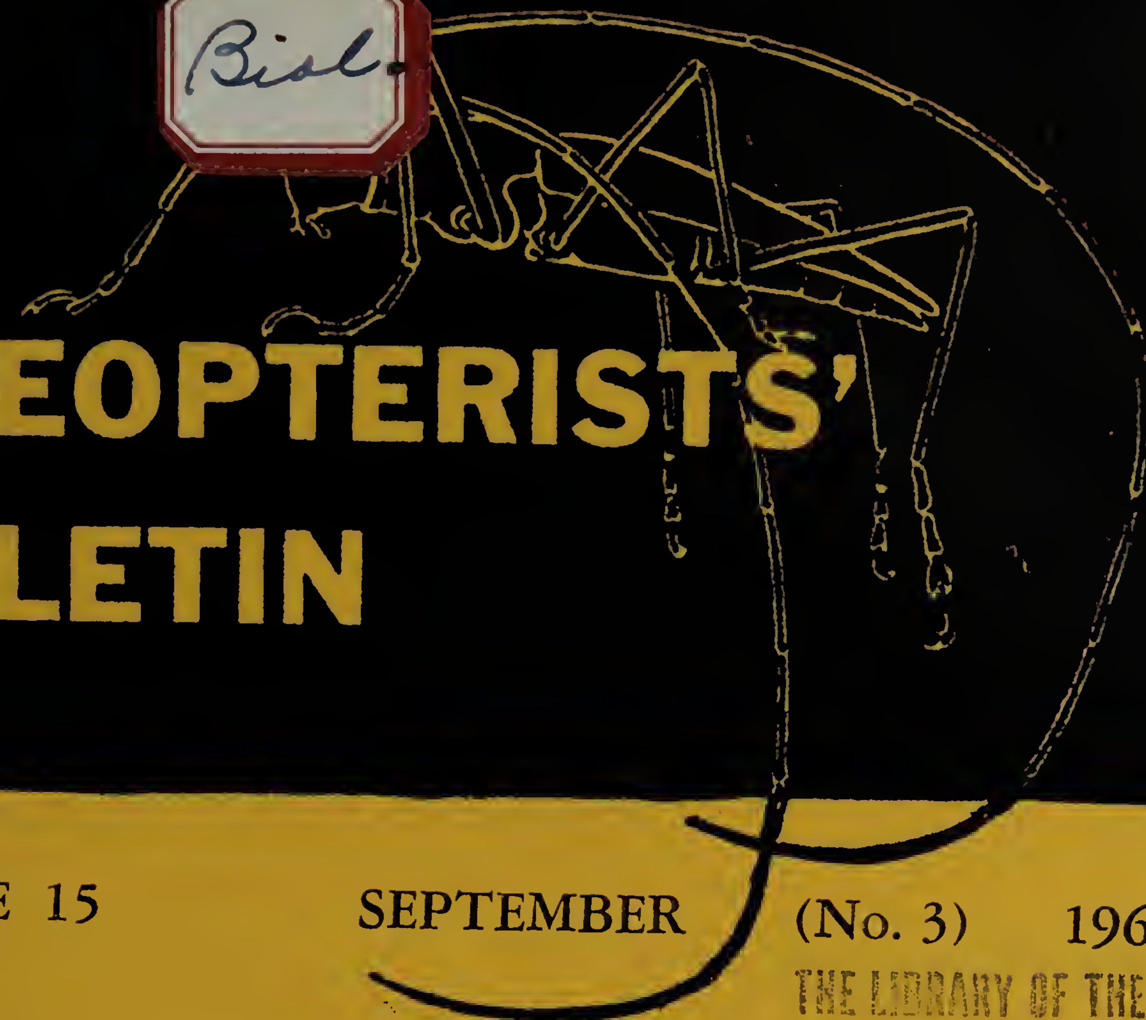
ROZEN, J.
1960. Misc. Publ. Ent. Soc. America, 1: 35-68.

SCHENKLING, S.
1915. Col. Cat., pars. 65, 82 pp.

SEIDLITZ, G. in ERICHSON, W. F.
1899. Nat. Ins. Deutschland, Col., 5 (2): 681-968.

SEIDLITZ, G.
1917. Deutsche Ent. Zeitschr., 1917, Dh. I/II, p. 94.

THE COLEOPTERISTS' BULLETIN



VOLUME 15 SEPTEMBER (No. 3) 1961

ARTICLES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by Ross H. Arnett, Jr. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, Department of Biology, Catholic University of America, Washington 17, D. C.

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 15 September (No. 3) 1961

REVISION OF THE SPECIES OF PYROPYGA (LAMPYRIDAE)

By JOHN WAGENER GREEN [1]

The genera of the lampyrid series from *Lucidota* to *Photinus* are mutually very similar in their external anatomy. Motschulsky (1853) described a considerable number of these that were subsequently suppressed as synonyms by Olivier. Motschulsky's descriptions were not satisfactory, being based primarily on the light organs, with which he apparently included all pale areas of the ventral abdominal surface. Fortunately he designated a type species for each genus. One of these, *Pyropyga,* is the subject of the present discussion.

LeConte recognized *Pyropyga* as a valid genus, but he included therein a mixture of generic types. After removing these misfits, there remain four specific names cited by LeConte that are properly assignable to *Pyropyga,* namely, *nigricans* Say, *fenestralis* Melsheimer, *decipiens* Harris, and *minuta* LeConte. Another species, *P. incognita* E. Olivier, occurs in the West Indies. Motschulsky designated *P. nigricans* Say as the type of his genus, and added as additional species *P. californica* Motschulsky and *P. tarda* Motschulsky. The latter, from Brazil, is unknown to the author. The type species has remained more or less unknown, but a study of Say's description points conclusively to its identity with *P. fenestralis,* Say's name having priority. This synonymy was suggested to the author some years ago by the late H. S. Barber, an authority on the Lampyridae. Gorham's description of *Lucidota exstincta* (1880:17), from Guatemala, apparently applies to a species of *Pyropyga.* Since his type specimen was a female and therefore unidentifiable, it must be regarded for the present as a species indeterminata. In the Biologia (1881:48) Gorham placed his species in the genus *Photinus,* and added additional material from Mexico, undoubtedly a species mixture.

A random check of the male genitalia of an assortment of Neotropical *Photinini* revealed a gratifying diversity of structure that undoubtedly will supply the key to their generic segregation. The male genitalia of *Pyropyga* are of a unique type, interpreted in the following manner. All the exterior parts are closely united to form a subtubulate tegmen, with the distal section of the median lobe, and subapical processes of the lateral lobes, free. Two species categories are indicated according as the lateral lobes are each provided with an outer and an inner process, or with the outer

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[1] California Academy of Sciences.

process only. The prominent outer process arises near the tip of the lateral lobe and extends forward usually somewhat beyond the tip of the median lobe. The inner process is small and concealed laterally by the outer process, but it is visible, in part at least, from a ventral viewpoint. These processes arise at the origin of the outer processes, and extend forward as far as, or farther than, the apices of the lateral lobes, but on a lower level. The tips of the inner processes are inflexed, and are either in contact with each other or with the lower edge of the median lobe. From a dorsal viewpoint, the lateral lobes, excluding the processes, usually embrace the base of the free part of the median lobe, which hereinafter will be designated simply the median lobe. An exception to this formation occurs in *P. incognita,* where the lateral lobes unite and cover the base of the median lobe. A considerable amount of variability is evident in the genitalia, and this is especially true of the two most widely distributed species, *P. minuta* and *P. nigricans*. It is possible that these two species are complexes that will eventually be divided. No correlation has been noted, however, between genitalic variations and geographic habitat or any external characteristics.

In all the known species of *Pyropyga* the body, except the prothorax, is entirely black or dark piceous. The pronotum is pale flavate, often with a rosy tinge, and is provided with a sharply defined median vitta roughly one-third to one-half the pronotal width. The vitta extends usually from apex to base, where it is often somewhat abruptly expanded. In *P. nigricans* the pronotum is also normally completely bordered with black, while in *P. decipiens* the entire pronotum may be dark. In both these species, however, the pronotum may be pale with only the median vitta dark. In *P. alticola* the vitta is expanded to cover nearly all of the convex median area.

This study was based largely on the collection of the California Academy of Sciences. Additional material of great value was received from the following institutions and individuals, to whom the author expresses his sincere thanks and appreciation. The abbreviations in parentheses are used in the text to indicate the present location of certain specimens.

(AMNH) American Museum of Natural History, Mont A. Cazier, Marjorie Statham.

(CU) Cornell University, Henry Dietrich.

(OSU) Ohio State University, J. N. Knull.

(UCal) University of California at Berkeley, P. D. Hurd, Jerry Powell.

(UKans) University of Kansas, G. W. Byers.

(UMich) University of Michigan, T. E. Moore.

F. A. McDermott.

Pyropyga Motschulsky

Pyropyga Motschulsky, 1852, Etudes entomologiques, Helsingfors, p. 28.

Any generic description of *Pyropyga* will necessarily be inadequate, inasmuch as related genera are at present unrecognized and proper distinguishing characters cannot be given. Both sexes alate, non-luminous. Body texture soft; form elongate-oval, parallel-sided; size small, length 3-8.5

mm. Color black or dark piceous, pronotum pale with median vitta, sometimes also with dark borders, rarely entirely dark. Antennae similar in the sexes, about half as long as the body, rather slender, compressed, segments from third parallel-sided; vestiture fine, short, decumbent. Eyes small, distant. Clypeus subconnate with front, suture evident. Palpi as usual, maxillary massive, terminal segment of labial securiform. Prosternum emarginate in front. Elytra with dual pubescence, the secondary absent basally; epipleurae narrow. Legs short, tarsal claws simple. Male with pygidium broadly rounded or subtruncate at apex, ventral segment 8 arcuately emarginate; genitalia of the unique type described in a preceding paragraph.

KEY TO MALES OF PYROPYGA

1. Lateral lobes of genitalia with both outer and inner processes ------------------- 2
   Lateral lobes without inner processes ------------------------------------- 8
2. Median lobe of genitalia, viewed laterally, with lower margin sinuate near tip --------- 3
   Median lobe not as above -- 5
3. Pronotum normally with distinct black borders, these sometimes faint, rarely lacking. Median lobe of genitalia, viewed dorsally, broader at base, basal angles nearly right --(1) Pyropyga nigricans (Say)
   Pronotum normally without dark borders, sometimes faintly indicated. Median lobe narrower at base, basal angles strongly obtuse ------------------------------ 4
4. Median lobe of genitalia not extending beyond tips of outer processees ------------- --(2) Pyropyga modesta Green, new species
   Median lobe extending beyond tips of outer processes ------------------------ --(3) Pyropyga cordobana Green, new species
5. Tips of lateral lobes of genitalia greatly produced, nearly meeting tips of inner processes (Argentina) ---------------------(4) Pyropyga australis Green, new species
   Tips of lateral lobes not produced (North America)---------------------------- 6
6. Median lobe of genitalia broad, viewed laterally, not arcuately deflexed ---------- --(5) Pyropyga extensa Green, new species
   Median lobe narrow, arcuately deflexed between outer processes---------------- 7
7. Size smaller, less than 6 mm. in length. Pronotal vitta narrower, parallel-sided, expanded only near base-------------------------(6) Pyropyga minuta (LeConte)
   Size larger, 6 mm. or more in length. Pronotal vitta expanded to cover nearly all of convex surface, subparabolic, widening from apex to base ----------------- --(7) Pyropyga alticola Green, new species
8. Lateral lobes of genitalia, viewed dorsally, united over base of median lobe (British West Indies, Venezuela)---------------------------(8) Pyropyga incognita E. Olivier
   Lateral lobes normal, separated by base of median lobe (North America)----------- 9
9. Outer processes of genitalia, viewed ventrally, abruptly narrowed basally. Color pattern of pronotum variable (NE. United States, SE. Canada)----(9) Pyropyga decipiens (Harris)
   Outer processes not as above. Pronotum with median vitta only (Argentina)--------- --(10) Pyropyga saltensis Green, new species

Species indeterminata

Pyropyga tarda Motschulsky, 1853, Etudes Entom., p. 4.

Lucidota exstincta Gorham, 1880, Ent. Soc. London, Trans., p. 17.

In seven of the ten species of *Pyropyga* recognized herein, the male genitalia provide the only positive means of identification. Females must remain unidentified, or at best they may be tentatively placed through association in the field with the males. Detailed species descriptions would be completely useless. Differences in the relative length and width of pronotum and elytra occur, but the usual lampyrid variability in this respect nullifies its value as a taxonomic feature.

(1) *Pyropyga nigricans* (Say)

Lampyris nigricans Say, 1823, Acad. Nat. Sci. Philadelphia, Jour., 3: 179.

Pyratomena fenestralis Melsheimer, 1846, Acad. Nat. Sci. Philadelphia, Proc., 2: 304 (new synonymy).

Pyropyga californica Motschulsky, 1853, Etudes Entom., Helsingfors, p. 5.

Photinus reversus Gemminger, 1870, Coleop. Hefte, 6: 120.

Lucidota californica Gorham, 1880, Ent. Soc. London, Trans., p. 17.

Photinus sobrinus Gorham, 1881, Biol. Centrali-Amer., Coleop. 3, part 2, p. 49.

Body black or dark piceous, except pronotum pale with median vitta and entire border black, varying with borders only faintly darker, or not at all. Genitalia as in figure 1, inner processes present; viewed dorsally, median lobe broader as compared to two following species, basal angles nearly right. Length 4.25-8.5 mm.

Motschulsky designated this as the type species of the genus. Say's description unquestionably applies to the species subsequently named *fenestralis* by Melsheimer, which is now reduced to synonymy. The genitalia are confusingly variable, but always the median lobe, viewed dorsally, is quite wide at base with the basal angles nearly right. The median lobe in the two following related species is distinctly narrower with the basal angles strongly obtuse. The dorso-ventral outline varies from a normal elongate-oval to subtriangular or subrhombic. The lower margin of each outer process is slightly expanded and inflexed for a short distance beginning beyond the tip of the inner process, and possibly acting as a guide or stop limiting deflection of the median lobe. Such a structure occurs frequently in the Lampyrinae. It is not shown in the drawings but may be seen from a somewhat diagonally dorsal viewpoint. It is extremely variable in its development.

The pronotum of *P. nigricans* is usually completely bordered with black, in addition to the median vitta. The dark border varies to narrow and paler or indistinct, especially in specimens from Arizona. Complete elimination of the dark border is rare, but has been noted in a series from Corpus Christi, Texas.

In the females the terminal ventral segment of the abdomen is angulately notched at apex. The two preceding segments usually have a more or less distinct angulate notch at the middle of the apical margin, which is sinuate each side. It cannot be stated that this is a unique feature of *P. nigricans* because of the impossibility of identifying females of most of the other species.

In an interesting series collected by Peter Rubtzov at Pitkin Marsh in Sonoma County, California, the elytra in both sexes are definitely shortened, exposing several abdominal segments. In another series, collected by the author on the shores of Lake Champlain, near Plattsburg, New York, the same incipient brachyptery is evident in the females but not in the males. Possibly this phenomenon is associated with permanent moisture.

Distribution.—The range of this species includes all but the southeastern section of the United States. It is rather uncommon east of the Mississippi River, and apparently very abundant from the Rocky Mountains to the Pacific Coast. It is known also from British Columbia and Saskatchewan; and in Mexico from Baja California, Chihuahua, Sinaloa, Durango, Nayarit, Michoacan, Aguascalientes, Hidalgo, and Puebla.

(2) *Pyropyga modesta* Green, NEW SPECIES

Holotype.—MALE. Roaring River State Park, Missouri, VI-15-54, J. W. Green. In collection of California Academy of Sciences.

Body black, pronotum pale with median vitta. Genitalia as in figure 2, inner processes present; viewed dorsally, median lobe narrower as compared to *P. nigricans,* with basal angles strongly obtuse; median lobe not extending beyond tips of outer processes. Length 7.25 mm.

Variations.—In an occasional specimen from Arizona the pronotal borders are narrowly infuscate, never deep black as in *P. nigricans.* In one example, from Devils River, Texas, the pronotal vitta is partially obliterated. Length 5-7.25 mm.

Distribution.—UNITED STATES.—MISSOURI. Roaring River St. Park, VI-15-54, J. W. Green, holotype, 1 paratype (CAS). OKLAHOMA. Grandfield, VII-5-37, Standish-Kaiser, 1 paratype (CAS). Murray County, V-15-32, J. Smith, 1 paratype (CAS). TEXAS. Devils River, VII-27, J. W. Green, 2 paratypes (CAS). Edna, VIII-8-28, R. H. Beamer, 2 paratypes (UKans). Del Rio, VII-8-38, R. I. Sailer, 2 paratypes (UKans). Christoval, Tom Greene County, VI-29-48, C. & P. Vaurie, 1 paratype (AMNH). NEW MEXICO. Nogol Cn., Lincoln County, VI-23-21, C. D. Duncan, 1 paratype (CAS). ARIZONA. Oak Creek Canyon: VI-6-40, G. E. Bohart, 1 paratype (CAS); VII-9-41, E. L. Todd, 1 paratype (UKans); VI-26-50, J. G. Rosen, 1 paratype (UKans); VI-28-50, L. D. Beamer, 1 paratype (UKans). Chiricahua Mts.: VII-24-55, D. J. & J. N. Knull, 15 paratypes, 17 females (OSU); VII-3-47, L. D. Beamer, 1 paratype, 1 female (UKans); VII-4-40, D. E. Hardy, 1 paratype (UKans); SW. Research Station, VII-27-55, P. D. Hurd, 1 paratype, 2 females, 1 pair in copulo (UCal); Cave Creek, VII-4-30, J. O. Martin, 1 paratype (CAS). Huachuca Mts., W. side, Sunnyside Cn., 6000 ft., VIII-4-52, Leech & Green, 2 paratypes (CAS). Baboquivari Mts., E. side, Brown Cn., Pima County, VII-29-52, Leech & Green, 1 paratype (CAS). Tumacacori Mts., Yanks Spring, Sycamore Cn., Santa Cruz County, VIII-3-52, Leech & Green, 2 paratypes (CAS).

MEXICO.—COAHUILA. 15 mi. N. of Saltillo, V-24-52, Cazier et al., 1 paratype (AMNH). TAMAULIPAS. Liera, VII-19-54, U. Kans. Mex. Exped., 2 paratypes (UKans). S. L. POTOSI. Tamazunchale, XII-20-48, E. S. Ross, 1 paratype (CAS); Palitla, 5 mi. N. of Tamazunchale, XII-22-48, H. B. Leech, 1 paratype (CAS). MORELOS. Cuernavaca, VI, A. Fenyes collection, 2 paratypes (CAS).

(3) *Pyropyga cordobana* Green, NEW SPECIES

Holotype.—MALE. Cordoba, Vera Cruz, Mexico, Dr. A. Fenyes. In collection of California Academy of Sciences.

Body black, pronotum pale with median vitta. Genitalia as in figure 3; inner processes present; viewed dorsally, median lobe narrower as compared with *P. nigricans,* with basal angles strongly obtuse; median lobe extending beyond tips of outer processes; viewed laterally, outer processes with upper margin subrectilinear as compared to arcuate in *P. modesta.* Length 7.5 mm.

Variations.—Viewed laterally, the tip of the lateral lobe may be slightly produced downward, somewhat in the manner of *P. modesta.* Length 5.25-7.5 mm.

Distribution.—MEXICO.—VERA CRUZ. Cordoba, Dr. A. Fenyes, holotype, 6 paratypes (CAS). Orizaba, 2500 ft., II-13-54, R. R. Dreisbach, 1 paratype (CAS). S. L. POTOSI. 5 mi. N. of Tamazunchale, XII-22-48, E. S. Ross, 1 paratype (CAS). CHIAPAS. San Carlos, 10 mi. S., III-11-53, R. C. Bechtel & E. I. Schlinger, 2 paratypes, 1 female (UCal); 5 mi. S., III-6-53, Ray F. Smith, 1 paratype (UCal). Ocosingo, 4 mi. NW., III-9-53, Bechtel & Schlinger, 3 paratypes (UCal). Soyalo, 4 mi. SE., III-1-53, Bechtel & Schlinger, 2 paratypes (UCal).

(4) *Pyropyga australis* Green, NEW SPECIES

Holotype.—MALE. Tabillas, Salta, Argentina, G. L. Harrington. In collection of California Academy of Sciences.

Body dark piceous, probably somewhat teneral, pronotum pale with median vitta incomplete, not attaining base or apex. Genitalia as in figure 4, inner processes present; viewed laterally, lateral lobes each with tip greatly produced and nearly meeting tip of inner process. Length 5.25 mm.

Variations.—Except in the holotype, the color of the body is more nearly black. The pronotal vitta is abbreviated or indistinct in front, but usually attains the base or nearly so. Length 4.25-5.25 mm.

Distribution.—ARGENTINA.—Tabillas, Salta, G. L. Harrington, holotype, 1 female (CAS). Crest ridge NW. of Tucuman, II-11-51, Ross & Michelbacher, 1 paratype, 3 females (CAS).

(5) *Pyropyga extensa* Green, NEW SPECIES

Holotype.—MALE. Jalapa, Mexico, May, A. Fenyes. In collection of California Academy of Sciences.

Body black, pronotum pale with median vitta. Genitalia as in figure 5, inner processes present; viewed laterally, median lobe broad, not arcuately deflexed; viewed dorsally, lateral lobes diverging from base of median lobe; inner processes visible ventrally as in *P. nigricans.* Apparently related to *P. minuta* in the general structure of the genitalia, but differing greatly therefrom in the broad nondeflexed median lobe. A small denticle occurs on the inner face of each outer process near the lower margin. This is not present in *P. minuta.* Length 5 mm.

Distribution.—MEXICO.—The holotype and a paratype, both from Jalapa, Vera Cruz, are the only known representatives of this species. The paratype is in the collection of the American Museum of Natural History, and was collected by J. & D. Pallister, V-22-46.

(6) *Pyropyga minuta* (LeConte)

Ellychnia minuta LeConte, 1851, Acad. Nat. Sci. Philadelphia, Proc., (2) 5: 333.

Body black, pronotum pale with median vitta subparallel-sided, usually somewhat expanded near base. Genitalia as in figure 6, inner processes present, not visible from direct ventral viewpoint except sometimes the extreme tips; viewed laterally, median lobe arcuately deflexed between outer processes; viewed dorsally, lateral lobes usually diverging from base of median lobe; viewed laterally, outer processes variable in shape as shown in figure 6. Length 3-5.5 mm.

This is the smallest species of the genus, and is usually but not always narrowly elongate. Similar narrow specimens occur in other species, so the character is not dependable for identification. Genitalic variability is extreme, indicating a possible species complex, although nothing definite could be established from the abundant material available.

Distribution.—UNITED STATES.—NORTH CAROLINA: Raleigh. FLORIDA: Tampa; Crystal River; Inverness. LOUISIANA: New Orleans. MISSOURI: Roaring River State Park; Ranken. KANSAS: Mt. Hope; Wichita; Gove County; Meade County. OKLAHOMA: El Reno; Stillwater. TEXAS: Dallas; Brownsville; San Antonio; Cameron County; Val Verde County; Kinney County; Hidalgo; Karnes County. COLORADO: La Junta. NEW MEXICO: Jemez Mts.; Bernalillo; Torrance County. ARIZONA: Patagonia.

MEXICO.—NUEVO LEON: Carcado. S. L. POTOSI: San Luis Potosi. DURANGO: Registro. VERA CRUZ: Cordoba. PUEBLA: Atlixco; Puebla. MORELOS: Cuernavaca; Las Estacas.

HONDURAS.—Brus Lagoon.

(7) *Pyropyga alticola* Green, NEW SPECIES

Holotype.—MALE. San Cristobal 1. Casas, IV-27-59, 7500 ft., H. E. Evans. In collection of Cornell University.

Body black, pronotum pale with median vitta broadly attaining apex and base, subparabolic, covering all of convex surface except a very narrow strip each side. Genitalia as in figure 7, similar in structure to *P. minuta,* more densely sclerotized. Length 6.5 mm.

Variations.—Nothing of importance noted. Length 6-7 mm.

Distribution.—MEXICO.—CHIAPAS. San Cristobal de las Casas: IV-27-59 to V-1-59, 7500 ft., H. E. Evans, holotype, 2 females (CU), paratype (CAS); VII-10-55, 7000 ft., P. & C. Vaurie, 2 paratypes (AMNH). MEXICO. Atlacomulco, VIII-18-54, 8100 ft., Univ. Kans. Mex. Expedition, 1 paratype (UKans).

(8) *Pyropyga incognita* E. Olivier

Pyropyga incognita E. Olivier, 1912, Revue sci. du Bourbonnaise, 25:21.

Body black, pronotum pale with median vitta. Genitalia as in figure 8, inner processes lacking; viewed dorsally, tips of lateral lobes not separated by median lobe but united above it. Length 4-4.5 mm.

DISTRIBUTION.—BRITISH WEST INDIES.—St. Vincent, Kingston, III-29-27 (CU). Also recorded by Leng and Mutchler from Dominica and various localities on the island of Grenada.

VENEZUELA.—Ciudad Bolivar, VII and XI, 1898, E. A. Klages (CU, CAS).

(9) *Pyropyga decipiens* (Harris)

Lampyris decipiens Harris, 1836, Nat. Hist. Soc. of Hartford, Trans., 1: 74.

Body black, pronotum variable in color pattern. Genitalia as in figure 9, inner processes lacking; viewed ventrally, outer processes abruptly narrowed at about basal two-fifths, the angle formed by the constriction somewhat deflexed. Length 4.5-7.25 mm.

The pronotum may be pale with only the median vitta dark, or it may have in addition narrow obscurely darker borders. In the latter case the resemblance to *P. nigricans* may cause some uncertainty in identification unless the genitalia are examined. The median vitta may become quite wide, covering all, or nearly all, of the convex surface. Sometimes a combination of wider vitta and darker borders results in the complete elimination of pale lateral areas. These various color patterns intergrade and do not permit a definite segregation of color phases. In the female the terminal ventral segment is broadly, very feebly, arcuately emarginate, as compared to angulately notched in *P. nigricans*.

DISTRIBUTION.—Southeastern Canada and northeastern United States. Quebec and Ontario south to North Carolina and Tennessee. The western limits cannot be given from the available material. A single male from Broken Bow, Oklahoma, is at hand but may be mislabeled.

(10) *Pyropyga saltensis* Green, NEW SPECIES

HOLOTYPE.—MALE. Salta, Argentina, II-14-51, Ross & Michelbacher. In collection of California Academy of Sciences.

Body black, pronotum pale with median vitta indistinct apically. Genitalia as in figure 10, inner processes lacking. Length 4.5 mm.

DISTRIBUTION.—ARGENTINA.—Salta, II-14-51, Ross & Michelbacher, holotype, 1 paratype (CAS).

LITERATURE CITED

GEMMINGER, MAX

1870. Coleopterologische Hefte, vol. 6, pp. 1-131.

GORHAM, H. S.

1880. Materials for a revision of the Lampyridae. Trans. Ent. Soc. London, 13: 1-36.

1881. Malacodermata. Biologia Centrali-Americana, Coleoptera, vol. 3, part 2, pp. 1-372.

HARRIS, THADDEUS W.

1836. Characteristics of some previously described North American coleopterous insects, and descriptions of others which appear to be new, in the collection of Mr. Abraham Halsey. Trans. Nat. Hist. Soc. Hartford, 1: 65-99.

LeConte, John L.

1851. Synopsis of the Lampyrides of temperate North America. Proc. Acad. Nat. Sci. Philadelphia (2), 5: 331-347.

Motschulsky, T. Victor von

1852. Etudes Entomologiques, Helsingfors, pp. 1-80.

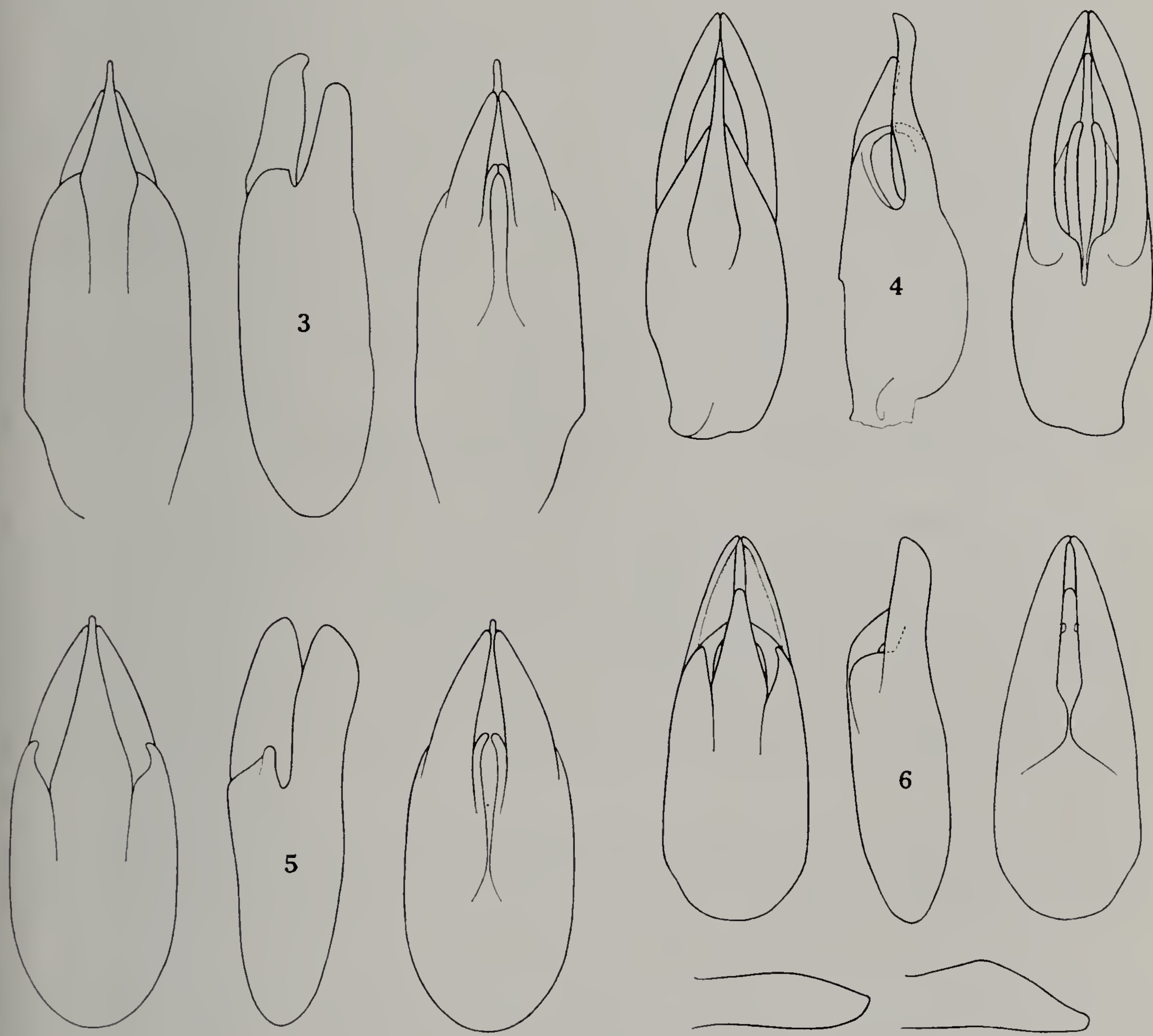
1853. Etudes Entomologiques, Helsinfors, pp. 1-56.

Olivier, Ernest

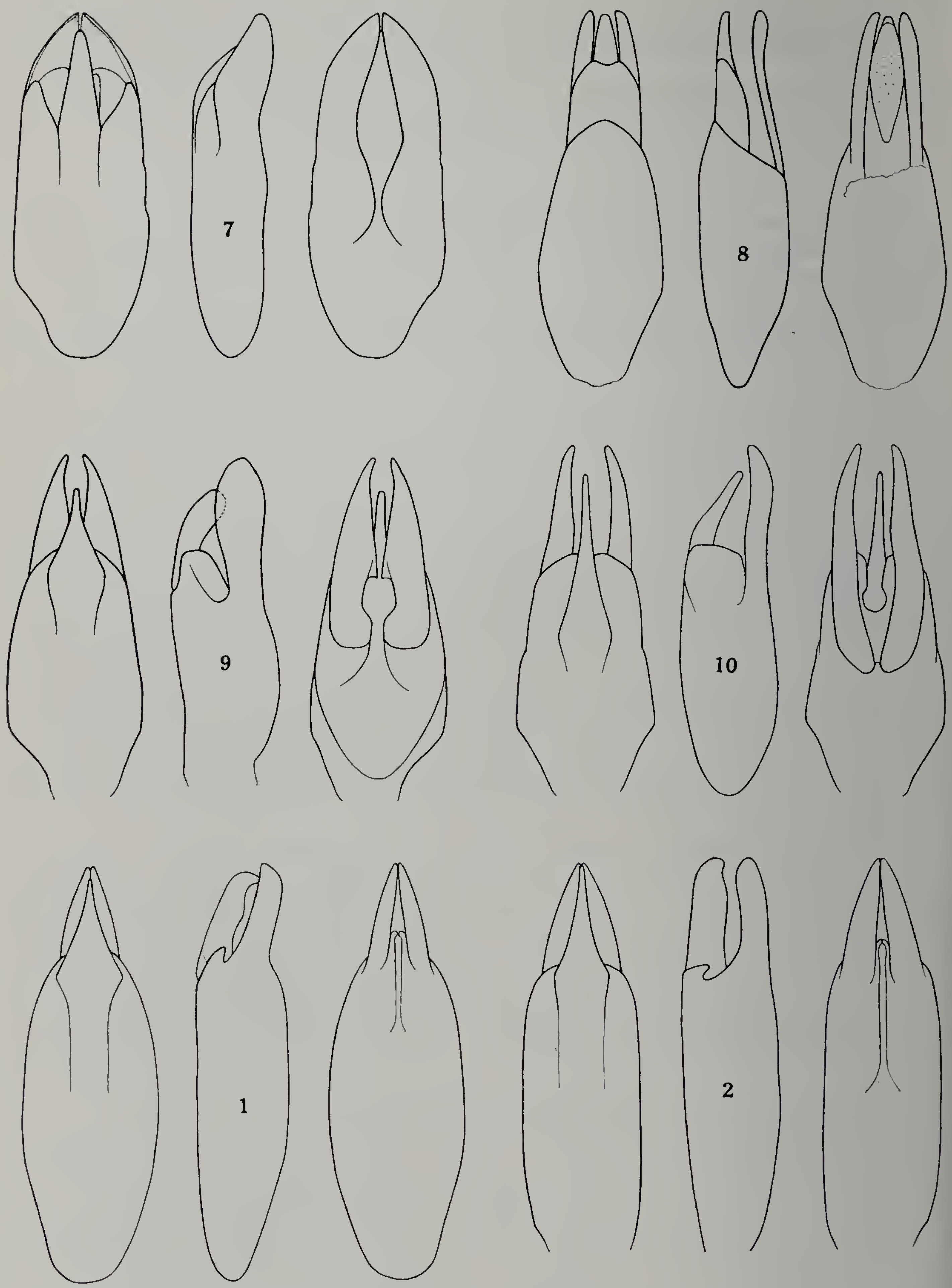
1912. Contribution a la faune entomologique des Antilles. Rev. Sci. Bourbonnaise centre France, 25: 18-34.

Say, Thomas

1823. Descriptions of coleopterous insects collected in the late expedition to the Rocky Mountains. Journ. Acad. Nat. Sci. Philadelphia, 3: 139-216.



Male genitalia of *Pyropyga* species; dorsal, lateral, and ventral aspects arranged from left to right. Fig. 1, *P. nigricans* Say, Corpus Christi, Texas, IV-28-42, E. S. Ross (CAS); Fig. 2, *P. modesta* Green, new species, holotype; Fig. 3, *P. cordobana* Green, new species, holotype; Fig. 4, *P. australis* Green, new species, holotype; Fig. 5, *P. extensa* Green, new species, holotype; Fig. 6, *P. minuta* LeConte, with variations of outer processes, Inverness, Florida, Citrus County, V-23-43, B. Malkin (CAS).



Male genitalia of *Pyropyga* species; dorsal, lateral, and ventral aspects arranged from left to right. FIG. 7, *alticola* Green, new species, holotype; FIG. 8, *P. incognita* E. Olivier, Kingstown, St. Vincent, B.W.I., III-29-1947 (CU); FIG. 9, *P. decipiens* Harris, Wind Gap, Pa., VII-2-30, J. W. Green (CAS); FIG. 10, *P. saltensis* Green, new species, holotype.

A REVISION OF THE GENUS *ISODACRYS* SHARP (CURCULIONIDAE, TANYMECINI)

By ANNE T. HOWDEN[1]

This is the second[2] of a proposed series of studies on the Tanymecini. In the present paper, the six previously described species of *Isodacrys* are discussed and clarified, and an additional seven species are described. The original nomenclature remains unmodified.

A total of 171 specimens from ten collections was studied. Several additional collections were given specimens of *Isodacrys* on the completion of the study. In the following list of collections examined and now containing specimens of *Isodacrys,* the name of the collection is followed by the abbreviation by which it is referred to in the text and the name of the curator responsible for the loan: American Museum of Natural History (AMNH), P. Vaurie; British Museum (Natural History) (BM), E. B. Britton; California Academy of Sciences (CAS), H. B. Leech; Canadian National Collection (CNC), H. F. Howden; Chicago Natural History Museum (CNHM), H. Dybas; Cornell University (CU), H. Dietrich; Illinois Natural History Survey (INHS), J. M. Kingsolver; D. G. Kissinger personal collection (Kissinger); University of Kansas (UK), G. Byers; Dirección General de Defensa Agricola, Mexico, D. F. (Mexico), R. Muniz; University of Michigan (UM), T. H. Hubbell; Texas Agricultural and Mechanical College (Texas), H. Burke; United States National Museum (USNM), R. E. Warner. Many thanks are accorded these people and institutions for the loan of specimens.

A lectotype is designated for *Isodacrys ovipennis* (Schaeffer), the only species of which the entire cotype series was seen. The type series of each of the Sharp and Champion species, except *minutus* Sharp, is split, with some cotypes in the United States National Museum and the remainder presumably in the British Museum. All the cotypes in the United States National Museum and representative cotypes from the British Museum were examined and were considered sufficient for the recognition of the respective species.

Treatment of previously described species is limited mainly to diagnostic characters, discussion of the types, and interpretation of the species in the light of additional specimens and new congeners. New species are described and discussed in detail.

Attempts to clean greasy specimens by soaking them in ammonia met with very little success, and even some crucial specimens remained so greasy or dirty that their color and the sculpture of their scales were obscured.

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[1] 23 Trillium Way, Ottawa 5, Ontario.

[2] The first paper was published in: Proc. California Acad. Sci. (4), 29(10): 361-421.

In describing the curvature of the setae, the terms recumbent, completely arched, incompletely arched, and erect are used in the following way—recumbent: completely prostrate; completely arched: arcuate, with the apex of the seta touching the surface (Fig. 5); incompletely arched: decidedly curved, but with the apex not touching the surface (Figs. 6, 7); erect: straight or obsoletely curved and at a 45° to 90° angle with the surface (Figs. 8, 9).

In describing the shape of the segments of the antennal funicle, the anterior view is used; the segments appear to have slightly different shapes when viewed from other angles.

To obtain the relative lengths of the pronotum and prosternum, the pronotum was measured dorsally along the median line, and the prosternum was measured along the median line as seen in lateral view.

"Last abdominal segment" refers to the last ventral abdominal segment.

A map is presented to show the distribution of the species of *Isodacrys*.

Genus *Isodacrys* Sharp

Isodacrys Sharp, 1911, pp. 175-177. Champion, 1911, p. 341. Pierce, 1913, p. 401.

GENOTYPE.—*Isodacrys guatemalenum* Sharp, designated by Pierce, 1913, p. 401.

The genus *Isodacrys* is distinguished by the following characters. Size small, length 4 mm. or less. Beak short, deflected at approximately a right angle to body; sides parallel, vertical; with a distinct epistoma. Antennal scrobe lateral, abruptly bent, reaching ventral surface of beak. Antenna with first segment of funicle never slender; second segment of funicle shorter than first; antennal club short. Thorax with or without ocular vibrissae; pronotum distinctly longer than prosternum. Humerus obsolete to partially developed. Elytral declivity obsolete to pronounced, tumid. Fore leg scarcely or not at all enlarged; anterior tibia with or without teeth on inner edge. Fore coxae very close to or contiguous with anterior margin of prosternum, very narrowly separated. Tarsal claws free. Aedeagus (where known) arcuate, short and stout, except in *buchanani* where it is slender.

Several secondary characters should be mentioned. The setae across the apex of the beak are long and erect. The apical emargination of the beak varies in width interspecifically and does not always extend across the entire apex of the beak as stated in Howden, 1959, p. 363. The edge of the apical emargination may be very finely to moderately carinate, a character which varies widely intraspecifically. Likewise, the dorsal punctures, especially on the pronotum, vary intraspecifically and are not useful taxonomically.

The setae of the dorsal surface present excellent taxonomic characters. On the whole, there is little intraspecific variation in the size, shape or curvature of the setae, though they are subject to abrasion which may affect their appearance. The scales, also, are constant, and the majority of scales on any given surface will be as described for that species.

The characteristics of the ocular vibrissae are constant in species where the vibrissae are well-developed or absent. However, in species where they are poorly developed, the vibrissae are unstable and vary in size and number even on different sides of the same specimen. This variation is probably not due to abrasion, since the ocular vibrissae are closely appressed to the body and not particularly vulnerable.

Males were seen of only seven of the thirteen species of *Isodacrys,* so it is difficult to analyze the taxonomic value of the male genitalia. Obviously, it cannot be relied upon too heavily in specific diagnoses if males are so scarce or if some species are parthenogenetic. There appear to be reliable specific characters in the apex of the aedeagus.

Taxonomically, *Isodacrys* is usally considered with the tribe Tanymecini in Brachyderinae. Van Emden characterizes the tribe as having the pronotum "with a few, usually with many, cilia (vibrissae) at the sides of the front margin" (1944, p. 509). However, seven of the thirteen species now known do not have even vestigial vibrissae. Nevertheless, there are strong affinities between *Isodacrys* and some other Tanymecini, particularly *Pandeleteinus,* and this is the most logical place for the genus. Sharp (1911, p. 167) placed more importance on the poorly developed humeri than on the ocular vibrissae and placed the genus in his Group Sciaphilina, Otiorhynchinae Apterae (Van Emden's Brachyderini), which have connate tarsal claws.

Several other genera bear superficial resemblance to *Isodacrys* and differ from *Isodacrys* as follows: *Elissa* Csy. and *Minyomerus* Horn—head and beak much wider, genae inflated beneath oblique scrobes, eyes nearly touching pronotum; *Isodrusus* Sharp—humeri well-developed, tarsal claws connate; *Piscatopius* Sleeper—pronotum not produced anteriorly, pronotum much broader than long, "nasal plate absent" (specimens of this genus were not seen by the author), scrobe toothed (though this may be a specific rather than a generic character) and more obsoletely angled; *Pandeleteinus* Champion—humeri well-developed, aedeagus more slender and more arcuate, antennal club longer and more slender, secondary sexual characteristics less prononunced.

Nomenclatorially, the gender of *Isodacrys* has been erroneously interpreted in the specific names of other authors. Sharp gave his species names with masculine endings. Blackwelder (1947, p. 799) changed these to feminine. However, the root of *Isodacrys* appears to be "dakryon" (Greek for tear) and is neuter, hence the specific names are given neuter endings herein.

With the exception of records by Pierce (1909) of *I. ovipennis* and Burke (1959) of *I. burkei,* the only indications of the biology of *Isodacrys* are the meagre data on the labels of the specimens. Three species are recorded from herbaceous plants (lupine, cut flowers, lantana flowers, peas, watermelon, tomatoes, roadside vegetation), and three species are recorded from trees (oak, hackberry, *Condalia* and eucalyptus). These two different types of "hosts" do not appear to be coupled with taxonomic characters and therefore suggest that *Isodacrys* are general feeders as adults as is generally characteristic of the Brachyderinae.

There are several conspicuous groups of species in the genus. The species with non-denticulate fore tibiae (*brevirostre, geminatum, schwarzi, buchanani*) are very closely related to each other and distinct from their congeners. They probably merit subgeneric status, but *I. buchanani* is the only species of these four of which a male was seen. The aedeagus of *buchanani* (Figs. 21, 22) is very different from those of the other species of *Isodacrys* where the aedeagi were available for study. But without substantiation from the aedeagus of some of the other species in the group, there does not seem to be sufficient evidence for the erection of a new subgenus or genus.

The two Texas species with long subcylindrical elytra and elytral tumescences (*ovipennis* and *burkei*) also form a distinct unit. Another group, composed of *mexicanum* and *apicale,* is characterized by the partial development of the humeral angles, the short elytra and robust habitus. Groupings for the remaining five species, which include the genotype, are obscure.

KEY TO THE SPECIES OF *ISODACRYS*

1. Anterior tibiae denticulate or dentate on inner edge ---------- 5
   Anterior tibiae without teeth or denticles on inner edge ---------- 2
2. Setae clavate; slightly, incompletely arched (see introduction and fig. 7) at base of elytra, becoming erect at apex of elytra; thoracic setae completely arched (see introduction and fig. 5). Central Mexico ---------- (1) BREVIROSTRE N. SP.
   Setae of elytra lanceolate, nowhere erect; setae of thorax completely or incompletely arched ---------- 3
3. Sutural interval at declivity not or obsoletely tumescent, its scales granular and not pustulate or convex. Third interval not or obsoletely more prominent on declivity. Without ocular vibrissae. Central Mexico ---------- (2) GEMINATUM N. SP.
   Sutural interval at declivity tumid, its scales pustulate or convex. Ocular vibrissae present ---------- 4
4. With ocular vibrissae poorly developed, i.e., one or two slender, small vibrissae. In lateral view (fig. 10) the summit of declivity extends posteriorly further than apex of elytra. Third interval not raised on declivity. Northeastern Mexico ---------- (14) BUCHANANI N. SP.
   With cluster of ocular vibrissae. In lateral view the summit of declivity does not extend posteriorly further than apex of elytra. Third interval slightly raised on declivity. Northeastern Mexico ---------- (3) SCHWARZI Champ.
5. Prothorax with strong squamose ocular tooth, without ocular vibrissae. Southern Texas ---------- (11) BURKEI N. SP.
   Prothorax without ocular tooth, with or without ocular vibrissae ---------- 6
6. Setae of elytra very long, conspicuous, erect, parallel-sided (fig. 9). Guatemala ---------- (5) GUATEMALENUM Sharp
   Setae of elytra not long; recumbent to incompletely arched, clavate or lanceolate ---------- 7
7. Thorax as broad as long. Elytra in profile evenly arcuate from base to apex. West central Mexico ---------- (6) MINUTUM Sharp
   Thorax longer than broad. Elytra in profile deflected towards apex forming a discernible declivity ---------- 8
8. Elytra rounded from base, humeri obsolete, form of elytra elliptical or oviform (figs. 2, 3) ---------- 9
   Elytra with sides subparallel at base, humeri poorly developed, form of elytra roughly subcylindrical (figs. 1, 4) ---------- 11
9. Scales of dorsal surface pustulate or convex, with conspicuous raised margins. Setae of dorsal surface long, lanceolate, slender, completely arched. Durango, Mexico ---------- (7) CRISPUM N. SP.
   Scales of dorsal surface granular, with inconspicuous margins or amarginate. Elytral setae stout, lanceolate or clavate, incompletely arched to erect ---------- 10

10. Elytra oviform, widest before middle. Last abdominal segment of female tumid. Vera Cruz, Mexico---------------------------------------(8) ORIZABAE Sharp
Elytra elliptical, widest at middle. Last abdominal segment of female flat. Honduras ---(9) ELLIPTICUM N. SP.
11. Elytra with second and tenth intervals tumescent at their apices. Elytra somewhat constricted basally (fig. 1). Elytra 1.9 to 2.0 times length of thorax. Southern Texas--(10) OVIPENNIS (Schffr.)
Elytra with second and tenth intervals not tumescent at their apices. Elytra not constricted basally (fig. 4). Elytra 1.5 to 1.8 times length of thorax. Mexico-------- 12
12. Base of elytra straight. Apices of elytra individually rounded (fig. 4). Apex of aedeagus acutely pointed (fig. 12). Sinaloa, Mexico-------------(12) APICALE N. SP.
Base of elytra emarginate. Apices of elytra conjointly rounded. Apex of aedeagus broadly rounded (fig. 24). Central Mexico-------------------(13) MEXICANUM Sharp

1. *Isodacrys brevirostre* n. sp.

(FIGURES 7, 8, 25)

HOLOTYPE.—Female. Length 2.4 mm.; width 1.0 mm. Scales fuscous and various shades of pale brown, arranged in the following pattern: thorax with a pair of pale, approximate vittae; elytra slightly mottled, marked at declivity with a common crescentic fascia of pale scales bordered on both sides with fuscous scales. Occasional scales pale aqua. Scales of head and thorax finely margined, coarsely and irregularly granular, contiguous or not; scales of elytra more strongly margined, distinctly separated. Setae of head and beak broadly lanceolate, completely arched on vertex, becoming erect anteriorly. Setae of thorax lanceolate, completely arched. Setae of elytra broad, spatulate, slightly arched (fig. 7) at base of elytra, becoming erect (fig. 8) at apex; in single rows on each interval; very conspicuous.

Head and beak (fig. 25) very short, rather robust, with deep semi-confluent punctures. Beak with sides slightly convergent apically; median line deeply impressed on basal half; dorsal surface flat; apical emargination obtusely angled, not carinate, occupying two-fifths of anterior edge. Epistoma rugulose, its anterior margin truncate, slightly irregular. Apical two rows of scales less sculptured, aqua in color. Scrobe wide, obtusely angled, the horizontal portion about two-thirds the length of the vertical portion; separated from apex of beak and from eye by a single row of scales. First segment of funicle short, oviform; second segment very small, subspherical; segments three to seven short, about twice as wide as long. Eye small, prominent, more so posteriorly.

Thorax longer than wide, constrictions very feeble, sides very slightly arcuate between them. Pronotum 1.9 times as long as prosternum. Disc of thorax between constrictions subfoveate, some punctures confluent. Ocular vibrissae completely absent.

Elytra elliptical in dorsal view, 1.4 times longer than broad; 1.9 times as long as thorax. Elytra in profile (fig. 25) flat from base to apical third, thence gently sloping to declivity which is nearly vertical. Strial punctures moderate, inconspicuous. Intervals flattened with no elevations.

Fore leg equal to hind leg. Inner edge of fore tibia without teeth, with several long, slender bristle-like setae arising from small tubercles. Fore coxae very narrowly separated. Last abdominal segment flattened, apex elongate-arcuate.

Male. Unknown.

HOLOTYPE.—Female, 6 mi. N. Cuernavaca, Morelos, Mexico, 7500 ft., August 15, 1954, J. G. Chillcott (CNC No. 7383). Paratypes, 23 females: 2 females, same data as holotype; 1 female, 5 mi. N. Cuernavaca, Morelos, Mexico, Aug. 28, 1958, E. Mockford, on oak; 1 female, 10 mi. E. Toluca, 8900 ft. Mexico, Mexico, August 31, 1954, J. G. Chillcott; 7 females, Real de Arriba, Temescaltepec, Mexico, July, 1932, H. Hinton Collector, Pres. by E. C. Zimmerman; 11 females, Bejucos, Temescaltepec, Mexico, July 3, 1933, H. E. Hinton, R. L. Usinger Collectors, Pres. by

E. C. Zimmerman; 1 female, 10 mi. N. E. Jacala, Hidalgo, Mexico, Aug. 2, 1960, H. F. Howden, on *Condalia*.

Paratypes are in the following collections: CAS, CNC, Howden, USNM.

The paratypes vary in length from 2.3 to 2.8 mm., and in width from 0.9 to 1.2 mm. Color of the paratypes varies from fuscous to brown. Variations in the markings include: a band of pale scales around the scutellum, sides of beetle broadly pale, and thoracic vittae in the shape of a "V" instead of parallel.

Essentially, the characteristics of the scales and setae are constant, though occasionally the elytral scales have weaker margins and the setae are slightly narrower than in the holotype. The median line may be deeply impressed on basal half of beak as in the holotype, or reduced to a fovea between the eyes, or not impressed at all. In a few paratypes, there is a double instead of a single row of scales separating the scrobe from the eye. In several specimens one or both antennae have the third and fourth segments of the funicle partly fused, creating a six-segmented funicle. This is the only species of *Isodacrys* in which aberrant antennal segments were noticed. Punctuation of the pronotum is shallower in some paratypes.

Isodacrys brevirostre differs from the other species of *Isodacrys* with non-denticulate fore tibiae *(geminatum, schwarzi, buchanani)* in its conspicuous, erect, spatulate setae of the elytra, extremely short beak, and short oviform or sub-spherical first segment of the funicle.

2. *Isodacrys geminatum* n. sp.

HOLOTYPE.—Female. Length 2.7 mm.; width 1.3 mm. Elytra light brown, with a black-bordered white crescent on each side which extends from elytral base at the sixth interval to fifth interval on basal third; from there the white becomes obsolete and the black line continues diagonally to the summit of the declivity. Thorax indistinctly marked with vittae of light and dark cinereus scales. Scales coarsely granular, contiguous or not; margins extremely fine and incomplete on elytral scales, very fine and more nearly complete on thoracic scales. Setae very small, slender, lanceolate; completely arched on vertex and thorax, mostly incompletely arched on elytra, frons and beak.

Head and beak moderate in length, the dorsum slightly sinuate in profile. Frons slightly prominent between eyes. Beak with median line sulcate from between eyes to between insertion of the antennae; apical emargination not carinate, roughly right-angled, the vertex of the angle rounded. Epistoma concave, rugulose. Scrobe obtusely angled, horizontal portion about as long as vertical portion, very broad at angle, tapering to a point at either end; separated from eye by the width of one and a half scales. Funicle with first segment broadly clavate; second segment broadly clavate, about one-half the length of first segment; segments three to seven moniliform, each shorter than second segment, the distal segments becoming broader. Eye small, subcircular, prominent.

Thorax slightly longer than broad. Pronotum 2.0 times longer than prosternum. Basal and apical constrictions obsolete on disc, moderate on sides, the sides only slightly arcuate between the constrictions. Surface between constrictions subfoveate-punctate. Ocular vibrissae absent.

Elytra 2.0 times longer than thorax, 1.4 times longer than wide. Elytra in dorsal view subelliptical, widest just before middle. Base of elytra straight. Elytra in profile gently arcuate, apical deflection beginning just beyond the middle of elytra; declivity with upper half vertical, lower half oblique due to slight attenuation of elytral apices. Strial punctures moderate, the basal five or six punctures on the sutural stria set in slight depressions making them more conspicuous. Elytral intervals slightly convex.

Fore leg similar to hind leg; inner edge of fore tibia slightly sinuate, without teeth, denticles or tubercles. Fore coxae very narrowly separated. Last abdominal segment slightly convex medially; margin smooth and shiny; apex broadly rounded.

Male. Unknown.

HOLOTYPE.—Female, Texcoco, Mexico, Mexico, 7000 ft., Aug. 20, 1958, H. F. Howden Collector (CNC No. 7384). Paratypes, 3 females: same data as type (CNC, Howden).

The paratypes are 2.7 mm. long and 1.1 to 1.2 mm. wide. The paratypes are all less robust in the form of the elytra than in the holotype. The declivity may be more nearly vertical than in the holotype. Except for one specimen, the basal five or six punctures of the sutural stria are set in slight concavities as in the type—an obscure but distinctive character.

Of the species with non-denticulate fore tibiae, *Isodacrys geminatum* may be distinguished from *brevirostre* by its lanceolate, incompletely arched elytral setae and its incompletely margined scales; from *schwarzi* by its absence of ocular vibrissae; from *buchanani* by its unmodified sutural interval at declivity.

From *brevirostre,* its closest relative, *geminatum* also differs in having: elytra more convex in profile; beak slightly longer and slightly concave medially; frons more prominent between eyes; first segment of funicle usually longer and more slender; sides of thorax more arcuate; inner edge of fore tibia more sinuate; last abdominal segment slightly more convex and broader apically. Locality records indicate that *I. geminatum* may be sympatric with *brevirostre* (see map).

3. *Isodacrys schwarzi* Champion

Isodacrys schwarzi Champion, 1911, p. 341.

Female. Length 2.9 mm.; width 1.3 mm. Thorax brown, with a broad white crescentic vitta on each side; elytra dark brown, with an irregular fascia and sides of elytra white. Scales finely granular; on thorax convex, with gently turned-up margins; on elytra not margined, pustulate; on sutural interval at declivity more strongly pustulate to convex. Setae of dorsal surface inconspicuous, slender, completely arched on head and thorax; incompletely arched on elytra. Beak very short, dorsal surface flat; median line impressed from between anterior margin of eyes to between insertion of antennae; apical emargination not carinate, obtusely angled, the vertex of the angle rounded. Scrobe obtusely angled, separated from eye by the width of three scales. Eye small, round, prominent. Thorax 1.04 times longer than broad. Pronotum 1.7 times longer than prosternum. Thorax with basal and apical constrictions feeble, sides arcuate between them. Surface between constrictions moderately punctate. Ocular vibrissae well-developed. Elytra 2.0 times longer than thorax; 1.4 times longer than wide. Elytra in dorsal view subelliptical; base triangularly emarginate. Third interval slightly raised on declivity; sutural interval tumid on summit of declivity. Elytra in profile flattened to summit of declivity which is abrupt, vertical, and slightly concave just before apex. Fore tibia without teeth or denticles on inner edge; with long, slender straight hairs on inner edge. Fore coxae very narrowly separated. Last abdominal segment slightly concave on either side of midline, with apex rounded.

TYPE SERIES.—Two specimens. There is a female cotype in the United States National Museum labelled "Monterrey, Mex., 1.1, E. A. Schwarz," and a red label reading "TYPE."

ADDITIONAL SPECIMENS.—None.

The two drawings accompanying the original description are good, though the colors are more vivid than in the cotype examined.

Isodacrys schwarzi differs from the other species with non-denticulate fore tibiae in its well-developed ocular vibrissae; abrupt, vertical declivity which is slightly concave before the apex; its slender, incompletely arched elytral setae; and its scales which are finely granular, pustulate and not margined on the elytra.

4. *Isodacrys buchanani* n. sp.

(FIGURES 10, 21, 22)

HOLOTYPE.—Male. Length 2.3 mm.; width 0.9 mm. Pale cinereus and light brown. No distinct pattern, but sides of elytra, suture and a pair of broad vittae on thorax paler. Scales indistinctly margined, granular; scales of the sutural interval at declivity convex and nearly smooth. Setae very small and inconspicuous, slender, recumbent to completely arched.

Head and beak moderate in length, frons prominent between eyes. Beak flattened dorsally, scarcely deflected at apex; median line finely impressed at base; apical emargination carinate, broad, arcuate. Epistoma flat, except for a concave median notch; obsoletely sculptured. Scrobe obtusely angled, the horizontal portion about two-thirds the length of the vertical portion; separated from the eye by the width of two scales. Funicle with first segment clavate; second segment clavate, about one-half the length of first segment; segments three to seven cuboidal. Eye small, round, prominent.

Thorax 1.2 times longer than broad. Pronotum 1.5 times longer than prosternum. Basal and apical constrictions moderate laterally and dorsally; sides scarcely arcuate between constrictions. Punctuation of thorax obscured. Ocular vibrissae poorly developed, represented by a single vibrissa of moderate length.

Elytra 2.0 times longer than thorax, 1.5 times longer than wide. Elytra in dorsal view subelliptical, slightly wider medially. Base of elytra conspicuously arcuately emarginate. Sutural interval at declivity strongly produced posteriorly, extending beyond apex of elytra. Declivity in profile strongly indented just above apex. No other elevations on elytra. Elytra in profile flattened dorsally. Strial punctures small, obscured by scales.

Legs relatively long and slender. Fore leg similar to hind leg, but fore femur slightly larger than other femora. Inner edge of fore tibia slightly sinuate, without teeth, denticles or tubercles. Fore coxae minutely separated. Last abdominal segment slightly convex; apex broadly rounded and slightly emarginate medially.

Aedeagus (figs. 21, 22) long, slender; apex a 45° angle.

ALLOTYPE.—Female. Length 3.2 mm.; width 1.4 mm. Pale cinereus, light brown and ochraceous, with scattered fuscous patches sometimes due to abraded scales. Pattern as follows: thorax with a fine light brown median line flanked by a broad pale vitta which in turn is flanked by an immaculate, broad, light brown vitta which covers two-thirds of the side of the thorax; sides of elytra pale from base to just beyond middle where the pale area extends diagonally to suture; third elytral interval pale; sutural tumidity at declivity ochraceous. Scales granular, incompletely and indistinctly margined on head and thorax, more completely and more distinctly margined on disc of elytra. Scales of sutural tumidity convex, smooth and shining. Setae as in holotype. Form (fig. 10) more robust than in holotype. Beak longer than in holotype, slightly concave in profile and with a shallow fovea medially which is connected to apical emargination by a carina. Scrobe separated from eye by the width of three scales. Pronotum more robust than in holotype, 1.9 times longer than prosternum; sides distinctly arcuate between the constrictions. Ocular vibrissae represented by two feeble vibrissae on each side. Elytra 1.9 times longer than thorax, 1.4 times longer than wide. Sutural interval at declivity (fig. 10) more tumid than in holotype; apex of elytra extending posteriorly as far as the tumidity, and indentation of declivity in profile evenly arcuate. Legs similar to those of holotype. Last abdominal segment slightly more elongate than in holotype, obsoletely margined; apex rounded.

HOLOTYPE.—Male, from Mexico [intercepted at] Laredo, Texas, Oct. 31, 1945, Jones 45-19507 (USNM No. 65480). Allotype, female, same data as type (USNM). No paratypes. The accession number on these beetles was kindly checked by Miss Rose Ella Warner and the following information forwarded: "Lot No. 45-19507, from Laredo, Tex. no. 37700. 2 insects from cut flowers. Origin Mexico, found in baggage at foot bridge. Inspector Jones. October 31, 1945. Laredo, Tex. 37000. Ident.-Buchanan as *Isodacrys* sp.—New to coll. and prob. undescribed." Since cut flowers are a relatively perishable commodity, it suggests that the type locality is somewhere near Laredo in Tamaulipas or Nuevo Leon.

In this species the elytral declivity is much more strongly modified in both the male and female than in any other species of *Isodacrys*. The species may also be distinguished from species with non-denticulate fore tibiae by its very small, inconspicuous setae and poorly developed ocular vibrissae.

I. buchanani most closely resembles *I. schwarzi,* and geographically its range is probably the closest to that of *schwarzi* (Monterrey).

The aedeagus of *buchanani* is atypical of the genus. It strongly resembles the aedeagus found in the genus *Pandeleteinus* in its more slender, longer and evenly arcuate form. However, *buchanani* is readily distinguished from *Pandeleteinus* by its obsolete humeri and short, stout antennal club.

This species is named in commemoration of L. L. Buchanan who first recognized it as a new species of *Isodacrys.*

5. *Isodacrys guatemalenum* Sharp

(FIGURES 9, 16, 17)

Isodacrys guatemalenus Sharp, 1911, p. 175.

Isodacrys guatemalensis Sharp. Pierce, 1913, p. 401. Designated as genotype.

Isodacrys guatemalena Sharp. Blackwelder, 1947, p. 799.

Male. Length 2.9 mm.; width 1.3 mm. Females, length 3.1 to 3.4 mm.; width 1.4 to 1.6 mm. Light brown, marked with white, fuscous, and a conspicuous black "V" posteriorly bordered with white on elytra just before declivity. Scales of various irregular shapes, inconspicuously granular, with pronounced raised margins. Scales of sutural interval at declivity becoming convex, smooth, shining, amarginate. Setae of head and thorax vary from erect to completely arched; rather conspicuous on head and apicad of apical constriction of thorax. Elytral setae (fig. 9) very long, erect, parallel-sided; much more numerous on alternate intervals. Beak elongate. Scrobe obtusely angled, extending onto ventral surface of beak. Thorax with basal and apical constrictions moderate laterally and dorsally. Ocular vibrissae absent in females, poorly developed in the male. Elytra in dorsal view broadly elliptical, profile thickest at declivity; alternate intervals slightly raised. Anterior tibia with three or four acute moderate-sized teeth on inner edge. Last abdominal segment of male convex, truncate at apex. Last abdominal segment of female flattened, apex rounded. Aedeagus (figs. 16, 17) evenly arcuate, laterally constricted at basal third, opening occupying apical third.

TYPE SERIES.—Fifteen specimens. Examined: two female cotypes in the United States National Museum and a female cotype in the British Museum labelled, "Duenas, Guatemala, C. Champion."

ADDITIONAL SPECIMENS.—One male, 2 females, Antigua, Guatemala, 5000 ft., Aug. 16, 1947, Colls. C. & P. Vaurie, F. Johnson Donor (AMNH, Howden). Antigua is only about 8 miles from the type locality of Duenas (Vaurie and Vaurie 1949, pp. 11-12). These specimens generally agree with the original description and illustration though the color pattern is less distinct.

The long, very conspicuous elytral setae readily distinguish this species from all other *Isodacrys*.

6. *Isodacrys minutum* Sharp

Isodacrys minutus Sharp, 1911, pp. 176-177.

Isodacrys minuta Sharp. Blackwelder 1947, p. 799.

Females. Length 2.7 to 2.8 mm.; width 1.2 mm. Color ferrugineus with white, light brown and fuscous scales. Scales finely granular, without margins and mostly not contiguous. Setae small and inconspicuous, completely arched, becoming incompletely arched to erect on declivity. Scrobe obtusely angled, horizontal portion about two-thirds the length of the vertical portion, vertical portion very broad and deep, passing very close to eye and scarcely reaching ventrum. First segment of funicle short, ovoid; segments two to seven subequal in length, second segment cuboidal or ovoid, segments three to seven much broader than long. Eye small, prominent. Ocular vibrissae absent. Thorax very short, as broad as long, gently convex, basal and apical constrictions only vaguely indicated dorsally; deeply and closely punctate. Pronotum 1.6 times longer than prosternum. Elytra in dorsal view subelliptical, in profile evenly convex from base to apex. Legs short and stout. Fore femur enlarged at least as much as in some *Pandeleteius* (e.g. *cinereus, subtropicus*). Fore tibia with inner edge slightly sinuate and bearing three or four teeth. Fore coxae narrowly separated. Last segment of abdomen in female with raised margin, a slight depression at base on either side, and slightly convex at apex.

TYPE SERIES.—Four specimens. Examined: one female cotype in the British Museum labelled, "Omilteme, Guerrero, 8000 ft., July, H. H. Smith."

ADDITIONAL SPECIMENS.—Two females, Cerro Tancitaro, Michoacan, Mexico, Alt. 2800 ft., June 30, 1941, sweeping lupine, Coll. Hoogstraal and Haag (INHS, USNM). These specimens agree with the cotype examined except that they are testaceous (teneral) and have no discernible color pattern.

All the specimens examined are more slender than the figure in the original illustration and none have the wine color depicted in the copy of the book I used, though the pattern is like that of the cotype examined.

Isodacrys minutum is characterized by its short pronotum, short legs with enlarged fore femur and granular amarginate scales. It approaches *Pandeleteius* as much in the enlarged fore femora as in the short pronotum mentioned by Sharp in his description.

7. *Isodacrys crispum* n. sp.

(FIGURE 3)

HOLOTYPE.—Female. Length 3.3 mm.; width. 1.4 mm. Color obscure (specimen greasy), brown; markings obscure except on disc of thorax with its immaculate cinereus bordered on either side with a tortuose, fuscous vitta. Scales of head coarsely granular with complete carinate margins. Scales of thorax coarsely granular and/or pustulate, with conspicuous complete carinate margins, not contiguous. Scales of elytra conspicuously pustulate and/or coarsely granular; margins mostly absent anteriorly, strongly carinate and slightly reflexed laterally and posteriorly; contiguous or not. Setae of dorsal surface conspicuous, moderately long, acutely pointed, lanceolate, completely arched or recumbent; much more numerous on sutural interval at declivity. On elytral intervals the apex of one seta often reaches or exceeds the base of the following seta.

Head and beak very short; frons prominent behind eyes. Beak narrow; apex obsoletely tumescent at middle, no impressed median line or fovea apparent; apical emargination poorly defined, broad, obtusely triangular; epistoma with its apical margin truncate, indented medially. Scrobe very deep, right-angled; horizontal portion about three-fifths as long as vertical portion; vertical portion separated from eye by two to three rows of scales and distinct to its termination on ventral surface of beak. Funicle with second segment a little shorter than first; segments three to seven equal, shorter than second segment, and cuboidal. Eye small, round, prominent.

Thorax 1.2 times longer than broad. Basal and apical constrictions moderate on disc and on sides; sides arcuate between constrictions. Pronotum 2.0 times as long as prosternum. No punctuation evident. Ocular vibrissae represented by two slender curved setae on left side, one on right side.

Elytra 1.9 times longer than thorax, 1.5 times longer than broad. Elytra (fig. 3) widest at middle, sides arcuate for basal five-sixths, thence slightly attenuate to apex; gently convex in profile. Intervals flattened on disc and at base, slightly convex on declivity; sutural interval scarcely more prominent at summit of declivity.

Legs moderate in length, rather stout. Fore tibia with five moderate teeth on inner edge. Fore coxae broadly separated for the genus. Last abdominal segment flattened, with a shallow depression at the base on either side; apex broadly rounded.

Male. Unknown.

HOLOTYPE.—Female, Palos Colorados, Durango, Mexico, 8000 ft., Aug. 5, 1947, D. Rockefeller Exp., Schramel (AMNH). No allotype or paratypes.

In form, *I. crispum* falls between *apicale* and *orizabae,* its elytra being more inflated than in *apicale* and less inflated than in *orizabae*. From these two species, and all other *Isodacrys, crispum* may be distinguished by: its setae which are moderately long, conspicuous, lanceolate and completely arched; its elytral scales which are pustulate and carinate-marginate on their lateral and posterior edges; its very short narrow beak with right-angled scrobe; and its head prominent behind the eyes as in *Pandeleteinus*. These characters will probably exhibit little intraspecific variation and should enable the proper identification of additional specimens of the species when found.

I. crispum bears a strong superficial resemblance to *Isodrusus debilis* Sharp, but it differs in the lack of humeri, broader elytra and free tarsal claws.

8. *Isodacrys orizabae* Sharp

Isodacrys orizabae Sharp, 1911, p. 176.

Male. Length 3.0 mm.; width 1.4 mm. Females, length 3.3 to 3.7 mm., width 1.6 mm. Color brown with whitish and fuscous markings. Scales granular, very finely margined. Setae of elytra broad, clavate, erect to incompletely arched; setae of head and thorax more slender, completely to incompletely arched. Apical emargination of beak acute, carinate, occupying over one-half of apical edge. Median line obsoletely impressed on beak to frons. Scrobe obtusely angled; separated from eyes by the width of one scale. Funicle with first segment clavate, second segment clavate and about one-half the length of the first, segments three to seven strongly moniliform, segment seven much broader than the others. Eye moderate. Thorax 1.12 times longer than broad, pronotum 1.7 times longer than prosternum. Thorax with disc foveate-punctate; basal and apical constrictions moderate dorsally and laterally. Ocular vibrissae absent or poorly developed. Elytra of male subelliptical; elytra of females broadly oviform, broadest at basal third; fifth interval slightly raised at declivity which is weak. Body in profile thickest just before middle. Fore femur distinctly enlarged; fore tibia with four or five teeth on inner edge. Fore coxae separated rather broadly for the genus. Apex of last abdominal segment of male deflected and arcuately emarginate; last abdominal segment of female tumid medially, broadly rounded at apex. Aedeagus strongly resembling that of *I. guatemalenum.*

TYPE SERIES.—Nine specimens: "Mexico (Truqui), Orizaba (Salle, H. H. Smith)." Specimens examined: a female cotype in the United States National Museum and a male and a female cotype in the British Museum labelled, "Orizaba, H. S. & F. D. G. Dec. 1887." The United States National Museum specimen is greasy and its vestiture is not in good condition; some scales are abraded and some setae are broken. The British Museum specimens are in good condition and the color and pattern are as in the original illustration.

ADDITIONAL SPECIMENS.—None.

Isodacrys orizabae is related to *minutum* and *guatemalenum*. Of all *Isodacrys, orizabae* has the most oviform elytra and the most tumid last abdominal segment in the female. It may also be distinguished by its granular scales and stout, short, incompletely arched to erect elytral setae.

9. *Isodacrys ellipticum* n. sp.

(FIGURE 2)

HOLOTYPE.—Female. Length 2.7 mm.; width 1.3 mm. Color obscured (specimen greasy). Scales granular, margined or not. Setae of head and thorax mostly abraded, remainder very small, incompletely arched, becoming erect on beak. Setae of elytra short, stout, clavate, incompletely arched, becoming longer and more erect on declivity. Beak slightly deflected at apex; apical emargination obtusely angled, carinate, occupying over one-half of apical edge. On the beak a short median carina extends from the apex of emargination and terminates in a fovea between the insertion of the antennae. Scrobe obtusely angled; horizontal portion long, subequal to vertical portion; vertical portion separated from eye by the width of about two scales. Funicle with first segment broadly conical; segments two to five equal, cubical; segments six and seven large and slightly moniliform. Eye small, moderately prominent.

Thorax 1.18 times longer than broad. Pronotum 1.7 times longer than prosternum. Disc of thorax with sub-foveate punctures. Thorax cylindrical in dorsal view, sides nearly straight; basal and apical constrictions distinct but not conspicuous in profile or dorsal outline. Ocular vibrissae absent.

Elytra quite convex transversely; sides in dorsal view elliptical (fig. 2), broadest at middle. Elytra 1.9 times longer than thorax. Elytral intervals not raised or tumid. In profile, body thickest at middle; elytra evenly arcuate from base to summit of declivity which is oblique to apex.

Fore tibia with three teeth and several minute denticles on the inner edge. Fore coxae rather broadly separated for the genus. Last abdominal segment nearly flat; finely carinately margined; without depressions at base; apex rounded.

Male. Unknown.

HOLOTYPE.—Female. Camara, Zamorano, Honduras, September, 1953, N. K. Krauss, Flowers Lantana, 4369, 53-11260 (USNM No. 65481). No allotype or paratypes.

The holotype is in poor condition. Only one tarsus is complete, many of the setae of the disc of the elytra and thorax are absent, and the sculpture and color of the scales is obscured by dirt or grease. The ocular vibrissae are absent as noted in the description; considering the condition of the specimen, it is possible that they have been abraded and that their absence is atypical.

I. ellipticum is quite similar to *brevirostre* in size, form and setae. It differs from *brevirostre* in having its fore tibiae dentate, elytra much more convex and broader, setae quite similar but less erect on disc of elytra, apical emargination of beak deeper and carinate, fovea on beak between insertion of antennae instead of between the eyes, fore coxae much more widely separated, and legs stouter and longer.

Of the species with dentate fore tibiae, *ellipticum* most closely resembles *orizabae*, the general characteristics of the setae, beak, prothorax and widely separated fore coxae being particularly similar. *I. ellipticum* has quite different elytra: the sides are very evenly elliptical, broadest at the middle instead of the basal third, much more convex transversely and with no elevations on any of the intervals. The other principal differences are in the last abdominal segment of the female which is flat instead of tumid; the eyes which are smaller and more convex; and segments two to five of the funicle which are cubical instead of moniliform. Of course, these comparisons were made with only four specimens, but the characters mentioned are of a nature which should remain valid within the bounds of normal intraspecific variation as exhibited in other species of *Isodacrys*. If the species is not parthenogenetic, the male may have the elytra less inflated and therefore less strikingly elliptical.

The type locality (see map) of *I. ellipticum* is the farthest extension of the range of the genus into Central America.

10. *Isodacrys ovipennis* (Schaeffer)

(FIGURES 1, 18, 19)

Pandeletejus ovipennis Schaeffer, 1908, p. 215. Pierce, 1909, p. 359.

Isodacrys ovipennis (Schaeffer). Pierce, 1913, p. 401.

Males. Length 3.0 to 3.6 mm.; width 1.2 to 1.3 mm. Females, length 3.1 to 3.6 mm.; width 1.3 to 1.4 mm. Color varies from nearly immaculate cinereus to an elaborately patterned cinereus, with maximum expression as follows: thorax with two pale and two dark vittae on each side of fine pale median line; elytra with sides to seventh interval pale from base to basal third where a lunule extends across fifth interval, a parallel lunule at apical third extends to suture, third interval pale from base to first lunule. Scales granular, obsoletely margined; not different on sutural interval at declivity. Setae small, inconspicuous, lanceolate; completely or incompletely arched on head and thorax, incompletely arched on most of elytra. Head globose; beak cuboidal. Antennae with first segment of funicle clavate, segments two to six subequal, becoming shorter and broader, segment seven moniliform. Eye small, round, not at all prominent. Pronotum usually 1.5 times longer than prosternum. Basal and apical constrictions moderate. Ocular vibrissae represented by a cluster or row of three to six vibrissae of various lengths. Elytra very distinctive (fig. 1), 1.9 to 2.0 times length of thorax. Elytra very narrow at base, widest at middle; in lateral view thickest at apical third. Base of elytra slightly arcuately emarginate; slightly raised and with the basal puncture of each stria foveate, presenting the total effect of a constriction at base. Elytra strongly convex transversely. Fifth and sixth intervals prominent at their terminations on apical fifth; second and tenth intervals quite prominent at their junction; both of these prominences conspicuous in dorsal outline. Elytral intervals slightly convex; sutural interval not more convex or raised at declivity. Fore femur definitely larger than other femora. Inner edge of fore tibia straight with three or four distinct teeth and several denticles among the hairs of the expanded apex. Fore coxae narrowly separated. Last abdominal segment very little different in the sexes; convex; apex truncate in males; slightly elongate in females. Aedeagus (figs. 18, 19) arcuate, tubular; apex forming approximately a 45° angle.

LECTOTYPE.—Here designated and labelled "Type." Female, 3.6 mm. long, 1.4 mm. wide. The first cotype in the row and bearing the label "Pandeletejus ovipennis Schaef." in script. The specimen is in excellent condition.

TYPE SERIES.—Five males, 6 females, all in United States National Museum. Cotype No. 42474. Lectotype "EsperRch, Brownsville, Tex. VII.28, Brooklyn Museum Collection 1929." Other cotypes are labelled: Esprza Rch, Brownsville, Tex., VII.22 (3 males, 2 females), VII.28 (1 female), VIII.16 (1 male, 1 female), VIII.18 (1 female), VIII.22 (1 male).

ADDITONAL SPECIMENS.—Seven males. 1 male, Brownsville, Texas, April 20, 1937, on Eucalyptus, Mexico (Howden); 1 male, Brownsville, Texas, June, Wickham (USNM); 1 male, Brownsville, Texas, July 8, 1908, Sweepings, S. Texas Garden (USNM); 1 male, Pt. Isabel, Texas, Wickham (USNM); 3 males, Pt. Isabel, Texas, July 22, 1906, Coll. by A. B. Wolcott, Liljeblad Collection (Howden, UM).

I. ovipennis is readily distinguished from all other *Isodacrys* by the form of its elytra, which are cuneate or elongate-elliptical, very narrow basally, and with the apices of the second and fifth intervals tumid. *I. burkei* approaches this condition, but in *burkei* the second and fifth intervals are only obsoletely prominent, if at all. *I. ovipennis* also differs from *burkei* in its more shallowly punctured pronotum, ocular vibrissae, without an ocular tooth, and scales indistinctly margined. The aedeagi of the two species are quite similar.

I. ovipennis and *burkei* are the only two species recorded from Texas (see map) and their ranges as now known do not overlap. Pierce (1913, p. 401) records *I. ovipennis* from Victoria, but specimens were seen from only Brownsville and its immediate vicinity.

11. *Isodacrys burkei* n. sp.

(FIGURES 5, 13, 14, 20)

HOLOTYPE.—Male. Length 3.0 mm.; width 1.1 mm. Scales pale cinereus, light brown and fuscous arranged in the following pattern: thorax with broad median vitta pale shading to fuscous near sides; elytra with suture pale, second interval mottled dark brown, remainder of disc mottled light brown, sides with mottled pale area irregularly bordered with fuscous extending before middle in an arm onto fifth interval and extending obliquely across summit of declivity to suture. Scales faintly alutaceous; slightly pustulate on elytra, not pustulate on head or thorax. Scales of head and thorax with margins conspicuously reflexed anteriorly and laterally; scales of elytra with margins conspicuously reflexed posteriorly and laterally; scales of sutural interval at declivity quite convex, margins inconspicuous. Setae of dorsal surface small, inconspicuous, completely arched (fig. 5).

Head and beak moderate in size. Dorsal surface of beak nearly flat; median line impressed from just before the eyes to the apical emargination which is distinctly carinate and slightly less than a 90° angle. Epistoma flat, lightly punctate; anterior margin with an asymmetrical indentation. Scrobe obtusely angled, wide; horizontal portion five-sevenths as long as vertical portion; separated from eye by the width of three scales. Funicle with first segment oviform; second segment clavate, about one-half the length of the first; third segment very small, cuboidal; segments four to seven moniliform, the distal segments larger. Eye moderate in size, suboblong; not at all prominent, not extending beyond side of head in anterior view. A vague keel extends along dorso-lateral edge of beak from scrobe to eye.

Thorax 1.2 times longer than wide. Pronotum 1.8 times longer than prosternum. Thorax subcylindrical, flattened dorsally; basal and apical constrictions obsolete, the sides slightly arcuate at middle. Disc of thorax foveate. Anterior margin on side of thorax with a conspicuous convex squamose tooth (fig. 20) directed between eye and scrobe; without ocular vibrissae.

Elytra (fig. 20) subcylindrical, widest at middle; 1.8 times longer than thorax; 1.6 times longer than wide. Base of elytra obsoletely, arcuately emarginate. Alternate intervals much wider and slightly more convex, the third and fifth intervals more conspicuously convex basally. Fifth interval tumescent at its apex; second and tenth intervals tumescent at their apical junction; both tumescences visible in dorsal outline, though neither is as pronounced as in *ovipennis.* Elytra flattened dorsally. Sutural interval at declivity slightly enlarged. Declivity vertical, gently rounded at its summit, its profile interruped by the tumescence of the second interval and the slightly extended apices of the elytra which are broadly, conjointly rounded.

Fore legs more robust than other legs. Right fore tibia with three, left fore tibia with four moderate teeth on inner edge which is straight. Fore coxae moderately separated. Last abdominal segment slightly convex; apex broadly rounded.

Aedeagus (figs. 13, 14) very slender, arcuate, its tip slightly attenuated and rounded.

ALLOTYPE.—Female. Length 3.6 mm.; width 1.5 mm. Form much more robust than in holotype. Color as in holotype, but pattern more distinct. Thorax with disc dark brown, except for a pale fine median line; pleura broadly pale. Scales and setae as in holotype. Head and beak as in holotype, but the vague keel along the side of the beak is reduced to an indistinct tumescence over the eye. All segments of the antennal funicle less rounded and more cuboidal or cylindrical. Thorax more robust than in holotype, 1.2 times longer than wide; base conspicuously wider than apex; pronotum 1.6 times longer than prosternum. Elytra much more robust than in holotype, sides more arcuate. Elytra 2.0 times longer than thorax; 1.5 times longer than wide. Basal strial punctures deeper, alternate intervals more convex, and base of elytra more keeled than in the holotype; similar to the base of the elytra of *ovipennis.* Fifth interval less tumescent at its apex. Fore tibia with four teeth on inner edge. Fore coxae slightly more narrowly separated. Last abdominal segment slightly convex, more elongate; apex rounded.

HOLOTYPE.—Male, Brazos Co., Texas, May 12, 1960, H. R. Burke Coll. (Texas). Allotype, female, same data as holotype (Texas). Paratypes, 43 males, 46 females: 26 males, 27 females, same data as holotype; 3 males, 5 females, Brazos Co., Texas, May 8, 1956, H. R. Burke Collector; 2 females, College Station, Texas, May 3, May 7, 1931, H. J. Reinhard Collector, #268, swept from weeds, #2082, sweeping; 2 males, 2 females, Gonzales Co., April 17, 1955, H. R. Burke, damaging foliage of watermelon and peas; 11 males, 6 females, Lee Co., Texas, May 29, 1960, S. D. and H. R. Burke Collectors, sweeping low vegetation along roadside; 1 female, Peeler, Texas, June 22, 1938, L. W. Hepner; 2 males, 2 females, Milano, Texas, Milam County #7315, on tomato plants, very numerous, eating stems particularly, causing plants to fall over.

Paratypes are in the following collections: British Museum (Natural History), CNHM, CNC (No. 7386), CU, Mexico, Texas, UK, USNM, Howden, Kissinger.

Male paratypes vary in length from 2.7 to 3.4 mm., and in width from 1.1 to 1.2 mm. Female paratypes vary in length from 3.2 to 4.0 mm., and in width from 1.3 to 1.6 mm. Color in the paratypes is reduced in some to a faintly mottled pale brown or pale cinereus. The allotype bears the most distinct markings. The head and beak are quite uniform, the lateral keel of the beak being never more strongly expressed than in the holotype and usually obsolete. The robust habitus of the head and beak is quite distinctive. The ocular tooth on the thorax is well developed in all paratypes and varies little, and then in the acuteness or bluntness of the apex. In no specimens are there any ocular vibrissae. The elytra are variable in several aspects. The sides of some males are subparallel. The alternate intervals are generally wider and more convex in females than in males. In many paratypes of both sexes the base of the elytra is unmodified, i.e., there is no keel, the basal strial punctures are not deeper than other strial punctures, and the alternate intervals are not more convex. The tumescence of the apex of the fifth interval varies considerably and is obsolete in some. The tumescence at the junction of the second and tenth intervals also varies, but is always present. The teeth of the inner edge of the fore tibiae are always fuscous and sharp and vary in number from one to four, three or four being the usual number. The apex of the aedeagus varies in acuteness: in most specimens the apex is like that of the holotype (Fig. 14), but in some it is more blunt and less attenuate. In one specimen it is much more acute, approaching the shape of the apex in *apicale,* but not as attenuated as in *apicale.*

I. burkei is easily distinguished from all other *Isodacrys* by the conspicuous, convex, squamose thoracic tooth without ocular vibrissae. No other *Isodacrys* has any modifications of the anterior margin of the thorax other than ocular vibrissae. Other distinguishing characteristics are the robust head and beak, subcylindrical thorax, dorsally flattened elytra, and the "imbricated" scales.

I. ovipennis and *burkei* are quite closely related and differ from the other species of *Isodacrys* by their subcylindrical habitus with elytral tumescences and similar aedeagi. *I. burkei* differs from *ovipennis* principally in its more robust head and beak; shorter stouter antennal club; shorter, stouter first segment of funicle; "imbricated" scales instead of obsoletely margined scales; elytral setae more slender and fully arched instead of incompletely arched; less distinct "constriction" at base of elytra; less convex, dorsally flattened body; and shorter, stouter legs. The aedeagi are so similar that it would be difficult if not impossible to identify the species on the basis of the aedeagus alone. These two species are the only ones which are known in the United States (see map) and so far are known only from the United States. *I. burkei* has been collected in five counties of Texas: Brazos, Gonzales, Lee, Leon, Milam.

Dr. Burke states in correspondence that he collected the 54 specimens on May 12 "in a period of about one hour, indicating that they are rather abundant. However, I have not yet been able to single out the plant on which they are feeding. . . . These specimens were swept from low, mixed vegetation in a roadside ditch."

This species is named in honor of Dr. Horace R. Burke who collected all but three specimens of the type series.

12. *Isodacrys apicale* n. sp.

(FIGURES 4, 6, 11, 12, 15)

HOLOTYPE.—Male. Length 2.9 mm.; width 1.3 mm. Light brown and cinereus with no distinct pattern. Scales of head and thorax finely granular, faintly pustulate, with fine margins. Scales on disc of elytra finely granular, faintly pustulate becoming more strongly pustulate towards declivity, with slightly reflexed margins laterally and posteriorly presenting an imbricated appearance; scales of entire declivity strongly convex, smooth, and without margins. Setae of head and thorax small and very inconspicuous, completely arched. Setae of elytra short, incompletely arched (fig. 6), broad; becoming longer and more erect on declivity, more numerous on sutural interval at declivity.

Head and beak moderate in size. Sides of beak slightly convergent apically; dorsum slightly concave with an indistinct shallow fovea at either end of a fine median line; apex slightly deflected, arcuately emarginate, not carinate. Epistoma on lower plane with its anterior margin truncate with apex of beak. Scrobe (fig. 15) very obtusely angled, the horizontal portion four-fifths as long as the vertical portion; separated from eye by two rows of scales. Funicle with first segment ovoid; second segment subcylindrical, almost as long as first; segments three to seven shorter than first and second segments but subequal to each other, cuboidal, the distal segments submoniliform. Eye large, round, not very prominent in dorsal view.

Thorax 1.07 times longer than broad. Pronotum 1.9 times as long as prosternum. Basal and apical constrictions obsolete on disc, less obsolete on sides; sides slightly arcuate between constrictions. Punctuation obscured by scales. Ocular vibrissae represented by several short setae and several long setae which almost reach eye.

Elytra (fig. 4) subcylindrical with humeri feebly developed. Elytra 1.47 times longer than broad; 1.7 times longer than thorax. Base of elytra nearly straight (fig. 4). Sides of elytra subparallel for basal fourth-fifths; apices individually rounded. Elytra in profile (fig. 15) with disc flattened, gently sloping to base and to declivity which is not well defined. Elytral intervals regular, slightly convex, not raised at base or apex; sutural interval not raised at declivity.

Legs relatively long, similar to each other. Tibiae slender and expanded at apex; fore tibia with four acute teeth on inner edge. Fore coxae very narrowly separated. Last abdominal segment deflected on sides and apex, emarginate at apex.

Aedeagus (figs. 11, 12) short, stout, curved; apex attenuated into acute point.

ALLOTYPE.—Female. Length 3.6 mm.; width 1.6 mm. Brown, marked with tan as follows: head and pleura of thorax and elytra pale; disc of thorax with pale, apically convergent vittae; elytra with a short, pale fascia at middle. More robust than holotype and differing from it as follows: scales of elytra more conspicuously punctate; eye with ventral margin straight; thorax 1.06 times longer than broad; thorax with fine, sparse punctures basally, becoming impunctate apically; elytra 1.44 times longer than broad, 1.8 times longer than thorax; humeri more prominent; apices of elytra more attenuate; left fore tibia with six teeth on inner edge, right fore tibia with five teeth; last abdominal segment convex with margin finely carinate, apex broadly rounded.

HOLOTYPE.—Male, Choix, Sinaloa, August 13, 1935, 151/35 (CNC No. 7385). Allotype, female, same data as holotype (Mexico). Paratype, 1 female, same data as type, Algodon (Howden).

Paratype, length 3.3 mm.; width 1.4 mm. Intermediate in habitus and differing from holotype and allotype in the following minor respects: scales of declivity less convex and more like the scales of disc of elytra; fore tibia with four teeth and several denticles on inner edge; last abdominal segment truncate at apex.

I. apicale is nearest *mexicanum* which it strongly resembles in its short cylindrical habitus. From *mexicanum* it is most readily distinguished by the following characters: apex of aedeagus acutely pointed instead of broadly rounded; apices of elytra individually rounded; base of elytra straight instead of emarginate; elytral intervals not raised or tumescent at base, apex, or on declivity; setae of elytra incompletely arched becoming longer and more erect on declivity. The posteriorly imbricated scales of the elytra are also different from the simply margined scales of the elytra of *mexicanum,* but there is some variation in the degree of imbrication and only a little dirt will obscure the character.

The ocular vibrissae are longer in the three specimens of *apicale* than in any other *Isodacrys* examined. The eyes of *apicale* are larger than in any other specimens of the genus at hand except *guatemalenum.* The humeral angles reach their greatest development in the genus in this species and *mexicanum.* None of the specimens of *apicale* were dissected for the presence of wings, but I suspect they are absent or vestigial.

The type locality of Choix is in northern Sinaloa, the westernmost record of *Isodacrys.*

13. *Isodacrys mexicanum* Sharp

(FIGURES 23, 24)

Isodacrys mexicanus Sharp, 1911, p. 176.

Isodacrys mexicana Sharp. Blackwelder, 1947, p. 799.

Males. Length 2.5 to 2.8 mm.; width 1.0 to 1.1 mm. Females, length 2.7 to 3.2 mm.; width 1.1 to 1.4 mm. Scales finely margined, granular; some scales finely pustulate. Scales of suture at declivity becoming strongly pustulate. Entire dorsal surface with small, lanceolate, completely arched setae which are depressed and very inconspicuous on vertex and disc of pronotum, conspicuous and more numerous on sutural interval at declivity. Apical emargination of beak carinate, roughly right-angled. Scrobe approximately right-angled. Thorax long, sides moderately arcuate; basal and apical constrictions weak, especially dorsally. Ocular vibrissae poorly developed, represented by one to three slender, long hairs. Base of elytra faintly to conspicuously arcuately emarginate. Length of elytra 1.5 times length of thorax in males; 1.7 times length of thorax in females. Sides of elytra subparallel from base to middle, thence gradually converging to apex. Elytra in profile thickest at about middle. Intervals three and five raised at base and sometimes at apex; sutural interval tumescent at declivity. Fore tibia with three to six teeth on inner edge. Last abdominal segment of male with sides deflected; deeply emarginate at apex. Last abdominal segment of female with large shallow depression on either side at base; apex truncate or slightly emarginate. Aedeagus (figs. 23, 24) short, stout, curved; with a long, thin, apical attentuation which is parallel-sided and broadly rounded at the apex.

TYPE SERIES.—Five specimens. Specimens examined: a female cotype in the United States National Museum and a male cotype in the British Museum labelled, "Guanajuato, Mexico, Salle Coll."

ADDITIONAL SPECIMENS.—Three males, 9 females. 1 male, 5 miles N. Cuernavaca, Morelos, on oak, Aug. 28, 1958, E. Mockford; 2 males, 9 females, YMCA Camp, Tepoztlan, Morelos, Aug. 21, 1958, H. F. Howden (CNC, Howden). These additional specimens agree completely with the cotypes examined and with the brief original description and illustration, but in none of the specimens is the color pattern as distinct.

This beetle has a very distinctive habitus with its long thorax and short, subcylindrical form. From other species with ocular vibrissae and dentate fore tibiae, it may also be separated by its emarginate elytral base; small, completely arched setae; and broadly rounded apex of aedeagus.

The additional specimens were taken by beating trees at an elevation of approximately 5000 feet near the southern edge of the highlands.

Literature cited

Blackwelder, Richard E.

1947. Checklist of the Coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 5. United States Nat. Mus. Bull. 185:765-925.

Burke, Horace R.

1959. Notes on some Texas Curculionidae with a description of a new species. The Coleopterists' Bull. 13:36-41.

Champion, G. C.

1911. Biologia Centrali-Americana. Insecta. Rhynchophora 4 (3):178-354.

Howden, Anne T.

1959. A revision of the species of *Pandeleteius* Schonherr and *Pandeleteinus* Champion of America North of Mexico (Coleoptera: Curculionidae). Proc. California Acad. Sci. (4) 29 (10):361-421.

Pierce, W. D.

1909. Studies of North American Weevils. Proc. United States Nat. Mus. 37 (1708):325-364.

Pierce, W. D.

1913. Miscellaneous contributions to the knowledge of the weevils of the families Attelabidae and Brachyrhinidae. Proc. United States Nat. Mus. 45 (1988):365-426.

Schaeffer, C. F. A.

1908. New Rhynchophora. III. J. New York Ent. Soc. 16:213-222.

Sharp, David

1911. Biologia Centrali-Americana. Insecta. Rhynchophora 4 (3):1-177.

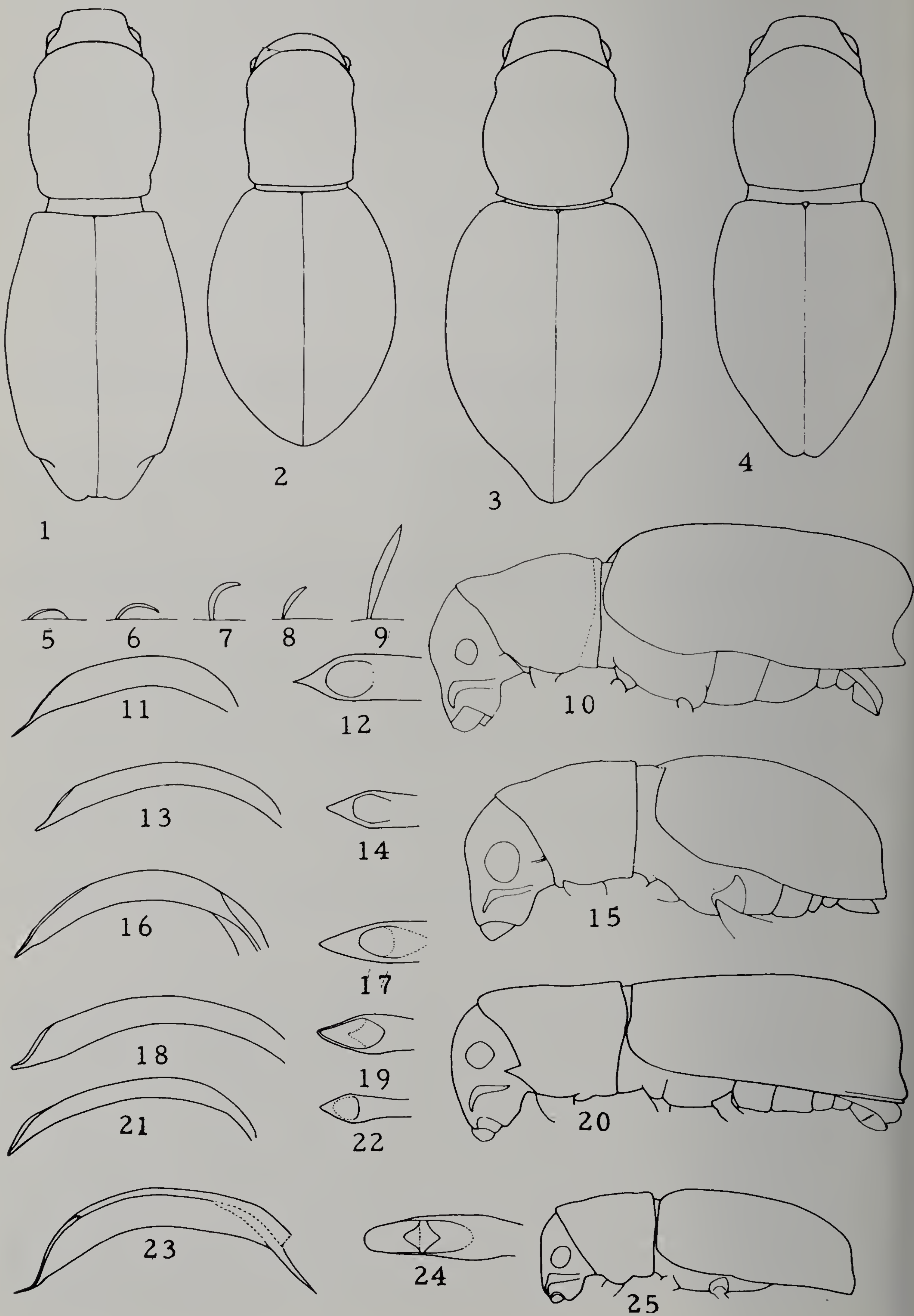
Van Emden, F. I.

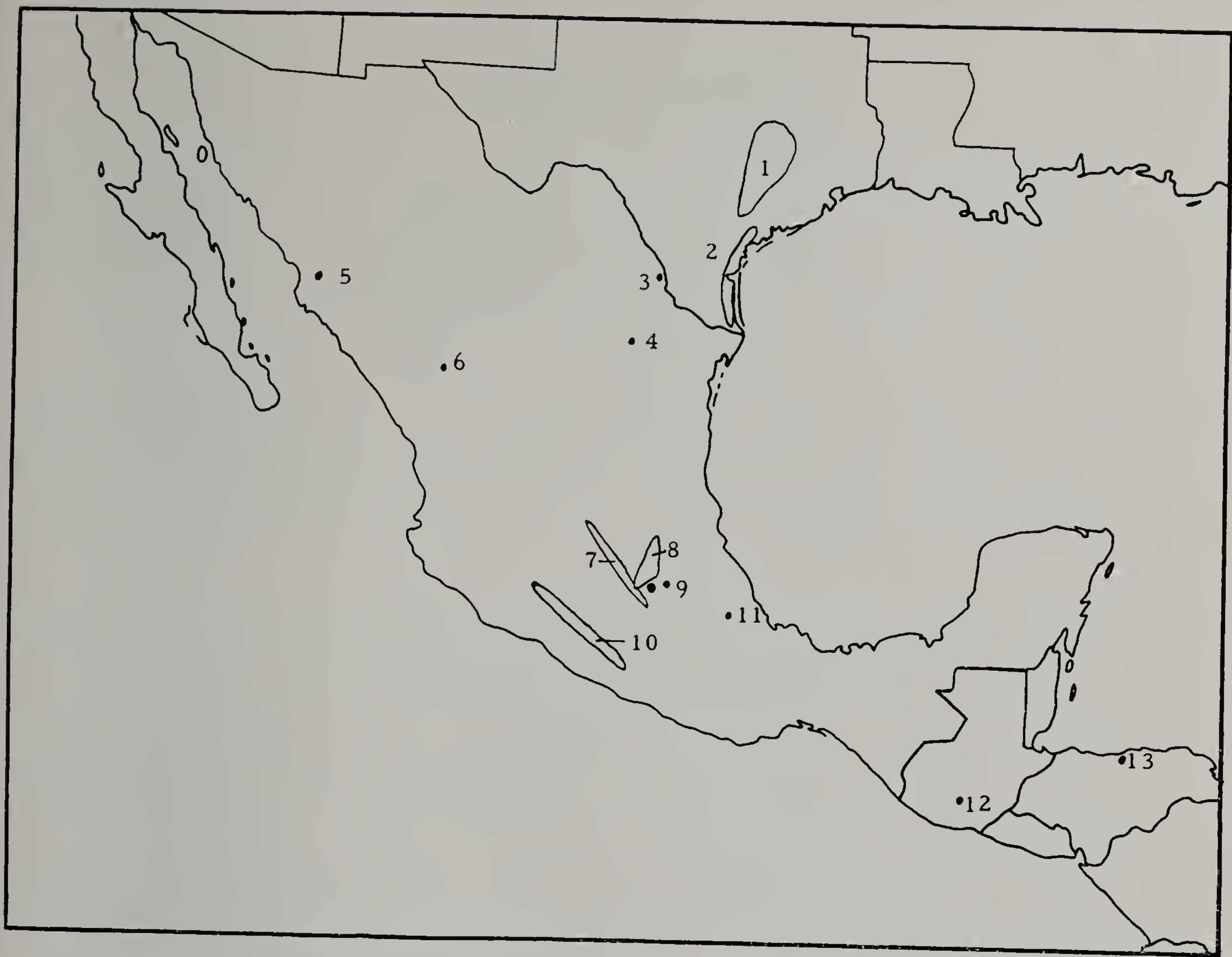
1944. A key to the genera of Brachyderinae of the World. Annals Mag. Nat. Hist. (11) 11:503-532, 559-586.

Vaurie, Charles and Patricia

1949. Insect collecting in Guatemala 65 years after Champion. J. New York Ent. Soc. 57:1-18.

Fig. 1, dorsal view of *Isodacrys ovipennis* (Schffr.) cotype male; Fig. 2, dorsal view of *I. ellipticum* n. sp. holotype; Fig. 3, dorsal view of *I. crispum* n. sp. holotype; Fig. 4, dorsal view of *I. apicale* n. sp. holotype; Fig. 5, typical completely arched seta of *I. burkei* n. sp.; Fig. 6, typical incompletely arched seta of *I. apicale* n. sp.; Fig. 7, typical slightly arched seta of *I. brevirostre* n. sp.; Fig. 8, typical erect seta of *I. brevirostre* n. sp; Fig. 9, typical erect seta of *I. guatemalenum* Sharp; Fig. 10, lateral view of *I. buchanani* n. sp. allotype; Fig. 11, lateral view of aedeagus of *I. apicale* n. sp. holotype; Fig. 12, dorsal view of apex of aedeagus of *I. apicale* n. sp. holotype; Fig. 13, lateral view of aedeagus of *I. burkei* n. sp. holotype; Fig. 14, dorsal view of apex of aedeagus of *I. burkei* n. sp. holotype; Fig. 15, lateral view of *I. apicale* n. sp. holotype; Fig. 16, lateral view of aedeagus of *I. guatemalenum* Sharp; Fig. 17, dorsal view of apex of aedeagus of *I. guatemalenum* Sharp; Fig. 18, lateral view of aedeagus of *I. ovipennis* (Schffr.); Fig. 19, dorsal view of apex of aedeagus of *I. ovipennis* (Schffr.); Fig. 20, lateral view of *I. burkei* n. sp. male; Fig. 21, lateral view of aedeagus of *I. buchanani* n. sp. holotype; FIG. 22, dorsal view of apex of aedeagus of *I. buchanani* n. sp. holotype; FIG. 23, lateral view of aedeagus of *I. mexicanum* Sharp; FIG. 24, dorsal view of apex of aedeagus of *I. mexicanum* Sharp; FIG. 25, lateral view of *I. brevirostre* n. sp. female.





Distribution of species of *Isodacrys:* 1, *I. burkei* n. sp.; 2, *I. ovipennis* (Schffr.); 3, *I. buchanani* n. sp.; 4, *I. schwarzi* Champ.; 5, *I. apicale* n. sp.; 6, *I. crispum* n. sp.; 7, *I. mexicanum* Sharp; 8, *I. brevirostre* n. sp.; 9, *I. geminatum* n. sp.; 10, *I. minutum* Sharp; 11, *I. orizabae* Sharp; 12, *I. guatemalenum* Sharp; 13, *I. ellipticum* n. sp.

The circled dot near "9" represents Mexico City.

A NOTE ON THE ABUNDANCE OF A WEEVIL, *CENTRINASPIS PICUMNIS* (HERBST), IN A SMALL FIELD

Centrinaspis picumnis (Herbst) is a minute weevil (about 2 to 3 mm. long) that occurs over most of the eastern half of the United States, from spring until fall, feeding on the pollen of many plants, for example, dogwood, blackberry, and goldenrod. The fact that the adults congregate on flowers was used as an indication of the abundance of the insect. The study area for this note is a small uncultivated field about two acres (8100 m^2) in extent, located about 5 miles northwest of Huntsville, Alabama. The plant species mentioned in this note were determined by the late S. F. Blake, an authority on composite taxonomy.

Early in August, 1959, a group of 28 *Solidago gigantea* Ait. on the periphery of the study area was found to be in bloom in advance of the composites in the field. The weevils present on these flowers were collected three times a day by shaking the flowers into a large net. This was done at 7 a.m., noon, and 5 p.m. for 10 days from August 10 until August 21, 1959. The purpose was to determine during what part of the day the weevils were most active and to demonstrate the large population present.

During this phase of the study 31 collections were made on the group of 28 *Solidago* plants. The collections contained a total of 36,000 *C. picumnis*. The average number of weevils arriving on the flowers during the five hours before noon was 31 weevils per plant; the average for the five hours after noon was 58 weevils per plant. Using chi-square this difference is significant at the five per cent level indicating that the weevil probably flies more actively in the afternoon. The average for the 7 a.m. collections was 4 weevils per plant which probably includes those weevils missed when the previous 5 p.m. collection was made; apparently the weevil does not fly at night.

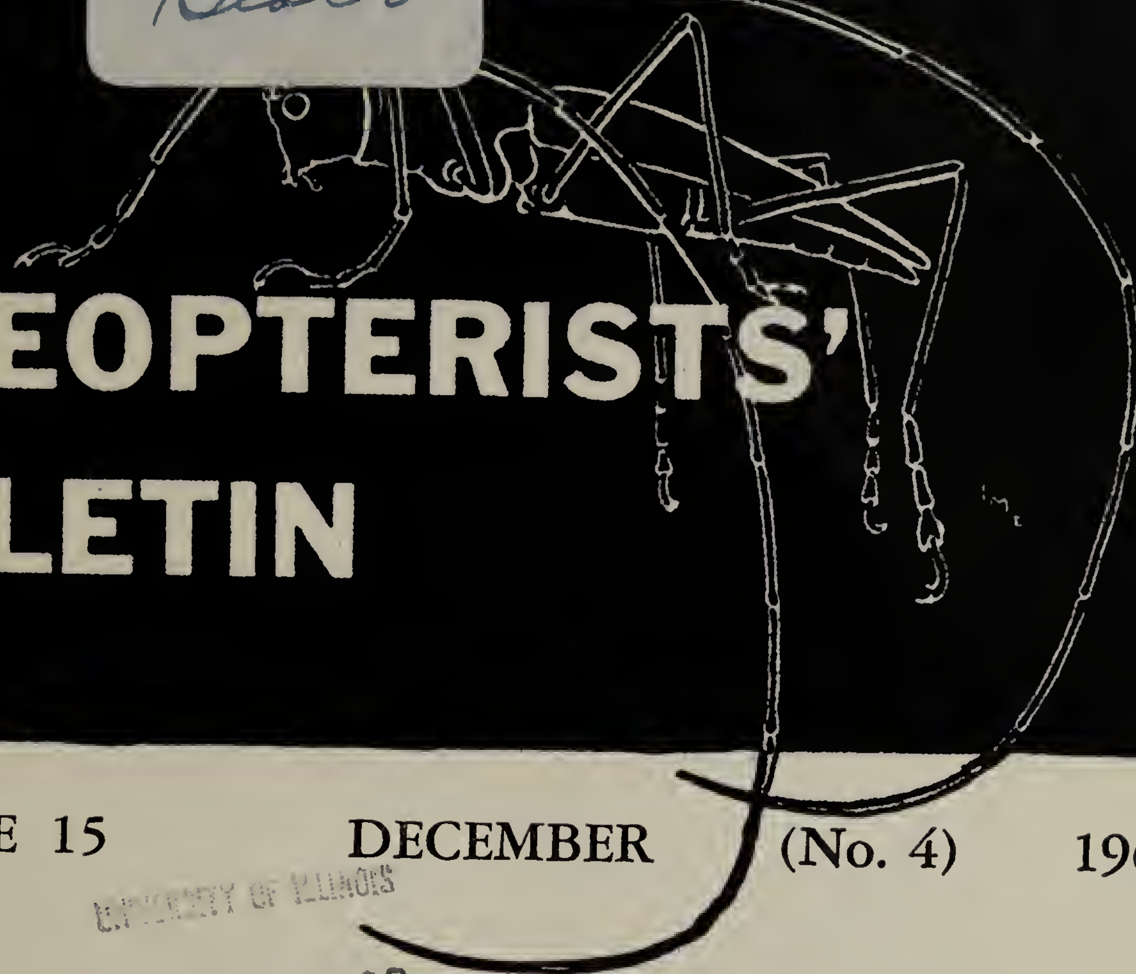
An attempt was made to estimate the number of *C. picumnis* occurring on the composites in the study area. The following numbers of plants were estimated to be blooming in the study area on the basis of a visual count—*Solidago gigantea* Ait., 120; *Eupatorium perfoliatum* L., 90; and *Eupatorium altissimum* L., 340. *Eupatorium serotinum* Michx. was abundant in patches; the average number of plants in 15 one-meter-square quadrates was 5.0; a conservative estimate for the field is one plant per square meter, or about 8100 plants.

On August 14 the first estimate was made. The goldenrod was open and the other composites were beginning to bloom. The following gives the number of plants examined, the plant species, and the average number of weevils per plant: 20 *Solidago,* 48.8; 5 *perfoliatum,* 25.2; 20 *altissimum,* 1.2; 20 *serotinum,* 1.5. The estimated number of *C. picumnis* present on these flowers was 20,500.

On August 19 a second estimate was made, at which time the goldenrod was in fuller bloom than before and the other flowers were open. The following results were obtained as above: 33 *Solidago,* 96.5; 10 *perfoliatum,* 35.7; 9 *altissimum,* 11.6; 40 *serotinum,* 3.8. At this time the estimated number of *C. picumnis* present was 49,500, or more than twice the figure obtained by the first estimate. Presumably this influx was due to the increased attractiveness of the flowers as they shed more pollen. The exact source for this influx of adults is not known as the larval host plant is unknown.

—D. G. KISSINGER, *Atlantic Union College, South Lancaster, Massachusetts.*

THE COLEOPTERISTS' BULLETIN



VOLUME 15 DECEMBER (No. 4) 1961

ARTICLES

NOTES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by Ross H. Arnett, Jr. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, Department of Biology, Catholic University of America, Washington 17, D. C.

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 15 December (No. 4) 1961

SYSTEMATICS OF DUBOISIUS, A NEW GENUS OF PEDILID BEETLES (PEDILIDAE)

By MOHAMMAD ABDULLAH[1]

A new genus of pedilid beetles belonging to the tribe Eurygeniini is described with twelve new species. The genus is named after Mr. John J. du Bois, whose personal collection of Pedilidae proved highly valuable to the author in his present study.

Duboisius is distinguished from all other described genera of Eurygeniini (i.e., *Bactrocerus* LeConte, *Pseudobactrocerus* Abdullah (1961), *Egestria* Pascoe, *Pergetus* Casey, *Stereopalpus* Laferte, *Mastoremus* Casey, *Leptoremus* Casey, and *Retocomus* Casey) by the following combination of characters: Antennae with terminal segment not much longer than penultimate segment, pronotum usually without a median canal, fourth segment of maxillary palpi obconical and slightly excavated laterally, eyes entire or only feebly emarginate and coarsely faceted, tempora prominent, metasternum with a patch of spines in males of most species, fifth visible abdominal sternum emarginate, strongly laterally produced in male, rounded to feebly emarginate in female, seventh tergum laterally produced in female and usually with a median projection, female genitalia long, slender, sparsely hairy at apex.

SYSTEMATICS

Duboisius, new genus.

Moderate sized. Body irregularly covered with white pubescence. Tempora prominent. Eyes entire or only feebly and broadly emarginate, coarsely faceted, large, separated by less than their width above, bulging laterally. Antennae filiform; first segment large, more than twice longer than wide; second half as long as first; third nearly as long as first; fourth shorter than or equal to third; segments five to ten becoming succeedingly broader; last segment slightly longer than penultimate, equally slightly tapering at both ends with greatest width at middle. Labrum half as long as wide, flat ventrally, slightly elevated in center dorsally, fringed with long hairs apically. Mandibles longer than wide, prostheca large, fringed anteriorly, molar lobe smooth with only a few ridges. Maxillary palpi with first segment smallest, quadrate, second segment less than twice longer than third, third segment half as long as fourth, fourth segment obconical, slightly excavated laterally. Labium with mentum subtrapezoidal, broad at base, bulging at sides; labial palpi three segmented, third segment largest, subtriangular. Neck not constricted at base, half as wide as pronotum.

[1] Department of Biological Sciences, Illinois State Normal University, Normal.

Pronotum nearly as long as broad, punctate, pubescent, subcircular, constricted apically to form a narrow flange as wide as neck. Mesepisterna meeting in front of mesosternum. Metasternum with a patch of spines in males or else simply pubescent ventrally. Scutellum rounded at apex, notched at base and laterally, sulcated medially towards base, surface nearly concealed with dense pubescence. Elytra punctate, maculated, pubescence dimorphic. Wing with anal cell open or closed. Legs piceous, clothed with silvery pubescence and bristly hairy, coxae nearlly contiguous, tibial spurs thick, short, tarsi with antepenultimate segments lobed below, claws with a basal dentation, empodium small, chitinous, setose. Abdomen with seventh sternite (= fifth visible sternite) emarginate, strongly laterally produced in male; rounded to feebly emarginate in female; seventh tergite broadly truncate in male; emarginate, laterally produced, usually with median projection in female; eighth sternite emarginate, laterally produced, variously formed medially in male; eighth tergite more or less truncate in male. Male genitalia with parameres (lateral lobes) polyspined, punctate, tapering near apex; aedeagus (median lobe) with a pair of cuticular backwardly directed processes at apex, basal processes short (fig. 6). Female genitalia long, slender, flattened, sparsely hairy at apex.

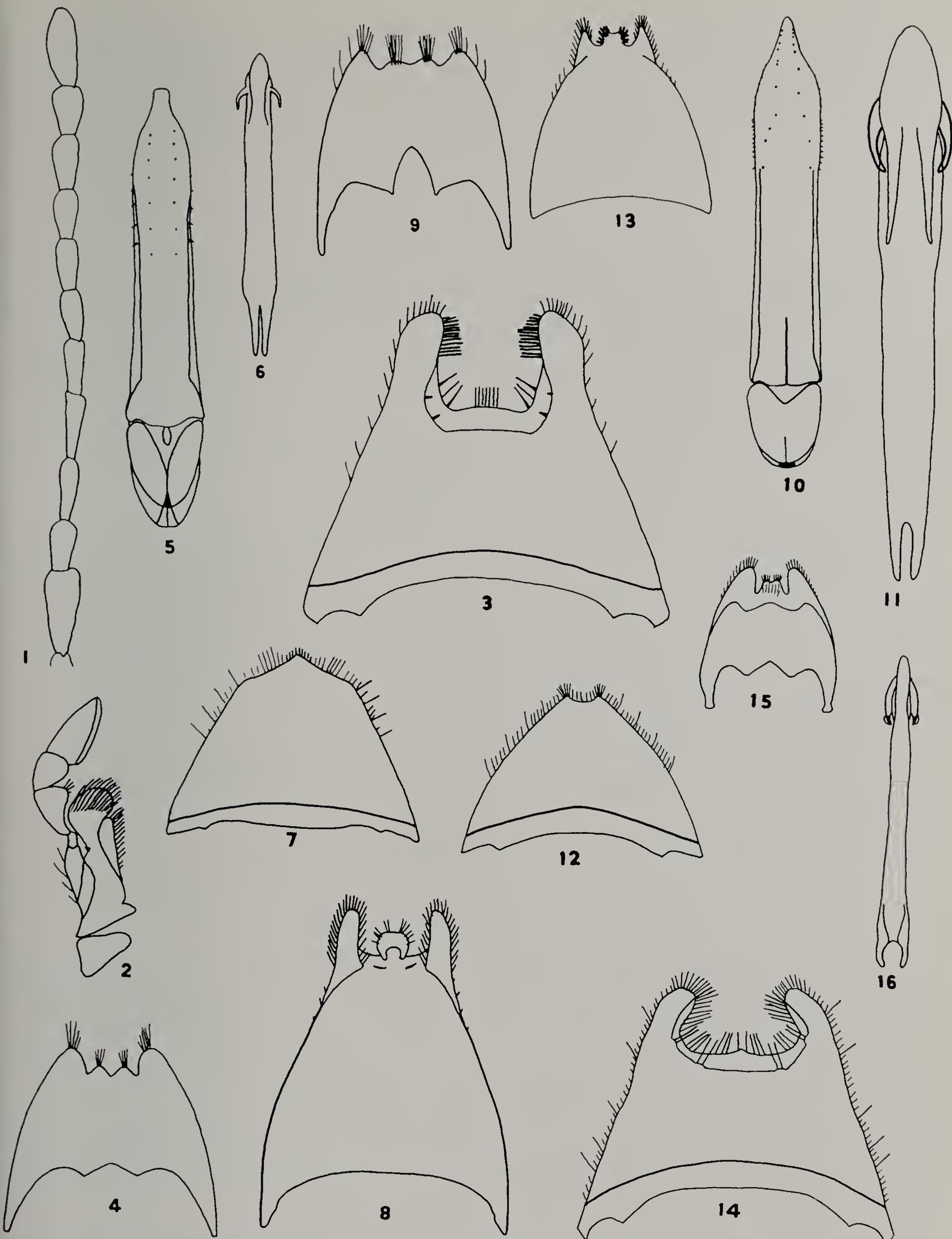
Type species: *D. arizonensis.*

Key to the males of *Duboisius*

1. Metasternum with a patch of spines ventrally---------------------------------- 2
   Metasternum without a patch of spines ventrally, seventh abdominal sterum feebly emarginate (fig. 27)--HOWDENI
2. Tegmen with two rows of spines and punctures------------------------------ 3
   Tegmen irregularly punctured and spined------------------------------------ 4
3. Seventh abdominal sterum with lateral processes long (fig. 3), parameres blunt apically (fig. 5) --ARIZONENSIS
   Seventh abdominal sternum with lateral processes short, parameres tapering apically (fig. 10) ---TEXANUS
4. Parameres abruptly tapering near apex, wing with anal cell open--------------- 5
   Parameres not abruptly tapering near apex (fig. 26), wing with anal cell closed --WICKENBURGIENSIS
5. Seventh abdominal sternum with lateral processes bent inwards and short (fig. 14) --PUNCTULATUS
   Seventh abdominal sternum with lateral processes not bent inwards and short (fig. 22) ---BENEDICTI
   Seventh abdominal sternum with lateral processes not bent inwards and long------ 6
6. Seventh abdominal tergum half as long as wide, aedeagus with the head end sharply arrowshaped ---MEXCALIENSIS
   Seventh abdominal tergum more than half as long as wide, aedeagus with the head end not sharply arrowshaped (fig. 16)------------------------------------BOWDITCHI

Key to the females of *Duboisius*

1. Seventh abdominal tergum with a median process---------------------------- 2
   Seventh abdominal tergum without a median process (fig. 32)--------------TERMINALIS
2. Median process of seventh abdominal tergum longer than lateral processes (fig. 21), seventh abdominal sternum feebly emarginate and medially depressed and ridged (fig. 20) ---ABNORMIS
   Median process of seventh abdominal tergum as long as or shorter than lateral processes, seventh abdominal sternum not grooved or ridged medially-------------- 3
3. Median process of seventh abdominal tergum small, pointed, not emarginate, simple (fig. 31) ---DISTINGUENDUS
   Median process of seventh abdominal tergum small to large, blunt, usually emarginate, variously modified -- 4
4. Seventh abdominal sternum entire-- 5
   Seventh abdominal sternum emarginate-------------------------------------- 6
5. Lateral processes of seventh abdominal tergum twice as long as the median process (fig. 8) --ARIZONENSIS



FIGURES 1-8, *D. arizonensis*: FIG. 1, Antenna of male; FIG. 2, Maxilla of male; FIG. 3, Seventh sternite of male, ventral view; FIG. 4, Eighth sternite of male, ventral view; FIG. 5, Tegmen of male, ventral view; FIG. 6, Aedeagus of male, ventral view; FIG. 7, Seventh sternite of female, ventral view; FIG. 8, Seventh tergite of female, ventral view.

FIGURES 9-13, *D. texanus*: FIG. 9, Eighth sternite of male, ventral view; FIG. 10, Tegmen of male, ventral view; FIG. 11, Aedeagus of male, ventral view; FIG. 12, Seventh sternite of female, ventral view; FIG. 13, Seventh tergite of female, ventral view.

FIGURE 14, *D. punctulatus*: FIG. 14, Seventh sternite of male, ventral view.

Lateral processes of seventh abdominal tergum as long as or slightly shorter than the median process ---EMARGINATUS

6. Seventh abdominal sternum deeply emarginate (fig. 12), seventh abdominal tergum comparatively shallowly emarginate (fig. 13)------------------------------TEXANUS

Seventh abdominal sternum feebly emarginate (fig. 18), seventh abdominal tergum comparatively deeply emarginate (fig. 19)-------------------------------BOWDITCHI

Duboisius arizonensis, NEW SPECIES

MALE: Length: 5 mm-6 mm. Width 1 mm-1.5 mm. Color: brownish black. Head black, pubescence short, not concealing surface below, obliquely combed off on either side medially on vertex. Eyes feebly emarginate in front. Antennae with segments one to three piceous or rufous, four to eleven rufous, shape as in figure 1. Maxillae with lacinia having a tooth like dilatation at base (fig. 2). Metasternum with a patch of long, stiff, sharp spines on either side of a median sulcus. Wing with anal cell open. Abdomen sparsely pubescent; seventh sternite deeply emarginate, densely hairy apically, as long as wide (fig. 3); seventh tergite half as long as wide; eighth sternite laterally acutely produced, notched at inner bases, slightly longer than wide (fig. 4). Genitalia: Parameres with two linear rows of punctures apically, produced into a short, narrow process at apex (fig. 5).

FEMALE: Length: 6 mm-7mm. Larger and more robust than male. Metasternum hairy, not spinous. Abdomen with seventh tergite deeply emarginate, strongly produced on sides, medially produced in a bulbous spinous process projecting half as long as lateral processes (fig. 8); seventh sternite entire, pointed apically (fig. 7).

Holotype: Male, 28 miles North of Sonoita, July 20, 1941, Pima County, Arizona, J. J. du Bois Collector (S). Allotype: Female, 28 miles North of Sonoita, July 20, 1941, Pima County, Arizona, J. J. du Bois Collector (S). Paratypes: 22 designated (S, CU).

Records of distribution: ARIZONA: 28 mi. N. of Sonoita, Pima Co. (CU, S); Palmerlee, Cochise Co. (CU) 2; and 30 mi. E. of Quijotoa, Pima Co., (CU) 1.

Seasonal distribution: July 20-August 29.

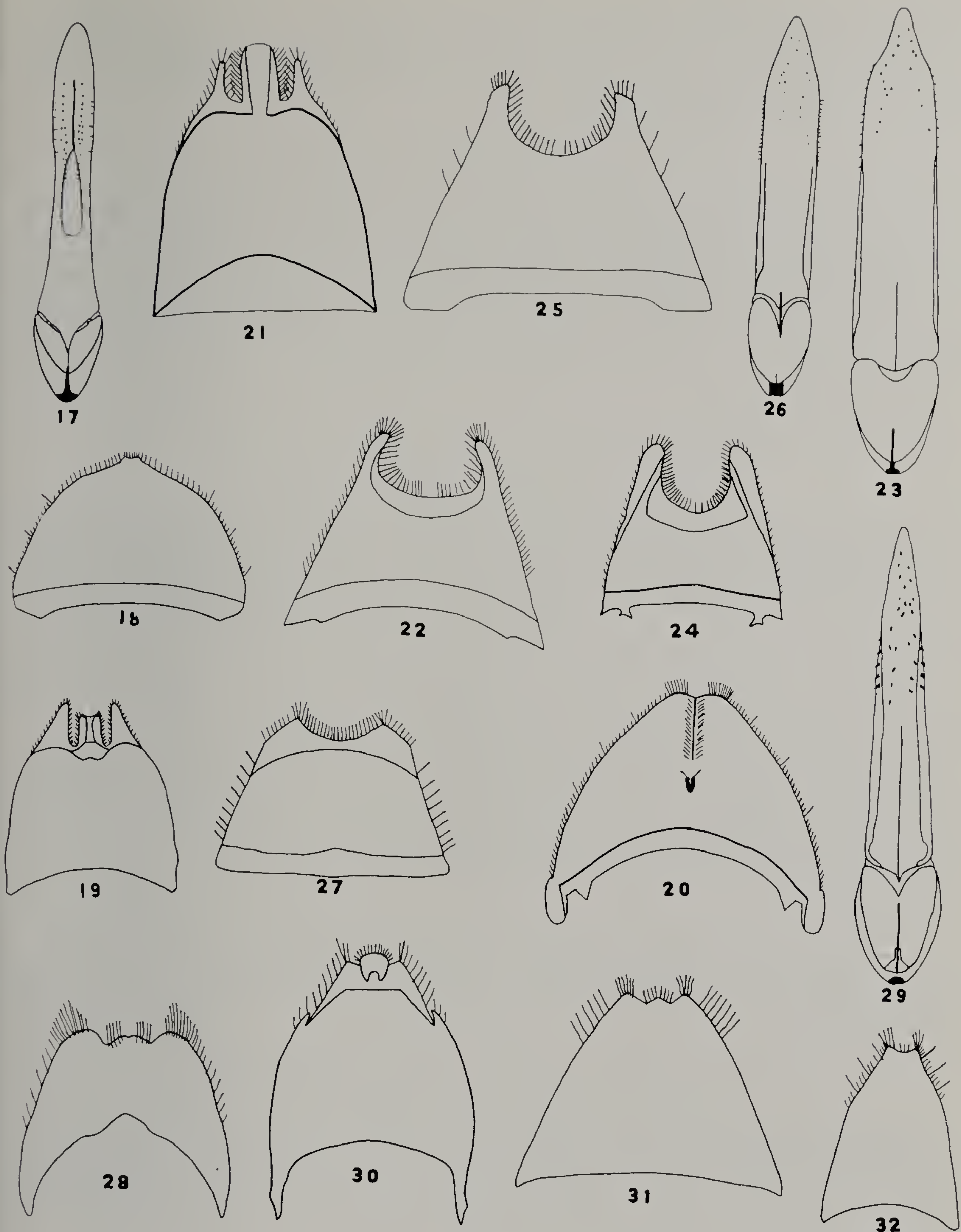
Duboisius texanus, NEW SPECIES

MALE: Length: 7 mm-9mm. Width: 2 mm-2.5 mm. Color: brownish black to black or somewhat paler. Head as in *arizonensis.* Eyes feebly emarginate. Antennae twice as long as head. Neck slightly or not constricted at base. Metasternum with a patch of spines ventrally. Wing with anal cell open. Abdomen sparsely pubescent; seventh sternite deeply emarginate, lateral processes half as long as in *arizonensis,* densely hairy apically, as long as wide; seventh tergite half as long as wide; eighth sternite notched at inner bases, nearly as long as wide (fig. 9); eighth tergite broadly emarginate. Genitalia: Parameres with two linear rows of punctures apically, slightly denser than in *arizonensis,* produced apically in a narrow blunt process, slightly longer than in *arizonensis* (fig. 10); aedeagus thicker and slightly shorter than in *arizonensis* (fig. 11).

FEMALE: Metasternum not spinous. Abdomen with seventh sternite emarginate, half as long as wide (fig. 12); seventh tergite medially produced in a spinous, notched process projecting as long as lateral processes, as long as wide (fig. 13).

Holotype: Male, 1 mi. North of Fort Davis, Jeff Davis County, Texas, July 16, 1941, J. J. du Bois Collector (S). Allotype: Female, 1 mi. North of Fort Davis, Jeff Davis County, Texas, July 16, 1941, J. J. du Bois Collector (S). Paratypes: 20 designated (S, CU, Harvard).

Records of distribution: Texas: 1 mi. N. of Ft. Davis (S) 8; Davis Mts. (CU) 1 (Harvard) 3. NEW MEXICO: Lordsburg (Harvard) 2 (CU) 2.



FIGURES 15-19, *D. bowditchi*: FIG. 15, Eighth sternite of male, ventral view; FIG. 16, Aedeagus of male, ventral view; FIG. 17, Tegmen of male, ventral view; FIG. 18, Seventh sternite of female, ventral view; FIG. 19, Seventh tergite of female, ventral view.

FIGURES 20-21, *D. abnormis*: FIG. 20, Seventh sternite of female, ventral view; FIG. 21, Seventh tergite of female, ventral view.

FIGURES 22-23, *D. benedicti*: FIG. 22, Seventh sternite of male, ventral view; FIG. 23, Tegmen of male, ventral view.

FIGURE 24, *D. mexcaliensis*: FIG. 24, Seventh sternite of male, ventral view. (Caption continued, next page.)

Seasonal distribution: July 6—16.

Remarks: This species is closely related to *arizonensis,* from which it can be distinguished by the shape of seventh morphological sternite (= fifth visible sternite) and parameres.

Duboisius punctulatus, NEW SPECIES

MALE: Length: 7.5 mm. Width: 2 mm. Metasternum with a patch of spines. Wing with anal cell open. Abdomen pubescent; seventh sternite with apices of lateral processes bent centrally, enclosing a rather suboval area, slightly broader than long (fig. 14); seventh tergite half as long as wide; eighth sternite notched at inner bases, as long as wide; eighth tergite feebly emarginate apically, longer than broad. Genitalia: Parameres narrowly produced apically, with punctures and spines irregularly distributed at apex,

FEMALE: not known.

Holotype: Male, Fort Davis, Texas, 6-8-28. Chamberlain Coll. (CU)

Duboisius bowditchi, NEW SPECIES

MALE: Length: 7.5 mm. Width: 2 mm. Metasternum with a patch of spines. Wing with anal cell open. Seventh sternite with lateral processes long, straight, emargination round; seventh tergite slightly more than half as wide as long; eighth sternite narrowly notched at inner bases, median portion small, bilobed, slightly wider than long (fig. 15). Genitalia: Parameres long, irregularly punctate and spinous (figs. 16, 17).

FEMALE: Length: 8 mm. Width: 2.5 mm. Metasternum not spinous. Abdomen with seventh tergite deeply emarginate, slightly longer than broad (fig. 19); seventh sternite apically produced, feebly emarginate, wider than long (fig. 18).

Holotype: Male, Rio Balsas, Gro., Mexico, Wickham, F. C. Bowditch Collection, Museum of Comparative Zoology (Harvard). Allotype: Female, Rio Balsas, Gro., Mexico, Wickham, F. C. Bowditch Collection, Museum of Comparative Zoology (Harvard). Paratypes: 6 designated (Harvard).

Remarks: This species and *punctulatus* together form a natural group of species within the genus *Duboisius,* closely resembling in the structure of wing, metasternum, parameres, and differing in the shape of seventh abdominal sternite.

Duboisius abnormis, NEW SPECIES

FEMALE: Length: 10 mm. Width: 3 mm. Eyes not or only broadly and feebly emarginate. Metasternum hairy, but not spinous. Wing with anal cell open. Abdomen with seventh tergite deeply emarginate, median lobe longer than lateral processes, slightly longer than broad (fig. 21); seventh sternite feebly emarginate, medially depressed dorsally, ridged internally with a toothlike process, broader than long (fig. 20).

(Caption continued from previous page.)

FIGURES 25-26, *D. wickenburgiensis*: FIG. 25, Seventh sternite of male, ventral view; FIG. 26, Tegmen of male, ventral view.
FIGURES 27-29, *D. howdeni*: FIG. 27, Seventh sternite of male, ventral view; FIG. 28, Eighth sternite of male, ventral view; FIG. 29, Tegmen of male, ventral view.
FIGURE 30, *D. emarginatus*: FIG. 30, Seventh tergite of female, ventral view.
FIGURE 31, *D. distinguendus*: FIG. 31, Seventh tergite of female, ventral view.
FIGURE 32, *D. terminalis*: FIG. 32, Seventh tergite of female, ventral view.

MALE: not known.

Holotype: Female, Mexcala, Gro., (= Guerrero), Mexico, June 29, 1951, at light, H. Evans (CU).

Duboisius benedicti, NEW SPECIES

MALE: Length: 7 mm. Width: 1.5 mm. Color: rufous, much lighter than other species, elytra becoming yellowish at apex. Metasternum spinous. Wing with anal cell open. Abdomen with seventh sternite densely hairy apically, nearly as long as wide (fig. 24); seventh tergite half as long as wide; eighth sternite notched at inner bases. Genitalia: Parameres irregularly punctate and spinous with occasional linear arrangement, not abruptly tapering; aedeagus with the head end arrow shaped.

FEMALE: not known.

Holotype: Male, Mexcala, Gro., Mexico, June 29, 1951, at light, H. Evans (CU).

Duboisius wickenburgiensis, NEW SPECIES

MALE: Length: 4 mm-5 mm. Width 1 mm-1.5 mm. Metasternum spinous. Wing with anal cell closed. Abdomen pubescent; emargination of seventh sternite semicircular (fig. 25); eighth sternite with inner process less notched than in *arizonensis.* Genitalia: Parameres irregularly spinous and punctured apically (fig. 26).

FEMALE: not known.

Holotype: Male, Wickenburg, Maricopa County, Arizona, August 18, 1950, light trap; H. K. Gloyd leg. presented by O. Park (CNHM).

Duboisius howdeni, NEW SPECIES

MALE: Labrum one third as long as wide, not elevated in center dorsally in some specimens. Metasternum not spinous. Wing with anal cell closed. Abdomen with seventh sternite moderately emarginate with lateral processes short, slightly wider than long, hairy (fig. 27); seventh tergite slightly wider than long with short central and lateral processes; eighth sternite with a central process (fig. 28). Genitalia: Parameres tapering apically (fig. 29).

FEMALE: not known.

Holotype: Male, Cortaro, Arizona, August 7, 1940, R. P. Allen, H. F. Howden Collection (CNC). Paratypes: 4 designated (CU, S, and U.K.).

Records on distribution: ARIZONA: Arivaca, VII-24-40 (U.K.) 1, eyes one third black in this specimen; Globe (CU) 1; Superior, VII-25 to 27 (S) 1. MEXICO: Hermosillo, Sonora, VII-25-59 (S) 1.

Remarks: In one specimen eye is one third black and two thirds white. It is unusual among the males of other species in that the metasternum is not spinous.

Duboisius emarginatus, NEW SPECIES

FEMALE: Length: 7 mm. Width: 2 mm. Metasternum not spinous. Wing with anal cell closed. Abdomen with seventh tergite longer than broad, sides produced into short lateral processes, median spinous process slightly longer than lateral processes (fig. 30); seventh sternite entire, broader than long.

MALE: not known.

Holotype: Female, Tehwantapec, 16 mi. W. Oax., Mexico, July 8, 1953, 700 ft., V. R. Mexico Expedition (U.K.).

Duboisius distinguendus, NEW SPECIES

FEMALE: Length: 8.5 mm. Width: 2.5 mm. Metasternum not spinous. Wing with anal cell closed. Abdomen with seventh tergite wider than long, with a small pointed median process (fig. 31); seventh sternite feebly emarginate, broader than long.

MALE: not known.

Holotype: Female, Wickenburg, Maricopa County, Arizona, August 20, 1950, light trap, H. K. Gloyd leg. presented by O. Park (CNHM).

Duboisius terminalis, NEW SPECIES

FEMALE: Length: 8 mm. Width: 2.5 mm. Pronotum feebly sulcated medially. Metasternum not spinous. Wing with anal cell closed. Abdomen densely pubescent, seventh tergite without a median process, longer than broad (fig. 32); seventh sternite feebly emarginate, broader than long.

MALE: not known.

Holotype: Female, 10 miles East of Globe, Arizona, June 21, 1956, H. A. Howden (CNC).

General remarks on phylogeny

Any attempt to interpret phylogeny is premature in this genus unless both sexes of all the species are known. However, certain trends are apparent. In the family Pedilidae wings usually have an open anal cell, which is considered as a specialization over the closed cell condition usual in the family Oedemeridae. Anal cell is open in the following species of *Duboisius: arizonensis, texanus, mexcaliensis, benedicti, punctulatus, bowditchi,* and *abnormis;* while *howdeni, terminalis, distinguendus, wickenburgiensis,* and *emarginatus* have wings with anal cell closed.

Among the open anal cell group, punctures and spines on the parameres exhibit greater morphological resemblances between the following species groups: (a) *arizonensis* and *texanus,* (b) *benedicti* and *mexcaliensis,* (c) *bowditchi* and *punctulatus.*

In the closed anal cell group, *howdeni* is apparently the only species where metasternum is not spinous in male. Seventh tergite of female lacks a median process in *terminalis;* as against *distinguendus* and *emarginatus,* although it is small, pointed and simple in the former and large, un-pointed and as long as the lateral processes in the latter.

Acknowledgments

The author is thankful to Messrs. Edward C. Becker, Entomology Research Institute, Canada National Collection (CNC); G. W. Byers, University of Kansas (U.K.); P. Darlington, Museum of Comparative Zoology, Harvard College (Harvard); H. Dietrich, Cornell University (CU); R. Snelling (S); R. L. Wenzel and H. Dybas, Chicago Natural History Museum (CNHM) for the loan of specimens; and to Dr. Richard B. Selander for his advice during the progress of this work.

The letters in parantheses are the same as those used in citing specimens used in the descriptions and indicate their disposition.

Reference cited

Abdullah, Mohammad

1962. A key to the genera of Eurygeniini with redescription of the genus *Bactrocerus* and description of a new genus (Coleoptera: Pedilidae) Proc. Ent. Soc. Washington, (In Press).

NOTES ON THE BIOLOGY AND DISTRIBUTION OF SPERCHOPSIS TESSELLATUS (ZIEGLER) (COLEOPTERA: HYDROPHILIDAE)

By PAUL J. SPANGLER[1]

Four decades have elapsed since Richmond (1920) noted the habitat of *Hydrobius tesselatus* [=*Sperchopsis tessellatus* (Ziegler)] and briefly mentioned its larva. No additional biological information has been published about this species since that time. During the past few years, information on the life history of this beetle has been obtained by rearing the immature insects to the adult stage in the laboratory and by making supplementary observations in the field. Presentation of this information also affords the opportunity to include brief comments on the systematic status of this species and to present accumulated distribution records.

Acknowledgment is gratefully extended to the following institutions for the loan of specimens: Academy of Natural Sciences of Philadelphia; American Museum of Natural History; California Academy of Sciences; Canadian National Museum; Carnegie Museum; Cornell University; Illinois Natural History Survey; Ohio State University; United States National Museum; University of Michigan; and the University of Minnesota.

This species was originally described as *Spercheus tessellatus* by Ziegler (1844). In 1862, LeConte described a new monotypic genus, *Sperchopsis,* and cited *tesselatus* (sic) as the type species. In 1873, Horn transferred this species to the genus *Hydrobius.* Schwarz and Barber (1918) treated *tessellatus* as a *Spercheus.* In 1921, Knisch transferred this species to *Hydrocyclus* where it remained until 1928 when D'Orchymont restored *Sperchopsis.*

Generic status for *Sperchopsis tessellatus* is justified by numerous adult and larval characteristics that differ from other related hydrophilid genera. These larval characteristics are described in this study. An attempt also has been made to include a full synonymy for this species.

Sperchopsis tessellatus (Ziegler)

Spercheus tessellatus Ziegler, 1844, Proc. Acad. Nat. Sci. Philadelphia, 2:44.

Sperchopsis tesselatus, LeConte, 1862 (emended pages), Smithson. Misc. Coll., 3:47; Horn, 1873, Proc. American Philos. Soc., 13:113; Leng and Mutchler, 1927, Supplement to the Catalogue of the Coleoptera of America, North of Mexico, p. 19; D'Orchymont, 1928, Catalogue of Indian Insects, part 14, p. 93; Leng and Mutchler, 1933, Second and Third Supplement to the Catalogue of the Coleoptera of America, North of Mexico, p. 16; D'Orchymont, 1942, Mem. Mus. roy. Hist.

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nat. Belgique, 23(28):20; Spangler, 1954, Ent. News, 65(5):116; Young, 1954, Univ. Florida Studies Biol. Sci. Ser., 5(1):172, 173.

Hydrobius tesselatus, Horn, 1873, Proc. American Philos. Soc., 13:133; LeConte and Horn, 1883, Smithson. Misc. Coll., 507:72; Wickham, 1895, Canadian Ent., 27:214; Ulke, 1902, Proc. U. S. Natl. Mus., 25(1275):9; Blatchley, 1910, Bull. Indiana Dept. Geol. Nat. Res., 1:263; Leng, 1913, Jour. New York Ent. Soc., 21:38; Leng and Mutchler, 1918, Bull. American Mus. Nat. Hist., 38:110; Richmond, 1920, Bull. American Mus. Nat. Hist., 42(1):55; Leng, 1920, Catalogue of the Coleoptera of America, North of Mexico, p. 84; Leng and Mutchler, 1927, Supplement to the Catalog of the Coleoptera of America, North of Mexico, p. 19; Löding, 1945, Geol. Surv. Alabama, Monog. 11, p. 31.

Hydrobius tessellatus, Horn, 1890, Trans. American Ent. Soc., 17:266, t. 4, f. 3.

Spercheus tesselatus, Schwarz and Barber, 1918, Proc. Ent. Soc. Washington, 19(1-4):135.

Hydrocyclus tesselatus, Knisch, 1921, Ent. Anz., 1:102; Knisch, 1924, Coleopterorum Catalogus, 79:176; Leng and Mutchler, 1927, Supplement to the Catalogue of the Coleoptera of America, North of Mexico, p. 19.

Hydrocyclus tessellatus, Winters, 1926, Pan-Pacific Ent., 3(2):53.

Biology

This species occurs throughout the eastern half of the United States but is considered rare. It is scarce probably because of its habitat preference which is unusual for most hydrophilids. This beetle is one of the few water scavengers that occur in a lotic habitat. It has been my experience that this species prefers the margins of cold, clear, rapidly flowing streams. Undercut gravelly and sandy stream banks with overhanging roots seem to be especially suitable. A similar habitat has been reported for this species by Leng (1913), Richmond (1920), and Young (1954). These areas are frequently overlooked by general collectors or purposely neglected because the returns, numerically speaking, are seldom rewarding.

During the summer of 1952, while attending the University of Michigan Biological Station, I found numerous larvae in association with adults in Maple River, Emmet County, Michigan. Twenty-three larvae of different instars were collected and transferred to 4-inch finger bowls in the laboratory. The bowls were partially filled with sand, tilted, and water added so that both water and moist sand were available. Records were kept of behavior, food provided, molts, and length of pupal period. Early instars were fed plankton such as *Leptodora kindti, Polyphemus pediculus, Cyclops, Daphnia, Bosmina* and other unidentified copepods and cladocerans. After a few days, plankton was discontinued in favor of larger, soft-bodied insects. Some of these were larval Dixidae, Culicidae and Chironomidae, adult Dolichopodidae, and nymphal Cercopidae and Cicadellidae. Occasionally, field-collected larvae devoured some of their own kind before they could be returned to the laboratory and separated.

When feeding, some larvae placed themselves with their abdomens in a vertical position along the side of the finger bowl and their thoracic regions floating on the surface with their heads and the food held up and out of the water. In this position they masticated and ingested their food. They dropped the exoskeletons of the food organisms when they finished eating. Other larvae rested their bodies on the sand but held their heads and the food in a vertical position.

Only five larvae and one pupa remained alive at the end of the summer session. These were transported by auto to the University of Kansas for further study. The specimens were examined daily while enroute. One larva died and another pupated. After arriving at the University of Kansas, one more larva pupated and the remaining two died. Of the three that pupated, one was reared to the adult stage to make sure that it was *Sperchopsis tessellatus*. Another pupa was preserved for descriptive purposes. The third pupa died and was also preserved.

Before pupation, the larvae became restless. They crawled rapidly over the sand, and food offered at this time was either completely ignored or else seized with apparent irritation. Seized food was released quickly or tossed away with a backward or sidewise snap of the head.

The last instar constructed its pupal chamber by means of undulating movements of its body which packed the moist sand and prevented collapse of the structure. One pupal chamber was 7.0 mm. high, 12.0 mm. long, and 10.0 mm. wide. No silk or other material was used to support the walls as reported by F. Balfour-Browne (1910) for *Hydrobius fuscipes*.

Several adults and one egg case of *tessellatus* were collected on April 9, 1954, in the Meramec River, 5 miles west of Steelville, Missouri. Eggs were present in the egg case which was kept for rearing purposes. Seventeen larvae hatched from the egg case but these died soon afterwards and were preserved.

Information obtained from the different rearing was pieced together and the duration of each stage was as follows: Egg to larva, 6-7 days; first instar ?; second instar $\pm$20 days; third instar, 54-63 days; pupal period, 6-7 days.

The duration of the third instar could have been different from that required in nature because of the following conditions: (1) Food might have been more or less readily available; (2) the transfer from a cold-water habitat to water at room temperature could have altered physiological processes; (3) the transfers from field to laboratory to car and back to the laboratory again probably were disrupting; (4) the moisture content of the sand provided for the larvae might have been undesirable. I believe the fourth condition was the major reason why the last instar was prolonged because before they would construct a pupal chamber, the larvae frequently wandered over the damp sand for a week or two until it became noticeably drier.

Description of the egg case and eggs

The egg case (Fig. 3) is white, constructed of silk, and 6.0 mm. long, 4.0 mm. high, and 6.0 mm. wide. No mast is constructed as extensive as that found on an egg case of *Hydrobius,* although there is a marginal flap around the edge of the cap. In *Hydrobius,* the neck of the egg case is constricted, but there is only slight evidence of this in the single egg case of *Sperchopsis tessellatus* found by the author, which was collected in a net from sand beneath an overhanging stream bank. The method of attachment or placement is not definitely known but because sand grains adhered to the case, it probably was placed in the sand so that only the cap was exposed.

The eggs are white, 1.75 mm. long, and 1.0 mm. wide. They are placed on end and side by side within the case. Eyespots became noticeable in three days.

Description of the first instar larva

(Figure 6)

Total length 5.2 mm.; width of thorax 0.8 mm.; color whitish with light yellow-brown sclerotized areas darkening with age; integument covered with asperities (Fig. 12) arranged in irregular, short, transverse groups.

Head quadrangular (Fig. 1); 0.65 mm. wide; 0.55 mm. from labro-clypeus to occipital foramen; fronto-clypeal suture feebly indicated; frontal sutures united forming an epicranial suture; frons sagittate; cervical sclerites present, rectangular in shape. Ventral surface of head (Fig. 2) with few setae laterally, glabrous medially; with two posterior tentorial pits behind gula.

Labro-clypeus prominent (Fig. 10), slightly asymmetrical; with five teeth, central (third) one so small as to be hardly noticeable; left tooth slightly more distant from others; six setae are present, one on each side of each tooth; antero-lateral projections of epistoma equal in length to labro-clypeal teeth, rounded and with setae on anterior margin.

Ocular areas each with groups of six distinct ocelli arranged in an ellipse; anterior three larger and close to each other; posterior three smaller, one separated from other two.

Antennae short, moderately flattened, shorter than stipes; first segment constricted slightly in middle and about same size as penultimate; penultimate segment wider distally; ultimate segment very small, one-third as long as penultimate and with a distal seta.

Mandibles symmetrical, prominent, stout, sharply pointed apically, each with three well defined inner teeth and one large distal tooth, proximal one smallest, molar area rounded.

Maxillae with jointlike palpifer; stipes stout, tapering distally, bearing a row of eight stout setae on inner margin; palpifer with slender sclerotized appendage on inner side longer than first segment of palpus and with terminal seta at disto-medial angle, outer margin with two ventral setae; palpi tapering distally, first segment short, approximately one-half width of palpifer, penultimate segment tapering sharply and with apical setae.

Labium extending as far forward as palpifer; penultimate segment of palpus short, ultimate segment three to four times longer than penultimate and with apical setae; ligula distinct, twice as long as penultimate segment of palpus; palpiger subquadrate and with two setae on antero-apical angles; two long setae arising from membrane at base of ligula; mentum slightly wider than submentum, narrowing posteriorly, dorsal surface spinous and with numerous setae on anterior edge, ventrally with few setae on antero-apical angles; gula pentagonal, rounded posteriorly.

Prothorax with sides rounded, wider posteriorly; antero-lateral angle with a group of four to five large setae; postero-lateral angle with two large setae preceded by two smaller ones; sagittal line present. Prosternal sclerite large (Fig. 7), with no indication of sagittal line, subrectangular.

Mesothorax wider than prothorax but only half as long; with two small, strap-like, anterior sclerites and two large, irregularly triangular, mesotergal sclerites; lateral margins each provided with a prominent spiracular tubercle and a setiferous lobe; sagittal line present.

Metathorax slightly wider than prothorax but about half as long; anterior metatergal sclerites larger in size, irregularly rectangular in shape; posterior sclerites small, narrow and with two tubercles each surmounted by a seta; sagittal line present.

Legs four-segmented (Fig. 13), about as long as thorax is wide; coxae moderately widely separated, transverse; trochanter about half as long as coxa; femur slightly longer than tibiotarsus; tarsal claw single, with two inner setae.

Abdomen with eight distinct segments, ninth and tenth segments reduced, terga similar and separated by an intersegmental membrane. True segmentation obscured by additional transverse folds on segments, segmental folds continued onto sternum. Each segment with four folds (Fig. 4); anterior fold with six small setose tubercles; second fold with four setose tubercles, two small, two large; third fold without tubercles; posterior fold with four small setose tubercles; outermost tubercles of second fold largest, each surmounted by a long seta. Numerous small blunt setae are present on all tubercles. A large spiracular tubercle also is present on each segment followed by a large seta-bearing tubercle. Epipleurites and hypopleurites prominently lobed. Eighth tergum represented by superior valve of stigmatic atrium which bears a large sclerite, broader than long and feebly rounded anteriorly. Ninth tergum trilobed; middle lobe large, with two setae, one on each side of median line on caudal margin; lateral lobes each with two setae, one dorsal and one ventral on middle of caudal margin.

Description of the third instar larva

Total length 15.0 mm., width 3.6 mm.; color brownish above and below, with darker brown sclerotized areas. Similar to first instar but tubercles, lobes, and setae more distinctly developed. Antennae less flattened, more cylindrical.

Description of the pupa

(Figures 11, 15)

Total length 7.5 mm., width 4.0 mm.; color white except eyes reddish-brown; glabrous except for styli described below.

Head without supraorbital styli.

Pronotum with twenty-four styli as follows: three on each antero-lateral angle, two on each side of median line on anterior margin, three on each postero-lateral angle, two on each side of median line at posterior margin and two on each side of median line on disc of pronotum. Mesonotum with two styli, one stylus on each side of scutellum. Metanotum with one pair of styli.

Abdomen with four styli on first segment; second to seventh abdominal segments each with six styli arranged as follows: one stylus lateral to each abdominal spiracle, two styli between each spiracle and midline. Segment eight with four styli; segment nine with two cerci longer than width of eighth segment.

First to seventh abdominal segments with a pair of spiracles, those on segments one and seven are greatly reduced.

Antennae and legs extending outward at right angles from body axis. Tibiae of first two pairs of legs folded against femora. Tarsi turned backward parallel with body axis and widely separated. Femora and tibiae of hind legs not folded against each other. Metafemora directed obliquely away from mid-line and metatibiae directed obliquely toward mid-line. Metatarsi almost parallel with body axis and narrowly separated.

The partially developed parameres and median lobe of the male genitalia visible at the apex of the abdomen indicate that the pupa described above is a male.

The pupa usually rested in its chamber on its venter and when turned onto its dorsum for observation it would wriggle until it regained its original position. When the pupa was turned on its side for observation, it occasionally moved in a circle using its pronotal styli as a pivot and pushing with its cerci.

This genus runs to *Hydrobius* in our present keys to aquatic beetle larvae. However, it may be separated from *Hydrobius* by the following couplet:

Labro-clypeal teeth prominent, third tooth as large as other four (fig. 9); abdominal segments with minute tufts of branchiae on mid-line (fig. 5), laterally on tuberculate areas and ventrally; prosternal sclerite divided by a sagittal line (fig. 8); asperities in short transverse rows (fig. 14) -------------------------- HYDROBIUS

Labro-clypeal teeth prominent except third which is minute, less than half as long as adjacent teeth (fig. 10); abdominal segments without tufts of branchiae (fig. 4); prosternal sclerite not divided by a sagittal line (fig. 7); asperities irregular (fig. 12) -- SPERCHOPSIS

Distribution

A total of 268 specimens were examined from the following localities: ALABAMA: Mobile; Oneonta. ARKANSAS: Washington Co. CONNECTICUT: Cornwall; Cos Cob; Fairfield Co. FLORIDA: Centreville; Defuniak Springs. GEORGIA: Chatooga River, Pine Mt. ILLINOIS: no additional data. INDIANA: Lake Co.;

Tippecanoe Co.; White River, Rogers. MARYLAND: Baltimore; Beltsville; Bladensburg; Clinton. MASSACHUSETTS: Fall River; South Hadley, Fairfield Lake. MICHIGAN: Cheboygan Co.; Douglas Lake; Emmet Co.; Free Soil, Great Sable River; Gd. Ledge; Marquette; Merriweather, Merriweather Cr.; Oakland Co.; Ogemaw Co., Houghton Creek; Pentwater. MISSISSIPPI: Avera; Clara; Columbus, Camp Pratt; Lucedale. MISSOURI: Eminence, Shawnee Creek; Steelville, Meramec River, NEW JERSEY: Atco; Clementon; Eatontown; Highlands; Hillsdale; Lahaway; Montvale; Pollersville; Spotswood; Westwood. NEW YORK: New York City, Clason Point; Warren Co.; Washington Co. NORTH CAROLINA: Reidsville. OHIO: Millersburg, Holmes Co. PENNSYLVANIA: Bethlehem; Pittsburgh. SOUTH CAROLINA: Blackwater, Edisto Exp. Sta.; Clemson College (at light). VERMONT: Brattleboro. VIRGINIA: Fredericksburg; Mt. Vernon. WISCONSIN: Millston.

NOVA SCOTIA: S. Millford. QUEBEC: Kazubazua.

Selected bibliography

Balfour-Browne, Frank, 1910. On the life-history of *Hydrobius fuscipes* L. Trans. Roy. Soc. Edinburgh, vol. XLVII, part 2, No. 14, pp. 317-340.

Horn, George, 1873. Revision of the tribe Hydrobiini. Proc. American Phil. Soc., vol. XIII, pp. 132, 133.

Knisch, Alfred, 1921. Uber die Gattung *Hydrocyclus* Sharp (Coleoptera: Hydrophilidae op. 9). Ent. Anzeiger, Jahrg. 1, Nr. 8, pp. 100-107.

LeConte, John L., 1862. Classification of the Coleoptera of North America, Part 1. Smithson. Misc. Coll., No. 3, 1861, pp. xxv + 208, figs. (pp. 209-286 were published in 1862 and pp. 43-48 were emended in March, 1862).

Leng, Charles W., 1913. Aquatic Coleoptera. Jour. New York Ent. Soc., vol. XXI, No. 1, pp. 32-42.

d'Orchymont, Armand, 1928. Catalog of Indian insects, part 14-Palpicornia. Government of India, Central Publication Branch, Calcutta, India, pp. 1-146.

d'Orchymont, Armand, 1942. Contribution a l'etude de la tribu Hydrobiini Bedel, specialement de sa sous-tribu Hydrobiae (Palpicornia-Hydrophilidae). Mem. Mus. roy. Hist. nat. Belgique, 23rd Ser., fasc. 24, pp. 1-68.

Richmond, E. Avery, 1920. Studies on the biology of the aquatic Hydrophilidae. Bull. American Mus. Nat. Hist., vol. XLII, Art. 1, pp. 1-94.

Schwarz, E. A., and H. S. Barber, 1918. Two new hydrophilid beetles. Proc. Ent. Soc. Washington, vol. XIX, no. 1-4, pp. 129-135.

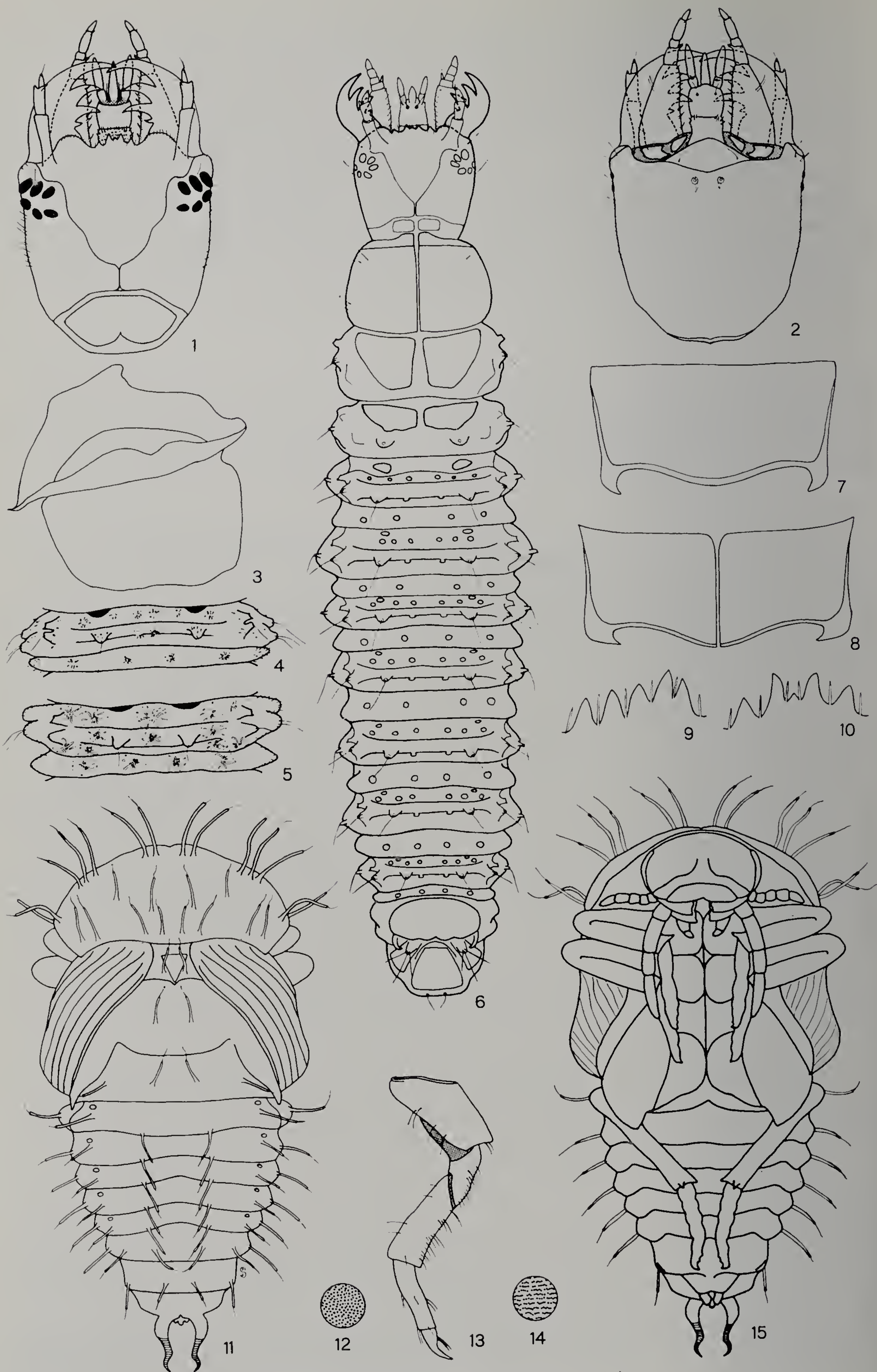
Winters, Fred C., 1926. Notes on the Hydrobiini (Coleoptera: Hydrophilidae) of Boreal America. Pan-Pacific Ent., vol. II, no. 2, pp. 49-58.

Young, Frank N., 1954. The water beetles of Florida. Univ. Florida Studies Biol. Sci. Ser., vol. V, no. 1, pp. x + 238.

Ziegler, Daniel, 1844. Descriptions of new North American Coleoptera. Proc. Acad. Nat. Sci. Philadelphia, vol. II, pp. 43-47.

Sperchopsis tessellatus: Fig. 1, head capsule, dorsal view; Fig. 2, head capsule, ventral view; Fig. 3, egg case; Fig. 4, first abdominal segment, dorsal view; Fig. 6, larva, dorsal view; Fig. 7, prosternum; Fig. 10, labro-clypeus; Fig. 11, pupa, dorsal view; Fig. 12, arrangement of tergal asperities on first abdominal segment; Fig. 13, right prothoracic leg; Fig. 15, pupa, ventral view.

Hydrobius globosus: Fig. 5, first abdominal segment, dorsal view; Fig. 8, prosternum; Fig. 9, labro-clypeus; Fig. 14, arrangement of tergal asperities on first abdominal segment.



(See caption, bottom of page 111.)

ULOMA EXTRAORDINARIA, A NEW SPECIES FROM CUBA (TENEBRIONIDAE)

By T. J. Spilman[1]

The species described below as new to science is so distinctive that it should be of special interest to all students of the ulomine Tenebrionidae. It is so different from the other species of *Uloma* that its segregation may eventually be necessary, but it should remain in *Uloma* until we have more information on generic relationships in the tribe. The new species was collected by my friend and colleague Fernando de Zayas, the zealous collector of Cuban insects. The specimens are deposited in the United States National Museum and in the personal collection of de Zayas; this is indicated in distributional data given below by "USNM" and "de Zayas" in parentheses.

Uloma extraordinaria, NEW SPECIES

HOLOTYPE, male. Reddish brown; very shiny. *Head* short; epistoma with anterior border straight, laterally with distinct angle then weakly convex to eyes, epistomal sulcus semicircular and meeting anterior border at angle mentioned above; clypeal area moderately convex, between eyes strongly convex, these areas without setae; with deep, transverse, dorsal depression posteriorly. Eye with posterior border straight, emarginate anteriorly, dorsal lobe narrower and shorter than ventral lobe.

Mouthparts. Labrum without transverse carina, with large and small punctures of moderate density. Maxillary palpus with fourth segment only moderately expanded apically. Mentum slightly wider than long, lateral borders strongly arcuate, anterior border acutely emarginate medially, surface strongly concave and with a few coarse punctures and also with a broad band of very dense setae just inside the borders; labial palpi with third segment subcylindrical, not specialized. *Antenna* relatively short and relatively narrow, gradually expanded to 6th segment, 6th to 10th subequal in width and with borders rounded, 11th narrower and symmetrically rounded apically; sensory pores or pits not distinct.

Thorax. Pronotum in dorsal view wider than long though not apparently so; anterior border weakly concave and weakly margined, lateral borders with moderate margin and strongly and uniformly convex; posterior border weakly margined and moderately bisinuate with a weak emargination at middle; surface transversely and longitudinally strongly convex, evenly convex except for a small depression medio-posteriorly, densely covered with very fine punctures; pronotal hypomeron with sparser fine punctures. Prosternum sparsely punctate laterally; prosternal process narrow anteriorly, strongly arched posteriorly, with sharp hook at apex. Mesopleura sparsely, coarsely punctate. Mesosternum impunctate medially, medial notch declivous. Metepisternum sparsely, coarsely punctate. Metasternum with medial umbo just anterior to half length; densely, coarsely punctate laterally, remainder densely, very finely punctate.

Legs. Procoxa with a distinct umbo. Profemur very stout, flat ventral surface sharply delimited anteriorly but not posteriorly and with short, sparse, erect setae on basal half, glabrous on distal half. Protibia (fig. 1) with very strong dorsal excavation on distal half, thereby forming a strong projection at half length; posterior surface with very strong, broad, truncated, subapical projection; without an immovable spine at extreme apex, the apex formed by spurs: short, erect, moderately dense

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setae on most of ventral surface, then with very dense large setae ventrally near apex. Mesofemur slightly longer than usual, stout, strongly arcuate, ventrally flat and with short, erect setae on basal two-thirds. Mesotibia very weakly arcuate, gradually expanded apically, with very coarse punctures on anterior surface, with small distinct teeth on dorsal margin, with rough carina on posterior surface, with sparse, short, erect setae ventrally. Metafemur stout, strongly arcuate, ventrally flat and with short, erect setae on basal two-thirds. Metatibia straight, gradually expanded apically with a small though distinct ventral tooth on basal third, with a few very coarse punctures on anterior surface. Tarsi relatively short, with dense golden setae ventrally.

Elytra subparallel-sided, slightly wider at posterior third of length; strongly convex transversely; striae composed of coarse punctures connected by fine longitudinal sulcus, the striae therefore impressed; intervals weakly convex, with very minute punctures; elytral epipleurae continuous and distinct to elytral apex, though narrowing in area of ultimate visible sternite.

Abdomen with intercoxal process comparatively broad, rounded anteriorly; ultimate visible sternite with very weak sinuosities on posterior margin; lateral borders of visible sternites strongly margined, except ultimate visible sternite which has lateral margin only at basal angles. Genitalia not examined.

ALLOTYPE, female. Dark reddish brown. Head less strongly convex between eyes. Pronotum obviously wider than long; lateral border strongly convex on anterior half, almost straight on posterior half; surface less strongly convex. Labium having memtum with concave surface densely and coarsely punctate and without hand of setae on border. Metasternum without umbo.

Procoxa without umbo. Femora typical for the genus, not exceedingly stout, not arcuate, without setae ventrally. Protibia (fig. 2) gradually expanded and toothed dorsally on basal half, then with strong dorsal emargination on distal half; posterior surface with a few spines of medium size; apical spurs smaller; ventral surface with small subapical patch on dense setae. Mesotibia slenderer, without posterior carina, with very few setae ventrally. Metatibia without ventral tooth on basal third, without carina on posterior surface, with very few setae ventrally.

VARIATION. *Paratype, male.* Black with a reddish tint, the tint being stronger ventrally and on appendages. Larger than holotype, dorsal convexity slightly stronger, therefore appearing slightly more robust. Pronotum with anterior border slightly more concave; anterior angles therefore more acute. Genitalia with paramere broad, expanded apically into a flat lobe (fig. 3). *Paratype, female.* Slightly smaller than allotype. Elytra with intervals slightly more convex.

MEASUREMENTS. The following order is maintained in each measurement: first, holotype male; second, paratype male; third, allotype female; and fourth, paratype female. The question mark indicates that such a measurement could not be made because the specimen had been distorted through damage. Millimeters are the units of measure. Head, maximum width including eyes: 2.1, 2.3, 1.9, 1.8. Pronotum, maximum width: 4.3, 4.8, 3.5, 3.3. Pronotum, width at anterior angles: 2.6, 2.9, 2.4, 2.2. Pronotum, width at posterior angles: 3.8, 4.1, 3.4, ?. Pronotum, medial length: 3.5, 4.0, 2.8, 2.6. Elytra, maximum width: 4.9, 5.5, 4.2, ?. Elytra, medial length: 8.1, 9.0, 7.0, 6.9. Approximate total length: 12.9, 15.1, 11.2, 11.2.

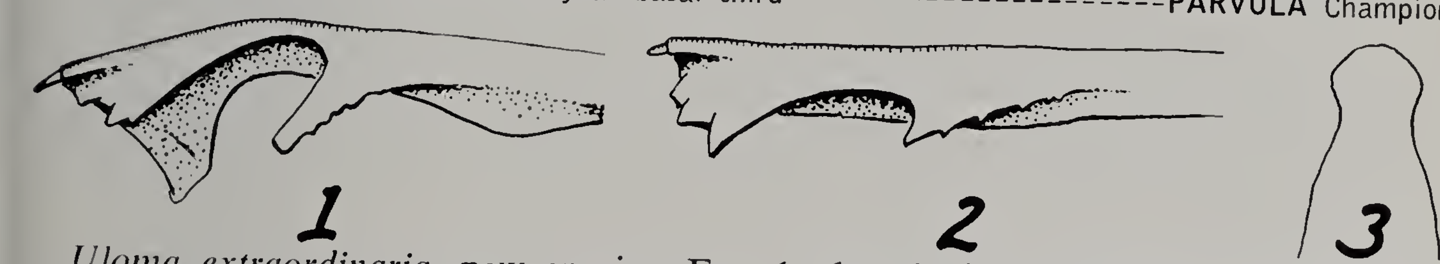
DISTRIBUTION RECORDS. *Cuba. Oriente Province:* Pico Palma Mocha-Pico Joaquín, Sierra Maestra, Elev. 3900-5300 feet, May 18, 1948, F. de Zayas (Holotype, male, USNM No. 65593); Gran Piedra, Caney, June 1954, de Zayas and Alayo (Allotype, female, USNM); Piloto, Moa, VI-7-51, de Zayas (Paratype, male, de Zayas); Calas, Pico Turquino, V-48, de Zayas (Paratype, female, de Zayas). All localities are relatively inaccessible areas in the higher altitudes of the Province and are seldom visited by entomologists.

Seven characteristics stand out as the most distinctive for this species. First, the odd shape of the male protibia is not even approached in any other species of the genus, hence the specific name. Strong serrations along the dorsal margin of the apical expansion of the protibia and numerous teeth on the posterior surface are found in other species. Second, the emargination along the dorsal border of the protibia of the female is likewise unique; strong serrations usually form that border. Third, the immovable spine at the extreme apex of the protibia in both male and female is uncommon; such a spine is usually found only in males. Fourth, the ventral tooth near the base of the metatibia of the male is rare; it is also present in the male of *U. grenadensis*. Fifth, the absence of an anterior depression on the pronotum in both male and female is characteristic of many species of the genus; it is mentioned here only because it is often used in determination keys. Sixth, the metasternal umbo of the male is apparently unique to this species. Seventh, and last, the complete elytral epipleuron is important; it is likewise complete in *U. retusa, mexicana, sulcata,* and *parvula*. Most species of *Uloma* have epipleura abbreviated in the area of the base of the last visible abdominal sternite; this is the condition in the species of *Uloma* from the United States and in all Old World species that I have seen.

All five species of *Uloma* previously recorded in the West Indies are from the Lesser Antilles, the most northern locality being Montserrat Island. Only one, *retusa,* is also known from the mainland. The first and second characteristics given in the previous paragraph should isolate *extraordinaria* from all other species of *Uloma* in any key known to me. However, a key to the species of the West Indies does not exist. The following key should be used with caution because it was constructed from the original descriptions of Champion's species, not from specimens.

KEY TO THE MALES OF THE SPECIES OF *ULOMA* FROM THE WEST INDIES

1. Pronotum evenly convex anteriorly-- 2
   Pronotum with a strong depression anteriorly---------------------------------- 5
2. Metatibia with a ventral tooth near base------------------------------------ 3
   Metatibia without a ventral tooth near base---------------------------------- 4
3. Protibia with very strong excavation on dorsal border (fig. 1) EXTRAORDINARIA, new species
   Protibia with usual serrations on dorsal border----------------GRENADENSIS Champion
4. Elytral intervals strongly convex---------------------------------SULCATA Champion
   Elytral intervals moderately convex.------------------------ANTILLARUM Champion
5. Protibia widened ventrally at basal third--------------------------RETUSA (Fabricius)
   Protibia not widened ventrally at basal third---------------------PARVULA Champion



Uloma extraordinaria, new species. FIG. 1, dorsal view of protibia of holotype, male; FIG. 2, same of allotype, female; FIG. 3, dorsal view of paramere of paratype, male.

"MIMETISM" IN LAMPYRIDAE

The late M. Pic (revue scientifique du Bourbonnais, 1938, pp. 26-28) called attention to what he called "mimetism"—the similarity in elytral patterns—of species of *Lucidota* and *AEthra*. Lacordaire (Genera des Coléoptères, 1857, IV, p. 318) had already remarked that this pattern of pale marginal or submarginal vittae on black elytra was common in *Lucidota*. It is of some interest that this pattern is rather widespread among the Lampyridae. The accompanying illustration shows six specimens from my small collection with this type of elytral pattern. Representatives of the following genera are shown in figure 1 arranged left to right, top to bottom: *Cratomorphus* (Argentina), *Lamprocera* (Paraguay), *Lucidota* (Argentina), *Pyrogaster,* female (Paraguay), *AEthra* (Argentina), and *Cladodes* (Paraguay). A similar but less distinct pattern was also noted in a cantharid from the same region. Not very different designs are also found in *Photinus, Aspisoma,* and probably other genera, but when the ground color of the elytra is not black, the effect is less noticeable. Another pattern frequently repeated in different genera is that in which the basal half or third of the elytra is yellow, and the remainder black; sometimes the reverse arrangement is found.

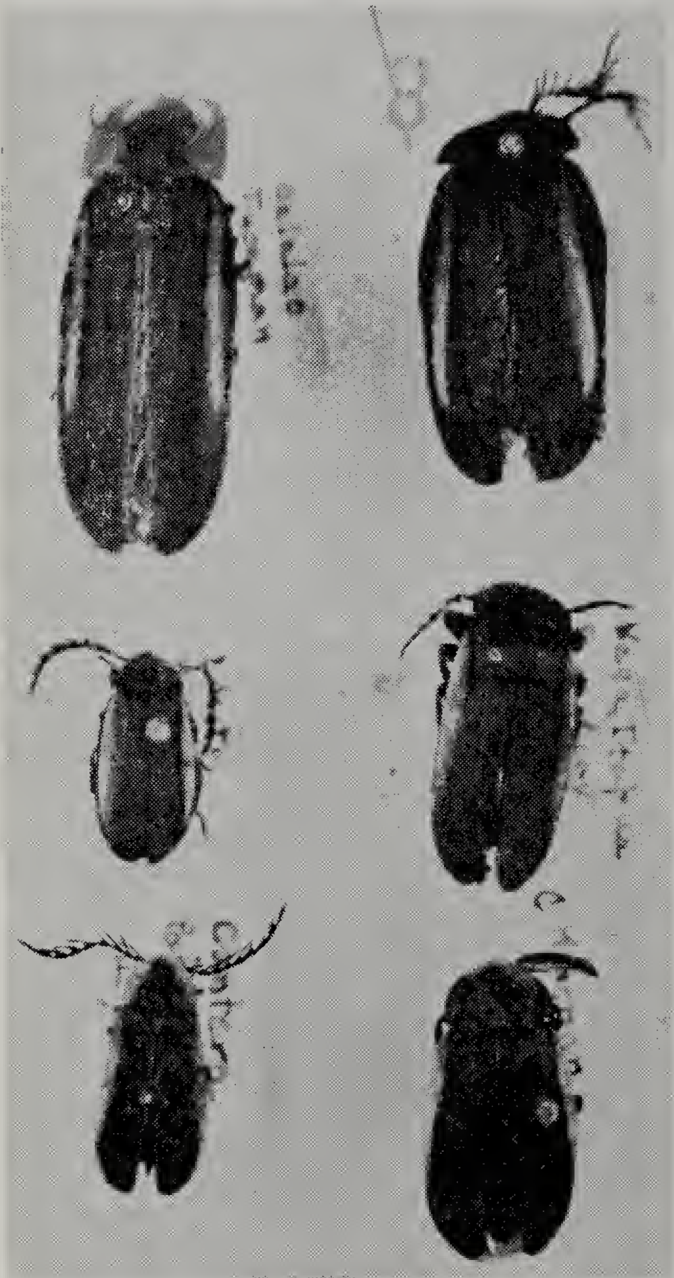


FIGURE 1. See text.

It is difficult to understand of what value this pattern can be to the insects. The *Cratomorphus* sp. is luminous, and the *Lucidota* sp. has a small luminous organ on the sixth visible abdominal sternite in both sexes; the others are essentially nonluminous and probably diurnal.—FRANK A. MCDERMOTT, *Wilmington, Del.*

A NOTE ON THE FEMALE OF *PHOTINUS SANCTAE-LUCIAE* McDERMOTT

The original description of this species (Coleopt. Bull., 1958, XII, pp. 23-25) was based on three males. Recently a series of this species, including two females, was collected by Mr. G. R. Proctor, of the Institute of Jamaica, on the island of St. Lucia. The female is alate and differs from the male only in the somewhat broader form, slightly shorter antennae, and the usual restriction of the luminous tissue to a median quadrangular spot on the sixth visible abdominal sternite. One female has been deposited in the collection of Cornell University.—FRANK A. MCDERMOTT, *Wilmington, Del.*

A NEW SPECIES OF SPERCHEUS FROM TEXAS (COLEOPTERA: HYDROPHILIDAE)

By PAUL J. SPANGLER[1]

When unidentified hydrophilid beetles were being sorted in the U. S. National Museum, a specimen was found that superficially appeared to be an aberrant *Sperchopsis tessellatus* (Ziegler). However, a study of this specimen showed it to be very different from any of our North American genera and that it was a new species belonging to the genus *Spercheus* Kugelann (1798, p. 241). At present there are sixteen species in this genus. Only one of these, *Spercheus fimbriicollis* Bruch, from Argentina, has been described from the Western Hemisphere. *Spercheus fimbriicollis* may be distinguished readily from *texanus* sp. nov. by the bituberculate vertex of the head and by the very strong emarginations of the lateral margins of the pronotum.

The genus *Spercheus* belongs to the subfamily Spercheinae which is not included in our present keys to North American water beetles. In Leech's (1956, p. 337) key to adult hydrophilid genera, this subfamily runs to couplet 11, which separates the subfamily Berosinae from the Hydrobiinae. The following couplets will separate the three subfamilies that run to couplet 11.

1. Head not strongly deflexed; antennae 6- or 9-segmented; middle and hind tibiae without natatory fringes -- 2
   Head markedly deflexed; antennae 7-segmented; middle and hind tibiae with natatory fringes -- BEROSINAE
2. Antennae 6-segmented; scutellum a long triangle; anterior margin of clypeus strongly reflexed (SPERCHEINAE) -------------- ----------SPERCHEUS TEXANUS sp. nov
   Antennae 9-segmented; scutellum not or not much longer than its basal width; anterior margin of clypeus not reflexed--------------------------------HYDROBIINAE

Spercheus texanus NEW SPECIES

Color: Dorsal surface of head, pronotum, and elytra castaneous. Elytra with a few irregularly shaped, fuscous maculae on disc and along sutural margin; maculae narrowly confluent, thus appearing almost vittiform along sutural margin. Ventral surface castaneous.

Male: Body form strongly convex and in general facies resembling *Sperchopsis tessellatus* (Ziegler). Dorsal surface of head rugulose; epicranial suture present but feebly indicated. Clypeus strongly reflexed marginally and with broad V-shaped emargination anteriorly. Labrum partially hidden by clypeus; mentum three times as wide as long and strongly rugose. Submentum arising at an 80°—90° angle from gula. Maxillary palpi slightly longer than antennae, ultimate segment stouter and as long as two preceding segments combined. Antenna 6 segmented; first segment long, stout, and glabrous except for a few apical setae; second hemispherical, pubescent, and more closely attached to third; remaining segments larger and pubescent, ultimate segment subquadrate. Pronotum finely margined anteriorly; twice as wide as long, strongly arcuate laterally and with coarse, dense punctures. Inflexed margin of pronotum distinctly carinate longitudinally. Prosternum not modified medially but with

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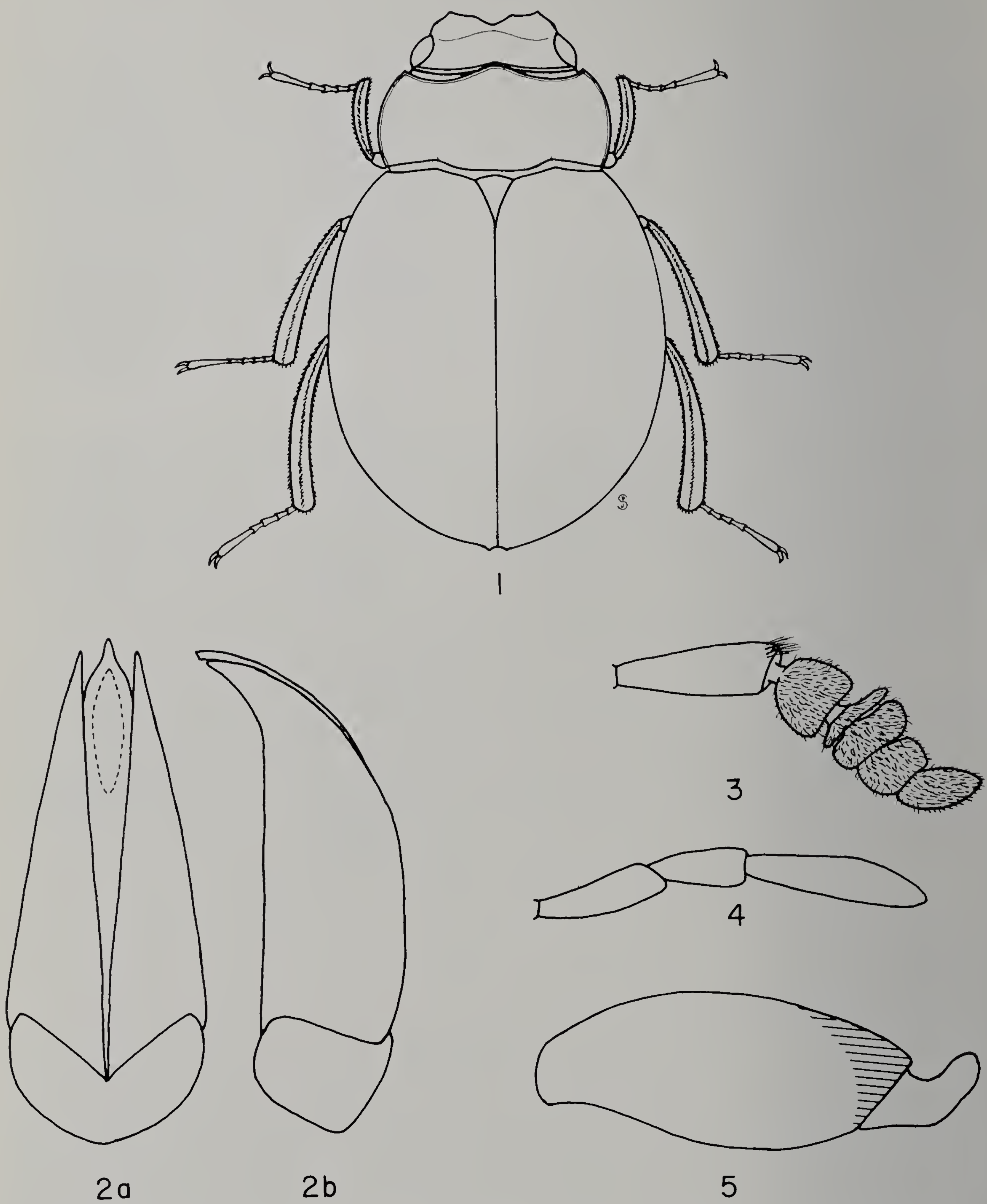

Spercheus texanus; FIG. 1, holotype male; FIG. 2, aedeagus: a. ventral view, b. lateral view; FIG. 3, antenna; FIG. 4, maxillary palpus; FIG. 5, hind femur illustrating extent of basal pubescent area.

a small tuft of setae anterior to antero-lateral angles of procoxae. Scutellum one and one-half times as long as broad. Metasternum with a minute longitudinal carina. Elytra densely, coarsely punctate, each elytron with indications of 10-11 feeble costae that are more evident apically. Costae indicated by short, sparse, golden setae. Metasternum between mesocoxae with small, short, longitudinal carina behind which is a small, transverse, glabrous area. Abdominal segments unmodified except fifth which has lateral margins deflexed and median apical margin reflexed. Ventral surface of body pubescent except inflexed portions of pronotum and epipleura. Coxae and trochanters pubescent. Legs glabrous except for pubescence on small basal area of femora. Ventral side of femora coarsely, densely punctate, appearing rugose. Femoral punctures with short, stiff, golden setae. Tibiae apparently without spurs; each with 6 rows of coarse, stiff setae giving tibiae a hexagonal appearance. Basal tarsal segment short, subequal to second and fourth; third slightly longer. Fifth segment stouter and longer than preceding four segments combined. Length 6.5 mm., greatest body width 4.5 mm.

Type: Holotype male, U. S. National Museum type No. 65149, from: Texas, Corpus Christi (6 mi. s.), August 25, 1935, Charles E. Burt.

Literature cited

KUGELANN, J. C., 1798. *In:* Illiger's Verz. Kaf. Preussens, xlii + 510 pp.

LEECH, H. B., 1956. *In:* Aquatic insects of California with keys to North American genera and California species, ix + 508 pp.

BIOLOGY AND LIFE HISTORY OF THE LIGUSTRUM WEEVIL (CURCULIONIDAE)

By DAVID L. WRAY[1]

The Ligustrum Weevil (*Ochyromera ligustri* Warner) was first found in Wake County, North Carolina on June 8, 1959. Attention was directed to a large ligustrum tree (*Ligustrum japonicum* Thumb.) about twenty-five feet high and with a spread of about twenty-five feet diameter. Most of the leaves were perforated by feeding of the adult beetles. Leaves of lilac nearby were also being eaten. Adult beetles were observed feeding on the leaf tissues and were easily collected if the foliage was not unduly disturbed. However, many beetles would fall to the ground just as soon as a twig was touched or the leaves only slightly jarred. This feigning death and dropping habit has been noted in some other Curculionidae.

Life History Notes

Data on life history have been collected during the past three years (1959-61) in the Wake County, North Carolina locality. Although data on life history are not as yet complete the following notes seem worth recording. The dates included in the following notes would probably be applicable only for the latitude of Wake County.

[1] Entomologist, Div. of Entomology, Dept. of Agriculture, Raleigh, N. C.

Adult beetles emerge from the ligustrum seeds around May 15. By this date the leaves are fully grown and blooming has begun. The adults begin to feed on the tissues of the leaves and also on the pollen in the blooms. Many adults can be collected by shaking the bloom head over a small white piece of paper or canvas. The females lay their eggs in the seed capsules or fruit just as soon as they are well formed which is around July 1 depending on the weather conditions and temperature. A small, slightly curved incision may be noted in the skin of the fruit. The eggs hatch within a few weeks and the young larvae feed on the fleshy fruit and seed capsule during the fall and winter. Apparently there is only one larva to each seed as only one has been found so far. The fruit drupes remain hanging on the shrubs until late fall or early winter when the infested seeds may be found on the ground beneath the shrubs. The larvae become full grown by late April and pupae are found in early May. Most adult beetles are found in late June and early July. Data so far suggest only one brood per year.

Biological Notes

In feeding the adults cut holes either completely through the leaf tissues, or sometimes only partially through in which case only a netting of tissues remains. The feeding holes vary in size and shape but the most predominant is a round or oblong hole about 3 to 4 mm. in length and about 2 mm. in width.

Feeding signs have been found on *Ligustrum japonicum* Hort., *L. amurense* Carr., *L. lucidum* Ait., lilac, and grape.

On June 17, 1960 a brief survey was made around Raleigh and nearby points in Wake County. Adult beetles were found at four places. Two of these were in nurseries, and two in a public park and a garden. Since then beetles have been found farther west in Davidson County, N. C.

The best time to find beetles is during the blooming period in late May. Shaking the foliage over a white paper or canvas is a very effective means of collecting. In this way a survey for the presence of beetles can be made with a considerable saving of time.

Much of the rearing data was obtained by placing the infested seeds in bell jars in the laboratory. A tiny hymenopterous parasite emerged from one rearing jar. Mites were also found in some jars.

It is hoped that this study will continue to obtain information to fill in some of the gaps in the biology of this weevil.

NOTICE TO COLEOPTERISTS

The coleopterists of the U. S. Department of Agriculture and the Smithsonian Institution at the U. S. National Museum are planning to revise the Leng Catalog and its supplements.

In order to stay abreast of new taxa described while the catalog is in preparation, we would like to solicit separates, notifications of papers published or some indication of new taxa as they appear. We hope this will overcome lags or possible omissions in abstracting journals and allow us to prepare a catalog that will be as current as possible.—Paul J. Spangler *for the Coleoptera Unit, U. S. Department of Agriculture.*

THE GENUS OCHYROMERA NEW TO THE WESTERN HEMISPHERE, WITH A NEW SPECIES AND ADDITIONS TO THE JUNK-SCHENKLING COLEOPTERORUM CATALOGUS.[1] (CURCULIONIDAE: PRIONOMERINAE, ENDAEINI)

By Rose Ella Warner[2]

The species of the genus *Ochyromera* are distributed in the Oriental Region and Japan. On June 8, 1959, the new species, undoubtedly an introduced one, was first noticed feeding upon the foliage of Japanese privet (*Ligustrum japonicum* Thunb.) in Wake County, North Carolina, U.S.A. Specimens were collected and submitted for identification by D. L. Wray, of the North Carolina Department of Agriculture in Raleigh. The species was found again during the summer of 1959, and on April 29 and May 18, 1960. On April 29 several lots of Japanese privet seeds were collected, in some of which small larvae were found. These seeds were placed in rearing jars, and on May 24 several adult weevils emerged. Since then many adults have been reared in the laboratory from seeds. The weevils have also been found on glossy privet (*L. lucidum* Ait.), Amur or common privet (*L. amurense* Carr.), and lilac (*Syringa* spp.). However, Japanese privet seems to be the favorite host plant.

Ochyromera ligustri NEW SPECIES

(Figures 1-8)

Integument testaceous, shiny; pronotum clothed with recumbent, transverse, golden-yellow hairlike scales, with a definite median stripe and an ill-defined lateral stripe where the hairs are more sparse and the integument darker, laterally, in the middle, with a small denuded, impunctate spot. Elytra with similar golden-yellow hairlike scales and suberect black and yellow setae; a small patch of black setae on interval 5 at the base and on intervals 4-5 at about the middle; the whole apical third of elytra, beginning at the suture of the second visible abdominal sternum, dark, black setae more numerous, integument brown, and yellow hairs sparse; intervals 2, 3, and 6 in apical third each with a patch of black setae; a deep depression behind callus. Legs and ventral surfaces covered with golden recumbent hairs, anterior end of metepisternum bare except for a patch of long yellow hairs overhanging the lateral anterior corner. Pygidium exposed, sometimes the apex only in the female.

Head with fine punctures dorsally, striolate laterally, thinly clothed with recumbent golden hairs directed anteriorly; eyes subovate, coarsely faceted, more convex an-

[1] Acknowledgments.—I am indebted to R. T. Thompson of the British Museum (Natural History) for the comparison of the specimens with the types of Marshall's species of *Ochyromera* in the Museum, and for information on other material of the genus in the collection. My sincere thanks are extended to Guillermo Kuschel, University of Chile, Santiago, Chile, who also compared material in the British Museum, and who, while on a recent visit to the U. S. National Museum, helped place the species in the genus.

[2] Entomology Research Division, Agricultural Research Service, United States Department of Agriculture, Washington, D. C.

teriorly; forehead with a deep median fovea, (♂) distance between eyes half the width of rostrum, (♀) distance between eyes as wide as ½ diameter of an eye.

Rostrum (figs. 4-5) longer than the pronotum in both sexes (but varying considerably in length), distinctly curved, the same width throughout; in male stout, carinated, furrowed, and coarsely punctate in basal half, some punctures confluent, apical area with large but less confluent punctures, scrobes continued beyond antennal insertion; in female slender, carina less distinct and punctures finer; base and ventral side with yellow hairs.

Antenna (fig. 6) slender, scape extending to the eye, funicle 7-segmented, first segment widened, second long, segments 5-7 transverse, club with basal segments broad, inserted at about the middle in female and a little beyond middle in male.

Prothorax wider than long (13:9), strongly rounded on sides, widest at middle, apex strongly constricted and subtubulate, basal margin shallowly bisinuate, dorsum transversely and longitudinally convex, closely punctate, punctures partly hidden by recumbent golden hairs, which are transverse except anterior to apical constriction where they are oblique, true setae recumbent; propleural vestiture and punctures as on disc.

Scutellum brown, subcordate, sparsely setose and punctate, scutellar area dark.

Elytra oblong-ovate (29:21), much wider than prothorax, slightly compressed in back of prominent humeri and then gently rounded to the broadly rounded apex, apical calli prominent, longitudinally and transversely convex, on a plane higher than prothorax, highest before middle; intervals on disc broad and flat, finely rugulose, each with a row of stout suberect setae which arise from punctures with anterior margins raised, the setae are dark on dark areas and vice versa but yellow setae occur variably here and there in the dark areas and black setae in the light areas, especially on intervals 1, 3, and 5 on the disc; posterior calli with a tuft of short black and yellow setae, apices of intervals 3 and 9 converge into a raised hump with a tuft of short yellow hairs; striae with small, deep, distinct punctures.

Legs (fig. 2) testaceous, clothed with recumbent yellow hairs, densely punctate; front femora very powerful, longer and broader than the rest, with an acute simple tooth which projects to a distance equal to half the width of femur in the middle, mid and hind femora smaller and less strongly toothed; protibiae strongly curved and broadly dilated toward the apex, uncinate, mid and hind tibiae sinuate, uncinate, pretarsal claws divaricate and broadly toothed. Mesosternal process same width from base to apex, perpendicular and broadly truncate, apex sometimes furrowed, appearing bilobed. Visible abdominal sterna 2, 3, and 4 prolonged at sides (fig. 3).

Length (from anterior margin of eyes to tip of elytra), female: 3.0-4.7 mm.; width (across widest portion of elytra), 1.6-2.3 mm.; average length, 3.9 mm.; average width, 1.9 mm. *Length*, male: 3.2-4.3 mm.; width, 1.6-2.3 mm.; average length, 3.7 mm.; width, 2.0 mm. *Length of rostrum* (along straight line from lower margin of eye to tip of rostrum): Female, 1.0-1.9 mm.; male, 0.9-1.3 mm.

Holotype female, USNM Type No. 65702: length, 4.2 mm.; width, 2.1 mm.; length of rostrum, 1.7 mm., Wendell, North Carolina, June 8, 1959, D. L. Wray, feeding on the foliage of *Ligustrum japonicum* Thunb.

Paratype series: 18 ♀♀ and 5 ♂♂, all collected at Wendell, North Carolina, August 24, 1959, D. L. Wray. On *Ligustrum* and *Syringa* (lilac). Holotype and 10 paratypes (8 ♀♀ and 2 ♂♂) in the USNM collection. Thirteen paratypes (3 ♂♂ and 10 ♀♀) with the collector, D. L. Wray, North Carolina Department of Agriculture in Raleigh.

Additional specimens studied: 1 ♀ (IIPIRB No. 59-17400) Clemson, South Carolina, July 16, 1959, Francis McAlister, at light trap. 5 ♀♀ and 6 ♂♂, ? Shanghai, China, E. Deschamps collector. Where the latter collection was made is questionable because a discrepancy occurs in the recorded localities of Emile Deschamps. His collection of birds, fishes, plants, reptiles, shells, insects, etc., was purchased by the Smithsonian Institution in 1903. In his first correspondence, from Shanghai, China, July

7, 1902, he stated that his collection consisted of fishes from India, and birds, insects, etc., from Singapore and vicinity. At a later date, July 11, 1903, his correspondence came from San Jose, California, but his collection was listed from Shanghai, China. In reply to this correspondence the curator of reptiles stated that the collection was unsatisfactory because of lack of definite data as to the localities. Although the localities of the collection are doubtful, I believe I can safely assume that the North Carolina species originated from the Orient and was probably introduced into the United States through commerce, with nursery stock.

Ochyromera ligustri is to be placed near *O. subcruciata* Marshall and keys out to that species in Marshall (1926, Annals and Magazine of Natural History, Ser. 9, Vol. XVII, p. 362). Both species have the mesosternal process perpendicular and truncate. *O. subcruciata* differs, however, in the markings of the elytra by having a very broad grey stripe curving from the shoulder to the suture and then out again to the posterior callus, the two stripes forming a common X-like marking.

The tribe Endaeini, which contains the genus *Ochyromera,* is being retained in the subfamily Prionomerinae until a more exhaustive study can be made of its placement. The tribe can be separated from the other groups in the Prionomerinae by the formation of the tooth on the profemora. In most of this subfamily the tooth is serrated, but the genera of the tribe Endaeini (of Prionomerinae) have a tooth on the profemora that is not serrated. This character, in addition to the angulated abdominal sterna, could place the tribe substantially closer to the Ceratopinae.

The following species, described since 1936, will bring the number of species in *Ochyromera* to 24. These additions are to be made in the Coleopterorum Catalogus, auspicis et auxilio W. Junk, editus a S. Schenkling. Pars 150: S. Schenkling auxilio G. A. K. Marshall, Curculionidae: Subfamily Prionomerinae, page 7, 1936.

Ochyromera Pasc.

Pascoe, Journ. Linn. Soc. London XII, 1874, p. 31, 33.	
asperata Heller & Gunther, Tijdschr. Ent. d. 79. al/2. 1936, p. 68	Java
brevicornis Mshl., Novitates Zool. v. 42, pt. 3, Mar. 12, 1948, p. 424	N.E. Burma
cognata Mshl., l. c. p. 425	N.E. Burma
coronata Mshl., l. c. p. 425	N.E. Burma
decorata Heller, Adh. u. Berlin d. Mus. f. Tierk. u. Volkark zu Dresden, Bd. XVII. nr. 3, 1929, p. 13	Luzon
distinguendo Voss, Decheniana sup. 5, June 1958, p. 109	China
japonicus Roelofs, Ann. Soc. Ent. Belgique XVII. 1874, p. 163 (*Minyrus*)	Formosa
miwai Kono, Sapporo Nat. Hist. Soc. Trans. V.16, pt. 1, 1939, p. 27	Formosa
quadrimaculata Voss, Decheniana, sup. 5, June 1958, p. 109	China
sericea Mshl., Novitates Zool. v. 42, pt. 3, Mar. 12, 1948, p. 424	Burma
signatella Voss, Tijdschr. Ent. d. 80, a. 1-2. 1937, p. 141-2	Java

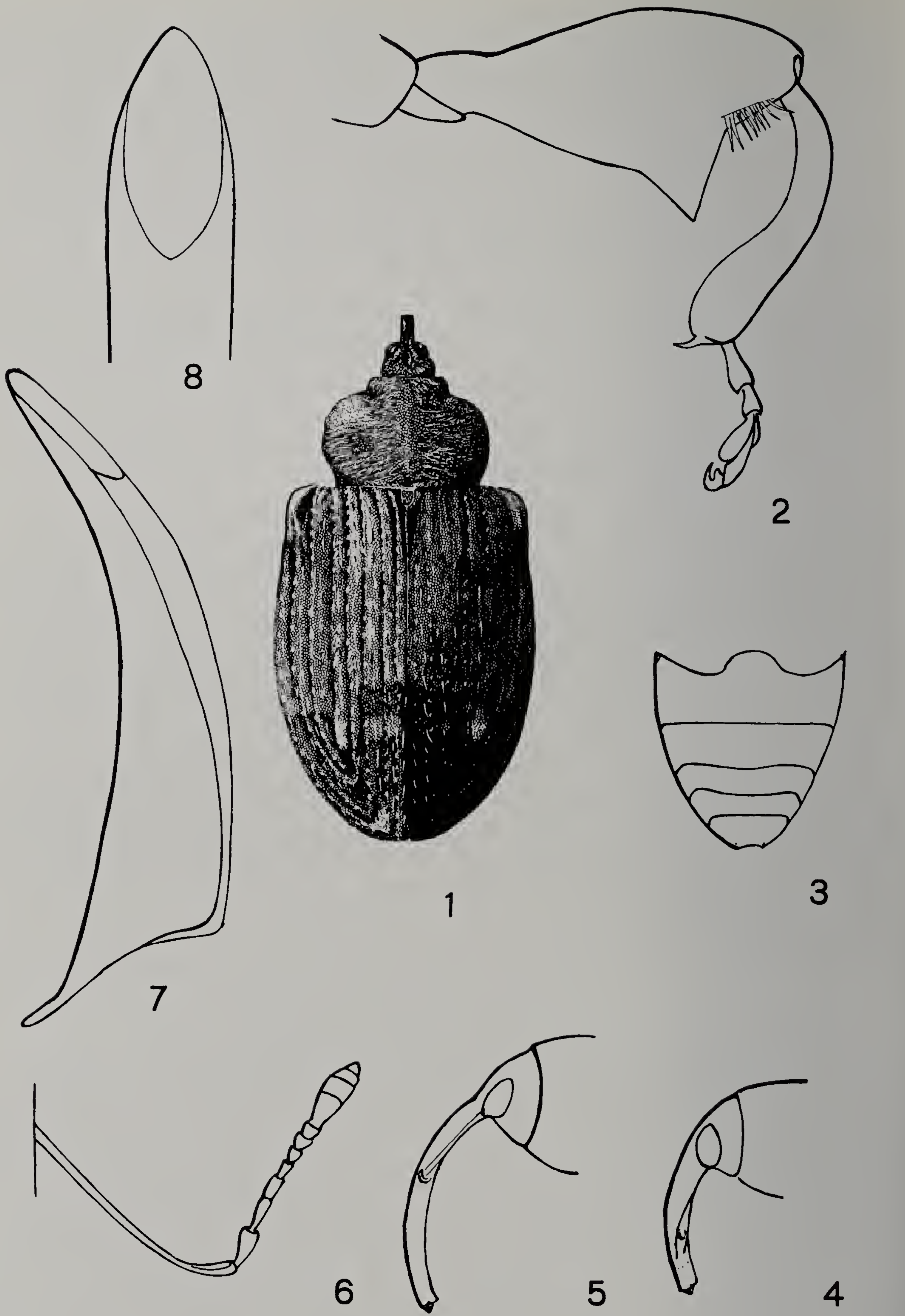

FIGURE 1.—Holotype, *Ochyromera ligustri* n. sp. FIGURE 2.— Anterior view of prothoracic leg. FIGURE 3.—Outline of visible abdominal sterna. FIGURE 4.—Lateral view of male rostrum. FIGURE 5.—Same of female, holotype. FIGURE 6.—Antenna (♀). FIGURE 7.—Outline of lateral view of median lobe of male genitalia. FIGURE 8. —Dorsal view of apex of median lobe of male genitalia.

THE GENUS *PHALEROMELA* REITTER IN NORTH AMERICA (TENEBRIONIDAE)

By C. A. TRIPLEHORN

Among North American workers in the Tenebrionidae, Nearctic members of the tribe Phaleriini have heretofore been restricted to but a single genus, *Phaleria* Latreille, containing twelve described species, most of which appear to be valid. Typically, the species of *Phaleria* have the anterior tibiae broadly expanded apically and all of the tibiae coarsely and densely spiny; the mesosternal groove into which the erect prosternal process fits is deep and acutely V-shaped and the antennae are short and stout, rarely extending caudad beyond the middle of the pronotum; the eyes are large, transverse and broadly emarginate anteriorly.

Horn (1870:377) suggested that *Phaleria globosa* LeConte and *P. humeralis* Horn differed sufficiently from other species of *Phaleria* known to him to warrant the recognition of a separate genus but neglected to name it.

In 1916, Reitter erected the genus *Phaleromela* to receive *Phaleria subhumeralis* Marseul, which thus became the monobasic type of the genus. Reitter's primary criteria in separating *Phaleromela* from *Phaleria* were the smaller, rounded eyes with entire anterior margins and . . . less strongly excavated mesosternum.

Gebien (1939) lists the genus *Phaleromela* Reitter and includes *subhumeralis* (Marseul), *humeralis* (Laporte), *picta* (Mannerheim) and *globosa* (LeConte), but offers no explanation for the transfers. However, there seems but little doubt that this assemblage of species forms a natural group. Reitter's description, based as it is upon a single species, is not sufficiently general to characterize all the included species. It therefore seems in order to present a broader redescription of *Phaleromela* in which all of the known species may be included.

Phaleromela Reitter

Elongate-oval to broadly oval, convex, glabrous, shiny. Head with anterior margin evenly arcuate from eye to eye; clypeus poorly defined; eyes small, widely separated both above and below, anterior margin entire; terminal segment of maxillary palpus narrowly elongate, obliquely truncate apically; antennae long, extending well beyond base of pronotum, feebly clavate. Pronotum narrower than elytra at base. Elytra finely punctate-striate, striae sharply incised but feebly impressed, each elytron with eight discal striae, no short stria paralleling margin of scutellum; intervals subconvex, finely, asperately punctured. Ventral surface of pronotum finely, longitudinally wrinkled; prosternal process convex between front coxae, slightly prolonged behind, deflexed apically; mesosternum rather deeply but not abruptly excavate anteriorly; epipleura entire but very narrow and everted at elytral apices, anterior tibiae conspicuously flattened and expanded apically, margined externally with flat, stiff spines; all tibiae rather densely spiny with prominent apical spurs.

[1] Department of Zoology and Entomology, Ohio Agricultural Experiment Station, Wooster, Ohio.

This genus is very similar to *Phaleria* in general appearance and has many characters in common with it (i.e. expanded front tibiae, entire epipleura, spiny tibiae, etc.). It is readily separable from *Phaleria* on the basis of the longer antennae which extend well beyond the pronotal base, the deflexed prosternal process, much smaller and rounded eyes and the absence of short elytral striae paralleling the margin of the scutellum.

During the author's studies in the Nearctic components of the closely related tribe Diaperini, it was concluded that *Scaphidema pictum* Horn (1874) actually belonged to the Phaleriini. The front tibiae are expanded apically and all of the tibiae are densely spiny, the mesosternum is shallowly excavated anteriorly and the eyes are small and rounded with entire anterior margins. Its general habitus is clearly *Phaleria*-like but the structure of the mesosternum, eyes and antennae place it more properly in *Phaleromela*.

Since *Phaleromela* already contains *pictum* (Mannerheim), the transfer of Horn's *Scaphidema pictum* to this genus results in homonymy and a new name is required for the latter species. It is proposed that it henceforth be known as *Phaleromela variegata* NEW NAME.

An additional case of homonymy in *Phaleromela* must be resolved. In 1870, Horn published a brief comparative description of a species which he called *Phaleria humeralis*. Gebien lists this as another reference to *humeralis* Laporte. It is probable that Horn missed Laporte's earlier description and use of the same name and it is entirely possible that they had reference to the same insect. Nevertheless, until such time as the identity of these two nominate species is established, a new name will be required to replace that of Horn, for which *Phaleromela prohumeralis* NEW NAME is proposed.

In order to clarify the existing situation in regard to the genus *Phaleromela* and the North American species which it is now considered to include, the following catalog has been prepared:

Genus PHALEROMELA Reitter

Phaleromela Reitter, 1916. Ent. Blätter 12:4.
Type: *Phaleria subhumeralis* Marseul, 1876. Ann. Soc. Ent. France (5)6:102. (Japan) Monobasic.

1. *variegata* NEW NAME. Oregon.
   Scaphidema pictum Horn, 1874. Trans. American Ent. Soc. 5:36 (nomen preocc.).
   Phaleromela variegata Triplehorn. NEW NAME
2. *globosa* (LeConte). California.
   Phaleria globosa LeConte, 1857. Rept. Ins. Surv. [Rept. Exp. Surv. RR Miss. R. to Pacific] :51, pl. 2, fig. 4.
   Phaleromela globosa (LeConte), Gebien, 1939. München. Ent. Ges. 29:743.

3. *humeralis* (Laporte). California, Asia.
   Phaleria humeralis Laporte, 1840. Hist. Nat. Ins. Coleop. 2:219.
   Phaleromela humeralis (Laporte), Gebien, 1939. München Ent. Ges. 29:743.

4. *picta* (Mannerheim). Sitka, Alaska.
   Phaleria picta Mannerheim, 1843. Bull. Soc. Imp. Nat. Moscou 16:277.
   Phaleromela picta (Mannerheim), Gebien, 1939. München Ent. Ges. 29:743.

5. *prohumeralis* NEW NAME. California.
   Phaleria humeralis Horn, 1870. Trans. American Phil. Soc. n.s. 14:375,377 (nomen preocc.).
   Phaleromela prohumeralis Triplehorn. NEW NAME.

Two of the species mentioned above, *P. variegata* and *P. globosa*, have recently been illustrated by Papp and Pierce (1960). Both were found associated with stored grain products in the Mojave Desert, California.

Acknowledgments.—The author wishes to express his gratitude to Mr. T. J. Spilman of the United States Department of Agriculture for his aid in the preparation of this manuscript and for checking the literature citations.

Literature Cited

Papp, Charles S. and Pierce, Harold D. 1960. Ecological remarks on some tenebrionids connected with stored animal food in the Mojave Desert, California. Journ. Kansas Ent. Soc. 33(4):154-156.

A FEW TENEBRIONIDS NEW TO CUBA

Sr. Fernando de Zayas, of Cuba, recently gave me the opportunity to study some of the beetles he collected on Cuba. He has a few species not previously recorded from the island, so I present the data below as a contribution to our knowledge of beetle distribution in the Caribbean area.

Tribe Stenosini. Specimens of *Rhypasma haitianum* Marcuzzi, 1953 (Atti Mus. Civ. Stor. Nat. Trieste 19(2):82, 84, fig. 3), were labeled as follows: Cuabitas, Oriente Prov., IX-1948. In addition, specimens of this species in the U. S. National Museum are labeled Jobabo, Cuba. Unfortunately a Province is not indicated on these labels; according to my gazetteers the name Jobabo is used for localities in several Provinces. This species was previously recorded only from Haiti.

Tribe Branchini. A specimen of *Branchus woodi* LeConte, 1866 (Smithsonian Misc. Coll. 6(140):111), was labeled as follows: Litoral de la Hab. Marianao, La Habana Prov. The head and legs were missing when it was collected. The condition of the specimen and the situation in which it was found necessitate only tentative inclusion of the species in the Cuban faunal list. The species was previously recorded from New Providence Island of the Bahama Islands.

Tribe Opatrini. Specimens of *Leichenum canaliculatum variegatum* (Klug), 1833 (Ins. Madagascar, p. 418), were labeled as follows: Península de Guanacahabibes, Pinar del Río Prov., VII-1955; Paredon de los Acosta, Pinar del Río Prov., V-1953. This species was probably introduced into the United States from Madagascar. In the United States it has been recorded from the Gulf Coast areas of Mississippi and Alabama, from a few places in North and South Carolina and Georgia, and throughout much of Florida. It is suspected of feeding on the roots of grasses.

Tribe Dysantini. Specimens of *Calymmus cucullatus* Pascoe, 1871 (Ann. Mag. Nat. Hist. (4)8: 349, pl. 14, fig. 8), were labeled as follows: Camagüey, Camagüey Prov.; Península de Guanacahabibes, Pinar del Río Prov., VII-1955; Cumanayagua, Santa Clara Prov., VI-10-33. This species was previously recorded from Mexico, Guatemala, Nicaragua, Panama, Colombia, Brazil, and Argentina.—T. J. Spilman, *Entomology Research Division, A.R.S., U.S.D.A., Washington, D. C.*

LETTER FROM LeCONTE TO ALEXANDER AGASSIZ

PHILADELPHIA, April 28, 1875
1625 SPRUCE STREET

My Dear Sir:—For the better preservation of the types of North American Coleoptera contained in my collection, I wish to have it placed, after my death, in the Museum of Comparative Zoölogy, in Cambridge, Massachusetts.

I am moved thereto, not only by the belief that the organization of your Museum, and the climate of Cambridge, are favorable for the preservation of perishable objects of natural history, but also because I desire, in illustrating the Museum established by Prof. L. Agassiz, to testify the strong affection I had for him.

I need not mention the value which my collection has for the future study of the Coleoptera of the United States; for, besides type specimens of nearly all the species described by me, it contains specimens carefully compared with those described by Say, Harris, Melsheimer, Haldemann, and Ziegler, and all the unique types of the three last-named authors.

It has been also enriched by the extreme liberality and courtesy of many distinguished European entomologists, who have sent to me even the second specimens of many of the North American species, which were otherwise unattainable, at that time. I have thus a nearly complete series of those species described from the western coast by Eschscholtz, Mannerheim and Mäklin.

I trust that it may be consistent with the funds of the Museum to retain permanently the services of an experienced entomological curator, with sufficient assistance to keep in order and protect the vast collection now being assembled.

I would suggest that, for ordinary study, type collections should not be opened freely, but that, by accurate comparison with authentic types, a separate collection for easy reference should be formed as rapidly as by purchase, or otherwise, material may be procured.

When these separate collections become tolerably perfect, as must result after a moderate time, the typical collections would be seldom consulted, only by those who were engaged in monographic work, or in authenticating specimens for the more public collections.

It is also important, for the preservation of entomological collections, that a rigid inspection should be made of each box of specimens, at least twice a year; and I would therefore suggest that it should be a permanent and stringent rule of the Entomological Department, to have such an inspection regularly made, and its results reported to the Director of the Museum.

In addition to the recommendations above made, I would urge strongly the necessity of preserving, in type collections, all the original labels of the author; these are sometimes removed for the sake of producing uniformity of appearance, which, however pleasing to the eye, occasionally gives rise to confusion.

If these views be acceptable to you, please signify to me your approval, and I will, without delay, send you an order upon the executors of my estate, to deliver to you, or your successors in office, my entomological collection. This order will be available, in case of my death, if the collection is not sooner placed in the Museum.

I would mention, the boxes used by me are very convenient for constant study, and for permanent protection could be readily placed, by pairs, in tight glass-covered drawers, similar to those now in use in the Museum.

With my best wishes for the future extension and prosperity of the Museum, I remain, as ever,

Very sincerely yours,

John L. LeConte

Alexander Agassiz, Esq., Museum of Comparative Zoology, Cambridge, Mass.

(Editor's note: *The above letter was first published in the report of the Museum of Comparative Zoology. It was suggested by Dr. Melville H. Hatch that it should be reprinted; for that purpose it was submitted to the editor by Dr. P. J. Darlington, Jr., Curator of Insects, Museum of Comparative Zoology.*)

The Coleopterists' Bulletin

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

VOLUME 16, 1962

Published by

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

Subscriptions: The subscription price for each annual volume of four numbers is $5.00 payable in advance. All subscriptions begin with the first issue of the year and those subscribing later in the year will receive the back issues of the volume.

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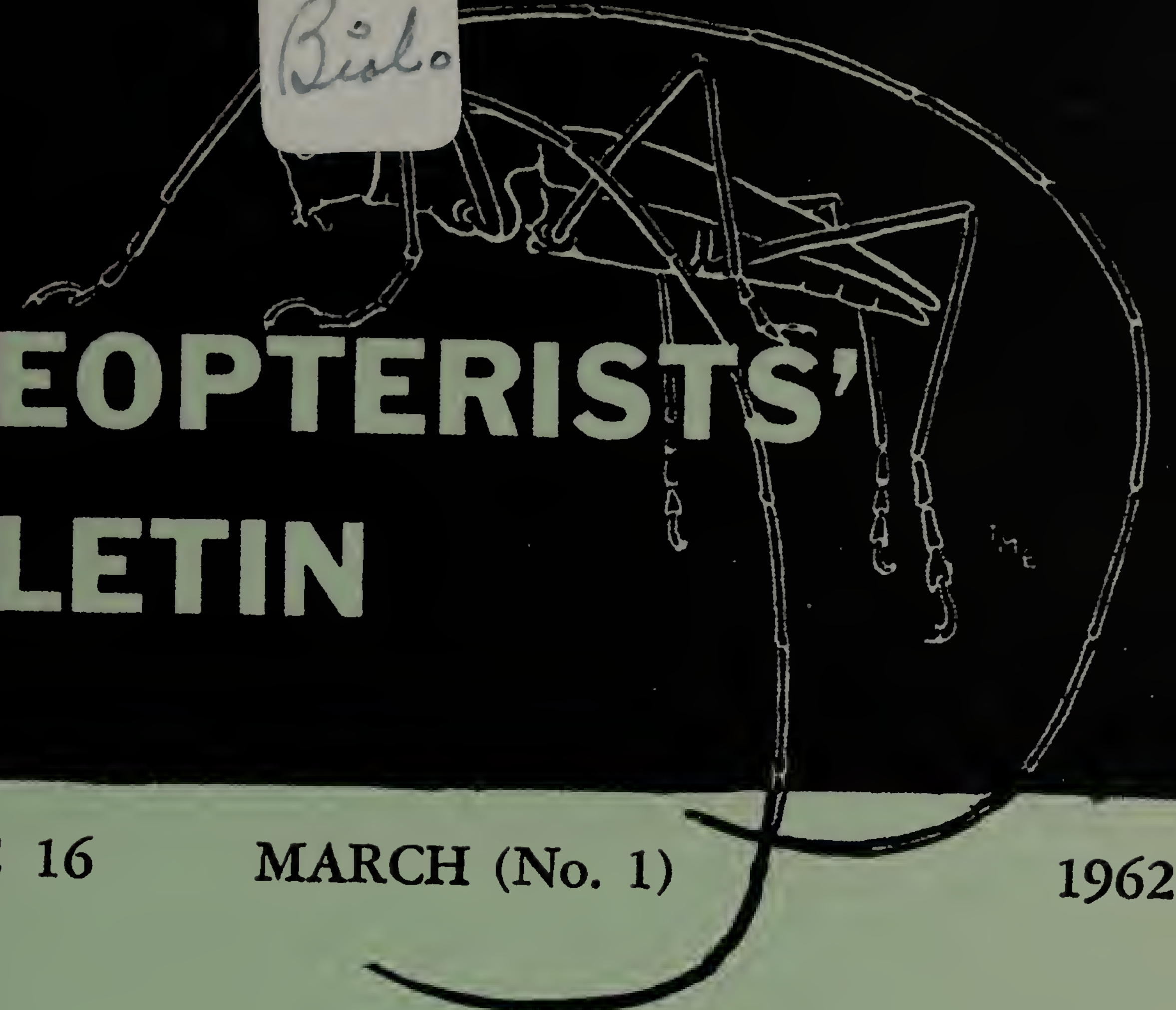

THE COLEOPTERISTS' BULLETIN

VOLUME 16 MARCH (No. 1) 1962

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THE CATHOLIC UNIVERSITY OF AMERICA PRESS
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The Coleopterists' Bulletin

Volume 16 March (No. 1) 1962

SOME NOTES ON THE COSSONINE GENUS *CAULOPHILUS* WOLLASTON WITH A KEY TO THE SPECIES (COLEOPTERA: CURCULIONIDAE)

By G. KUSCHEL[1]

In an unpublished attempt to rearrange the Cossonine genera of the world into a more natural system I found that *Allomimus* LeConte as well as *Tytthomimus* Champion cannot be adequately separated from the genus *Caulophilus* Wollaston. After studying the types I was able to establish a number of new synonyms. In this paper I have dealt only with the know species. The genus is briefly redescribed and a key to the species is presented.

Caulophilus Wollaston

Caulophilus Wollaston, 1854. Ins. Maderensis p. 315 (type *C. sculpturatus* Wollaston)

Allomimus LeConte, 1876. Proc. American Phil. Soc. 15:339 (type *A. dubius* G. Horn), NEW SYNONYMY.

Tytthomimus Champion, 1909. Biol. Centrali Americana 4(7):37 (type *T. rubicundus* Champion), NEW SYNONYMY.

Eyes convex, slightly transverse; scape short; scrobes deep, their inferior margin more or less suddenly ending. Seventh and ninth interstria of elytra raised and continued to the distal margin (if this character is indistinct there is a fine lateral groove on the pronotum), cryptotarsite not exposed. Male: 7th abdominal tergite with a loose stridulatory file; aedeagus bare; paramera absent.

Type species: *Caulophilus sculpturatus* Wollaston (= *oryzae* (Gyllenhal)).

Caulophilus belongs to the Rhyncolini, Rhyncolina and to the closely related generic group of *Heptarthrum, Stenomimus, Micromimus,* and *Stenotribus*. It differs from *Heptarthrum* by the unexposed cryptotarsite (the small fourth tarsal segment); from *Stenomimus* by the shape of the claw joint and/or by the presence of the lateral groove on the pronotum, and from the other two genera by the convex, slightly transverse eyes.

[1] Centro de Investigaciones Zoológicas, Universidad de Chile. 29th contribution, Col. Curculionoidea.

The genus, as defined above, includes sixteen described species. A single species, *C. dubius* (Horn), is confined to the U.S.A., all the other ones are distributed from Mexico to Bolivia and southern Brazil. The Seychelles species, *C. orientalis* Champion, is actually a synonym of *C. dirutus* Champion from Guatemala (NEW SYNONYMY). *C. nigrirostris* Aurivillius from Juan Fernandez belongs to the genus *Pachystylus* Wollaston (Rhyncolini Heterarthrina, NEW COMBINATION).

As far as *Caulophilus* and the other mentioned genera are concerned, their present-day character as a Neotropical element is clear. If we consider the other closer related genera of the Rhyncolina, such as *Pseudeucoptus, Carphonotus, Apotrepus,* and *Pseudapotrepus,* as well as *Stenancylus,*[2] we cannot derive these genera from any Holarctic genus of the present-day fauna. Within the approximately 30 Rhyncolina genera of the world, *Phloeophagus* of the Holarctic is certainly the closest element to the Neotropical generic group of the subtribe. All the genera of the Americas which show relationships with *Caulophilus* must be considered as Neotropical elements. We can, and probably must, admit a derivation of the Neotropical Rhyncolina from the Holarctic fauna, but that would mean that it has to go far back into the Tertiary.

The Nearctic Rhyncolina fauna has therefore two quite different components, (1) an older element with the genera *Phloeophagus* and *Rhyncolus* distributed in both subregions of the Holarctic; and (2) a recent post-Pleistocene Neotropical element with the genera *Caulophilus, Stenomimus, Micromimus, Carphonotus, Apotrepus,* and *Stenancylus.*

KEY TO THE KNOWN SPECIES OF THE GENUS *CAULOPHILUS*

1. Funicle segments 2 to 7 strongly widening and transverse; claw segment cylindrical or tapering distally ---------- 2
   Funicle nearly filiform, only slightly widening distally, or claw segment dilated distally 3

2(1). Claw segment of male noticeably tapering distally; aedeagus strongly dilated at apex, more or less spatuliform (length 1.9 to 3.1 mm.; U.S.A., Hawaii, Mexico, Guatemala, Jamaica, Madeira, and occasionally from Europe; transferred from Rhyncolus) ---------- ORYZAE (Gyllenhal)
   Claw segment subcylindrical in both sexes; aedeagus not dilated at apex (length 1.85 to 2.25 mm.; Mexico, Guatemala) ---------- SERICATUS Champion

3(1). Second interstria distinctly abbreviated at apex (length 3.2 mm.; Mexico) ---------- COSTATUS Champion
   Second interstria not abbreviated at apex ---------- 4

4(3). Elytra narrowing toward base and apex ---------- 5
   Elytra parallel ---------- 6

5(4). Prothorax wider near middle (length 2.4 mm.; Guatemala; transferred from Tytthomimus) ---------- RUBICUNDUS (Champion)
   Prothorax wider near base (length 2.65 mm.; Bolivia; transferred from Stenomimus) ---------- OVATULUS (Hustache)

6(4). Rostrum long and slender, at least three times as long as wide from apex to anterior margin of eyes ---------- 7
   Rostrum short, about twice as long as wide ---------- 8

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[2] *Stenancylus* Casey 1892 = *Liolepta* Blatchley 1916 = *Rhinonus* Kuschel 1959 (NEW SYNONYMY).

7(6). Pronotum with a smooth central line (length 2.25 mm.; Panama; transferred from Tytthomimus) ---------------------------------- LINEATICOLLIS (Champion)
Pronotum without a smooth central line (length 2.55 mm.; Guatemala; transferred from Stenomimus) ---------------------------------- FILIROSTRIS (Champion)
8(6). Pronotum with at least partly alutaceous or striolated microsculpture (X 50) ------ 9
Pronotum very shiny throughout, without alutaceous microsculpture ------------- 11
9(8). Reddish-brown; striae very fine, sixth and seventh partly obsolete (length 2.10 mm.; Guatemala; transferred from Tytthomimus) ------------ RUFOTESTACEOUS (Champion)
Very dark, almost black; striae strongly developed, sixth and seventh not obsolete -- 10
10(9). Pronotum partly alutaceous, coarsely and densely punctate, intervals between punctures less than diameter of a puncture (length 3.05 mm.; Guatemala; transferred from Stenomimus) ---------------------------------- RHYNCOLOIDES (Champion)
Pronotum alutaceous throughout, punctures fine, their intervals larger than diameter of one puncture (length 1.85 to 2.15 mm.; Guatemala, Seychelles; transferred from Stenomimus) -- DIRUTUS (Champion)
11(8). Larger species, length 2.35 to 2.55 mm.; with striae narrower than interstriae ---- 12
Smaller species, length 1.70 to 2.15 mm.; with striae about as wide as interstriae -- 13
12(11). Rostrum from apex to anterior margin of eyes about 1.4 longer than its distal width (length 2.35 mm.; Mexico; transferred from Stenomimus) -------- RUFIPES (Champion)
Rostrum from apex to anterior margin of eyes about twice as long as its distal width (possibly this species is the female of rufipes; length 2.55 mm.; Guatemala; transferred from Stenomimus) -------------------------------- QUICHENSIS (Champion)
13(11). Elytra less than twice as long as wide -- 14
Elytra more than twice as long as wide ------------------------------------- 15
14(13). Tibiae slightly dilated distally (length 2.0 to 2.34 mm.; U.S.A.; transferred from Stenomimus) -- DUBIUS (Horn)
Tibiae strongly dilated distally (length 2.0 mm.; Guatemala; transferred from Stenomimus) -- VERAEPACIS (Champion)
15(13). Elytra about 2.10 longer and wide (length 1.70 to 2.15 mm.; Guatemala, Costa Rica; transferred from Stenomimus) ------------------ GUATEMALENSIS (Champion)
Elytra about 2.15 longer than wide (length 1.95 mm.; Venezuela; transferred from Stenomimus) -- VENEZOLANUS (Kuschel)

SOME SYNONYMIC REMARKS

Caulophilus oryzae (Gyllenhal, 1838) NEW COMBINATION (from *Rhyncolus*)

Rhyncolus oryzae Gyllenhal, 1838

Rhyncolus lauri Gyllenhal, 1838 NEW SYNONYMY

Caulophilus sculpturatus Wollaston, 1854

Caulophilus pinguis (Horn, 1873)

Caulophilus latinasus authors since 1873 (not Say, 1831)

Unfortunately the above synonymy implies an unavoidable change of the trivial name for the pest in stored grains commonly known as the "broad-nosed grain weevil." The description of *Rhyncolus latinasus* by Say (1831) and Gyllenhal (1838) does not fit at all the characters of the present species, but both descriptions agree very well with a specimen in Schönherr's collection, Stockholm, which had been sent by Say himself to Schönherr as his *Rhyncolus latinasus*[3] from Florida. I have selected

[3] *Borophloeus corticola* (Say, 1831) NEW COMBINATION (from *Cossonus* = *Rhyncolus latinasus* Say 1831, NEW SYNONYMY).

this specimen as lectotype of *Rhyncolus latinasus* Say, 1831, and returned it to Stockholm. *Rhyncolus oryzae* was described from a specimen found on rice in a grain store in Stockholm, but the original country of the rice was unknown to the collector. This is, so far, the oldest available name for the species. On the following page of the same volume Gyllenhal described another species named *Rhyncolus lauri,* which was actually based on an immature specimen of the same species received from Mexico and reared from "seminibus Lauri perisci," as stated by Gyllenhal. G. Horn is actually responsible for the misidentification of *Rhyncolus latinasus* Say.

Caulophilus sericatus Champion, 1909

Caulophilus veraecrucis Champion, 1909 (NEW SYNONYMY).

I could not find any specific difference between these two species. Although *C. veraecrucis* has line priority, I have selected *sericatus* to be used because of its more appropriate name and because it has been figured by Champion.

Caulophilus dirutus (Champion, 1909) NEW COMBINATION

Stenomimus dirutus Champion, 1909

Stenomimus orientalis Champion, 1914 (NEW SYNONYMY).

Champion says "one (species) from the Seychelles is so closely related to *S(tenomimus) guatemalensis* and some other Central American forms described by myself that it is here referred to the same genus." There are some Rhyncolina genera in the zoogeographical region to which Seychelles belong, such as *Ochronanus (= Philippista), Rhyncolosoma, Catolethrobius, Gloeoxenus* and *Melarhinus,* but they do not show any relationship with *Caulophilus* to which certainly belongs *Stenomimus orientalis* Champion. The presence of a true *Caulophilus* in a zoogeographical region other than the Neotropical is more puzzling than interesting. In such cases we cannot but assume that something is wrong either biogeographically or taxonomically. Therefore I have compared with particular care the Seychelles species with those of the Neotropical region and have succeeded, I hope, in finding out that *S. orientalis* from Seychelles does not specifically differ from *C. dirutus* described from Guatemala.

Champion states in the same paper on the Seychelles weevil fauna (p. 490) that *Stilbocara constricticollis* Broun, from New Zealand, is in his opinion congeneric with *S. orientalis*. I have seen three *Stilbocara* species from New Zealand at the British Museum and can establish that *Stilbocara* Broun certainly belongs to the same subtribe Rhyncolina but it is a quite distinct and valid genus.

LITERATURE NOTICE

The following pamphlet will be of use to those having difficulty translating Czech, Danish, Dutch, French, German, Polish, Russian, and Swedish: A glossary of some foreign-language terms in entomology, by Ruth O. Ericson, U. S. Dept. of Agriculture Agricultural Handbook No. 218, pp. i-iv, 1-59, illus., 1961 (price 25 cents).

THE GENUS *OBEREA* MULSANT (COLEOPTERA: CERAMBYCIDAE) WITH NOTES ON THE TAXONOMY, VARIATION, AND HOST-AFFINITIES OF MANY OF THE SPECIES

By STANTON D. HICKS[1]

It is so rightly stated in the introduction of the first fascicle of *The Beetles Of The United States* (Arnett, 1960) that "Ecological information about beetles is distressingly limited." As a contribution to this neglected field, I offer below facts and observations that I have made over the years on many species of *Oberea*. The genus is poorly understood taxonomically and it is my feeling that this is largely because so few of the life-histories and host preferences are understood, plus the fact that many of the species are so variable in color. In an effort to solve at least part of the problem I borrowed material from several institutions, United States National Museum, American Museum of Natural History, New York State Museum, Illinois State Natural History Survey, Iowa Wesleyan College, Ontario Agricultural College, Royal Ontario Museum, and two Canadian entomology laboratories. These specimens supplemented those contained in the Canadian National Collection (CNC) and my own private collection, now presented to the Canadian National Collection. In addition I made numerous observations in the field and sought by other means as well to clarify the habits and food preferences of these beetles. The data assembled, mostly pertaining to species of Eastern North America, soon showed that many published records and opinions were in error.

The present contribution does not pretend to comprise a comprehensive review, but it will, I hope, clarify a number of taxonomic questions, and pave the way for a more complete analysis. *Oberea brooksi* Wallis is reduced to synonymy under *O. oculaticollis* (Say); no other changes in status are proposed.

The problem of resolving the species of *Oberea* appears to be similar to and as difficult as that experienced by Brown (1956) in his study of *Chrysomela,* even though sibling species do not appear to be involved. However, there are forms with very close superficial resemblance which may well have the same host and sibling affinity. The larvae of *Oberea* species are live stem borers not easily discovered in many cases in their specific hosts. This is exemplified by *Oberea tripunctata* (Swed.), taxonomically identifiable, and easy to collect in the adult stage, yet with no host record in literature or on specimens. As one sweeps or hand picks adult leaf beetles, it is usually possible to relate the discovery of the first few to their host by critical observation in the immediate area, especially if there are larval or pupal stages on the leaves. It is not as easy to find

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the host of a species of *Oberea* by the girdling of stem or twig and the resultant wilting of the leaves, unless an abundant colony of adults is present. It seems probable, therefore, that at least several species will only be properly understood by field study.

When the species are better understood it may be possible to prepare a key using pronotal structure and color. Specimens can be sorted to immaculate, bimaculate, and quadrimaculate groups by the presence or absence of colored pronotal callosities. However, it was found that body color in general is a variable, undependable factor in many species; morphological characters within these groups are often unsatisfactory, and the median lobes of male genitalia of easily separated species are too similar to be useful.

The following is a list of 21 species with notes to support their validity. The specimens were checked with the original descriptions and in some cases compared with the types and cotypes. It is hoped that these data will serve as a foundation for future interest in this genus of the Cerambycidae.

IMMACULATE GROUP

(Callosities absent, pronotum light)

Oberea gracilis (Fab.). Length 11 to 15 mm. Easily separated from the only other species in this group by the general yellowish-brown colour, the black stripe on each side of the elytra, and the size which is about half that of *ruficollis*. Records: 6 specimens are in the C.N.C. from Sherborn (1), Massachusetts; Sanford (1) and Enterprise (2), Florida; and locality (?) (2). Host: not known.

Oberea ruficollis (Fab.). Length 16 to 19 mm. The largest of any *Oberea,* this species has a mat of fine, gray pubescence on the black elytra which contrasts with the reddish-orange head and thorax. Records: 11 specimens are in the C.N.C. from Clark's Valley (2), Harrisburg (1), Hummelstown (1), and Pike County (1), Pennsylvania; Leamington (1), Ontario; Highlands (2), North Carolina; Satola (1), Georgia; and locality (?) (2). Host: larva in the stem and root of young living sassafras (Craighead, 1923).

BIMACULATE GROUP

(Callosities 2, page)

(Callosities 2, dark)

Oberea affinis Leng. Length 11 to 13 mm. The only species in the group with the callosities pale, the same color as the pronotum. This is the common pest of raspberry and blackberry plantations and can be collected anywhere within a radius of thirty miles of Ottawa. I have seen specimens morphologically similar but with two black callosities; these range from Maine to New Jersey and west to Wisconsin and Manitoba. Authors have used the name *bimaculata* in the literature for these two forms for many years. Further I have seen forms from New York State that appear to be intermediates in the maculation on the thorax. It needs to be established whether or not there is a cline from north to south that connects these forms. Records: 156 specimens are in the C.N.C. from localities in the eastern townships of Ontario, southwestern Quebec, and south to Tennessee and west to Windsor, Ontario. Host: many adults were reared from larvae in the stems and crowns of raspberry and blackberry (*Rubus* spp.).

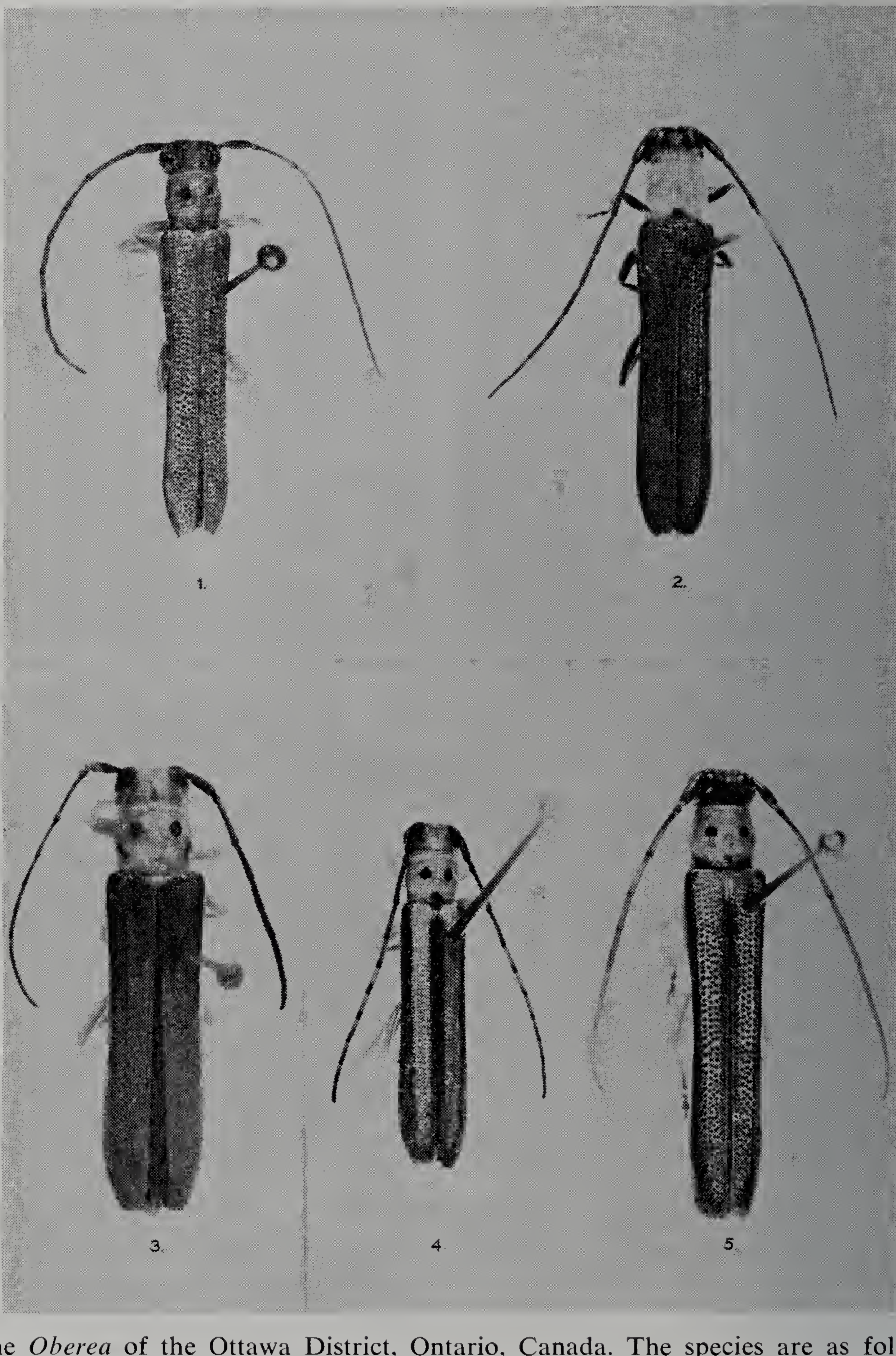
There seems to be no possibility of locating Olivier's type specimen of *Oberea bimaculata* for study. Olivier stated that he had found this beetle in the Var region (southern France). According to Mr. A. Descarpentries of the Paris Museum it is not in their collection. Further, no French species satisfies the original description. There is no reason to believe that the type was American, although Gemminger and Harold and subsequent authors restrict the name to the American form. Therefore, it is probably best to consider *bimaculata* as an unidentifiable species.

Authors have also misused the name *bimaculata* for similar and smaller forms in this group. The major problem is a proper understanding of many of Casey's names *intermedia, delicatula, filum, iowensis, insignis, umbra dolosa* and *plagiata.* Other names to be considered are *mandarina* of Fabricius, *amabilis* and *tibialis* of Haldeman, and *basilis* of LeConte. These are names applied to closely allied and variable forms based only on one or two specimens in many cases.

Oberea tripunctata (Swed.). Length 9 to 13 mm. The commonest of several yellow and black-striped species in this group and almost as easy to collect as *affinis.* Specimens have yellow to black heads, scutellum and pre-scutellar spot black, and annulated antennae. Records: 173 specimens in the C.N.C. show the same general range as *affinis.* Host: not known.

Oberea praelonga Csy. Length 9 to 13 mm. Some of our specimens have been compared with the cotypes by Mr. William Haliburton of the former Division of Forest Biology, Science Service, Department of Agriculture, Ottawa, Canada. Although similar in appearance to *tripunctata,* it can be easily separated by the consistently black head (with pale basal collar), pale scutellum, and pre-scutellar dark spot which varies from an almost obsolete to a dark color. Records: 49 specimens are in the C.N.C. from Bells Corners (25), City View (1), Ancaster (3), Pt. Pelee (2), Campden (1), Marmora (1), Prince Edward County (1), Britannia (Carleton County (1)), Addington-Lennox County (1), Ontario; northeast side of the Champlain Bridge (2), Point Gatineau (1), Harrington Lake (8), Hull (1), Quebec; and Sherborn (1), Massachusetts. Host: several adults have been reared from larvae in the tips of stems of *Cornus stolonifera* Michx.

Oberea appalachiana Csy. Length 10 to 14 mm. Very closely allied to *praelonga,* but in general more robust. It appears to be a good species on the basis of identification in 1945 by Mr. W. S. Fisher, formerly with the Bureau of Entomology, United States Department of Agriculture, and by the fact that it has a different host. Records: 5 specimens are in the C.N.C. from Windsor (1), Westport (1), and Leamington (1), Ontario; and St. Stephen (2), New Brunswick. Host: the two specimens from Westport and Leamington were reared from larvae in twigs of elm (*Ulmus* sp.) by Mr. Haliburton.



The *Oberea* of the Ottawa District, Ontario, Canada. The species are as follows: FIG. 1, *O. pallida* Csy.; FIG. 2, *O. affinis* Leng; FIG. 3, *O. schaumii* LeC.; FIG. 4, *O. tripunctata* (Swed.); FIG. 5, *O. praelonga* Csy.

Oberea deficiens Csy. Length 14 mm. Closely allied to *praelonga* and *appalachiana,* this species is generally paler and has an entirely pale head. It also has a different host. Mr. Haliburton compared a specimen with the type. Records: 4 specimens are in the C.N.C. from Kitchener (1), Leamington (1), and Ivy Lea (2), Ontario. Host: the two specimens from Ivy Lea were reared from larvae in stems of *Viburnum* sp. by Mr. Haliburton.

Oberea ulmicola Chitt. Length 9 to 13 mm. (Webster, 1904). The writer has examined a series of 28 paratypes from the Illinois Natural History Survey Collection. The head is always black; the antennae are always dark, with no indication of annulation; the scutellum is always pale, and the pre-scutellar spot is either very small or lacking. This species has a purplish bloom on the elytra owing to the color combination of fine white hairs and brownish-black elytra. It is unlike any other bimaculate species. Since it was collected in great number at Decatur, Illinois, where it bred in the twigs of elm, there can be no doubt as to its validity. Records: 1 specimen is in the C.N.C. from the type locality Decatur, Illinois. Host: many specimens were reared by Mr. E. S. G. Titus and Mr. F. M. Webster from larvae in twigs of the American elm, *Ulmus americana L.*

Oberea pallida Csy. Length 11 to 13 mm. It is easy to recognize this species. The head, antennae, thorax, scutellum, elytra, and abdomen are a light yellowish-brown. The callosities and pre-scutellar spot vary from very light brown to black. Specimens were compared with the cotypes by Mr. Haliburton. Records: 8 specimens are in the C.N.C. from Marmora (1) and Hastings County (1), Ontario; Beech Grove (1), Berthierville (1) and Harrington Lake (Gatineau Park (1)), Quebec; Aweme (1) and Berens River (1), Manitoba; and Monmouth (1), Maine. Host: recorded as breeding in alder in Pennsylvania (Knull, 1946), the Maine specimen bears a label, "beating *Alnus,*" and the author has collected one specimen on an isolated alder shrub.

Oberea exilis Csy. Length 9 mm. A small, slender, blackish-brown species with dark antennae. The head is black, with a pale band extending across the face between the clypeus and the labrum. The callosities are large, shiny, and black, and are centrally located on a yellowish thorax with dark base and sides. One specimen was compared with the cotypes by Mr. Haliburton. Records: 1 specimen is in the C.N.C. from Roseland, Ontario. Host: not known.

Oberea flavipes Hald. Length 10 to 11 mm. A small series I have seen exhibits a distinctive general color pattern. The brownish-yellow elytra are paler at the base around the dark scutellum and slightly darker along the sides. This contrasts with the brownish-black abdomen, prosternum, and pronotum. The head is black and the legs from femora to tarsi are entirely yellow. Records: 2 specimens from Maryland are in the C.N.C. and other specimens examined were from the same state. Host: the larva feeds in the stems of *Phlox* (Craighead, 1923).

Oberea oculaticollis (Say). Length 13 to 14 mm. A robust, almost entirely black species covered completely with a fine, silvery mat of hairs. The antennae and legs are blackish-brown. It can be distinguished easily from any other species in the three groups. Mr. Haliburton has compared one Ontario specimen with specimens in the United States National Museum and the LeConte Collection. Two other specimens, the female type and the female paratype of *brooksi* Wallis from Manitoba, are identical with the Ontario specimen and agree with Say's original description. Mr. J. B. Wallis' name will have to go into synonymy. Records: 3 specimens are in the C.N.C. from Ojibway (1), Ontario, and Transcona (2), Manitoba (the ones referred to above). Host: not known.

Oberea myops Hald. Length 15 to 18 mm. A large species, averaging slightly smaller in size than *ruficollis*. Primarily a yellowish-orange, specimens examined exhibit a faint to a more noticeable sutural dark stripe which begins just beyond the pale scutellum, a heavier dark stripe along the sides which almost reaches the apex, dark antennae, and bicolored legs. Mr. W. Haliburton has compared a specimen with the type. Records: 4 specimens are in the C.N.C. from Franklin (1), North Carolina; Satolah (1), Georgia; Jamaica (1), Long Island, New York; and locality ? (1). Host: larvae have been found only in Rhododendron and related shrubs (Craighead, 1923).

Oberea ocellata Hald. Length 11 to 15 mm. A striking species, easily recognized by contrasting orange and black. The head, thorax, and abdomen are orange. The elytra (covered with a mat of fine, silvery hairs) and antennae are blackish. The legs are bicolored. Mr. W. S. Fisher identified one of our specimens in 1945 as *ocellata*. Records: 8 specimens are in the C.N.C. from Roseland (1), Ontario; Hummelstown (2), Pennsylvania; Moshola (1) and New Rochelle (1), New York; Framingham (1), Massachusetts; Lawrence (1), Kansas; and Williamsville (1), Missouri. Host: the larva has been found in two species of *Rhus* (Craighead, 1923).

Oberea ocellata discoidea LeC. Length 11 to 15 mm. Specimens examined average the same size and have the same basic color pattern as typical *ocellata*. However, the two forms can be easily separated by the consistently noticeable maculae on the head and thorax. There are two large, oval, black spots barely separated by the median line on the vertex of the head. Two larger black spots surround the callosities and join at the median line on the thorax. I have seen no intergrades. Records: 4 specimens are in the C.N.C. from Lakeland (2) and Gainesville (1), Florida, and locality ? (1). Host: unknown.

QUADRIMACULATE GROUP

(Callosities 4, dark)

Oberea delongi Knull. Length 8 to 12 mm. The author collected a considerable series of adults from one host at one locality on three occasions. The series agrees with the description of Knull (1946) in which he recognized a short, slender (prefer robust) form showing great variability in color. This is a dark species with yellow legs. The color variation is strikingly sexual and individual. Males have the labrum, clypeus, and frons pale and the vertex variably pale to black. The elytra have a short, yellow outer margin starting at the base. The last two ventral segments of the abdomen are variably pale. Females have a greater degree of color contrast in all these parts. Female heads are almost entirely pale, the pale outer margin of the elytra is more pronounced, and the last two ventral segments and the pygidium are yellow. Records: 41 specimens are in the C.N.C. from Roseland (34), Tecumseh (1), Windsor (2), and Point Pelee (1), Ontario; Montreal Island (1), Quebec; Chicopee (1), Massachusetts; and Lawrence (1), Kansas. Host: numerous adults were collected on seedlings and mature trees of *Populus deltoides* Marsh. at Roseland, Ontario.

Oberea schaumii LeC. Length 13 to 16 mm. The head varies from entirely orange to almost black in this species. The prothorax and prosternum are orange except for a basal, lateral black spot. The greater part of the ventral surface of the abdomen is orange. Each elytron has an orange outer margin which does not reach the apex. There may or may not be a pale area around the pale scutellum. Otherwise, the elytra are brownish-black with a mat of short, recumbent, silvery pubescence. The elytral apices are truncate. Records: 17 specimens are in the C.N.C. from Sault Ste. Marie (2), Leamington (1), Greely (1), and Prince Edward County (1), Ontario; Hemmingford (1), Quebec; Aweme (6) and Onah (1), Manitoba; Steep Creek (1), Fort Qu'Appelle (1), and Fort A La Corne (1), Saskatchewan; and McMurray (1), Alberta. Host: *Populus* spp. is indicated by labels on specimens.

Oberea pruinosa Csy. Length 13 to 15 mm. Easily distinguished from any other species of *Oberea* by the distinctive color pattern. A small series from the one host in the one locality demonstrates the variability in the peculiar basic pattern on the elytra. Predominantly khaki-colored, specimens have variable dark stripes on the elytra which form an elongate, heart-shaped area from the pale scutellum towards the apex. The elytral apices are rounded, not truncate as in *schaumii*. Records: 9 specimens are in the C.N.C. from Roseland (7), Ontario; Sandusky (1), Ohio; and Medicine Hat (1), Alberta. Host: a small series of adults was collected on seedlings and mature trees of *Populus deltoides* Marsh. at Roseland, Ontario.

Oberea cylindricollis Csy. Length 11 to 14 mm. Closely allied to *schaumii*, this species can be separated by four good characters in the males. The thorax is longer than wide, with the sides parallel; *schaumii* males have the thorax about as long as wide, and the thorax widest at the middle. The elongate basal callosities are twice as large. Along each side of the pronotal median line, below the central callosities, is an angled mat of long hair, not present in *schaumii*. The elytral apices are rounded. Records: 5 specimens are in the C.N.C. from Roseland (4), Ontario; and Willow Spring (1), Illinois. Host: the Roseland specimens were collected on the leaves of *Populus deltoides* Marsh.

Oberea quadricallosa Lec. Length 11 to 15 mm. The only western species with which the author is familiar. Resembling *schaumii*, it is separable by its range, west of the Rocky Mountains. Also, the head is always black, the scutellum is always black, and the basal spots on the sides of the pronotum average larger to twice as large in some specimens. There is no suggestion of a pale stripe on the elytra. Records: 22 specimens are in the C.N.C. from Agassiz (3), Creston (1), Vernon (1), Salmon Arm (1), Revelstoke (1), Royal Oak (1), Diamond Head Trail ((2500 ft.) Garibaldi Park (2)), 7 miles north of Oliver (7), and locality ? (3), B. C. Also, Stinson Creek (1), Mason County, Washington, and Gordon Head (1), Vancouver Island. Host: the two specimens from Garibaldi Park were collected on *Populus trichocarpa* Torr. and Gray.

Oberea canadensis Fisher. Length 8 to 16 mm. Originally described from two males; the paratype was destroyed when it was sent by Mr. Fisher for deposition in the Canadian National Collection. Specimens have been compared with the type by Mr. Haliburton. Records: 15 specimens are in the C.N.C. from Prince Edward County (5), and Hastings County (1), Ontario; Aweme (6), Winnipeg (1) and Lockport (1), Manitoba; and Wenoncha (1), Saskatchewan. Host: the type and paratype were collected on *Salix* by the author at Ojibway, Ontario.

The accompanying plate shows five distinct species of *Oberea,* the only ones known to occur in the Ottawa District. This area is embraced by a circle of thirty-mile radius centered at the Parliament Buildings in Ottawa.

Acknowledgments.—I wish to thank the curators of the institutions mentioned above for the generous loan of material.

Literature Cited

Arnett, R. H., Jr. 1960. Beetles of the United States. Washington.

Boitard, P. 1828. Manuel d'entomologie. Paris. Roret. 18. 2 Bde. 435 u. 417 pp., 110 Taf., p. 23.

Brown, W. J. 1956. The new world species of *Chrysomela* L. Canadian Ent., vol. 88, suppl. 3, pp. 1-54.

Craighead, F. C. 1923. North American cerambycid larvae. Dom. Canada Agr. Bull. 27, pp. 1-239.

Fisher, W. S. 1945. A new species of Oberea from Canada. Canadian Ent., vol. 77, p. 56.

Gemminger, M. and Harold, E. von. 1873. X. Cerambycidae (Lamiini), Bruchidae, pp. 2989-3232 (in Catalogus Coleoptorum, Munich, Tomes I-XII, 1868-1876, p. 3197).

Horn, G. H. 1878. Notes on some genera of Cerambycidae of the United States. Trans. American Ent. Soc., vol. 7, pp. 41-50.

Knull, J. N. 1946. The long-horned beetles of Ohio. Ohio Biol. Surv. Bull. 39 (vol. 7, no. 4), pp. 133-354.

Latreille, P. A. 1804. Histoire naturelle, VIII, Paris. (Dictionaire d'Hist. nat. de D'eterville, Paris, 1804, p. 278).

Olivier, A. G. 1795. Entomologie, IV, Paris. 519 pp., no. 68, p. 21.

Webster, F. M. 1904. Studies of the life history, habits, and taxonomic relations of a new species of *Oberea* (*Oberea ulmicola* Chittenden). Bull. Illinois St. Lab. Nat. Hist., vol. 7, pp. 1-14.

NEWS

Word has been received that in September of last year, Dr. Kurt Delkeskamp, coleopterist and specialist on African Erotylidae for 31 years at the Zoologisches Museum der Humboldt-Universitat in East Berlin, as well as all other scientists of the museum who live in the western zone, have been relieved of their jobs and can no longer even visit the museum.

THE OCCURRENCE OF *MESOCOELOPUS COLLARIS* MULSANT AND REY IN COLUMBUS, OHIO, WITH BIOLOGICAL NOTES (COLEOPTERA: ANOBIIDAE)

By RICHARD E. WHITE[1, 2]

On July 5, 1961, shortly after the appearance of my paper on *Mesocoelopus collaris* Mulsant and Rey in which the genus was newly recorded from the United States (White, 1961) I discovered four specimens of this species on window sills within the Botany and Zoology Building on the Ohio State University campus. This discovery is of interest because all previously recorded specimens are from the Atlantic coastal area, so that this record greatly expands the known range of this species. The original records were from Coatesville, Pa., Roanoke, Va., and Washington, D. C. Additional specimens have recently been seen from Newark, Delaware, collected November 2, 1950, by H. E. Milliron from lamp shades. These four individuals were in material loaned for study by W. A. Connell of the University of Delaware.

In my article recording *M. collaris* it was mentioned that some specimens bore labels stating that they were bred from English ivy. Examination of dead English ivy vines (*Hedera helix* Linnaeus) clinging to the Botany and Zoology Building disclosed numerous tiny holes dotting the surface of many of the stems. Removal of the bark showed damage which proved to be due to larval activity of *M. collaris*. This gave the author opportunity to make observations on the life history of this species.

Very little biological information is available for many species of Anobiidae, and though incomplete it seems advisable to present the following data on *M. collaris* Muls. & Rey.

The stems examined were collected on July 9, 1961, and varied from one to two feet in length. No evidence of larval activity was found in stems larger than 8 mm. in diameter. The smallest stem which contained burrows was 2 mm. in diameter. Close examination of seven once heavily infested stems disclosed one living, recently emerged adult (as evidenced by the general pale color and yellow, distended abdomen), three dead adults, two living larvae and over 30 dead larvae. With the exception of 4 or 5 dead larvae and one living larva, all of these were found in pupal chambers. The two living larvae and all but 1 or 2 dead larvae appeared mature. Between the elytra and abdomen of two dead adults there occurred circular, whitish objects knobed on one end which were found to be mites with greatly distended abdomens; one adult contained three of these, the other four. Numerous normal appearing, much smaller mites were observed on and within the beetles. Five of the dead larvae were partly covered with a dense, uniformly white fungus. An adult chalcid was found within the

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[2] My thanks to Richard Naskali for assistance with botanical portions of this paper.

hollow center of one of the stems; it was identified as a member of the family Pteromalidae and subfamily Pteromalinae. I was unable to carry the identification any farther.

The burrows lie mostly in the outer portion of the woody stem but nearly always extend partly into the bark tissue which is closely applied to the stem. The average maximum diameter of a burrow is about 1.2 mm. The tunneling typically runs the length of the stem but occasional short side branches and meanderings occur. Often the burrow will double on itself or cut transversely for some distance. Where many larvae occur close together the burrows are quite confused and irregular so that the excavations of one larva are indistinguishable from those of another. The burrows are filled with a fine, powdery frass. Microscopic examination shows whitish woody frass to be distinct from the rounded light brown fecal pellets. In one heavily infested stem (6 mm. in diameter) there occurred 5 pupal chambers within a one inch section.

The pupal chamber is elongate oval and is located deeper into the woody tissue than the regular larval burrows; it is level with the surface and most often parallel to the long axis of the stem. Some are at an angle to the length of the stem or even at right angles to it; these are often adjacent to a bud or an irregular part of the stem. A silk-like plug is constructed which seals the larval entrance off from the pupal chamber; bits of wood or fecal material cling to the outside of this. The silken material may also close off a wall of a chamber exposed by a burrow. In some of the smaller stems the pupal chamber is constructed in the central, hollow portion of the stem. When this occurs, both ends of the chamber as well as the larval entrance are sealed off with silken plugs. No cocoons were observed, although they have been recorded for other anobiids, notably *Eucrada humeralis* (Melsh.) by Rozen, 1957, *Hedobia granosa* Lec., by Rozen, 1957, *H. imperalis* (L.), by Xambeu, 1874, *H. regalis* (Duft.), by Portevin, 1896, and *H. pubescens* (Oliv.), by Wachtl, 1876.

The exit hole is nearly circular and the bore emerges at a right angle to the surface of the stem unless the pupal chamber is quite shallow. No larval or pupal exuviae were observed in the pupal chambers.

The central, hollow portion of the stem is frequently filled for some distance with rounded or oval, nearly white to often blackish, sometimes resinous looking bodies which are assumed to be fecal pellets. These are up to two times larger than the light brown fecal pellets found in the frass from larval burrows. One end of the tunnel is closed with a dense, nearly black plug quite different from that which is made by the larva in constructing the pupal chamber. This plug is presumably constructed of glued together fecal pellets. It is not known if the work and the fecal pellets are produced by the larva or the adult.

Böving (1954, pp. 135 to 136) described a larva collected from ivy which he designated as *Catorama* sp. The collection data of his two series are nearly identical with those given for two series of adult specimens on which the article recording *M. collaris* Muls. & Rey from the United States was partly based (White, 1961). The two larvae which were collected alive by myself agree fairly closely with Böving's description except that the number of dorsal asperities is consistently a few less than he records.

It was noted that the number of asperities differed between the two larvae examined, so this discrepancy with his description may be of no significance. All evidence considered, there can be little doubt that his description is of the larva of *Mesocoelopus collaris* Mulsant & Rey.

Literature Cited

Bøving, A. G.

1954. Mature larvae of the beetle-family Anobiidae. Det Kongelige Danske Videnskabernes Selskab (Biol.). 22(2): 1-298, 50 plates.

Portevin, G.

1896. Description de la larva de *Hedobia* (*Ptinomorphus*) *regalis* Duft. Bull. Soc. Ent. France, pp. 15-16.

Rozen, J. G.

1957. Biological notes on *Eucrada humeralis* (Melsheimer) (Anobiidae). Coleopt. Bull., 11: 53-54.

Wachtl, F.

1876. Beschreibung der Metamorphose und der Lebensweise von *Hedobia pubescens* Oliv. Verhand. zool.-bot. Ges. Wien., 26: 709-712, figs.

White, R. E.

1961. A genus of Anobiidae unrecorded from the United States. Ohio Journ. Sci., 61(3): 183-185, 1 fig.

Xambeu, V.

1894. Moeurs et métamorphoses des insectes. Ann. Soc. Ent. France., 63: 459-504.

NOTICE

Ross H. Arnett, Jr., when a graduate student at Cornell University, conceived the idea of a magazine devoted to the study of beetles. He published Vol. 1, No. 1, of the Coleopterists' Bulletin on April 1, 1947. At first the Bulletin was mimeographed, but soon it was printed in set type, all the work being done by hand by Arnett and his family. Finally it was printed by professional printers. It grew from a magazine for techniques, field notes, literature notices, and items of current interest to become an outlet for basic research articles, including revisions, new taxa, life history studies, etc. The Bulletin was made into a magazine at which Coleopterists could look with pride. It seems superfluous to say that all this came about because of Arnett, but it should be said and remembered. He conceived it, he made it, he nurtured it, and he developed it. Few people know how much he nurtured it, through thick and thin, with ideas, time, and materials. Even today he holds in his pocket a bill for several hundred dollars for the printing costs of volume 12. Now, after fifteen years as editor, he resigns so he may devote more time to his personal research. All Coleopterists owe Arnett a debt of gratitude for having made the Coleopterists' Bulletin. He has done a fine job.—T. J. Spilman

BEETLE TALK

The foreign grain beetle is *Ahasverus advena* (Waltl). Many people apparently refuse to believe that Waltl is actually an author's name. They put a period after the final "l" as if the name were an abbreviation, or they assume Waltl is a typographical error for Walk.(=Walker). There must be a practical plan that would establish Waltl as a legitimate name. Any suggestions? Please do not suggest an application to the International Commission on Zoological Nomenclature to change the spelling of the author's name.

DESCRIPTION OF THE LARVA AND PUPA OF *AMETOR SCABROSUS* (HORN) (COLEOPTERA: HYDROPHILIDAE)

By PAUL J. SPANGLER[1]

The immature stages of some of our North American genera of hydrophilid beetles have not been described. One of these genera is *Ametor* (Semenov, 1900, p. 614). The larva of *Hydrobius scabrosus,* now *Ametor scabrosus* (Horn), was mentioned briefly by Richmond (1920) but it was not formally described. Therefore, when several larvae and pupae in association with adults of *A. scabrosus* were found in the U. S. National Museum collection, this description, based on larval and pupal characters, was prepared to show the relationship of this genus to related genera.

DESCRIPTION OF THE LARVA

(FIGURE 3)

Total length, 6.0 mm.; width of thorax 0.85 mm. Color brownish with sclerotized portions darker brown. Integument covered with irregularly arranged asperities.

Head quadrangular (Fig. 6); 0.7 mm. wide; 0.6 mm. from labroclypeus to occipital foramen. Frontoclypeal suture feebly indicated. Ecdysial cleavage line present and forked near base; frontal arms diverging and extending to bases of antennae. Frons sagittate. Cervical sclerites present, irregularly rectangular in shape. Ventral surface of head (Fig. 8) with few setae laterally, glabrous medially; gula pentagonal, rounded posteriorly; two posterior tentorial pits behind gula.

Labroclypeus (Fig. 4) asymmetrical; with four teeth, left tooth separated from others; anterolateral projections of epistoma rounded, with setae on anterior margin, and subequal in length to labroclypeal teeth.

Ocular areas with six ocelli arranged in an ellipse. Ocelli rather evenly spaced except for a wider gap dorsally; anterior three slightly larger than posterior three.

Antenna short, subcylindrical, slightly longer than length of stipes. First segment constricted slightly in middle and about a third longer than penultimate segment. Ultimate segment small, about a third as long as penultimate segment and with a terminal seta.

Mandibles symmetrical, prominent, stout, sharply pointed apically. Each mandible with one minute and two well-defined inner teeth. Molar area smooth and rounded.

Maxilla with stipes stout, tapering distally, bearing a row of four stout setae on inner margin. Palpifer jointlike, with slender sclerotized appendage on inner side as long as first segment of palpus and with a terminal seta. Palpus tapering distally; first segment short and only two-thirds as wide

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as palpifer; penultimate segment tapering distally; ultimate segment tapering sharply, two-thirds as long as penultimate and with a basal seta.

Labium extending as far forward as palpifer. Penultimate segment of palpus short. Ultimate segment two and a half times longer than penultimate and with a terminal seta. Ligula distinct, twice as long as penultimate segment of palpus. Palpiger subquadrate; ventrally with two setae arising near base of ligula. Mentum slightly wider than submentum, narrowing posteriorly, anterolateral angles with few setae dorsally and ventrally.

Prothorax broader than long, with sides gently rounded, wider posteriorly. Anterolateral angle with three to six long setae; posterolateral angle with one to four long setae. Sagittal line present. Prosternal sclerite (Fig. 7) broader than long, with an incomplete sagittal line. Mesothorax wider than prothorax but only half as long; with two small, narrow, anterior sclerites and two large, irregularly triangular, posterior sclerites; lateral margins each provided with a prominent spiracular tubercle and a setiferous lobe; sagittal line present. Metathorax slightly wider than mesothorax; with two large anterior sclerites and two small, poorly defined, posterior sclerites; sagittal line present.

Legs four-segmented, about as long as width of prosternal sclerite. Coxae moderately widely separated, transverse. Trochanter about half as long as coxa. Femur slightly longer than tibiotarsus. Tarsal claw single, with two inner setae near base.

Abdomen with eight distinct segments; ninth and tenth segments reduced. Segment 1 with a pair of small sclerites anteriorly. Remaining segments without sclerites and separated by an inter-segmental membrane. True segmentation obscured by additional transverse folds on segments; segmental folds continued on to sternum. Each segment with four folds. Segment 1 lacks setose tubercles on first and second fold; third and fourth fold with four setose tubercles. Segments 2 through 6 with first fold without setose tubercles; second fold with two; third and fourth folds each with four setose tubercles. Segment 7 with four setose tubercles only on fourth fold. In addition to the tubercles discussed above, a large spiracular tubercle followed by a moderately large setose tubercle is present on each side of segments 1 through 7. Numerous, small, blunt setae are present on all tubercles. Epipleurites and hypopleurites prominently lobed. Eighth tergum represented by superior valve of stigmatic atrium, a large, slightly broader than long sclerite; feebly crenulate posteriorly and with a stout seta ventrally at posterolateral angles. Ninth tergum trilobed; middle lobe large, divergent posteriorly and with two setae on caudal margin; lateral lobes narrower and with a stout seta ventrally near caudal margin. Spiracles present. Mesocerci prominent, conical; each bearing two setae, one arising posteriorly, the other arising laterally. Paracerci present, flattened, apices incurved, apparently unsegmented and each with an apical seta.

One larva had the left tooth of the labroclypeus closer to the three other teeth so that the gap between them was not so distinct as shown in figure 4.

The larva of *Ametor scabrosus* runs to couplet 10 in Leech and Chandler's (1956, pp. 339-340) larval key but does not fit either alternative. The five genera, *Hydrobius, Helochares, Cymbiodyta, Sperchopsis,* and *Ametor,* that run to couplet 10 in Leech and Chandler's key may be separated by the following couplets:

1. Labroclypeus with four distinct teeth, outer left tooth usually more distant from others; each mandible with two distinct inner teeth and only a feeble third basal tooth ---------- AMETOR

   Labroclypeus with five or more teeth; each mandible with two or three distinct inner teeth ---------- 2

2. Labroclypeus with five teeth; each mandible with three distinct inner teeth ---------- 3

   Labroclypeus with six or more teeth; each mandible with two inner teeth ---------- 4

3. Third (middle) tooth of labroclypeus as large as adjacent teeth; prosternal sclerite divided by a sagittal line ---------- HYDROBIUS

   Third (middle) tooth of labroclypeus minute, less than half as long as adjacent teeth; prosternal sclerite not divided by a sagittal line ---------- SPERCHOPSIS

4. Labroclypeus with six distinct teeth in two groups, two on left and four on right; anterior sclerites of metathorax with caudal projections ---------- HELOCHARES

   Labroclypeus with more than six teeth, those toward right not clearly defined and with several smaller teeth; anterior sclerites of metathorax without caudal projections ---------- CYMBIODYTA

Description of Pupa

(Figures 1 and 2)

Total length, 6.0 mm.; width 2.5 mm. Color white; glabrous except for yellowish styli described below.

Head with a pair of supraorbital styli adjacent to each eye.

Pronotum with 20 styli as follows: three on each anterolateral angle, two on each side of midline on anterior margin, three on each posterolateral angle and two on each side of midline on posterior margin. Mesonotum with a pair of styli, one stylus on each side of scutellum. Metanotum with a pair of styli, one on each side of midline.

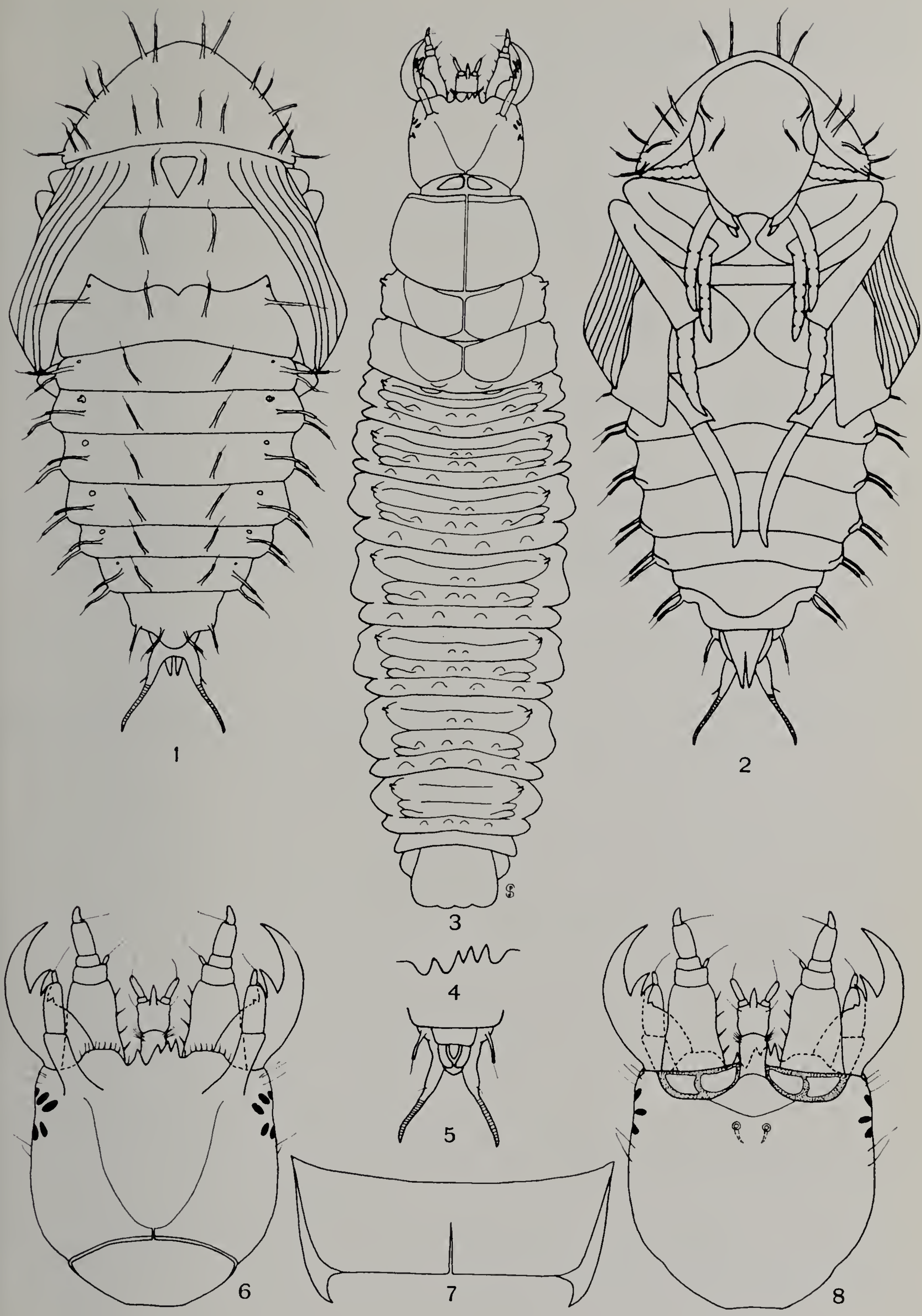
Abdomen with four styli on first segment, one on each side of midline and one posterior to each spiracle. Segments 2 through 7 each with six styli arranged as follows: one stylus immediately posterior to each spiracle, one stylus on each side of midline, and one pleural stylus on each side. Segment 8 has four styli along posterior margin. Segment 9 has two long cerci, as long as width of eighth segment. Each cercus has a single, small, lateral seta. Segments 1 through 7 each with a pair of spiracles, those on segments 1 and 7 are reduced and difficult to find.

Antennae and femora extend outward at right angles from body axis. Maxillary palpi are directed posteriorly. Tibiae are folded against femora. Tarsi are turned backward, parallel with body axis.

The pupa (Fig. 2) described above is a female as indicated by the two partially developed styli seen in ventral view. Male pupae viewed ventrally show the partially developed parameres and median lobe of the genitalia (Fig. 5).

One pupa had one additional stylus on the posterior margin of the pronotum making a total of 21.

The pupa of *Ametor scabrosus* runs to couplet 9 in Leech and Chandler's (1956, p. 341) key to certain hydrophilid pupae. Five genera, *Ametor,*



FIGURES 1-8, *Ametor scabrosus:* 1—pupa, female, dorsal view; 2—pupa, female, ventral view; 3—larva, dorsal view; 4—larva, labroclypeus; 5—pupa, caudal segments of male, ventral view; 6—larva, head, dorsal view; 7—larva, prosternum; 8—larva, head, ventral view.

Hydrobius, Sperchopsis, Bersosus and *Laccobius,* run to couplet 9 and these may be separated by the following couplets:

1.	Supraorbital styli lacking or vestigial; 20 or 24 pronotal styli in all	2
	Supraorbital styli well-developed; 20, 24 or 26 pronotal styli in all	3
2.	Pronotal styli 20 in number	HYDROBIUS
	Pronotal styli 24 in number	SPERCHOPSIS
3.	Pronotal styli 20 in number	AMETOR
	Pronotal styli 24 or 26 in number	4
4.	Pronotal styli 24 in number	LACCOBIUS
	Pronotal styli 26 in number	BEROSUS

Eight pupae and six larvae were examined in the course of this study. The specimens were collected in 1891 from streams in Yellowstone National Park, Wyoming, and in the Bear Paw Mountains, Montana. All the larvae appear to be last instars.

References

Leech, Hugh B., and Harry P. Chandler

1956. Aquatic Coleoptera, Chapter 13, *In* Aquatic insects of California with keys to North American genera and California species. (Edited by R. L. Usinger.) University of California Press, Berkeley, pp. 293-371.

Richmond, E. Avery

1920. Studies on the biology of the aquatic Hydrophilidae. Bull. Am. Mus. Nat. Hist., Vol. XLII, pp. 1-94.

Semenov, Andreas

1900. On a new genus of the family Hydrophilidae (Coleoptera) and a contribution to a study of parallel morphology. Hora Soc. Ent. Rossica, Vol. XXXIV, pp. 614-630.

ILLUSTRATIONS OF THE AEDEAGI OF THE LAMPYRIDAE (COLEOPTERA)

By Frank A. McDermott[1]

The three principal genera of the Photurinae, *Bicellonycha, Photuris,* and *Pyrogaster,* which have very similar facies, have been separated on the basis of the structure of the claws of the male; *Bicellonycha* has both claws bifid at the tips; *Photuris* has only one claw bifid, and *Pyrogaster* has simple claws (E. Olivier, 1911, pp. 103-107). Examination of the aedeagi also shows that this organ as well as the claws differ in the three genera.

Barber (1951, pp. 19-21) noted that the aedeagi of the North American species of *Photuris* are essentially identical; also that of *P. jamaicensis* E. Olivier is of the same pattern (McDermott and Buck, 1959, p. 6, fig. 63). The aedeagi of three tropical species, *P. annulicornis* Boheman, *P. mollis* Gorham, and an unidentified South American species, have been extracted. The dorsal and ventral aspects of these aedeagi are so similar to those of the North American species that it is not deemed necessary to illustrate them, but the generally similar lateral views are shown (figure 1).

In view of the almost identical structure of the aedeagi in obviously different species of *Photuris* it appears that the only isolating mechanism is the specific flashing pattern described by Barber. Information on the flashing of species in Central and South America is unfortunately lacking, and the usual simple flash of *P. jamaicensis* is sufficient in the absence of other congeneric species in that Island.

The aedeagi of five species of *Bicellonycha, B. mexicana* Gorham, *B. collaris* Gorham, *B. amoena* Gorham, *B. gibba* Pic, and *B. lineola* Blanchard have been extracted and the dorsal, lateral, and ventral views of each are shown (figures 2 to 6). The aedeagi of these species of *Bicellonycha* differ distinctly from those of *Photuris* not only in general form but also in the absence of the two long, thin lateral processes characteristic of the latter genus. Green (1959, p. 93) has noted that similar processes are present on the aedeagi of *Vesta* spp., but in the latter case they are attached to the lateral lobes at about midlength instead of extending to the base as in *Photuris*. While there are specific differences in this organ in *Bicellonycha,* the general form is similar.

Presbyolampis Buck (1947, pp. 76-77, pl. 3, fig. 25) has all claws bifid and would apparently be *Bicellonycha* on superficial appearance, but there are some differences from the latter in addition to the aedeagus and it seems to constitute a subgenus.

Two species of *Pyrogaster* were available for dissection, *P. squalidus* E. Olivier (figure 7), and *P. moestus* (Perty) (figure 8). These aedeagi are obviously different from those of *Photuris* and *Bicellonycha.*

[1] Wilmington, Delaware.

Macrolampis Motschulsky (I, 1853, p. 37) resembles an elongated *Photinus* and was not distinguished from the latter by Gorham (1880, p. 24; 1881, pp. 41, 261). The principal easily recognized character is the longer eighth visible ventral abdominal plate of *Macrolampis,* in addition to its narrow, elongate outline, but neither is entirely reliable. Most known females of *Macrolampis* are larviform, but this does not separate it from *Photinus,* and indeed Motschulsky (II, 1854, p. 37) included as *Macrolampis* the common *Photinus scintillans* Say of the eastern United States. *P. collustrans* LeConte, an elongate, narrow species with a brachelytral female, more likely should be included in *Macrolampis.*

The aedeagi of the North American species of *Photinus* have been illustrated by Green (1956), and those of the Jamaican species by McDermott and Buck (1959). Barber (1941, p. 4) gives a general description of the structure. I have removed the aedeagi of *Macrolampis olivieri* Pic and of *M. attenuata* Gorham (figures 9 and 10 respectively). The aedeagus of the former is quite definitely not of the photinoid pattern. The drawings do not show clearly the peculiar divergence of the lateral and median lobes as seen under the microscope, although it is partially indicated in the apical view (fig. 9D) which shows the sharp hooks on the lateral lobes. Several preparations from different specimens gave the same structure. The aedeagus is small, only 0.9 mm. long, in a body 15 mm. long. In this species the males completely lack luminous organs, while the females are larviform with very short, dark elytra, and the penultimate and antepenultimate ventral abdominal plates are luminous. However, in *M. longipennis* Motschulsky, the type of the genus, the males have the penultimate and antepenultimate ventral abdominal plates luminous as in *Photinus,* but the female is brachelytral. In *M. attenuata, M. extensa,* and *M. volcanica,* all described as *Photinus* by Gorham, the sixth and seventh visible ventral abdominal plates are luminous as in *Photinus.* The female of *attenuata* was not known to Gorham, but that of *extensa* is brachelytral and luminous from a spot on the sixth visible ventral abdominal plate, while in *volcanica* the female is alate and luminous from the sixth. This arrangement of the luminous organs suggests that these species are properly *Photinus,* and the aedeagus of *attenuata* (figure 10) is rather clearly of the photinoid type. This also proves to be true of the organ of *extensa,* which is quite similar; in *volcanica* the minute size of the aedeagus renders comparison difficult, but it appears to resemble that of *M. olivieri* Pic in the divergent lateral lobes and distinctly separated median lobe, which supports its assignment in *Macrolampis* in spite of the alate female.

Other species of *Macrolampis* were not available for dissection but it appears probable that they are definitely distinct from *Photinus* on the basis of aedeagal structure.

Barber (1941, p. 4) put a series of Jamaican lampyrids in a new genus, *Diphotus,* distinguished from *Photinus* by having functional luminous organs only on the eighth visible ventral abdominal plate. McDermott (1955, p. 49) extended this genus to include other Antillean species, including *Heterophotinus limbipennis* DuVal. This would give *Heterophotinus* E. Olivier (1894, p. 24) priority over Barber's *Diphotus;* however, pending further information, the use of *Diphotus* for the Jamaican species was continued by McDermott and Buck (1959). The aedeagus of *H. limbipennis* has been extracted, mounted, and is shown (figure 11). When withdrawn, but before treatment with caustic, the aedeagus is very similar to that of *Diphotus dahlgreni* Buck (1947), but subsequent treatment darkened and distorted it, producing a deflected median lobe which causes it to somewhat resemble the aedeagus of *Pyrogaster squalidus* Olivier, to which it is not closely related. However, the resemblance is sufficiently close to that of other *Diphotus* species to make it fairly certain that it compares with the shorter form of the organ in the latter genus and that the two genera are the same. In this case also, the presence of larviform females is not a generic character.

The lampyrids which are today listed under *Lucidota* Laporte are rather obviously a composite of species which are not very evidently congeneric. By separating as valid the genera *Ellychnia* and *Pyropyga* and by referring to *Leucothrix* E. Olivier (1911, p. 72) those species which have pale distal antennal segments, even though this character is of doubtful generic significance, the number of species in *Lucidota* is considerably reduced. The remainder are still heterogeneous.

Laporte (1833, p. 136) gives the following as some of the characters of the genus: "Antennae almost as long as the body, broad, very compressed, each with a fairly long branch . . . body elongate . . . mandibles somewhat prominent . . . pronotum slightly angulate in front . . . elytra elongate, almost parallel . . . abdomen usually with the last two segments luminous." Lacordaire (1857, pp. 318-319) says that the antennae are flabellate to feebly dentate, and the luminosity feeble. Leng and Mutchler (1922, p. 435) somewhat doubtfully regard strongly serrate antennate in the male as complying with the specifications for *Lucidota*. E. Olivier (1907) says the antennae in the male are dentate, sometimes with a rather long, elliptical, and compressed branch. LeConte (1881, p. 31) speaks of the broadly compressed, not serrate antennae, and the feeble development of the luminous organs, but says that the genonym should probably be rejected for the North American species. Gorham (1881, p. 34) says that there are two divisions of *Lucidota* differing in the structure of the apical ventral segments, and that the antennae of both are often long, pectinate or serrate.

The type species of *Lucidota, L. banoni,* from Cayenne, is described briefly by Laporte (1833, p. 137) as measuring 12.7 mm. long by 4.2 mm. wide, black; pronotum, scutellum, thorax beneath, femora, and end of abdomen yellow-orange. E. Olivier (1885, p. 336) however says that the thorax, scutellum, abdomen, and legs are black; the last ventral abdominal plate with a white spot on each side, and the antepenultimate with a medio-basal white spot. (This would not indicate pronounced luminosity.)

With these varying characterizations, it is perhaps not surprising that the species assigned to *Lucidota sensu latu* show a wide variation in facies and structure. Laporte originally included in *Lucidota* the species *flabellicornis* Fabricius, *appendiculata* Germar, *compressicornis* Fabricius, *banoni* Laporte, *limbata* Laporte, *modesta* Laporte *thoracica* Laporte, and *antennata* Laporte; of these, Olivier (1910) referred *limbata* and *modesta* to *Aethra,* leaving the others in *Lucidota* but changing *thoracica* to *pennata* Dejean, the former being preoccupied by *thoracica* G. A. Olivier.

The aedeagi have been extracted from several species listed in *Lucidota,* and as might be expected, they show a variety of forms. E. Olivier (1911, p. 71) segregated our common North American species *L. atra* G. A. Olivier and *L. punctata* LeConte in a proposed new genus, *Rileya.* The aedeagus of *L. atra* is shown (figure 12), and those of other species as follows: *L. diaphanura* Gorham (figure 13); *L. discolor* Gorham (figure 14); *L. thoracica* G. A. Olivier (figure 15). It will readily be seen that no two of these species have similar aedeagi, which tends to confirm the heterogeneous nature of the genus. The organ in *L. thoracica* G. A. Olivier indicates that this species belongs properly in *Vesta,* as mentioned to me by Mr. J. W. Green, and that of *L. discolor* Gorham suggests the unrelated *Lucernuta* by its short lateral processes. The aedeagus of *L. atra* G. A. Olivier is generally similar to that of *Pyractonema bifenestrata* Fairmaire and Germain (McDermott 1960), and the latter is to some degree similar to that of *Lucidina puerile* E. Olivier of Japan (figure 16). The aedeagus of *L. bicellonycha* McD. (1958) somewhat suggests a curved form of that of *L. atra.* For comparison, the aedeagus of *Ellychnia corrusca* Linnaeus is also shown (figure 17).

Luciola is at present the most numerous genus in the Lampyridae, with about 265 species. There are several derivative genera, *Colophotia, Pyrophanes, Pteroptyx,* and *Curtos,* with the same abdominal structure of six visible ventral abdominal plates but with rather elaborate modifications of the last segment. Among the simpler of such modifications is that of *Colophotia* in which the apical ventral abdominal plate bears two parallel longitudinal hooked carinae with a slot between them through which projects a triangular plate. In at least some species there are also two other hooks laterad of the carinae. Some species with hooked projections or other modifications are still listed as *Luciola.*

The aedeagi have been extracted from *Luciola chinensis* Linnaeus, from India, *L. melaspis* Bourgeois, from India, and *L. cruciata* Motschulsky from Japan (figures 18, 19, and 20 respectively). That of *L. cruciata* is somewhat suggestive of the photinoid type.

Luciola ovalis Hope is described as having two lateral plates on the last abdominal sternite. The ventral appearance of the last segments of this species is shown in figure 21, the luminous areas being the unshaded fifth segment and the subcircular plates on the sixth. In most species of *Luciola* the sixth visible ventral abdominal plate is either integral or at most with a longitudinal line. It would appear that a subdivision of *Luciola* based on these differences might be made.

The aedeagus of *Colophotia praeusta* Eschscholtz (figure 22) and that of *C. concolor* E. Olivier, both species from the Philippines, are similar but the latter is rather narrower. In this genus the appearance of the last ventral abdominal plate is perhaps of more interest than the aedeagus (figure 23) which in a lateral view shows the projecting aedeagus and the triangular plate projecting through the slot; the dorsal view shows the pygidium (shaded). The entire arrangement is quite complicated and probably accounts for Motschulsky's comment that the genitalia are external.

Literature Cited

Barber, H. S.
1941. Proc. Rochester Acad. Sci., 8: 4.
1951. Smithsonian Misc. Coll., 117 (No. 4051). 58 pp.

Buck, J. B.
1947. Proc. United States Nat. Mus., 97 (No. 3210): 76-77, pl. 3, fig. 25.

Gorham, H. S.
1880. Trans. Ent. Soc. Lond., p. 24 (*M. longipennis*).
1881. Biol. Cent.-Americana, Ins. Coleop., 3 (2): 41, 261.

Green, J. W.
1956. Proc. California Acad. Sci., 27: 561-613.
1959. Coleopt. Bull., 13: 80-96.

Lacordaire, J. T.
1857. Gen. Coleop., 4: 318-319.

Laporte, F. L. N.
1833. Ann. Soc. Ent. France, 2: 122-153.

LeConte, J. L.
1881. Trans. American Ent. Soc., 9: 31.

Leng, C. W., and A. J. Mutchler
1922. Bull. American Mus. Nat. Hist., 56: 435.

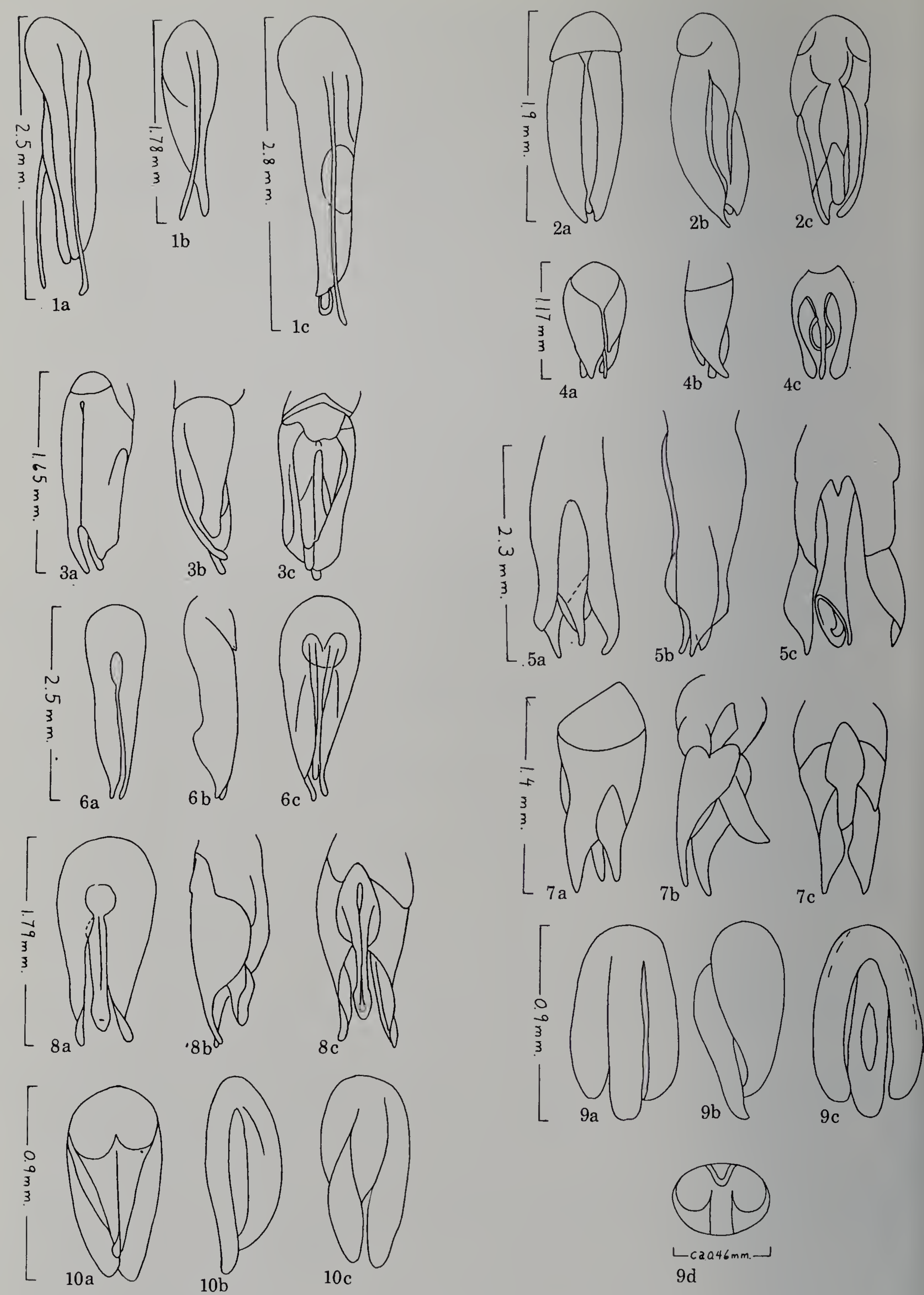
McDermott, F. A.
1955. Coleopt. Bull., 9: 49.
1958. Coleopt. Bull., 12: 26.
1960. Proc. United States Nat. Mus., 112 (No. 4322): 133-157.

McDermott, F. A., and J. B. Buck
1959. Trans. American Ent. Soc., 85: 1-112.

Motschulsky, V.
Etudes entomologiques, 1853, I: 25-58.
Etudes entomologiques, 1854, II: 1-14; 33-43.

Olivier, E.
1885. Ann. Mus. Genova, 22: 336.
1894. Ann. Soc. Ent. France (7), IV (LXIII): 24.
1907. Wytsman Gen. Insect., Fasc. 53, 74 pp.
1910. Coleopt. Cat., 9: 68 pp.
1911. Rev. Scient. Bourbonnais, 24: 24-27, 39-58, 63-85, 98-112.

Figures 1-23. Aedeagi and a few terminal abdominal segments of Lampyridae. Where not otherwise indicated, figures are of aedeagi. In all figures, "a" is dorsal view, "b" is lateral view, "c" is ventral view, and "d" is apical view, except figure 1 where the view is indicated. 1—a, *Photuris annulicornis* Boheman, lateral view; b, *Photuris mollis* Gorham, lateral view; c, *Photuris* sp., lateral view. 2—*Bicellonycha mexicana* Gorham. 3—*Bicellonycha collaris* Gorham. *Bicellonycha amoena* Gorham. 5—*Bicellonycha gibba* Pic. 6—*Bicellonycha lineola* Blanchard. 7—*Pyrogaster squalidus* E. Olivier. 8—*Pyrogaster moestus* (Perty). 9—*Macrolampis olivieri* Pic. 10—*Macrolampis attenuata* Gorham. 11—*Heterophotinus limbipennis* DuVal. 12—*Lucidota atra* G. A. Olivier. 13—*Lucidota diaphanura* Gorham. 14—*Lucidota discolor* Gorham. 15—"*Lucidota*" *thoracica* G. A. Olivier. 16—*Lucidina puerile* E. Olivier. 17—*Ellychnia corrusca* Linnaeus. 18—*Luciola chinensis* Linnaeus. 19—*Luciola melaspis* Bourgeois. 20—*Luciola cruciata* Motschulsky. 21—*Luciola ovalis* Hope, terminal ventral segments, luminous areas not shaded. 22—*Colophotia praeusta* Eschscholtz. 23—*Colophotia praeusta* Eschscholtz, terminal abdominal segments.



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4a
4b
4c
1.65 mm.
3a
3b
3c
2.3 mm.
5a
5b
5c
2.5 mm.
6a
6b
6c
1.4 mm.
7a
7b
7c
1.79 mm.
8a
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9c
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10a
10b
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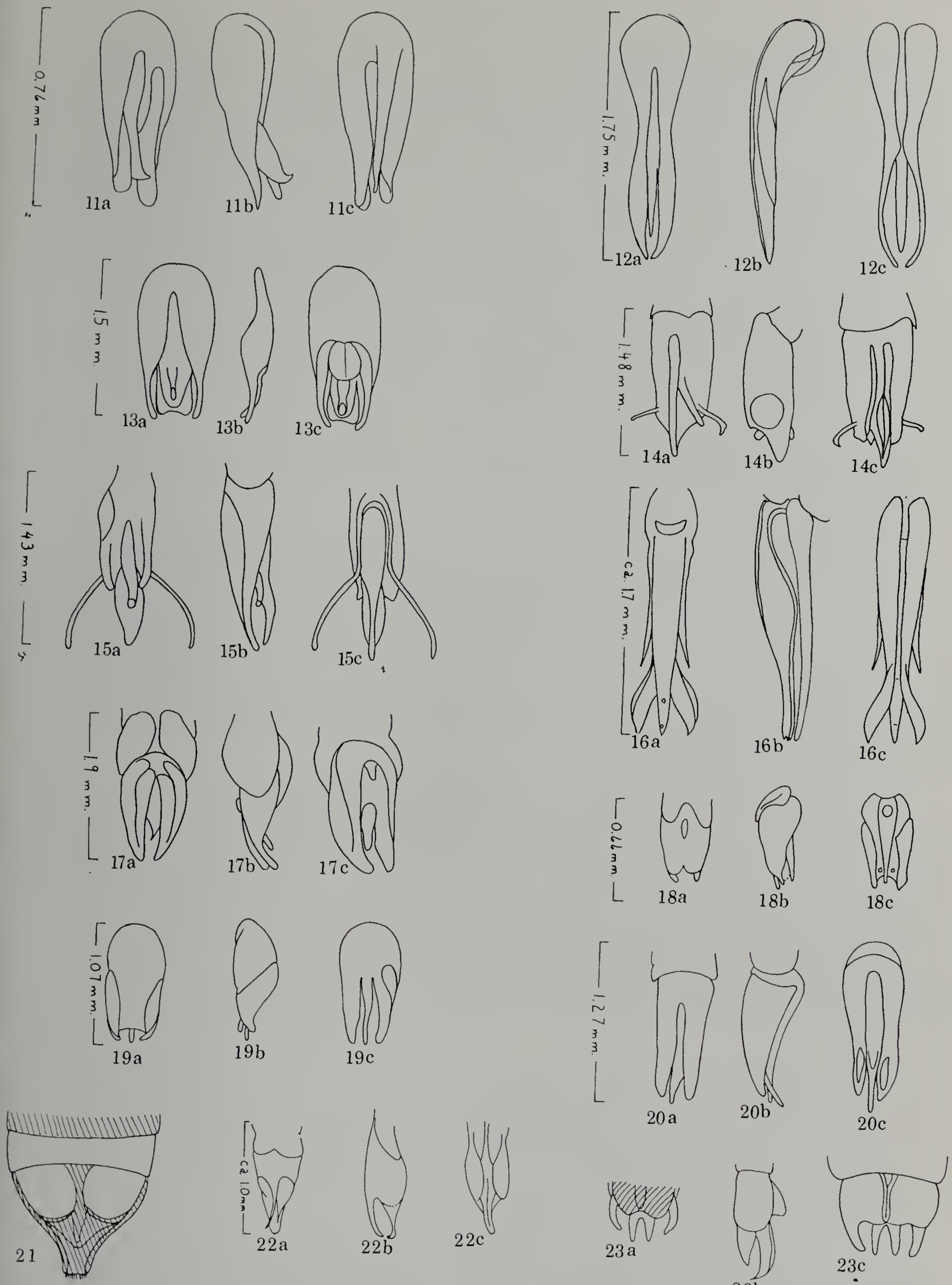
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15a
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15c
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16a
16b
16c
1.9 mm.
17a
17b
17c
0.66 mm
18a
18b
18c
1.07 mm.
19a
19b
19c
1.27 mm.
20a
20b
20c
21
ca. 1.0 mm
22a
22b
22c
23a
23b
23c

BOOK REVIEW

BEETLES, by Ewald Reitter. G. P. Putnam's Sons, New York, 205 pp., cloth, $20.00. This book shows once and for all that photographs of beetles can be as beautiful as those of butterflies and moths. The 60 magnificent full-color plates are in perfect focus and are a truly artistic achievement. Unfortunately, however, after the initial pleasure of seeing some of the more spectacular beetles in all their natural grandeur, most Coleopterists will feel increasingly disappointed as they examine the book further. In spite of the great appeal of this type of book to the potential student of beetles, certain aspects cannot pass without criticism.

Besides a rather poor job of editing the translation, the textual treatment, while entertaining, is rather shallow, even for the non-entomologist. The sections on anatomy, physiology, and metamorphosis are adequate, but the drawings of a generalized cicindelid beetle are poor. Sutures are indicated where none exist and are lacking in places where they naturally occur (such as those separating the mesosternum from the metasternum and the latter from the abdomen). Following a brief discussion of nomenclature and classification (in which the law of priority is not explained) is an interesting but sketchy section on zoogeography and ecology. Included are the cave, parasitic, symbiotic, and aquatic habitats. Size range is also treated, including an enlightening section entitled "A systematic review of large beetles." Sexual dimorphism and dichromism are treated briefly, followed by 11 pages of "beetle friends and foes."

The concluding pages deal with beetles in mythology, folk-lore, and the law. This is perhaps the most original and entertaining feature of the book aside from the photographs, where, in spite of their superb quality, a few simple additions might have increased their usefulness. For instance, the plates could have been numbered and perhaps referred to in the text. The beetles are not arranged according to family sequences in many cases. Although over 300 species are illustrated, only 29 beetle families are represented; of the 60 plates, 18 are devoted exclusively to scarabs and 17 to cerambycids. Compare this to Austin's *Birds of the World* in which over 700 species, including at least one species of each family and most sub-families, are illustrated.

In an appendix following the plates, a brief history of beetle study is given, including a list of specialists in each group. It is unfortunate that the latter has not been brought up to date. At least the list could have been accurate. Of the "more important workers in each group," R. H. Arnett is listed under Cucujidae, a family in which he has never worked, while Fall, Casey, etc., are not mentioned at all. A few European serial publications on insects are listed followed by a discussion of some of the more important beetle collections. Finally, details of making and maintaining a beetle collection are provided for the benefit of beginners.

Inaccuracies such as those mentioned above make the value and usefulness of the book as a whole subject to serious question.—E. R. Van Tassell, Catholic University, Washington, D. C.

NOTICE

All of the fascicles of *The Beetles of the United States* by R. H. Arnett, Jr., are now in the hands of the printer. Any corrections and addenda that need to be made should be called to the attention of the author as the parts are issued so that these may be added to the corrigenda to be published with the general index.

The author wishes again to acknowledge the tremendous help he has received from the Coleopterists of this country and abroad in preparing this manual. It is greatly appreciated.

It is anticipated that the entire book will be published before the end of 1962. Bound copies will be available at that time.

A NEW INVADER OF INSECT COLLECTIONS OF EASTERN CANADA, *TROGODERMA PARABILE* BEAL (COLEOPTERA: DERMESTIDAE)

By Adrien Robert, c.s.v.[1]

In the Spring of 1959, a heavy infestation of *Trogoderma parabile* Beal was accidentally discovered in a wasp's nest housed at Montreal University. The species, identified by the author, using Beal's key for *Trogoderma* of economic importance (Beal, 1956), was present in the larval stage only and fed on dead wasp remains (larvae, adults) in the nest. This constitutes a first record of *T. parabile* in Eastern Canada and its presence in a wasp's nest is a first record of this feeding site for the species.

T. parabile, originally described and reported by Beal (1954), as infesting stored grain in California, was first found in Canada by Liscombe in Alberta (Loschiavo, in Litt.) and later by Brooks (1958) in Saskatchewan. Loschiavo (1960) has studied the life history and behaviour of this insect.

The most probable introduction of the pest at the University occurred in the Spring of 1955. At that time, a sample of infested flour received for examination from a warehouse in Montreal contained larvae of *Trogoderma*. These were placed in a plastic vial stoppered with a fibrous cork, for rearing, and left unattended for a time. A subsequent examination of the vial revealed that the edge of the fibrous stopper had been gnawed out by larvae escaping for transformation. Within the vial no living specimens were to be found. Adults emerging from transformed escaped larvae eventually found their way to the wasp's nest and over a period of nearly four years developed into the heavy infestation discovered in 1959.

During the winter of 1960 a few *T. parabile* were again observed, this time feeding on pinned specimens of beetles in cardboard boxes, and indications were that the pest had come from the original colony from the wasp's nest. From February 15 to March 30, 1961, adults were seen, one or two at a time, on walls, furniture, and windows (attempting to escape) in the room housing insects in paper envelopes; an inspection of the containers in May and June of that year revealed extensive injury to stored specimens by *T. parabile*.

It was observed from a culture on hand that at room temperature *T. parabile* completes two generations a year. Individual specimens can complete the entire larval stage on insects contained in envelopes, leaving these just for transformation much like other dermestids, e.g., *Perimegatoma vespulae* Milliron (Robert, 1956). Larvae are so well concealed within the host body that a thorough inspection of dried specimens stored in envelopes does not always reveal the presence of *T. parabile*.

Attempts at extermination of the pest were made by placing in insect boxes large quantities of para-dichlorobenzene crystals, then sealing the containers with thick paper. The results although encouraging are incomplete. A few larvae escaped unnoticed at the time the crystals were being placed in the boxes and adults which subsequently emerged from these

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laid their eggs outside the containers. Also, a few boxes were inadvertently left untreated. As a result, as many as a dozen adults were recovered in November and December 1961. It appears that control of this dangerous museum pest can be obtained through prevention measures, but eradication measures like fumigation are preferable. The highly adaptable nature of *T. parabile* and the fact that at room temperature it can complete two generations a year make this pest a most important economic species of insect collections.

References

Beal, Jr., R. S.
1954. Biology and taxonomy of the nearctic species of *Trogoderma* (Coleoptera: Dermestidae). University of California Publications in Entomology, 10: 35-102.
1956. Synopsis of the economic species of *Trogoderma* occurring in the United States with description of a new species (Coleoptera: Dermestidae). Ann. Ent. Soc. America, 49: 559-566.

Brooks, A. R.
1958. Household and stored product pests. The Canadian Insect Pest Review, 36: 153.

Loschiavo, S. R.
1960. Life-history and behavior of *Trogoderma parabile* Beal (Coleoptera: Dermestidae). Canadian Ent., 92: 611-618.

Robert, Adrien
1956. Notes sur un Dermestidé adventice dans la faune du Québec, *Perimegatoma vespulae* Milliron (Coléoptères). Ann. Soc. Ent. Québec, 1: 61-63.

ADDITIONAL NOTES ON NEARCTIC ACANTHOCININI (COLEOPTERA: CERAMBYCIDAE)

By Lawrence S. Dillon[1]

After the paper dealing with the North American Acanthocinini[2] was in press, additional material was received from the U. S. National Museum, through the courtesy of Mr. George B. Vogt, and from Dr. H. F. Strohecker of the University of Miami. Thanks to the cooperation of these gentlemen, the status of two members of the tribe can be further clarified.

Leptostylus vogti Dillon

Upon examination of a series of *Leptostylus gibbulosus* Bates from Venezuela, the type locality, it became apparent that *L. vogti* Dillon is a subspecies of that species, a relationship not discernible from published descriptions. Furthermore, studies of specimens from intervening areas revealed a sharing of characteristics with the forms at the extremes of the range and these are therefore considered to be intergrades. The two races may be characterized briefly as follows:

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[1] Department of Biology, A. & M. College of Texas, College Station, Texas.
[2] L. S. Dillon. 1956. The Nearctic Components of the tribe Acanthocinini. Ann. Ent. Soc. Amer., 49: 134-167, 207-235, 332-355, 3 pl.

Leptostylus gibbulosus gibbulosus Bates

Leptostylus gibbulosus Bates, 1874, Trans. Ent. Soc Lond., p. 230, *nota.*

Body form robust; eye with lower lobe large, nearly as high as wide, distinctly taller than gena. Pubescence of upper surface cinereous, rarely whitish; on elytra at apex, and sometimes on sides of disk, tinged with fulvous. Elytral fulvous pubescent area dull, usually not very sharply delimited posteriorly with fuscous; surface toward side of disk ranging from orange-brown to dull olive-yellow. Abdominal surface orange to orange-brown, usually broadly glabrous medially; fifth sternite each side with a rather large, black macula, the two maculae not interconnected along base. Tarsi with surface of last segment blackish, imperceptibly becoming brown at base, strongly contrasting as a whole with the third segment; Colombian specimens, however, have the black of the last segment confined to the apical region.

Length 8-11 mm.; width 4.5-5.0 mm.

Five specimens were examined from Venezuela (El Valle, Valera, and San Felipe) and two from Colombia (Barranquilla), all in the U. S. National Museum.

In addition, two examples from Tampico, Mexico, Jan. 4, 1912 (E. A. Schwarz collector), one from Pacific Slope of the Cordillieras, Chiapas, Mexico, 800-1000 meters (I. Hotzen, collector), and one other from Nicaragua, May 10, 1943, in patacon seed, also in the U. S. National Museum, are considered to be closer in most respects to the nominotypic form, but show some resemblance especially in the characters of the eye and of the fifth sternite to *vogti.*

Leptostylus gibbulosus vogti Dillon [NEW COMBINATION]

Leptostylus vogti Dillon, 1956, Ann. Ent. Soc. Amer. 49:141.

Body form less robust; eye with lower lobe small, distinctly transverse, visibly shorter than gena in height. Pubescence of upper surface white, on elytra at sides broadly cinereous, not tinged with fulvous. Elytral discal fulvescent area clear, more or less tinged with rosaceous, sharply delimited at apical third by a fuscous, oblique streak; behind apical quarter a distinct, brown band that is only vaguely suggested in the nominotypic form; surface laterally broadly green or olive-green, especially near humerus and in a depressed area posterior to this structure. Abdominal surface fuscous, not glabrous at middle but with pubescence somewhat sparser medially than laterally; fifth sternite nearly entirely black except at apex, shining. Tarsi with surface of last segment agreeing with that of basal segments, except at extreme apex, where it is fuscous to piceous.

Length 6.5-9 mm.; width 3.2-4.3 mm.

Thirty-three specimens from S. W. Hidalgo Co., Texas, were examined in addition to the type series. All were reared by George B. Vogt and are contained in the U. S. National Museum collection.

Probatius umbraticus (Duval)

Probatius umbraticus Duval, 1857, *in* de la Sagra, Hist. Cuba, 7:272.
Hirsutographis pulchra Dillon, 1956, Ann. Ent. Soc. Amer. 49:207.

As this species is incorrectly listed in Leng's catalogue under the Onciderini, the prior reports of its presence in this country were inadvertently overlooked. The author is grateful to Dr. Strohecker for calling the above synonymy to his attention. *Hirsutographis* Dillon, 1956, thus sinks to a synonym of *Probatius* Thomson, 1860 (NEW SYNONYMY), and *pulchra* to that of *umbraticus* (NEW SYNONYMY), on the same basis.

BOOK REVIEW

THE CHRYSOMELIDAE (COLEOPTERA) OF CHINA AND KOREA, PART I. J. L. GRESSITT and S. KIMOTO. B. P. Bishop Museum, Honolulu. 1961, pp. 1-299, 77 figures.

This outstanding contribution to the taxonomy of leaf beetles will be extremely useful to entomologists everywhere. A key is given for the identification of 17 subfamilies of leaf beetles, as well as keys to 77 genera and hundreds of species within 12 of these subfamilies. (The remaining subfamilies, which will be treated in Part II, are Chrysomelinae, Galerucinae, Alticinae, Hispinae, and Cassidinae.)

The keys are detailed, well constructed, and easy to use. Members of every major genus are illustrated by accurate drawings that fulfill their function even better than would photographs. The authors estimate that 2,000 or more species of leaf beetles occur in China and 50,000 species in the world. In this first volume, 691 species from the Chinese mainland, Hainan Island, and Korea are treated, including 63 which are described as new species. A few species from neighboring Siberia, North Vietnam, Laos, and Taiwan are covered in the keys, and many of them are also described and discussed. For each species in the book there is a complete listing of synonyms and a summary of the known geographic and ecological distribution. A map of China, Korea, and surroundings is presented to facilitate better understanding of the distributional data.

Extensive generic relationships are noted between the faunae of South China and parts of India and Southeast Asia, but affinities with the Philippines seem rather weak. In Yunnan there are many elements that appear to be related to those of Burma and the mountainous areas of Vietnam, Laos, and Thailand. A more detailed discussion of the zoogeography will be presented in the summary at the end of part two of this Monograph.

It has always been difficult to identify the numerous Oriental leaf-beetles, and this book will be greatly appreciated by collectors and curators everywhere. The key to subfamilies is applicable internationally, and a surprising number of Nearctic and Holarctic genera are also included in the keys and plates. Without a doubt these monographs will be a very welcome addition to every entomological library in the world, and will result in a great increase in our future knowledge of the coleopterous fauna of China and Korea.

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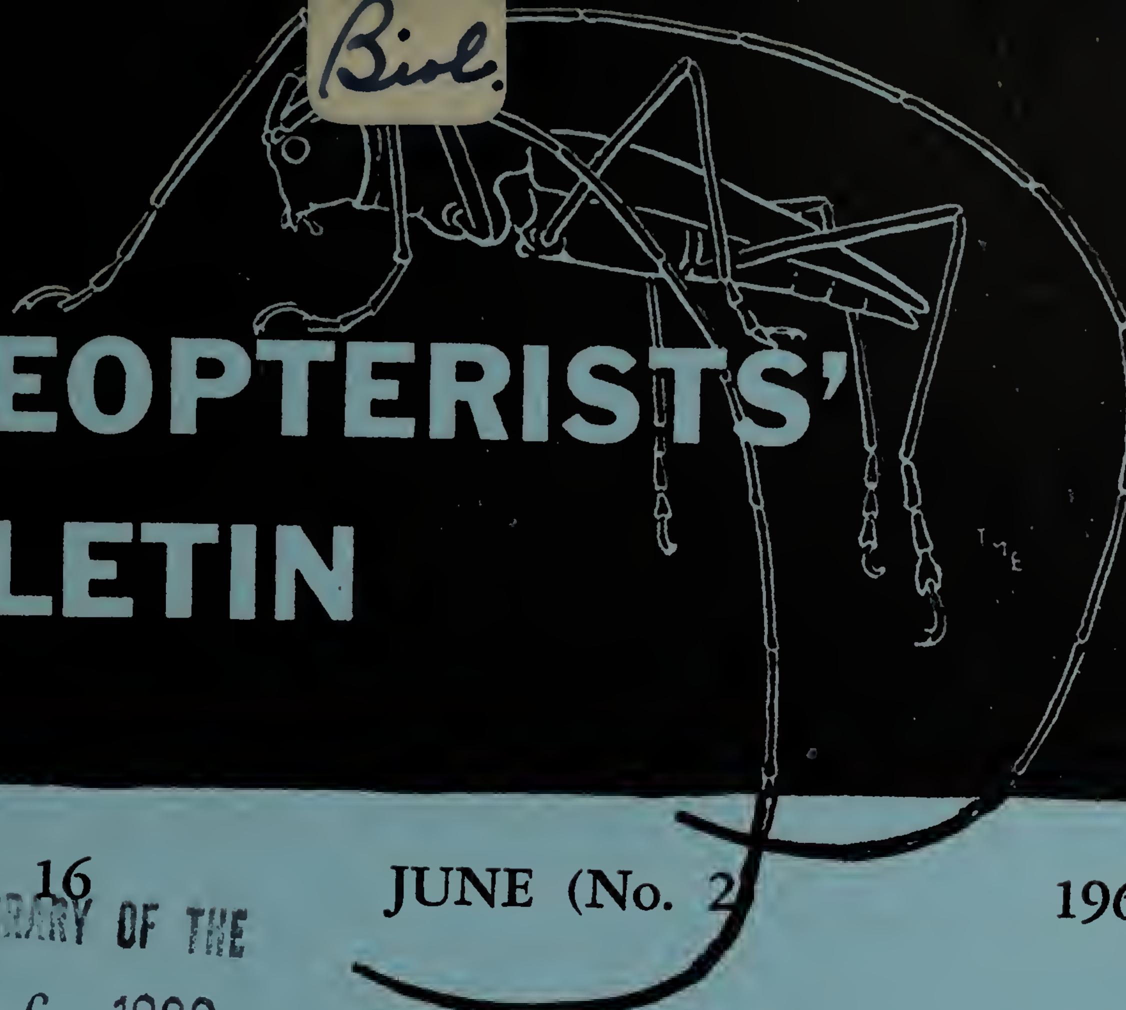

THE COLEOPTERISTS' BULLETIN

VOLUME 16 JUNE (No. 2) 1962

ARTICLES

NOTES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

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Any article, note, or news items likely to be of interest to readers of the Bulletin will be considered. Articles with illustrations are particularly desired, and *in all cases, descriptions of new species must be illustrated.* Descriptions of new species or genera MUST contain keys or be correlated with existing keys.

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 16 June (No. 2) 1962

A REVISION OF THE GENUS *SONOMA* CASEY (COLEOPTERA: PSELAPHIDAE)

By GORDON A. MARSH[1] *and* ROBERT O. SCHUSTER[2]

INTRODUCTION

The genus *Sonoma* is a particularly interesting group of North American pselaphids intimately associated with the Pacific Coast fauna. It was first recognized and described as a distinct genus by Thomas Casey (1886) to include two species previously placed in *Faronus* by John LeConte (1850, 1852). Casey (1887) proposed two new species from California and included *Euplectus parviceps* Mäklin (1852). Four additional species were described by Casey (1893) in the last complete revision up to the present time.

Consequently, in the last half century this predominantly Western North American genus has been decidedly neglected with the possible exceptions of such diagnostic compilations as Raffray (1908), Bowman (1934), and faunistic studies by Jeannel (1949), and Park (1953, 1961) in which the higher categories pertaining to *Sonoma* and its relations were reclassified and placed in a modern frame of reference.

The privilege of examining specimens of *Sonoma* belonging to the United States National Museum, the California Insect Survey of the University of California at Berkeley, the University of California at Davis, and the collection of Orlando Park is gratefully acknowledged, as well as the help of many individuals, who during the past seven years have placed numerous specimens at the authors' disposal. Special mention should be made of J. R. Helfer, E. E. Gilbert, V. D. Roth and D. J. Burdick, all of whom have contributed considerable time and effort in obtaining specimens from Berlese samples, and who have discovered species which otherwise would have remained unknown.

COLLECTION METHODS

Members of this genus have been collected primarily from the upper layers of soil and surface litter, particularly rotting logs, by using Berlese

[1] University of California, Berkeley.
[2] University of California, Davis.

funnels. Many of the species possess functional wings, and it is possible that some specimens may have been taken by light trap.

The most satisfactory method used by us has been the collection of litter in heavy paper bags which are tied closed and brought to the laboratory for processing. Sixteen-inch square funnels of the type described by Newell (1955) with window screen inserted above the hardware cloth at the bottom of the hopper with a 100 watt bulb above will process one-third cubic foot of material each in four to eight hours. If need be, this time can be reduced considerably by occasionally removing the top layer of the sample. Specimens are collected in, and temporarily stored in, 95% ethanol.

Preparation for Study

Whenever a sufficient series is available, both conventional point-mounts and slide-mounts were prepared. Many of the characters useful in the differentiation of species can only be appreciated by observation with a compound microscope, while others, such as the foveation, can be observed best on pointed specimens. Slide-mounted specimens are first cleared in warm lacto-phenol, dissected in a drop of Hoyer's, dehydrated, and mounted in balsam. It has been our experience that the Hoyer's has a tendency to crystallize in time, possibly because lacto-phenol is carried over in the specimen from the clearing process, or possibly a perversity of the medium inherent in thick preparations. However, Hoyer's remains the best medium for study preparations as it dries slowly, and small anatomical parts can be easily manipulated with dissecting tools. Minuten nadeln in pin chucks are adequate instruments for gross dissection.

Distribution

This genus is found in the coastal area of North America from Alaska to Southern California.[1] However, in the Pacific Northwest, the genus is not entirely restricted to the coast, and in California it may occur rarely in the Sierra.

Most of the species and the largest concentration of individuals seem to inhabit the moister situations within the coastal ranges and are found in isolated areas near permanent moisture south of the Transverse Range in California.

Morphology

The genus may be recognized by the following characters. The head has a frontal fovea that does not obviously extend between the antennal bases. There are two smaller vertexal foveae located approximately on a line with the rear margin of the eyes. The eyes are well developed and easily visible from above. In addition to the normal complement of small setae there are two long recurved pairs, one near the front margin of the eyes and one on the tempora. Two pairs of minute tubercles are usually visible, one pair near the frontal fovea, the other pair near the neck. The neck has a single

[1] One species, *S. tolulae* (LeConte), occurs in the Southeastern United States.

row of monaxial setae originating at the sides and extending to the ventral surface. The antennae have eleven segments with segment three the smallest. The distal segments are gradually enlarged forming a feeble, loose club. All of the segments except the third bear a few long recurved setae as well as the normal complement of smaller setae which are directed obliquely forward. The maxillary palpi have four segments, the third bearing one longer seta and the fourth a blunt palpal cone. The pronotum has two bastolateral foveae and a basal sulcus with one large fovea at the middle and two minute foveae at the lateral ends of the sulcus posterior to the median fovea. Two discal foveae may or may not be present. Faint sulci may extend from the discal foveae to the foveae at the lateral limits of the basal sulcus. The pronotal disc is never medially longitudinally sulcate. The basal lateral margin may be weakly crenulate. Three pairs of the longer recurved setae usually occur on the pronotum. The elytra are about as long as wide. Sutural striae are present and complete, but subhumeral fovea or sulci are lacking. There are two obscure antebasal foveae and a varying number of foveae occur on the sutural and on the two discal striae. Some recurved setae are usually present. The abdomen has five visible tergites in both sexes, the first four laterally margined. The first visible tergite usually has a thin, transverse spongiose strip. Recurved setae occur on all of the tergites except the first when the spongiose strip is present, and on all lateral margins except the fourth. The venter of the female has seven normal sternites although the sixth may be asymmetric. The venter of the male has eight apparent sternites; six normal, the seventh a penial plate or capsule, and the eighth a small part of another plate covering the left side of the penial plate. The mesocoxal cavities are separated by processes of the meso- and metasterna; the metacoxae are contiguous. The male metatibia may have a secondary sexual modification on its inner surface near the apex. The tarsi bear two equal claws. The aedeagi of the males are approximately as broad as long, asymmetric, with the parameres setate or tuberculate.

Taxonomy

Type-species. *Sonoma corticina* Casey (fixed by Bowman, 1934).

Sonoma repanda Marsh and Schuster, new species

(Figs. 1, 2)

Male. Head 0.246 mm. long x 0.328 mm. wide; pronotum 0.369 mm. x 0.410 mm.: elytra 0.385 mm. x 0.541 mm.; abdomen 0.672 mm. x 0.657 mm.; total length 1.68 mm.

Brown. Head wider than long; eyes of moderate size, of about 20 coarse facets, scarcely projecting from the head; frontal margin of eyes 2/5ths from front of head; median fovea extending beyond middle of eyes (past vertexal foveae in slide-mounts); vertexal foveae separated by distance between fovea and eye, located slightly behind posterior margin of eyes; tempora evenly rounded; mandibular rami with about 14 small teeth. Pronotum wider than long, widest at middle, rounded to apical angle, arcuate to base; median fovea located anterior to basal lateral foveae; antebasal sulcus extends posteriorly to 2 minute foveae near the basal lateral foveae; discal punctures absent; brachypterous. Elytra with 2 foveae on sutural stria, 1 on the inner stria, 2 on the outer. Metatrochanter with inner margin evenly rounded in outline. Metatibia lacking obvious structures; each tibia terminating in a small spine. Abdomen with 6 long recurved setae on the first visible tergite, 8 on the second and third, 6 on the fourth, and 1 on each margin except the fourth; the first visible tergite lacks a pilose strip; sternites 2 through 4 with a fovea at each anterior-lateral margin; apex of venter asymmetric. Aedeagus as illustrated (Fig. 2).

Female resembles the male except: eyes slightly smaller; sixth sternite symmetric; seventh simple, non-capsulate with 2 apical pairs of elongate setae.

The holotype male, four male and four female paratypes were collected at Stevens Creek Reservoir, seven miles N.W. of San Jose, Santa Clara County, California by D. J. Burdick on November 15, 1953. Specimens not included in the type series are females collected at Boulder Creek, Santa Cruz County, California, January 22, 1955, D. J. Burdick; and Big Basin, Santa Cruz County, December 23, 1953, V. D. Roth.

The holotype is deposited in the California Academy of Sciences, paratypes in the California Insect Survey and the collection of the authors.

In this species and the following three, the pronotum is devoid of discal foveae and the pubescent strips on the first visible tergite are lacking. These four species differ primarily on the basis of the males, the aedeagi of which, although distinct from each other, share several characters which tend to set them apart from other species in the genus. The setation of the paramere forms a dense brush around the apex. The left paramere has a characteristic elongated process which is absent from the right. Furthermore, the asymmetric median lobe is highly developed and is more strongly contorted than it is in the other species groups.

The females are presently recognized only by association with the males.

This species is restricted to the Santa Cruz Mountains of California south of San Francisco Bay.

Sonoma spadica Marsh and Schuster, new species

(FIG. 3)

Male. Head 0.246 mm. long x 0.328 mm. wide; pronotum 0.344 mm. x 0.385 mm.; elytra 0.385 mm. x 0.492 mm.; abdomen 0.648 mm. x 0.558 mm.; total length 1.68 mm.

Dark brown. Head wider than long; eyes moderately large, of 18 facets; median fovea deep, constricted posteriorly to form a "T"-shaped cavity, extending to middle of eyes (not extending beyond posterior margin of eyes in slide-mounts); vertexal foveae separated by the distance from fovea to eye, located behind posterior margin of eyes; tempora evenly rounded. Pronotum wider than long, widest at middle, nearly straight to apical angle, arcuate to basal angle; disc not foveate; brachypterous. Elytra with 3 foveae on sutural stria, 2 on inner discal, and 3 on outer stria. Abdomen with some long, recurved setae on all visible tergites and on all margins except the last. Metatrochanter with inner margin evenly rounded in outline. Metatibia not modified; apices of all tibia with at least 1 large spine. Aedeagus as illustrated (Fig. 3).

Female resembles the male except: eyes slightly smaller, sixth sternite simple, transverse margin not arcuate, the seventh sternite broadly pentagonal.

The holotype male, three male and three female paratypes were collected by J. R. Helfer as follows: one male, July 15, 1954, holotype male July 18, 1954, one female November 1, 1954, at Mendocino, Mendocino County, California, and two females August 18, 1957, one male August 27, 1954, at Comptche, Mendocino County, California. Three males and one female not included at Mt. Saint Helena, Napa County, California on

April 23, 1957 by S. F. Bailey. One additional female was collected at the same locality February 3, 1959 by R. O. Schuster.

This species is closely allied to *S. repanda*, the males differing primarily in the configuration of the aedeagus. However, *S. spadica* has a tendency to become bicolored with the elytra red-brown and the rest of the body a dark brown. Also, the frontal fovea is constricted forming a "T"-shaped depression, and the elytra are obviously longer than the pronotum but equal to the pronotal width.

The type locality of this species is Mendocino, California which is on the immediate coast of Northern California. Although large numbers of other species of *Sonoma* have been collected by J. R. Helfer in his systematic sampling of this area, *S. spadica* is never represented by large series, suggesting a very specific habitat preference for this species. A disjunct but apparently conspecific population occurs inland and further to the south on the slopes of Mt. Saint Helena in Napa County. This population varies in having the frontal sulcus widened posteriorly, and the male aedeagi having a slightly longer lateral process on the median lobe.

Sonoma dolabra Marsh and Schuster, new species

(Fig. 4)

Male. Head 0.250 mm. long x 0.350 mm. wide; pronotum 0.370 mm. x 0.440 mm.; elytra 0.480 mm. x 0.610 mm.; abdomen 0.950 mm. x 0.635 mm.; total length 1.80 mm.

Brown. Head wider than long; eyes large but not prominent, of more than 20 facets, beginning at 4/10ths and ending at 7/10ths head length; median fovea extending almost to posterior margin of eyes (on slide-mounts to posterior margin of vertexal foveae); vertexal foveae separated by the distance from fovea to eye, located behind posterior margin of eyes; tempora rounded; setae directed toward center except behind eyes where they point towards the rear; mandibular rami with numerous small teeth. Pronotum wider than long, widest at middle, nearly straight to apical angle, arcuate to basal angle; disc not foveate; brachypterous. Elytra with 2 foveae on sutural stria, 3 on inner discal, 4 on outer. Abdomen with some long, recurved setae on all visible tergites and on all margins except the last. Metatrochanter with inner margin evenly rounded in outline. Metatibia not modified; apices of all tibiae with at least 1 large spine. Aedeagus as illustrated (Fig. 4).

Female unknown.

The holotype male was collected eighteen miles south of Klamath, Del Norte County, California by E. E. Gilbert and R. O. Schuster on September 19, 1953, and is deposited in the California Academy of Sciences.

This species is characterized primarily by the male genitalia. The right lateral lamina of the median lobe is strongly developed while the apical median process is greatly reduced as compared with *S. spadica*. The apical process of the left paramere is thickened into a partially lobed and club-shaped head. *Sonoma dolabra* externally shares the characters of the preceding species with but minor variations, such as the elytra being obviously longer than the pronotal width.

The paucity of material in view of extensive sampling to the south of Humboldt County, California suggests that the range of this species, unlike that of its allies which are found from Mendocino County south to Monterey County, extends north into Oregon.

Sonoma vanna Marsh and Schuster, new species

(FIG. 5)

Male. Head 0.238 mm. long x 0.312 mm. wide; pronotum 0.336 mm. x 0.377 mm.; elytra 0.377 mm. x 0.533 mm.; abdomen 0.698 mm. x 0.630 mm.; total length 1.68 mm.

Brown. Head wider than long; eyes large, not projecting beyond outline of head, of 18-20 facets; median fovea extending to middle of eyes (on slide-mounts beyond the posterior margin of vertexal foveae); vertexal foveae separated by the distance from fovea to eye, located behind posterior margin of eyes; tempora rounded. Pronotum wider than long, widest at middle, nearly straight to apical angle, arcuate to basal angle; disc not foveate; brachypterous. Elytra with 2 foveae on sutural stria, 1 or 2 on inner discal, and 3 or 4 on outer stria. Abdomen with some long, recurved setae on all visible tergites and on all margins except the last. Metatrochanter with inner margin evenly rounded in outline. Metatibia not modified; apices of all tibiae with at least 1 large spine. Aedeagus as illustrated (Fig. 5).

Female resembles the male except: eyes smaller, sixth sternite is simple, without a strong marginal arcuation, and the seventh sternite not capsulate.

The holotype male and two female paratypes were collected seven miles south of Big Sur, Monterey County, California by V. D. Roth on December 22, 1953. One male paratype was collected near Pt. Sur, Monterey County, California on May 31, 1954 by M. Wasbauer.

The holotype is deposited in the California Academy of Sciences, paratypes in the California Insect Survey, and in the collection of the authors.

Sonoma vanna is related to those three species previously described which comprise the group which are brachypterous and lack median pronotal foveae, secondary sexual modifications of the male metatibia, and a transverse strip of short matted setae on the first visible tergite. However, the males markedly differ in the configuration of the aedeagus. In this species the median lobe has developed into a thin fan-shaped structure with no obvious secondary processes. The apical median process is atrophied and bent to conform to the fan-shaped outline.

Thus far, this species has been collected only along the immediate coast to the south of Monterey Bay, California.

Sonoma isabellae (LeConte)

(FIGS. 6, 7)

Faronus isabellae LeConte, 1852, Ann. Lyceum Nat. Hist. New York, 5:215.

Sonoma isabellae Casey, 1887, Bull. California Acad. Sci., 2:195-196, 481-482; 89, Ann. New York Acad. Sci., 7:436.

Light brown. Head wider than long; eyes large, of about 40 facets, scarcely interrupting lateral outline, margin beginning at 2/5ths and ending at 4/5ths of head length; median fovea extending to the middle of eyes (on slide-mounts to the posterior margin of eyes); vertexal foveae on line with posterior margin of eyes; tempora rounded; setae directed to the rear, longer toward back of head; a single row of monaxial setae extend from side of neck to nearly the median line of the ventral surface of head; mandibular rami with about 12 small teeth. Pronotum wider than long, widest just before middle, feebly arcuate to apical and basal angles; median fovea just anterior to the basal-lateral foveae; antebasal sulcus extends posteriorly to 2 minute foveae, one near each baso-lateral fovea; discal foveae reduced or lacking; winged. Elytra with 2 foveae on sutural striae, 3 foveae on inner discal stria and 2 on outer. Abdomen with long recurved setae on each visible tergite except the first, and one on each margin except the fourth; the narrow spongiose band of the first visible tergite barely interrupted medially; apex of the venter asymmetric; metatrochanter with inner margin subtruncate apically; metatibia without secondary tooth on inner margin; apex of each tibia with a small inner distal spine. Aedeagus as illustrated (Fig. 7).

Female resembles the male except: sixth sternite asymmetrically biarcuate, forming a blunt median cusp with the left arcuation deeper and more pronounced than the right.

Recorded distribution. LeConte (1852), "Sta. Isabel" (Santa Ysabel, San Diego County, California, type locality); Casey (1887), Alameda County, California; Bowman (1934), California.

New distribution. CALIFORNIA. Los Angeles County: Pasadena, 5 males, 3 females, A. Fenyes. San Diego County: Poway, 3 males, June 14, 1890, F. E. Blaisdell; Palm and Sheep Canyons, Borrego State Park, 23 males, 35 females, April 25, 1955, R. O. Schuster.

Sonoma isabellae resembles the preceding species by the absence of discal foveae on the pronotum and by the spinose projections on the inner distal surface of the male metatibia. It differs from these species in the reduced head size as compared with the pronotum and in the eyes which are about twice as large.

The elytra are nearly two times the pronotal length, the wings are fully developed, the sixth sternite of the female is asymmetrical, and a transverse pubescent strip occurs on the first visible tergite of both sexes.

This is the only species known to occur south of the Transverse Range in California where it occupies a variety of habitats from coastal plains and inner montane valleys to isolated canyons on the periphery of the Colorado Desert.

LeConte's original description, and the subsequent discussions and redescriptions of this species were based on coastal populations which are piceous with reddish elytra and appendages. However, populations from the desert slopes are pale, testaceous, and greatly resemble *S. corticina* and *S. cavifrons.* This bicolored condition led Casey to mention *S. isabellae's* occurrence in the San Francisco Bay area, but the material he examined proved to be *S. spadica.*

Sonoma parviceps (Mäklin)

(FIG. 8)

Euplectus parviceps Mäklin, 1852, Bull. Soc. Nat. Moscou, 25:372.

Sonoma parviceps Casey, 1887, Bull. California Acad. Sci., 2:195-196.

Faronus parviceps Brendel, 1890, Bull. Univ. Iowa, p. 79.

Sagola parviceps Raffray, 1893, Rev. Ent., p. 30.

Sonoma parviceps Casey, 1893, Ann. New York Acad. Sci., 7:440-441.

Since the description of this species in 1852, a variety of citations as to its actual identity have been made without benefit of comparisons with the European type. In 1893, Casey examined in the LeConte collection a male which is considered to be one of the original Frankenhauser types, and published a redescription. There are several specimens in the Casey collection labeled *S. parviceps,* presumably compared with the type in the LeConte collection. However, this material, collected by the Reverend Keene at Massett, Queen Charlotte Islands, British Columbia, Canada, represents two distinct species. In order to utilize this species in the pselaphid section of the *Beetles of the Pacific Northwest* edited by Melville Hatch, Dr. Park fixed the identity of *S. parviceps* by designation. The illustration of the male genitalia is included in this paper (Fig. 8).

When describing *S. cavifrons,* Casey indicated a close relationship with *S. parviceps* and this statement is further substantiated by a comparison of the aedeagi of these two species. The fundamental structure, unlike other allied species, is nearly identical, with specific character changes restricted to the distal one-third of the median lobe and to the number and configuration of the accessory processes on the parameres. *Sonoma parviceps* occurs from Alaska south into Washington and east into Idaho, while *Sonoma cavifrons* occurs from west central Oregon through north coastal California and south to beyond San Francisco Bay.

Sonoma cavifrons Casey

(Fig. 9)

Sonoma cavifrons Casey, 1887, Bull. California Acad. Sci., 2:481.

Sonoma longicollis Casey, 1893, Ann. New York Acad. Sci., 2:438-439. [NEW SYNONYMY]

Sonoma subsimilis Casey, 1893, Ann. New York Acad. Sci., 2:439. [NEW SYNONYMY]

Male. Head 0.242 mm. long x 0.32 mm. wide; pronotum 0.323 mm. x 0.382 mm.; elytra 0.588 mm. x 0.590 mm.; abdomen 0.412 mm. x 0.573 mm.; total length 1.68 mm.

Red-brown. Vestiture mostly short but some longer marginal setae. Head wider than long; eyes large, fairly prominent, of about 35 facets, their front margin at 3/10ths and ending at 7/10ths head length; median fovea extends to 1/3rd length of eyes (on slide-mounts to 2/3rds); vertexal foveae separated by distance from fovea to eye, located on line with posterior margin of eyes; tempora gently rounded; a row of monaxial setae on neck; mandibular rami with numerous minute teeth. Pronotum wider than long; widest at middle, arcuate to both apical and basal angles; disc foveate; winged. Elytra with 3 or 4 foveae on sutural stria and each of the discal striae. Abdomen with long recurved setae on each visible tergite except the first and on each margin except the last. Metatrochanter with inner margin evenly rounded from base to apex; metatibia not modified; each tibia ending in a small inner spine. Aedeagus as illustrated (Fig. 9).

Female as in the male except: eyes reduced in size, sixth sternite with a left lateral comma-shaped notch in the margin.

Type locality. S. cavifrons Casey—Mendocino County, California in lit.; the neotype (USNM 38580)—Santa Clara County, California. *S. subsimilis* Casey—Sonoma County, California. *S. longicollis* Casey—Santa Cruz Mts., Santa Cruz County, California.

New distribution. OREGON. Linn County: Berlin, 1 female, March 23, 1954, V. D. Roth. Coos County: near Bridge, Oregon, 1 female, July 27, 1955, V. D. Roth. CALIFORNIA. Del Notre County: 18 miles south of Klamath, 1 female, August 13, 1953, G. A. Marsh, R. O. Schuster; 2 males, September 19, 1953, E. E. Gilbert, R. O. Schuster. Humboldt County: 19 miles east of Green Point Ranch, 2 females, July 11, 1954, R. O. Schuster, E. E. Gilbert; Carlotta, 2 males, 1 female, October 1, 1959, V. D. Roth; 1 mile south of Dyerville, 1 female, September 19, 1953, E. E. Gilbert, R. O. Schuster. Mendocino County: Mendocino, 1 female, September 13, 1957, J. R. Helfer; Little River, 3 females, June 7, 1955, J. R. Helfer. Marin County: Samuel P. Taylor State Park, 1 male, February 3, 1958, J. R. Helfer; Drakes Bay, Point Reyes, 1 male, May 16, 1952, H. B. Leech; Muir Woods, 1 female, August 30, 1908, E. C. Van Dyke; Mount Tamalpais, 5 males, 4 females, October 5, 1958, F. C. Raney. Contra Costa County: Redwood Park, 1 female, June 28, 1953, E. E. Gilbert. San Mateo County, near Portola, 1 male, February 23, 1959, P. Arnaud.

Sonoma cavifrons is characterized by a well developed and elongate median fovea on the head, a foveate pronotal disc, and unmodified male metatibia. It is closely allied to *S. parviceps* from which it is separated geographically.

This species is also similar to *S. isabellae* and *S. corticina* but differs from the former by virtue of the foveate pronotal disc and from the latter by the deep median tentorial pits surrounded by numerous setae in the nuchal sulcus at the posterior ventral surface of the head.

The unique male types of *S. longicollis* and *S. subsimilis* are both identical with *S. cavifrons*.

Sonoma corticina Casey

(Fig. 10)

Sonoma corticina Casey, 1887, Bull. California Acad. Sci., 2:480 (female only).

Male. Head 0.213 mm. long x 0.287 mm. wide; pronotum 0.295 mm. x 0.328 mm.; elytra 0.492 mm. x 0.492 mm.; abdomen 0.517 mm. x 0.492 mm.; total length 1.55 mm.

Light brown. Head wider than long; eyes large, prominent, of about 40 facets, at about middle 1/3rd of head; median fovea small, not quite reaching front margin of eyes; vertexal foveae separated by distance from fovea to eye, located on line with posterior margin of eyes, tempora abruptly converging at nearly right angles to neck; two large partially coalesced densely setate cervico-gular pits present; mandibular rami with numerous denticulations. Pronotum wider than long, widest at middle, rounded to apical angle, arcuate to base, disc minutely foveate; winged. Elytral foveation obscure. Abdomen with spongiose band on first visible tergite. Metatrochanter with inner margin produced; metatibia weakly modified. Aedeagus as illustrated (Fig. 10).

Female as in the male except: eyes reduced, ventral concavity of the neck smaller, metatibial flange absent, sixth sternite with a median half circle projecting into what appears to be a spongy area of the seventh sternite.

Type locality. Soda Springs, Anderson Valley, Mendocino County, California (USNM 38575).

New distribution. OREGON: Coos County, near Bridge Camp, 1 female, July 28, 1954, V. D. Roth. CALIFORNIA: Mendocino County, Little River, 5 males, 3 females, August 18, 1957, 1 male, August 4, 1957, J. R.

Helfer. Marin County, 2 miles south of Olema, 1 male, November 1, 1953, R. O. Schuster; Mt. Tamalpais, 1 male, 2 females, October 5, 1958, F. C. Raney; Lagunitas, 1 female, March 9, 1913, F. E. Blaisdell; Samuel P. Taylor State Park, 2 males, 2 females, February 3, 1958, J. R. Helfer, South Park Entrance, 1 male, November 1, 1953, E. E. Gilbert, R. O. Schuster, V. D. Roth.

S. corticina is related to that group of species which is relatively small, lack or have ill defined discal foveae on the pronotum, have a fine pubescent line on the first visible abdominal tergite, and have an atrophied or no spine on the inner distal margin of the metatibia. It is further characterized by having an abruptly rounded-angulate tempora and two deep approximate tentorial pits at the ventral base of the head which are surrounded by numerous setae.

The male genitalia are considered as the most divergent type when compared with the fundamental pattern. The setation on the parameres is greatly reduced and the two conical projections of the right lobe are heavily tuberculate as in *S. margemina* from the Pacific Northwest.

The type described by Casey was a female which accounts for certain discrepancies between his description and the above which is taken from the male.

Sonoma margemina Park and Wagner

(Fig. 11)

Sonoma margemina Park and Wagner, 1961, Univ. Washington Publ. Biol. 16:6.

Male. Head 0.320 mm. long x 0.338 mm. wide; pronotum 0.412 mm. x 0.445 mm.; elytra 0.742 mm. x 0.684 mm.; abdomen 0.760 mm. x 0.742 mm.; total length 2.23 mm.

Brown. Head wider than long; eyes large, prominent, of 35 to 40 facets, at about middle 1/3rd of head; median sulcus well developed, deep, obtriangular; vertexal foveae separated by distance from fovea to eye, located on a line with posterior margin of eyes; tempora rounded angulate to neck; cervico-gular pit obsolete; mandibular rami with small teeth. Pronotum wider than long, widest at middle, rounded to apical angle, arcuate to base; disc with 2 small median foveae; winged. Elytra nearly 2 times longer than pronotum. Abdomen with transverse, spongiose pubescent band on first visible tergite, medianly interrupted. Metatrochanter with inner margin produced medianly; metatibia weakly modified with spine. Aedeagus as illustrated (Fig. 11).

Type locality. Peavine Ridge near McMinnville, Yamhill County, Oregon.

Female unknown.

New distribution. CANADA. Massett, Queen Charlotte Island, British Columbia, 2 males, Reverend Keene. WASHINGTON. Kittitas County: Easton, 1 male, A. Koebele.

There is an interesting relationship between this species and *S. corticina* in that only these two species have tuberculate processes arising from the parameres of the male genitalia. Further similarities are evident in the rounded-angulate condition of the tempora and the presence of a weak metatibial spine on males. The metatibial spine is, however, closer to the tibial apex than in *S. corticina.* It can be separated from this species by its much larger size, absence of foveae or excess setation on the ventral surface of the head, a more elongate median cephalic sulcus, and the absence of setae and abundance of tuberculate spines on the parameres of the male genitalia. With more intensive collecting in the Pacific Northwestern states and British Columbia, this species should prove to be very widespread within and west of the Cascades. It already occurs in three widely separated areas in this region.

Sonoma triloba Marsh and Schuster, new species

(FIG. 12)

Male. Head 0.240 mm. long x 0.320 mm. wide; pronotum 0.330 mm. x 0.380 mm.; elytra 0.492 mm. x 0.573 mm.; abdomen 0.631 mm. x 0.574 mm.; total length 1.75 mm.

Brown. Vestiture mostly short but some longer, marginal setae. Head wider than long; eyes moderately large, the margins beginning before 2/5ths and ending slightly past 3/5ths head length; median fovea extending past front margin of eyes (on slide-mounts to nearly middle of eyes); vertexal foveae large, separated by distinctly less than the distance from fovea to eye; tempora rounded; a single row of monaxial setae extend from side of neck to nearly the middle of the ventral surface of head; mandibular rami with about 15 minute denticulations. Prothorax wider than long, widest through middle; arcuate to apical and basal angles; disc foveate; winged. Elytra with 4 or 5 foveae on discal stria; 3 on inner discal stria and 2 or 3 on the outer. Abdomen with long recurved setae on each visible tergite except the first, and on each margin except the last; the narrow spongiose band on the first visible tergite is interrupted at center; sternites 2 through 5 with a fovea at each anterior-lateral margin; apex of venter of usual asymmetric nature; metatrochanter with inner margin evenly rounded from base to apex; metatibia not modified; spine of inner distal apex reduced or absent. Aedeagus as illustrated (Fig. 12).

Female unknown.

The holotype male was collected at Fort Bragg, Mendocino County, California on December 24, 1954 by J. R. Helfer. It is deposited in the California Academy of Sciences. A male and female paratype were collected at Caspar, Mendocino County, California on March 7, 1954 by J. R. Helfer, and they are retained by the authors.

This species is allied to *S. cuneata* by virtue of its comparable external morphology and the configuration of the male genitalia. Each species shares the reduced setation and general accessory armatured condition of the parameres. However, the median lobe of *S. triloba* is fully three times longer than broad whereas it is just slightly longer than broad in *S. cuneata.*

This species is presently known to occur only in two approximate areas on the central Mendocino County coast despite intensive sampling of the north coast ranges from the Oregon border south to San Francisco Bay.

Sonoma cuneata Marsh and Schuster, new species

(FIGS. 13, 23)

Male. Head 0.246 mm. long x 0.361 mm. wide; pronotum 0.410 mm. x 0.470 mm.; elytra 0.608 mm. x 0.622 mm.; abdomen 0.657 mm. x 0.657 mm.; total length 2.00 mm.

Brown. Head wider than long; eyes moderate in size and prominence, margin beginning at 3/10ths and ending at 6/10ths head length; median fovea small, extending slightly past the front margin of eyes (on slide-mounts to anterior 1/3rd); vertexal foveae small, separated by a distance slightly greater than that from fovea to eye; tempora rounded angulate; a single row of monaxial setae extend from the side of the neck to nearly the median line of ventral surface of head; mandibular rami with about 15 minute teeth. Prothorax wider than long, widest just before the middle; arcuate to apical and basal angles; front and rear margins sinuate; discal foveae minute. Elytral foveae variable; winged. Abdomen with long recurved setae on each visible tergite except the first and 1 on each margin except the fourth. The first visible tergite with a spongiose strip interrupted at middle; apex of venter of usual asymmetric nature; metatrochanter small, inner margin evenly rounded; metatibia with modification at distal 1/3rd (Fig. 23); apexes of tibia with small inner spine. Aedeagus as illustrated (Fig. 13).

Female unknown.

The holotype male and two male paratypes were collected two miles north of Fort Dick, Del Norte County, California on November 21, 1953 by V. D. Roth. One male paratype was collected at Freshwater, Humboldt County, California, August 18, 1953 by G. A. Marsh and R. O. Schuster.

The holotype is deposited in the California Academy of Sciences, the paratypes in the California Insect Survey collection and in the collection of the authors.

The males of this species are distinct only on the basis of the aedeagi. The configuration of the median lobe, while unique, indicates a morphological similarity to both *S. triloba* and *S. humilis.* External characters alone are not sufficient to separate *S. cuneata.* Their distributions are not known to overlap.

Females, although collected with the type series, have not been positively associated with the males because additional specimens of both sexes representing two other species occurred in the same samples.

Sonoma grandiceps Casey

(Fig. 14)

Sonoma grandiceps Casey, 1893, Ann. New York Acad. Sci., 7:437-438.

At present, this species is known only from the type series which was collected in Santa Cruz County, California. On the basis of Casey's original description this species falls within that group of species having large eyes, a bifoveate pronotal disc and a transverse pubescent line near the caudal margin of the first visible dorsal abdominal segment. Examination of the aedeagus further substantiates its relationship with *S. rubida, S. triloba,* and *S. cuneata* in that all these species have well developed median lobes and reduced setation on the parameres as well as heavy, though relatively simple, accessory projections.

Two unique characters noted by Casey and observed by the senior author are the lateral setate cusps on the fifth sternite of the male and the small deflexed median cusp on the posterior margin of the penultimate segment of the female.

Sonoma humilis Marsh and Schuster, new species

(Figs. 15, 22)

Male. Head 0.287 mm. long x 0.355 mm. wide; pronotum 0.360 mm. x 0.460 mm.; elytra 0.680 mm. x 0.657 mm.; abdomen 0.820 mm. x 0.705 mm.; total length 2.13 mm.

Brown. Vestiture mostly short, some long recurved marginal setae. Head wider than long; eyes large, somewhat prominent, beginning at 3/10th and ending at 7/10ths head length; median fovea short, extending but slightly past front margin of eyes (on slide-mounts to middle of eyes); vertexal foveae separated by distance from fovea to eye; tempora rounded, the curve more pronounced toward cervix; a single row of monaxial setae extends from side of cervix to nearly the median line of the ventral surface of head; mandibular rami with about 20 small teeth. Prothorax wider than long, widest at middle, arcuate to both apical and basal angles; foveae and sulcus as usual; discal punctures present; winged. Elytra with 4 foveae on sutural stria, 3 on inner discal stria, 3 or 4 on the outer. Abdomen with normal setation; spongiose strip of first visible terigite present; metatibia with a simple tumosity about 1/3rd from the apex; inner distal apex of each tibia with a small spine (Fig. 22). Aedeagus as illustrated (Fig. 15).

Female resembles the male except: the metatibia is simple and the sixth and seventh sternites are as in *S. corticina* with an atrophied median cusp which is not obviously attached to the margin of the sixth sternite.

The holotype male, 3 male and 2 female paratypes were collected at Little River, Mendocino County, California on June 7, 1955 by J. R. Helfer. A male and a female paratype from the same locality were collected by J. R. Helfer on May 3, 1955. Twenty-four additional paratypes were collected by J. R. Helfer in Mendocino County, California at Mendocino, Comptche, Casper, Ft. Bragg, and the Pigmy Forest.

Other specimens not included in the type series were collected as follows: CALIFORNIA: Del Norte County: six miles east of Cresent City, 1 male, July 10, 1958, J. Powell. Humboldt County: 9 miles east of Carlotta, 1 female, October 1, 1959, V. D. Roth; one mile south of Dyerville, 1 male, 1 female, September 19, 1953, E. E. Gilbert, R. O. Schuster; 14 miles east of Green Point Ranch, 3 females, July 11, 1954, E. E. Gilbert, R. O. Schuster. Mendocino County: Talmadge, 1 male, July 29, 1959, R. O. Schuster, L. M. Smith. Sonoma County: Rhododendron State Park, 1 female, October 9, 1954, C. D. MacNeill, R. O. Schuster; Mark West Springs, 1 male, December 31, 1953, G. A. Marsh, R. O. Schuster; Mark West Reservoir, 1 male, January 22, 1958, R. O. Schuster. Napa County: 7 miles east of Rutherford, 1 male, January 6, 1957, R. O. Schuster; Oakville, 1 male, 3 females, March 14, 1954, J. R. Helfer; 7 miles west of Oakville, 1 female, March 15, 1954, G. A. Marsh, R. O. Schuster. Marin County: Corte Madera, 1 female, October 16, 1954, J. R. Helfer; Mt. Tamalpais, 2 males, 2 females, October 5, 1958, F. C. Raney; Muir Woods, 1 male, July 30, 1908, E. C. Van Dyke; Boot Jack Canyon, Muir Woods, 1 male, May 21, 1952, H. S. Dybas; Samuel P. Taylor State Park, 1 female, October 24, 1953, V. D. Roth, 1 male, December 6, 1958, C. W. O'Brian. Alameda County: Oakland Hills, 1 female, January 15, 1947, K. S. Hagen; Oakland, 1 male, 2 females, December 12, 1953, J. R. Helfer, 2 females, February 5, 1953, R. O. Schuster. Contra Costa County: Redwood Peak, Oakland Hills, 1 female, January 9, 1954, R. O. Schuster, G. A. Marsh; Redwood Park, 2 males, 1 female, May 18, 1953, E. E. Gilbert, R. O. Schuster, 1 male, May 12, 1953, E. E. Gilbert.

The holotype male and a female paratype are deposited in the California Academy of Sciences. Other paratypes to be distributed to the California Insect Survey collection, the collection of Orlando Park and the collection of the authors.

This species, while closely related to *S. rubida,* differs markedly in the shape of the male genitalia and the last three sternites of the female. It is perhaps the most widely distributed species in California, extending along the north coast range from Humboldt to Marin Counties. It is the only species other than *S. cavifrons* which occurs in those countries immediately east of San Francisco Bay. Because of its wide range it is commonly associated with many other species of the genus.

Sonoma rubida Casey

(Fig. 16)

Sonoma rubida Casey, 1893, Ann. New York Acad. Sci., 7:437-438.

Male. Head 0.275 mm. long x 0.360 mm. wide; pronotum 0.385 mm. x 0.480 mm.; elytra 0.680 mm. x 0.680 mm.; abdomen 0.738 mm. x 0.680 mm.; total length 2.10 mm.

Brown. Vestiture mostly short, some longer recurved marginal setae. Head wider than long; eyes large, somewhat prominent, margins beginning at 3/10ths and ending at 7/10ths head length; median fovea extending to anterior third of eyes (on slide-mounts to posterior third); vertexal foveae separated by distance subequal to that between fovea and eye, located slightly posterior to rear margin of eyes; a single row of monaxial setae extends from side of neck to nearly the median line of ventral surface of head. Prothorax wider than long, widest through middle, weakly arcuate to apical angle, strongly arcuate to basal angle; fovea and sulcus of base normal; discal foveae present. Elytra with 3 foveae on inner stria, 3 or 4 on outer; winged. Abdomen with spongiose strip on first visible tergite; apex of venter of usual asymmetric nature; metatrochanter triangular, inner margin nearly straight; metatibia with projection at distal third; projection rounded basally, pointed apically; apex of each tibia ending with a small spine. Aedeagus as illustrated (Fig. 16).

Female resembles the male except: metatrochanter and metatibia simple. Sixth abdominal sternite asymmetrically biarcuate with small caudally elevated median process which does not attain the margin of the terminal segment.

Type locality. Santa Cruz Mts., Santa Cruz County, California.

New distribution. CALIFORNIA. San Mateo County: 6 miles southeast of Half Moon Bay, 1 female, December 23, 1953, V. D. Roth; 5 females, June 1, 1957, R. O. Schuster; King Mt., 7 males, 1 female, September 1, 1958, R. O. Schuster. Santa Cruz County: Santa Cruz Mts., 2 males, 5 females, A. Koebele; Big Basin, 1 male, 4 females, December 23, 1953, V. D. Roth; Boulder Creek, 1 female, December 23, 1953, V. D. Roth. Santa Clara County: Stevens Creek Reservoir, 1 female, February 15, 1953, D. J. Burdick. Monterey County: Carmel, 2 females, December 22, 1953, V. D. Roth.

Sonoma rubida is closely related to *S. humilis* and presumably is geographically isolated. Both species are large with well developed eyes and a deep triangular frontal fovea which extends internally between the eyes. The metatrochanter is not modified in either species and both have strongly produced laminated spines on the inner distal surface of the metatibia.

They differ primarily on the basis of the male genitalia and the last three sternites of the female. *Sonoma grandiceps,* which occurs within the range of this species, can be differentiated by its smaller size, two lateral setate cusps on the fifth sternite of the male and the configuration of the male genitalia. The female has an elongate median cusp on the penultimate sternite, whereas the female of *S. rubida* has a short oblique median ridge or process directed caudally.

Sonoma dilopha Marsh and Schuster, new species

(FIG. 17)

Male. Head 0.320 mm. long x 0.40 mm. wide; pronotum 0.455 mm. x 0.565 mm.; elytra 0.760 mm. x 0.820 mm.; abdomen 0.784 mm. x 0.658 mm.; total length 2.40 mm.

Brown. Vestiture mostly short but some longer marginal setae. Head wider than long; eyes large, prominent; margins from 3/10ths to 7/10ths head length; median fovea ending behind front margin of eyes (on slide-mounts nearly to middle of eyes); vertexal foveae separated by approximately the distance from fovea to eye, located at posterior margin of eyes; tempora rounded; a single row of monaxial setae on side and venter of neck; inner rami of mandible crenulate. Pronotum widest through middle, arcuate to apical and basal angles; disc foveate. Elytral foveae pattern variable; winged, 1.25 mm. Abdomen with long recurved setae on each visible tergite except the first and on each margin except the last; the narrow spongiose band of the first visible tergite barely interrupted at the middle; metatrochanter expanded, inner margin deeply rounded; metatibia with a projection at the inner distal fourth; apices of all tibia with a small spine. Aedeagus as illustrated (Fig. 17).

Female unknown.

The holotype male was collected fourteen miles east of Blue Lake, Humboldt County, California, by E. E. Gilbert and R. O. Schuster on September 19, 1953, and is deposited in the California Academy of Sciences.

This species would appear to be closely allied to *S. hespera* because of the comparable size and the shortened wings. It shares other characters, such as the reduced median fovea of the head, with *S. priocera*, and the well developed modification of the male metatibia with *S. rubida*. The aedeagus is so modified that it superficially resembles that of the related genus *Megarafonus.*

Sonoma hespera Park and Wagner

(FIG. 18)

Sonoma hespera Park and Wagner, 1961, Univ. Washington Publ. Biol. 16:6.

Male. Head 0.310 mm. long x 0.385 mm. wide; pronotum 0.420 mm. x 0.495 mm.; elytra 0.730 mm. x 0.622 mm.; abdomen 0.738 mm. x 0.738 mm.; total length 2.45 mm.

Brown. Vestiture mostly short but some longer marginal setae. Head wider than long; eyes large, front margin 3/10ths head length, rear margin 7/10ths head length; median fovea narrowly elongate, extending to middle of eyes (on slide-mounts to posterior third of eyes); vertexal foveae separated by distance from fovea to eye, located on a line with rear margin of eyes; a single row of monaxial setae on neck; inner rami of mandibles with numerous small teeth. Prothorax wider than long;

widest just before the middle; weakly arcuate to apical and basal angles; discal foveae obsolete; wing short but not as brachypterous as in *S. spadica.* Elytral foveation variable. Abdomen with long recurved setae on each visible tergite except the first and 1 on each margin except the fourth; narrow spongiose strip of first visible tergite interrupted medially; sternites 2 through 5 with a fovea at each anterior-lateral margin; metatrochanter with short blunt spine at inner distal fourth; apex of each tibia with an inner spine. Aedeagus as illustrated (Fig. 18).

Type locality. Boyer, Polk County, Oregon.

New distribution. OREGON. Linn County: 10 miles southeast of Detroit, 1 male, March 14, 1954, V. D. Roth. Douglas County: Loon Lake, 1 male, 2 females, July 1, 1959, L. M. Smith. Coos County: near Bridge, 1 male, July 28, 1954, V. D. Roth. CALIFORNIA. Del Norte County: 2 miles north of Ft. Dick, 2 females, November 21, 1953, V. D. Roth; 18 miles south of Klamath, 1 male, September 19, 1953, E. E. Gilbert, R. O. Schuster.

This species, recently described by Park and Wagner, is closely related to *S. priocera.* It differs on the basis of the aedeagus which is more complex than in any known species of *Sonoma.* The median fovea of the head is well developed, expanded apically then narrowly constricted as it extends to the middle of the eyes. The elytra are obviously more than twice the length of the head, and the male metatibial spine is well developed and strongly produced.

Because of insufficient samples from the Pacific Northwest, the few records which exist do not provide an adequate basis for conclusive distributional analysis. However, it would appear that the extreme northern portions of California represent the southern periphery of the range of this species and that it may be expected to occur widely in Oregon east to the Cascades and into Washington.

Sonoma priocera Marsh and Schuster, new species

(Fig. 19)

Male. Head 0.280 mm. long x 0.350 mm. wide; pronotum 0.375 mm. x 0.460 mm.; elytra 0.590 mm. x 0.615 mm.; abdomen 0.886 mm. x 0.662 mm.; total length 2.10 mm.

Brown. Vestiture mostly short but some longer marginal setae. Head wider than long; eyes large, prominent; median fovea small, subtriangular terminating just behind the front margin of eyes (on slide-mounts, near middle of eyes); vertexal foveae separated approximately by the distance from fovea to eye, located at posterior margin of eyes; tempora weakly rounded to subtruncate basal lateral angle; a single row of monaxial setae on side and venter of neck. Prothorax widest through middle, rounded to apical angle, weakly arcuate to basal angles; disc foveate; winged. Elytral foveae pattern variable. Abdomen with long recurved setae on each visible tergite except the first and on each margin except the last; the narrow spongiose band of the first visible tergite barely interrupted at the middle; metatrochanter with inner margin depressed medially, not evenly rounded; metatibia with a projection at the inner distal 1/10th, just superior to apical spine by length of spine. Aedeagus as illustrated (Fig. 19).

Female unknown.

The holotype male and one male paratype were collected at Berlin, Linn County, Oregon on March 23, 1954, by V. D. Roth. The holotype is deposited in the California Academy of Sciences, the paratype in the collection of the authors.

This species shares a number of characters with *S. hespera*. One unique structure to be found only in these two species is the thin, obliquely transverse, marginally serrate lamina of the aedeagus. However, *S. priocera* differs in the reduction or absence of processes on the lateral parameres. Also, the median fovea of the head is reduced to a small subtriangular foramen. The head is just subequal in length to the elytra, and the male metatibial spine is reduced to an abortive spur evident only on slide mounts.

This species is presently known only from the type locality which is in the southern portion of the Willamette Valley in Oregon.

Sonoma tolulae (LeConte)

(Fig. 20)

Faronus tolulae LeConte, 1850, Boston J. Nat. Hist., 6:108-109; 1852, Ann. Lyceum Nat. Hist., 5:215.

Rafonus tolulae Casey, 1893, Ann. New York Acad. Sci., 7:441-442.

Sonoma tolulae Raffray, 1903, Ann. Ent. Soc. France, 72:484-604.

Male. Total length 2.1 mm.

Dark brown, shining, antenna and legs light reddish yellow. Vestiture long, coarse. Head with median fovea broad at apex, narrowing posteriorly between eyes, not attaining vertexal foveae; tempora rounded. Pronotum nearly as long as wide; discal foveae reduced or absent; winged. Elytra short as in *S. repanda*. Abdomen with first visible tergite simple, lacking transverse spongiose strip of setae. Metatrochanter evenly rounded in outline. Metatibia simple, not modified on ventral surface. Aedeagus as illustrated (Fig. 20).

Recorded distribution. LeConte (1850), "cataractam Georgiae" (northern Georgia; type locality), Brendel and Wickham (1890), Virginia; Casey (1893), Georgia and Pennsylvania (St. Vincent, Pennsylvania).

New distribution. Black Mountain, Buncombe County, North Carolina.

At present, this is the only species occurring in the eastern United States. Although originally described in a different genus, there is no question that this species belongs in the genus *Sonoma* as indicated by other authors. The short elytra and simple first visible abdominal tergite are characteristic of *S. repanda* and its allies. However, *S. tolulae* is considerably larger than the four species of this group and the male aedeagus more closely approximates that of *S. isabellae*.

Sonoma olycalida Park and Wagner

(Fig. 21)

Sonoma olycalida Park and Wagner, 1961, Univ. Washington Publ. Biol. 16:6.

Male. 2.0 mm. long x 0.6 mm. wide.

The manuscript description and genitalic illustration of this species were made available for inclusion in this revision through the kindness of Orlando Park. On the basis of general facies and characters such as the secondary sexual modifications of the male metatibia, this species is closely allied to *S. cuneata* and *S. humilis*. Moreover, the male aedeagus shares numerous common points of reference with these two species.

The unique male was collected in northwestern Washington at Olympic Hot Springs, Olympic National Park.

Key to males of Sonoma

1. Pronotum with discal foveae absent or reduced ---------- 2
   Pronotum with two distinct discal foveae ---------- 9

2(1). Vestiture sparse, fine; wings atrophied; aedeagus with apices of parameres densely setate (Figs. 2-5); California ---------- 3
   Vestiture coarse, not sparse; wings well developed; aedeagus with four or five subapical setae on parameres (Fig. 20); Atlantic Coast States ---------- **SONOMA TOLULAE** (LeConte)

3(2). Elytra shorter than pronotal width ---------- 4
   Elytra equal to, or longer than, pronotal width ---------- 5

4(3). Median terminal process of aedeagus strongly contorted, without additional small processes or laminae (Fig. 2) ---------- **SONOMA REPANDA**, new species
   Median terminal process of aedeagus terminating in smaller, tubular sigmoid process (Fig. 3) ---------- **SONOMA SPADICA**, new species

5(3). First visible tergite without transverse strip of fine pubescence (Fig. 1) ---------- 6
   First visible tergite with transverse strip of fine pubescence (Fig. 6) ---------- 7

6(5). Median terminal process of aedeagus asymmetrically trifed (Fig. 4) ---------- **SONOMA DOLABRA**, new species
   Median terminal process of aedeagus asymmetrically expanded into thin, fan-shaped lamina incised at upper left margin (Fig. 5) ---------- **SONOMA VANNA**, new species

7(5). Metatibia with modification of inner distal surface ---------- 8
   Metatibia without modification of inner distal surface ---------- **SONOMA ISABELLAE** (LeConte)

8(7). Metatibia with carinoid process at inner distal one-third (Fig. 23); metatrochanter small, evenly rounded in outline; aedeagus with subtruncate, laminate median process (Fig. 13) ---------- **SONOMA CUNEATA**, new species
   Metatibia with short, blunt spine at inner distal one-fourth; metatrochanter broadly convex to subtruncate mesially; aedeagus with median process obliquely inclined, partially trough-like with rounded apex (Fig. 18) -- **SONOMA HESPERA** Park and Wagner

9(1). Fifth sternite with two lateral setate cusps; aedeagus with median process subapically constricted and obliquely bent; parameres nearly symmetrical with two superior elongate processes and three setae each (Fig. 14) -- **SONOMA GRANDICEPS** Casey
   Fifth sternite simple; aedeagus variable but parameres distinctly asymmetrical ---- 10

10(9). Metatibia without modification of inner distal surface ---------- 11
   Metatibia with modification of inner distal surface ---------- 13

11(10). Parameres of aedeagus with dense brushes of long setae, mesial margins produced as thin laminae partially enclosing erect median lobe ---------- 12
   Parameres of aedeagus with five or six long apical setae, not contiguous and each bearing a projection as broad as the apex of the median lobe (Fig. 12) ---------- **SONOMA TRILOBA**, new species

12(11). Median lobe of aedeagus with apex enlarged and directed sharply to left (Fig. 8) ---------- **SONOMA PARVICEPS** (Mäklin)
   Median lobe of aedeagus nearly straight and of more uniform width (Fig. 9) ---------- **SONOMA CAVIFRONS** Casey

13(10). One or both parameres of aedeagus with apical conic projections bearing numerous granulo-tuberculations (Figs. 10 & 11) ---------- 14
   Parameres variously modified or sculptured but without granulo-tuberculate projections ---------- 15

14(13). Head with two large partially coalesced, densely setate cervico-gular foveae; tempora abruptly converging to neck; metatibia with weak inner distal spine; only one paramere of aedeagus with tuberculate projections (Fig. 10) ---------- **SONOMA CORTICINA** Casey
   Head with cervico-gular fovea not as above; tempora rounded to neck; metatibia with

weak spine near apex; both parameres of aedeagus with tuberculate projections (Fig. 11) ------------------------------ SONOMA MARGEMINA Park and Wagner

15(3). Both parameres of aedeagus with elongate apices or supplementary projections---- 16

One paramere of aedeagus lacking supplementary projections (Fig. 19)---------- -- SONOMA PRIOCERA, new species

16(15). Median lobe of aedeagus narrowed and evenly rounded or acuminate apically (Figs. 15, 16) -- 17

Median lobe of aedeagus broad and produced laterally at apex------------------ 18

17(16). Aedeagus with projections of parameres broad, laminate (Fig. 15)-------------- -- SONOMA HUMILIS, new species

Aedeagus with projections of parameres narrow, one recurved to form crook (Fig. 16) -- SONOMA RUBIDA Casey

18(16). Aedeagus with median lobe laterally produced at apex; parameres apically elongated (Fig. 17) ------------------------------------ SONOMA DILOPHA, new species

Aedeagus with median lobe subapically constricted, apex narrower than base; parameres not produced at apex (Fig. 21)------ SONOMA OLYCALIDA Park and Wagner

Literature Cited

Bowman, J. R.

1934. The Pselaphidae of North America. Pittsburgh, privately published. 149 pp.

Brendel, E., and Wickham, H. F.

1890. The Pselaphidae of North America. Bull. Lab. Nat. Hist. St. Univ. Iowa, *1*:216-304, *2*:1-84.

Casey, T. L.

1886. Descriptive notices of North American coleoptera. Bull. California Acad. Sci., *2*(6):157-264.

1887. On some new North American Pselaphidae. Bull. California Acad. Sci., *2*(8):455-482.

1893. Coleopterological notices, V. Ann. New York Acad. Sci., *7*:281-606.

Jeannel, R.

1949. Les Pselaphidae de L'Afrique Orientale. Mem. du Museum d'Histoire Naturelle, n. s., *29*:1-226.

LeConte, J. L.

1850. On the Pselaphidae of the United States. Boston Jour. Nat Hist., *6*:64-110.

1852. Descriptions of new species of coleoptera from California. Ann. Lyceum Nat. Hist., *5*:125-216.

Mäklin, F. W.

1852. *In* Mannerheim, C. G. Zweiter Nachtrag zur Kaefer-Fauna der Nord-Amerikanischen Laender des Russichen Reiches. Moskovoe Obshchestva Ispytately Priordy. Bull. Soc. Nat. Moscou, *25*(1):283-387.

Newell, Irwin M.

1955. An autosegregator for use in collecting soil-inhabiting arthropods. American Micros. Soc. Trans., *74*:389-392.

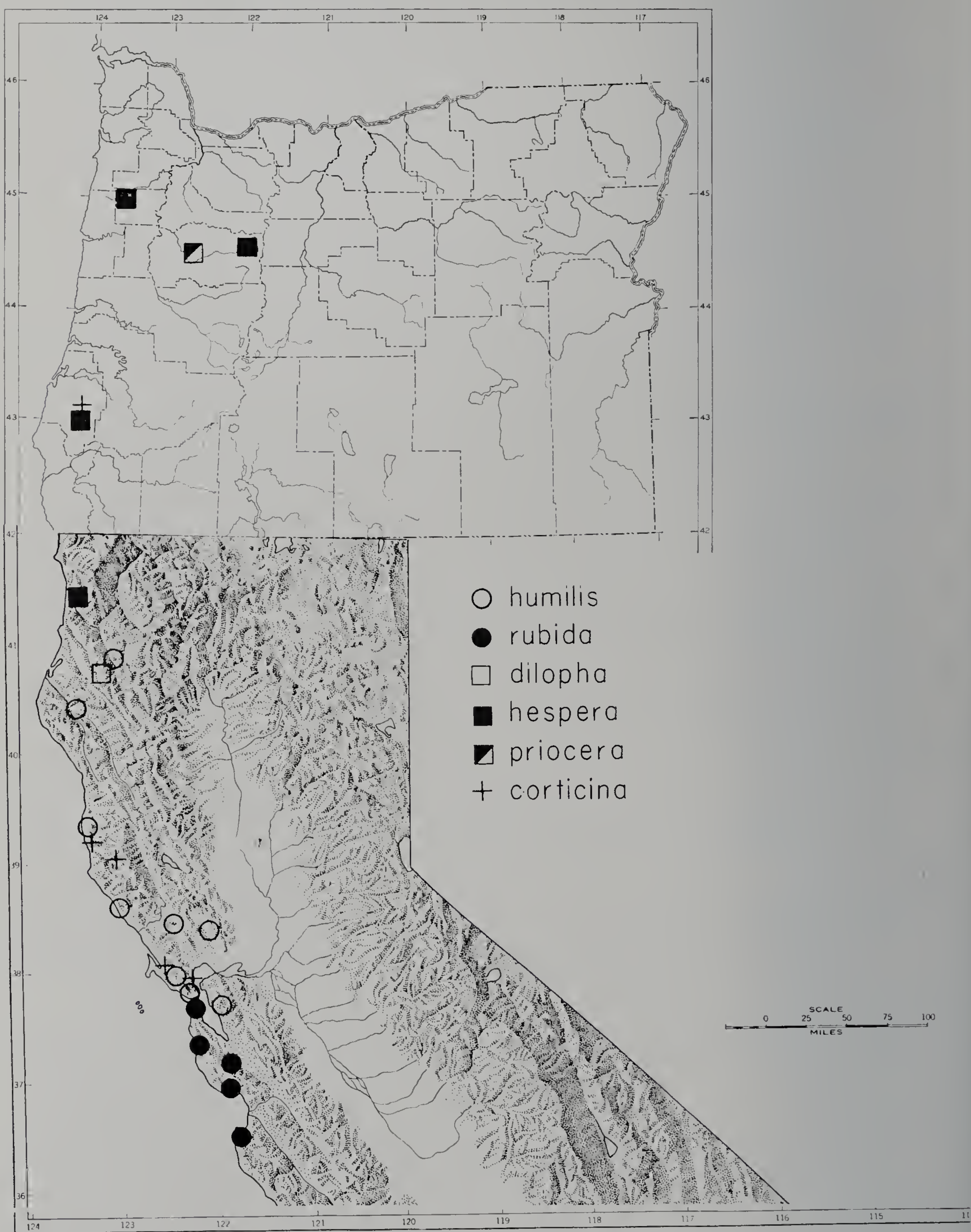
Park, Orlando

1953. Discrimination of genera of pselaphid beetles of the United States. Bull. Chicago Acad. Sci., *9*:299-331.

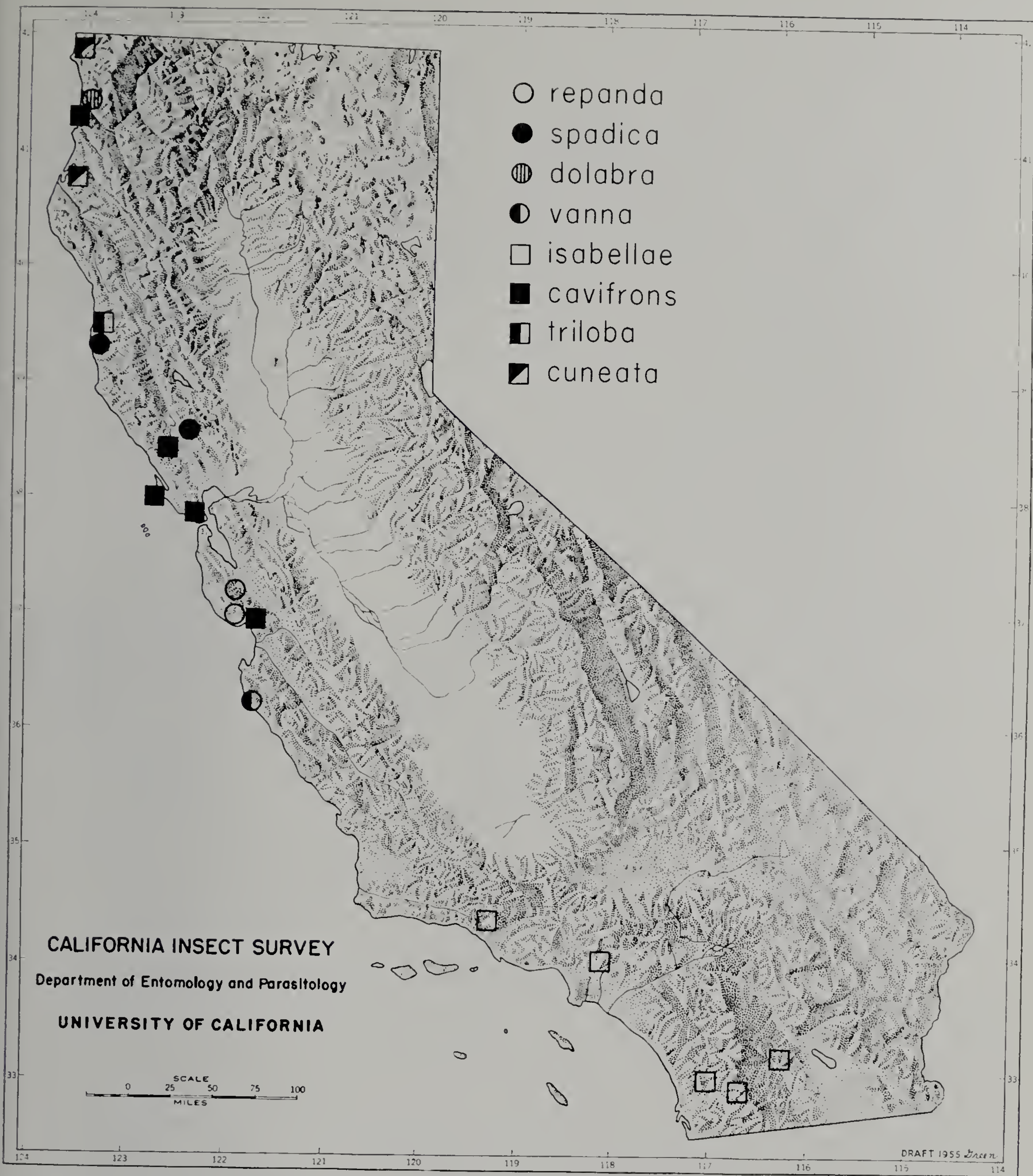
Park, Orlando, and John A. Wagner

1961. *In* M. H. Hatch, The beetles of the Pacific Northwest, Part III: Pselaphidae and Diversicornia I. Univ. Washington Publ. Biol., *16*:1-380.

RAFFRAY, ACHILLE
1893. Essai Mon. sur la tribu des Faronini. Rev. d'Ent., *12*:1-53; 157-196.
1903. Genera and Cat. des Psélaphides. Ann. Soc. Ent. France, 72:484-604.



Distribution map of six species of *Sonoma*.



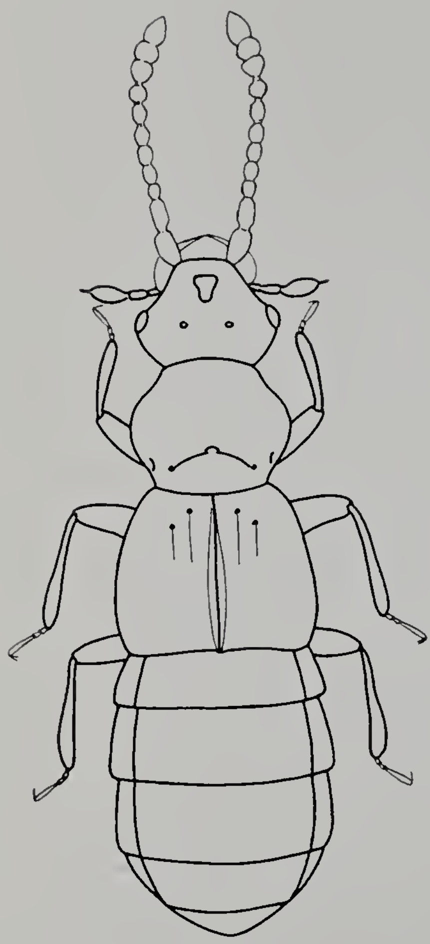
Distribution map of eight species of *Sonoma.*

Explanation for illustrations on following three pages:

FIGURES 1, 6—Dorsal aspect of entire specimens. FIGS. 2-5, 7—Dorsal aspect of aedeagi.

FIGURES 8-14—Dorsal aspect of aedeagi.

FIGURES 15-21—Dorsal aspect of aedeagi. FIGS. 22, 23—Male metatibiae.



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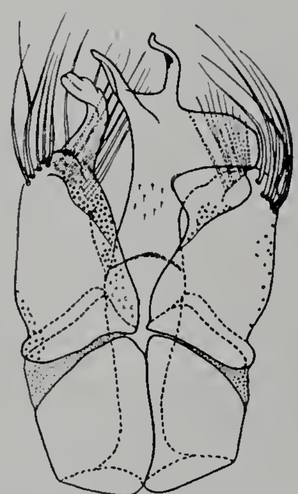
2 repanda

3 spadica



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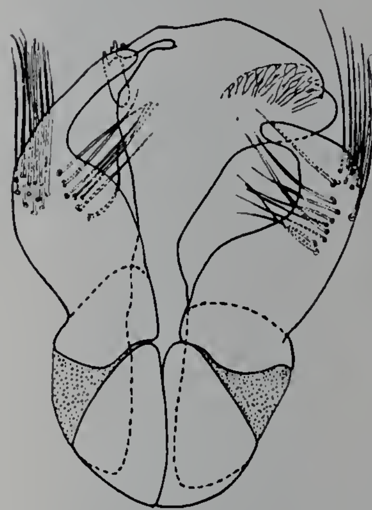
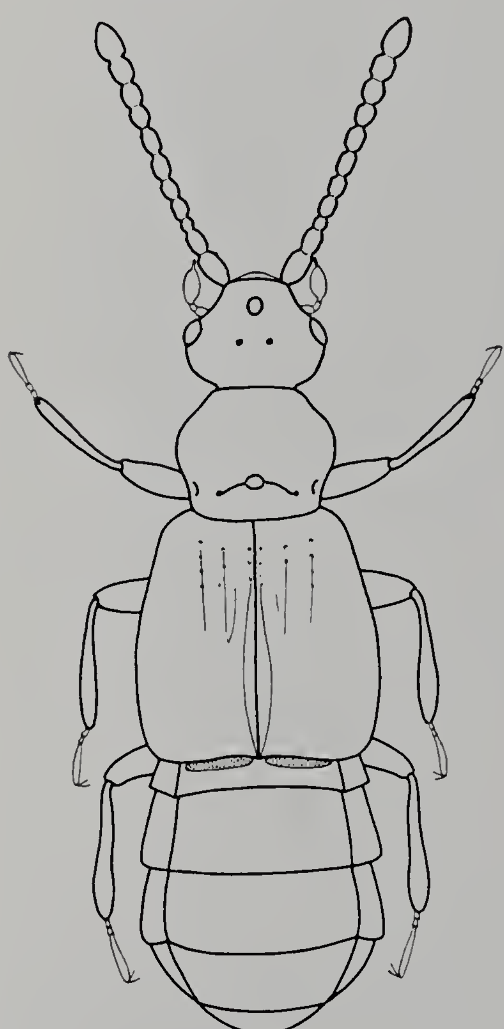
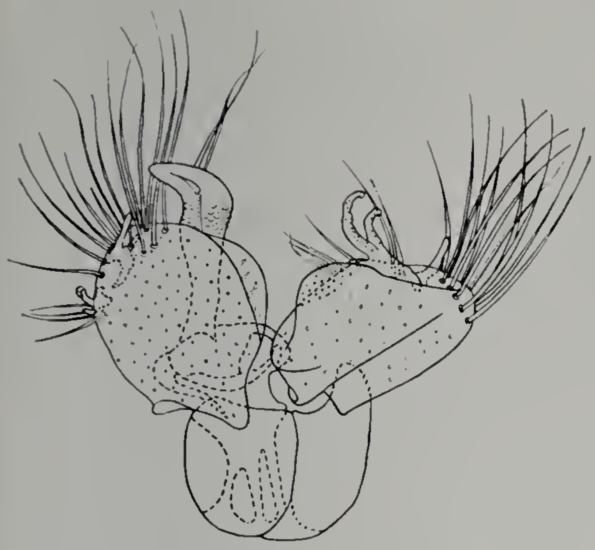


5 vanna

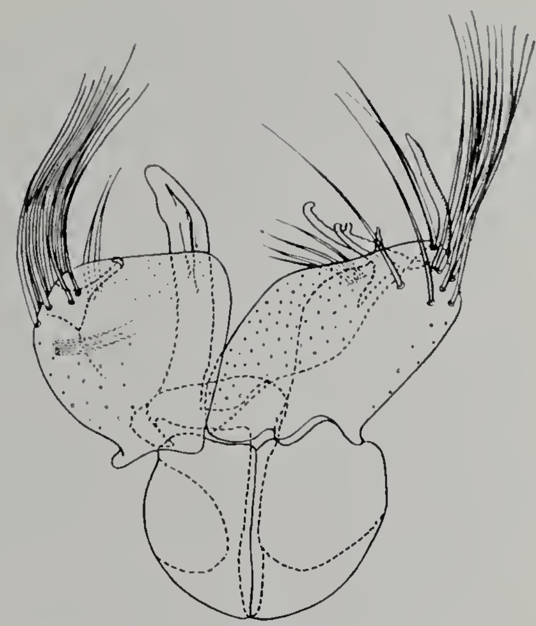


6 isabellae

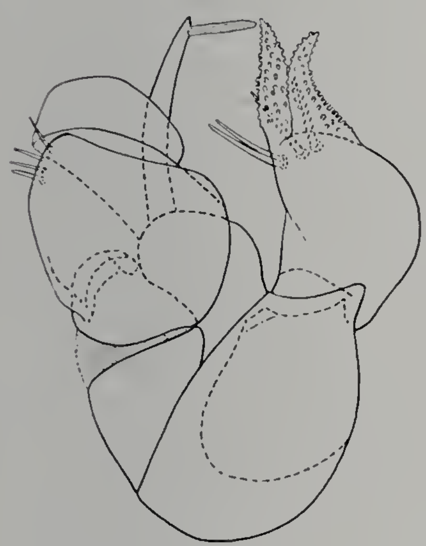
7 isabellae



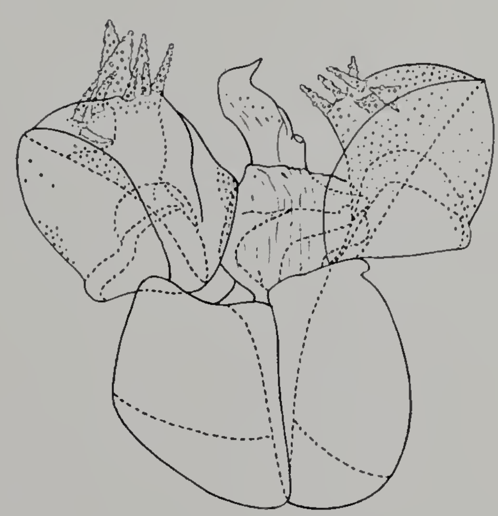
8 parviceps



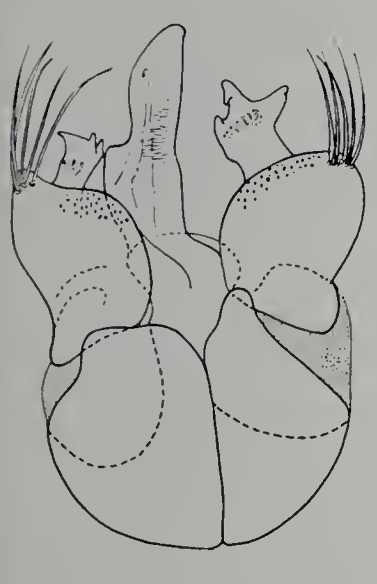
9 cavifrons



10 corticina

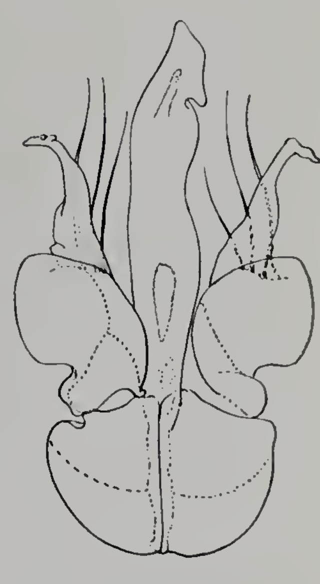


11 margemina

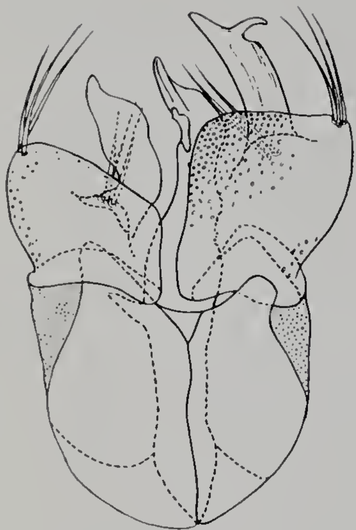


12 triloba

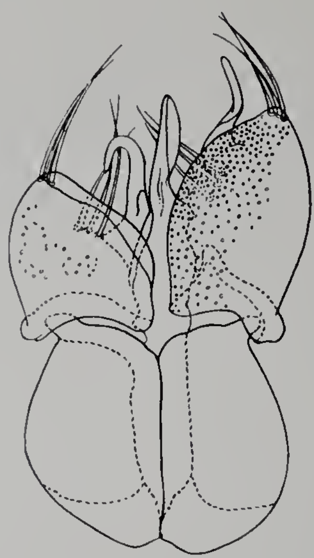
13 cuneata



14 grandiceps



15 humilis



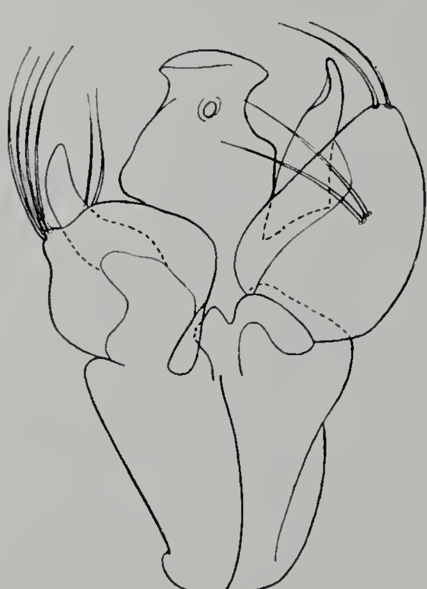
16 rubida

17 dilopha

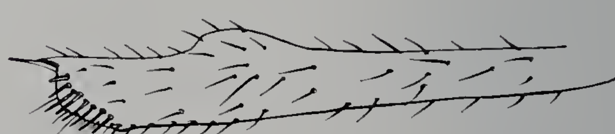
18 hespera

19 priocera

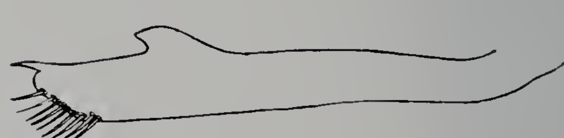
20 tolulae



21 olycalida



22 humilis



23 cuneata

A FEW REARRANGEMENTS IN THE TENEBRIONIDAE, WITH A KEY TO THE GENERA OF THE ULOMINI AND TENEBRIONINI OF AMERICA, NORTH OF MEXICO (COLEOPTERA)

By T. J. SPILMAN[1]

A few new changes in the Tenebrionidae are being published to make them available to Ross H. Arnett for the forthcoming fascicle on the Heteromera in his *Beetles of the United States (A Manual for Identification).* In addition, I include previously published changes which were overlooked by authors or published after the Leng *Catalogue of the Coleoptera of America, north of Mexico,* and its supplements were completed. These changes are cited so the student using a key will not be mystified by an unfamiliar name, combination, or deletion.

Finally, completely new keys to the genera of the Ulomini and Tenebrionini are presented. The keys apply only to those specimens found in America, north of Mexico. Genera in many sections of the Tenebrionidae are not easily distinguished at sight, but the opposite is true in the two tribes mentioned. However, a student without access to a reference collection would have more than a little difficulty determining North American ulomine and tenebrionine genera using existing keys. The keys given below are not meant to be natural or to show phylogeny. They are merely my idea of the easiest method of quickly identifying genera by means of characteristics that do not depend on the subjective judgment of the identifier. One characteristic (couplet 5 of the ulomine key) might be unfamiliar: The distance from the ventral border of the eye to the cardo, which is the basal part of the maxilla. This distance is actually a way of measuring the ventral projection of the eye; the easiest method of expressing it is the mentioned distance. Incidentally, this characteristic should be investigated in genera of the Ulomini, for I have found it useful in determining some species of those genera.

ELEODINI, ELEODOPSINAE, AND ELEODOPSINI; ELEODES AND ELEODOPSIS

Eleodopsis was described as a new genus by Blaisdell (1939:52) for his new species *subvestita* (1939:53, pl. 4, figs. 8, 9, 14, 15). The species was based on 14 specimens collected on San Nicolas Island, one of the Channel Islands off the coast of southern California. Blaisdell stated that the facies of the species resembled that of *Eleodes (Blapylis) inculta* LeConte, found on the Channel Islands of Santa Rosa and San Miguel. However, he erected the subfamily Eleodopsinae and tribe Eleodopsini for *Eleodopsis.*

Through the courtesy of Hugh B. Leech I have examined the holotype, allotype, and ten paratypes of *Eleodopsis subvestita* in the California Academy of Sciences. In the first place, the holotype label was attached to a female and the allotype label was attached to a male. But Blaisdell in

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his original description stated that the holotype is a male and the allotype is a female. I have, therefore, exchanged the labels on those two specimens to comply with Blaisdell's published designations.

Secondly, the pin holding the true male holotype also holds a small piece of cardboard on which is glued a non-eleodine male aedeagus (the basis of Blaisdell's figures 8 and 9), but the holotype still has within its abdomen a typically eleodine male aedeagus with clavae present and conspicuous. Now, one of the distinguishing characteristics of the Eleodini is the presence of clavae on the male genitalia. A pair of clavae, fingerlike processes, is attached ventrally, one on each side of the penis; when the penis is retracted the clavae lie parallel to the penis, but when the penis is extruded the clavae are at right angles to the axis of the penis. Because Blaisdell did not find clavae on what he supposed was the genitalia of *subvestita,* he erected the new subfamily, tribe, and genus. In addition, the pin holding a paratype holds a small piece of cardboard on which is glued the same type of non-eleodine male aedeagus as is pinned with the holotype, but that paratype is actually a female with female genitalia still inside the abdomen.

Thirdly, the pin holding the true female allotype also holds a small piece of cardboard on which is glued the female genitalia (the basis of Blaisdell's figures 14 and 15); the abdomen of that allotype has been emptied of all genitalic structures. The hemisternites of the illustrated genitalia do not have the lamina dorsalis and lamina ventrolateralis that are typical of eleodines. Nevertheless, Blaisdell stated in his original description that the female genitalia in question are typically eleodine. On the genitalia of two female paratypes I have found that laminae are indeed present and that these genitalia are distinctly different from those illustrated. I assume Blaisdell accidentally mixed the genitalic dissections of a non-eleodine beetle and *Eleodopsis subvestita.* Unfortunately I cannot state the genus and species from which the non-eleodine genitalia came, but I do think that some member of the Tentyrinae is involved. The most perplexing problem in this jumble is in the synonymies to be made. Should the scientific names be synonymized on the basis of the figured genitalia or on the basis of the whole specimen mounted above those genitalia? It seems to me that Blaisdell established his new higher taxons on the combination of genitalia and whole specimen. This was an erroneous combination, a composite. This situation is not discussed in the new International Code of Zoological Nomenclature. I have arbitrarily chosen to base the name *Eleodopsis subvestita* on the whole specimen, not on the illustrated genitalia.

Thus, I have arrived at the following conclusions: Eleodopsinae and Eleodopsini are junior synonyms of Eleodini, because of the presence of clavae; *Eleodopsis* is a junior synonym of the subgenus *Blapylis,* because of the sexual dimorphism of the tarsi; and *subvestita* is a valid species, easily separated from *inculta* by the presence of yellowish setae, which are longest on the lateral portions of the pronotum and elytra. The synonymies developed above can be shown in the following manner:

Tribe: Eleodini Blaisdell, 1909
Synonym: Eleodopsinae Blaisdell, 1939 [NEW SYNONYMY]
Synonym: Eleodopsini Blaisdell, 1939 [NEW SYNONYMY]
Genus: *Eleodes* Eschscholtz, 1829
Subgenus: *Blapylis* Horn, 1870
Synonym: *Eleodopsis* Blaisdell, 1939 [NEW SYNONYMY]

Phrenapatini and Ulomini

Lacordaire established the family-group taxon Phrenapatini for the Neotropical genera *Phrenapates* and *Delognatha* and based the group almost exclusively on the large mandibles. Other genera which do not have large mandibles have since been added to the tribe; *Dioedus* and *Phthora,* which include species from the United States, are among these genera. Several attempts have been made to give differences between Phrenapatini and Ulomini, but only three characteristics seem to be constant for all genera of the tribes: In Phrenapatini the small scutellum, the absence of a scutellar stria, and the anteriorly parallel elytral striae; and in Ulomini the larger scutellum, the presence of a scutellar stria, and the anteriorly nonparallel elytral striae. Some authors synonymize these two tribes, others do not. For the present I prefer to keep them separate and to use the scutellar stria and scutellar size as key characteristics. The two North American genera in Phrenapatini are easily separated: In *Phthora* the antennal club has three segments, and in *Dioedus* the antennal club has two segments.

Tribolium and Aphanotus

Aphanotus LeConte, 1862 was made a junior synonym of *Tribolium* Macleay, 1825 by Hinton (1948:25). *Aphanotus* contained two species, *brevicornis* and *parallelus,* both from the United States.

Tenebrionini and Coelometopini

The American genera *Polopinus, Polypleurus, Rhinandrus, Centronopus, Scotobaenus, Cibdelis,* and *Coelocnemis,* with other American and Old World genera, are often grouped in the Coelometopini, separate from the Tenebrionini. The family-group taxon Coelometopini was proposed by Lacordaire in 1859. An analysis of Lacordaire's description or any subsequent descriptions shows only one difference between Coelometopini and Tenebrionini: In the former the wingless condition with the concomitant short metasternum and lack of elytral humeri, and in the latter the winged condition with the concomitant long metasternum and presence of elytral humeri. If genera are grouped into Coelometopini and Tenebrionini, such similar genera as *Rhinandrus* and *Zophobas* are kept apart and the species of *Centronopus* would have to be put into two different tribes! I prefer to group under Tenebrionini the seven genera mentioned in the first sentence. Some authors who have concerned themselves with the Tenebrionini have not used the category Coelometopini, and a few have synonymized the tribes in print. *Coelometopus,* a palaearctic genus, and other coelometopines not mentioned herein should remain in Coelometopini until they are studied more fully; I expect that they, too, will eventually be included in Tenebrionini.

Zophobas, Rhinandrus, and Alobates

Alobates subnitens (Horn) 1874, originally described in *Nyctobates,* and *Rhinandrus sublaevis* Horn, 1885, are synonymous. Horn noted the resemblance, but he was misled by external sexual dimorphism. The former name was based on a female, having the anterior epistomal border truncate, and the latter on males, having the border strongly incised. All specimens used in the original descriptions came from Arizona.

The species *subnitens* cannot remain in *Alobates*. In *subnitens* the head is comparatively long, the epistoma is long and sexually dimorphic, the eye is large and prominent, the antenna has comparatively long segments, the mouthparts are comparatively long, the maxillary palpus has the ultimate segment broadened apically, the prosternal intercoxal process is narrow and arcuate, the mesosternum has a strong V-shaped depression, and the male genitalia have the paramere long and apically acuminate. *Alobates* has the opposites of all these characteristics.

Nor can *subnitens* be placed in *Rhinandrus,* even though the two agree in the above-mentioned characteristics. In *subnitens,* wings are present, and thus the metasternum is long, the scutellum is large, and the elytra are parallel-sided and have humeri. In *Rhinandrus* the wings are absent, the metasternum is short, the scutellum is small, and the elytra are elliptical and lack humeri. *Rhinandrus* must therefore be stricken from the list of United States genera; all species remaining in the genus occur either in or south of Mexico.

The genus *Zophobas* is the most logical place for *subnitens*. The two agree in all the above-mentioned characteristics. The species previously included in *Zophobas* are robust and heavily sclerotized and have the last visible sternum with a sulcus on the posterior border, whereas *subnitens* is more fragile and lacks the sulcus; I do not consider these two characteristics to be worthy of generic rank. Some other species of *Rhinandrus* will surely have to be moved to *Zophobas*. A look at the illustrations of some species of the former indicates such transfers should be made, but I do not have enough material at hand to do a complete study. The synonymy of *subnitens* as developed above can be shown as follows:

Zophobas subnitens (Horn). [NEW COMBINATION]
  Nyctobates subnitens Horn, 1874.
  Rhinandrus sublaevis Horn, 1885. [NEW SYNONYMY]

Zophobas atratus (Fabricius) 1775, not of authors, is synonymous with *Zophobas morio,* of authors, not Fabricius; the species occurs in the United States and much of the Neotropical Region. *Alobates morio* (Fabricius) 1776, not of authors, is synonymous with *Alobates barbata* (Knoch) 1801; the species occurs in the United States. These changes were made by Blair (1914:487).

Centronopus, Scotobates, and Scotobaenus

Centronopus Solier, 1848, is synonymous with *Scotobates* Horn, 1875; the genus contains two species from the United States, *calcaratus* and *opacus*. *Scotobaenus* LeConte, 1859, is synonymous with *Centronopus* of authors, not Solier; the genus contains four species from the United States, *parallelus, wagneri, punctatus,* and *simplex*. These changes were made by Spilman (1962:1-5).

Tenebrio and Neatus

Neatus LeConte, 1862, has usually been considered a synonym or subgenus of *Tenebrio* Linnaeus, 1758. Reitter (1920:22) again established the distinction between the two genera, and at the same time he separated the nearctic species *N. tenebrioides* from the palaearctic species *N. picipes*.

Adelonia, Merotemnus, and Rhacius

Adelonia Laporte, 1840, is a senior synonym of *Merotemnus* Horn, 1870 (formerly in the Ulomini), and *Rhacius* Champion, 1885 (always in the Tenebrionini); *Adelonia* is in the Tenebrionini. These changes were made by Spilman (1961:50). *Adelonia* contains two species from the United States, *filiformis* and *sulcatula*.

Key to the Genera of Ulomini of America, North of Mexico

1. Elytral intervals finely carinate ---------- TRIBOLIUM
   Elytral intervals flat or convex, or with a weak carina on eighth interval only ---------- 2
2. Elytral pseudopleuron gradually tapering posteriorly, attaining elytral apex ---------- 3
   Elytral pseudopleuron abruptly ending well before elytral apex ---------- 10
3. Antenna capitate ---------- LYPHIA
   Antenna clavate ---------- 4
4. Pronotum with dorsal surface having punctures of two distinct sizes ---------- 5
   Pronotum with dorsal surface having punctures of one size ---------- 6
5. Pronotum with dorsal surface having larger punctures laterally only; distance from eye to cardo subequal to width of last antennal segment ---------- MYCOTROGUS
   Pronotum with dorsal surface having larger punctures medially only or scattered over whole surface; distance from eye to cardo distinctly less than width of last antennal segment ---------- ULOSONIA
6. Eye not emarginate anteriorly ---------- PALORUS
   Eye emarginate anteriorly ---------- 7
7. Epistoma in dorsal view with anterior border emarginate ---------- 8
   Epistoma in dorsal view with anterior border not emarginate ---------- 9
8. Pronotum in dorsal view with posterior border bisinuate; mesosternum with deep, distinct V-shaped depression ---------- ALPHITOBIUS
   Pronotum in dorsal view with posterior border convex; mesosternum without deep depression, merely weakly declivous ---------- LATHETICUS
9. Metasternum short, distance between mesocoxa and metacoxa less than width of metacoxa; elytral apex rounded ---------- EUTOCHIA
   Metasternum long, distance between mesocoxa and metacoxa greater than width of metacoxa; elytral apex truncate ---------- CORTICEUS
10. Elytra with eighth interval having a weak carina ---------- DOLIEMA
    Elytra with all intervals flat or convex ---------- 11
11. Protibia strongly expanded apically and very strongly serrate dorsally ---------- ULOMA
    Protibia slender, at most weakly expanded apically, smooth dorsally ---------- 12
12. Metatarsus with segment 1 long, equal to or longer than combined lengths of segments 2 and 3 ---------- 13

Metatarsus with segment 1 short, much shorter than combined lengths of segments 2 and 3 -- THARSUS

13. Pronotum in dorsal view with posterior border evenly convex; epistoma in dorsal view with anterior border straight or convex ------------------------- GNATHOCERUS

Pronotum in dorsal view with posterior border bisinuate; epistoma in dorsal view with anterior border emarginate or concave ------------------------------ 14

14. Antennal segments 2 and 4 subequal in length ----------------------- SITOPHAGUS

Antennal segment 4 almost twice as long as segment 2 ------------------ CYNAEUS

Key to the Genera of Tenebrionini of America, North of Mexico

1. Eye completely divided -- IDIOBATES

Eyes not divided -- 2

2. Abdomen with visible membrane between 3rd, 4th, and 5th visible sterna ---------- 3

Abdomen without visible membrane between sterna -------------------------- 20

3. Tarsi with fine, hairy setae ventrally ------------------------------------ 4

Tarsi with coarse, spinous setae ventrally --------------------------------- 19

4. Head above eye with deep sulcus extending distinctly posterior to eye -------- GLYPTOTUS

Head above eye with or without sulcus, if present, sulcus not extending posterior to eye -- 5

5. Antenna with last segment rounded apically ------------------------------- 6

Antenna with last segment asymmetrically angulate apically -------------------- 9

6. Metasternum short, medial length much less than medial length of prosternum including intercoxal process; elytral pseudopleuron as broad at apex as at first visible abdominal sternum -- 7

Metasternum long, medial length much more than medial length of prosternum including intercoxal process; elytral pseudopleuron much narrower at apex than at first visible abdominal sternum ------------------------------------- 8

7. Elytra with alternate intervals costate; antenna with last segment wider than long -- POLYPLEURUS

Elytra with intervals flat or convex; antenna with last segment longer than wide POLOPINUS

8. Eye short, length of dorsal lobe obviously less than width of last antennal segment -- IPHTHIMUS

Eye longer, length of dorsal lobe obviously greater than width of last antennal segment -- ALOBATES

9. Epistoma with anterior border obviously thickened ------------------- CENTRONOPUS

Epistoma with anterior border not thickened -------------------------------- 10

10. Metasternum short, distance between mesocoxa and metacoxa equal to or less than width of mesocoxa --- 11

Metasternum long, distance between mesocoxa and metacoxa much greater than width of mesocoxa --- 13

11. Elytral intervals tuberculate or mucronate ---------------------------- CIBDELIS

Elytral intervals not tuberculate or mucronate ------------------------------ 12

12. Tibiae with two distinct rows of very dense, fine setae on ventral surface of apical half; elytral pseudopleuron gradually narrowing posteriorly -------- COELOCNEMIS

Tibiae with confused setae on ventral surface of apical half; elytral pseudopleuron abruptly narrowing at base of last visible sternum, then becoming linear toward apex --- SCOTOBAENUS

13. Abdomen with last visible sternum having marginal sulcus posteriorly ----------- 14

Abdomen with last visible sternum not having marginal sulcus posteriorly --------- 15

14. Pronotum with dorsal surface very sparsely punctate, punctures separated by more than their diameters ------------------------------------ ZOPHOBAS ATRATUS

Pronotum with dorsal surface very densely punctate, punctures separated by their diameters or less -------------------------------- XYLOPINUS SAPERDOIDES

15. Elytra not striate, but with confused depressions and sulci ------------------- UPIS

Elytra striate -- 16

16. Epistoma in dorsal view with anterior border emarginate ---------------------- 17

Epistoma in dorsal view with anterior border not emarginate ------------------ 18

17. Pronotum with dorsal surface having minute punctures which are much smaller than punctures of elytral striae; elytral striae not sulcate ------ ZOPHOBAS SUBNITENS

Pronotum with dorsal surface having coarse punctures which are as large as punctures of elytral striae; elytral striae sulcate -------------------- XYLOPINUS AENESCENS

18. Eye with dorsal lobe larger than ventral lobe; femora clavate---------------- MERINUS
Eye with dorsal and ventral lobes of equal size; femora of approximately equal thickness throughout their length---------------------------------- HAPLANDRUS
19. Pronotum with dorsal surface having punctures of two sizes, large laterally and small overall; abdomen with last visible sternum having marginal sulcus posteriorly -- NEATUS
Pronotum with dorsal surface having punctures of only one size; abdomen with last visible sternum not having marginal sulcus posteriorly----------------- TENEBRIO
20. Antenna with last segment rounded apically---------------------------------- 21
Antenna with last segment acuminate apically------------------------------- 22
21. Elytra striate; metafemur with strong ventral tooth apically ---------------- ADELONIA
Elytra not striate but with confused punctures; metafemur without tooth -------- BIUS
22. Epistoma with anterior and lateral borders strongly reflexed; pronotum with angulation between dorsum and hypomeron acute------------------------------ ALAEPHUS
Epistoma with anterior border not reflexed and lateral border only weakly reflexed; pronotum with angulation between dorsum and hypomeron obtuse or rounded -- EUPSOPHULUS

Literature Cited

Blair, K. G.

1914. On the Fabrician types of Tenebrionidae (Coleoptera) in the Banks Collection. Ann. Mag. Nat. Hist. (8)13(77):482-490.

Blaisdell, F. E.

1939. Studies in the relationships of the subfamilies and tribes of the Tenebrionidae based on the primary genital characters, also descriptions of new species (Coleoptera). Trans. Amer. Ent. Soc. 65(1):43-60, pls. 4-5.

Hinton, H. E.

1948. A synopsis of the genus *Tribolium* Macleay, with some remarks on the evolution of its species-groups (Coleoptera; Tenebrionidae). Bull. Ent. Res. 39(1):13-56, illus.

Reitter, E.

1920. Bestimmungs-Tabellen der europaeischen Coleopteren. Heft 87. Tenebrionidae. XV Teil: Belopinae, Borinae, Tenebrioninae und Coelometopinae aus der palaearktischen Fauna. 24 pp. (privately published).

Spilman, T. J.

1961. Remarks on the classification and nomenclature of the American tenebrionine genus *Adelonia* (Coleoptera: Tenebrionidae). Pan-Pacific Ent. 37(1):49-51.

1962. The new world genus *Centronopus*, with new generic synonymy and a new species (Coleoptera: Tenebrionidae). Trans. Amer. Ent. Soc. 88:1-19, illus.

NEWS

The U. S. National Museum and U. S. Department of Agriculture insect taxonomists, staffs, and collections, including the Casey Collection, which were situated in the Natural History Building of the Smithsonian Institution in Washington have been moved to a building at 701 Lamont Street, N.W. However, the mailing address remains the same as before: Division of Insects, U. S. National Museum, Washington 25, D. C.

I would leave the well-paved highway of my purposeful intentions and wind up under shadowy ferns among mystical beetle tracks.—Alexander King

BOOK NOTICE

ECOLOGICAL STUDIES ON DUNG-BEETLES, by Bengt-Olof Landin, Opuscula Entomologica, supplementum 19, 228 pp., 1961.—Here is a fine example of an ecological study that is useful to the systematic zoologist. The author has made a careful study of a particular environment and the interaction of the dung-beetles with this environment. The interesting and noteworthy feature of this study, however, is the treatment of the animals involved. He has carefully recorded the species he has used in these studies, many of them experimental, never losing sight of the importance of species determination and distinction. The result is very valuable systematic information that must be considered in any future systematic treatment of the species involved.

This book is worthy of further consideration, more than space allows here. It is required reading for all coleopterists, ecologists, and is a pacesetter for all of those interested in the broad aspects of speciation and evolution.

BEETLE TALK

Students of the Curculionidae will be interested in knowing of the existence of the Boll Weevil Record Company, which has recently released the second record of jazz music by the Boll Weevil Jazz Band. This probably represents a new "record" in the distribution of the boll weevil, for the Band is located in Ann Arbor, Michigan!

LITERATURE NOTICE

Horn and Kahle (1935-1937) listed the location of entomologists' collections. A supplement, bringing the list up to date, has been published by Hans Sachtleben, 1961, Beiträge zur Ent. 11(5-6):481-540.

BOOK REVIEW

CATALOGUS COLEOPTERORUM FENNOSCANDIAE ET DANIAE, by V. Hansen, E. Klefbeck and O. Sjoberg, G. Stenius, A. Strand. Edited by Carl H. Lindroth. Published by Entomologiska Sallskapet I Lund. 1960. 476 pp. 1 map.—This list of the Coleoptera found in northern Europe, edited by Dr. Carl H. Lindroth, presents the combined lists of Denmark by Victor Hansen, Sweden by Einar Klefbeck and Oscar Sjöberg, Finland by Gunnar Stenius, and Norway by Andreas Strand, along with a list for the British Isles by A. A. Allen and Northern Germany by Ad. Horion.

Presentation follows the system used in the 1939 catalog of species found in the same area with a few important chages. In this list the species of each genus are listed alphabetically, a much preferable arrangement for large genera. Distribution is shown for Sweden in seven rather than two provinces. For Norway and Fenescandia (Finland and neighboring provinces of Russia) provinces are combined two to a column to save space, the distribution being indicated by a full circle, right or left semicircle.

The arrangement used requires four consecutive pages with the species names duplicated down the left side of the first and third pages, with columns across the opposing pages headed by country and province. Thus the first two pages include columns for 19 provinces of Norway and 16 for Fenoscandia; the following two pages cover 30 areas of Sweden, 3 of Denmark and one each of Northern Germany and the British Isles. Outlines of the various provinces with the abbreviations designating each are superimposed in red on a map of northern Europe to delimit the exact areas involved.

The numbers of species listed for each country are: Denmark, 3,485; E. Fennoscandia, 3,443; Norway, 3,091; and Sweden, 4,058. Northern Germany and the British Isles are not summarized.—O. L. Cartwright, U. S. National Museum.

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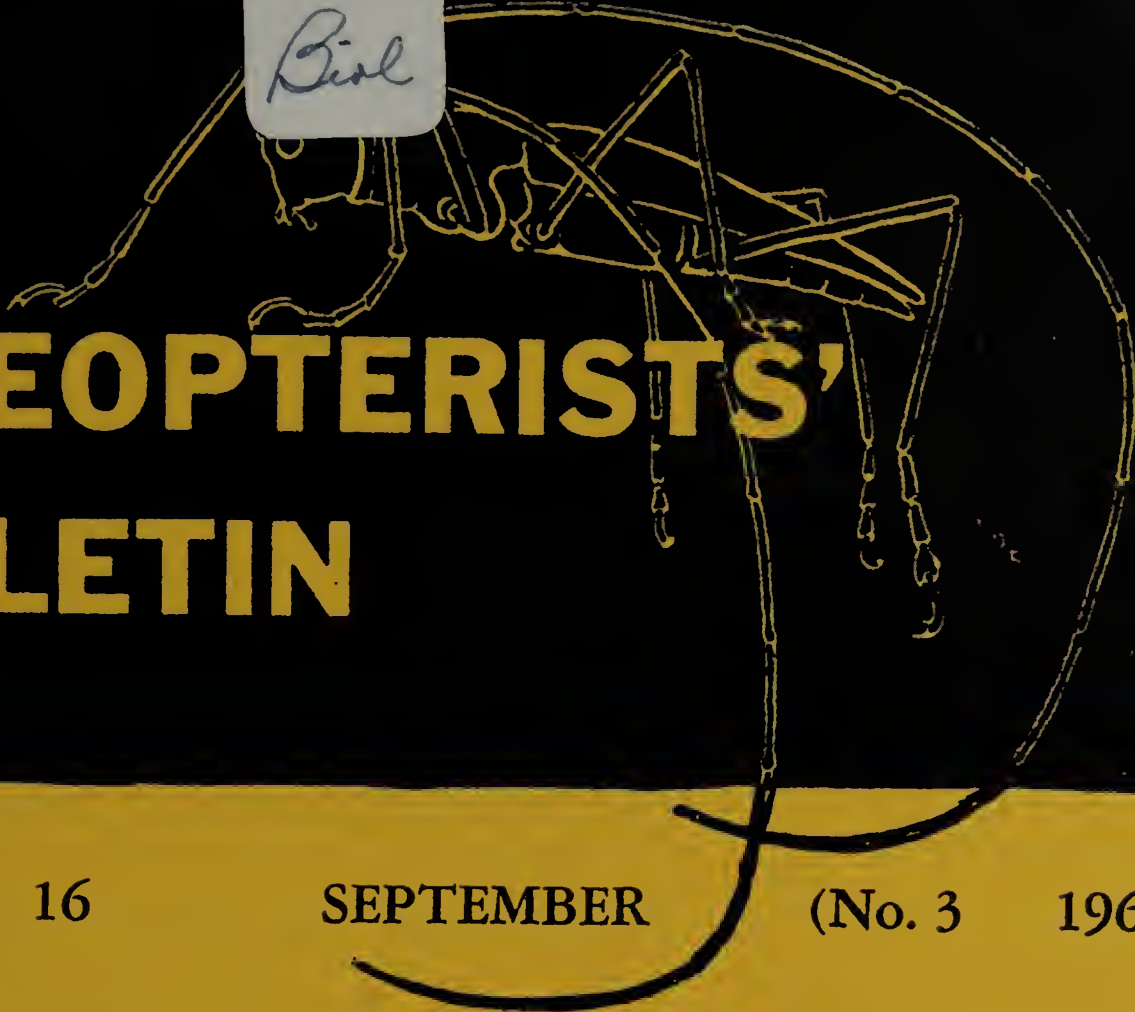

V16
No 3

VOLUME 16 SEPTEMBER (No. 3 1962

ARTICLES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

Subscriptions: The subscription price for each annual volume of four numbers is $5.00 payable in advance. All subscriptions begin with the first issue of the year and those subscribing later in the year will receive the back issues of the volume.

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 16 September (No. 3) 1962

THE GENUS TRECHUS (COLEOPTERA: CARABIDAE: TRECHINI) IN THE SOUTHERN APPALACHIANS[1]

By THOMAS C. BARR, JR.[2,3]

The carabid fauna of the southern Appalachians has been characterized by Darlington (1943) as incompletely known, but well sampled. Like other mountain faunas it has comparatively few species, most of them geophiles and "more than half of all species, and a large majority of geophiles alone" are effectively wingless. It is a fauna which has been formed by "elimination and concentration, but with some later multiplication of species" in wingless stocks.

Among the more abundant, wingless geophiles are the species of the genus *Trechus* Clairville. The *Trechus* of the southern Appalachians are small (2.4-5.0 mm.), wingless geophiles restricted to cool, moist microhabitats. All are black or pale piceous and shining, either highly polished or (usually) with finely alutaceous microsculpture. Jeannel (1927, 1931) recognized 5 species from western North Carolina—*T. carolinae* Schaeffer, *T. schwarzi* Jeann., *T. beutenmulleri* Jeann., *Microtrechus vandykei* Jeann., and *M. barberi* Jeann. Although the species belonging to *Microtrechus* are readily distinguishable on the basis of the male protarsus (only one segment enlarged instead of two as in *Trechus*), and although they form a geographically compact group (as will be demonstrated), I do not believe

[1] This investigation was supported by a grant (G-12968) from The National Science Foundation.

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[3] *Acknowledgments.*—I am indebted to the following individuals and their respective institutions for loan of specimens: P. J. Darlington, Jr., Museum of Comparative Zoology, Harvard University; Henry Dietrich, Cornell University; Harold J. Grant, Jr., Academy of Natural Sciences, Philadelphia; O. L. Cartwright, U. S. National Museum; and J. G. Rozen, Jr., American Museum of Natural History. To the following park naturalists I am grateful for collecting permits and other assistance: Conley L. Moffett, Chief Park Naturalist, North Carolina Department of Conservation and Development; Garrett Smathers, District Naturalist, Blue Ridge Parkway; and Arthur Stupka, Chief Naturalist, Great Smoky Mountains National Park. Mr. J. C. Nicholls, Jr., Murphy, North Carolina, gave freely of his time and expert knowledge of the southern Appalachians and their fauna. Dr. William H. Adams, Tennessee Wesleyan College; Dr. and Mrs. Ross T. Bell, University of Vermont; Mr. Stewart Peck, Davenport, Iowa; Mr. William Rosenberg, Balsam, N.C.; and Mr. B. C. Stewart, Cookeville, Tennessee, assisted in collection of some of the material. Mr. Harrison R. Steeves, Jr., Birmingham, Alabama, donated for study a large series of *Trechus beutenmulleri* taken in the Black Mountains. Finally, I wish especially to acknowledge the zeal, initiative, and collecting technique of Mr. Melvin C. Bowling, who assisted me, both in field and laboratory, throughout this investigation.

that the retention of *Microtrechus* as a full genus serves any useful taxonomic purpose, based as it is on a single character. Accordingly, in the present paper, I have reduced *Microtrechus* to subgeneric status.

Methods and Scope.—In June and September, 1959, preliminary collections were made on Roan Mountain, Carter Co., Tenn.-Mitchell Co., N.C.; Grandfather Mountain, Avery Co., N.C.; Mt. Mitchell, Yancey Co., N.C.; and Clingmans Dome and Mt. Collins, Sevier Co., Tenn.-Swain Co., N.C. During July and August, 1960, M. C. Bowling and I collected approximately 1500 *Trechus* from about 50 localities between White Top Mountain, Grayson Co., Virginia, and Rabun Bald, Rabun Co., and Brasstown Bald, Union Co., Georgia. A few additional collections were made in the Great Balsam and Smoky Mountains in May, 1961. Other specimens, primarily from caves, were obtained from the adjacent Appalachian valley and Cumberland plateau. In this paper no attempt has been made to treat species of *Trechus* outside this area. The beetles were taken by hand and preserved in Barber's fluid, degreased in ether, and pointed. Male genitalia were dissected from nearly 200 specimens and permanently cleared and mounted in Down's medium by the method I have described elsewhere (Barr 1961). Measurements were taken with a calibrated ocular micrometer, and drawings of the cleared genitalia were made with a camera lucida. The following abbreviations are employed: TL total length, HL head length, HW head width, PL pronotum length, PW pronotum width, EL elytra length, EW elytra width, ANT antenna length. All lengths are measured along the mid-line, and all widths are maximum widths; the head length is measured from the anterior margin of the labrum. All measurements are given in millimeters.

Holotypes have been deposited in the U. S. National Museum.

GEOGRAPHY

The many chains of the southern Appalachians are difficult to define. There are at least six major massifs of special importance to the present discussion because of the species of *Trechus* which occur in them. Their precise location and topography may be ascertained by examination of small-scale topographic maps, such as the Army Map Service 1:250,000 series (NJ 17-10 Johnson City, NJ 17-11 Winston-Salem, NI 16-3 Chattanooga, and NI 17-1 Knoxville).

Roan Mountains. A short chain, along the border between Carter Co., Tennessee, and Mitchell Co., North Carolina. "Roan Mountain" itself is readily accessible by paved U.S. Forest Service road; its highest point, Roan High Bluff, has an elevation of 6313 feet.

Black and Great Craggy Mountains. These two *en echelon* chains in Yancey and Buncombe counties, North Carolina, extend north and south, in contrast to the general northeast-southwest strike of most of the Appalachians. For zoogeographical purposes, they may be considered a single unit. Both ranges contain several peaks over 6000 feet in elevation, and Mt. Mitchell, in the Blacks, is the highest point in eastern America, with an elevation of 6684 feet. The Blacks and Craggies are readily accessible by the Blue Ridge Parkway and the road into Mt. Mitchell State Park.

Great Balsam Mountains. A U-shaped chain, south of Waynesville and Canton, along the Haywood-Transylvania and Haywood-Jackson County boundaries, North Carolina. The eastern arm, terminating in Mt. Pisgah (el. 5721 feet), is sometimes called "Pisgah Ridge," or in older usage, "Pisgah Ledge." The western arm includes the highest peaks, many over 6000 feet, with a maximum elevation of 6370 feet at the summit of Richland Balsam. To the north, between Lickstone Ridge and Cold Mountain, the range is deeply cleft by the West Fork of Pigeon River, along which lies the settlement of Retreat, given as type locality for *Microtrechus barberi* Jeann. and as a locality record for *Trechus schwarzi* Jeann. "Pisgah Ledge" is readily accessible via the Blue Ridge Parkway, and the section of the Parkway from Beech Gap to Balsam Gap, through the western arm of the Balsams, is now under construction.

Plott Balsam Mountains.—The Plott Balsams are a short range separating the Great Balsams and Great Smokies, and extend northeast-southwest from Waynesville to Sylva, in Haywood and Jackson Counties, North Carolina. The highest point, Water Rock Knob, has a summit elevation of 6292 feet. The Plott Balsams are readily accessible via a newly completed segment of the Blue Ridge Parkway; more remote portions, such as Junaluska Balsam (=Jones Knob), can be reached on foot by logging road.

Great Smoky Mountains.—Extending for more than 50 miles along the Tennessee-North Carolina border, the Great Smokies, by their massive size and extent, aptly deserve Arnold Guyot's appellation of "Citadel" of the Appalachians. The highest point is Clingman's Dome (el. 6642 feet). The Canadian spruce-fir forest characteristic of high elevations throughout most of the Appalachians reaches its southernmost extension in the Smokies. The entire chain, including a southward extension at the east end ("Balsam Mountain"), lies within Great Smoky Mountains National Park. At the northwest boundary of the Park, *Trechus* occurs in caves developed in the Knox dolomite where it is exposed in windows in the Great Smoky Mountains thrust sheet.

Unicoi Mountains.—This range separates Monroe Co., Tennessee, and Graham Co., North Carolina, and has a length of approximately 20 miles. The highest peak, Haw Knob, has an elevation of 5500 feet. The Unicoi Mountains are accessible by primitive U. S. Forest Service road from Tellico Plains on the Tennessee side, or by foot trail from Joyce Kilmer Memorial Forest in North Carolina.

ECOLOGY

The most striking observation made about the ecology of the species of *Trechus* studied in this investigation is their rigid restriction to cold, wet microhabitats. Except for the cave and sinkhole species, only three specimens were collected at altitudes below 4500 feet. Two individuals, both females but each of a different species not determinable with certainty, occurred along Little River two miles upstream from Elkmont, Sevier Co., Tennessee, at an elevation of 2300 feet. A single male *T. barberi* was taken in the gorge below Whitewater Falls, Jackson Co., North Carolina, at an elevation of 2400 feet. Both localities are kept cold and damp by the proximity of mountain streams.

The summits and north and northwest faces of the mountains, on the side toward the prevailing winds, are generally much more favorable *Trechus* localities, and appear to be consistently colder and damper. The westernmost ranges—Roan Mountain, the Bald Mountains, the Great Smokies, and the Unicoi Mountains—are damper and have a more luxuriant moss flora, which facilitates the collection of *Trechus*. Most of the large series, and almost all of the local endemics, were collected within or near the edge of the Canadian forest of red spruce (*Picea rubens*) and Fraser fir (*Abies fraseri*), which extends southward to the Great Balsams, Plott Balsams, and eastern two-thirds of the Great Smokies.

The two primary substratum requirements of a montane *Trechus* microhabitat appear to be contact with a rock surface and the presence of rich humus or duff. A majority of species thus are found under carpets of moss, on rock ledges, boulders, and low cliffs. The moss must be light and spongy, retaining moisture readily, yet insuring good drainage and aeration. The species of *Hylocomium,* which have feathery leaves, are ideally suited, since they form compact, light, airy, damp mats which may be several square yards in area. Roots of trees, various small angiosperms, and occasional ferns and other mosses provide local variability in the composition of the *Hylocomium* mats. When such a mat is rolled back from the boulder or rock outcrop it covers, a characteristic moss mat arthropod fauna is observed scurrying across the rock surface or struggling in the moss rhizoids. In addition to *Trechus,* the common components are earthworms, pseudoscorpions (esp. *Neobisium carolinense*), spiders, mites (chiefly predatory species, but oribatids are locally numerous), millipedes, centipedes (esp. geophilomorphs), symphylans, collembolans, diplurans (esp. japygids), and beetles of the families Staphylinidae and Pselaphidae (genera *Batrisodes, Batriasymmodes,* and rarely *Arianops*). Other carabids are not uncommon, especially *Bembidion* (*Amerizus*) *oblongulum* Hbst., *Pterostichus adoxus* (Say), *Agonum hypolithum* (Say), *A. trifoveolatum* (Beut.), and various Cychrini (*Sphaeroderus canadensis* Chd., *Sph. multicarinatus* Darl., *Scaphinotus andrewsi* Harris, *Sc. tricarinatus* Csy., *Sc. viduus irregularis* Beut., and various small, endogenous *Scaphinotus* of the subgenus *Maronetus* Csy.). Plethodontid salamanders are sometimes encountered, and include *Desmognathus ochrophaeus carolinensis* Dunn, *D. wrighti* King, *Plethodon jordani* subspp., and *Eurycea bislineata wilderae* Dunn. *Trechus* larvae, apparently of *beutenmulleri,* were taken from an extensive moss mat on Roan Mountain. Within the moss mat community there are thus numerous potential food species as well as many potential predators, as far as *Trechus* is concerned.

Other species of mosses form less suitable mats. Those of *Polytrichum* spp. and *Dicranium* spp. are too dense, and those of *Sphagnum* spp. too wet and poorly aerated. The mats formed by *Thuidium* spp. usually retain moisture poorly, but in ravines or on shady summits will sometimes harbor a typical mat fauna, including *Trechus.*

Accumulations of forest floor duff, lightly bound together by rootlets, can serve a function similar to that of the moss carpets. Such accumulations seem especially favorable where piled against the base of wet, vertical, or steeply sloping rock faces. The top 10 to 25 cm can usually be pushed back with a small trowel or other collecting tool, and the *Trechus* are then found walking across the rock.

The temperature of the moss and duff mats sampled ranged between 13°-18° C. in July and August, 1960, with a mean of about 14°. Mat temperatures are directly related to circumambient air temperatures, but apparently fluctuate more slowly, within narrower limits, probably because of the insulating effect of the adjacent rock.

Certain species of *Trechus* are more commonly found in loose piles of rock fragments and black, podzolic humus and rootlets, especially in gullies and on low banks in seepage areas at high altitudes. Two species with small eyes and pale coloration belong in this category. One species, *T. beutenmulleri,* although restricted to altitudes above 5000 feet, ranges through many microenvironments, occurring under moss, under rocks in ravines, under and inside rotting logs, and in spruce and fir needle duff.

The cave and sinkhole *Trechus* exist in an environment of high relative humidity and nearly constant temperature (13°-15° C.). The species described from the Cumberland plateau was on one occasion found in a strictly epigean locality—in a deep gorge, among wet rocks at a cold spring, at 16°.

TAXONOMY

Key to Trechus of the Southern Appalachians and Cumberland Plateau (Males only)

1\. Males with first and second segments of front tarsus enlarged ---Subgenus **TRECHUS** s.str. 2

Males with first segment only of front tarsus enlarged --Subgenus **MICROTRECHUS** Jeannel 3

2(1). Aedeagus unusually elongate, the apex produced, attenuate, more or less inflected before the tip; left copulatory piece rod-like and half as long as the spatulate, marginally serrulate right piece within which it lies; internal sac armed with very small scales and provided with a dorsal, wing-like extension (fig. 1-5)---**HYDROPICUS** group 5

Aedeagus large, long and slender, strongly arcuate in left lateral view, the apex curved strongly to the left in dorsal view; left copulatory piece rod-like, almost as long as the spatulate right piece, both pieces usually with serrated margins; internal sac armed with scales, but without a wing-like extension (figs. 6-9) ---**CAROLINAE** group 8

3(1). Aedeagus more or less strongly arcuate, the apex gradually attenuate, the tip usually slightly rounded and reflexed but never hooked; internal sac with very small or moderate scales -- 4

Aedeagus provided with an apical hook, the apex more or less produced (figs. 16-20); internal sac armed with large, prominent scales (except in one species)---**UNCIFER** group 15

4(3). Size smaller (2.4-3.3 mm.); scutellar stria of elytra obsolete; transfer apparatus of two lightly sclerotized, lamellar copulatory pieces, the left small and triangular, the right large and apically rounded; internal sac armed with very small, indistinct, blunt or apiculate scales, sparsely set (figs. 11-15)----------**VANDYKEI** group 11

Size larger (3.3-5.0 mm.); scutellar stria of elytra well developed (except in one large species); transfer apparatus of two variable copulatory pieces, but always heavily sclerotized and unusually large and prominent; internal sac armed with medium-sized scales, thickly set in oblique rows, blunt toward the base of the sac and apiculate near the apex (figs. 21-27)----------------**NEBULOSUS** group 19

5(2). Size smaller (2.7-3.5 mm.); pronotum ½ wider than long; first discal puncture behind level of 4th marginal humeral puncture; Grayson Co., Virginia, southwestward to Buncombe Co., N.C.---------------------------------**BEUTENMULLERI** 6

Size larger (3.8-4.4 mm.); pronotum 1/3 wider than long; first discal puncture at level of 3rd marginal humeral puncture; known only from Roan Mountain, Tenn.-N.C. -- **ROANICUS** n. sp.

6(5). Apex of aedeagus knobbed or conspicuously inflected ---------------------------- 7

Apex of aedeagus simply attenuate, only slightly inflected (fig. 2); Carter Co., Tenn., southwestward to Buncombe Co., N.C. --- **BEUTENMULLERI BEUTENMULLERI** Jeannel

7(6). Apex of aedeagus bearing a small but prominent knob (fig. 3); Ashe Co. to Avery Co., N.C. ------------------------------------ **BEUTENMULLERI AVUS** n. subsp.

Apex of aedeagus not knobbed but conspicuously inflected (fig. 4); Grayson Co., Va.-- -- **BEUTENMULLERI CANUS** n. subsp.

8(2). Size small (3.4-4.2 mm.); elytra 7/10 to 3/4 as wide as long, subconvex; pronotum 1/3 to 2/5 wider than long -- 9

Size large (4.4-4.8 mm.); elytra 4/5 as wide as long, very convex; pronotum only 1/4 wider than long; known only from the summit of Mt. Mitchell, N.C. ------ -- **CAROLINAE** Schaeffer

9(8). Apex of aedeagus attenuate, the apical knob rounded ------------------------ 10

Apex of aedeagus not appreciably attenuated, the apical knob with a sharp ventral carina (fig. 8); Black Mountains and adjacent ranges, N.C. --- **MITCHELLENSIS** n. sp.

10(9). Apical knob of aedeagus larger (fig. 7); right copulatory piece not apically truncate; Great Balsam, Great Craggy, and Black Mountains, N.C. --------- **SCHWARZI** Jeannel

Apical knob of aedeagus smaller (fig. 9); right copulatory piece apically truncate; Cumberland plateau of Tenn. and Ky.---------------------- **CUMBERLANDUS** n. sp.

11(4). Size smaller (2.4-2.9 mm.); pronotum nearly 1/2 wider than long ---------------- 12

Size larger (2.8-3.3 mm.); pronotum about 2/5 wider than long --------------- 13

12(11). Sides of pronotum arcuate to basal sinuosity; aedeagus (fig. 11) smaller (0.43-0.48 mm.); Greene Co., Tenn., to Jackson Co., N.C., exclusive of Great Smoky Mountains; common --------------------------------------- **VANDYKEI** Jeannel

Sides of pronotum arcuate only in apical half, then convergent to the obtuse, almost rounded hind angles; aedeagus (fig. 12) larger (0.65-0.70 mm.); known only from Great Smoky Mountains ---------------------------------- **BOWLINGI** n. sp.

13(11). Aedeagus smaller (0.64-0.82 mm.); head as wide as long; antenna slightly less than half the body length -- 14

Aedeagus (fig. 15) larger (0.85-0.92 mm.); head slightly wider than long; antenna 3/5 the body length; known only from Haywood Co., N.C. ----------- **SUBTILIS** n. sp.

14(13). Aedeagus (fig. 14) slender, broadly inflected before the apex; apex of pronotum 1/10 wider than base; apical recurrent groove elongate, laterally inflected, usually curved at anterior end; known only from Thunderhead Mountain, Blount Co., Tenn.-- **TONITRU** n. sp.

Aedeagus (fig. 13) thicker, gradually attenuate and not inflected; apex and base of pronotum subequal; apical recurrent groove short, not inflected, oblique to suture; mountain region of Tenn., N.C., and Ga. south of French Broad River; common -- -- **BARBERI** Jeannel

15(3). Size smaller (2.7-3.5) mm.); internal sac of aedeagus armed with conspicuous, apiculate scales -- 16

Size larger (3.6-4.0 mm.); internal sac of aedeagus armed with small spines only; eyes small, integument pale piceous; Great Smoky Mountains ------------ **VERUS** n. sp.

16(15). Head rounded, its length and width subequal; aedeagus smaller (0.66-1.03 mm.), 1/3 the body length or less -- 17

Head slightly transverse, 1/12 wider than long; aedeagus (fig. 17) very large (1.47-1.49 mm.), about 0.45 the body length; Great Balsam Mountains **SATANICUS** n. sp.

17(16). Aedeagus smaller (0.66-0.81 mm.); apex only slightly produced, the apical hook broadly rounded and reflexed -- 18

Aedeagus (fig. 16) larger (0.88-1.03 mm.), apex abruptly narrowed and greatly produced, the apical hook a sharp, reflexed barb; scales of internal sac extremely large and prominent, totally obscuring transfer apparatus; Great Smoky Mountains and Plott Balsam Mountains---------------------------------- **UNCIFER** n. sp.

18(17). Size larger (3.1-3.4 mm.); aedeagus (fig. 19) larger (0.79-0.81 mm.); eye diameter equal to length of scape; Great Balsam Mountains, N.C.------------ **ADUNCUS** n. sp.

Size smaller (2.7-3.0 mm.); aedeagus (fig. 20) smaller (0.66-0.73 mm.); eye diameter about 8/10 length of scape; Unicoi Mountains------------------- **TALEQUAH** n. sp.

19(4). Size smaller (3.3-4.3 mm.); in mountains or in caves------------------------ 20

Size larger (4.3-5.0 mm.); known only from mountain peaks over 6000 feet in elevation --- 25

20(19). Right copulatory piece of aedeagus twisted into the shape of a bird's head (fig. 21); margins of pronotum not sinuous; hind angles large, blunt, obtuse, and reflexed; known only from high conifer forests in Great Smoky Mountains----**NEBULOSUS** n. sp.
Right copulatory piece not as described; margins of pronotum with basal sinuosity; hind angles small, sharp, subquadrate, acute---------------------------- 21

21(20). Color pale, reddish-piceous; eyes small (about 0.15 mm.); longitudinal striation of elytra fairly well developed, with inner 5 or 6 striae complete; known only from caves and sinkholes in East Tennessee ------------------------------------ 22
Color black to dark piceous; eyes large (0.20-0.24 mm.); external elytral striae obsolescent; intervals with faint rows of micropunctures; known only from high altitudes in the Plott Balsam, Great Smoky, and Unicoi Mountains------------ 24

22(21). Aedeagus (fig. 22) smaller (0.85-0.90 mm.); anterior discal puncture of elytra placed anterior to the 4th marginal humeral puncture; hind angles of pronotum subquadrate; right copulatory piece ⅓ longer than left piece, apically rounded and enlarged; Tuckaleechee Caverns, Blount Co., Tenn.---------**TUCKALEECHEE** n. sp.
Aedeagus (fig. 23) larger (1.02-1.07 mm.); anterior discal puncture at the level of the 4th marginal humeral puncture; hind angles of pronotum acute; copulatory pieces subequal, slender, and strongly arcuate--------------**TENNESSEENSIS** n. sp. 23

23(22). Clypeus with a pair of small grooves internal to extension of frontal grooves onto clypeus; labrum singly emarginate; known only from Berry Cave, Roane Co., Tennessee--**TENNESSEENSIS** s. str.
Clypeus without internal grooves; labrum doubly emarginate; known only from sinkhole outside Bull Cave, Blount Co., Tenn.------------**TENNESSEENSIS TAURICUS** n. subsp.

24(21). Aedeagus (fig. 24) larger (0.93-1.05 mm.); size smaller (3.6-3.9 mm.); margins of pronotum sinuate only briefly, in basal 1/20; Plott Balsam Mountains, N.C.-- --**BALSAMENSIS** n. sp.
Aedeagus (fig. 25) smaller (0.63-0.73 mm.); size larger (3.7-4.4 mm.); margins of pronotum sinuate in basal 1/9 or 1/10; Great Smoky Mountains and Unicoi Mountains--**LUCULENTUS** n. sp.

25(19). Form convex, larger (4.5-5.0 mm.); color black; margins of pronotum with shallow sinuosity in basal 1/10; scutellar stria present; right copulatory piece of male transfer apparatus expanded, hatchet-shaped, 1/5 longer than from left piece (fig. 26); Plott Balsam and Great Balsam Mountains, N.C.--------**ROSENBERGI** n. sp.
Form subdepressed, smaller (4.2-4.7 mm.); color pale piceous; margins of pronotum not sinuous; scutellar stria obsolete; both copulatory pieces extremely slender and elongate, the right piece only slightly longer than the left, both pieces subequal in width (fig. 27); known only from Clingmans Dome in Great Smoky Mountains-- --**NOVACULOSUS** n. sp.

Subgenus Trechus s. str.

HYDROPICUS GROUP

Length 2.7-4.4 mm. Integument dark piceous, shining; legs and palps pale piceous. *Head* rounded or slightly wider than long; labrum emarginate; eyes moderately convex, their diameter equal to or slightly less than length of scape; antennae half body length or less. *Pronotum* transverse, ⅓ to ½ wider than long; hind angles moderate to large. *Elytra* ¾ as wide as long, convex; longitudinal striae feeble, the inner 4 or 5 complete and external striae obsolescent; apical recurrent groove rather short, arcuate, then subparallel to suture, entering 5th longitudinal stria at or before level of the apical discal puncture; anterior discal puncture at or before level of the 4th marginal humeral puncture. *Aedeagus* unusually elongate, apex drawn out, attenuate, more or less inflected before tip, which may be slightly knobbed or not; left copulatory piece rod-like and half as long as spatulate, marginally serrulate right piece within which it lies; internal sac armed with very small scales and provided with a dorsal, wing-like process.

Type-species: *T. hydropicus* Horn.

I have more closely circumscribed this species group than Jeannel (1931) did, removing *carolinae, schwarzi,* and their relatives. *Trechus hydropicus* is a poorly known species whose type locality is simply "Va." In the U.S. National Museum is a broken male, collected by Ulke, which is probably part of the original type series. I have seen a few other specimens from "Virginia," "West Virginia," and "Maryland," which apparently are conspecific, but it is impossible to define the range of *hydropicus* from such inadequate material. It is probably distributed through the northwestern part of Virginia and adjacent ranges of the Appalachians in West Virginia, Maryland, and perhaps Pennsylvania, but extensive collecting is required to establish this. The aedeagus of the Ulke specimen (fig. 1) is so similar to that of *beutenmulleri* that the two species are undoubtedly closely related, perhaps geographic variants of an abundant, wide-ranging polytypic species. But *hydropicus* as currently defined does not occur within the area covered by the present study, and I am reluctant to alter Jeannel's (1931) arrangement without better material.

Trechus (T.) beutenmulleri beutenmulleri Jeannel [NEW STATUS]
(FIG. 2)

Trechus Beutenmulleri Jeannel 1931: 436. Type: Mt. Mitchell, N.C. (Mus. Nat. Hist. Nat., Paris).

T. hydropicus: Schaeffer 1901: 212, pl. 28, fig. 4; Casey 1918: 410; Jeannel 1927: 191, fig. 589-591.

Similar to *hydropicus* Horn, differing in the more elongate head, more transverse pronotum, and more convex elytra.

Length 2.7-3.5, mean 3.0. Dark piceous, form short, robust and convex. *Head* about as long as wide; eyes moderately convex, their diameter (0.16) slightly less than length of scape; antenna less than half (0.45) body length. *Pronotum* 1/2 wider than long; apex 9/10 of base width, and base width 3/4 of maximum width, which occurs in apical 1/3; margins arcuate in apical 1/2, then convergent to brief basal sinuosity; hind angles small, rounded, and right; basal foveae short and linear, separated from the marginal gutter by a low ridge. *Elytra* 3/4 as wide as long, convex; inner four longitudinal striae complete, outer striae obsolescent or obsolete; apical recurrent groove subparallel to suture at anterior end, running into 5th longitudinal stria in advance of apical discal puncture; first discal puncture behind level of the 5th marginal humeral puncture. *Aedeagus* 0.80-0.94, mean 0.87; elongate, the basal bulb large and deflexed, with a slight inflection just before apex; copulatory pieces very elongate, the left rod-like and half as long as the curved, spatulate right piece within which it is nested; margins of both pieces serrulate; internal sac armed with very small, sparsely scattered scales, and provided with a wrinkled, membranous, dorsal, wing-like process apparently characteristic of the species group; parameres elongate, with 4 long setae.

Topotype male (Mt. Mitchell, in author's collection): TL 3.48, HL 0.73, HW 0.71, PL 0.67, PW 1.02, EL 2.08, EW 1.55, ANT 1.55.

Distribution: NORTH CAROLINA: Mt. Mitchell, Yancey Co.; Roan Mountain, Mitchell Co.; Craggy Dome and Balsam Gap, Buncombe Co. TENNESSEE: Roan Mountain, Carter Co.; Unaka Mountain, Unicoi Co.; Camp Creek Bald, Greene Co. The range thus extends southwestward from Roan Mountain through the Bald Mountains along the Tennessee-North Carolina border and eastward to the Black and Great Craggy Mountains to the edge of the Blue Ridge.

Trechus (T.) beutenmulleri avus NEW SUBSPECIES
(FIG. 3)

Similar in all respects to *beutenmulleri* s. str. except that the apex of the aedeagus bears a small but very distinct knob instead of being simply attenuate.

Holotype male (U.S.N.M. 65973) and numerous paratypes, Grandfather Mountain, Avery Co., North Carolina, 22 Aug. 1960 (TCB/MCB); additional paratypes from Grandfather Mountain, June, 1959, and from Three Top Mountain, Ashe Co., N.C., August, 1960. Known only from these two localities, which are about 25 miles apart along the Blue Ridge.

Trechus (T.) b. beutenmulleri X *beutenmulleri avus*

A series of 14 *beutenmulleri* from near the summit of Beech Mountain, at Banner Elk, Avery Co., N.C., exhibits aedeagal characteristics intermediate between the nominate race and *b. avus,* and is here regarded as a case of intergradation. The series includes specimens with both the *beutenmulleri* and *avus* aedeagal apices, as well as morphological intermediates which have a rather blunt, rounded, but not enlarged apex. Geographically, Beech Mountain is 7 miles north of Grandfather Mountain and 15 miles northeast of Roan Mountain.

Trechus (T.) beutenmulleri canus NEW SUBSPECIES (FIG. 4)

Distinguished from *b. beutenmulleri* and *b. avus* by the character of the aedeagal apex, which is thickened and more sharply inflected, but does not bear a distinct knob.

Holotype male (U.S.N.M. 65974) and 33 paratypes, White Top Mountain, Grayson Co., Virginia, 18 July 1960 (TCB/MCB). Known only from the type locality, which is 17 miles north and a little west of Three Top Mountain.

Trechus (T.) roanicus NEW SPECIES (FIG. 5)

A large species of the *hydropicus* group, readily distinguished from *beutenmulleri* by its larger size and by the position of the anterior and apical discal punctures of the elytra.

Length 3.8-4.4, mean 4.1. Dark piceous, shining, rather convex and robust. *Head* 3/20 wider than long; labrum deeply emarginate; eye diameter 0.20, 1/4 head length and subequal to length of scape; antenna half total body length. *Pronotum* 1/3 wider than long; base 1/8 wider than apex; width of base 3/4 maximum width, which occurs at apical 1/4; margins rounded apical 3/4, gradually becoming subparallel in basal 1/4; hind angles large and right. *Elytra* convex, 3/4 as wide as long; longitudinal striation feeble, with inner 5 striae complete and outer striae obsolete; apical recurrent groove short, running into 5th longitudinal stria at level of apical discal puncture, which is placed rather close to apical margin; anterior discal puncture at level of 3rd marginal humeral puncture. *Aedeagus* 1.14-1.26, similar to that of *beutenmulleri* but larger; apex slightly knobbed; parameres with 4 long setae.

Holotype male (U.S.N.M. 65977) and 34 paratypes, Roan Mountain, Carter Co.; Tennessee, 12 July 1960 (TCB/MCB). *Holotype male:* TL 4.17, HL 0.73, HW 0.84, PL 0.86, PW 1.18, EL 2.58, EW 2.04, ANT 2.04.

Distribution: Known only from the type locality at Roan High Knob (el. 6313 feet) on Roan Mountain.

CAROLINAE GROUP, NEW GROUP

Length 3.4-4.8 mm. Integument dark piceous, often almost black, shining; legs and usually elytral margin pale piceous. *Head* rounded; labrum singly emarginate; eyes subconvex or convex, their diameter about equal to length of scape; antenna half body length. *Pronotum* transverse, 1/4 to 2/5 wider than long; hind angles usually of moderate size (large in *schwarzi*) and somewhat reflexed; basal foveae separated from marginal gutter by a low ridge. *Elytra* 7/10 to 8/10 as wide as long, moderately to prominently convex; longitudinal striae feebly impressed, inner 4 always distinguishable, sometimes all striae complete; apical recurrent groove arcuate, short, oblique to suture, running into the 5th longitudinal stria at or a little anterior to level of the apical discal puncture; anterior discal puncture slightly in advance of or at level of 4th marginal humeral puncture. *Aedeagus* large, long and slender, strongly arcuate in left lateral view, apex curved strongly to left in dorsal view and bearing an apical knob, variously modified in different species; transfer apparatus of a rod-like left copulatory piece nested within a broad, sinistrally concave, spatulate right piece, both pieces sometimes with serrulations; internal sac armed with small spines.

Type-species: *T. (T.) carolinae* Schaeffer.

Trechus (T.) carolinae Schaeffer
(Fig. 6)

Trechus carolinae Schaeffer 1901: 212, pl. 28, fig. 5. Type: Mt. Mitchell, N.C. (Am. Mus. Nat. Hist.). Jeannel 1931: 439.

T. carolina: Casey 1918: 409.

Distinguished from all other *Trechus* s. str. in the southern Appalachians by its large size, as well as the proportions of the pronotum and elytra and the aedeagal characteristics.

Length 4.4-4.8, mean 4.6. Pale, reddish-piceous, robust and very convex, shining. *Head* only slightly wider than long; labrum shallowly emarginate; eyes subconvex, equal in diameter (0.22) to length of scape; antenna 0.55 the body length. *Pronotum* 1/4 wider than long; apex 6/7 width of base; base width 3/4 maximum width, which occurs in apical 1/4; margins arcuate in apical 1/2, then convergent and rather broadly reflexed to very brief basal sinuosity; hind angles moderate, sharp, and right; basal foveae separated from marginal gutter by low ridge. *Elytra* 4/5 as wide as long, very convex; longitudinal striae feebly impressed but all of them distinguishable; apical recurrent groove short, arcuate, oblique to suture, continuous with 5th longitudinal stria at level of apical discal puncture; first discal puncture placed before level of 4th marginal humeral puncture. *Aedeagus* 1.13-1.21, mean 1.17; basal bulb large and prominently keeled, apex long, gradually attenuate, its tip slightly knobbed; left copulatory piece rod-like, ventrally and apically serrulate; right piece broad and spatulate, obliquely truncate; internal sac armed with numerous small, apiculate scales; parameres long, with 4 long setae.

Topotype male (Mt. Mitchell, N.C., in author's collection): TL 4.45, HL 0.78, HW 0.82, PL 0.95, PW 1.18, EL 2.72, EW 2.14, ANT 2.46.

Distribution: Known only from the type locality, at the summit of Mt. Mitchell, where it is very rare; on two visits in July and August, 1960, I took only 8 specimens.

Trechus (T.) schwarzi Jeannel
(Fig. 7)

Jeannel 1931: 437. Type: probably from Retreat, Haywood Co., N.C. (U. S. Nat. Mus.).

Trechus hydropicus: Schaeffer 1901: 212 (in part)?

Distinguished from *T. carolinae* by the smaller size, and from all members of the group by the prominent, rounded apical knob of the aedeagus.

Length 3.4-3.8, mean 3.6. Dark piceous, robust, subconvex, shining. *Head* 1/10 wider than long; eyes rather small, not convex, their diameter (0.20) slightly less than length of scape; antenna half total body length. *Pronotum* 2/5 wider than long, widest at apical 1/4, apex 9/10 width of base; base width 7/10 maximum width; margins arcuate in apical 9/10, then subparallel; hind angles large, sharp, and right; basal foveae continuous with basal gutter medially but separated from marginal gutter by a ridge. *Elytra* 3/4 as wide as long, moderately convex; longitudinal striae feebly impressed, inner striae more prominent but all distinguishable; apical recurrent groove oblique to suture, running into 5th longitudinal stria in advance of apical discal seta; first discal seta at level of 4th marginal humeral seta. *Aedeagus* 1.23-1.38, long and arcuate, basal bulb large and prominently keeled, apex tapered and conspicuously knobbed; left copulatory piece thin and rod-shaped, nested in the broader, spatulate right piece, which has a serrulate margin; internal sac armed with numerous small, apiculate scales; parameres long and slender, with 4 long setae.

Paratype male (Retreat, Haywood Co., N.C., in author's collection): TL 3.84, HL 0.73, HW 0.80, PL 0.78, PW 1.10, EL 2.33, EW 1.78, ANT 1.93.

Distribution: Jeannel (1931, pp. 437-439) gives the type locality as Roan High Knob, (Carter Co.), Tennessee, and records several examples from Retreat, N.C., which he believed was situated in the same region. However, Retreat is located in Haywood Co., N.C., near Lake Logan, some 65 miles southwest of Roan Mountain. More than 150 specimens of *Trechus* taken on Roan Mountain included no examples of *schwarzi* whatever. The U. S. National Museum collection contains a pair of *schwarzi* collected on Mt. Pisgah, near Retreat, by E. R. Quirsfeld (Sept. 1934). My own collections include 18 *schwarzi* from Craggy Dome, Buncombe Co., N. C., and a male from Mt. Mitchell, Yancey Co., N.C. Females from Tusquitee Bald, Clay-Macon Cos., N.C., and Camp Creek Bald, Greene Co., Tenn., may belong to *schwarzi.* It is probable that the entire type series came from Retreat, Haywood Co., N.C., in the surrounding Great Balsam Mountains, and that the "Roan High Knob" label on the type is a curatorial error. The material at hand indicates that *T. schwarzi* ranges from the northeastern edge of the Great Balsam Mountains, in Haywood Co., through the Great Craggy Mountains, Buncombe Co., to the Black Mountains, Yancey Co., N.C.

Trechus (T.) mitchellensis NEW SPECIES
(Fig. 8)

Superficially similar to *T. schwarzi* Jeann., but readily distinguished by the shorter, less attenuate aedeagal apex, by the sharp ventral carina on the apical knob, and by the differing copulatory pieces.

Length 3.6-4.2, mean 3.7. Dark piceous black, robust and subconvex, shining. *Head* as wide as long; eyes convex, their diameter slightly greater than length of scape; antenna almost half the body length. *Pronotum* 1/3 wider than long; apex less than 9/10 width of base; base width equal to pronotum length and 2/3 maximum width, which occurs in apical 1/3 a little posterior to anterior marginal setae; margins arcuate in apical 1/2, then gradually convergent, broadly reflexed but scarcely sinuate before hind angles, which are moderate, sharp, and right. *Elytra* 3/4 as wide as long, rather convex; inner 4 longitudinal striae feebly developed; outer striae obsolescent; apical recurrent groove oblique to the suture, running into 5th longitudinal stria a short distance in advance of the apical discal puncture; first discal puncture just anterior to 4th marginal humeral puncture. *Aedeagus* 1.21-1.30, mean 1.23; large, arcuate, and rather thick, the apex scarcely attenuate; basal bulb deflexed and bearing a large keel; apex provided with a large, rounded knob which bears a sharp, ventral carina; left copulatory piece a thick, somewhat flattened rod whose ventrolateral surface is armed with tiny scales; right piece blunt, its apex obliquely truncate, the left margin rolled and thickened; internal sac with numerous scales, a few apiculate ones near the apex; parameres long, bearing 4 long setae.

Holotype male (U.S.N.M. 65976) and numerous paratypes, Celo Mountain, Yancey Co., North Carolina, 21 Aug. 1960 (TCB/MCB); additional paratypes from Mt. Mitchell, Yancey Co.; Balsam Gap, Buncombe Co., and Pinnacle Mountain, McDowell Co. *Holotype male:* TL 3.86, HL 0.76, HW 0.78, PL 0.80, PW 1.06, EL 2.30, EW 1.69, ANT 1.78.

Distribution: Black Mountains, North Carolina, usually between 5000-5500 feet.

Trechus (T.) cumberlandus NEW SPECIES
(Fig. 9)

Closely similar to *T. schwarzi* Jeann., differing in the smaller hind angles of the pronotum, the smaller size of the aedeagus, the smaller apical knob, and the nature of the copulatory pieces.

Length 3.4-3.8, mean 3.6. Dark blackish piceous, robust and subconvex, shining. *Head* 1/10 longer than wide; eyes subconvex, their diameter (0.20) slightly greater than length of scape; antenna half body length. *Pronotum* 1/3 wider than long; apex 9/10 width of base; base width 4/5 the maximum width and equal to pronotum length; maximum width at apical 1/4; margins arcuate in apical 1/2 then convergent to very brief basal sinuosity; hind angles moderate, blunt, reflexed and right; smaller than in *schwarzi. Elytra* 7/10 as wide as long; longitudinal striae feebly impressed, only inner four complete; apical recurrent groove broad, arcuate, oblique to suture, running into 5th longitudinal stria anterior to apical discal puncture; first discal puncture anterior to level of 4th marginal humeral puncture. *Aedeagus* 1.14-1.24, mean 1.20; of same form as *schwarzi* but less strongly arcuate, apical knob smaller; left copulatory piece rod-like, its ventral edge with small spines; right piece spatulate and truncate, with inconspicuous serrations; parameres with 4 long setae.

Holotype male (U.S.N.M. 65975) and numerous paratypes, Elisha Steele Cave, 3 miles east of Monticello, Wayne Co., Kentucky, 3 Oct. 1959 (TCB and T. S. Treanor); additional paratypes from Jewett Cave, Cumberland Co., Tenn.; Falling Springs Cave, Overton Co., Tenn.; and Savage Gulf, Grundy Co., Tenn. *Holotype male:* TL 3.86, HL 0.80, HW 0.73, PL 0.76, PW 1.02, EL 2.30, EW 1.67, ANT 1.96.

Distribution: All four of the known colonies of *T. cumberlandus* are in the Cumberland plateau, giving a maximum range of about 100 miles.

Incertae sedis

Trechus (T.) dietrichi NEW NAME
(Fig. 10)

Trechus (s. str.) *Vandykei* Jeannel 1931: 439; nom nov. for *ruficollis* Van Dyke 1926: 66; type in Cornell Univ. coll.

The transfer of *Microtrechus* to *Trechus* has necessitated an unfortunate nomenclatural change involving an inadequately known species named *ruficollis* by Van Dyke and based on 4 specimens in the Crew collection, labeled "Lawrence, Massachusetts." Like Jeannel, I regard the locality label as a curatorial error. I have examined the type and a paratype of *ruficollis* Van Dyke (preoccupied by *ruficollis* Putzeys 1870 and consequently renamed by Jeannel) and have not been able to place them in any previously described species, nor do they seem to belong to any known North American species group. The aedeagus of the type (Fig. 10) measures 0.61 mm. in length, is strongly arcuate and attentuate with a blunt tip, lacks a basal keel (probably broken off), and has a heavy, scaly armor on the internal sac, effectively obscuring the transfer apparatus. The dubious honor of having this "lost" species bear his name has been accorded Dr. Henry Dietrich, Cornell University, who was kind enough to lend me the type and permit me to dissect it.

Subgenus Microtrechus Jeannel [NEW STATUS]

Microtrechus Jeannel, 1927: 585; type: *M. Vandykei* Jeannel.

VANDYKEI GROUP, NEW GROUP

Length 2.4-3.3 mm. Integument pale to dark piceous, shining; legs and mouthparts paler. *Head* rounded to slightly wider than long; eyes subconvex or convex, their diameter about equal to length of scape; antenna 2/5 to 3/5 body length. *Pronotum* transverse, 1/2 to 2/5 wider than long; hind angles small to moderate, usually obtuse and blunt; marginal gutter deep; basal foveae broad and deep. *Elytra* 3/4 as wide as long, subconvex; inner 3 or 4 longitudinal striae feebly impressed, external striae obsolete; scutellar stria obsolete; apical recurrent groove variable, either short and oblique, or long and subparallel to suture, always running into 5th longitudinal stria anterior to the apical discal puncture; anterior discal puncture placed before level of the 4th marginal humeral puncture (except in *tonitru*). *Aedeagus* more or less strongly arcuate, apically gradually attenuate, tip sometimes slightly reflexed, but never hooked; transfer apparatus of two lamellar copulatory pieces, the left small and triangular, the right large and apically rounded; internal sac armed with very small, blunt or apiculate scales.

Type-species: *T. (Microtrechus) vandykei* Jeannel.

Trechus (Microtrechus) vandykei (Jeannel) [NEW COMBINATION]

(Fig. 11)

Microtrechus Vandykei Jeannel, 1927: 587, figs. 1280-1285; 1931: 443; type: Black Mtns., N.C. (Mus. Nat. Hist. Nat. Paris).

Not *T.* (s. str.) *Vandykei* Jeannel, 1931: 439, nom. nov. for *ruficollis* VanDyke, 1926: 66.

Distinguished from other species of the group by its smaller size and extremely transverse pronotum, with well-defined hind angles, and by the small, arcuate, thickened aedeagus.

Length 2.4-2.9, mean 2.7. Dark piceous, shining, robust and subconvex. *Head* as wide as long; labrum emarginate; frontal grooves deeply impressed; eyes scarcely convex, their diameter (0.11) subequal to length of scape; antenna 2/5 body length. *Pronotum* nearly 1/2 wider than long; apex and base subequal and 7/10 maximum width, which occurs in apical 1/4; margins arcuate (posteriorly convergent and less arcuate in certain local populations), basal sinuosity in basal 1/8; hind angles small, blunt, slightly more than right. *Elytra* 13/20 as wide as long; inner 3 longitudinal striae feebly impressed, external striae obsolete or obsolescent; apical recurrent groove broad, arcuate at elytral apex, then subparallel to suture, running into trace of 5th longitudinal stria in advance of apical discal puncture; anterior discal puncture slightly before 4th marginal humeral puncture; no scutellar stria. *Aedeagus* 0.43-0.48, mean 0.46; small, thick, and strongly arcuate in left lateral view; apex blunt, somewhat attenuate, and slightly reflexed; transfer apparatus of two lamellar copulatory pieces, the left short and triangular, nested within larger right piece, the dorsal border of which is rounded and thickened; internal sac armed with very small, apiculate spines; parameres short and thick, bearing 4 or 5 short setae.

Male (Celo Mountain, Yancey Co., N.C., in author's collection): TL 2.93, HL 0.60, HW 0.60, PL 0.58, PW 0.85, EL 1.75, EW 1.13, ANT 1.27.

Distribution: NORTH CAROLINA: Celo Mtn. and Balsam Gap, Yancey Co.; Pinnacle Mtn., McDowell Co.; Mt. Pisgah, Devils Courthouse, Cold Mtn., and Graveyard Fields, Haywood Co.; Tusquitee Bald, Clay-Macon Counties; Cheoah Bald, Joanna Bald, and Haoe Lead, Graham Co.; Whiteside Mtn., Jackson Co. TENNESSEE: Unaka Mtn., Unicoi Co.; Camp Creek Bald, Greene Co. The approximate range is from the Bald and Unaka Mountains of Tennessee, southwestward through the Black, Great Craggy, Great Balsam, and Nantahala Mountains, occurring rather commonly at the lower elevations, but seldom above 5000 feet. Certain demes seem to vary consistently in the degree of reflection of the posterior pronotal angles, the arcuate or convergent margins of the pronotum, the presence or absence of faint external longitudinal striae on the elytra, or the thickness of the aedeagal apex, but such independent variation is not readily correlated with geography, and I have not attempted to subdivide the species.

Trechus (Microtrechus) bowlingi NEW SPECIES
(Fig. 12)

Similar to *vandykei* Jeannel but differing in the less pronounced hind angles of the pronotum, in the larger size and shape of the aedeagus, and in microhabitat preference.

Length 2.6-2.9, mean 2.7. Closely similar to *vandykei,* differing as follows: Eyes larger (0.15), more convex. Pronotal margins convergent, not arcuate in basal half, the basal sinuosity nearly obliterated; hind angles much more obtuse, almost rounded. Elytral longitudinal striae more distinct, disc slightly more depressed. Aedeagus larger (0.65-0.70, mean 0.68); middle portion of median lobe flattened; apex more sharply attenuate and more distinctly reflexed.

Holotype male (U.S.N.M. 65980) and numerous paratypes, Mt. Kephart, Sevier Co., Tennessee-Swain Co., North Carolina, 1 July 1960 (TCB, MCB, Joyce and R. T. Bell); additional paratypes from Great Smoky Mountains National Park as follows: Clingmans Dome, Indian Gap, Sugarland Mountain, Mt. Buckley, Cataloochee Balsam, Old Black, and Mt. Sterling. *Holotype male:* TL 2.89, HL 0.58, HW 0.60, PL 0.58, PW 0.82, EL 1.73, EW 1.18, ANT 1.29.

Distribution: Known only from the spruce-fir forests at high elevations in the Great Smoky Mountains, from 4900 feet to 6600 feet.

Trechus (Microtrechus barberi (Jeannel) [NEW COMBINATION]
(Fig. 13)

Microtrechus barberi Jeannel, 1931: 444, figs. 55-57; type: Retreat, Haywood Co., N.C. (U. S. Nat. Mus.).

Distinguished from *vandykei* and *bowlingi* by the large body size, the absence of a basal sinuosity in the pronotal margin, and the larger, more attenuate aedeagus.

Length 2.8-3.2, mean 3.0. Dark, blackish-piceous, shining, similar in form to *vandykei* but larger and more robust. *Head* about as wide as long; eye proportionately a little larger and more convex than in *vandykei,* its diameter (0.18) subequal to length of scape; antenna half body length. *Pronotum* 2/5 wider than long; base and apex subequal, equal to 5/7 maximum width, which occurs in apical 1/3; margins arcuate apical half, then convergent, with scarcely any sinuosity, to blunt, slightly obtuse hind angles; basal foveae broad and deep. *Elytra* 3/4 as wide as long; internal 3 or 4 longitudinal striae feebly impressed, outer striae usually obsolete; apical recurrent groove short, arcuate, then oblique to suture, running into trace of 5th longitudinal stria a short distance before level of apical discal puncture; anterior discal puncture between level of 3rd and 4th marginal humeral punctures. *Aedeagus* 0.64-0.82, mean 0.71; larger, more elongate, and less arcuate than in *vandykei,* apex more attenuate and slightly produced, tip slightly enlarged and reflexed; copulatory pieces as in *vandykei;* parameres more elongate, with 4 long setae.

Male (Richland Balsam, Haywood Co., N.C., in author's collection): TL 3.04, HL 0.64, HW 0.65, PL 0.62, PW 0.89, EL 1.78, EW 1.31, ANT 1.47.

Distribution: Jeannel (1931, p. 445) records *barberi* from the type locality and also from Roan High Knob, Carter Co., Tennessee, both collections made by Hubbard and Schwarz. The species is abundant in the Great Balsam Mountains near Retreat, which Jeannel supposed was near Roan Mountain, but on Roan Mountain only *T. b. beutenmulleri* and *T. roanicus* were encountered in my field work. The type locality is quite probably near Retreat, as stated, but the record from Roan Mountain is certainly a mistake. I have already shown that a similar error—apparently in labeling—was made with respect to *T. schwarzi* Jeannel. The true range of *barberi* appears to be almost as extensive as that of *vandykei,* whose range it overlaps widely, and with which it is often associated. NORTH CAROLINA: Richland Balsam, Rhinehart Knob, Big Sam Knob, Cold Mountain, Devils Courthouse, Graveyard Fields, Mt. Pisgah, Water Rock Knob, and Junaluska Balsam, Haywood Co.; Standing Indian Mountain, and Wayah Bald, Macon Co.; Whitewater Falls gorge and Whiteside Mountain, Jackson Co. TENNESSEE-NORTH CAROLINA: Cataloochee Balsam, Old Black, Mt. Kephart, Sugarland Mountain, Clingmans Dome, and Mt. Buckley, Great Smoky Mountains National Park. GEORGIA: Rabun Bald, Rabun Co.; Brasstown Bald, Union Co. The area occupied by this species is thus about 75 miles long by 50 miles wide, and extends from the vicinity of Asheville, N. C., to northeastern Georgia. In altitude, *T. barberi* ranged from 2400 feet in the Whitewater gorge to 6300 feet on Clingmans Dome.

Trechus (Microtrechus) tonitru NEW SPECIES

(FIG. 14)

Closely similar to *barberi* Jeann., differing in the broadened apex of the pronotum, the unusually long, inflected, apical recurrent groove, sometimes curved at the tip, and the slender, apically inflected and reflexed aedeagus.

Length 2.8-3.2, mean 3.0. Differs from *barberi* as follows: Eyes smaller and less convex. Apex of *pronotum* 1/10 wider than base; hind angles as in *vandykei*, small, blunt, slightly obtuse. *Elytra* rather depressed, often with decided iridescence, with irregular, short, transverse striae; apical recurrent groove much longer than in *barberi*, laterally inflected, often curved at tip toward trace of the 5th longitudinal stria. *Aedeagus* 0.76-0.81, mean 0.79, apex broadly inflected and reflexed at the tip.

Holotype male (U.S.N.M. 65990) and 18 paratypes, Thunderhead, Great Smoky Mountains National Park, Blount Co., Tennessee, 6 July 1960 (TCB/MCB). *Holotype male:* TL 2.84, HL 0.55, HW 0.55, PL 0.58, PW 0.80, EL 1.71, EW 1.22, ANT 1.36.

Distribution: Known only from the type locality, elevation 5530 feet.

Trechus (Microtrechus) subtilis NEW SPECIES
(Fig. 15)

Similar superficially to *barberi* Jeann. but immediately distinguished by the much larger, more elongate aedeagus.

Length 3.1-3.3, mean 3.2. Differs from *barberi* as follows: *Head* slightly wider than long; eye proportionately smaller (diam. 0.16); antenna nearly 3/5 body length. *Pronotum* with base slightly wider than apex; slightly sinuate at margins in basal 1/10. *Aedeagus* 0.85-0.92, mean 0.89; larger, more slender, and less arcuate than in *barberi*, but of same general pattern and with similar transfer apparatus.

Holotype male (U.S.N.M. 65986) and 6 paratypes, Mt. Sterling, Haywood Co., North Carolina, 29 August 1960 (TCB/MCB); one male paratype, Junaluska Balsam, Haywood Co., N.C. *Holotype male:* TL 3.22, HL 0.65, HW 0.71, PL 0.67, PW 0.93, EL 1.90, EW 1.45, ANT 1.86.

Distribution: Known only from the two localities stated, one in the Great Smoky Mountains and the other in the Plott Balsams; rare.

UNCIFER GROUP, NEW GROUP

Length 2.7-4.0 mm. Integument piceous, rather pale, shining. *Head* rounded or slightly wider than long; labrum singly emarginate; eyes small, their diameter equal to or a little less than length of scape; antenna half body length. *Pronotum* transverse, 1/4 to 1/2 wider than long; hind angles small, blunt (except in *verus*); basal foveae either linearly impressed or broadly impressed. *Elytra* 7/10 as wide as long, and 1/3 wider than pronotum; 3 or 4 internal longitudinal striae complete, remainder obsolescent or effaced; recurrent portion of apical groove either parallel to suture or slightly divergent outwardly, ending anterior to apical discal puncture and continuous with trace of 5th longitudinal stria; anterior discal puncture at level of 4th marginal humeral puncture. *Aedeagus* provided with an apical hook or barb, the apex more or less produced; internal sac armed with large, prominent spines (except in *verus*).

Type-species: *T. (Microtrechus) uncifer* n. sp.

Trechus (Microtrechus) uncifer NEW SPECIES
(Fig. 16)

Immediately distinguishable by the produced, barbed aedeagal apex and the extremely large scales of the internal sac.

Length 2.7-3.2, mean 2.9. Pale piceous, shining. *Head* rounded, about as wide as long; labrum evenly and conpicuously emarginate; eye diameter 0.15, subequal to length of scape; antenna half total body length. *Pronotum* transverse, 1½ times as wide as long; apex and base subequal and 7/10 maximum width, which occurs in apical 1/3 just posterior to the level of anterior marginal setae; basal foveae short and linear; margins broadly arcuate, barely perceptibly sinuate immediately before hind angles, which are small, right, and blunt. *Elytra* 7/10 as wide as long, 1/3 wider than pronotum; first longitudinal striae feeble, outer striae obsolescent to completely absent; recurrent part of apical groove parallel to suture, continuous with trace of 5th longitudinal stria, ending well in advance of apical discal puncture; anterior discal puncture at level of 4th marginal puncture. *Aedeagus* 0.88-1.03, mean 0.97; apex produced into long spine, tip sharply reflexed, having barbed appearance; internal sac armed with oblique rows of unusually large, apiculate scales; parameres with 4 setae.

Holotype male (U.S.N.M. 65992), Clingmans Dome, Sevier Co., Tennessee-Swain Co., North Carolina, 28 June 1960 (TCB); additional paratypes from Clingmans Dome, Mt. Buckley, and Sugarland Mountain, Great Smoky Mountains National Park; and two paratype males from Water Rock Knob, Haywood Co., N.C. *Holotype male:* TL 3.06, HL 0.62, HW 0.64, PL 0.62, PW 0.91, EL 1.82, EW 1.26, ANT 1.45.

Distribution: Known only from altitudes above 5500 feet in the Great Smokies and Plott Balsams.

Trechus (Microtrechus) satanicus NEW SPECIES
(FIG. 17)

Recognized by the extremely elongate, straight aedeagus with large, deflexed basal bulb, spiny internal sac, and apical hook; aedeagus nearly half the body length.

Length 3.2-3.5, mean 3.3. Dark piceous, shining, microsculpture a fine, transverse network on pronotum and elytra. *Head* 1/12 wider than long; labrum shallowly emarginate; eye diameter 0.15, a little less than length of scape; antenna half body length. *Pronotum* 2/5 wider than long; apex, base, and length all subequal, and 0.70-0.75 maximum width, which occurs in apical 1/3; sides convergent, barely perceptibly sinuate before hind angles, which are small, blunt, and slightly obtuse; basal foveae broadly impressed. *Elytra* 7/10 as wide as long, 1/3 wider than pronotum; longitudinal striae 1-4 feebly impressed, 5 obsolescent, external striae effaced; recurrent part of apical groove slightly divergent from suture, continuous with trace of 5th stria, ending well in advance of apical discal puncture; anterior discal puncture at level of 4th marginal puncture. *Aedeagus* 1.47-1.49, mean 1.48; extremely elongate and straight, about 9/20 body length; basal bulb large and sharply deflexed, apex produced, bearing a large, reflexed hook; internal sac armed with very large, apiculate scales obscuring the transfer apparatus; parameres long, with 4 setae.

Holotype male (U.S.N.M. 65985) and 8 paratypes, west end of Graveyard Fields near Devils Courthouse, Haywood Co., North Carolina, 27 May 1961 (TCB); two paratypes from same area, 20 July 1960 (TCB). *Holotype male:* TL 3.33, HL 0.68, HW 0.74, PL. 0.67, PW 0.95, EL 1.98, EW 1.37, ANT 1.64.

Distribution: Known only from the type locality, where it is rare. The locality is an open thicket of blackberry bushes 100 yards north of the Blue Ridge Parkway at mile 420.5, approximately a mile east of the Devils Courthouse.

Trechus (Microtrechus) verus NEW SPECIES
(FIG. 18)

Distinguished from other members of the group by its larger size, the pale coloration and small eyes, and by the long, slender aedeagus with broadly hooked apex; no large scales in armature of internal sac.

Length 3.6-4.0, mean 3.7. Pale piceous, shining. *Head* 1/8 wider than long; eye diameter 0.18, subequal to length of scape. *Pronotum* transverse, 1/4 wider than long; base and apex 7/10 maximum width, which occurs at apical 1/3; sides arcuate, sinuate just before small hind angles, which are right and sharp; basal foveae broad, deeply impressed. *Elytra* 7/10 as wide as long, convex; 1/2 wider than pronotum; inner four longitudinal striae feeble, external striae obsolescent or absent; recurrent part of apical groove slightly divergent, ending just anterior to apical puncture, continuous with trace of 5th stria; first discal puncture at level of 4th marginal humeral puncture. *Aedeagus* 0.95-1.02, mean 0.97; rather long and slender, with large basal bulb and sagittal keel; apex abruptly reflexed into large, flattened hook; copulatory pieces subequal in length, the right one thicker and obliquely truncate at tip; scales of internal sac very small; parameres long, with 4 long setae.

Holotype male (U.S.N.M. 65993), one male and two female paratypes, Mt. Sterling, Haywood Co., North Carolina, 29 June 1960 (TCB/MCB); additional paratypes from Clingmans Dome, Sugarland Mountain, Cataloochee Balsam, Old Black, and Mt. Kephart, all in Great Smoky Mountains National Park. *Holotype male:* TL 3.85, HL 0.67, HW 0.75, PL 0.82, PW 1.06, EL 2.36, EW 1.69, ANT 1.84.

Distribution: Known only from the conifer forests of the Great Smoky Mountains, much more common in the deeper layers of moss mats and conifer needle duff, usually in close contact with rock, or under deeply embedded rocks in podzolic humus.

Trechus (Microtrechus) aduncus NEW SPECIES
(FIG. 19)

Distinguished from *uncifer,* which it resembles externally, by the shorter aedeagus with smaller scales of the internal sac and a shorter, more broadly hooked aedeagal apex; total body length slightly greater than *uncifer.*

Length 3.1-3.4. Pale piceous, shining. *Head* rounded, about as wide as long; labrum evenly emarginate; eye diameter 0.14, subequal to length of scape; antenna half total body length. *Pronotum* transverse, 1½ times as wide as long; apex and base subequal and 3/4 maximum width, which occurs in apical 1/4 just posterior to level of anterior marginal setae; basal foveae short and linear, expanding into hind angles and continuous with marginal gutter; margins convergent toward base, barely perceptibly sinuate immediately before hind angles, which are small, right, and blunt. *Elytra* 7/10 as wide as long; longitudinal striae feeble, 1-3 deeper than 4-7; recurrent part of apical groove parallel to suture, continuous with 5th longitudinal stria, ending well in advance of apical discal puncture; anterior discal puncture at level of 4th marginal puncture. *Aedeagus* 0.79-0.81; arcuate, with moderate basal bulb and large sagittal keel; apex slightly produced and expanded into prominent, reflexed hook; parameres with 4 setae; scales of internal sac smaller than in *uncifer.*

Holotype male (U.S.N.M. 65978) and 3 paratypes, Mt. Pisgah, Haywood Co., North Carolina, 13-14 September 1934 (E. R. Quirsfeld); additional paratypes from Mt. Pisgah and Richland Balsam, Haywood Co., N.C. *Holotype male:* TL 3.07, HL 0.64, HW 0.64, PL 0.58, PW 0.85, EL 1.85, EW 1.15, ANT 1.42.

Distribution: Known only from the Great Balsam Mountains, between 4800-6400 feet; comparatively scarce.

Trechus (Microtrechus) talequah NEW SPECIES
(FIG. 20)

Similar to *aduncus,* especially in aedeagal form, but differing in the smaller size, proportionately smaller eye, shorter apical recurrent groove, and shorter, straighter aedeagus.

Length 2.7-3.0, mean 2.8. Differs from *aduncus* as follows: Eye 0.13, only 0.77 length of scape. Apical groove shorter, its recurrent portion ending just beyond apical discal puncture. *Aedeagus* 0.66-0.73, mean 0.70, about 7/10 length of aedeagus in *aduncus*, basal bulb more strongly bent, middle portion of the median lobe not arcuate, apex scarcely produced, terminal hook as in *aduncus* but somewhat less reflexed.

Holotype male (U.S.N.M. 65987) and 5 paratypes, Haw Knob, Monroe Co., Tennessee, 11 August 1961 (TCB and W. H. Adams); additional paratypes from Haoe Lead, Graham Co., North Carolina, 25 July 1960 (TCB/MCB). *Holotype male:* TL 2.75, HL 0.55, HW 0.58, PL 0.56, PW 0.78, EL 1.64, EW 1.07, ANT 1.37.

Distribution: Known only from the Unicoi Mountains, between elevations of 4800-5000 feet.

NEBULOSUS GROUP, NEW GROUP

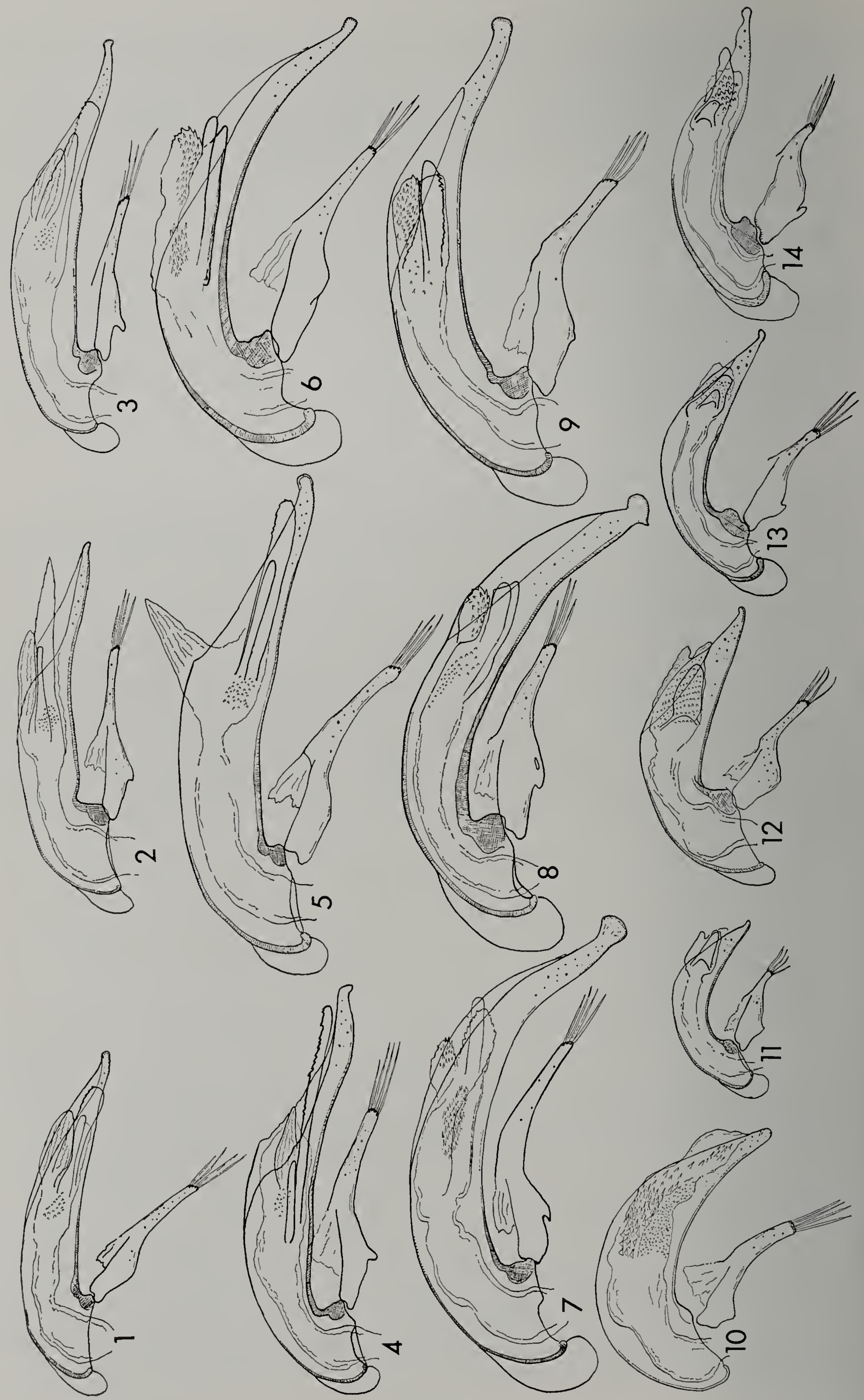
Length 3.3-5.0 mm. Integument black to reddish piceous, shining; microsculpture of pronotum and elytra a very fine, transverse or slightly oblique meshwork (except in *novaculosus*); form robust, convex to subconvex. *Head* slightly wider than long; labrum singly or doubly emarginate; eyes variable, from large and convex to small and flattened; antennae half body length. *Pronotum* transverse, 1/4 to 9/20 wider than long; margins with or without basal sinuosity; hind angles usually sharp, but may be acute, right or obtuse. *Elytra* 7/10 to 3/4 as wide as long; longitudinal striation rather well developed, at least 3 or 4 internal striae complete, but in some species 5 or more complete striae; apical recurrent groove short, usually oblique to suture, running to 5th longitudinal stria; anterior discal puncture variable, at level of 4th marginal humeral puncture or anterior to it; scutellar stria well developed (except in *novaculosus*), but short and deeply impressed. *Aedeagus* strongly arcuate, with large mid-sagittal keel and tapered, reflexed apex; copulatory pieces heavily sclerotized, their structure variable and usually diagnostic of the species; internal sac thickly set with numerous small, blunt or occasionally apiculate scales; parameres with 4 or 5 setae.

Type-species: *T. (Microtrechus) nebulosus* n. sp.

Explanation for illustrations on following two pages:

FIGURES 1-10. Aedeagi of *Trechus* (s.str.). 1—*hydropicus* Horn; "Va." (U.S.N.M.). 2.—*b. beutenmulleri* Jeannel; Mt. Mitchell, N.C. 3—*b. avus* n. subsp.; Grandfather Mtn., N.C. 4—*b. canus* n. subsp.; White Top Mtn., Va. 5—*roanicus* n. sp.; Roan Mtn., Tenn.-N.C. 6—*carolinae* Schaeffer; Mt. Mitchell, N.C. 7—*schwarzi* Jeannel; Craggy Dome, N.C. 8—*mitchellensis* n. sp.; Celo Mtn., N.C. 9—*cumberlandus* n. sp.; Steele Cave, Ky. 10—*dietrichi* nom. nov.; holotype, Cornell Univ. coll.

FIGURES 11-27. Aedeagi of *Trechus* (*Microtrechus*). 11—*vandykei* (Jeannel); Craggy Dome, N.C. 12—*bowlingi* n. sp.; Mt. Sterling, N.C. 13—*barberi* (Jeannel); Richland Balsam, N.C. 14—*tonitru* n. sp.; Thunderhead Mtn., Tenn.-N.C. 15—*subtilis* n. sp.; Mt. Sterling, N.C. 16—*uncifer* n. sp.; Clingmans Dome, Tenn.-N.C. 17—*satanicus* n. sp.; Graveyard Fields, N.C. 18—*verus* n. sp.; Old Black Mtn., Tenn.-N.C. 19—*aduncus* n. sp.; Mt. Pisgah, N.C. 20—*talequah* n. sp.; Haw Knob, Tenn.-N.C. 21—*nebulosus* n. sp.; Old Black Mtn., Tenn.-N.C. 22—*tuckaleechee* n. sp.; Tuckaleechee Caverns, Tenn. 23—*tennesseensis tennesseensis* n. sp. and subsp.; Berry Cave, Tenn. 24—*balsamensis* n. sp.; Water Rock Knob, N.C. 25—*luculentus* n. sp.; Clingmans Dome, Tenn.-N.C. 26—*rosenbergi* n. sp.; Water Rock Knob, N.C. 27—*novaculosus* n. sp.; Clingmans Dome, Tenn.-N.C.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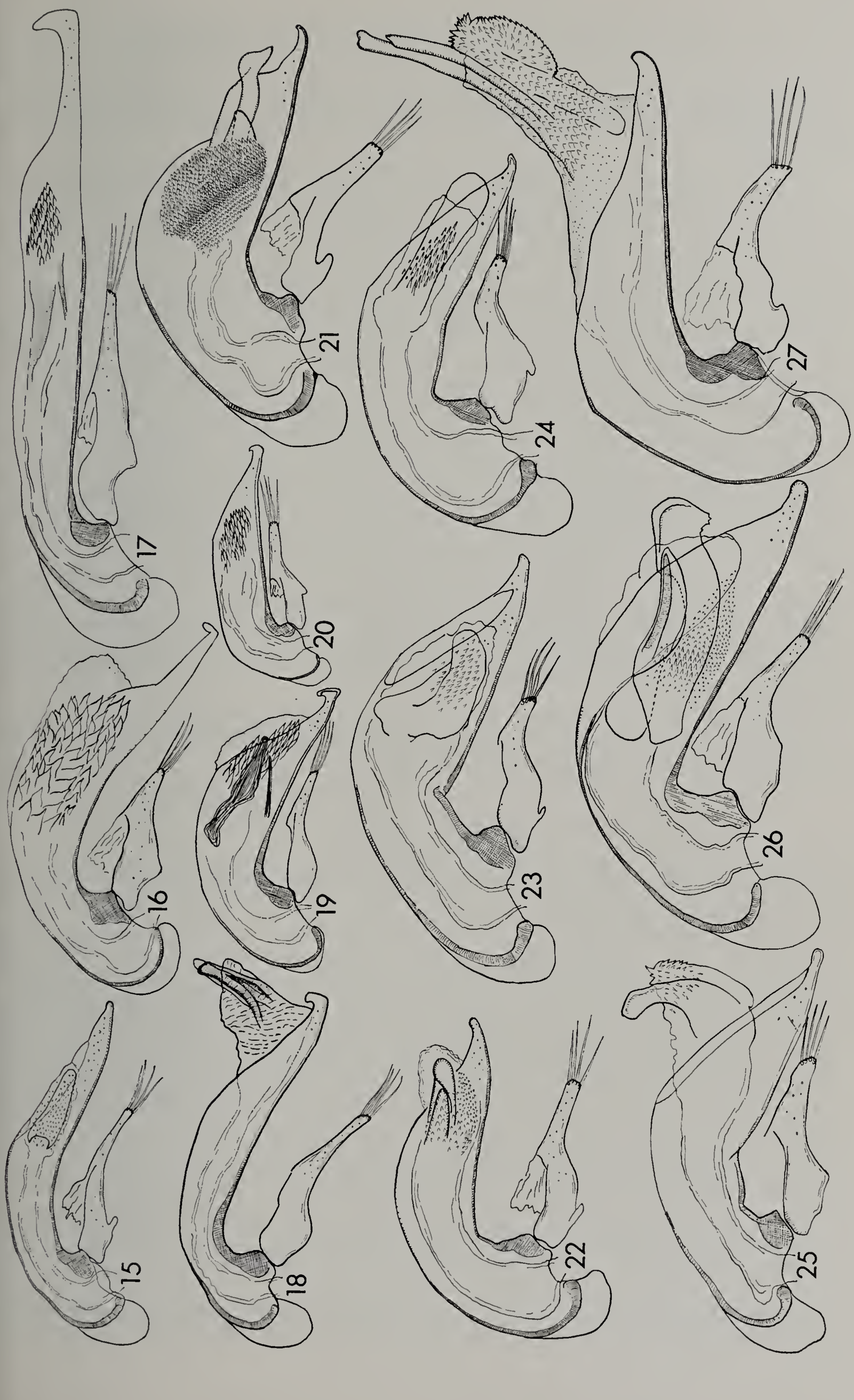
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Trechus (Microtrechus) nebulosus NEW SPECIES
(FIG. 21)

Immediately distinguished from other members of the group by the right copulatory piece, the apex of which is twisted into the shape of a bird's head.

Length 2.3-4.0, mean 3.7. Black to dark piceous, disc of the pronotum and antennal segments III-V slightly darker; form robust and subconvex. *Head* slightly wider than long; labrum only shallowly emarginate; eyes small (diam. 0.18) and convex; antenna nearly half body length. *Pronotum* 2/5 wider than long; apex 9/10 as wide as base width, and 9/10 maximum width, which occurs in apical 1/3; margins arcuate in apical half, then convergent posteriorly, with no sinuosity, to hind angles, which are large, blunt, obtuse, and reflexed; basal foveae broad and deep. *Elytra* 3/4 as wide as long; inner 3 or 4 longitudinal striae complete, sutural stria lightly and irregularly punctulate, external striae obsolescent and barely traceable; apical recurrent groove broad, short, and oblique to suture, running to 5th longitudinal stria or juncture of the 5th, 6th, and 7th, ending a short distance anterior to apical discal puncture; scutellar stria short but deep and prominent; anterior discal puncture between level of the 3rd and 4th marginal humeral punctures. *Aedeagus* 0.98-1.03, mean 1.01; large, thick, and strongly arcuate, apex gradually attenuate, blunt, and slightly reflexed; copulatory pieces heavily sclerotized, the left triangular and nested in the right piece, which is 1/3 longer and has apex completely twisted and folded into a lamina resembling the head of a bird; internal sac thickly set with oblique rows of heavy, blunt scales; parameres large and thick, with four long setae.

Holotype male (U.S.N.M. 65982) and 10 paratypes, Mt. Kephart, Sevier Co., Tennessee, 1 July 1960 (TCB, MCB, Joyce and R. T. Bell); additional paratypes from Clingmans Dome, Mt. Buckley, Indian Gap, Newfound Gap, and Old Black, Great Smoky Mountains National Park. *Holotype male:* TL 3.82, HL 0.71, HW 0.75, PL 0.77, PW 1.06, EL 2.34, EW 1.69, ANT 1.82.

Distribution: Known only from high altitudes (5000-6300 feet) along the crest of the Great Smoky Mountains.

Trechus (Microtrechus) tuckaleechee NEW SPECIES
(FIG. 22)

Similar to *nebulosus* but differing in the sinuate margins of the pronotum, the larger size, smaller eyes, smaller aedeagus, and the rounded apex of the right copulatory piece.

Length 3.7-4.3, mean 4.0. Reddish piceous, brilliantly shining; form robust and subconvex. *Head* slightly wider than long; labrum shallowly and singly emarginate; frontal grooves broad and deep; eyes small (diam. 0.15) and subconvex but otherwise normal; antenna half body length. *Pronotum* 1/4 wider than long; apex 1/20 less than width of base, which is 3/4 maximum width; maximum width at apical 1/4; margins arcuate with a noticeable sinuosity in the basal 1/7, hind angles sharp, subquadrate, and lightly reflexed; basal foveae broad and deep, separated from the marginal gutter by a low ridge; disc medially flattened, with very fine, transverse microsculpture. *Elytra* 3/4 as wide as long; longitudinal striation feeble, but all striae distinguishable, becoming shallow externally and faintly punctulate; apical recurrent groove short, running into 5th longitudinal stria at level of apical discal puncture and slightly oblique to suture; scutellar stria short but deep and prominent; anterior discal puncture between level of 3rd and 4th marginal humeral punctures. *Aedeagus* 0.85-0.90, mean 0.87; similar to that of *nebulosus* but smaller; copulatory pieces similar, heavily sclerotized, but the right piece with apex a rounded knob; right piece 1/3 longer than left piece.

Holotype male (U.S.N.M. 65991) and numerous paratypes, Tuckaleechee Caverns, Blount Co., Tennessee, 25 August 1960 (TCB/MCB);

additional paratypes 18 April 1959 (TCB). *Holotype male:* TL 3.95, HL 0.73, HW 0.75, PL 0.80, PW 1.02, EL 2.42, EW 1.76, ANT 2.02.

Distribution: Known only from the type locality, a large stream cavern in Tuckaleechee Cove, at the west base of the Great Smoky Mountains.

Trechus (Microtrechus) tennesseensis tennesseensis

NEW SPECIES AND SUBSPECIES

(FIG. 23)

Closely similar to *T. tuckaleechee,* differing in the acute posterior angles of the pronotum, the position of the anterior discal puncture, the larger aedeagus, and the slender, subequal copulatory pieces.

Length 4.0-4.3, mean 4.1. Reddish piceous, brilliantly shining, form robust and subconvex. *Head* slightly wider than long; labrum shallowly and singly emarginate; frontal grooves broad and deep; most specimens with a pair of internal clypeal grooves in addition to lateral continuations of the frontal grooves onto clypeus; eyes small (diam. 0.15), flattened, less than length of scape; antenna half body length. *Pronotum* as in *tuckaleechee,* but basal sinuosity more pronounced, hind angles sharp and acute. *Elytra* as in *tuckaleechee,* but scutellar stria much weaker, and anterior discal puncture at or slightly behind level of 4th marginal humeral puncture. *Aedeagus* 1.02-1.07, mean 1.05; similar to that of *nebulosus* and larger than that of *tuckaleechee;* copulatory pieces subequal, slender, and arcuate.

Holotype male (U.S.N.M. 65989) and 27 paratypes, Berry Cave, Roane Co., Tennessee, 30 August 1957 (TCB and B. C. Stewart). *Holotype male:* TL 4.11, HL 0.73, HW 0.78, PL 0.82, PW 1.06, EL 2.56, EW 1.84, ANT 2.14.

Distribution: Known only from the type locality in the Appalachian valley, a cave 8 miles south of Kingston and ¼ mile west of the Tennessee River at mile 578.4, on the southeast side of a valley east of Huckleberry Ridge, at an elevation of 840 feet.

Trechus (Microtrechus) tennesseensis tauricus NEW SUBSPECIES

Differs from *tennesseensis* s. str. as follows: Labrum faintly trilobate, i.e., doubly emarginate, in most specimens; clypeus without internal grooves; external longitudinal striae of elytra obsolescent. Aedeagus with no appreciable differences.

Holotype male (U.S.N.M. 65988) and 9 paratypes, Bull Cave Sinkhole, Blount Co., Tennessee, 25 August 1960 (TCB/MCB).

Distribution: Known only from the type locality. Bull Cave is located just inside the boundary of Great Smoky Mountains National Park near the Cades Cove Entrance, where the road between Tuckaleechee Cove and Cades Cove passes through Rich Mountain Gap, at an approximate elevation of 1800 feet.

Trechus (Microtrechus) balsamensis NEW SPECIES

(FIG. 24)

Closely similar to *nebulosus,* differing in the slightly wider head, larger and more convex eyes, more sharply defined posterior pronotal angles, and the scoop-shaped copulatory pieces.

Length 3.6-3.9, mean 3.7. *Head* slightly wider than long, more so than in *nebulosus;* eyes slightly larger (diam. 0.20) and more convex. *Pronotum* 9/20 wider than long;

apex 9/10 width of base; base width only 7/10 maximum width, which occurs in apical 1/3; margins convergent in basal half, with feeble sinuosity in basal 1/20 only; hind angles small, sharp, and subquadrate. *Elytra* 3/4 as wide as long; inner 3 or 4 striae feebly impressed, external striae obsolescent; intervals with very faint, irregular rows of micropunctures; microsculpture a very fine, transverse meshwork; apical recurrent groove short, oblique to suture, ending a short distance anterior to apical discal puncture; anterior discal puncture between levels of 3rd and 4th marginal humeral punctures; scutellar stria very short but deep. *Aedeagus* 0.93-1.05, mean 0.98; of the same general size and shape as *nebulosus,* but apex much broader in dorsal view; copulatory pieces broad, scoop-shaped, the right piece much larger; parameres with 4 or 5 setae.

Holotype male (U.S.N.M. 65979) and 22 paratypes, Water Rock Knob, Haywood-Jackson Counties, North Carolina, 20 July 1960 (TCB/MCB). *Holotype male:* TL 3.74, HL 0.73, HW 0.77, PL 0.73, PW 1.06, EL 2.28, EW 1.69, ANT 1.85.

Distribution: Known only from the type locality, Water Rock Knob, in the Plott Balsam Mountains, at an elevation of 6200 feet.

Trechus (Microtrechus) luculentus NEW SPECIES
(FIG. 25)

Distinguished by its larger size, well-defined, rectangular posterior pronotal angles, the position of the anterior discal seta, and the structure of the transfer apparatus.

Length 3.7-4.4, mean 4.0. Dark, blackish piceous, shining; form robust and convex. *Head* 1/8 wider than long; labrum evenly emarginate; eyes large and very convex, their diameter (0.24) 1/5 greater than length of scape; antenna half body length. *Pronotum* 2/5 wider than long; apex slightly less than width of base; base width 7/10 maximum width; maximum width in apical 1/3; margins convergent in basal half, distinctly sinuous at basal 1/9, then subparallel; hind angles small, sharp, and subquadrate; basal foveae deep and linear, connected to marginal gutter. *Elytra* 3/4 as wide as long; inner 5 longitudinal striae weakly developed, external striae obsolescent; intervals with irregular rows of faint micropunctures; apical recurrent groove short, broad, oblique to suture, ending at terminus of 5th longitudinal stria just anterior to apical discal puncture; anterior discal puncture placed anterior to level of 4th marginal humeral puncture; scutellar stria short and deep. *Aedeagus* 0.63-0.73, mean 0.68; left copulatory piece very small, rod-like, nested at base of the much larger, lobate right piece, both pieces curved sharply to the right in dorsal view; apex rather short and blunt in dorsal view, not produced; parameres with 4 setae.

Holotype male (U.S.N.M. 65981) and 8 paratypes, Clingmans Dome, Swain Co., North Carolina, 21 May 1961 (TCB); additional paratypes from Clingmans Dome in June and July, 1960. *Holotype male:* TL 3.98, HL 0.76, HW 0.86, PL 0.82, PW 1.13, EL 2.40, EW 1.80, ANT 2.02.

Distribution: Known only from the type locality and from Haw Knob and Laurel Top, in the Unicoi Mountains, Monroe Co., Tennessee, and Graham Co., North Carolina; scarce. There are minor differences between the populations from the Smokies and from the Unicois, but I have only 5 specimens from the latter area and do not wish to base a subspecific diagnosis on so small a sample. The species occurred at 6300 feet on Clingmans Dome and between 5200-5400 feet in the Unicoi Mountains.

Trechus (Microtrechus) rosenbergi NEW SPECIES
(FIG. 26)

Distinguished by its unusually large size and distinctive transfer apparatus.

Length 4.5-5.0, mean 4.7. Form unusually large, robust, convex; blackish-piceous, shining. *Head* slightly longer than wide; labrum shallowly and somewhat irregularly emarginate; eyes small and subconvex, their diameter (0.18) 1/5 less than length of scape; frontal grooves narrowly incised, becoming broad and shallow as they continue onto clypeus; antenna half body length. *Pronotum* 2/5 wider than long; apex 1/20 less than width of base, which is equal to 7/10 maximum width; maximum width at apical 1/3; margins convergent in basal half to the slight sinuosity in basal 1/10; hind angles small, sharp, slightly obtuse, and broadly reflexed; basal foveae broad and shallow, with scarcely any ridge separating them from marginal gutter. *Elytra* 7/10 as wide as long; at least internal 5 longitudinal striae developed and lightly punctulate, external striae obsolescent but usually traceable; apical recurrent groove broad, short, oblique to suture, running into 5th longitudinal stria a short distance in advance of apical discal puncture; anterior discal puncture at level of 4th marginal humeral puncture. *Aedeagus* 1.21-1.27, mean 1.24; of the general form typical of the group; copulatory pieces heavily sclerotized, the left elongate with pointed apex, nested in base of the right piece, which is 1/5 longer and has an expanded, hatchet-shaped apex bearing ventrally two small teeth; parameres large but proportionately rather slender, bearing 4 or 5 setae.

Holotype male (U.S.N.M. 65984) and 21 paratypes, Water Rock Knob, Haywood-Jackson Counties, North Carolina, 20 July 1960 (TCB/MCB); one male and one female paratype, Richland Balsam, Haywood Co., North Carolina, August 1960 (TCB). *Holotype male:* TL 5.00, HL 0.95, HW 0.91, PL 0.95, PW 1.33, EL 3.10, EW 2.18, ANT 2.46.

Distribution: Known only from the two stated localities, at altitudes above 6000 feet. It is a great pleasure to name this species, the largest of all southern Appalachian *Trechus,* in honor of Mr. William Rosenberg, Balsam, North Carolina, whose knowledge of the coleopterous fauna of the Plott Balsams is unsurpassed.

Trechus (Microtrechus) novaculosus NEW SPECIES
(FIG. 27)

A species of large size, distinguished from *luculentus,* which it resembles, by the convergent margins of the pronotum; the unusually large posterior pronotal angles; the narrow, produced aedeagal apex (dorsal view); and the thin, extremely elongate, razor-shaped copulatory pieces.

Length 4.2-4.7, mean 4.4. Piceous, brilliantly shining; form robust and subconvex. *Head* 3/20 wider than long; labrum broadly and shallowly emarginate; eyes small and subconvex, their diameter (0.20) 1/10 less than length of scape; antenna half body length. *Pronotum* 1/3 wider than long; apex less than 9/10 width of base; base width only 3/4 maximum width, which occurs in apical 3/10; margins strongly convergent posteriorly, no trace of a sinuosity; hind angles sharp, broadly reflexed, and slightly obtuse; basal foveae broad and deep. *Elytra* 3/4 as wide as long; most longitudinal striae feebly impressed and faintly punctulate; apical recurrent groove broad, slightly oblique to suture, and short, ending just anterior to apical discal puncture at level of 4th marginal humeral puncture; marginal humeral series crowded; scutellar stria obsolete. *Aedeagus* 1.22-1.24, mean 1.23; apex produced and (in dorsal view) narrow; copulatory pieces extremely narrow and very elongate, the left razor-like, its apical border obliquely-sinuately truncate, the right piece slightly longer with rounded, folded apex; parameres with 4 setae.

Holotype male (U.S.N.M. 65983) and 9 paratypes, Clingmans Dome, Swain Co., North Carolina, 21 May 1961 (TCB); two paratypes from Clingmans Dome, July, 1960. *Holotype male:* TL 4.33, HL 0.78, HW 0.89, PL 0.91, PW 1.22, EL 2.64, EW 1.80, ANT 2.20.

Distribution: Known only from the type locality, where it was collected at an elevation of 6300 feet; scarce.

DISCUSSION

Species of *Trechus* s. str. occur, for the most part, north of the French Broad River, while those of *Microtrechus* occur south of the river. That this boundary is only approximate is indicated by the presence of *T. (Microtrechus) vandykei* in the Great Craggy, Black, and Bald Mountains, and by *T. (T.) schwarzi* in the Great Balsams. The more widely distributed species—*beutenmulleri* and *vandykei* in the north and *barberi* and *vandykei* in the south—are the only *Trechus* known from the Nantahala Mountains, the Blue Ridge proper, and adjacent, somewhat disconnected, upland areas. The local endemics are found in six massifs previously described—Roan Mountain, the Black-Great Craggy Mountains, the Great Balsam Mountains, the Plott Balsam Mountains, the Great Smoky Mountains, and the Unicoi Mountains.

In order to obtain a comparative measure of the degree of endemism in these six areas, the following scheme has been adopted. In Table 1 the "endemic sum" is computed by adding 1.0 for each strict endemic and 0.5 for each species known only from two adjacent ranges. The last column is the quotient of the endemic sum and the total number of species of *Trechus* found in the respective mountain range times 100 per cent. The "approximate length" of the massifs are lengths of the main crests, measured from 1:250,000 topographic maps. The table shows two important things: (1) the endemic species are, with the exception of the Unicoi Mountains (which have a lower endemic index), limited to the higher ranges, each with several peaks over 6000 feet in elevation; (2) there is an approximate correlation between the extent of the range and the number of endemics. Thus the Great Smokies, with a crest length of more than 50 miles, have an endemic sum of 6 (5+2/2) out of a total of 8 species (cavernicole species not included), and Roan Mountain, only 6 miles long at the crest, has only two species, one of which is endemic.

Species clusters of surprising complexity, as described in the present paper, are not unusual in *Trechus* (cf. Jeannel 1927), but have been previously unknown in North America. It seems reasonable to speculate that winglessness, a burrowing habit, and restriction to cold, wet microenvironments greatly reduce the mobility of a beetle population. The climatic changes in the southern Appalachians during the Pleistocene must have alternately lowered and raised the altitudinal zone within which favorable *Trechus* niches were found, in effect alternately opening and closing avenues of dispersal. Such a mechanism can be invoked to explain the allopatric distribution of pairs of closely related species such as *uncifer-satanicus, aduncus-talequah, balsamensis-luculentus,* and *schwarzi-cumberlandus.* Adaptation to at least two rather different microenvironments—moss carpets and deep humus—is clearly indicated by both morphology and ecology, the deep humus species tending toward larger size, paler coloration, a proportionately narrower head, smaller eyes, and more fully developed elytral striation.

In the cavernicole species *T. cumberlandus,* from the Cumberland plateau of Tennessee and Kentucky, we have an example of how caves may be colonized by trechines from a montane, Appalachian source. The relatives of *cumberlandus* are concentrated in the Blacks and Great Craggies. The distribution of *cumberlandus* coincides almost exactly with that of the *robustus* group of *Pseudanophthalmus,* four species of eyeless trechines which occupy caves at the western margin of the same plateau. Jeannel (1949) has suggested that the cave systems of the Interior Lowlands and Cumberland plateau were populated by successive waves of ancestral forms spreading outward from the Appalachians in periods of glacial advance and retreating into caves during the interglacials. If this hypothesis be correct, we may have in the distribution of *T. cumberlandus* the repetition of a pattern of cave colonization which can help clarify the existing distribution of cave trechines. *T. tennesseensis* and *T. tuckaleechee* probably share a common ancestry with *balsamensis* and *luculentus* because of the generally similar transfer apparatus. They occupy caves much closer to the Appalachians, in an area close to the Great Smokies but devoid of troglobitic trechines.

Table 1. Endemism in Southern Appalachian Trechus

Range	*Approximate Length (Miles)*	*Total Species*	*Endemic Sum*	*Endemic Index*
Great Smoky Mountains	50	8	6.0	75%
Great Balsam Mountains	35	6	3.0	50%
Black and Great Craggy Mountains	20	5	2.5	50%
Unicoi Mountains	20	4	1.5	38%
Plott Balsam Mountains	15	5	2.5	50%
Roan Mountains	6	2	1.0	50%

LITERATURE CITED

Barr, Thomas C., Jr.
1961. A one-step clearing and mounting technique for male genitalia in Coleoptera. The Coleopterists' Bull. 15: 7-8.

Casey, T. L.
1918. Observations on the American Pogoninae, including *Trechus.* Memoirs on the Coleoptera VIII, pp. 394-412.

Darlington, P. J., Jr.
1943. Carabidae of mountains and islands: Data on the evolution of isolated faunas, and on atrophy of wings. Ecol. Monogr. 13: 37-61.

Jeannel, René
1927. Monographie des Trechinae. Monographie comparée et distribution géographique d'un groupe de Coléoptères (2e livraison). L'Abeille 33: 1-592.
1931. Révision des Trechinae de l'Amérique du Nord. Arch. Zool. exp. et gén., 71: 403-499.
1949. Les coléoptères cavernicoles de la région des Appalaches. Notes Biospéologiques, fasc. 4, Publ. Mus. Nat. Hist. Nat. (Paris), no. 12: 37-104.

PUTZEYS, J. A. A. H.
1870. Trechorum oculatorum monographia. Stettiner Ent. Zeitung 31: 7-48, 145-201.

SCHAEFFER, CHARLES
1901. Synopsis of the species of *Trechus*, with the description of a new species. Bull. American Mus. Nat. Hist. 14: 209-212.

VAN DYKE, E. C.
1926. New species of Carabidae. Pan-Pacific Ent. 2: 113-126.

TWO NEW SPECIES OF HYMENORUS (COLEOPTERA: ALLECULIDAE) FROM PANAMA

By J. M. CAMPBELL[1, 2]

On a recent collecting trip to Panama[3], I obtained specimens of two new species of *Hymenorus* Mulsant by beating small dwarfed oak trees that were heavily covered with several species of lichens. Upon further investigation it was found that the beetles were concealed under the lichens, upon which they were apparently feeding. It is of interest to note that three additional species of Alleculidae (two species of *Lobopoda* Solier and *Pseudocistela decepta* Champion) were also collected in this habitat with the species of *Hymenorus*.

Champion (1888-1893) described 39 species of the genus *Hymenorus* in the Biologia Centrali-Americana. Of these, only *Hymenorus americanus* Champion was recorded from south of Guatemala. However, Pic (1924, 1930, and 1931) described three species of *Hymenorus* from Brazil. It seems probable that the genus ranges throughout Central America, the scarcity of records being accounted for by the small size, dull coloration, and secretive habits of the beetles.

Champion's work does not include a key to the Central American species of *Hymenorus,* and it would be extremely difficult, if not impossible, to construct a really functional key without examining all of his material. The following key, based in large part on Champion's specific descriptions, in the Biologia Centrali-Americana, is designed to separate the two new species described herein from all other Central American species, which are, for the sake of brevity, referred to by the numbers assigned them by Champion. The groups of species delineated in the key are not to be interpreted as necessarily natural in the taxonomic sense.

1. Eyes of both male and female separated by a distance equal to or greater than the width of an eye -- 3
   Eyes of male or female separated by a distance less than the width of an eye ---- 2
2. Apex of male genitalia trilobed; sides of pronotum broadly rounded from near base to center of apex ------------------------------ HYMENORUS PANAMENSIS

---

[1] Department of Entomology, University of Illinois, Urbana.

[2] I would like to acknowledge the assistance of Dr. R. B. Selander for his reading of this manuscript.

[3] This trip was made possible in part by a grant from the Sigma Xi-RESA Research Fund.

Apex of male genitalia not trilobed; apex of pronotum somewhat transverse ---Species 1-2, 5-6, 9, 11, 13-23, 26

3. Punctures of elytral interstices placed in distinct rows ------------------ Species 3, 7
Punctures dense, irregularly distributed ------------------------------------ 4

4. Sides of pronotum distinctly converging from near base to apex -- Species 4, 12, 24-25, 27-28, 33-36
Sides of pronotum parallel or very weakly converging in basal half ---------------- 5

5. Length less than 6 mm.-- Species 30-31, 37-39
Length greater than 6½ mm.-- 6

6. Elongate in shape; surface opaque or slightly shining ------------------ Species 8, 10
Oval; surface strongly shining ------------------------- HYMENORUS CHIRIQUENSIS

Hymenorus panamensis Campbell, new species (FIGS. 1-4)

Narrow, elongate-oval; not at all shining above; dark brown; legs, maxillary palpi, labial palpi, and antennae light brown; first and second antennal segments much lighter in color than remaining segments; each segment becoming somewhat lighter in color approaching its apex; femora becoming somewhat lighter in color approaching its apex.

Head densely punctate; punctures separated by a distance equal to the width of a puncture; each puncture bearing one short, light brown seta. In both male and female eyes separated by a distance equal to half the width of the eye (Fig. 4). Antennae four-tenths length of body and twice length of pronotum; antennal segment three twice as long as segment two and slightly longer than each of the following segments; segments four to eleven three-fifths as wide as long; each segment except apical one distinctly obconical. Mandibles notched apically; notch half as deep as width of apex. Maxillary palpi with segment two expanded externally, expanded area bearing a pair of long spines; apex of terminal segment equal in length to inner margin of segment. Labial palpi with a single long spine on first and second segments.

Base of pronotum continuous in outline with base of elytra; sides of pronotum slightly constricted at base, broadly rounded from base to center of apex, which is not at all truncate; basal angles slightly acute; base sinuate (Fig. 2). Punctures of moderate size, dense, separated by a distance equal to diameter of a puncture. Pronotum one and one-half times as wide as long. Disk evenly convex, with no evidence of basal foveae or a median impressed line.

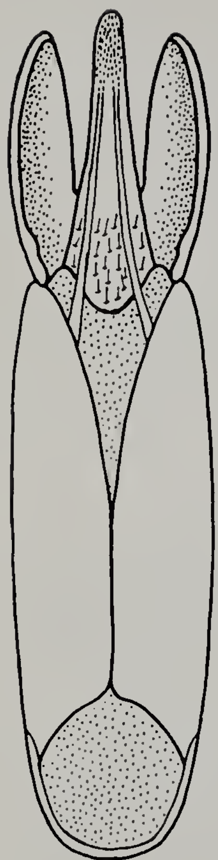
Elytra about twice as long as wide and four times as long as pronotum. Sides parallel for basal half, then broadly rounded to apex. Eight rows of striae across middle of each elytron; striae very lightly impressed; strial punctures small, separated by a distance two to three times as great as diameter of a puncture; punctures each bearing one light brown seta in center. Interstices flat, bearing two or three irregular rows of setae. Surface very feebly shining.

Prosternum densely punctate; propleura deeply punctate on inner margin but becoming smoother approaching base and outer edge, which are impunctate. Metasternum with somewhat less dense punctation on anterior three-fourths, impunctate on posterior fourth. Abdominal sterna with punctation less dense than on metasternum; all sterna equally punctured. Venter moderately shining.

Tarsal segment three narrowly lobed and segment four broadly lobed beneath on anterior and intermediate tarsi; only segment four narrowly lobed beneath on posterior tarsi. Tarsal claws with eight or nine teeth in both male and female.

Length: 5.5-6.0 mm.

Male: Front femora and tibiae not enlarged internally. Lobes of eighth sternum curved inward and very broadly rounded, each lobe bearing four long setae at apex; apical portion of lobes with small punctures. Lobes of ninth sternum well developed (Fig. 3). Genitalia with lateral lobes separate at apex, fused at their base on the dorsal surface (Fig. 1B); aedeagus long and narrowly rounded at apex, equal in length to lateral lobes, apex with minute spines; basal piece narrowest at base, sides slightly curved (Fig. 1A).



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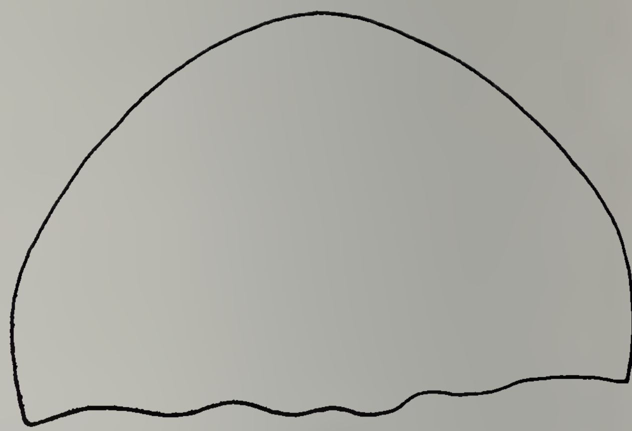

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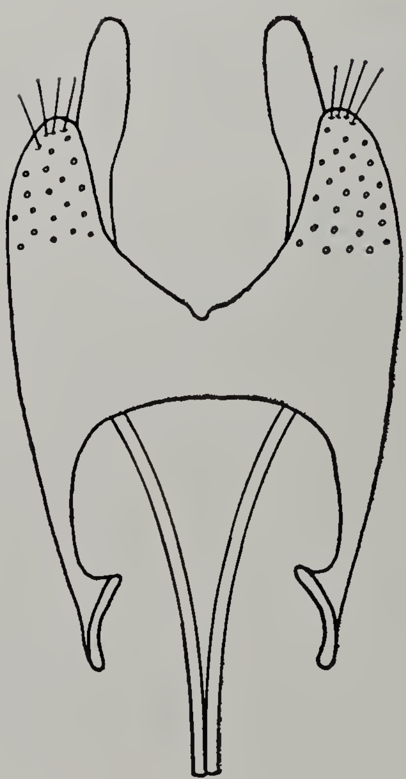

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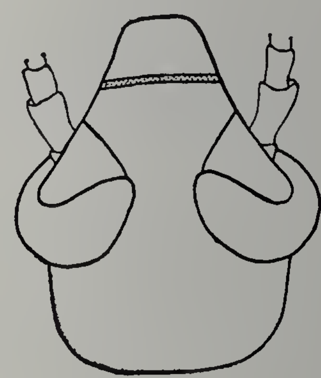

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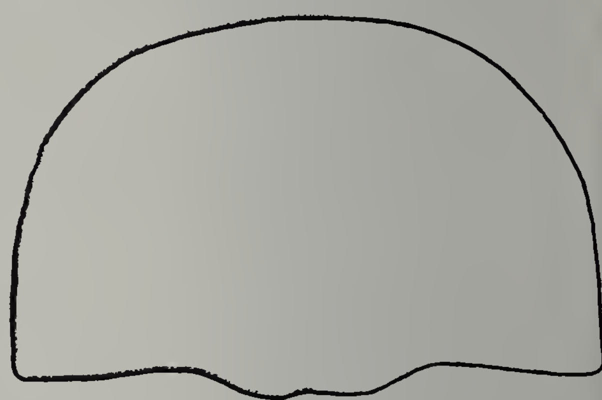

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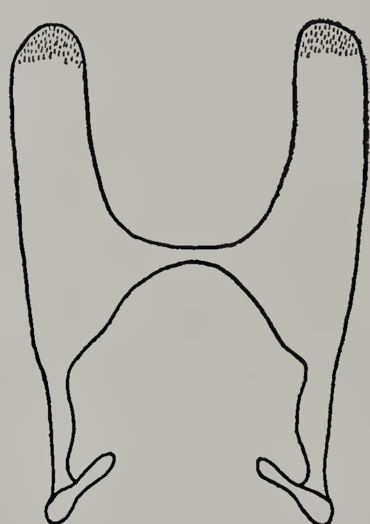

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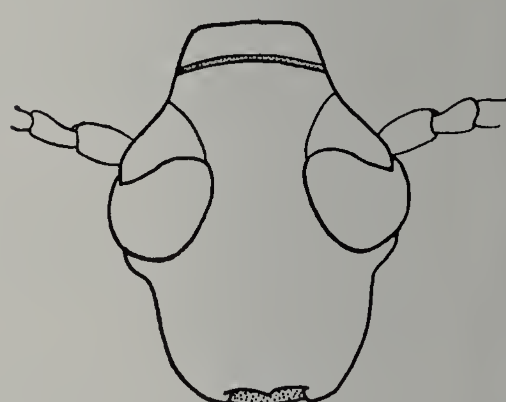

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Specimens examined: Holotype, male, from 1 mile north of El Volcán, Chiriquí Province, Republic of Panama; July 24, 1961; J. M. Campbell. Deposited in the collection of the Chicago Natural History Museum.

In addition to the holotype, the following specimens were examined, all collected by me at the type locality: 10 males and 10 females collected July 22, 1961, and 13 males and 25 females collected July 24, 1961.

Discussion: It is quite possible that when the genus *Hymenorus* is revised, it will be necessary to place this species in a separate genus. It is very distinct from other species of the genus *Hymenorus* in the form of the male genitalia. In it, the aedeagus is large and conspicuous, whereas in other species of the genus (and family), this structure is represented by a small membranous structure concealed in a dorsal, triangular groove in the fused lateral lobes. The genitalia of *H. panamensis* are further distinctive in that the lateral lobes are separated from each other nearly to the basal piece. In other alleculids that I have seen, the lateral lobes are solidly fused together throughout their length. Since paired lateral lobes are undoubtedly primitive for beetles, the condition in *H. panamensis* could be regarded as archaic, but I am more inclined to regard it as a secondary specialization within the family Alleculidae.

The pronotum in *H. panamensis* is wider than in the other members of the genus. In the well developed lobes of the ninth sternum the species resembles the genus *Lobopoda*. In Champion's (1888-1893) key to the genera of Alleculidae of Central America some difficulty may be encountered in keying the species to *Hymenorus*. Thus, it could be keyed to either *Telesicles* Champion or *Menes* Champion; however, the pronotum is not constricted behind as much as in *Telesicles* nor is the pronotum twice as broad as long as in *Menes*.

Hymenorus chiriquensis Campbell, new species
(Figs. 5-8)

Broadly oval; strongly shining above and beneath; dark brown; mouthparts, apex of anterior and intermediate femora, tarsi, and first two antennal segments light yellow-brown.

Head densely, deeply punctate; punctures separated by a distance equal to width of a puncture. Eyes small, separated in male by a distance equal to the width of the eye, in female separated by a slightly greater distance (Fig. 8). Antennae .35 to .40 length of body and three times length of pronotum; antennal segment three two and one-half times as long as segment two and visibly longer than each of remaining segments; segments four to eleven half as wide as long, each segment slightly obconical. Mouthparts similar to those of *H. panamensis.*

Base of pronotum narrower than base of elytra; sides of pronotum parallel for basal half, then broadly rounded to apex. Basal angles rectangular; base feebly sinuate. Pronotum almost twice as wide as long (Fig. 5). Punctures large, deeply impressed, very dense, separated by a distance much less than diameter of a puncture. Disk convex; basal foveae small and shallowly depressed.

Figs. 1-4, *Hymenorus panamensis* new species, male. Fig. 1A—Dorsal view of genitalia. Fig. 1B—Ventral view of apex of genitalia. Fig. 2—Pronotum. Fig. 3—Dorsal view of eighth and ninth abdominal sterna. Fig. 4—Dorsal view of head.

Figs. 5-8, *Hymenorus chiriquensis* new species, male. Fig. 5—Pronotum. Fig. 6—Dorsal view of genitalia. Fig. 7—Dorsal view of eighth sternum. Fig. 8—Dorsal view of head.

Elytra almost twice as long as wide and five times length of pronotum. Sides parallel for basal third, then broadly rounded to apex. Nine rows of striae at middle of each elytron; striae deeply impressed; strial punctures very large, rectangular at base of elytra, becoming smaller and circular approaching apex; each puncture separated by a very narrow ridge at base which becomes more distant approaching apex; punctures each with a central pit bearing a short seta. Interstices flat, bearing two irregular rows of short setae.

Prosternum and propleura very densely punctate; metasternum with large punctures somewhat widely spaced; posterior margin impunctate. Abdominal sterna finely, shallowly punctate.

Tarsal segments as in *H. panamensis*. Tarsal claws each with nine teeth in both male and female.

Length: 7-8 mm.

Male: Front femora and tibiae not expanded internally. Lobes of eighth sternum straight, broadly rounded at apex which is often slightly deflexed (Fig. 7). Apex of lobes bearing many small, straight setae. Lobes of ninth sternum very poorly developed and not sclerotized. Genitalia long, wide, tapering from near base to apex; apex without setae or spines; aedeagus small, lying in a triangularly shaped groove on dorsal surface of fused lateral lobes (Fig. 6).

Specimens examined: Holotype, male, from 1 mile north of El Volcán, Chiriquí Province, Republic of Panama; July 24, 1961; J. M. Campbell. Deposited in the collection of the Chicago Natural History Museum.

In addition to the holotype, the following specimens, all collected by me, were examined: three males and four females collected July 2, 1961, and two males and nine females collected July 24, 1961, all from the type locality; and seven males and six females collected 5 miles east of Boquete, Chiriquí Province, Republic of Panama, July 29, 1961.

Discussion: Hymenorus chiriquensis is most similar to *H. tarsalis* Champion on the basis of description of the latter. It resembles *H. tarsalis* in the small, widely separated eyes and in the shape of the lateral lobes of the eighth sternum of the male. However, it is distinguished from that species in having a more oval shape, more strongly shining surface, and a very differently shaped pronotum. In *H. tarsalis* the sides of the pronotum converge from near the base, in contrast to *H. chiriquensis,* in which the sides of the pronotum are parallel in the basal half. The new species also differs from *H. tarsalis* in that the legs of the male are not enlarged and the lobes of the tarsus are not greatly expanded.

Literature Cited

Champion, G. C.

1888-1893. Family Cistelidae. *In* Godman, F. E., and O. Salvin, Biologia Centrali-Americana, Coleoptera, vol. 4, pt. 1, pp. 385-465, 563-570, pls. 17-21, 23. London.

Pic, Maurice

1924. Nouvelles espèces de Coléoptères exotiques du Muséum National de Prague. Sborník Entomologického Oddeliní Národního Musea v Praze. II(14):85-90.

1930. Descriptions abrégées diverses. Mélanges Exotico-Entomologiques. Fasc. 55, p. 23.

1931. Descriptions abrégées diverses. Mélanges Exotico-Entomologiques. Fasc. 58, p. 23.

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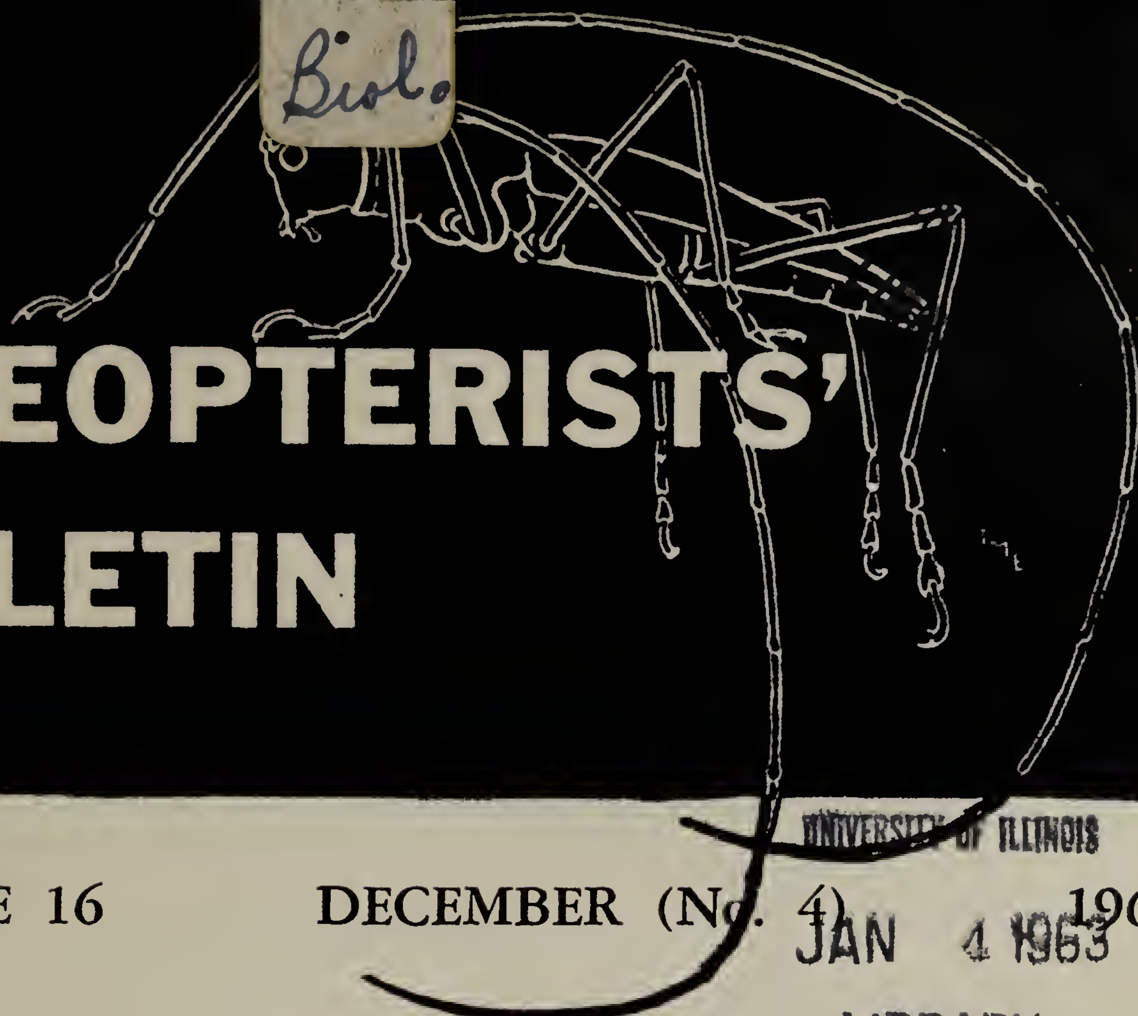

VOLUME 16 DECEMBER (No. 4) 1962

ARTICLES

NOTES

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
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A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

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Any article, note, or news items likely to be of interest to readers of the Bulletin will be considered. Articles with illustrations are particularly desired, and *in all cases, descriptions of new species must be illustrated.* Descriptions of new species or genera MUST contain keys or be correlated with existing keys.

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 16 December (No. 4) 1962

NEW SYNONYMY FOR DIPLOTAXIS EBENINA FROM MARTINIQUE AND NEW DISTRIBUTION RECORDS FOR DIPLOTAXIS (COLEOPTERA: SCARABAEIDAE: MELOLONTHINAE)

By PATRICIA VAURIE[1]

NEW SYNONYMY

For more than a hundred years *Diplotaxis ebenina* Blanchard, 1850 (type from the island of Martinique in the Lesser Antilles), has continued to be recognized as a valid form although no further specimens have been found. Twice I discussed this species, listing it as Incertae Sedis (Vaurie, A Revision of the Genus Diplotaxis, 1958, pt. 1, p. 389; 1960, pt. 2, p. 413) and expressed doubt as to its status and identity. Not having seen the type, however, I included *ebenina* in the key to the species of *Diplotaxis* (1960, p. 180). Now I have examined the type, which Dr. A. Villiers found for me in the Muséum National d'Histoire Naturelle in Paris, and it is the well-known, readily identified, abundant species, *liberta* Germar, 1824, from the eastern and southern United States [NEW SYNONYMY].

It seems questionable, however, to include Martinique in the range of *liberta*. First, the type, a female, bears the label, "M[ont] Pelée, Martinique," a 4400 foot high volcano that erupted violently in 1902. The specimen might be more credible if it had been taken at least on the coast instead of in the mountains, presuming the beetle was actually captured on the island and not mislabeled. Secondly, the genus occurs definitely elsewhere in the West Indies in Jamaica only, where the endemic *D. jamaicensis* Cazier is common and comes readily to light at night. A single specimen of another species from the United States, *atlantis* Fall, 1909, is in the Zoologisches Museum in Berlin, and it bears the label "Gouadeloupe" which probably refers to the island of Guadeloupe north of Martinique. Thirdly, although Guadeloupe has been well collected by the French, and although my husband and I searched for *"ebenina"* in Martinique in the summer of 1960, no additional specimens of either *liberta* or *atlantis* are yet known from these islands. I believe that the Lesser Antilles should be dropped from the range of these species.

[1] American Museum of Natural History, New York, N. Y.

New Distribution Records

Since the publication of the new records in "A Revision of the Genus Diplotaxis" (Vaurie, 1960, pp. 176-177), the following new localities or specimens of unusual interest have been examined in material from various collections.

Diplotaxis amecameca Vaurie. The type and four paratypes come from Amecameca in the state of Mexico at about 8000 feet. In the collection of Henry Howden is a female collected by Evans on March 26, 1959, at 5500 feet, in Cuernavaca in the adjacent state of Morelos.

Diplotaxis arizonica Schaeffer. A specimen taken May, 1961, by Henry Howden in Yecora, Sonora, adds a second state (after Chihuahua) to the Mexican localities. The record of this species from Texas (Vaurie, *loc. cit.*) is an error; in the United States this species is known from Arizona only.

Diplotaxis fissilabris Fall. A second specimen from the state of Sonora, Mexico, has been examined; it is from Hermosillo, collected by Henry Howden on May 25, 1961. This is farther south than the other locality, Pitiquito.

Diplotaxis insignis LeConte. Recorded previously from Nevada, Idaho, Utah, and California, this species is now found to occur in southern Oregon, according to a specimen in Oregon State University collected by Hasbrouck in May of 1957, at 16 miles southeast of Silver Lake.

Diplotaxis mascula Vaurie. Two additional males from Todos Santos, Baja California, collected September, 1959, by Radford and Werner, and in the Canadian National Collection, Ottawa, bring the total number of specimens of this species to six, all from the Cape region.

Diplotaxis obregon Vaurie. A second specimen of this species, described from a single male from Obregon, Sonora, Mexico, has been examined. It is a large female (the type is 9 mm. long), also from Obregon, collected August 5, 1960, by W. W. Gibson, and in the collection of Henry Howden.

Diplotaxis residua Fall. This rather rare, short winged species, not known previously to occur outside of Idaho, does apparently cross the border into eastern Oregon, according to a male specimen from the collection of Oregon State University, collected at Harper, Malheur County, March 30, 1953.

Diplotaxis sierrae Fall. Although known from over 200 examples from California and western Nevada, this species was not recorded until now from Oregon where its presence is confirmed by a series of 35 males and six females in Oregon State University from two localities in Deschutes County in the central part of the state, 13 miles southeast of Sisters, June, 1921, and from 7 miles north of Tumalo—all taken at light by D. R. Smith.

LITERATURE NOTICE

The latest article in the recent interesting series on lycid mimics concerns "Lycid predation by mimetic adult Cermabycidae," by Eisner, Kafatos, Linsley, in Evolution 16:316-324, illus., 1962.

THE TAXONOMIC POSITION OF THE RHYSODIDAE (COLEOPTERA)[1]

By Ross T. Bell *and* Joyce R. Bell[2,3]

For many years entomologists have debated the taxonomic position of the Rhysodidae. The earlier workers placed them near the polyphagous families Cucujidae and Colydiidae, to which they have a superficial resemblance. In more recent times, evidence has accumulated that they actually belong in the suborder Adephaga. Forbes (1926) pointed out the adephagous character of the hind wings. Böving and Craighead (1930) showed that the larva has the essential characteristics of an adephagan. Crowson (1955) considers them to be the most primitive of living Adephaga and this arrangement has been followed by Arnett (1960). Apparently no contrary idea of the position of the Rhysodidae within the suborder has yet been expressed. We would like to present an alternative hypothesis, that the Rhysodidae are a modified offshoot of the Carabidae.

Crowson considers the following characters to be evidence of the primitiveness of Rhysodidae: the presence of a labrum in the larva, the large size of the intercoxal piece of the first visible abdominal sternite of the adult, the wide separation of the hind coxae, the extremely simple metendosternite, the bark-dwelling habits.

The structure which Crowson regards as the labrum of the larva is considered to be the epipharynx by Böving and Craighead. It is shown in their illustration as a small, apparently membranous protuberance and does not closely resemble a normal labrum in form. Possibly, therefore, it is an independent development, not homologous to a true labrum.

The large size of the intercoxal piece and the wide separation of the hind coxae appear to be interrelated, since the intercoxal piece serves to fill space between the coxae. The aberrant carabid, *Gehringia olympica* Darlington, also has hind coxae that are widely separated, and has an equally broad intercoxal piece. In *Gehringia,* the coxae, though separated, are relatively large and the abdomen is not elongate. Consequently, the intercoxal piece, though broad, is relatively short. In the Rhysodidae, by contrast, the hind coxae are very small and the abdomen is elongate. The intercoxal piece, in consequence, is broad and long.

If the size of the intercoxal piece is a result of the placement of the hind coxae, it becomes important to decide whether contiguous or widely separated hind coxae are the more primitive. If separated coxae were the more primitive kind, Rhysodidae and *Gehringia* would be the most primitive Adephaga. The Cychrini then would occupy an intermediate position between them and the majority of the suborder. If the reverse were true, the widely separated coxae of *Gehringia* and Rhysodidae would be the result of parallel evolution.

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[1] This research has been supported by Grant No. G19378 from the NATIONAL SCIENCE FOUNDATION.

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[3] ACKNOWLEDGMENTS—We are indebted to George Ball, Philip J. Darlington, Jr., and J. Gordon Edwards for the loan or gift of specimens, and to Wayne Gibson for the preparation of the illustrations.

However, evidence suggests that contiguous hind coxae are more primitive than separated ones. In the neuropteroid orders, all pairs of coxae are nearly or quite contiguous at the midline. In these orders the coxae are not retracted into coxal cavities. Since the Coleoptera probably evolved from a neuropteroid ancestor, it is reasonable to suppose that the coxal cavities developed around coxae which were contiguous at the midline. These cavities were confluent internally, but their external openings were separated by the junction of median processes from preceding and following sternites. In the Nebriini and Carabini, all three pairs of coxal cavities are still in this condition. These two tribes are usually considered to be among the most primitive Carabidae because of their open anterior coxal cavities, the simple form of the antenna cleaner, and the generalized character of the male genitalia. None of the Adephaga which were dissected have all three pairs of coxal cavities separated although most have one pair separated and a few have two pairs separated. The middle coxal cavities seem to be the most conservative. Only in *Metrius contractus* Eschscholtz are the middle coxal cavities truly separated by a relatively thin internal partition. By contrast, the majority of the Adephaga have the anterior coxal cavities slightly separated. As pointed out by Sloane (1923), the left and right coxal cavities are separated by a plate in all those Carabidae having closed anterior cavities, excepting the Omophronini. A similar separation exists in the Rhysodidae. Slightly separated posterior cavities occur in the Cychrini; and widely separated ones in Rhysodidae and *Gehringia. Metrius* and the Rhysodidae are the only groups known to us in which two pairs of cavities are separated (in *Metrius* the front and middle pairs, and in Rhysodidae the front and hind pairs). Thus it appears that the wide separation of the hind coxae is a derivative and not a primitive condition.

The extremely simple form of the metendosternite of Rhysodidae could also be a secondary condition. In a typical carabid such as *Nebria* (Fig. 3) the endosternite extends the whole length of the metasternum. At its anterior end it bifurcates, forming the "anterior arms" of Crowson. The latter make contact with the rear wall of the middle coxal cavities. Posteriorly, the metendosternite gives off a pair of lateral branches which parallel the anterior margin of the hind coxae. These antecoxal branches terminate laterally without making contact with the edge of the sternum. The position of the antecoxal branches shows externally as the antecoxal suture. In *Gehringia* (Fig. 4) the metendosternite is much shorter, and the "anterior arms," although well developed, lie far posterior to the middle coxal cavity. The antecoxal branches are well developed but are recurved so that they make contact with the suture between the metasternum and the hind coxae, producing what appears to be a pair of distinct sclerites. The shortening of the metendosternite in *Gehringia* might be the first stage of its reduction. In Rhysodidae the reduction has proceeded much further. The "anterior arms" are entirely absent. The endosternite itself is reduced to a shallow ridge on the inner surface of the metasternum. In *Rhysodes americanus* Laporte (Fig. 5) there are vestiges of the antecoxal branches in the form of a slight widening of the endosternite at the level where antecoxal branches would be expected to arise. In *Clinidium sculptile* Newman, antecoxal branches are entirely absent. Many polyphagous beetles have a well-developed metendosternite and, as shown in Crowson's figures, it is often similar in form to that of *Nebria*. We believe, therefore, that the simple metendosternite of Rhysodidae is a result of a process of reduction which has begun also in *Gehringia*.

Crowson's theory that the bark-dwelling habits of Rhysodidae are primitive is based on two suppositions—that the Coleoptera first evolved in this habitat and that the distinctive features of the Adephaga were originally adaptations to life under bark. His evidence for the first point is based largely on the structure and habits of the Cupedidae, which are generally conceded to be the most primitive living beetles. He presents a convincing argument that the evolution of elytra would be likely to occur in a bark-inhabiting insect. However, even if the earliest beetles lived under bark, it does not necessarily follow that all those beetles living today have been bark dwellers throughout their evolutionary history. Bark-dwelling is certainly secondary in the carabids *Morion, Helluomorpha,* and *Ardistomis,* which are derived, respectively, from Pterostichini, Lebiini, and Scaritini.

There are a number of features of Rhysodidae which are highly specialized and which could not have been present in the ancestors of other adephagous beetles. The most prominent of these are the features of the mouthparts. The maxillae are extremely reduced and are retracted into pockets in the dorsal face of the mentum. The ligula and labial palpi are likewise very small and are similarly concealed. The well-developed maxillae and ligula of a typical carabid approximate much more closely what one might expect of an ancestral Adephagan. Even if the bark-dwelling habits of Rhysodidae were primitive, their feeding mechanism certainly is not.

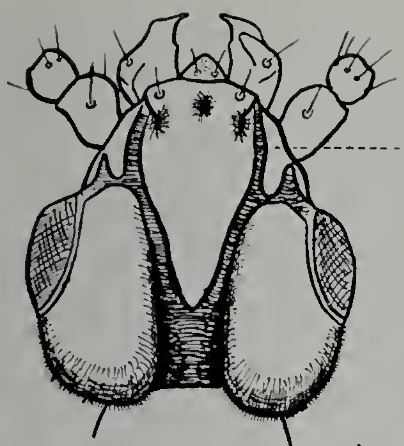
The most distinctive structural characteristic of the suborder Adephaga is the immobilization of the hind coxae which are functionally part of the body wall rather than of the legs. The hind coxae of Rhysodidae differ from those of other Adephaga only in their small size and in their lateral displacement. Crowson feels that the immobilization of the hind coxae can not be explained as an adaptation for running. He concluded that the ancestral Adephagan was unable to move the hind coxa while in confined spaces and subsequently lost the ability to do so.

We believe that the structure of the hind coxae of the adephagous beetles can be explained as adaptations to cursorial locomotion. It is instructive to compare the adaptations of adephagous beetles to those of an unrelated groups of running animals, the ungulate mammals. As summarized by Frechkop (1955), two basic features characterize the legs of cursorial ungulates: firstly, a specialization of the front legs for carrying the body weight and of the hind legs for supplying the thrust, and, secondly, a reduction in possible leg movements. The differences in function are reflected in strong anatomical differences of front and hind legs. The bones and muscles of the legs are modified so as to restrict the possible movements to those of direct use in running. The loss of the ability to rotate the feet makes the ungulate limbs of little use in climbing or feeding, but confers an advantage in running since muscular power is not needed to hold the legs in the proper position.

We believe that the adaptations of the Carabidae parallel those of the ungulates, and that the legs of all other adephagous beetles were derived from modifications of legs of the carabid type. The hind leg of a carabid is strongly differentiated from the other legs in its function. The hind coxa is fixed in such a position that the femur moves in an anteroposterior direction with the tibia directed largely rearward, and only slightly downward. Thus the hind leg is of very little use in supporting the animal's weight. It is, however, exceedingly effective in running because the rearward movement of the leg is almost entirely translated into the forward thrust of the body. Unlike those of other beetles, the hind leg of Adephaga has very little ability to rotate forward, an ability not needed in running but possibly of considerable importance in climbing. A slight degree of rotation is possible because of the oblique joint between femur and trochanter. The immobilization of the hind coxa thus may be regarded as analogous to the fusion of the tibia and fibula in the ungulate hind leg. It results in an increase in the efficiency of propulsion with a sacrifice of versatility. In contrast, the highly mobile coxae of the front and middle legs are capable of rapid rotation around a vertical axis. They are thus well adapted for the complex movements necessary for the support and balance of the body during rapid locomotion, often over irregular surfaces. It is true, of course, that not all cursorial beetles show these adaptations, but the Adephaga contain a very high proportion of those beetles which are able to run fast. Rapid locomotion apparently has been achieved by other means in the few cursorial Polyphaga, such as Staphylinidae.

The special features of the rhysodid hind coxa can be explained as adaptations of the carabid coxa to a relatively sedentary life in narrow tunnels. The few observations which we have made on living rhysodids indicate that they are incapable of rapid motion. Judging from the small size of the hind coxae, the musculature of the hind legs must be much reduced. The lateral migration of the hind coxae has the effect of shifting the legs to a more vertical position. This makes it possible for the hind legs to play a greater role in supporting the body. Since the femora project less laterally, the leg is less restricted in its movements within narrow confined places. *Gehringia* also seems to be adapted for slow locomotion in confined spaces, in this case in gravel beds rather than under bark. The few collectors who have taken it have commented on its sluggish movements (Lindroth, 1961).

FIG. 1—*Clinidium sculptile* Newman, dorsal view of head; V-possible vestige of frontal plate. FIG. 2—*Clinidium sculptile,* posterior view of left anterior tibia; TS-tibial spur, AC-antenna cleaner, T-base of tarsus. FIG. 3—*Nebria pallipes* Say, dorsal view of metasternum; AB-antecoxal branch, AA-"anterior arm," C2-mesocoxal cavity, C3-metacoxal cavity, E3-metendosternite. FIG. 4—*Gehringia olympica* Darlington, dorsal view of metasternum; abbreviations as in Fig. 3. FIG. 5—*Rhysodes americanus* Laporte, dorsal view of metasternum; abbreviations as in Fig 3. FIG. 6—*Clivina bipustulata* (Fab.), anterior view of tibia and tarsus of left front leg; AC-antenna cleaner, TS-tibial spur, T1-apical tooth, T2,3,4-lateral teeth. FIG. 7—*Dyschirius sphaericollis* Say, view and abbreviations as in Fig. 6. FIG. 8—*Clinidium sculptile,* view and abbreviations as in Fig 6. FIG. 9—*Clivina bipustulata,* posterolateral view of tibia and tarsus of left front leg; abbreviations as in Fig. 6. FIG. 10—*Dyschirius sphaericollis,* posterolateral view of tibia and tarsus of left front leg; abbreviations as in Fig. 6. FIG. 11—*Clinidium sculptile,* posterolateral view of tibia and tarsus of left front leg; abbreviations as in Fig. 6.



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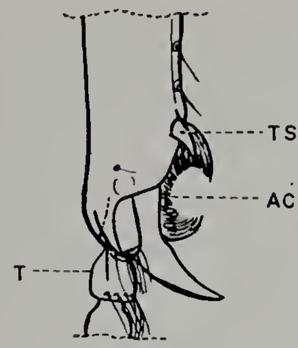

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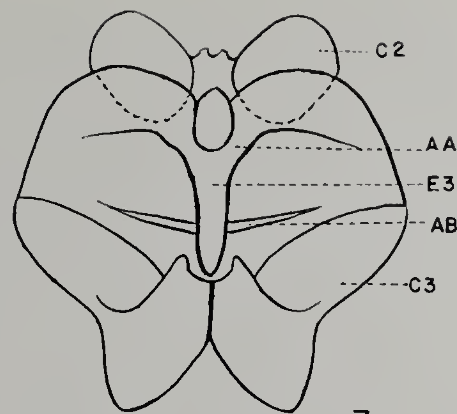

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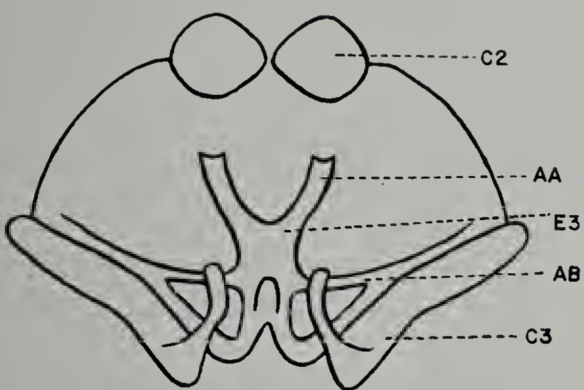

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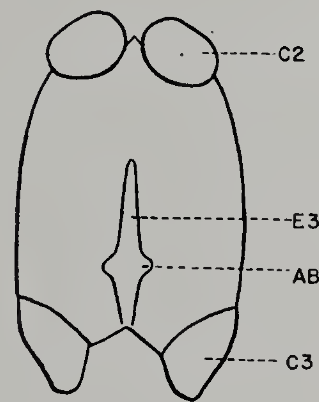

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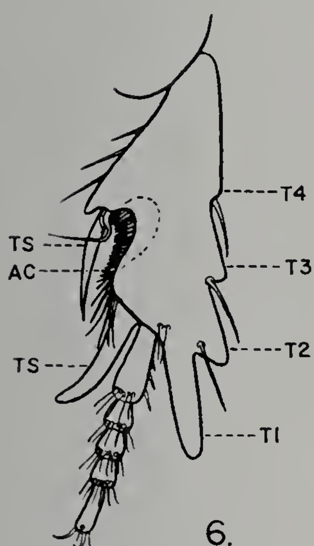

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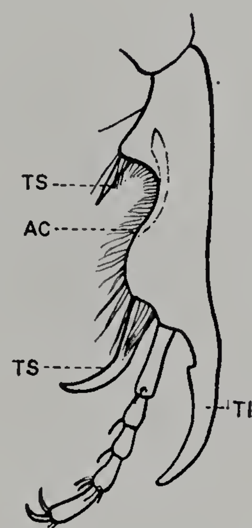

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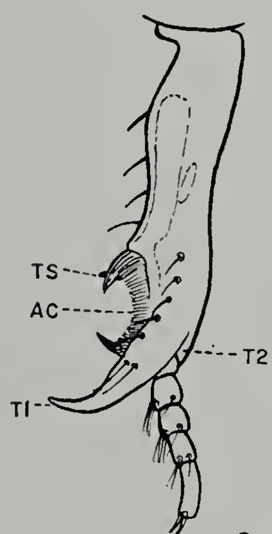

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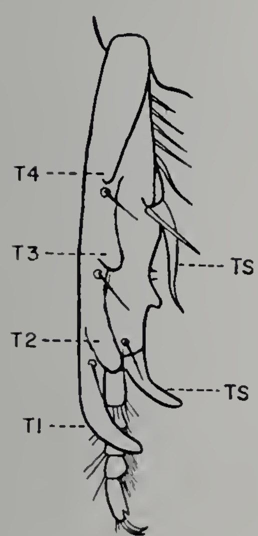

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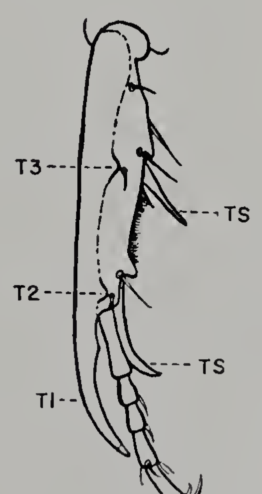

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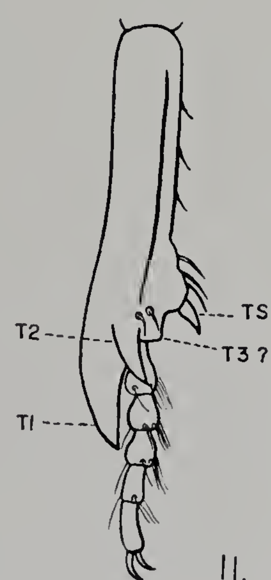

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Three characters of Rhysodidae seem to indicate an origin from some group of Carabidae. These are: the presence of tactile setae, the presence of an antenna cleaner of the "advanced anisochaetous" type, and the presence of closed, separated anteriod coxal cavities.

Tactile setae are a prominent feature of the Carabidae and have been much used in their classification. Apparently they have gone unnoticed in the Rhysodidae. In the two rhysodids occuring in eastern North America, the tactile setae are much reduced. In *Clinidium sculptile* they consist of a pair on the labrum, a pair on the clypeus, a pair on the last visible sternite, one on the scrobe of each mandible, and a scattered group on the mentum. In some specimens, at least, there is also a seta at the posterior angle of the pronotum. *Rhysodes americanus* has the same setae except that those on the pronotum apparently are absent. In addition, there are three setae at the tip of each elytron. In *Clinidium mexicanum* Chevrolat and in an unidentified *Clinidium* from Chiapas, southeastern Mexico, the tactile setae are much more numerous, and their arrangement is strongly suggestive of that of many Carabidae. As yet, we have not been able to study in detail the distribution of setae in *C. mexicanum*. The Chiapas species has the following setae: a pair on the clypeus, apparently two pair on the labrum, a single seta above and behind each eye, a seta at the middle of the lateral margin of the pronotum, another at each posterior angle, a pair on the last visible sternite, and a very well-developed series on the elytra. The elytral setae, like those of many carabids, are situated in the odd-numbered striae. There are approximately four in the first stria, five in the third stria, at least one in the confluent posterior portion of the fourth and fifth striae, and at least five along the lateral margin of the elytron, probably belonging to the ninth stria. Those of the third stria are placed evenly, while those of the other striae are concentrated in the posterior portion.

The Rhysodidae have a well-developed antenna cleaner consisting of a comb of hairs bounding an emargination on the inner edge of the anterior tibia (Fig. 2). On the posterior face of the tibia near the proximal end of the antenna cleaner is a small peglike structure. When cleared in KOH, this projection can be seen to be a separate sclerite. This and its location indicate that it is probably a reduced tibial spur. If so, the antenna cleaner is of the "advanced anisochaetous" type which is found in the majority of the Carabidae. The apical tibial spur has completely disappeared. The "advanced anisochaetous" antenna cleaner has apparently evolved independently in several different lines of Carabidae, so that its evolution in Rhysodidae might be the result of convergence. However, practically all Carabidae have an antenna cleaner of one type or another, and the "advanced anisochaetous" type is generally thought to have been derived from the simple type found in *Nebria* and *Carabus*. The presence of an "advanced anisochaetous" type in Rhysodidae implies that their ancestors had at least a simple antenna cleaner.

The structure of the anterior coxal cavity is another feature which the Rhysodidae share with a majority of the Carabidae. It is of the fully closed and separated type described by Sloane. The left and right coxal cavities are separated by a vertical plate (prosternal declivity of Sloane). The coxal cavity is closed posteriorly by the junction of the tip of the proepimeron with a postcoxal process arising from the top of the prosternal declivity.

Together they form a postcoxal bar. In Bembidiini, Elaphrini, Patrobini, and certain other tribes the tip of the proepimeron merely fits into a shallow concavity in the postcoxal process of the prosternum. In the Rhysodidae, as well as in the Scaritini, Cicindelini, Harpalini, Pterostichini, and many other tribes, a firm suture has developed. The tip of the proepimeron is dilated to form a ball or disc. It is exactly fitted into a deep concavity in the postcoxal process. The orifice of the cavity is more or less narrowed to fit the neck of the proepimeron.

It is next proper to ask whether the Rhysodidae can be shown to be related to any particular tribe of Carabidae. In general appearance the Rhysodidae resemble most closely some members of the Scaritini. If they were included in the Carabidae, the rhysodids would trace to Scaritini in Sloane's key. A number of features suggest that this resemblance is not simply a result of convergence. In both groups the anterior tibia is denticulate and has a large apical tooth extending well distad to the insertion of the tarsus. Additional common features are an "advanced anisochaetous" antenna cleaner, disjunct middle coxal cavities, closed and separate anterior coxal cavities with a ball-and-socket suture, and the concealment of the dorsal condyle of the mandible beneath the lateral margin of the clypeus.

In most Scaritini the teeth of the anterior tibia form a row along the lateral margin, and the apical one is curved outward (Figs. 6, 9). In the Rhysodidae the anterior tibia is superficially different (Figs. 8, 11). There are two teeth at the apex, the anterior one being the larger. Both arise at the lateral margin and curve inward, with the tarsus appearing to arise between them. On the posterior surface of the tibia there is a small projection which may represent a rudimentary third tooth. Some species of *Dyschirius* (Figs. 7, 10) show how the rhysodid tibia could have originated from the scaritine type. In *Dyschirius sphaericollis* Say the apical tooth is curved inward rather than outward as in other scaritines. The other teeth of the tibia have migrated to the posterior face and are invisible in anterior view. If the most distal of these teeth were elongated parallel to the apical tooth, the result would be a tibia very similar to that of the rhysodid.

There are several features in which scaritines and rhysodids do not agree. In the Scaritini there is a well-developed frontal plate above the base of the antenna. In the Rhysodidae such a plate is absent, although there is a small swelling above the base of the antenna which might represent a vestige of the frontal plate (Fig. 1). The metepimeron is totally absent from the Rhysodidae, while it is visible as a distinct sclerite in a vast majority of the Scaritini. The mesothorax is strongly constricted and the body pedunculate in Scaritini while the waist is broad in the Rhysodidae. Finally, the scrobal seta, which is present in the Rhysodidae, is absent in the Scaritini.

Possibly the Rhysodidae are a highly modified offshoot of the Scaritini. If so, the broad waist and the loss of the frontal plate are secondary modifications. The retention of the mandibular seta is less compatible with an origin from the Scaritini. It is possible that the seta was lost independently by all the surviving genera of Scaritini at some time after the Rhysodidae originated. The more likely explanation is that the Scaritini and Rhysodidae arose from a common ancestor which was basically like a scaritine but had mandibular setae and possibly lacked the narrowed waist and the frontal plate.

In our view, the Rhysodidae represent a specialized offshoot of the Carabidae. Those coleopterists who prefer to regard the Cicindelidae, Omophronidae, and other highly modified carabids as separate families will probably wish to retain the family rank of the Rhysodidae, also. Those who wish to follow the more natural classification and who reduce the aforementioned to the rank of subfamily or tribe should follow the same course with the Rhysodidae. There is some evidence of a relationship between the Rhysodidae and the Scaritini but it is not sufficiently strong to justify uniting the two. We suggest instead that the Rhysodidae be regarded as a tribe, Rhysodini, of the Carabidae, to be placed next to the Scaritini.

Literature Cited

Arnett, R. H., Jr.
1960. The beetles of the United States. Catholic Univ. Press. Washington, D. C.

Böving, A. G., and F. C. Craighead
1930. An illustrated synopsis of the principal larval forms of the order Coleoptera. Ent. Amer. 11(1): 1-125.

Crowson, R. A.
1955. The natural classification of the families of Coleoptera. N. Lloyd Co., Ltd. London. 187 pp.

Forbes, W. T. M.
1926. The wing folding patterns of the Coleoptera. Jour. N. Y. Ent. Soc. 34: 42-139.

Frechkop, S.
1955. Super-ordre des ongulés. Pp. 484-500. In Traité de Zoologie. Vol. 17 (1), Masson, Paris.

Jeannel, R.
1941. Coléoptères carabiques. Faune de France 39: 1-571.

Lindroth, C. H.
1961. The ground-beetles of Canada and Alaska. Opusc. Ent. Suppl. 20(2): 1-200.

Sloane, T. G.
1923. The classification of the family Carabidae. Trans. Roy. Ent. Soc. London, pp. 234-250.

BOOK NOTICE

THE GROUND-BEETLES (CARABIDAE, EXCL. CICINDELINAE) OF CANADA AND ALASKA, part 2, by Carl H. Lindroth, Opuscula Entomologica, supplementum 20, 200 pp., 1961—The readers of the *Bulletin* are well aware already of the outstanding work of Carl Lindroth. It is sufficient that he is the author to know the value of the work. The present volume represents the first of a projected treatment of this large beetle family, especially well represented in the northern half of North America. (Part I will be published as a final volume of the five proposed, with keys to genera, introduction, and other information.) The present volume, complete with specific keys and descriptions, locality data, and 101 figures covers the subfamily Trachypachinae through tribe Trechini. Future parts will be announced as received.

THE SCIENTIFIC NAME OF THE ALFALFA WEEVIL (COLEOPTERA: CURCULIONIDAE)

By Rose Ella Warner[1]

Since 1823 the generic names *Phytonomus* Schoenherr and *Hypera* Germar have been widely used for the clover and alfalfa weevils, though not always in the same sense. The following facts are presented at this time as a possible aid toward restoring nomenclatural stability to an economically important group of weevils. The principal questions are whether *Phytonomus* or *Hypera* is the correct generic name for the clover and alfalfa weevils, and whether *variabilis* Herbst or *postica* Gyllenhal is the correct specific name for the alfalfa weevil. All four combinations of these generic and specific names have been used at one time or another for the alfalfa weevil.

The Generic Name

The nomenclatural histories of *Hypera* and *Phytonomus* may be condensed as follows:

1817, Germar, Magazin der Ent., Vol. 2, p. 340, establishes *Hypera,* not by a morphological description, but by including the following: "*Hypera* nob. *Rhynch. nigrirostris, scanicus, Curculio Polygoni, punctatus, Arundinis.*"

1819, Leach, in Samouelle, The Entomologist's Useful Compendium, p. 205, lists several recently established genera and says, "the species mentioned may be considered the type." Under *Hypera* Germar he lists "sp. 1 *Cur. nigrirostris,*" which undoubtedly is *nigrirostris* Fabricius (1775, Syst. Ent., p. 132).

1823, Schoenherr, Isis von Oken, Heft 10, establishes *Phytonomus,* but not by a morphological description. In column 1133 Schoenherr explains that he changed certain feminine generic names and changes *Hypera* to *Phytonomus*. Schoenherr did not designate a type-species for *Phytonomus* at this place in his paper, but later in this same paper (column 1143) he formally proposes the name as follows: "120 *Phytonomus* nob. *Hypera* Germ., Dej., Typ. *Rhynchaen. Polygoni* Fabr."

1826, Schoenherr, Curc. Disp. Meth., pp. v-vi, states that he had given masculine names to the genera of Curculionidae. On page 14 he repeats his 1823 designation of *polygoni* as type-species as follows: "Genus 94 *Phytonomus* nob. (*Hypera* Germ.) Typus: *Rhynch. Polygoni* auct."

Several brief discussions of Schoenherr's practice of substituting masculine names for feminine names have appeared in Petites Novelles Entomologique, Volume 2, 1876, by Rouget, p. 73, by Girard, p. 78, by Tournier, p. 79, and by Rouget, p. 83. Marshall in 1913 (Ann. Mag. Nat. Hist., Ser. 8, Vol. 11, p. 225) pointed out that *Phytonomus* was invalid. In spite of these clearly stated rejections, the name *Phytonomus* has continued in

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rather common use to the present time. Even Petri in his admirable monograph of the group (1901, Siebenburg Ver. Naturwiss. Hermanstadt.), Titus (1911, Ann. Ent. Soc. America, Vol. 4), and Zaslaskij (1961, Revue d'Entomologie de l'URSS. Vol. 40) have used *Phytonomus*.

Some authors have argued that *Phytonomus* has a different type-species than *Hypera* because of the designation of *polygoni* by Schoenherr in 1823. But the new International Code of Zoological Nomenclature, 1961, p. 65, Article 67(i) says, "Replacement names.—If a zoologist proposes a new generic name expressly as a replacement for a prior name, both nominal genera must have the same type-species, and, subject to (i) below, type-fixation for either applies also to the other, despite any statement to the contrary." (The statement, "subject to (i) below," does not apply here.) Therefore, the type-species of *Phytonomus* is automatically the same as the type species of *Hypera,* which is *Curculio nigrirostris* Fabricius, according to Leach, 1819. *Rhynchaenus polygoni* cannot be the type-species of *Phytonomus,* despite Schoenherr's designation. Thus, *Hypera* and *Phytonomus* are absolute synonyms, because they have the same type-species. *Phytonomus,* therefore, can never be used as a valid generic name.

The Specific Name

The early names that were proposed for the alfalfa weevil are:

1784 *Curculio haemhorroidalis* [*sic*] Herbst, in Fuessly's Arch. Ins. Gesch., Heft 5, p. 78, preoccupied by *Curculio haemorrhoidalis* Fabricius, 1775, Syst. Ent., p. 140.

1795 *Curculio variabilis* Herbst, Natursys. Ins., Vol. 6, p. 263, preoccupied by *Curculio variabilis* Fabricius, 1776, Gen. Insectorum, Mantissa specierum, p. 224.

1802 *Curculio bimaculatus* Marsham, Coleop. Brit., p. 266, preoccupied by *Curculio bimaculatus* Fabricius, 1787, Mant. Insectorum, Vol. 1, p. 98.

1813 *Rhynchaenus pollux* Gyllenhal, Ins. Suecica, Vol. 1, Part 3, p. 96, preoccupied by *Rhynchaenus pollux* Fabricius, 1801, Syst. Eleuth., Vol. 2, p. 457.

1813 *Rhynchaenus posticus* Gyllenhal, Ins. Suecica, Vol. 1, Part 3, p. 113.

All specific names for the alfalfa weevil published before *Rhynchaenus posticus* Gyllenhal, 1813, are preoccupied and are rendered permanently unavailable. Therefore, the valid scientific name of the alfalfa weevil, following the International Code of Zoological Nomenclature, is *Hypera postica* (Gyllenhal).

AVE ATQUE VALE

ROBERT EVANS SNODGRASS

1875—1962

THE ROBUSTUS GROUP IN THE GENUS PSEUDANOPHTHALMUS (COLEOPTERA: CARABIDAE: TRECHINI)[1]

By Thomas C. Barr, Jr.[2]

The blind carabid beetles of the cavernicole genus *Pseudanophthalmus* Jeannel are wingless, rufous or testaceous, usually pubescent, and for the most part completely eyeless. Like most carabids, they are predatory, feeding on small millipedes, enchytraeid annelids, and other cave animals. Like most representatives of the tribe Trechini, to which they belong, they are found in cool, moist microhabitats. In the caves, therefore, they are most often encountered in wet or humid areas near a source of food.

A feature of special biological interest is the pronounced local endemism exhibited by the genus, each cave region having its own peculiar assemblage of species. In a recent checklist of troglobites of the United States, Nicholas (1960) listed 82 described species and subspecies of *Pseudanophthalmus*. This number will be greatly increased as many additional species already collected from the extensive cave regions of the eastern United States are described. Although poorly represented in most museum and private collections because its species are known only from caves, *Pseudanophthalmus* is quite probably the fifth largest genus of Carabidae in the United States, exceeded in number of species only by *Bembidion, Pterostichus, Agonum,* and *Harpalus*. It is far more homogeneous and geographically less widely distributed than any of these four epigean genera.

The genus was reviewed by Jeannel (1949), but additional contributions have been made by Krekeler (1958) and Barr (1959a, 1959b, 1960a). An excellent review of problems of dispersal of these beetles was written by Krekeler (1959). Populations from different cave systems in a given region are often distinguished only by slight but constant differences. Even if it were possible to interbreed two such slightly different populations in the laboratory (breeding experiments of this nature have not yet been performed), one would not be justified in assuming that interbreeding occurs in nature, and that the two populations contribute to the same gene pool. Several factors have combined to necessitate an undesirable degree of subjectivity in assigning specific or subspecific rank to different populations from various cave systems. The principal difficulties are rarity of certain species, problems associated with subterranean collecting, and concomitantly, inadequately known range of variation and geographic range. The potential contribution of cavernicole taxonomy to the broader and more general problem of animal speciation is, however, great, and it should be well worth the effort to seek a more objective basis for defining and recognizing a cavernicole species.

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[1] This investigation was supported in part by grants from the Penrose Fund (No. 2413) of the American Philosophical Society and from the National Science Foundation (G-18765).

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Emerson (1945) suggested that the subspecies of *Pseudanophthalmus* described by Valentine (1932) are full species because of the "indicated reproductive isolation." However, it is often not possible to know in advance whether closely similar populations from two different caves in the same region are reproductively isolated or not (Barr 1959a, 1960a, 1960b). The beetles are probably capable of ranging rather widely through subterranean openings inaccessible to man. There is ample geological evidence that such openings are abundant and extensive in limestone terrains, especially in stream valleys (Barr 1961a). Just as an oil pool may be tapped by various wells at different locations, so may the species population of a widely dispersed cavernicole be sampled throughout its geographic range. The sampling localities are the individual, accessible caves.

As with epigean populations, extensive distributional data and large series of specimens would be most useful in clarifying some of the problems of cavernicole taxonomy. Some species of *Pseudanophthalmus* are either so rare or so difficult to obtain that it is not feasible to acquire large series from numerous caves. But certain species groups inhabiting karst regions with hundreds of known caves are characteristically rather abundant. A detailed analysis of one or more of these groups should provide evidence of possible application to the less common groups. Such an analysis has been attempted in the present paper.

The *robustus* species group of *Pseudanophthalmus,* as defined below, is distributed (Fig. 5) throughout much of the upper Cumberland River drainage in Tennessee and a small part of Kentucky. It inhabits cave systems in the valleys of the Wolf, Obey, Roaring, and Caney Fork rivers, all east tributaries of the Cumberland. Physiographically, the range of the group includes the western margin of the Cumberland plateau, the undulating surface of the Eastern Highland Rim, and a small portion of the east margin of the Central Basin of Tennessee. In this paper, four species are recognized. Conclusions are based on examination of approximately 1500 specimens from 75 different caves in 9 Tennessee counties and 2 Kentucky counties.

The material examined in the present study was collected between 1956 and 1961. Male genitalia were cleared and mounted in polyvinyl-lactophenol by the method I have described previously (Barr 1961b).

Jeannel (1949) included *P. horni* (Garman 1892), *P. macradei* Valentine 1948, *P. intermedius* Valentine 1931, and *P. templetoni* Valentine 1948 in his "groupe *robustus.*" *P. horni* and its relatives, found in central Kentucky and northward, are morphologically and geographically distinct (Krekeler 1959) and are more naturally included in the *horni* species group. Valentine (1952: page 15) proposed the subgeneric category *Tennessarius* for the large, slender, glabrous species *intermedius* and *templetoni,* although the proposal was not treated in detail and a type species (presumably *intermedius*) was not designated. In 1959 I followed Jeannel and placed *robustus, macradei,* and *templetoni* together in the "*robustus* group." Further study and collection of much additional material have convinced me that *intermedius, templetoni, macradei,* and *vanburenensis* Barr 1959 are sufficiently distinct to merit inclusion in an *intermedius* group (new group), but not different enough from other members of *Pseudanophthalmus* to warrant setting them apart as a subgenus. *P. macradei* and *P. vanburenensis* (see below) bridge the gap between *intermedius* and *templetoni* and the other members of the genus. These four species, plus other undescribed species of the *intermedius* group from Kentucky, Alabama, and Tennessee, will be treated in detail in a later paper. *Tennessarius* Valentine is here regarded as a synonym of *Pseudanophthalmus* Jeannel.

Pseudanophthalmus vanburenensis Barr [NEW STATUS]

Pseudanophthalmus templetoni vanburenensis Barr 1959a: page 15; type: McElroy Cave, Van Buren Co., Tennessee (American Mus. Nat. Hist., New York).

Since writing the original description of *P. vanburenensis,* I have taken additional material both of this species and of *P. templetoni,* and am convinced that the two forms are distinct species. From both *intermedius* and *templetoni, P. vanburenensis* differs in the proportionately more robust form, the rounded (not deplanate) humeri, the less obliquely inclined prehumeral borders, and the enlarged, boot-shaped apex of the aedeagus. These same characters and the larger size serve to distinguish it from *P. macradei.*

ROBUSTUS GROUP

Length 3.8-5.6 mm. Pronotum glabrous; elytra with sparse, very short pubescence when observed with oblique illumination. Labrum doubly emarginate, median lobe usually rather low. Pronotum transverse, usually 15-20% wider than long; margins feebly sinuate; hind angles large and right. Elytra oblong-elliptical; humeri angulate and serrulate, prehumeral borders nearly perpendicular to median line; longitudinal striae deep, conspicuously punctate (except in *valentinei*); apical groove short and rounded, its recurrent portion connected with 3rd longitudinal stria (or rarely 5th in *farrelli*) at level of apical discal seta; anterior discal seta behind level of 4th marginal humeral seta. Aedeagus elongate, rather slender; apex variously modified into a blunt, deflexed spout or a knob; transfer apparatus of two pieces, the left a slender, hollow rod nested in the broad, curved lamina of the right piece; internal sac feebly armed with small scales; parameres with 4 setae. Type species: *P. robustus* Valentine 1931.

The affinities of the *robustus* group lie with the *menetriesi* and *eremita* (sensu Barr 1960a) groups on the one hand, and with members of the *intermedius* group on the other. All four species groups are closely linked by the form of the copulatory apparatus, which consists of a large, lamellar, medially concave right piece, within which is nested a smaller, rod-like left piece; both copulatory pieces are simple, unmodified, and have blunt, rounded apices.

In listing caves from which members of the *robustus* group are known, I have made use of the county numbers assigned in *Caves of Tennessee* (Barr 1961a). By referring to this book, the reader can find the exact location and a brief description of each cave. Unnumbered caves are not described in the book. The location of holotypes is given in parentheses after citation of the original description.

KEY TO SPECIES OF THE ROBUSTUS GROUP (MALES ONLY)

1. Apex of aedeagus boot-shaped (Fig. 4); longitudinal striae of elytra very feeble, punctation obsolete; Putnam and Overton Counties, Tennessee ---- **P. VALENTINEI** Jeannel
   Apex of aedeagus produced but not boot-shaped; longitudinal striae well defined, usually strongly punctate -- 2

2(1). Apex of aedeagus not deflexed (Fig. 3); Overton, Pickett, and Fentress Counties, Tennessee, to Clinton and Wayne Counties, Kentucky----------- **P. BEAKLEI** Valentine
   Apex of aedeagus narrower in lateral view, slightly but clearly deflexed ----------- 3

3(2). Aedeagus smaller (0.88-1.02 mm), more slender, apex thicker in lateral view; (Fig. 1); central Overton to northern Grundy County, Tennessee--**P. ROBUSTUS** Valentine
   Aedeagus larger (1.01-1.12 mm), apex narrower in lateral view (Fig. 2); caves of Smith Fork drainage, DeKalb and Smith Counties, Tennessee --------- **P. FARRELLI** Barr

FIGURES 1-4. Aedeagi of *Pseudanophthalmus* of the *robustus* group. 1—*P. robustus* Val., Dairyhouse Cave, White Co., Tenn. 2—*P. farrelli* Barr, Indian Grave Point Cave, DeKalb Co., Tenn. 3—*P. beaklei* Val., Sells Cave, Fentress Co., Tenn. 4—*P. valentinei* Jeann., Blind Fish Cave, Putnam Co., Tenn.

Pseudanophthalmus robustus Valentine

FIG. 1

Pseudanophthalmus robustus Valentine 1931: page 250, pl. 20, Fig. 2; type: Johnson Cave, Putnam Co., Tennessee (U. S. Nat. Mus.). Valentine 1932: 274, pl. 23, Fig. 1. Jeannel 1949: page 49, Figs. 28, 31. Barr 1959a: page 10.

Pseudanophthalmus robustus neglectus Jeannel 1949: page 50, Fig. 33; type: Cumberland Caverns, Warren Co., Tennessee (Mus. Nat. Hist. Nat., Paris). Barr 1959a: page 12. [NEW SYNONYMY].

Pseudanophthalmus robustus megosteus Barr 1959a: page 12, Fig. 4(2); type: Big Bone Cave, Van Buren Co., Tennessee (American Mus. Nat. Hist., New York). [NEW SYNONYMY].

The type species of the group is also the most widely distributed, ranging along the Eastern Highland Rim, between the western margin of the Cumberland plateau and the eastern margin of the Central Basin in an area some 65 miles long and 6 to 25 miles wide. The northern limit is in central Overton County about 3 miles southwest of Livingston and the southern limit is in northern Grundy County near Viola. From the distribution map (Fig. 5) it may be seen that the Overton County populations are apparently isolated from the populations in the rest of the range, the intervening caves being inhabited by *P. valentinei* (drainage basin of Spring Creek, a tributary of Roaring River).

In various parts of its range, *P. robustus* is sympatric with *P. valentinei, P. macradei, P. templetoni, P. vanburenensis,* and *Nelsonites walteri* Val. In no known localities is it sympatric with its closest relatives, *P. beaklei* or *P. farrelli*. From *P. farrelli, P. robustus* is separated by the Caney Fork River, although there is no reason to suppose that the river constitutes a physical barrier to dispersal. *P. beaklei* approaches within 4 miles of the northernmost limit of the range of *P. robustus,* but no clinal variations indicating potential intergradation in the inaccessible, intermediate, subterranean areas have been detected.

P. robustus was collected from the following caves: TENNESSEE. *Overton County:* Carr Saltpeter, 2 Bear, 8 Crawford, 14 Mill, 22 Russell. *Putnam County:* 1 Ament, 5 Blind Fish, 8 Bridge Creek, 9 Buckner Sink, 10 Calfkiller Saltpeter, 18 Johnson (type loc.), 19 Kuykendall, Mine Lick Creek, 35 Wall. *DeKalb County:* 7 Clemons. *White County:* 1 Baker, 2 Blue Spring, 7 Haskell Sims, 8 Indian, 9 Lost Creek, 11 Moore, 12 Mott Cove, 15 Pollard Saltpeter, 17 Quebeck, 19 Rockhouse, 22 Selby, 23 Sparkman, 24 Stonehead, 25 Walling, 26 Ward. *Van Buren County:* 1 Big Bone, 10 McElroy, 12 Rice. *Warren County:* 2 Blowing, 3 Cumberland, 4 Grissom Quarry, 6 Hobbs, 8 John Green, 19 Solomon Saltpeter. *Grundy County:* 5 Boyd Hollow, 9 Dry, 19 Skull, 20 Tom Campbell, 22 Wanamaker.

Pseudanophthalmus farrelli Barr [NEW STATUS]

FIG. 2

Pseudanophthalmus robustus farrelli Barr 1959a: page 12, Fig. 4(3); type: Indian Grave Point Cave, DeKalb Co., Tennessee (American Mus. Nat. Hist., New York).

The range of this species is limited to caves in the valley of Smith Fork (a tributary of Caney Fork River, which flows into the Cumberland), on the west (left) side of the Caney Fork in Smith and DeKalb counties, Tennessee. All of the caves are developed in Ordovician limestones of the Nashville group at Central Basin level. At the type locality, *P. farrelli* is sympatric with *Pseudanophthalmus tiresias* Barr.

P. farrelli was collected from the following caves: TENNESSEE. *DeKalb County:* 1 Avant, 9 Cripps Mill, 12 Fox, 17 Hall, 19 Indian Grave Point (type loc.), 20 Jim, 25 Snow Hill. *Smith County:* 4 John Fisher.

Pseudanophthalmus beaklei Valentine [NEW STATUS]

FIG. 3

Pseudanophthalmus robustus beaklei Valentine 1937: page 97, pl. 8, Fig. 3; type: Bunkum Cave, Pickett Co., Tennessee (U. S. Nat. Mus.).

Pseudanophthalmus robustus subspp. *Beakleyi:* Jeannel 1949: page 51, Fig. 32 (emendation).

Pseudanophthalmus robustus lupus Barr 1959a: page 14, Fig. 4(4); type: Wolf River Cave, Fentress Co., Tennessee (American Mus. Nat. Hist., New York) [NEW SYNONYMY].

North of Livingston, Overton County, Tennessee, *P. beaklei* replaces *P. robustus* as the dominant *Pseudanophthalmus* in the caves along the western margin of the Cumberland plateau. Its range extends northeastward through Pickett and Fentress Counties, Tennessee, into adjacent portions of Clinton and Wayne Counties, Kentucky. It is sympatric in various caves with *P. valentinei, Nelsonites jonesei* Val., *Darlingtonea kentuckensis* Val., and with 3 other, undescribed species of *Pseudanophthalmus* (belonging to the *intermedius* and *menetriesi* groups).

P. beaklei was collected from the following caves: TENNESSEE. *Overton County:* 6 Coleman, 10 Falling Springs, 17 Parrott, 27 Wash Lee. *Pickett County:* 3 Bunkum (type loc.), 6 Massengill, 8 Pratt. *Fentress County:* 2 Copley Saltpeter, 4 Gwinn Cove, 5 Manson Saltpeter, 10 Sells, 12 Tater, 13 Wolf River. KENTUCKY. *Clinton County:* Copperas Saltpeter Cave, 1.4 mi. south of Savage, in the Port-au-Grace Community. *Wayne County:* Blowing Cave, 0.75 mi. southeast of Sunnybrook, at the head of Carpenter Fork; Wind Cave, 3.5 mi. south-southwest of Slickford, at the base of Horse Pound Ridge.

Pseudanophthalmus valentinei Jeannel

FIG. 4

Pseudanophthalmus Valentinei Jeannel 1949: page 51, Figs. 24, 29; type: Johnson Cave, Putnam Co., Tennessee (Mus. Nat. Hist. Nat., Paris).

P. valentinei occupies certain caves of the Eastern Highland Rim near the western base of the Cumberland plateau in Putnam and Overton Counties, Tennessee. It is sympatric with both *P. robustus* and *P. beaklei,* as well as with *Nelsonites walteri* and at least one undescribed species of *Pseudanophthalmus* (*intermedius* group). In the middle portion of its range (fig. 5) it appears to occupy exclusively the caves of the Spring Creek drainage north of Cookeville, separating the northernmost colonies of *P. robustus* from populations in the rest of the range of that species.

P. valentinei was collected from the following caves: TENNESSEE. *Putnam County:* Algood School, 5 Blind Fish, 18 Johnson (type loc.), Webb. *Overton County:* 3 Bilbrey, 7 Copeland Saltpeter, 10 Falling Springs, 11 Fancher (both cave and pits), 16 Obe Lee, 25 Swift, 27 Wash Lee.

DISCUSSION

The taxonomic picture revealed by examination of the wealth of material available in this group is one of three closely similar, allopatric forms, and one markedly dissimilar form (*P. valentinei*) which is sympatric with two of the others. In all probability, *robustus, farrelli,* and *beaklei* are comparatively recent descendants from a common ancestor. It is conceivable that one might wish to emphasize this recency of descent by treating them as a polytypic species, as has been done in the past. I prefer to regard them as full species for the following reasons: (1) The three do not interbreed in nature. Although it is possible that they might interbreed in the laboratory (and such desirable data are not yet available), the distributional data indicate that they do not do so in their natural habitats. (2) There is no evidence of clinal variation toward the limits of the ranges, which might be expected if intergradation occurred.

In arriving at this interpretation, I have been influenced by the arguments of Krekeler (1958, 1959) on the practicability of extrinsically determined isolation of species populations, but believe that the degree of isolation of a population in any given cave system is not determinable *a priori.* In extensive karst areas underlain by predominantly horizontal limestone strata, the geographic limits of a cavernicole species are probably decided by selective factors, not by the physical inability of the species to penetrate beyond the area in which it occurs. *P. valentinei* is quite rare in the Calfkiller Valley, at the southernmost limit of its range. *P. robustus* becomes relatively uncommon near the southern limit of its range, where it is sympatric with *P. macradei* (*intermedius* group), a species of similar size and apparently similar ecological preferences. *P. macradei* is very abundant where *P. robustus* is rare, but itself is extremely rare in the Calfkiller Valley. There is apparently no extrinsic deterrent to prevent dispersal of *P. robustus* and *P. macradei* within the limits of their respective ranges, but, if abundance is any index of adaptation to a particular set of environmental circumstances, the two species are responsive to different selection pressure complements.

One might suppose that *P. robustus* would be extrinsically isolated from *P. farrelli* by stratigraphic barriers. The bulk of the caves inhabited by *robustus* are developed in the Mississippian limestones of the Chester and Meramac series. Between the Meramac rocks and the Ordovician limestones of the Nashville group in which the *P. farrelli* caves are developed there is an unbroken sequence of Osage rocks (predominantly Fort Payne chert) and the Chattanooga shale. The Fort Payne and the Chattanooga apparently do not prevent dispersal of *P. robustus* across the entire Eastern Highland Rim to Central Basin level, where it has been taken in caves along Mine Lick Creek, in western Putnam County, and in a cave near Caney Fork River, in a nearby portion of DeKalb County.

It is believed that the ranges of the four species and of the group as a whole are rather accurately delineated. The *robustus* group is replaced (geographically though not necessarily ecologically) by the *engelhardti* group (*P. tiresias* and relatives) of *Pseudanophthalmus* to the west and south; by the *cumberlandus* and *menetriesi* groups to the northwest; and by *Ameroduvalius jeanneli* Valentine to the northeast. The *intermedius* group occurs in the same area as the *robustus* group but extends farther northeast and southwest along the western base of the Cumberland plateau, although it does not extend out into the Mississippian plateau or into the Central Basin.

The present interpretation of *P. robustus, P. farrelli,* and *P. beaklei* as full, strictly allopatric species raises questions about the status of the various "subspecies" of such wide-ranging polytypes as *P. loedingi* Valen-

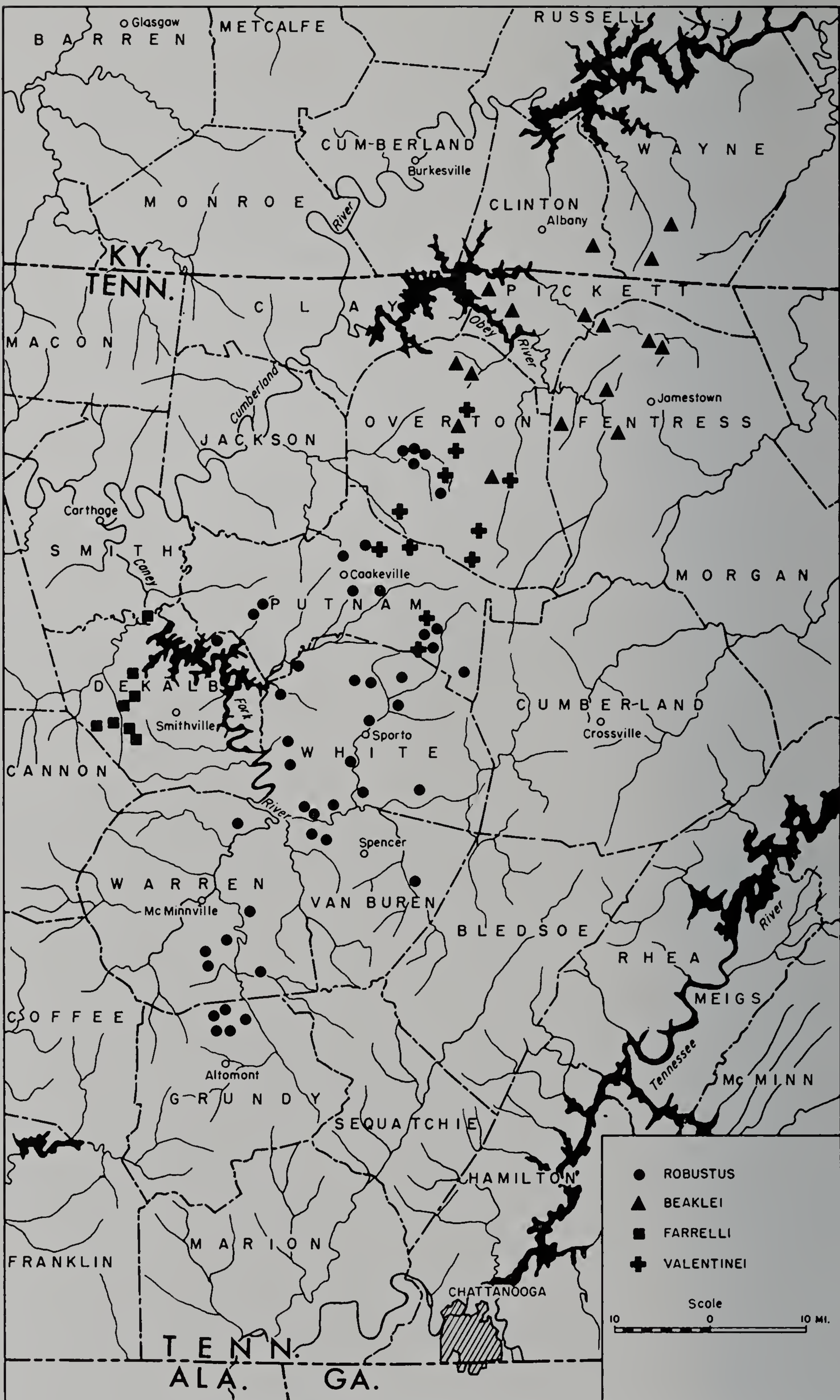

FIGURE 5. Geographic distribution of the *robustus* group of *Pseudanophthalmus* (drafted by R. Potts).

tine (emendation of *P. lödingi* Valentine 1931: page 252; *P. lodingi* of authors), *P. tiresias* Barr, and *P. tenuis* (Horn). Each of these polytypes requires reexamination and reevaluation, especially if larger series and better distributional data can be obtained. I made a partial attempt to do this for *P. tenuis* (Barr 1960a) and still believe that *P. eremita longicollis* Jeannel and *P. bloomi* Krekeler are synonyms *of P. tenuis*. Many more caves must be sampled before the status of the other supposed subspecies of this polytype can be clarified.

The geographic range of the *robustus* group (and to a lesser extent, of the *intermedius* group) coincides rather closely with the known range of *Trechus (T.) cumberlandus* Barr 1962, distributed along the Cumberland plateau from Grundy County, Tennessee, to Wayne County, Kentucky. *T. cumberlandus* is a member of the *carolinae* group, allied to *T. schwarzi* Jeannel. The *carolinae* group (Barr 1962) has four known species, three of which occur in the mountains of western North Carolina (Mt. Mitchell and vicinity). The fourth species, *T. cumberlandus,* is known from caves, sinkholes, and from gravelly areas near cold springs.

Jeannel (1949) suggested that the epigean ancestors of *Pseudanophthalmus* may have lived in the southern Appalachians during the Pleistocene, spreading outward into the Appalachian valley and Interior Low Plateaus in periods of glacial advance and retreating into caves or becoming extinct at the surface during the warmer, drier, interglacial periods. At the present time the only living surface Trechini in the eastern United States belong the genus *Trechus* (and to *Lasiotrechus,* introduced in the northeast), most of the species of which inhabit the southern Appalachians. A few wide-ranging species of *Trechus* are found in the extreme northern United States and Canada. We can only conjecture about the geographic distribution of ancestral *Pseudanophthalmus,* but in all probability the Appalachians served then, as now, as a center of trechine dispersal and speciation. The present distribution of the *carolinae* group demonstrates that at least one group of trechines centered in the Appalachians has been able to colonize wet, cool microhabitats along the western front of the Cumberland plateau. In view of the close morphological similarity of *T. cumberlandus* to *T. schwarzi,* this colonization must have been a comparatively recent event. Perhaps it took place during Wisconsin time, when a common ancestor of the two species ranged freely across the Cumberland plateau, becoming restricted to cool, moist areas as the Wisconsin ice sheet retreated northward. Such an event is possibly a pattern of trechine dispersal in the eastern United States. The epigean, ancestral species of *Pseudanophthalmus* which gave rise to *P. robustus, P. beaklei,* and *P. farrelli* could have colonized cave systems along the edge of the Cumberland plateau in a similar manner. It is suggested that the colonization of the plateau by the *carolinae* group may be repeating the pattern of similar colonization by the *robustus* group and possibly also the *intermedius* group during the Pleistocene.

Literature Cited

Barr, Thomas C., Jr.

1959a. New cave beetles (Carabidae, Trechini) from Tennessee and Kentucky. Jour. Tennessee Acad. Sci., 34(1): 5-30.

1959b. The male of *Pseudanophthalmus audax* (Coleoptera, Carabidae). Trans. Kentucky Acad. Sci., 20(1/2): 1-3.
1960a. A synopsis of the cave beetles of the genus *Pseudanophthalmus* of the Mitchell plain in southern Indiana (Coleoptera, Carabidae). Amer. Midland Nat., 63(2): 307-320.
1960b. Introduction (*To* Symposium: Speciation and raciation in cavernicoles). Ibid., 64(1): 1-9.
1961a. Caves of Tennessee. Tenn. Dept. Conserv. Commerce, Div. Geol. Bull. 64, 567 pp., 150 figs.
1961b. A one-step clearing and mounting technique for male genitalia in Coleoptera. Coleopterists' Bull., 15(1): 7-8.
1962. The genus *Trechus* in the southern Appalachians (Coleoptera: Carabidae: Trechini). Ibid., 16(3): 65-92, 27 figs.

EMERSON, ALFRED E.
1945. Taxonomic categories and population genetics. Ent. News, 56: 14-19.

JEANNEL, RENÉ
1949. Les coléoptères cavernicoles de la région des Appalaches. Étude systématique. Notes Biospéologiques, 4, Publ. Mus. Nat. Hist. Nat., Paris, no. 12: 37-115.

KREKELER, CARL H.
1958. Speciation in cave beetles of the genus *Pseudanophthalmus* (Coleoptera: Carabidae). Amer. Midland Nat., 59: 167-189.
1959. Dispersal of cavernicolous beetles. Systematic Zoology, 8(3): 119-130.

NICHOLAS, G.
1960. Checklist of macroscopic troglobitic organisms of the United States. Amer. Midland Nat., 64(1): 123-160.

VALENTINE, J. MANSON
1931. New cavernicole Carabidae of the subfamily Trechinae Jeannel. Jour. Elisha Mitchell Sci. Soc., 46: 247-258.
1932. A classification of the genus *Pseudanophthalmus* Jeannel (fam. Carabidae) with descriptions of new species and notes on distribution. Ibid., 48: 261-280.
1937. Anophthalmid beetles (fam. Carabidae) from Tennessee caves. Ibid., 53: 93-100.
1952. New genera of anophthalmid beetles from Cumberland caves. Geol. Surv. Alabama, Mus. Pap. 34: 1-41.

BOOK REVIEW

A HANDBOOK OF BIOLOGICAL ILLUSTRATION, by Frances W. Zweitel, Phoenix Science Series, The University of Chicago Press. Price $1.95.

This handbook is a welcome guide to "the biologist who is not an artist and the artist who is not a biologist." It is intended for the guidance of the student or professional biologist who is unfamiliar with the materials and techniques of illustrating and who may find it necessary to prepare his own illustrations for classroom assignments or scientific publications. The text is well written and clearly illustrated. The author discusses printing processes, size and preparation of graphs and maps, lettering, illustrations from photographs, mounting and handling illustrations. Each chapter has a list of selected references for those who wish to delve deeper into the subject. Every biologist who expects to publish and illustrate his publication will find this handbook a worthwhile investment.—Eugene J. Gerberg, Insect Control & Research, Inc., Baltimore 28, Maryland.

NOTE ON A CROSS MATING BETWEEN TWO SUBSPECIES OF TROPISTERNUS LATERALIS (FABR.) (COLEOPTERA: HYDROPHILIDAE)[1]

By David P. Wooldridge[2]

The *Tropisternus lateralis* (Fabricius) complex ranges from British Columbia and Quebec to Argentina. At least five color varieties are known (Leech, 1948). These differ primarily in shape and degree of pigmentation. Several of the color variants have been named and are usually considered to be subspecies, but the actual taxonomic status has frequently been questioned. An investigation of the factors controlling the degree of pigmentation in *Tropisternus* led to results which settle the issue for two subspecies of the complex.

Living adults of *Tropisternus lateralis nimbatus* (Say) were collected at Martinsville, Indiana, in October, 1959, by Dr. Frank Young. This subspecies of *lateralis* ranges from Quebec and Ontario to Florida and westward to Nebraska and Colorado. The dark, metallic green insect has yellow margins which are very narrow and regular on the pronotum and elytra. The strain from Martinsville was maintained in the laboratory through five generations by the methods outlined by Young (1958).

Living specimens of another subspecies, *T. l. binotatus* (Walker), were obtained from Lake Lenore, Washington, by Mr. David Miller, in May, 1960. This subspecies ranges from British Columbia and Alberta, southward through the western United States to Mexico and possibly to South America. It is larger and more robust than *T. l. nimbatus,* and the broad yellow margins of the elytra extend across the elytral bases to the scutellum and sometimes almost meet at the elytral apices.

The conditions necessary for the maintenance of *T. l. binotatus* in the laboratory could not be precisely determined, and the strain was lost after one generation. Mating of the adult beetles was observed in several instances, however, and fertile eggs were laid. The larval mortality rate was very high, possibly due to improper feeding, and the few F_1 adult *binotatus* obtained were small compared to their parents. None survived to reproduce.

An attempt to cross the two subspecies was successful. Reared virgin females of *T. l. nimbatus* were mated with males of *T. l. binotatus*. Mating was readily accomplished, and the females of *nimbatus* apparently responded to males of *binotatus* as readily as to males of their own subspecies.

Three successful cross matings were obtained. These cross mated females of *nimbatus* constructed 10 egg cases containing a total of 54 eggs. The eggs hatched 4 days after laying. Of the 54 larvae, 48 survived the first molt which occurred 2-4 days after hatching. Eleven more larvae died before the second molt which occurred 5-10 days after the first. Another thirteen larvae died after the second molt and without pupating. Many of these deaths may be due to a failure to provide proper conditions

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[1] Contribution No. 713 from the Zoological Laboratories of Indiana University, aided by a grant from the U. S. Public Health Service.

[2] Department of Biology, Wilkes College, Wilkes-Barre, Pennsylvania.

for pupation. Pupation occurred 26-38 days after hatching. Twenty-four adults emerged 5-7 days following pupation. No attempt was made to obtain an F_2 generation of the cross, but the adults seemed hardy and all survived for several weeks.

No clearcut ratios were evident from the distribution of color patterns in the F_1. All specimens showed a wider, more ragged yellow margin than normally found in *T. l. nimbatus,* but only a few showed the extension of the yellow margin across the bases of the elytra normally found in *T. l. binotatus.*

The reciprocal cross could not be made because no females of *T. l. binotatus* which were known to be unmated were available, and the experiment was discontinued when the laboratory strain of *binotatus* was lost.

The fact that *T. l. nimbatus* and *T. l. binotatus* will interbreed confirms their close relationship. It is hoped that conditions suitable for rearing *T. l. binotatus* will be found so that the question of pattern determination may be investigated further.

Literature Cited

LEECH, HUGH B.
1948. Contributions toward a knowledge of the insect fauna of Lower California. No. 11. Coleoptera: Haliplidae, Dytiscidae, Gyrinidae, Hydrophilidae, Limnebiidae. Proc. Calif. Acad. Sci. 24:375-484, 2 pls.

YOUNG, FRANK N.
1958. Notes on the care and rearing of *Tropisternus* in the laboratory (Coleoptera: Hydrophilidae). Ecology 39:166-167.

NOTICE

The List of Insects of Michigan is nearing completion. Volunteers are needed to identify specimens and read the manuscript for correct scientific names in the families listed below. Those interested should contact R. R. Dreisbach, 301 Helen Street, Midland, Michigan.

Anisotomidae	Dryopidae	Malachidae	Ptilodactylidae
Byrrhidae	Dytiscidae	Melasidae	Pyrochroidae
Cisidae	Endomychidae	Melyridae	Pythidae
Colydiidae	Euglenidae	Mycetophagidae	Rhizophagidae
Cryptophagidae	Helodidae	Nitidulidae	Sandalidae
Cucujidae	Hydrophilidae	Orthoperidae	Scydmaenidae
Dascillidae	Lagriidae	Ostomidae	Throscidae
Dermestidae	Lathridiidae	Phalacridae	

A KEY TO THE GENERA AND A CLASSIFICATION OF THE NORTH AMERICAN CLERIDAE (COLEOPTERA)[1]

By WILLIAM F. BARR[2]

The primary purpose of this paper is to provide a new key that will facilitate identification of the genera of the family Cleridae occurring in the continental United States and Canada. It could, in effect, be considered a supplement to Arnett's (1962) key.[3] The new generic name and synonymy proposed are taxonomic changes considered necessary following a study of representatives of all the North American clerid genera except *Perilypus* and *Ababa*. Specimens of these genera were not available, however, they are adequately characterized in the literature. Since it has not been possible to examine the type species of each genus under consideration, some synonymy as presented in the Corporaal Catalog (1950) has been accepted without confirmation.

In attempting to establish relationships of the clerid genera, the writer has found the currently accepted arrangement of the family into seven subfamilies to be unsatisfactory. A clearer and more realistic expression of relationships can be made by recognizing two subfamilies, each of which is divided into several tribes. This, essentially is the classification utilized by Schenkling in 1910. The only change in the present paper is the recognition of the Epiphloeini [NEW STATUS] as a distinct tribe; this group was formerly known as a subfamily, the Epiphloeinae.

The last half of this article is a checklist of the genera included in the key. Its arrangement is similar to that of the list published by Arnett (1962). The bibliography contains citations to be added to Arnett's bibliography.

KEY TO NORTH AMERICAN GENERA OF THE FAMILY CLERIDAE

1.	Fourth tarsal segment approximately equal in size to third segment; sides of prothorax usually not margined (CLERINAE)	2
	Fourth tarsal segment small, usually indistinct, embedded between lobes of third segment; sides of prothorax margined, at least near base (KORYNETINAE)	5
2(1).	Anterior coxal cavities confluent and usually open behind	3
	Anterior coxal cavities separated and closed behind; first tarsal segment distinctly visible from above (TILLINI)	7
3(2).	Antenna 11-segmented, terminal segment as long or longer than tenth segment	4
	Antenna appearing 10-segmented, eleventh segment small, closely united with enlarged tenth segment; eyes entire or nearly so (PHYLLOBAENINI)	14
4(3).	Eyes nearly entire; anterior tarsi broadly dilated, segments short and compact; thoracic punctures elongate-oval (THANEROCLERINI)	16
	Eyes deeply emarginate; anterior tarsi of usual form; thoracic punctures circular or indistinct (CLERINI)	18
5(1).	Eyes entire or emarginate in front; antenna 10- or 11-segmented	6
	Eyes emarginate internally; antenna 9- or 10-segmented (EPIPHLOEINI)	26

[1] Published with the approval of the Director of the Idaho Agricultural Experiment Station as Research Paper No. 555.

[2] University of Idaho, Moscow, Idaho.

[3] The manuscript of this article was received too late for inclusion in Arnett's manual.—ED.

6(5). Antenna 10- or 11-segmented, terminal three segments enlarged, forming a loose club which is longer than the preceding segments together or if equal in length to the preceding segments the eyes are coarsely granulate (ENOPLIINI)-------- 28
Antenna 11-segmented, terminal three segments enlarged, frequently forming a compact club which is shorter than the preceding segments together or if equal in length to the preceding segments the eyes are finely granulate (KORYNETINI)-- 32
7(2). Antenna 8- to 10-segmented-- 8
Antenna 11-segmented -- 9
8(7). Antenna of male with eight segments, of female with nine segments--------MONOPHYLA
Both sexes with 10-segmented antennae--------------------------------CALLOTILLUS
9(7). Eyes finely granulate -- 10
Eyes coarsely granulate -- 11
10(9). Hind femora extending beyond elytral apices; antennal segments flattened ---PERILYPUS
Hind femora not extending beyond elytral apices; antennal segments circular in cross section ---CYMATODERELLA
11(9). Front of head without horns; elytra with striated punctures---------------------- 12
Front of head with a prominent pair of horns arising in front of eyes; elytra without striated punctures --BOSTRICHOCLERUS
12(11). Antenna with eleventh segment ovate, shorter than the two preceding segments together --- 13
Antenna with eleventh segment subcylindrical, longer than the two preceding segments together ---LECONTELLA
13(12). Pretarsal claws with two teeth on inner margin subequal, situated closely together well above base of claw---ARAEODONTIA
Pretarsal claws with two teeth on inner margin equally spaced from apex, basal tooth shorter and stouter --CYMATODERA
14(4). Pretarsal claws simple or slightly thickened at base--------------------------- 15
Pretarsal claws with a broad basal tooth-----------------------------PHYLLOBAENUS
15(14). Antenna with third segment twice as long as broad; pronotum distinctly longer than broad --ISOHYDNOCERA
Antenna with third segment as broad or broader than long; pronotum nearly equilateral ---WOLCOTTIA
16(3). Anterior coxal cavities closed behind; sides of prothorax more or less carinate ------ 17
Anterior coxal cavities open behind; sides of prothorax not carinate--------ZENODOSUS
17(16). Pronotum with sides strongly constricted at base-------------------THANEROCLERUS
Pronotum with sides rounded, slightly narrowing at base-----------------------ABABA
18(4). Maxillary and labial palpi with terminal segments securiform or triangular-------- 19
Maxillary palpus with terminal segment cylindrical or narrowed apically; labial palpus with terminal segment securiform------------------------------------- 22
19(18). Eyes finely granulate; eighth antennal segment globular or transverse-------------- 20
Eyes coarsely granulate; eighth antennal segment about twice as long as broad------OPILO
20(19). Antenna with a distinct, 3-segmented club--------------------------------- 21
Antenna with last four to seven segments forming a gradually enlarged club------SERRIGER
21(20). Antennal club loosely formed; maxillary palpus with terminal segment securiform --AULICUS
Antennal club compact; maxillary palpus with terminal segment narrowly triangular ---TRICHODES
22(18). Eyes usually finely granulate; antenna gradually enlarged apically or with a terminal segmented club; protibia usually not conspicuously enlarged apically ----------- 23
Eyes coarsely granulate; antenna serrate; protibia abruptly and conspicuously enlarged beyond middle --PRIOCERA
23(22). Elytra unicolorous, if bicolored the markings consist of a pair of discal vittae ----- 24
Elytra bicolored or tricolored, the markings consisting of distinct fasciae of hairs and/or transverse integumental spots-------------------------------------- 25
24(23). Antenna with segments gradually enlarged apically, not forming a distinct club--COLYPHUS
Antenna with last three segments forming a small but distinct, rather loose club ---PLACOPTERUS
25(23). Antenna with terminal four or five segments gradually enlarged, forming a loose club; elytra with basal third usually very coarsely and deeply punctured and with a subapical fascia of hairs---THANASIMUS
Antenna with terminal three segments abruptly enlarged, forming a usually compact club; elytra not coarsely and deeply punctured, usually without a subapical fascia of hairs --ENOCLERUS

26(5). Antenna with 3-segmented terminal club longer than length of preceding segments together ---------- 27
Antenna with 3-segmented terminal club shorter than length of preceding segments together ----------PHLOGISTOSTERNUS
27(26). Antenna 10-segmented, segments of funicle distinct----------NEICHNEA
Antenna apparently 9-segmented, segments of funicle partially fused or closely united ----------ICHNEA
28(6). Sides of pronotum rounded---------- 29
Sides of pronotum angulate or strongly constricted at base---------- 31
29(28). Antenna 11-segmented ---------- 30
Antenna 10-segmented; eyes finely granulate; terminal segments of labial and maxillary palpi slightly triangular----------PITYCARA
30(29). Eyes coarsely granulate; terminal segments of maxillary and labial palpi slightly triangular ----------ORTHOPLEURA
Eyes finely granulate; terminal segments of maxillary and labial palpi securiform--CHARIESSA
31(28). Antenna 11-segmented ----------CORINTHISCUS
Antenna 10-segmented ----------CREGYA
32(6). Maxillary and labial palpi with terminal segments triangular; anterior coxal cavities open behind ---------- 33
Maxillary and labial palpi with terminal segments narrowed apically; anterior coxal cavities narrowly closed behind---------- 34
33(32). Robust; eyes finely granulate; first tarsal segment visible from above, about equal in length to second segment ----------LOEDELIA
Slender; eyes coarsely granulate; first tarsal segment not visible from above, much shorter than second segment ----------TARSOSTENUS
34(32). Eyes small, deeply emarginate and finely granulate----------LEBASIELLA
Eyes usually large, entire or shallowly emarginate and coarsely granulate--------NECROBIA

Cymatoderella Barr, new genus

Type species: *Tillus collaris* Spinola

Tillini, small, somewhat robust. *Head* short; labrum transverse, front margin subtruncate; maxillary palpus with last segment subcylindrical, somewhat flattened and tapering towards apex; labial palpus with last segment securiform; eyes rather small, finely granulate, broadly and deeply emarginate above and behind bases of antennae; antenna eleven-segmented, heavy, segments not flattened, basal segment robust and curved, segments two to four subequal, short, cylindrical, segments five to ten subequal, robust, strongly serrate, fifth segment nearly twice as long and broad as second segment, last segment slightly longer than tenth segment. *Prothorax* subcylindrical, without lateral margins, nearly smooth, finely punctured, broadest in front of middle, slightly narrower than head; sides feebly constricted behind front margin, strongly constricted behind middle; subbasal tumescences absent. *Elytra* covering abdomen; each elytron with 10 rows of punctures; sides gradually expanded behind middle; suture closed. *Hindwings* present and functional. *Metasternum* with a small, elongate depression near front margin. *Legs* rather slender; hind femora not extending beyond elytral apices; tarsi with five segments visible from above; pretarsal claws slender, with a broad, triangular basal tooth and a slender median tooth. *Abdomen* with six visible sternites; sexual modifications slight.

This genus is proposed for the reception of *Tillus collaris* Spinola and *T. patagoniae* Knull. Reassignment of these species removes the genus *Tillus* from the New World. The characteristic features of *Cymatoderella* are the small and finely granulate eyes, the sides of the prothorax being strongly compressed behind the middle and the rather heavy antennae that are serrate from the fifth segment. In addition, the antennal segments are nearly circular in cross section.

The affinities of this genus appear to be with the New World *Cymatodera*. Similarities in general fascies, in the structure of the antennae and pretarsal claws and in the nature of the mouthparts and prothorax are evident in the two genera. Furthermore, the shortened second, third and fourth antennal segments and the lack of distinct secondary sexual modifications on the last visible abdominal segment of the species assigned to *Cymatoderella* indicate a close relationship with the *puncticollis* species group of *Cymatodera*.

Serriger Spinola

Serriger Spinola, 1841, Rev. Zool. (Soc. Cuv.), 4:73.
Xenoclerus Schenkling, 1902, Bull. Mus. Hist. Nat. (Paris), 8:327. (NEW SYNONYMY)

Xenoclerus must be relegated to synonymy under the lesser-known genus *Serriger*. In the past it has been separated from *Serriger* on the basis of the number of segments making up the antennal club. However, this has been found to be a very variable character in both groups and one that is not of generic significance. No other anatomical or biological features have been noted that would warrant the retention of *Xenoclerus* as a valid genus.

Classification of the Genera of North America

CLERIDAE

Clerinae

TILLINI

Monophylla Spinola, 1841, 4 spp., eastern, southwestern and western United States, Lower California.
Macrotelus Klug, 1842
Elasmocerus LeConte, 1849

Callotillus Wolcott, 1911, 2 spp., Florida and southwestern United States, Mexico and Central America.

Perilypus Spinola, 1841, 1 sp., *P. carbonarius* Spinola, 1844, New Mexico, California and Nevada.

Cymatoderella Barr, 1962, 2 spp., southern United States, Ohio, Texas, Arizona and Mexico.
Tillus auctorum, nec Olivier, 1780

Lecontella Wolcott and Chapin, 1918, 2 spp., eastern, central and southwestern United States, Mexico.

Bostrichoclerus Van Dyke, 1938, 1 sp., *B. bicornis* Van Dyke, 1938, Gulf of California Islands and California.

Araeodontia Barr, 1952, 3 spp., southwestern United States and northern Mexico.

Cymatodera Gray, 1832, 61 spp., widely distributed, primarily in southwestern United States and northern Mexico.
Cymatoderus Desmarest, 1860

[*Tillus* Olivier, 1780, not in United States.]

PHYLLOBAENINI

Phyllobaenus Dejean, 1837, 58 spp., generally distributed.
Hydnocera Newman, 1838
Theano Chevrolat, 1843, *nec* Laporte, 1836

Isohydnocera Chapin, 1917, 14 spp., eastern, central and southern United States to Arizona.

Wolcottia Chapin, 1917, 3 spp., eastern and Central United States, Arizona.

THANEROCLERINI

Thaneroclerus Lefebvre, 1838, 1 sp., *T. buquet* (Lefebvre), 1835, cosmopolitan, known from California, Florida and New York in the United States.
Thaneclerus Desmarest, 1860
Thanateroclerus Gemminger and Harold, 1869
Taneroclerus Chevrolat, 1880

Zenodosus Wolcott, 1910, 1 sp., *Z. sanguineus* (Say), 1835, eastern, central and southern United States and southeastern Canada.
Xenodosus Champlain, 1920

Ababa Casey, 1897, 1 sp., *A. tantilla* (LeC.) 1865, eastern, central and southern United States.
Prionodera Wolcott, 1910, *nec* Erickson, 1847
Prionostichaeus Wolcott, 1911
Wolcottella Lucas, 1920

CLERINI

Priocera Kirby, 1818, 3 spp., Arizona and eastern, central and southern United States. 2 additional species, *P. lecontei* Wolcott, 1910, and *P. pusilla* Kirby, 1826, questionably recorded from California and "North America."

Opilo Latreille, 1802, 2 spp., cosmopolitan.
Notoxus Fabricius, 1775 *nec* Geoffroy, 1762
Opilus Latreille, 1806
Eupocus Illiger, 1807
Opilio auctorum

Colyphus Spinola, 2 spp., central United States, Texas, Mexico.
Cleronomus Klug, 1842
Derestenus Chevrolat, 1843

Thanasimus Latreille, 1806, 4 spp., widely distributed. An attempt was made to introduce the European *T. formicarius* Linnaeus into West Virginia in 1892.

Cleroides Schaeffer, 1777 (not binary)
Pseudoclerus Jacquelin du Val, 1860

Placopterus Wolcott, 1910, 4 spp., eastern, central and southern United States and Texas.
Poecilochroa Chevrolat, 1876, *nec* Westring, 1874
Phloeopterus Britton, 1920
Ploeopterus Leng, 1920
Phloepterus Wolcott, 1939

Enoclerus Gahan, 1910, 40 spp., generally distributed.
Clerus auctorum nec Fabricius, 1775

Trichodes Herbst, 1792, 11 spp., generally distributed.
Clerus Curtis, 1824 *nec* Fabricius, 1775
Pachyscelis Hope, 1840

Aulicus Spinola, 1841, 7 spp., Texas, Arizona, California and Mexico.

Serriger Spinola, 1841, 2 spp., California, Arizona, Idaho.
Xenoclerus Schenkling, 1902

KORYNETINAE

EPIPHLOEINI

Phlogistosternus Wolcott, 1944 3 spp., eastern, central and southern United States, Texas to California.
Phyllobaenus Spinola, 1844 *nec* Dejean, 1837

Neichnea Wolcott and Chapin, 1918, 1 sp., *N. laticornis* (Say), 1835, eastern and central United States.
Ellipotoma Wolcott, 1910 *nec* Spinola, 1844

Ichnea Laporte, 1836, 1 sp., *I. elongata* Knull, 1939, Arizona.
Ichenea Chevrolat, 1874

ENOPLIINI

Orthopleura Spinola, 1844, 3 spp., eastern, central, southern and southwestern United States, Mexico.
Dermestoides Schaeffer, 1771 (not binary)

Pyticara Spinola, 1841, 5 spp., central and southwestern United States.
Pyticera Spinola, 1844
Pelonides Kuwert, 1894

Chariessa Perty, 1830, 6 spp., widely distributed.
Brachymorphus Chevrolat, 1835
Pelonium Spinola, 1844 (in part)
Tarandocerus Chevrolat, 1876 (in part)

Corinthiscus Fairmaire and Germain, 1861, 4 spp., widely distributed.
Philyra Laporte, 1836, *nec* Leach, 1817, *nec* Haan, 1833
Pelonium Spinola, 1844 (in part)
Tarandocerus Chevrolat, 1876 (in part)
Cregya, Wolcott 1910 (in part)

Cregya LeConte, 1861, 3 spp., eastern, central and southern United States, Texas.
Galeruclerus Gahan, 1910
Pelonium auctorum

KORYNETINI

Tarsostenus Spinola, 1844, 1 sp., *T. univittatus* (Rossi), 1792, cosmopolitan.

Loedelia Lucas, 1920, 2 spp., New Mexico, Arizona, California, Oregon.
Necrobioides Gahan, 1910 *nec* Fairmaire, 1882

Lebasiella Spinola, 1844, 4 spp., Pennsylvania, Texas, Arizona, and California.
Labasiella Spinola, 1849

Necrobia Olivier, 1795, 3 spp., cosmopolitan.
Agonolia Mulsant, 1863

[*Korynetes* Herbst, 1792, not in United States.]

[*Opetiopalpus* Spinola, 1844, not in United States.]

Bibliography

Arnett, R. H., Jr., 1962. Beetles of the United States (A Manual for Identification), fasc. 66, 8 pp.

Barr, W. F., 1961. in Hatch, Beetles of the Pacific Northwest, part 3, pp. 105-112 (keys to Northwest spp.).

Barr, W. F., 1962. Coleop. Bull., 16:121-127 (new classification and keys for North America).

Corporaal, J. B., 1939. Bijd. Dierk., 17:347-360 (rev. Thaneroclerinae).

Schaeffer, C., 1911. Jour. New York Ent. Soc., 19:122-124 (rev. *Monophylla*).

Schenkling, S., 1903. Cleridae, Genera Insectorum, 13:1-124 (review of genera).

Spinola, M., 1844. Essai Monographique Clerites. Ins. Col., 1:1-386; 2:1-216 (old classification).

Winkler, J. R., 1961. Die Buntkäfer. A. Ziemsen Verlag, Wittenberg, pp. 1-108 (review of genera).

Wolcott, A. B., 1908. Ent. News, 19:70-72 (rev. *Chariessa*).

Wolcott, A. B., 1910. Publ. Field Mus. Nat. Hist. 7(10):384-393 (rev. *Corinthiscus* and *Cregya*).

Wolcott, A. B., 1922. Trans. American Ent. Soc. 48:67-68 (rev. *Placopterus*).

Wolcott, A. B., 1944. Jour. New York Ent. Soc., 52:121-152 (rev. Phyllobaeninae genera).

Wolcott, A. B., 1944. Pan.-Pacific Ent., 20(2):54-60 (rev. *Trichodes*).

Wolcott, A. B., 1947. Fieldiana: Zoology 32(2):59-105 (catalogue).

CURRENT RESEARCH PROGRAMS

This continuing department of the Bulletin is to include announcements of research underway on beetles. Its main purpose is to let Coleopterists know what is going on. These announcements are not meant to be requests for specimens or information, unless stated to the contrary; a letter to the researcher will determine whether or not specimens or information are wanted. All research workers are invited to send notices of research in progress to the Editor.

ALLECULIDAE: Revision of *Lobopoda,* by M. Campbell, Dept. of Entomology, Univ. of Illinois, Urbana, Ill.

ALLECULIDAE: Revision of Alleculidae of North America, excluding *Lobopoda, Charisius,* and *Hymenorus,* by J. D. Marshall, Dept. of Entomology, Cornell Univ., Ithaca, N. Y.

ANOBIIDAE: Revision of *Catorama* of North America, by R. E. White, Zoology-Entomology Dept., Ohio State Univ., Columbus 10, Ohio.

BRUCHIDAE: Revision of *Stator* of the United States, by C. D. Johnson, 3407 N. 5th St., Fresno 3, Calif.

CISIDAE: Revision of Cisidae of the western United States and Canada, by J. F. Lawrence, Dept. of Entomology and Parasitology, Univ. of California, Berkeley 4, Calif.

CURCULIONIDAE: Revision of *Eupagoderes* and *Ophryastes,* by D. G. Kissinger, Dept. of Biology, Atlantic Union College, South Lancaster, Mass.

CURCULIONIDAE: Revision of *Microlarinus,* by R. E. Warner, U. S. National Museum, Washington 25, D. C.

CURCULIONIDAE: Curculionidae of Micronesia, by E. C. Zimmerman, Hunter House, MacDowell Road, Peterborough, N. H.

DRYOPIDAE: Revision of Dryopidae of North America, by H. G. Nelson, Chicago Natural History Museum, Roosevelt Road and Lake Shore Drive, Chicago 5, Ill.

DYTISCIDAE: Taxonomy of *Laccophilus* of U.S.A. and Mexico, by J. R. Zimmerman, Dept. of Biology, New Mexico State Univ., University Park, N. M.

HETEROCERIDAE: Revision of Heteroceridae of North and Central America and the West Indies, by F. Pacheco M., Colegio de Post-Graduados, Chapingo, Mexico.

HYDROPHILIDAE: Revision of *Helophorus* of the United States, by D. McCorkle, Dept. of Zoology, Univ. of Washington, Seattle 5, Wash.

LAMPYRIDAE: Revision of *Ellychnia,* by K. M. Fender, Route 3, McMinnville, Oreg.

LYCIDAE: Larvae of Lycidae of North America, by J. G. Rozen, American Museum of Natural History, Central Park West at 79th Street, New York 24, N. Y.

SCARABAEIDAE: Revision of *Ataenius,* by O. L. Cartwright, U. S. National Museum, Washington 25, D. C. Specimens from Central and South America needed for study.

SCOLYTIDAE: Revision of *Dendroctonus* of North America, by S. L. Wood, Dept. of Zoology and Entomology, Brigham Young Univ., Provo, Utah.

SCOLYTIDAE: Revision of *Ips* of North America, by G. R. Hopping, Forest Entomology and Pathology Laboratory, 102 11th Ave. East, Calgary, Alberta, Canada.

TENEBRIONIDAE: Revision of Strongylium of North America, by C. A. Triplehorn, Ohio Agricultural Experiment Station, Wooster, Ohio, and T. J. Spilman, U. S. National Museum, Washington 25, D. C.

TENEBRIONIDAE: Taxonomy of Pan African Praogenini, by P. P. de Moor, Transvaal Museum, P. O. Box 413, Pretoria, South Africa.

BUPRESTIS: Most part of the species are clothed with such brilliant colours, that Geoffroy has thought proper to designate them all under the generic appellation of *Richard.* The origin of this name is as singular as its application is fantastical. It was originally given to the jay, in consequence of the facility with which that bird was taught to pronounce the word.—Griffith, 1832, Animal Kingdom 14:356.

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THE COLEOPTERISTS' BULLETIN
620 Michigan Avenue, N.E.
Washington 17, D. C.

The Coleopterists' Bulletin

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

VOLUME 17, 1963

Published by

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

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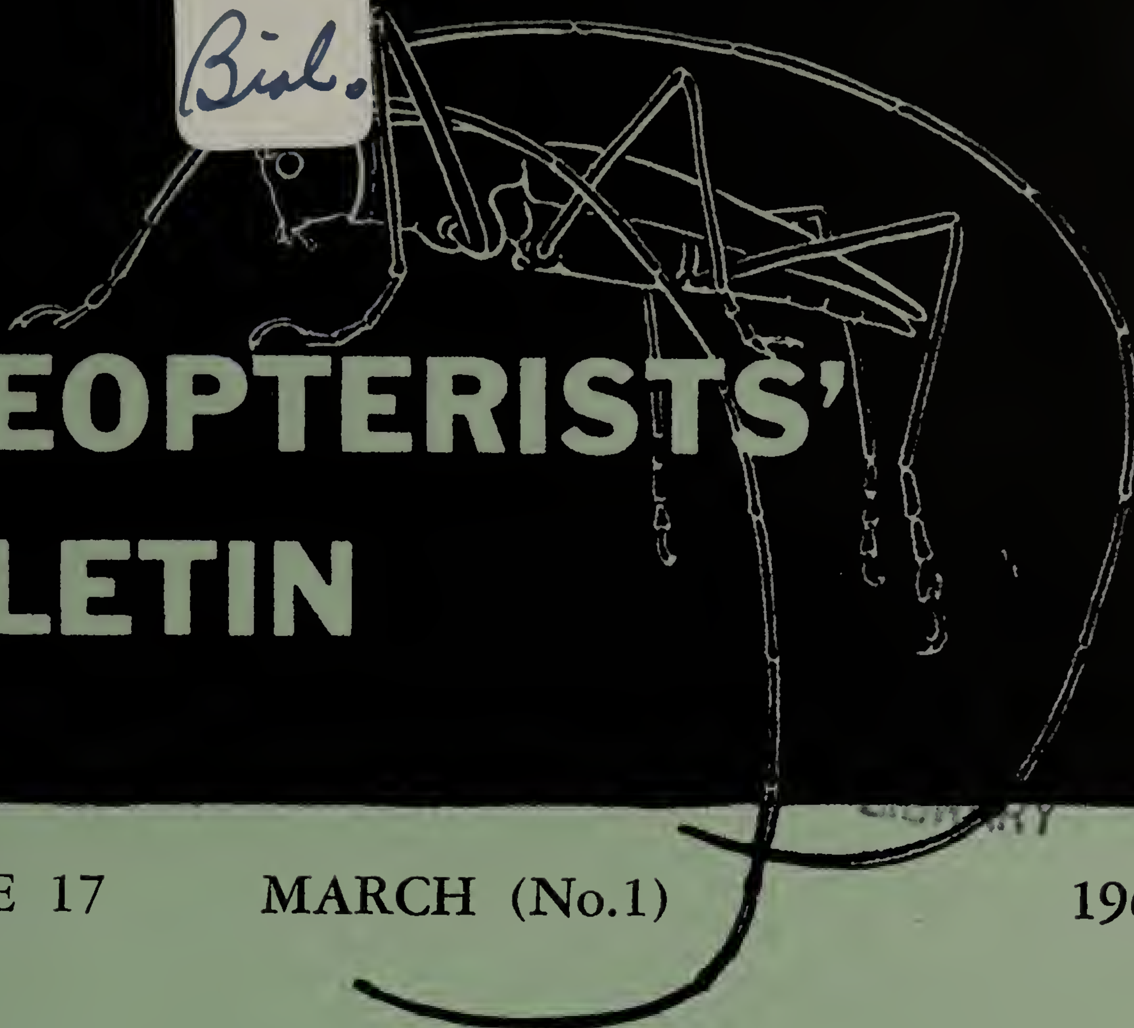

V. 17 No. 1

VOLUME 17 MARCH (No. 1) 1963

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 17 March (No. 1) 1963

A NEW BEROSUS FROM ARIZONA, WITH A KEY TO THE ARIZONA SPECIES (COLEOPTERA, HYDROPHILIDAE)

By EILEEN R. VAN TASSELL[1, 2]

During the past several summers, many thousands of beetles have been collected in the southwestern desert areas of the United States, as part of our study of beetle population dynamics.[3] The routine identification of this material shows that the following species of beetle is undescribed. The description is presented here in order that the species may become known as part of our fauna and to make it available to future revisors of the group. The accompanying key will facilitate identification of the species of *Berosus* known to occur in Arizona.

Examination of museum material and the literature suggests that western species of this genus are greatly in need of study. This is especially true of the *Berosus peregrinus* complex. Specimens I collected at Peña Blanca, Arizona compare favorably with *B. peregrinus* from New York. Young (1954) gives the western limit of the range as Louisiana, however. Leech (1948) states that Arizona specimens of *B. peregrinus* may be the Mexican *B. sharpi* Zaitzev. Nevertheless, since the latter has not been reported from the United States and since it is not known well enough to be satisfactorily separated from *B. peregrinus,* no attempt has been made to include it in the key.

Berosus notapeltatus Van Tassell, NEW SPECIES

FIGS. 4-6

The large, shield-shaped or rectangular ante-median sutural black spot on the elytra and the narrow lateral yellow margins of the pronotum readily separate this species from *Berosus moerens* Sharp (Fig. 1) and *Berosus blechrus* Leech (Fig. 7), both of which it closely resembles.

HOLOTYPE.—ARIZONA, Santa Cruz Co., Peña Blanca. Ross H. Arnett, Jr., and Eileen R. Van Tassell, August 2, 1962. To be deposited in U. S. National Museum.

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[1] Department of Biology, The Catholic University of America, Washington 17, D.C., Entomology Series, paper no. 18.

[2] I would like to thank Dr. P. J. Spangler, United States National Museum and Mr. H. B. Leech, California Academy of Science, for the loan of material.

[3] This research has been supported by National Science Foundation grant no, 14,272 to The Catholic University of America, Ross H. Arnett, Jr., Principal Investigator.

Description of the Holotype.—Male. Length 3.4 mm.; width 1.5 mm.

Head: Length/width ratio, .642; black with metallic rubescent to virescent luster; coarsely punctate basally, more finely and densely punctate distally, interspaces a little less than width of punctures basally, punctures barely separated distally; glabrous except for a series of fine hairs arising from punctures of labrum. Antennal club densely pubescent. Eyes large, one-half length of head, protuberant. Maxillary palpi slender, subequal in length to antennae; rufo-testaceous, apical third of distal segment piceous to brunneus. Mandibles stout, strongly curved, with two dorso-lateral teeth and two mandibulites. The latter are the "lacinia mobilis" of Hansen (1930), but following Snodgrass (1950), they are not regarded here as homologs of the lacinia, hence the name mandibulites.

Pronotum: Length/width ratio, .666; metallic black, as on head, with a narrow ochraceous border extending from outer third of anterior margin laterally and posteriorly to just beyond posterior angles; convex, slightly wider anteriorly, but appearing narrower in dorsal view because of greater downward flexure of the anterior angles; punctation sparser than base of head medially, more dense laterally and basally with a few patches of very closely set punctures; anterior angles finely crenate to about middle of lateral margin.

Elytra: Length/width ratio, .666; relatively narrow, broadest just beyond middle; yellowish to ochraceous with the following piceous markings: a humeral spot with a narrow anterior bar joining a sutural stripe; a large ante-median sutural spot, about as long or longer than distance between it and anterior margin of elytra and about one-half width of elytra in dorsal view, reaching third stria; a smaller postmedian sutural spot, barely separated from sutural stripe; a broad piceous to rufo-piceous lateral band of indefinite boundaries extending about four-fifths of length of elytra from just behind humeral spot; a small spot beneath each strial puncture, the spots joining on most of the striae to give a striped appearance; punctures of interspaces light brown or undifferentiated in color. Striae impressed except on disc, second stria short; strial punctation similar in size to that of pronotum, becoming coarser apically; punctures of interspaces each bearing a fine, silky hair; humeral angles crenate.

Legs slender; brown, streaked or tinged with piceous; trochanters, apices of femora and tibiae ochraceous to rufo-testaceous, protibia entirely rufo-testaceous; profemora finely granular in basal third ventrally, meso- and metafemora granular in basal two thirds ventrally, entirely glabrous on dorsal surface. Basal segment of protarsus slightly dilated with a dense ventral pad of hairs on distal half; first segment twice as long as second, second segment also bearing a ventral pad of hairs on distal half.

Sternum finely and evenly granulose; piceous to rufo-piceous; mesosternal protuberance granulose, thin, but not blade-like as in *Berosus infuscatus,* with a low anterior tooth; abdominal pubescence fine, silvery; first visible abdominal sternite with a median longitudinal carina just reaching posterior margin, fifth sternite with two small, closely set teeth in median emargination.

Aedeagus: Penis slender, slightly sinuate, pointed at apex; distal half of parameres bluntly, unevenly triangular in lateral view, partly membranous, dorsal margin moderately curved; pars basalis large, rectangular, distal edge articulating with apical third of ventral side of parameres (Fig. 5).

Allotype:—Same locality data as holotype. Female. Length 3.7 mm.; width 1.6 mm. Similar to male, but with striae less impressed, giving more of a ridged appearance, basal segment of protarsus not dilated, alutaceous, lateral piceous markings reduced to a single median lateral spot.

Paratypes:—222; 96 males, 86 females from ARIZONA, Santa Cruz Co., Peña Blanca; 25 males and 15 females from Santa Cruz Co., Sycamore Canyon, Yanks Springs, Hugh B. Leech, August 3, 1952.

Larvae: Unknown.

Distribution: Known only from Arizona, Peña Blanca and Yanks Springs.

FIGURES 1-3, *Berosus moerens* Sharp. 1—adult male. 2—aedeagus, lateral view. 3—aedeagus, dorsal view.

FIGURES 4-6, *Berosus notapeltatus*, new species. 4—holotype male. 5—aedeagus, lateral view. 6—aedeagus, dorsal view.

FIGURES 7-9, *Berosus blechrus* Leech. 7—adult male. 8—aedeagus, lateral view. 9—aedeagus, dorsal view.

All drawings were made from specimens collected at Pena Blanca, Arizona.

VARIATION: Length 3.0-3.8 mm. The elytra vary from pale ochraceous to deep yellow brown. In the palest specimens, the dark markings on the elytra are a pale chocolate brown and the lateral dark band is absent or reduced to a single median lateral spot. A single specimen from Yanks Springs had all elytral markings, including the large ante-median spot, reduced nearly to the size of the spots of *B. moerens* (Fig. 1). The darkest individuals have the humeral spot merged with the broad lateral band, which in turn is nearly continuous with the large ante-median bar. In general, the females show greater reduction of the lateral markings than the males. The yellow markings of the pronotum vary from a barely discernible lateral margin to a margin nearly approaching that of *B. moerens* in width, but never deeply incising the piceous spot to give a tri-lobed appearance as is the case with *B. moerens*.

BIOLOGY: This small species may be found in a variety of situations from stagnant rain puddles to margins of streams or arroyos. Most specimens may be found in livestock watering tanks and troughs during the dry season, since other aquatic situations are not available in this area during most of the year. Adults were collected as early as June 30 and as late as August 12.

A KEY TO THE ARIZONA SPECIES OF BEROSUS (HYDROPHILIDAE)

1. Elytral apices with one or two spines ---------- 2
   Elytral apices without spines ---------- 4

2. Pronotum smooth, fairly coarsely but more sparsely punctate, median carina hardly differentiated; each elytron with a tooth before the sutural angle, the latter produced into a tooth; elytral interspaces smooth, shining (males) or finely alutaceous (females), the punctures separated by about twice their own diameters; Texas, Arizona, Baja California ---------- **MILES** LeConte
   Pronotum coarsely, deeply punctate, with a longitudinal carina at middle; each elytron with a tooth before the sutural angle, the angle itself acute and slightly produced (most males) or rectangular or obtuse (most females); elytral interspaces rough, with numerous punctures, the margins of which are scabrous ---------- 3

3. Metasternum with apical median process broad, triangular, tooth-like, obscurely carinate along middle; form narrower (length 7 mm., width 3 mm.); parameres of male genitalia somewhat constricted in apical fifth, gradually narrowed to apices, which though spinous are shorter; Mexico, Arizona ---------- **SALVINI** Sharp
   Metasternum with apical median process narrower, with a sharp, blade-like, raised carina; form broader (length 7 mm., width 3.75-4 mm.); parameres of male genitalia gradually narrowed to apices, which are not spinous; Arizona, California, Nevada, Washington ---------- **PUNCTATISSIMUS** LeConte

4. Last visible abdominal sternite with two small teeth in apical emargination ---------- 5
   Last visible abdominal sternite with one tooth in apical emargination ---------- 11

5. Mesosternal protuberance with crest low or hoodlike, but not falcate ---------- 6
   Mesosternal protuberance with crest falcate anteriorly; Ohio to California, Mexico ---------- **STYLIFER** Horn

6. Mesosternal protuberance with crest excavated, hood-like; Southern California, Baja California, Arizona, Mexico ---------- **RUGULOSUS** Horn
   Mesosternal protuberance with crest not hoodlike ---------- 7

7. Pronotum mainly testaceous with a central dark spot or pair of spots; size 4-6 mm. -- 8
   Pronotum mainly metallic black or with a large irregular or trilobed black or metallic black spot; size smaller, 3.0-3.8 mm. ---------- 9

8. Elytra and pronotum of female and pronotum of male distinctly micro-reticulate (alutaceous), not strongly shining; elytral striae not very deeply impressed on the disc; middle and southern United States ---------------- INFUSCATUS LeConte

Elytra and pronotum of male and elytra of female without evident micro-reticulation, appearing very smooth and shining between the coarser punctures; elytral striae rather deeply impressed, especially on the disc; northern and western United States, southern Canada ---------------------------------- FRATERNUS LeConte

9. Strial intervals of elytra with punctures dark brown to piceous, conspicuous; form broader; lateral yellow margins of pronotum broad ------------------------- 10

Strial intervals of elytra with punctures usually inconspicuous, not darkly colored; form narrower; pronotum with lateral yellow margins narrow or absent (Fig. 4); Arizona --- NOTAPELTATUS n. sp.

10. Pronotum more convex, especially anteriorly; parameres of male genitalia strongly curved in profile, sharply pointed, but not acuminate (Fig. 2); Arizona, Texas, California, Mexico, Guatemala -------------------------------------- MOERENS Sharp

Pronotum flatter, less densely punctate; parameres of male genitalia acuminate, only slightly curved in profile (Fig. 8); Arizona, Texas ---------------- BLECHRUS Leech

11. Pronotal punctation of two sizes, large and small punctures intermixed; Arizona --- EXILIS LeConte

Pronotal punctures of nearly uniform size; New York to Florida and Louisiana, Arizona --- PEREGRINUS (Herbst)

Relative abundance of three species: *Berosus blechrus* is apparently rare at Peña Blanca, only ten specimens have been collected by the author during three summers; *B. moerens* and *B. notapeltatus* were present abundantly in about equal numbers. In a single collection at Yanks Springs, however, the situation seems to be reversed (Leech, *in litt.*), with *B. blechrus* (67 specimens) and *B. notapeltatus* (40 specimens) abundant and *B. moerens* (8 specimens) uncommon. Peña Blanca and Yanks Springs are the only localities where all three species have been found together. The data indicate that where *B. moerens* is abundant, *B. blechrus* is rare and where *B. moerens* is rare, *B. blechrus* is abundant. Further study of the life-history and biology of these two species may indicate that they are in competition.

Literature Cited

Hansen, H. J.
1930. Studies on Arthropoda III, Copenhagen, 376 pp., 16 pl.

Leech, H. B.
1948. Contributions toward a knowledge of the insect fauna of Lower California. No. 11. Coleoptera: Haliplidae, Dytiscidae, Gyrinidae, Hydrophilidae, Limnebiidae. Proc. California Acad. Sci., 24:375-484, 2 pl.

Snodgrass, R. E.
1950. Comparative studies on the jaws of mandibulate Arthropods. Smithsonian Misc. Coll., vol. 116, no. 1, pp. 1-85.

Young, F. N.
1954. The water beetles of Florida. University of Florida Press, Gainesville, 237 pp.

How often is it actually defensible to state, without fossil evidence, what is "primitive" and what "derivative"?—Lindroth, 1962, Psyche 69:10.

THE PHENOGRAM, A METHOD OF DESCRIPTION FOR STUDIES ON OXACIS (COLEOPTERA, OEDEMERIDAE)[1]

By Ross H. Arnett, Jr.[2]

The Phenogram

The data reported in this paper are of a preliminary nature, like most taxonomic data, and are used here only as a means of grouping possible evolutionary units. This will enable the reporting of future data without entirely repeating this information. For several years the genus *Oxacis* has been under intensive study. The following treatment of the species is to be considered as taxonomic only and does not constitute a review of the genus. A complete review of the genus is underway and will include data on the evolution of this group of natural species.

The recent articles by Ehrlich and Holm (1962), and Sneath and Sokal (1962), even if parts may be otherwise rejected by many practicing taxonomists, make two very important points: 1) the grouping of organisms into taxonomic units must be done in such a way that the work can be repeated by others, i.e., a description should be objective; 2) present day descriptive taxonomy, for the most part, is outmoded and must rapidly develop new methods that not only will be empirical but scientific as well. In this respect, these authors have performed a very important act—they have awakened some more systematists and have made them evaluate their techniques in the light of modern theories.

The following account of characteristics used in distinguishing specimens with locality data is a preliminary documentation useful for further studies on the variations among the living *Oxacis* beetles. As a working hypothesis only, the assumption is made that these features are under direct genetic control, either by a single gene, or by a gene complex. This remains to be proven and is currently under study. However, at the present time, there is no direct evidence for any of these assumptions. The final results will be available only after some years of study. Meanwhile, it seems useful to have these keys and descriptions available for the more ordinary identification work still required.

Descriptive characteristics.—The following features, in proper combination, will define any population of *Oxacis* beetles so far known in the North American and West Indian area. This includes all known intraspecific variations as well as interspecific differences. The key which follows shows how these populations have been grouped into taxonomic species. These features, it should be emphatically stated, do NOT define the genus, and do NOT define the species. There are many more features to be considered before such definitions are possible, e.g., internal anatomy, habits, distribution, and others.

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[1] Contribution towards a monograph of the Oedemeridae, no. 18.

[2] Professor of Biology, The Catholic University of America. The work reported herein was made possible by National Science Foundation grant no. 25,136. This help is gratefully acknowledged.

The following list of characters and states refer to the position on the phenograms. Each characteristic is numbered, such as, head color is number 1, head maculation is number 2, etc. Then, each state of each characteristic is given a value from 1 to 10 and is placed after a decimal point following the characteristic number, such as, head color pale is number 1.1, head color tan is number 1.2, etc. If in the following list certain numbers are not used because those states have not been observed, those numbers are put in parentheses, such as, the states of head maculation covered by the numbers 2.2-2.9.

HEAD CHARACTERS.—1. *Color:* 1.1 Pale; 1.2 Tan; 1.3 Yellow; 1.4 Orange; 1.5 Fuscus; 1.6 Piceus; 1.7 Metallic blue; 1.8 Metallic green; (1.9); 1.10 Lead. 2. *Maculation:* 2.1 Immaculate; (2.2; 2.3; 2.4; 2.5; 2.6; 2.7; 2.8; 2.9) 2.10 Central spot. 3. *Pubescence texture:* 3.1 Fine; 3.2 Moderate; (3.3; 3.4; 3.5) 3.6 Coarse; (3.7; 3.8; 3.9) 3.10 Very coarse. 4. *Pubescence distribution:* 4.1 Fine; 4.2 Moderate-recumbent; 4.3 Moderate, erect; 4.4 Dense, recumbent; 4.5 Dense, erect; (4.6; 4.7; 4.8; 4.9) 4.10 Dense, recumbent and erect. 5. *Pubescense color:* 5.1 White; 5.2 Yellow; 5.3 Brown; (5.4; 5.5; 5.6) 5.7 Black; (5.8) 5.9 Brown and white; 5.10 Brown and black. 6. *Punctation:* 6.1 Fine; 6.2 Moderate; (6.3; 6.4; 6.5) 6.6 Coarse; (6.7; 6.8; 6.9) 6.10 Rugose. 7. *Punctation distribution:* 7.1 Spare; (7.2; 7.3; 7.4; 7.5) 7.6 Moderate; (7.7; 7.8; 7.9) 7.10 Dense. 8. *Interspaces*: 8.1 Smooth; (8.2; 8.3; 8.4) 8.5 Micro-reticulate; (8.6; 8.7; 8.8; 8.9) 8.10 Rugose. 9. *Mandible size:* 9.1 Short; (9.2; 9.3; 9.4) 9.5 Moderate; (9.6; 9.7) 9.8 Elongate; (9.9) 9.10 Elongate, deflexed. 10. *Mandible shape:* 10.1 Stout; (10.2; 10.3; 10.4; 10.5) 10.6 Apex acute; (10.7; 10.8; 10.9) 10.10 Apex blunt. 11. *Antennal segments:* 11.1 Elongate-parallel; (11.2; 11.3) 11.4 Normal; (11.5) 11.6 Long, normal; (11.7) 11.8 Fusiform; (11.9) 11.10 Elongate, deflexed. 12. *Antennal color:* 12.1 Pale; 12.2 Tan; 12.3 Yellow; 12.4 Orange-red; 12.5 Fuscus; 12.6 Piceus; 12.7 Metallic blue; 12.8 Metallic green; (12.9) 12.10 Lead.

THORAX CHARACTERS.—13. *Color:* 13.1 Pale; 13.2 Tan; 13.3 Yellow; 13.4 Orange-red; 13.5 Fuscus; 13.6 Piceus; 13.7 Metallic blue; 13.8 Metallic green; (13.9) 13.10 Lead. 14. *Maculation:* 14.1 Immaculate; 14.2 Lateral spots only; 14.3 Central stripe; 14.4 Trimaculate; 14.5 Vertical narrow stripe; 14.6 Central stripe; 14.7 Cross bar; (14.8; 14.9) 14.10 Anterio-lateral mirror spot. 15. *Depressions:* 15.1 None; (15.2) 15.3 Basal; 15.4 Anterior-lateral; (15.5) 15.6 Central; (15.7; 15.8; 15.9) 15.10 Tri-impressed. 16. *Pubescence texture:* 16.1 Fine; (16.2; 16.3) 16.4 Moderate; (16.5) 16.6 Coarse; (16.7; 16.8; 16.9) 16.10 Very coarse. 17. *Pubescence distribution:* 17.1 Sparse; (17.2; 17.3; 17.4) 17.5 Moderate; (17.6; 17.7; 17.8; 17.9) 17.10 Dense. 18. *Pubescence color:* 18.1 White; (18.2) 18.3 Yellow; (18.4) 18.5 Brown; (18.6) 18.7 Black; (18.8) 18.9 Brown and white; 18.10 Brown and black. 19. *Pubescence position:* 19.1 Antrose-recumbent; 19.2 Antrose-erect; (19.3; 19.4) 19.5 Antrose, retrose posteriorly; (19.6) 19.7 Antro-recumbent and erect; (19.8; 19.9) 19.10 Recumbent latero-mesiad. 20. *Shape:* 20.1 Medially constricted; (20.2) 20.3 Convergent posteriorly; (20.4) 20.5 Strongly constricted; (20.6; 20.7; 20.8; 20.9) 20.10 Rounded. 21. *Punctation:* 21.1 Fine; (21.2;

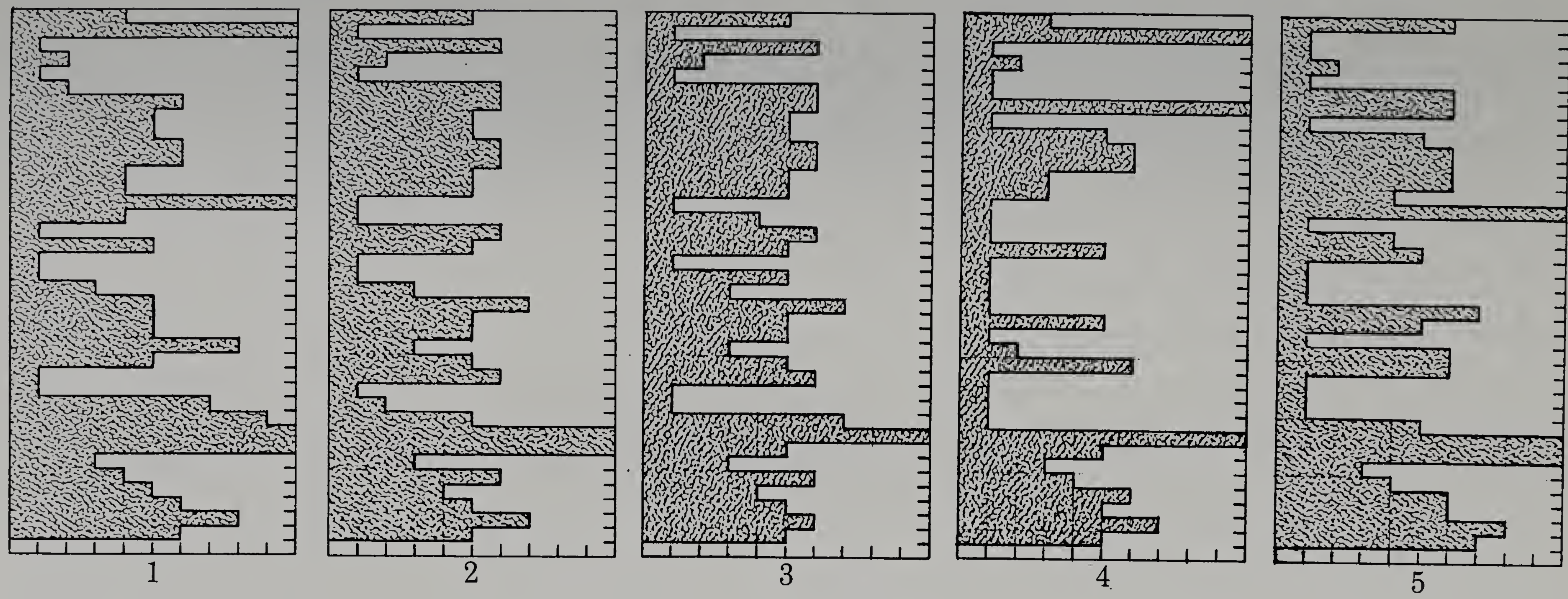
21.3; 21.4) 21.5 Moderate; (21.6) 21.7 Coarse; (21.8; 21.9) 21.10 Rugose. 22. *Punctation distribution:* 22.1 Sparse; (22.2; 22.3; 22.4) 22.5 Moderate; (22.6; 22.7; 22.8; 22.9) 22.10 Dense. 23. *Interspaces:* 23.1 Smooth; (23.2; 23.3; 23.4) 23.5 Micro-reticulate; (23.6; 23.7; 23.8; 23.9) 23.10 Rugose. 24. *Leg color:* 24.1 Pale; 24.2 Yellow; 24.3 Fuscus; 24.4 Piceus; (24.5) 24.6 Basally piceus; (24.7; 24.8; 24.9) 24.10 Basally red.

ELYTRA CHARACTERS—26. *Pubescence texture:* 26.1 Fine; (26.2; 26.3) 26.4 Moderate; (26.5) 26.6 Piceus; (26.7; 26.8; 26.9) 26.10 Very coarse. 27. *Pubescence color:* 27.1 White; (27.2) 27.3 Yellow; (27.4) 27.5 Brown; (27.6) 27.7 Black; (27.8) 27.9 Brown and white; 27.10 Brown and black. 28. *Costae:* 28.1 Obscure; 28.2 Raised; 28.3 Raised, pubescent; (28.4) 28.5 Pubescent only; (28.6) 28.7 Orange; (28.8; 28.9) 28.10 Outlined. 29. *Maculation:* 29.1 Immaculate; 29.2 Narrow central stripe; 29.3 Two stripes; (29.4) 29.5 Sutural only; 29.6 Submarginal only; 29.7 Sutural and marginal; 29.8 Marginal and submarginal; 29.9 All three; 29.10 Black. 30. *Punctation:* 30.1 Smooth; (30.2; 30.3; 30.4) 30.5 Moderate; (30.6) 30.7 Coarse; (30.8; 30.9) 30.10 Rugose. 31. *Interspaces:* 31.1 Smooth; (31.2; 31.3; 31.4) 31.5 Microreticulate; (31.6; 31.7; 31.8; 31.9) 31.10 Rugose. 32. *Elytra shape:* 32.1 Narrow; (32.2) 32.3 Moderate; (32.4; 32.5; 32.6; 32.7; 32.8; 32.9) 32.10 Moderate, blunt.

BODY IN GENERAL.—33. *Body shape:* 33.1 Very narrow; (33.2; 33.3) 33.4 Narrow; (33.5) 33.6 Moderate; (33.7) 33.8 Broad; (33.9) 33.10 Very broad.

BODY MEASUREMENTS.—34. *Total length:* 34.1, 1.00-5.00 mm.; 34.2, 5.01-6.00 mm.; 34.3, 6.01-7.00 mm.; 34.4, 7.01-8.00 mm.; 34.5, 8.01-9.00 mm.; 34.6, 9.01-10.00 mm.; 34.7, 10.01-11.00 mm.; 34.8 11.01-12.00 mm.; 34.9, 12.01-13.00 mm.; 34.10, over 13.01 mm. 35. *Head length/width ratio:* 35.1 less than .5000; 35.2, .5001-.6000; 35.3, .6001-.7000; 35.4, .7001-.8000; 35.5, .8001-.9000; 35.6, .9001-1.0000; 35.7, 1.0001-1.1000; 35.8, 1.1001-1.2000; 35.9, 1.2001-1.3000; 35.10, over 1.3001. 36. *Pronotum length/width ratio:* 36.1 less than .5000; 36.2, .5001-.6000; 36.3, .6001-.7000; 36.4, .7001-.8000; 36.5, .8001-.9000; 36.6, .9001-1.0000; 36.7, 1.0001-1.1000; 36.8, 1.1001-1.2000; 36.9, 1.2001-1.3000; 36.10, over 1.3001. 37. *Elytra length/width ratio:* 37.1 less than 2.000; 37.2, 2.0001-2.2000; 37.3, 2.2001-2.4000; 37.4, 2.4001-2.6000; 37.5, 2.6001-2.8000; 37.6, 2.8001-3.0000; 37.7, 3.0001-3.2000; 37.8, 3.2001-3.4000; 37.9, 3.4001-3.6000; 37.10, over 3.6001.

A detailed discussion of these features would occupy too much space here, and they have already been described in some detail in two previous papers (Arnett, 1958, 1960). Some mention must be made of the method used to assign the characters to a particular position. As can be seen from the preceding listing of characters, there are 37 characteristics used, each with ten possible states, representing ten conditions. Not all of these 370 possible positions on the phenograms are used. The system is, to some degree at least, an open-end system. If new features are noted, the vacant states may be assigned without disrupting the usefulness of previous work. Obviously, additional states and characters can be added if needed. But this would result in the necessity of a reorganization of the table which



FIGURES 1-5. Phenograms of new species of *Oxacis*. 1—*O. bernadettei*, n. sp. 2—*O. francesca*, n. sp. 3—*O. matthewi*, n. sp. 4—*O. michaeli*, n. sp. 5—*O. josephi*, n. sp.

The phenogram is to be read from top to bottom and left to right. The scale on the right side of each phenogram marks off the position of each of the 37 characters used in this study. The top darkened bar represents character number 1, and so on down the graph. The scale along the bottom of each phenogram marks off the ten states for each of the characters. Thus the bar representing each character is filled in to the position that represents the state of that particular character for the species represented. This position is numbered in the description given in the text. Thus it is possible to read the histogram in terms of characters and states by locating the position by number and referring to the text. The general pattern of the phenogram is useful *per se* for comparing species and species group, however.

would mean that previous work would have to be transferred to the new system. The order given to these features is purely arbitrary because there is little direct evidence at the moment that one state of a character is any more advanced, i.e., evolved, than another. However, the order of the states is such that they progress from a simpler to a more complex condition so far as it is possible to make such an arrangement. This does not apply to the length data or to the treatment of the length/width ratio. In these cases a mid point may be considered as the least complex.

In evaluating these features, first the individuals from a single locality are carefully studied to determine which of these characters are subject to variation and which remain stable. In a great many cases living specimens in a single area have been studied. Where several sympatric species are represented the limits of the variation for some of the populations are definitely known. That is, it is believed that species are represented in such areas because here the limits of the several populations can be seen clearly. Using this sort of information it is believed that all such populations as represented in our collections can be evaluated. There will remain, of course, odd specimens here and there in the collections that cannot be placed until a series is available. This process is still to be completed for the material now accumulated, and it is for this reason that these data are preliminary.

By using this system of character and state study, the five species described as new in this paper are characterized. To show graphically the pattern of characters in these populations, there is presented for the first time, a modified histogram, here called a phenogram. (Figures 1-5). For each of these species, I have hypothesized that genetic data would show that these states are related and that the variation from one population to another is the result of gene combinations and changes. It is possible that something very similar to this actually did occur in nature. This is based on the fact that studies in other groups where the genetics is known have shown a similar pattern of character relationships. This paper deals with alpha taxonomic problems, and, therefore, there is no obligation to go farther with this study. I submit that the experimental systematist may devise ways of testing this hypothesis. This is the value of the phenogram. Similar devices have been used by other authors, but, so far as I am aware, not in this way. It is called a phenogram because it graphically portrays the phenotype of the species. It represents the size, shape, color, and structure of the members of the population studied. Phenograms say nothing more than that contained in a description. However, to those who are conscious of the efforts in the direction of numerical taxonomy, it is apparent that this treatment of characters readily lends itself to statistical comparison in all of its aspects and techniques. Phenograms may be readily compared visually, and, if arranged on sorting cards, they may be treated mathematically. The remainder of this paper, including the key to species, is an example of the application of this method.

In the introduction above, the terms "evolutionary units" and "natural species" are used. An explanation of the meaning of these expressions is necessary because of the complexity of the nomenclature currently applied to what was once generally, if casually, called species. I have no intention of adding to this confusion, but with the variety of connotations for the word "species" it is necessary that an author explain what he has in mind when he presents the data he has gathered. The term evolutionary unit (see Ehrlich and Holm, 1962, p. 656) here means a single living group of organisms living together and interbreeding as a local community. We know them only as samples taken from the field by the ordinary sampling methods, and studied by comparing them with similar samples taken from other areas. It is believed that these samples represent members of a local, interbreeding community of organisms. They are called evolutionary units because it is these local communities that are capable of maintaining the gene flow, and such groups will express the variation that is the potential source of evolutionary change. The descriptions of the new species published here are each based on a single such evolutionary unit because these units are at this time thought to represent distinct species since they have been compared with similar units, either from the same locality or elsewhere. There are specimens from other nearby areas for each of these new species, but they are not included in the description for the reason that they have not as yet been studied for a sufficient number of characters to show that they are actually a part of the same breeding or potentially interbreeding population. The advantage of basing formal descriptions on single samples should be obvious. It permits an objective means of referring to a single group when further work shows that more than one species is involved, or perhaps, when synonymy is discovered. This is thought to be a way to keep nomenclatural problems to a minimum and to allow the addition of zoological data without becoming involved in the time consuming task of untangling nomenclature.

The term natural species cannot be adequately defined in brief terms. For the present study it is sufficient to say that it represents a collection of evolutionary units, all thought to be part of a breeding or potentially interbreeding group of individuals as represented by samples taken from the field. It is used to make a distinction between groups based on studies using all possible biological data, the natural species, and taxonomic species that are based on the study of museum species using the classical morphological characters only. By making this distinction, it is possible to correlate the previous literature and nomenclature with current biological studies.

DESCRIPTIONS OF NEW SPECIES

The following new species are dedicated to my children who have shared with me many pleasant months in the desert in Arizona and Mexico studying the habits of *Oxacis*. All measurements made in this study follow the procedure described in Arnett (1960).

Oxacis bernadettei Arnett NEW SPECIES

(Fig. 1)

The presence of two anterior laterally placed mirror spots makes this species easy to distinguish from *O. barbara* Arnett which it otherwise resembles. This species belongs in the Subfusca group.

Holotype: Male, TEXAS, Burkburnett, Red River, Wichita Co., June 26, 1948 (C. and P. Vaurie). Deposited in the collection of the American Museum of Natural History.

Description.—Head orange-red in color with a central dark spot; pubescence fine, white; punctation moderate, interspaces microretriculate. Mandibles moderate in length with apices acute. Antennae normal with the segments elongate, parallel-sided.

Thorax orange-red in color; pronotum with a dark lateral spot on each side and a dark central stripe; in addition, at approximately the same location as the lateral spots, but not coincident with them are mirror spots, smooth, denuded areas that are very shiny; pronotal surface with an anterior-lateral depression on each side; pubescence fine, white, recumbent, antrorose posteriorly; pronotal shape obovate, sides convergent posteriorly, only slightly constricted at the center; punctation moderate; interspaces microretriculate. Legs piceus, with the base of the femora, and the coxae orange-red; metafemora normal, not enlarged.

Elytra fuscus; pubescence fine, recumbent, white; costae raised, orange in color; sutural and submarginal stripes evident; surface rugose; shape convex with the apices rounded, with sutural angles acute.

Abdomen fuscus.

Body shape elongate, narrow; length 8.7 mm.; head length/width ratio, .9302; pronotum length/width ratio, 1.0227; elytra length/width ratio, 2.6153.

Allotype: Female, same data as the holotype.

Paratypes.—Same data as the holotype; 19 males and 19 females.

Larvae: Unknown.

Biology: Unknown.

Variation: These specimens are remarkably uniform, with no significant difference between the sexes to indicate secondary sexual dimorphorism. The mean length of all 40 specimens is 8.6 mm.; mean head length/width ratio, .9575; mean pronotum length/width ratio, 1.1196; mean elytra length/width ratio, 2.7031.

Oxacis francesca Arnett NEW SPECIES

(Fig. 2)

This species has the general appearance of *O. sericea* Horn, but lacks the powdery gray color of that species. It may be easily recognized by the pale elytral costae and uniform dark fuscus color. This species belongs in the Subfusca group.

Holotype: Male, CALIFORNIA, Bakersfield, July 8, 1928 (Ray F. Smith). Deposited in the California Academy of Sciences collection.

Description.—Head fuscus, immaculate; pubescence coarse, white; punctation coarse, interspaces microretriculate; mandibles moderate, apices acute; antennae normal, segments elongate and parallel-sided.

Thorax fuscus; pronotum immaculate, without depressions; pubescence coarse, white, recumbent, antrorose posteriorly; pronotal shape obovate with sides convergent posteriorly without pronounced constriction at the center; punctation coarse, interspaces microretriculate. Legs fuscus, metafemora normal, not enlarged.

Elytra fuscus; pubescence coarse, long, some setae erect, most recumbent, white; costae raised and pubescent; both sutural and marginal stripe pale; surface rugose; shape convex with apices rounded, sutural angles acute.

Abdomen fuscus.

Body shape moderately broad; length, 8.0 mm.; head length/width ratio, .7500; pronotum length/width ratio, 1.1428; elytra length/width ratio, 2.6666.

Allotype: Female, same data as the holotype.

Paratypes: Same data as holotype, 3 males and 12 females.

Larvae: Unknown.

Biology: Unknown.

Variation: This short series shows little variation except for one female which is paler than the others. There are no evident secondary sexual differences. The mean values for the 17 speciemens are: length, 7.8 mm.; head length/width ratio, .8530; pronotum length/width ratio, 1.0918; elytra length/width ratio, 2.7348.

Oxacis matthewi Arnett NEW SPECIES

(FIG. 3)

The unusual condition of the posteriorly directed pronotal pubescence sets this species apart from the others of this group. The uniform fuscus color and coarse pubescence distinguishes it from *O. rugicollis* Champion, to which it is very similar. This species belongs to the Subfusca group.

Holotype: Male, MEXICO, Estero de Sargente, 23 km. S. Desemboque, August 11, 1953 (B. Malkin). Deposited in the California Academy of Sciences collection.

Description.—Head fuscus, immaculate; pubescence coarse, recumbent, moderate in density, white; punctation coarse, moderate in density, interspaces microretriculate. Mandibles moderate in length, apices acute. Antennae with segments normal, segments elongate and nearly parallel-sided.

Thorax fuscus; pronotum immaculate; pronotal surface with an anterior-lateral depression on each side; pubescence coarse, moderately dense, white, recumbent, retrose posteriorly. Pronotal shape obovate with sides convergent posteriorly, very slightly constricted at the center; punctation coarse, moderate in density, interspaces microretriculate. Legs fuscus; metafemora normal, not enlarged.

Elytra fuscus; pubescence coarse, recumbent, moderate in density, white; elytral costae obscure; pale sutural and marginal stripe evident but not pronounced; surface rugose, interspaces microretriculate; elytra convex, apices rounded with sutural angles acute.

Abdomen fuscus.

Body shape moderately elongate; length 8.0 mm.; head length/width ratio .8947; pronotum length/width ratio 1.0714; elytra length/width ratio 2.7857.

Allotype: Female, same data as the holotype.

Paratypes: Same data as holotype; 19 males; 7 females, and 10 sex undetermined.

Larvae: Unknown.

Biology: Unknown.

Distribution: Known only from northern Sonora, Mexico.

Variation: The size ranges from 5.8 to 9.5 mm. in length, with no marked sexual difference in length. The mean length of the males is 7.6 mm., and the females 7.9 mm. The pronotum of the males seems to be narrower than those of the female. The mean ratio of pronotum length/width in the males is 1.0100; that of the females, .9700. There is some color variation; some of the specimens are paler than the majority.

Oxacis michaeli Arnett NEW SPECIES

(FIG. 4)

The rather pale pronotum and dark brownish elytra gives this species a superficial resemblance to *Xanthochroina bicolor* (LeConte), but it is otherwise similar to *O. cana* (LeConte). It is assigned to the Trimaculata group.

Holotype: Male, CALIFORNIA, Stovepipe Wells, Death Valley National Park, April 6, 1928. Deposited in the California Academy of Sciences collection.

Description.—Head yellow with a dark central spot; pubescence texture fine, moderately dense, white; punctation fine, sparse, the interspaces smooth. The mandibles are moderate in length with the apices acute. The antennal segments are elongate and nearly parallel-sided.

Thorax yellow, immaculate, without pronotal depressions; pubescence texture fine, moderately dense, white, recumbent, antrorse posteriorly on the pronotum; pronotum constricted laterally at the middle; punctation fine, the interspaces smooth. Legs entirely yellow.

Elytra piceus, immaculate; pubescence texture fine, white; costae not evident; surface rugose, interspaces microretriculate; shape convex with inner apical angles acute.

Abdomen piceus.

Body narrow, elongate; length 8.8 mm.; head length/width ratio, .9333; pronotum length/width ratio 1.1162; elytra length/width ratio 2.7868.

Allotype: Female, same data as the holotype.

Paratypes: Same data as the holotype; 2 males and 4 females.

Larvae: Unknown.

Biology: Unknown.

Distribution: Known only from Death Valley, California.

Variation: The color, pubescence, and punctation show no particular variation in this short series. The only sexual dimorphism exhibited in the series is a mean size difference. The mean length of the males is 8.5 mm.; of the females is 9.9 mm.

Oxacis josephi Arnett NEW SPECIES

(FIG. 5)

The rather narrow body gives this species an elongate appearance. This along with the shiny median stripe and the small, shiny anterior-lateral mirror spots are the distinguishing features of this species. It is otherwise very similar to some of the forms of *O. cana* (LeConte) and it belongs in the Trimaculata group.

Holotype: Male, MEXICO, 15 km. E. Sombrete, Zacatecas, July 28-31, 1951 (H. E. Evans). Deposited in the United States National Museum collection.

Description.—Head piceus, immaculate; pubescence fine, white; punctation coarse, interspaces smooth; mandibles moderate in length, apices acute; antennae normal, the segments elongate and parallel-sided.

Thorax orange-red; pronotum with a central spot and with an anterior-lateral mirror spot on each side; pronotal surface without depressions; pubescence moderate, white, recumbent, antrose posteriorly; pronotal shape obovate with sides constricted at the middle; punctation coarse, interspaces smooth; legs piceus, base of femora and coxae orange-red; metafemora normal, not enlarged.

Elytra piceus; pubescence fine, white; costae obscure; pale sutural stripe evident; surface rugose; shape convex, apices rounded, sutural angles acute.

Abdomen piceus.

Body shape elongate, narrow; length 9.6 mm.; head length/width ratio .9534; pronotum length/width ratio 1.1428; elytra length/width ratio 2.9242.

Allotype: Female, same data as the holotype.

Paratypes: Same data as the holotype; 8 males and 12 females.

Larvae: Unknown.

Biology: Unknown.

Distribution: Known only from central Mexico.

Variation: The series upon which this species is based is remarkably uniform, but the other specimens which may belong to this species show considerable variation. I do not know this species from my own field work. It is interesting to note that the anterior lateral black spots on the pronotum do not coincide with the mirror spots, although they always overlap. It would seem from this, that the genes responsible for these character states are quite distinct. The fact that mirror spots appear in other species independent of the pronotal maculations seems to indicate that separate genes may appear as dominant characters in various segments of the genus quite independent of other characteristics. This is one example for support of the deduction that the characters used in the phenogram have a genetic basis even if there has been, as yet, no experimental data in support of the hypothesis. Sexual dimorphism is indicated by the mean length: males, 9.3 mm.; females 10.5 mm. Also the elytra of the males are longer than those of the female: male elytra length/width mean ratio, 3.1000; female 2.9820.

DETERMINATION KEYS

The following key to the species includes all known species occuring north of Colombia, including the West Indies, Central, and North America. So far as it is now known, the genus does not occur outside of the New World. There are many species described from Brazil and Argentina, most of which are known only from the type specimens. Until these have been examined, a useful key to all of the species of the genus cannot be constructed.

I. KEY TO THE SPECIES GROUPS OF OXACIS

1. Body narrow; color pale to tan or yellow, or if brownish, body wide and pubescence coarse; elytra with or without black stripes; antennal segments may be short and fusiform (Key II) -- FRAGILIS GROUP
   Body usually narrow, if broad, color fuscus or brownish; color usually orange-red and piceus, entirely dark, or if pale, body not immaculate; antennal segments elongate and parallel-sided -- 2

2(1). Vestiture very coarse and dense, obscuring punctation (Key III) -------- PALLIDA GROUP
   Vestiture coarse to fine, but not obscuring punctation, or if coarse and with costae, then not light tan in color -- 3

3(2). Head, thorax, and elytra entirely dark, metallic or lead colored, without pale markings on elytra (Key IV) ---------------------------------- **PLUMBEA GROUP**
Head, thorax, and elytra fuscus or reddish-brown, or if nearly piceus, then with pale markings on thorax and rarely on elytra (Key V) -------------- **SUBFUSCA GROUP**
Thorax orange-red or testaceous, with or without darker markings, or if head, thorax, and elytra are dark, then pale sutural and marginal stripes on elytra (Key VI) -- **TRIMACULATA GROUP**

II. KEY TO THE SPECIES OF THE FRAGILIS GROUP

1. Pubescence of elytra of two distinct colors and texture -------------------- 2
Pubescence of uniform, or nearly uniform color throughout -------------------- 3
2(1). Coarse brown, erect hairs scattered throughout white, more recumbent hairs on elytra in proportions varying from nearly equal of each to a very few erect brown hairs located mainly toward apex and sutural areas of elytra ---- **BITOMENTOSA** Arnett
Brown hairs in patches cn elytra otherwise covered with white hairs, giving surface a variegated appearance ---------------------------------- **VARIEGATA** Champion
3(1). Antennae with segments fusiform, short and broad in shape; body usually very pale in color, immaculate -- **MEGATHORACICA** Arnett
Antennae with segments elongate, parallel-sided; body pale to tan or yellow, with or without distinct black markings -- 4
4(3). Body pale to tan or light brown, immaculate ---------------------------------- 7
Body yellowish, always with blackish to dark brown markings ------------------ 5
5(4). Elytra without black or dark brown stripes; body entirely reddish-yellow except for apex of femora and remainder of legs and antennae black -- **CONSTRICTICOLLIS** Champion
Elytra with a distinct narrow black or dark brown stripe on each elytron ---------- 6
6(5). Black stripe on each elytron entire ------------------------------ **BILINEATA** Champion
Black stripe on each elytron absent at basal half except for small black spot at base -- **PICTIPENNIS** Champion
7(4). Color pale; pubescence fine; surface somewhat shiny -------------------- **FRAGILIS** Horn
Color tan to light brown; pubescence coarse; surface dull ------------ **XERENSIS** Arnett

III. KEY TO THE SPECIES OF THE PALLIDA GROUP

1. Elytra with costae -- 2
Elytra without costae -- 3
2(1). Color dark with light central black stripe on elytra (northern and central part of range) -- **PALLIDA** LeConte
Color light tan with central black stripe on elytra (southern and western part of range) -- **PALLIDA** LeConte
3(1). Color tan (variant) -- **SERICEA** Horn
Color slate (variant) -- **SERICEA** Horn

IV. KEY TO THE SPECIES OF THE PUMBEA GROUP

1. Legs pale, body bluish-metallic ------------------------------------ **DURANGOSA** Pic
Legs dark -- 2
2(1). Body entirely bluish or greenish metallic in color; thorax only slightly narrower behind, widest near middle ---------------------------------- **CAERULEA** Champion
Body black, lead-colored, without metallic reflections; thorax widest in front, abruptly narrowed behind middle and base much narrower than apex -------- **PUMBEA** Champion

V. KEY TO THE SPECIES OF THE SUBFUSCA GROUP

1. Entire surface shiny; punctations very sparse; elytral surface barely irregular; color fuscus; elytra darker, but with broad pale sutural area ---------------- **NITENS** Arnett
Like preceding couplet, but with very broad, pale sutural area ------------ **KNULLI** Arnett
Surface of head and thorax shiny or dull, but elytra always dull, rugose ---------- 2
2(1). Costae of elytra distinctly outlined by double broken dark fuscus line; pubescence long, sub-erect; color dark brown -------------------------- **LINEATULA** Champion
Costae, if present, not outlined by broken line -------------------------------- 3

3(2). Area between pronotal punctures reticulate to rugose, or if area smooth, then very dark brown (rarely specimens of GRANULATA) ---------- 4
Area between pronotal punctures smooth or micro-punctate ---------- 6
4(3). Elytra depressed, apex blunt, not tapering to apex, but nearly parallel for entire length, margin broadly excavated at center; metafemora of male greatly enlarged ---------- PODAGRICA Champion
Elytra convex, apex pointed, widest near base, sides not emarginate; metafemora of male slender ---------- 5
5(4). Color very dark brown; pubescence short, fine, depressed; pronotal punctures distinct, well formed ---------- GRANULATA LeConte
Color brown; pubescence very long, fine, suberect; pronotal punctures coarse, very poorly formed ---------- PILOSA Champion
6(3). Color uniformly reddish-brown; elytra rarely stained with piceus; thorax always as light as or lighter than elytra. ---------- SUBFUSCA Horn
Color piceus-brown; elytra usually stained with piceus; thorax darker or as dark as elytra ---------- 7
7(6). Head and pronotum shiny, piceus brown; head densely and finely punctate; elongate, narrow species, pubescence coarse ---------- ANGUSTATA Champion
Head and pronotum not obviously shiny or piceus ---------- 8
8(7). Each elytron marked with two orange striae ---------- 9
Elytra at most with evident costae ---------- 10
9(8). Pronotum without anterior-lateral mirror spots ---------- BARBARA Arnett
Pronotum with two anterior-lateral mirror spots ---------- BERNADETTEA Arnett
10(8). Body usually uniformly fuscus, with evident costae with white pubescence; pubescence moderate and usually rather coarse ---------- FRANCESCA Arnett
Body maculate or pubescence coarse; elytra without evident costae ---------- 11
11(10). Color uniformly brown; pubescence coarse, that of posterior portion of pronotum directed posteriorly ---------- MATTHEWI Arnett
Pronotum with extreme base and apex reddish-brown, body otherwise dark; pubescence fine, that of posterior portion of pronotum directed anteriorly ---------- RUGICOLLIS Champion

VI. KEY TO THE SPECIES OF THE TRIMACULATA GROUP

1. Pronotum with a wide, central dark brown or piceus stripe which has a distinct reddish bar transversely through the middle, and each side of thorax with a reddish patch ---------- TEAPENSIS Champion
Pronotum immaculate, with piceus patch on each side, with a central piceus stripe, or with both lateral patch and central stripe ---------- 2
2(1). Lateral margins of prothorax only stained with piceus, central stripe absent ---------- 3
Prothorax immaculate, or with a central stripe only, or with a central stripe and lateral patches ---------- 4
3(2). Pronotum very shiny, punctures fine, poorly formed; pubescence sparse (western North America) ---------- LAEVICOLLIS Horn
Pronotum dull, punctures coarse, large, and closely placed (eastern United States) ---------- TAENIATA (LeConte)
4(2). General color reddish-orange, elytra stained at base with piceus to entirely piceus; mandibles usually large; pronotum distinctly marked with central piceus stripe, and a piceus patch on each side ---------- TRIMACULATA Champion
Elytra piceus or brown-piceus, with or without lateral markings, or if paler, not reddish-orange, mandibles not large, surface of a dusty appearance and thoracic markings not distinctly limited ---------- 5
5(4). Pronotum with coarse yellow-brown pubescence on each side, absent at middle and along lateral margins, arranged in "combed," orderly fashion, directed toward median line; median stripe of thorax usually red, rarely with piceus staining; elytra with or without sutural, marginal, or submarginal pale stripes ---------- SECURICULA Arnett
Pronotum without patches of coarse pubescence and not red ---------- 6
6(5). Elytra variable, but always with distinct pale submarginal stripe ---------- 7
Elytra always dark, and usually without pale submarginal stripe, or if pale stripe present, then poorly differentiated; head pale or dark ---------- 9

7(6). Elytra with sutural and marginal area broadly pale, dark longitudinal area traversing center of each elytron with bluish luster--------------------**COAHUILAE** Champion
Elytra dark to pale, with variable pale submarginal stripe; central area of each elytron without bluish luster-- 8
8(7). Thorax broad in front, length to width ratio 1:1; surface of thorax between punctures finely reticulate (W.I. and Fla.)------------------------------**LAETA** (Waterhouse)
Thorax narrower in front, length to width ratio 5:4; surface of thorax smooth between punctures (La., Kans., Tex., Ariz., and Mexico)------------**CHAMPION** Arnett
9(6). Elongate species; thorax distinctly marked with shiny, usually short, piceus median stripe and small shiny piceus mirror spot on each side; elytra purple-piceus; body with a general dusty lead-colored cast-----------------------------**JOSEPHI** Arnett
Short and broad species; elytra immaculate, without costae------------------ 10
10(9). Body shiny, thorax broad; pubescence yellow, fine--------------**NITIDICOLLIS** Champion
Body surface dull; pubescence white to yellow, coarse to fine------------------ 11
11(10). Apex of pronotum slightly emarginate; species generally over 7 mm. in length; pronotum broad and less abruptly constricted at middle-------------------- 12
Apex of pronotum generally evently arcuate; species 4.0-6.5 mm. in length generally; pronotum abruptly constricted behind middle and narrow------**MINUTA** Champion
12(11). Pronotum orange, immaculate with deep depressions on each side; elytra entirely piceus --**DUGESI** Champion
Pronotum orange, or pale, with or without piceus markings, and without obvious lateral depressions -- 13
13(12). Pronotum orange, usually with piceus markings; elytra purple-piceus, often with very narrow pale sutural and marginal stripe, rarely with vague sub-marginal pale stripe; pronotum rather sharply constricted behind apex--------------**CANA** (LeConte)
Pronotum pale, yellow, immaculate; elytra dark brown to piceus without evident sutural or marginal stripe; sides of pronotum gradually narrowing to base --**MICHAELI** Arnett

Literature Cited

Arnett, R. H., Jr.
1958. Contribution towards a monograph of the Oedemeridae 11. Speciation and distribution in the genus *Oxacis.* Proc. 10th International Congress of Entomology, 1: 805-811.
1960. Contribution towards a monograph of the Oedemeridae 13. The "Fragilis" complex of the genus *Oxacis.* Coleopt. Bull., 14: 33-44.

Ehrlich, Paul R., and Richard W. Holm
1962. Patterns and populations. Science, 137: 652-657.

Sneath, P. H. A., and Robert R. Sokal
1962. Numerical Taxonomy. Nature, 193: 855-860.

LITERATURE NOTICE

THE ANOBIIDAE OF OHIO (COLEOPTERA), by Richard E. White. Bulletin of the Ohio Biological Survey (New Series), Vol. 1, No. 4, x, 58 pp., 28 figs., 1962. (Price $1.00)—This is the fourth family of beetles treated in the Survey; the others, Cerambycidae, Cleridae, and Chrysomelidae, were treated by Knull and Wilcox. The anobiid manual includes 71 species in 28 genera, 52 of them having been found in Ohio, while the other 19 are discussed because they are known from one or more adjacent States and could occur in Ohio. Keys to subfamilies, genera, and species (often revised from Fall's 1905 anobiid revision), short synonymies, diagnostic descriptions, and distributions are given. One species of each genus, with two exceptions, is illustrated. The States of Ohio, Illinois, Connecticut, and California are still very active in producing insect manuals to the species level, and for this we should be thankful. The Pacific Northwest is being covered for the beetles by Hatch. Now, if some southern and southwestern States could put out such manuals, we would have at least the beginnings of a reasonable survey of the areas of the United States.

FAMILY NAME AND INDIVIDUAL VARIATIONS OF PEDILID BEETLES, WITH CORRECTIONS (COLEOPTERA: ANTHICIDAE: PEDILINAE)

By MOHAMMAD ABDULLAH[1]

This paper reports on three topics pertaining to the systematics of the pedilid beetles which are separately discussed below.

I. THE FAMILY NAME: ANTHICIDAE

The question of whether the pedilid beetles represent a separate family or a subfamily of Anthicidae is subjective in nature, and the evidence is in my opinion now overwhelming in favor of treating the group as a subfamily. The eyes are finely-faceted and more or less emarginate, and the hind coxae are contiguous or nearly so in the pedilid beetles. These characters, which have been used to separate the two groups into two different families in the past are rather weak. Several genera and species of beetles assigned to Pedilidae do not even have the family characters. Thus, the eyes are entire in *Pergetus* Casey, *Stereopalpus* Laferte- Senectere and *Duboisius* Abdullah (rarely, feebly emarginate), and are at most only feebly emarginate in *Bactrocerus* LeConte and *Egestria* Pascoe. Further, the eyes are coarsely-faceted in *Bactrocerus* LeConte, *Leptoremus* Casey and *Duboisius* Abdullah. In the genus *Pedilus* Fischer, one species (*parvicollis* Fall) has the eyes relatively coarsely-faceted in comparison with the other species in the genus. Crowson (1955) places the group as a subfamily of Anthicidae since the two groups share the following characters: 1. All visible abdominal sternites free; 2. Mesepisterna usually meeting in front of the mesosternum; 3. Tarsi with the penultimate segment more or less lobed below and the antepenultimate segment simple; 4. Internal keel of hind coxae usually reduced to a narrow-based apophysis; 5. Metendosternite not of the byturid type.

I agree with Crowson and consider the group, Pedilinae, a subfamily of Anthicidae.

II. VARIATION OF CHARACTERS

It appears to me that the following characters are fairly constant within a given species of Pedilinae: 1. Type and shape of the antenna within a sex; 2. Emargination and facets in the eye (whether fine or coarse); 3. Punctures on the head, pronotum and elytra (whether sparse or dense, fine or coarse); 4. Modification in the elytral apex of the male (in *Pedilus* only); 5. Closed or open condition of anal cell in the wing; 6. Size of teeth present in the tarsal claws within a sex; 7. Presence or absence of spines on metasternum of the male; 8. Emargination and shape of the last visible abdominal sternite and tergite; 9. Characters of the male genitalia.

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The following characters are subject to considerable intraspecific variation depending upon the species concerned: 1. Color of clypeus and maxillary palpi; 2. Color of pronotum; 3. Color of legs; 4. Color of the last two abdominal sternites.

III. Corrections and Additions

The following remarks concern my recent paper on *Duboisius* (Abdullah 1961:97-104).

The generic name *Pseudobactrocerus* Abdullah (1961:97) was a *nomen nudum;* it will be described at a later date. The spelling of the type locality of *Duboisius emarginatus* Abdullah (1961:103) should be corrected to "Tehuantepec." The types of the species of *Duboisius* Abdullah (1961:97-104) described from the collection of Mr. Roy R. Snelling will be deposited in the California Academy of Sciences.

My placing of *"Duboisius benedicti,* NEW SPECIES" above an original description (Abdullah, 1961:103) was a *lapsus calami;* the correct heading over that description should be *"Duboisius mexcaliensis,* NEW SPECIES." *D. mexcaliensis* was correctly placed in the key (1961:98) and correctly labeled in the illustration (1961, Fig. 24).

The description of *D. benedicti,* a new species, was omitted from that article. Nevertheless, *D. benedicti* was correctly delimited in a key (1961:-98) and the genitalia were correctly illustrated (1961, Figs. 22, 23). Thus the species *D. benedicti* should be considered as having been originally proposed in 1961. The description of *D. benedicti* is given below.

Duboisius benedicti Abdullah, 1961: 98, Figs. 22, 23.

MALE: Length: 7 mm. Width: 2 mm. Metasternum with a spinous patch. Wing with anal cell closed. Abdomen with seventh sternite shallowly emarginate (1961, Fig. 22); eighth sternite nearly as long as wide, lateral processes twice as long as central processes; eighth tergite slightly notched. Genitalia: Parameres irregularly punctate and spinous with linear arrangement occasionally, abruptly tapering near apex (1961, Fig. 23).

FEMALE: not known.

Holotype: Male, White Sands, New Mexico, 7-23-33, W. Benedict. The holotype is to be deposited eventually at the University of Kansas.

Literature Cited

Abdullah, M.
1961. Systematics of *Duboisius,* a new genus of pedilid beetles (Pedilidae). Coleopt. Bull. 15(4):97-104, illus.

Crowson, R. A.
1955. The natural classification of the families of Coleoptera. London.

LITERATURE NOTICE

SUR LARVALSYSTEMATIK DER GATTUNG AGRIOTES ESCH. (COL. ELATERIDAE), by Joachim Oehlke. Deutsche Ent. Zeitschrift N.F. 9(3/4):336-349, 11 figs., 1962.—Presents key to larvae of 8 species. Attempts to solve difficulties in larvae of this genus by using proportions of spiracles.

STUDIES ON NORTH AMERICAN APION: THE APION BRACHYSPINOSUM GROUP (COLEOPTERA: CURCULIONIDAE)[1]

By D. G. KISSINGER[2]

This paper continues a series in which the 260 species of *Apion* occurring in North America will be revised. Kissinger (1959a) presents a key to 29 species groups of *Apion* known from North America. Explanation of abbreviations and measurements is given by Kissinger (1957, 1959b).

The two allopatric species belonging to this group occur in eastern United States, Mexico and Guatemala (see figure 2). Nothing is known concerning host plants of the species.

The secondary sexual modifications of the male are distinctive: tibiae 1-3 mucronate (mucro on tibia 1 may be minute) and sternite 1 with mediobasal tubercle. Other characteristics of the group are as follows: prothorax lacking distinct basal lateral expansion; little sexual dimorphism in structure of beak, dorsal margin of scrobe not strongly angulate (a trifle prominent near middle), frons wider than tip of beak in dorsal view, and in lateral view longitudinal dimension of eye somewhat greater than transverse diameter; tarsal segment 1 longer than segment 2; femur and tibia (in part at least) and base of antenna reddish or pale yellow; elytra aeneous; and pubescence white, conspicuous, dense on sides of mesothorax and metepisternum.

The following two species are very similar; a comparative statement of distinguishing characteristics is given in the treatment of *A. brachyspinosum* Wagner.

Apion roseae Kissinger, NEW NAME

FIGS. 4 and 6

Apion aeneipenne Smith, 1884, Trans. American Ent. Soc. 11: 61, *nec* Pascoe, 1883, Ann. Mag. Nat. Hist. (5) 11: 122.

Apion smithi Wagner, 1909, Deutsche Ent. Zeitschr., p. 767 [New name for *A. aeneipenne* Smith *nec* Pascoe], *nec* Scudder, 1893, Monog. United States Geol. Sur. 21: 81.

Length: 2.25 to 2.50 mm.; width: 1.00 to 1.12 mm.

I am pleased to rename this species in honor of Rose Ella Warner, a friend who has been patient and generous in sharing her knowledge of weevil taxonomy.

Distribution: ALABAMA: Chambers Co., 15 VII 52 (ELS); 5 miles northwest Huntsville, 9 IX 59, D. G. Kissinger (DGK). DISTRICT OF COLUMBIA: no further data (USNM). ILLINOIS: Seymour, M. W. Sanderson (CAF in MCZ). INDIANA: Perry and Wayne counties (Blatchley and Leng, 1916, p. 77). LOUISIANA: Opelousas, 15 IV,

[1] Study aided by grant G19,600 from National Science Foundation.
[2] Atlantic Union College, South Lancaster, Mass.

H. W. Wenzel (Knull). MARYLAND: Takoma Park, 1 VI 51, D. G. Kissinger (DGK). MISSISSIPPI: no further data (TLCC). MISSOURI: St. Louis, 1 VI, Liebeck (MCZ). OHIO: Hocking Co., 3 VI, N. J. and E. L. Sleeper (ELS); Scioto Co., 22 V and 11 VI, N. J. and E. L. Sleeper (ELS). SOUTH CAROLINA: Aiken, 31 V 57, H. F. Howden (Howden). TENNESSEE: "Elmwood," J. Coase (CAS); Green Briar Cove, Great Smoky Nat. Park, 18 V 57, H. and A. Howden (Howden).

Apion brachyspinosum Wagner

FIGS. 3 and 5

Apion brachyspinosum Wagner, 1912, Arch. Naturg. 78, Abt. A., Heft 2: 120.

Length: 2.00 to 2.18 mm.; width: 0.88 to 0.99 mm.

I am indebted to Mr. R. T. Thompson for sending a male specimen of this species determined by Wagner and labeled "Chacoj, Vera Paz, Champion," Guatemala. This specimen apparently lacks the tubercle at the base of sternite 1, but it has femur 2 stouter than femur 1, which condition is not apparent in Mexican specimens and in *A. roseae*. Additional specimens from Guatemala may reveal the significance of this variation. The elytral vestiture of this specimen is more similar to that seen in *roseae* than to Mexican individuals, but the vestiture on the lateral pro, meso and meta thorax and abdominal sternites is as seen in the Mexican population. In lateral view the prothorax of this individual is quite convex, much as in *roseae*.

I hereby designate as lectotype of *brachyspinosum* the specimen labeled type, "Cahabon, Vera Paz," in the British Museum (N.H.).

Distribution: *GUATEMALA:* VERA PAZ: Cahabon; "Chacoj." *MEXICO:* Mexico: 37 miles south east Mexico City, 15 III 1953, D. G. Kissinger (DGK); Temescaltepec, 20 V to 4 VI 1933, H. E. Hinton & R. L. Usinger (CAS). MICHOACAN: 20 miles east Morelia, 7 III 1953, D. G. Kissinger (DGK). MORELOS: Cuernavaca: June, Fenyes Colln. (CAS). PUEBLA: 35 miles south Puebla, 25 II 1953, D. G. Kissinger (DGK).

Comparing the two species, *brachyspinosum* and *roseae,* side by side they seem quite different, but the differences are hard to describe. *A. brachyspinosum* tends to have legs that are light yellow while the legs of *A. roseae* are reddish to piceous. *A. brachyspinosum* is smaller in size than *A. roseae* as indicated by the dimensions of the prothorax on Figure 1

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FIGURE 1—A comparison of width to length of the pronotum of *Apion brachyspinosum* Wagner and *Apion roseae* Kissinger. The number of individuals having identical measurements is indicated by a figure and an arrow. FIGURE 2—Distribution of *Apion brachyspinosum* Wagner and *Apion roseae* Kissinger. Species code is same as used in figure 1. FIGURE 3—Dorsal view of prothorax of *Apion brachyspinosum* Wagner; inset is diagram of punctation and scales in that region at same scale. FIGURE 4—Same of *Apion roseae* Kissinger. FIGURE 5—*Apion brachyspinosum* Wagner: Diagram of base of left elytral intervals 1-3 showing nature of scales; scutellum included. FIGURE 6—Same of *Apion roseae* Kissinger.

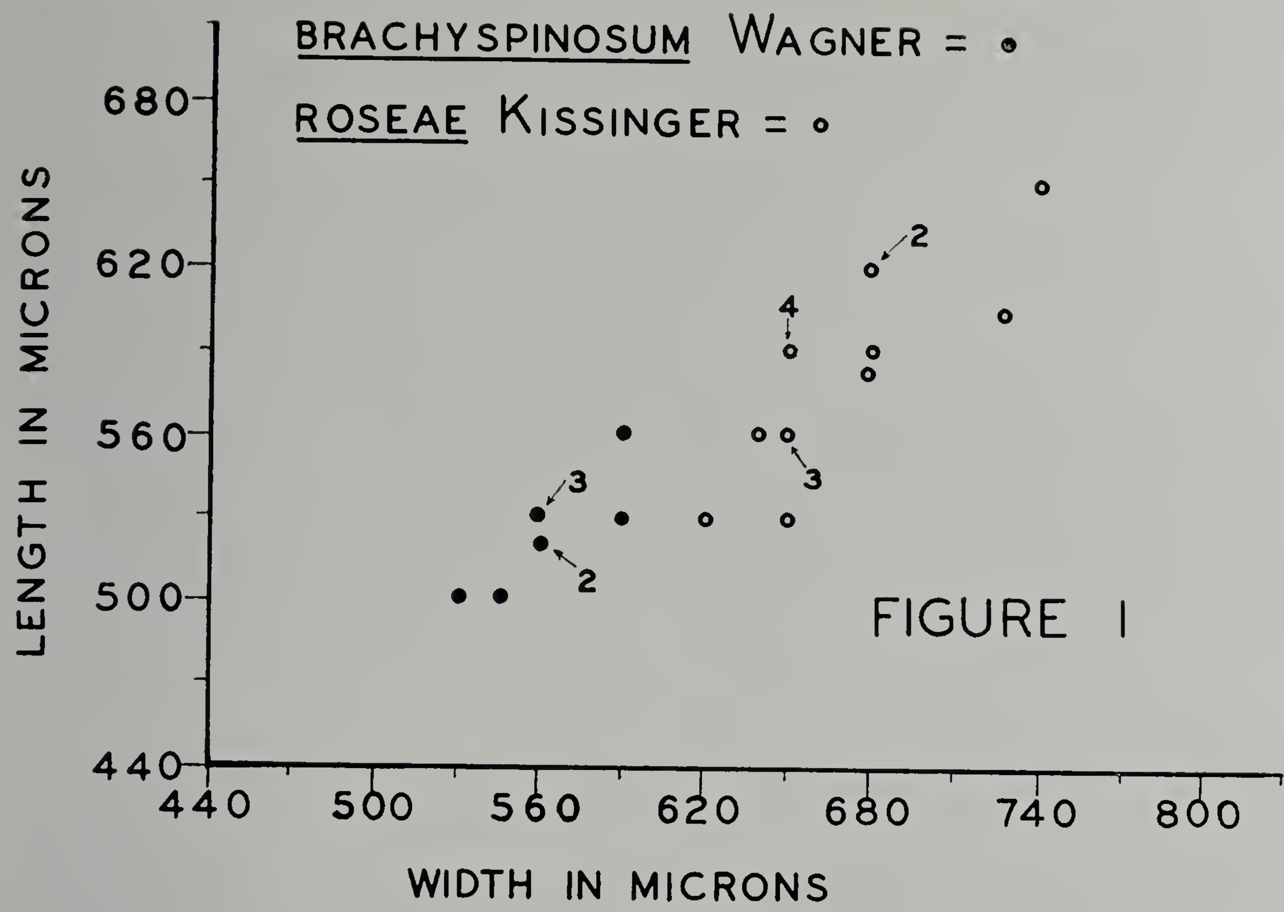


FIGURE I

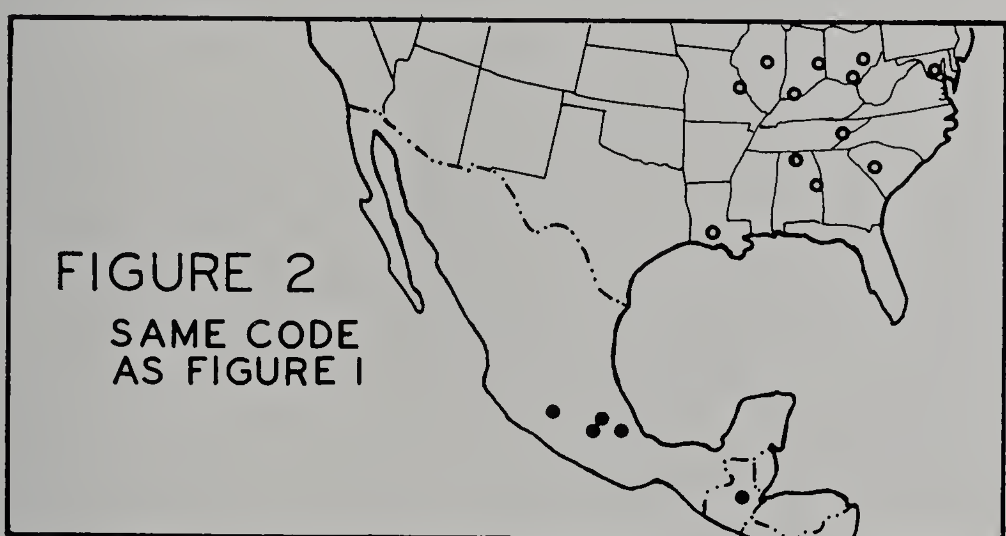
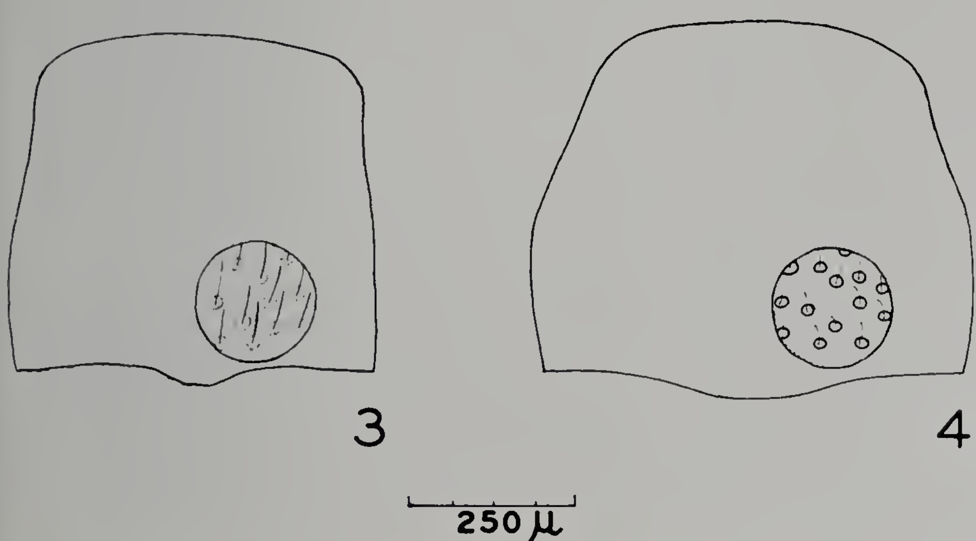


FIGURE 2
SAME CODE
AS FIGURE I



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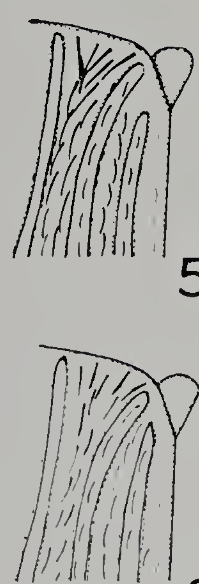

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6

and by the range of length and width cited for the species. The prothorax of *brachyspinosum* is only slightly wider than long, in dorsal view the sides at basal third are hardly broader than the base, and in side view the dorsal surface is flatter, while in *roseae* the prothorax tends to be broader, in dorsal view the sides at basal third are obviously broader than the base, and in side view the dorsal surface is more convex. The pronotum of *brachyspinosum* has shallow punctures and on the central part has long, fine scales ranging about 0.04-0.06 mm. long, the elytral scales tend to be coarser, and the sternites laterally are clothed with comparatively longer, coarser pubescence; in *roseae* the pronotum has deeper punctures and on the central part longer, fine scales about 0.03 mm. long, the elytral scales tend to be finer, and the sternites laterally have sparse, finer pubescence. The beak of the male of *brachyspinosum* is quite polished distad of the insertion of the antenna, while in *roseae* it is more strongly alutaceous here.

Literature Cited

Kissinger, D. G.

1957. Studies on North American *Apion* with descriptions of two new species (Curculionidae). Coleopt. Bull. 11: 17-24.

1959a. The species groups of *Apion* occurring in North and Central America (Curculionidae). Coleopt. Bull. 13: 13: 21-32.

1959b. Revision of the *Apion* subgenus *Trichapion* Wagner in the New World (Curculionidae). Proc. United States Nat. Mus. 110: 247-389.

BOOK REVIEW

THE TAXONOMY AND SPECIATION OF PSEUDOPHONUS (A SUBGENUS OF HARPALUS: HARPALINI: CARABIDAE, KNOWN TO OCCUR IN NORTH AMERICA), by George E. Ball and Joseph N. Anderson. Studies on Speciation No. 1, xi and 94 pp., 38 figs., 18 tables, 1 pl., 1962. (Price $3.95)

"Many generalizations have been made about the species problem; in comparison, relatively little has been made about the problem species." So say the authors in their preface. This taxonomic revision has more than its share of problem species. But the authors have not dismissed those problems with a few words; rather they have accentuated them by grouping them in a separate chapter. Many measurements, dissections, and extensive comparisons were made in hope of resolving the problems. These efforts were fruitful and form the basis for the classification, but the authors readily admit to being completely stymied in a few instances.

The organization of this study is such that almost any chapter can be read separately and understood. Only half the book is taken up with descriptions of species. A key is given to the 12 species. The short chapter on zoogeography attempts to explain present distributions; most of it concerns Pleistocene glaciation's probable effect on the beetles. The study is loaded with tables, all easily understood, making analysis of comparative data and measurements much easier to use than if it were buried in text.

Only two faults come to mind: the pie-graph method of showing distribution on maps is not effective with so much photographic reduction, and the plates are poorly designed in that the figures extend to the edge of the page. Those are minor troubles. I like this book. It is a small, hard-back book, approximately 5 by 7½ inches, and was published on December 27, 1962.

Studies on Speciation is a new series of monographs to contain results of studies directed toward understanding the mechanisms and factors affecting the evolution of populations of organisms. The series is published by the Catholic University of America Press, under the auspices of the Institute for the Study of Natural Species at the Catholic University of America. The Institute, directed by Ross H. Arnett, Jr., is a relatively new organization, providing research, training, and publication. It has facilities for the study of organisms in the field.—T. J. Spilman

TWO NEW SPECIES OF MEGASOMA FROM THE UNITED STATES AND MEXICO (COLEOPTERA: SCARABAEIDAE)

By O. L. CARTWRIGHT[1]

The first of the two species described below was known from female specimens at the time the description of *Megasoma punctulatus* Cartwright (Proc. Ent. Soc. Washington 54: pages 36-38, 1952) was published, but its description was delayed in the hope that males might be found. Males still have not been collected; however, because of the wide destruction of the flora of the type locality, there seems little use in further withholding the description.

Megasoma vogti Cartwright NEW SPECIES

(FIG. 6)

Holotype female.—Length 31.5 mm., width 17.0 mm. Moderately shining, piceous, upper surfaces without pubescence. Clypeus bidentate, the well-developed, erect teeth widely separated by a distance greater than the length of the strongly reflexed, lateral edges, the edges only weakly arcuate from the genae to the teeth; the reflexed, in-curving, posterior edges of the clypeus terminating above the anterior edges of the almost rectangular genae; anteriorly margined between the teeth, the margin smooth. Mandibles strongly tridentate, projecting well beyond anterior edges of clypeus. General surface of clypeus very slightly convex, sloping upward to a median, widely binodose basal prominence, closely, rather finely rugose-punctate throughout. Genae and head posterior to the median prominence finely rugose-punctate, becoming more discretely and moderately punctate basally between the eyes, a median smooth area near occiput. Pronotum 2/5 wider than long, angularly widest slightly behind the middle, sides almost straight before and behind the angles, margined except for a short distance along base toward the sides, base sinuate; dorsal area generally convex but with slightly concave lateral margins explanate posteriorly from about the middle; surface quite closely, moderately to coarsely punctate-rugose, the punctures gradually more discrete and larger toward base, a vague, median, longitudinal line indicated by slightly depressed, and closer punctures, punctures of explanate margins shallow, close, mixed, and indefinite. Scutellum margined laterally, the depressed lines inside the margin with very close, fine punctures, disc smooth otherwise except for the V-shaped line of fine punctures basally. Elytra 1/6 longer than wide, slightly constricted at basal fourth, punctures of discal areas including first two intervals and the germinate striae, coarse, deep, and about equal in size and depth, gradually finer and less distinct toward sides and apex, sides wrinkled behind the shoulders. Pygidium transversely, strongly convex over basal third, strongly concave over remainder; basal third with close, shallow, moderate, setigerous punctures, the setae quite long and coarse, concave portions with very fine, scattered setigerous punctures, the setae erect and similar but not nearly so dense. Underside, except for legs and middle area of abdominal segments, clothed with very close, fine, decumbent hair. Tarsi of front legs noticeably longer than the tibiae; tarsi of middle and hind legs approximately equal to length of tibiae.

Distribution: HOLOTYPE. ♀, USNM No. 66585, collected in S. W. Hidalgo Co., Texas, 20-IX-47, George B. Vogt, at light. One paratype in U.S.N.M., ♀, S. W. Hidalgo Co., Texas, 20-X-46, George B. Vogt, "On twig of tree felled 3 weeks ago in clearing. Head in a gnawed-out niche, ants present. *Prosopis julliflora* Swartz De Candolle."

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[1] Associate Curator, U. S. National Museum, Smithsonian Institution, Washington, D.C.

Remarks: The female of *Megasoma vogti* (the male is unknown) is most like that of *Megasoma thersites* LeConte. The elytra of the latter species, however, are quite hairy, the lateral margins of the pronotum are not so noticeably explanate posteriorly, and the head is quite different. The clypeus in *thersites* is much wider with the sides higher and more gradually reflexed, the disc flatter with the binodose basal prominence appearing more as a carina along the suture, and the genae are scarcely depressed below the level of the clypeus. In *vogti* the discal area of the clypeus is convex, the binodose prominence forming the edge of the swollen disc. The genae are placed on a lower plane and appear to emerge below the edge of the clypeus.

It gives me pleasure to name this species after its collector, Mr. George B. Vogt, friend, colleague, and a fine field entomologist.

Megasoma pachecoi Cartwright NEW SPECIES

(Figs. 1-3)

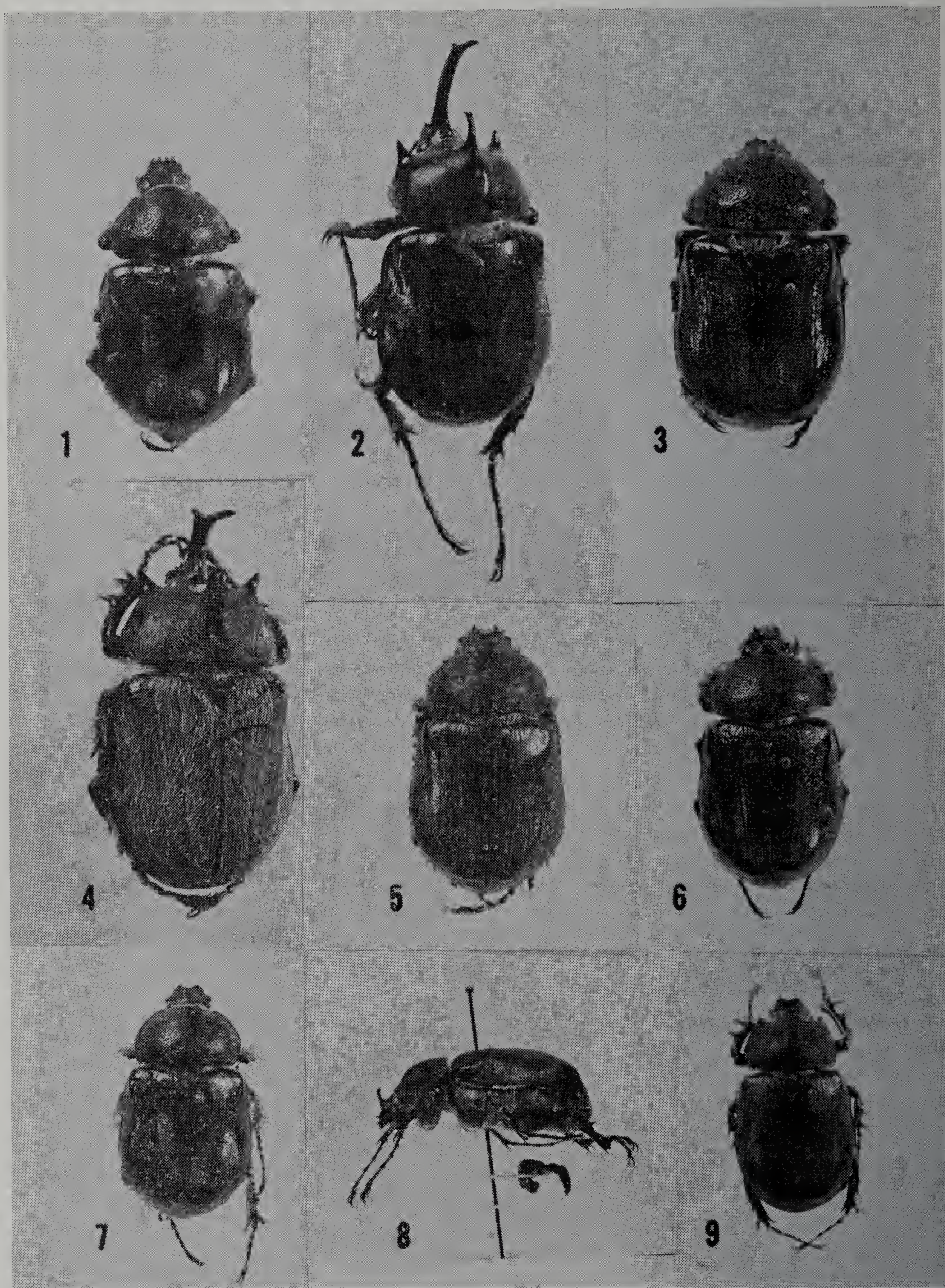
Holotype male.—Length (excluding cephalic horn), 40 mm., width, 23 mm. Shining, piceous, without pubescence on upper surface. Clypeus bidentate, the teeth erect, widely separated, the distance between them greater than the lateral edges to the genae; margined, the margin anteriorly flat to somewhat concave, the upper edges sharply cariniform, laterally rounded, convex; surface laterally concave behind the teeth and sloping quickly into a long, slightly recurved, bifurcate cephalic horn, the clypeal suture traceable up the horn to the bifurcation with the clypeal side dark red-black and a little wider than the black posterior cephalic half of the horn; horn 15 mm. in length, the terminal 3 mm. bifurcate with ends acuminate. Genae densely, finely punctate; base of horn and remainder of head finely punctate, the punctures generally separated by one or two diameters. Mandibles strongly tridentate and projecting in front of clypeus. Pronotum widest behind the middle with the sides straight forward and backward from the lateral angles; base and sides posteriorly with marginal bead, anteriorly the sides without bead and rounded upward into high, sharp, diverging horns near the anterior angles; anterior beading between the pronotal horns, wide, flat and smooth; base sinuate, posterior angles distinct; disc strongly convex with a strong, slender, very slightly bifurcate median horn, arcuate forward toward the cephalic horn; in line with and just inside the anterior lateral horns on each side, the surface is depressed in a deep fovea; except for a smooth midline spot back of the median horn, the surface sculpture is generally finely scabrous with very fine dense wrinkles and punctures, especially so laterally and posteriorly from the base of the median horn; the triangular area between the pronotal horns is slightly smoother. Scutellum densely, very minutely punctate. Elytra approximately 1/12 longer than wide, weakly constricted at basal third; costae only vaguely evident, surface very finely and densely scabrous with minute punctures and, in addition, scattered, larger, more discrete, fine punctures separated generally by six or seven times their diameters, only those outlining the sutural interval being larger and closer. Pygidium densely, minutely punctate with a few fine, decumbent hairs basally at the sides. Most of the underside, except for the legs and middle areas of the abdominal segments clothed with fine, decumbent hair. All tarsi noticeably long, longer than the tibiae.

Allotype female.—Length 36 mm., width 21 mm. Shining, piceous, lacking pubescence on upper surface. Clypeus bidentate, the well developed erect teeth widely separated by slightly more than the length of the strongly, gradually reflexed, quite strongly arcuate, lateral margins, the lateral margins ending noticeably above the anterior edge of the genae; edges of clypeus and teeth thin and sharp; clypeus more or less flat though weakly concave behind the anterior teeth and the thin, transversely compressed, sharply angled, median, posterior tubercle; surface of clypeus everywhere densely, rugosely punctuate with mixed moderately fine and minute punctures. Head and genae similarly punctate anteriorly, especially in the area back of the median tubercle, posteriorly becoming much more coarsely punctate, except for a median smooth area basally; mandibles tridentate, projecting well beyond anterior edge of clypeus. Pronotum almost twice as wide as long, widest slightly behind the middle, the sides almost straight before and behind the angles, base sinuate and without margin, lateral margin interrupted for a short distance midway between anterior and lateral angles; surface unevenly convex, coarsely punctate throughout with the punctures of midline and toward the anterior angles tending to coalesce in meandering lines, punctures more discrete over the disc, somewhat smaller and closer at extreme edges. Scutellum smooth. Elytra 1/8th longer than wide (21 x 24 mm.), slightly constricted at anterior fourth, discal punctures coarse but relatively shallow, separated by one to two diameters, gradually decreasing in size to fine punctures laterally and apically, costae evident but not well-defined, some transverse wrinkles laterally, especially near shoulder. Pygidium transversely convex over basal third, strongly concave over middle third, apically flattened; basal third closely, finely punctate with fine, decumbent hair basally toward sides, concave area rugulose transversely, flattened apical area longitudinally wrinkled. Underside except median area of abdominal segments and legs, clothed with close, coarse, decumbent hair, Middle tibiae relatively slender at apical third, about 1/6 wider at basal third. All tarsi quite long, with those of middle legs approximately 1/8 longer than the tibiae.

Distribution: HOLOTYPE ♂, U.S.N.M. No. 66586, Cd. Obregon, Sonora, México, 18-20, IX, 1959 at light. Wm. W. Gibson. ALLOTYPE ♀, Cd. Obregon, Sonora, México, 21-IX-1959 at light. Wm. W. Gibson. PARATYPES: 12 ♂♂. 53 ♀♀, Ciudad Obregon, Sonora, México, mostly at light, by Dr. Wm. W. Gibson, 16 to 30, September, 1959; 6 ♂♂, 6 ♀♀ from the same locality, September 1960, by Dr. Gibson (in Howden collection); 1 ♂, 9 ♀♀, from the same locality, 20 to 24 September 1959, by J. A. Sifuentes; 3 ♂♂, same locality, 19, 30 August 1956, circa luz, F. Pacheco M.; 2 ♂♂, 1 ♀, same locality, Sept. 5, 6, 1957, at light, by A. W. Vasquez (in Vasquez collection).—1 ♂, Valle del Yaqui, Sonora, México, Block 306, 10-IX-55, F. Pacheo M., circa luz; 1 ♂, same locality, Block 910, 21-IX-57, F. Orozco, en habitacion; 1 ♀, same locality, Block 910, 22-VIII-57, en habitacion, R. Garza S.—1 ♂, 1 ♀, Esperanza, Sonora. 4.IX.55, A. Zazueta N., circa luz; 1 ♂, same locality, circa luz, A. Zazueta N.—4 ♂♂, Novagoa, Sonora, México, Sept. 5, 1957, A. W. Vasquez (in Vasquez collection).—3 ♂♂, 35 mi. N. of Los Mochis, Sinaloa, México, 23.IX.59 at light, local resident.

Nearly 400 specimens collected by day near Tezopaco, 60 km. E. of Ciudad Obregon were lost in a fire which destroyed Dr. Gibson's collection.

Remarks: Males vary from 33 to 40 mm. excluding the cephalic horn, 35 to 48 mm. including the horn, and 19 to 24 mm. in width. Females vary from 29 to 37 mm. in length and 16 to 21 mm. in width. A few of the males approach the males of *M. punctulatus* in surface sculpture but they are more minutely, finely and discretely punctate. Most specimens present a smooth appearance with the elytra longer and the costae less distinct than in *punctulatus,* not traceable by lines of coarser punctures. All tarsi are much longer than the tibiae. The females differ from females of *punctulatus* in having the pygidium pubescent only narrowly at the base, the elytra proportionately longer and more noticeably shining, the cephalic tubercle more acuminate, the genae lower, emerging under the ends of the clypeal margin, the lateral clypeal margin reflexed higher and extending back farther, the extreme sides of the pronotum more evenly rounded, the



FIGURES 1-3. *Megasoma pachecoi,* n. sp. 1—♀. 2—♂. 3—♀ allotype.
FIGURES 4-5. *Megasoma thersites* LeConte. 4—♂. 5—♀.
FIGURE 6. *Megasoma vogti,* n. sp. 6—♀ holotype.
FIGURES 7-9. *Megasoma punctulatus* Cartwright. 7—♀. 8—♂. 9—♂.

middle tarsi relatively longer than their tibiae, and the middle tibiae noticeably much narrower at apical than at basal third. In *punctulatus* the middle tibiae are very little narrower at the apical third than at basal third.

I am very pleased to concur with Dr. Gibson's wish and name this species after Prof. Francisco Pacheco M., presently at the Colegio de Post-Graduados, Chapingo, México.

Key to Thersites Group of Megasoma

1. Upper surface of males clothed with noticeable, yellowish, recumbent hair; females with hair much less noticeable but evident at sides and apices of elytra; Baja California (Figs. 4-5) ---------- THERSITES LeConte

   Upper surface without hair ---------- 2

2. Female with clypeus convex and swollen, basally with widely binodose edge; pygidium with erect hair throughout; male unknown; Texas (Fig. 6) ---------- VOGTI new species

   Females with clypeus flat, not convex and swollen, the base with single tubercle; pygidium largely hairless, at most with a very few, sparse, erect hairs over apical half ---------- 3

3. Males with upper surface dull, finely, densely punctulate or scabriculate, pygidium with recumbent hair throughout (worn specimens excepted); female genae quadrate, noticeably angulate externally, and anteriorly meeting clypeus at approximately same level; Arizona (Figs. 7-9) ---------- PUNCTULATUS Cartwright

   Male with upper surface shining, at most minutely punctulate or alutaceous, pygidium with hair only at base; female genae triangular, not angulate externally, and anteriorly meeting clypeus at a lower level under the high, thin, recurved edge of the clypeus; Mexico (Figs. 1-3) ---------- PACHECOI new species

NOTICE

A RARITY, SPHENOPHORUS SCHWARZII CHTTN., REDISCOVERED (COLEOPTERA: CURCULIONIDAE)

By ROSE ELLA WARNER[1]

A male beetle was collected by Dr. E. A. Schwarz on May 29, 1891 and was described by F. H. Chittenden as *Sphenophorus schwarzii* 30 years later (Proc. Ent. Soc. Washington 1924, 26(6):145, p. 5, fig. 1). Now, after 71 years, another specimen has been found.

The finding of the second specimen of this beetle has already made history in the newspaper *The Virginian-Pilot,* Norfolk, Virginia (Tuesday, July 17, 1962) under the following headline, "Curator turns up rare bug." Roger Rageot, Curator, Natural History Section, Norfolk Museum, Norfolk, Virginia, said he found the beetle June 3, 1962, on a cattail plant, at the edge of a duck blind off Knotts Island, Currituck Co., North Carolina. The plant was growing a few feet from the water in a place that would be submerged at high tide.

On June 25 Ashley B. Gurney of this Division visited Mr. Rageot in Norfolk, and the latter gave him some miscellaneous specimens for identification. The weevils were referred to me. Among the assortment was a *Sphenophorus* in perfect condition. It was quite different from the usual North American *Sphenophorus,* and I began to doubt the collector's locality. The specimen proved to be *schwarzii.*

The following account extracted from "Two Old Coleopterists" (D. H. Blake, Coleop. Bull., 1951, 5(4 & 5); and 1952, 6(1, 2 & 3) adds enthusiam to this biological discovery:

"Dr. Schwarz, dean of Washington entomologists, would have nothing to do with the Doctor [Chittenden] and would not even name a beetle for him. . . . He [Chittenden] plainly regretted the loss of Dr. Schwarz' friendship. . . . A month earlier I [Mrs. Blake] said to Dr. Chittenden, 'We ought to do something for Dr. Schwarz on his birthday next month.' . . . The Doctor's next move was to write a paper in which he described a new species of *Sphenophorus* that he named *Sphenophorus schwarzi,* and, on Schwarz' birthday [80th], he sent me over to the Museum with the type specimen as well as the manuscript and a beautiful ink drawing of the beetle. . . . I handed him the box with the *Sphenophorus schwarzi* and he opened it eagerly. 'Oh I remember thaat thing, I remember it. I am glad to see it again, I am that.' He related how he himself had collected it at Fort Monroe, Virginia, at the flood of spring migrations, when things were washed up. He wondered if it was not a tropical species. He pored over the beetle, the manuscript, and the illustrations and said, 'That is a fine paper, a very fine paper.' " It was a festive birthday.

Vaurie (Bull. American Mus. Nat. Hist., 1951, 98:178) writes the following discussion of the weevil. "This beautiful and striking species, of which only the type is known in this country, is undoubtedly an im-

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portation, though from what part of the world is uncertain. A worn specimen of Dupont's (about 1840), with an unpublished manuscript name in his handwriting, was found in the collection of the British Museum with the label 'Ind or ?,' which might mean India, or even Indies, East or West. Except for the somewhat rubbed pronotum and the dirty condition of the white coating, this specimen agrees with the type of *schwarzii*."

Chittenden's discussion following the description of the species says, ". . . not closely related to any form but is allied to *aequalis,* because of the nature of the external coating and the tarsal structure, the brush of the extremely wide third tarsal joint being widely separated medially. It differs noticeably in the slender nearly straight rostrum, flat pronotum with declivous sides and strongly villous lower surface, and the strongly fimbriate legs. This beautiful species is so distinct from all the others of the genus known to the writer as nearly to warrant the erection of a new genus for its reception."

The finding of the second specimen, a female, has made me wonder if it is an immigrant, a tropical species washed in from the Indies during the high spring tides. Two specimens, though, are hardly enough to confirm the origin; therefore, additional collecting is being planned for the coming spring.

Sexual dimorphism is pronounced and exhibited as follows: MALE: Smaller and more slender. Length, 12 mm.; width, 4.5 mm.; length of rostrum, 3.6 mm. Pronotum, length, 4.6 mm.; width, 3.8 mm.; disc flat, opaque black, middle vitta a fine line extending from apex to base, lateral vitta black, raised, polished, of nearly uniform width, enclosing with side margin an elongate, flat, strongly declivous black area. Lower surface strongly villose, each puncture with a long yellow seta; first and second abdominal sterna concave, pygidium obtuse. FEMALE: Larger, not slender. Length, 17 mm.; width, 5.9 mm.; length of rostrum, 4.2 mm. Pronotum, length, 6.0 mm.; width 5.0 mm., disc flat, middle vitta wider, stronger, lateral vittae wider, raised, polished, the declivous space between lateral vitta and side margin narrower. Lower surface less villose, sterna convex, pygidium conical, 5th sternum longer.

The specimen from Knotts Island has been generously given to the U. S. National Museum.

BOOK NOTICE

THE CICINDELIDAE OF CANADA, by J. B. Wallis. University of Toronto Press, 74 pp., 4 colored plates, 1961, $5.00—This little book is certainly a valuable guide to the tiger beetles of Canada and northern United States. The author has spent a lifetime studying these interesting beetles in the field and laboratory. Although this book is, and is meant to be, an elementary treatment of the family, there are many data included which are new to the literature. As such, it serves to extend our knowledge of the group as well as to provide a working tool. The author and the publishers both are to be congratulated for this effort, modestly priced. We can hope that further volumes of a similar nature will soon appear.

CURRENT RESEARCH PROGRAMS

These announcements of research underway on beetles are not meant to be requests for specimens or information unless stated to the contrary; a letter to the researcher will determine whether or not specimens or information are wanted. All research workers are invited to send notices of research in progress to the Editor.

CARABIDAE: Revision of *Ceroglossus,* by Carl Farr Moxey, 414 Woodland Ave., Wayne, Penn. Specimens needed for study.

CARABIDAE: Taxonomic study of subgenus *Scaphinotus,* subgenus *Cyobius,* and genus *Evarthrus.* Preliminary preparations are underway for a study of the Carabidae of Mexico. George E. Ball, Dept. of Entomology, Univ. of Alberta, Edmonton, Alberta.

CHRYSOMELIDAE: Revision of *Diabrotica, Acalymma,* and related genera, by Ray F. Smith, Dept. of Entomology and Parasitology, 112 Agriculture Hall, Univ. of California, Berkeley 4, Calif. Central and South American specimens needed for study.

CICINDELIDAE: A study of the *Cicindela oregona—duodecimguttata* species complex, by R. Freitag, Dept. of Entomology, Univ. of Alberta, Edmonton, Alberta.

CURCULIONIDAE: Revision of *Rynchophorus* of world, by A. Wattanapongsiri, Dept. of Entomology, Univ. of Kansas, Lawrence, Kansas. Specimens needed for study.

CURCULIONIDAE: Revision of *Thysanocnemis* and *Eudiagogus,* by Rose Ella Warner, U. S. National Museum, Washington 25, D. C.

CURCULIONIDAE: Revision of *Metamasius,* by Patricia Vaurie, American Museum of Natural History, Central Park West at 79th St., New York 24, N. Y.

CURCULIONIDAE: Biology of acorn weevil, by L. P. Gibson, Ohio State Forest Laboratory, Delaware, Ohio.

CURCULIONIDAE: Revision of *Pandeleteius* and *Pandeleteinus,* by Ann T. Howden, 23 Trillium Way, Ottawa 5, Ontario. Loan of specimens appreciated.

OEDEMERIDAE: World revision of the family underway, by R. H. Arnett, Jr., and J. P. Macnamara, S.J., Catholic Univ. of America, Washington 17, D. C. Particularly need Asian and African material.

OSTOMIDAE: Revision of Ostomidae of North America, by John Barron, Dept. of Entomology, Univ. of Alberta, Edmonton, Alberta.

PHENGODIDAE: Biology of *Zarhipis integripennis,* by Darwin Tiemann, P. O. Box 5757, China Lake, Calif.

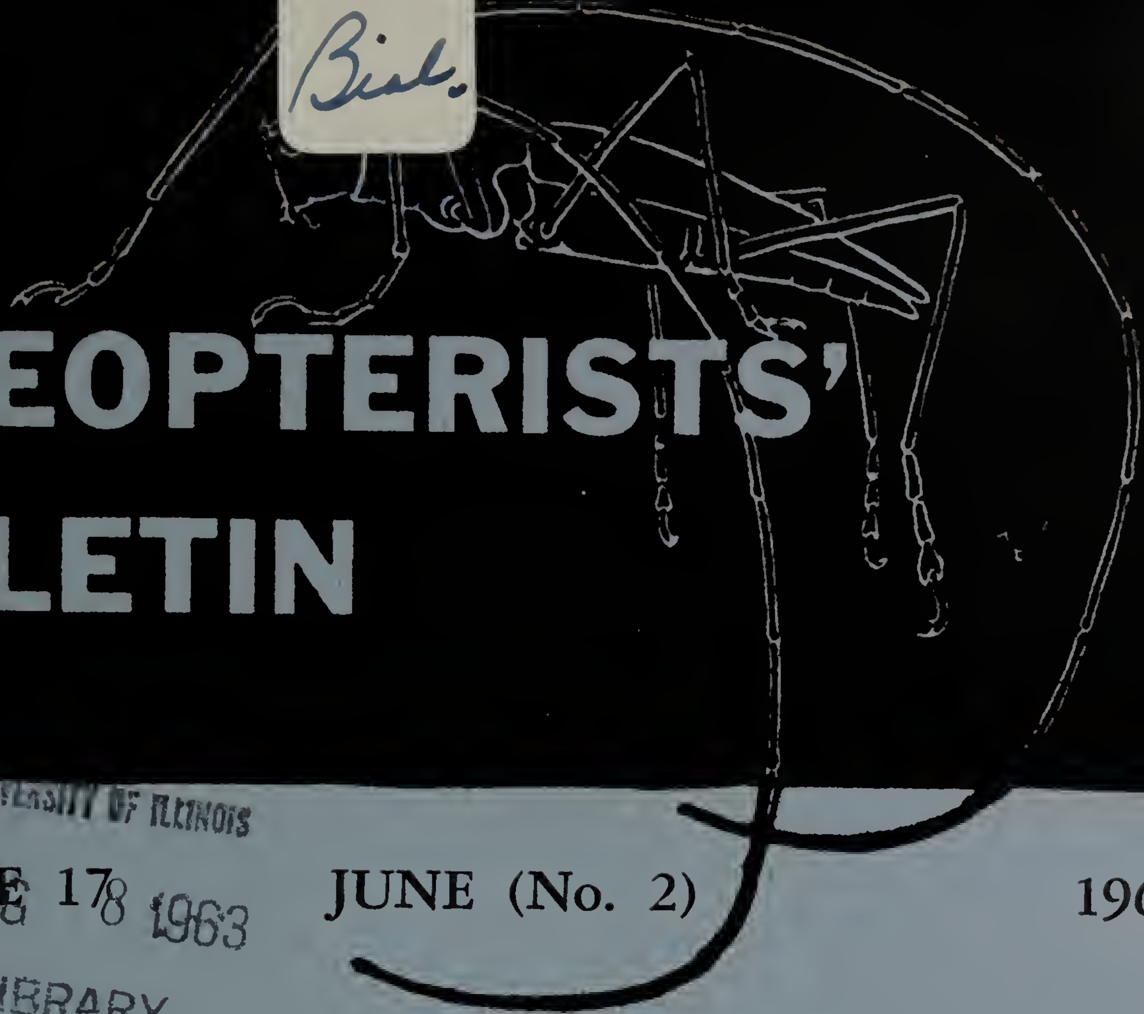
SCOLYTIDAE: Olfactory and gustatory perception in bark beetles, by J. W. Peacock, Ohio State Forest Laboratory, Delaware, Ohio.

NOTICE

Entomologists who wish to learn what is being done in any field of publicly supported or nationally financed research may call upon the *Science Information Exchange,* which is administratively controlled by the *Smithsonian Institution* and located at *1825 Connecticut Ave., NW, Washington 9, D. C.*

Scientists working under governmental agency grants usually deposit abstracts of their projects with the *Exchange.* A scientist may also register a project with the *Exchange* on a voluntary basis. Any scientist associated with a recognized research organization may ask the *Exchange* for names of scientists working in a specific field. The *Exchange* will, when possible, supply copies of summaries of all related research registered. This service facilitates communication among granting agencies and investigators. It also reduces the probability of duplicating work in progress. Some 36,000 active research projects in fields of biology and medicine, which are on file with the *Exchange,* are classified in 8,000 different categories.

THE COLEOPTERISTS' BULLETIN



VOLUME 17 JUNE (No. 2) 1963

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted
to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

Subscriptions: The subscription price for each annual volume of four numbers is $5.00 payable in advance. All subscriptions begin with the first issue of the year and those subscribing later in the year will receive the back issues of the volume.

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Any article, note, or news items likely to be of interest to readers of the **Bulletin** will be considered. Articles with illustrations are particularly desired, and *in all cases, descriptions of new species must be illustrated.* Descriptions of new species or genera MUST contain keys or be correlated with existing keys.

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 17 June (No. 2) 1963

NEW SPECIES AND NEW SYNONYMY IN PYROTA DEJEAN (COLEOPTERA: MELOIDAE)[1]

By RICHARD B. SELANDER[2]

It is necessary to introduce some systematic innovations at this time in order to establish valid names for four species of *Pyrota* involved in an ethological study now ready for publication. Additional information regarding the geographic distribution, variation, and bionomics of the species treated in the present paper will be given in a forthcoming revision of the genus, which will also contain appropriate acknowledgment of the individuals and institutions from which study material was obtained.

Pyrota deceptiva Selander, NEW SPECIES

Medium orange; elytra usually paler than head and pronotum, varying to orange or orange-yellow, never ivory or cream colored. Head almost invariably with occiput black, usually with a pair of black spots on front between eyes, often with black markings on vertex. Antennae with first two segments largely or entirely black. At least last two segments of maxillary palpi black. Pronotum with a pair of black spots on disk (these usually large, often fused with each other), frequently with a small spot on each side at anterior corner. Elytral color pattern trifasciate, as in *P. concinna* but with median spot on each elytron invariably separated from the basal black area and from the apical black spot by a distance less than its own length. Ventral surface with black markings of the same general pattern as in *P. concinna* but individuals almost always more heavily marked with black than those of the population of *P. concinna* in eastern Texas (see below). Coxae variably marked with black. Trochanters orange. Femora and tibiae orange tipped with black at apex, or (more commonly) with femora largely black and tibiae entirely black. Clothing setae colorless except on black areas of appendages, where they are black. Length: 10-20 mm.

Head moderately triangular; tempora well marked; integument shiny, smooth, sparsely micropunctate, finely, moderately densely punctate, each puncture with a short, erect seta. Antennae slender, weakly tapered, slightly more than twice as long as fore tibia, with segments less filiform and less elongate than in *P. concinna* (as in *P. palpalis*). Eyes large. Labrum evenly punctate and setate, transverse, distinctly bilobed, strongly rounded laterally, moderately emarginate anteriorly. Maxillae with galea obliquely subtruncate laterodistally. Labium with third segment relatively small, weakly expanded, no larger than second. Pronotum averaging nearly four-fifths as wide as long, concavely depressed on anterior half; integument as on vertex except that it is much more sparsely and more irregularly punctate throughout; disk not wrinkled; sides subparallel from base to anterior third, then weakly convergent. Elytra moderately shiny, distinctly microgranulate on posterior two-thirds, the granulations visible under high magnification; integument weakly rugose apically, finely,

[1] This study was supported by a grant (G-8698) from the National Science Foundation.

[2] Department of Entomology, University of Illinois, Urbana, Ill.

deeply, densely punctate, essentially glabrous; punctures well defined; setal punctures much larger than others; costulae well marked, complete. Ventral surface, especially of thorax, much more densely punctate and setate than in *P. concinna,* the setae relatively long and conspicuous (much as in *P. palpalis*). Outer hind tibial spur greatly thickened and obliquely truncate, its truncature oval in outline, with a definite apex, two to three times as wide as inner spur, which is somewhat thickened; spurs well separated apically. Tarsal pads well developed; first segment of hind tarsi with pale ventral setae limited to apex.

Male. Antennae (Fig. 9) with segment I one-tenth to one-fourth longer than frontal interocular distance, with posterior apical margin attaining posterior third of eye, considerably longer than in female, much more strongly expanded and heavier than in *P. concinna,* with apical setae much elongated, forming a sparse brush; ventral surface of segments with edge very poorly if at all defined; III as long as or slightly longer than IV, strongly bowed posteriad; IV straight; X only two-thirds as long as III, about half as wide as long. Maxillary palpi (Fig. 6) with last segment enlarged, pyriform, as in *P. concinna,* two-thirds as long as frontal interocular distance. Fore tarsi moderately, symmetrically expanded. Sixth abdominal sternum broadly, shallowly emarginate; membranous area broad, not attaining middle of sternum, less extensive and more nearly vertical than in *P. palpalis* (as in *P. concinna*). Pygidium feebly emarginate or entire. Genitalia (Fig. 1) with gonostyli each expanded apically to form a definite "foot" with a concave lateral face, more strongly curved dorsad than in *P. concinna;* the gonostyli are very similar to those of *P. palpalis* but have the "foot" more strongly defined and its lateral face more deeply concave than in that species; aedeagus with only one ventral hook (vestige of a second, subapical hook occasionally present).

Female. Antennae less compressed; segment I nine-tenths as long as frontal interocular distance; III distinctly bowed, slightly longer than IV. Maxillary palpi with last segment a little more slender than in *P. concinna.* Sixth abdominal sternum with a wide, deep, U-shaped emargination. Pygidium as in male.

Geographic Distribution. Nuevo León and eastern Texas (primarily on the Coastal Plain) northward to Oklahoma.

Type. Holotype, male, from San Antonio, Loop 13, Texas, September 30, 1953, electric light, B. J. Adelson, in the collection of the University of California at Berkeley.

Locality Records. A total of 299 specimens has been studied, from the following localities: OKLAHOMA: Cotton County, Stillwater, and Woodward. TEXAS: Alvin, Austin, Brownwood, Cisco, College Station, Columbus, Comal County, Corpus Christi, Cypress Mills, Dallas, Dimmit County, Donna, Eastland County, Esperanza Ranch (Brownsville), Fedor, Floresville, Fort Sam Houston, 5 mi. south of George West, Hidalgo County, Kerrville, Kingsville, Leon County, Leon Creek, Marlin, Medina Lake, Mountain Home, 11 mi. northwest of Mountain Home, New Braunfels, Orange, Pearsall, Plano, Round Mountain, San Antonio, Spur, 6 mi. south of Stephensville, Taylor, Victoria, Wasco, Weatherford, and Weslaco. NUEVO LEÓN (MÉXICO): Apodaca, El Diente [near Monterrey], 14 mi. north of Linares, and Monterrey.

Discussion. This species has been well represented in collections for many years but until now has been confused with *P. mylabrina* Chevrolat, *P. concinna* Casey, and *P. palpalis* Champion. It closely resembles *P. palpalis* in characters of the antennae, ventral setation, and male genitalia but is more similar to *P. concinna* in characters of color, the pygidium (not deeply notched), and the male sixth abdominal sternum. It is not likely to be mistaken for *P. palpalis* in the future because it can be shown to be allopatric with that species. It has, however, a sympatric relationship with

P. concinna; furthermore, the two species have been taken frequently in mixed series on Compositae or at lights. Of the differences between *P. deceptiva* and *P. concinna* noted in the above description, the most easily used for identification are those of antennal segment I, the male genitalia, and the color pattern. The relative length of antennal segment I is much greater in *P. deceptiva* than in *P. concinna.* Interspecific differences in the male genitalia, involving primarily the gonostyli, are best appreciated by comparison of figures 1 and 2. *Pyrota deceptiva* is, in general, more heavily marked with black than is the population of *P. concinna* with which it is sympatric. In eastern Texas, 144 of 146 specimens of *P. concinna* have the metasternum either immaculate orange or with only a small black spot on each side near the anterior margin. In *P. deceptiva,* only 1 of 205 specimens is so lightly marked ($P = < .005$), the rest of the specimens having additional black areas posteriorly, which in most cases are fused with the anterior marks, so that most of the metasternal surface is black.

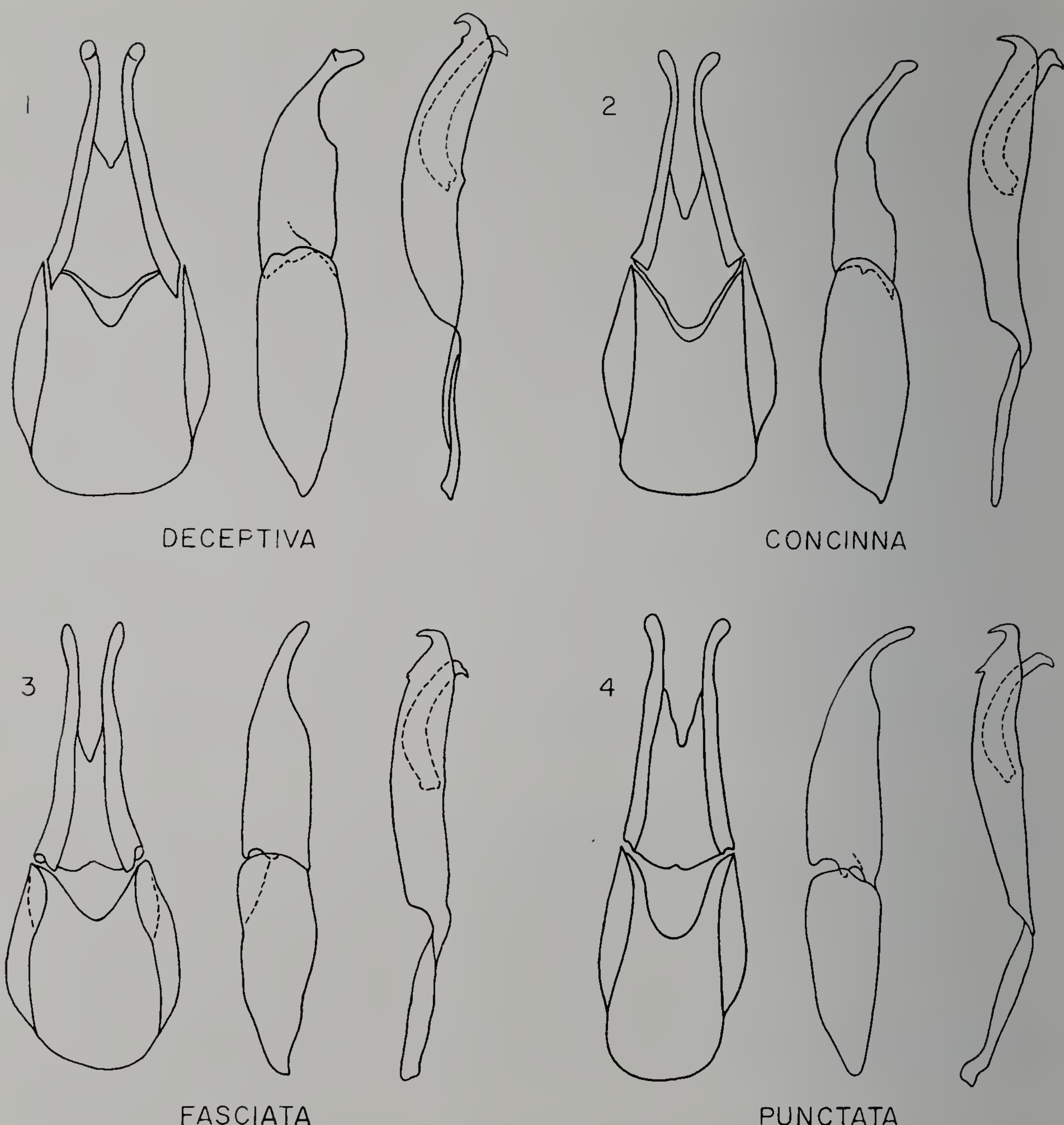
In Dillon's (1952) key to the species of *Pyrota* in Texas, *P. deceptiva* will run to couplet 8. In this couplet the description of the elytral surface given for *P. palpalis* actually applies to *P. concinna* and *vice versa.* Proper identification of specimens of the three species is possible if couplet 8 is modified as follows:

8. Elytra with surface scarcely alutaceous (microgranulate), even apically; pygidium deeply emarginate medianly. Western Texas -------------------- PALPALIS Champion
   Elytra with surface densely, minutely alutaceous (microgranulate); pygidium feebly emarginate or entire -- 8a

8a. Antennal segment I longer than frontal interocular distance in male, nine-tenths as long in female; male genitalia as in figure 1 [of present paper]. Central and eastern Texas -- DECEPTIVA new species
   Antennal segment I at most nine-tenths as long as frontal interocular distance in male, four-fifths as long in female; male genitalia as in figure 2 [of present paper]. Statewide -- CONCINNA Casey

It is evident that the species of *Pyrota* recorded from Monterrey, Nuevo León, by Champion (1891-1893), first as *P. terminata* LeConte and then as a variety of *P. palpalis,* is actually either *P. deceptiva* or *P. concinna.* Both Denier (1934) and Vaurie (1950) cited this record, using the name *P. palpalis.* As was ultimately recognized by Champion, the species involved is definitely not *P. terminata,* and his descriptive notes as well as distributional information now available make it clear that it is not *P. palpalis.* Although *P. concinna* probably ranges into Nuevo León, I have seen no specimens from that state. On the other hand, *P. deceptiva* is recorded above from several localities in Nuevo León, including Monterrey. It therefore appears likely that Champion's record of *P. palpalis* from Monterrey was based on a misidentification of *P. deceptiva.* In Texas, specimens recorded as *P. palpalis* by Dillon (1952) from Brownwood, College Station (part), Corpus Christi, Dallas, Marlin, Taylor, and Victoria are assignable to *P. deceptiva,* as are the specimens recorded as *P. concinna* by him from Weslaco, Texas.

The activity period of adults of *P. deceptiva* is known to extend from April 30 to November 18, but most of the records are in September and October. Food plants, all Compositae, include *Baccharis, Eupatorium,* and *Grindelia squarrosa.*



FIGURES 1-4. *Pyrota* species, as labeled. Male genitalia, showing for each species, from left to right, ventral and lateral views of gonoforceps and lateral view of aedeagus.

Pyrota fasciata Selander, NEW SPECIES

Medium orange; elytra not paler than rest of body. Head immaculate. Antennae black with first, or first two, segments often orange or fuscous. At least last two segments of maxillary palpi black; labial palpi fuscous. Pronotum with a pair of small to moderate-sized, round black spots on disk. Elytra with a fasciate pattern of black spots; scutellar and humeral spots on each elytron well separated from each other; scutellar spot well rounded, usually shorter than humeral spot; humeral spot narrow, dashlike, occasionally obsolescent; median spot subquadrate or transverse in form, usually separated from basal spots and apical spot by a distance greater than its own length, occasionally separated by a distance as great as or slightly less than its own length, well separated from sutural margin and even more widely separated from lateral margin, irregular in outline, with anterior margin usually notched and posterior margin often so, the constriction formed by these notches rarely completely dividing the spot; apical spot separated from margin (absent in one specimen), regularly lunate in form, relatively smaller than in any other species of *Pyrota* except *P. punctata*. Ventral surface relatively lightly marked with black; at the lightly marked extreme, mesepisternum with a black spot on dorsal angle, metepisternum black along dorsal half, metasternum with a black spot on each side near posterior margin, and first three abdominal sterna with a black spot on each side; at the heavily marked extreme, thoracic black markings enlarged, metasternum with a black spot on each side near anterior margin, anterior half of first four abdominal sterna black, and fifth sternum with a pair of black spots. Fore and middle coxae each with a black spot laterally; hind coxae largely black. Trochanters orange. Femora and tibiae cleanly tipped with black. Tarsi black. Clothing setae black on black areas of appendages and along lateral edge of fore and middle tibiae, colorless elsewhere. Length: 10-21 mm. (commonly less than 15 mm.).

Differs structurally from *P. punctata* as follows.

Elytra dull, strongly microgranulate except at base (where granulation is feeble), more rugose than in *P. punctata,* finely, deeply, densely punctate. Ventral surface feebly microreticulate, at least on thorax; thorax very finely, moderately densely punctate and setate, as in *P. mylabrina;* abdomen sparsely punctate and setate.

Male. Antennae with ventral edge on segments III and IV only; edge poorly defined, not sparsely punctate. Maxillary palpi (Fig. 7) with fourth segment of a distinctive shape and with ventral membranous area widely separated from posterior margin. Genitalia (Fig. 3) with gonostyli weakly expanded apically, weakly curved dorsad, relatively heavy; aedeagus with subapical ventral hook obsolescent.

Geographic Distribution. Southern and eastern New Mexico southeastward to the Coastal Plain of southern Texas and northern Nuevo León.

Type. Holotype, male, from Quemado, Texas, August 8, 1959, R. B. Selander and J. C. Schaffner, in the Chicago Natural History Museum.

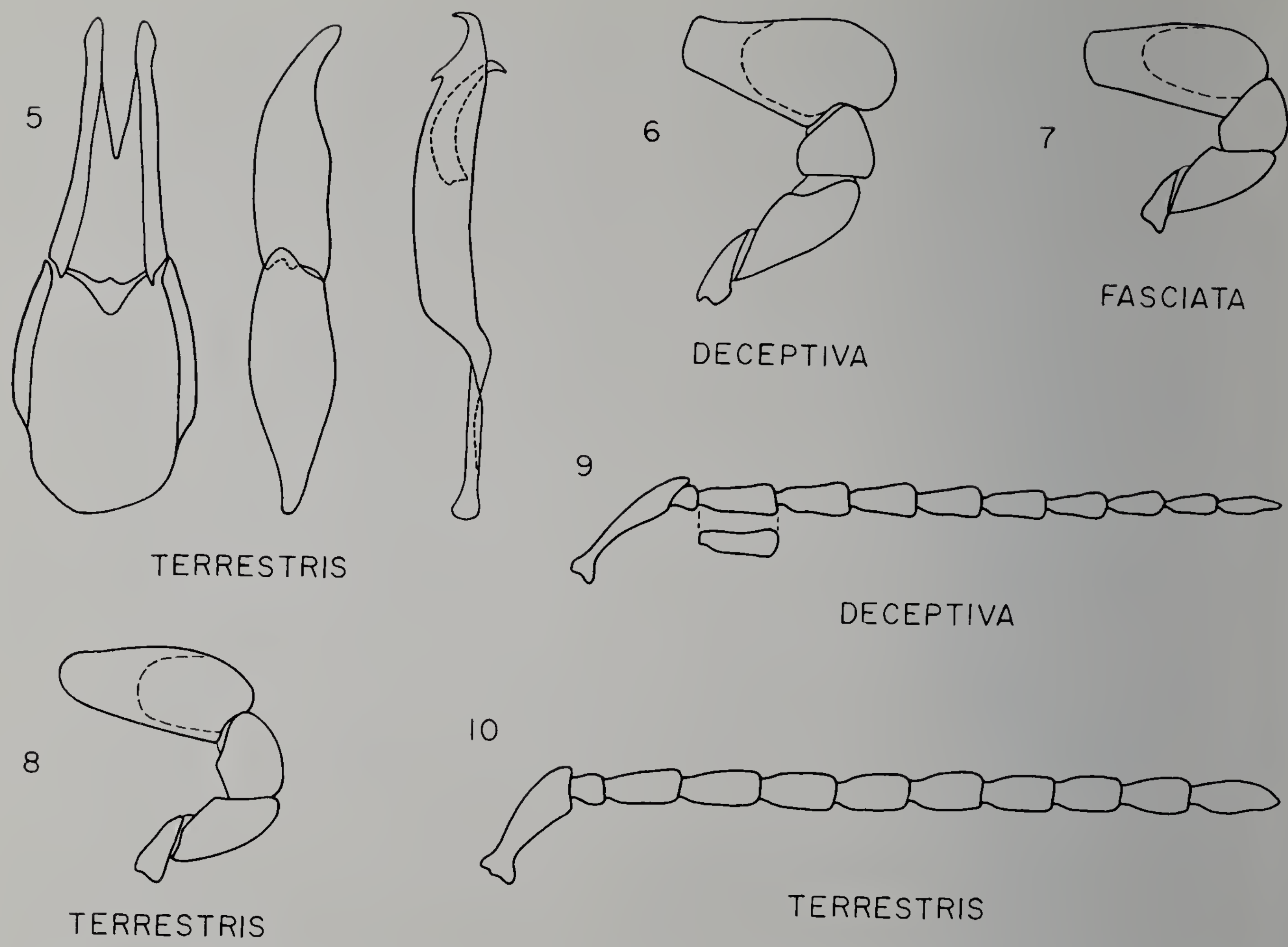
Locality Records. I have examined 101 specimens of this species, from the following localities: NEW MEXICO: 15 mi. west of Lordsburg, Orogrande, and Tucumcari. TEXAS: Abilene, Billings, Cotulla, 9 mi. south of Dell City, Del Rio, Dimmit County, Edinburg, El Paso, Fabens, Hidalgo County, Kingsville, Laredo, Maverick County, Nueces River (in Zavalla County), between Pecos River and Guadeloupe [= Guadalupe] Mountains, 20 mi. west of Del Rio (Pinto Creek), Quemado, San Angelo, Uvalde, and Van Horn. NUEVO LEÓN (MÉXICO): Apodaca, Pesquería, Sabinas Hidalgo, Vallecillo, and Villa de Santiago.

Discussion. This species replaces its closest relative, *P. punctata* Casey, in central and southern Texas and on the Coastal Plain of northeastern México and is, in turn, replaced by that species on the northern end of the Mexican Plateau. In extreme western Texas and in New Mexico the ranges of the two species overlap.

Pyrota fasciata will run to *P. punctata* in Dillon's (1952) key. The two species are readily separated from all other trifasciate species of the genus in having the apical black spot on each elytron clearly separated from the elytral margin. With regard to characters of color, *P. fasciata* is easily distinguished from *P. punctata* by the absence of a black spot on the occiput and by the fact that the elytra are of the same shade of orange as the rest of the body, rather than paler. The structural differences indicated in the description above are for the most part rather subtle but are constant. Interspecific male genitalic differences are shown in figures 3 and 4.

The specimens recorded as *P. punctata* by Dillon (1952) from Cotulla, Dimmit County, Kingsville, and San Angelo, Texas, are assignable to *P. fasciata.*

Adults have been collected from March 17 to September 1. They are strongly nocturnal and have been collected at lights on several occasions. Their feeding habits are unknown.



FIGURES 5-10. *Pyrota* species, as labeled. 5—Male genitalia (parts and views as in figures 1-4). 6-8—Right maxillary palpus of male, dorsal view, with extent of ventral membranous area shown by broken line. 9-10—Right antenna of male.

Pyrota terrestris Selander, NEW SPECIES

Dark orange; elytra not paler than head and pronotum. Head immaculate. Antennae, labrum, and palpi black. Pronotum usually with a pair of small round black spots on disk, these sometimes faintly indicated or (in three specimens) lacking. Elytra with a fasciate pattern of black spots, as shown in figure 11; basal spots on each elytron distinctly separated from each other; scutellar spot rounded; humeral spot narrow, dashlike, usually longer than scutellar spot; median spot large, half as long as elytron or longer, nearly or actually fused along it lateral margin with humeral or apical spot, or with both spots, in 34 (49 percent) of specimens examined, well separated from sutural margin and even more widely separated from lateral margin, with its anterior margin roughly transverse and posterior margin strongly oblique; apical spot reaching margin, heavy, lunate in form. Prosternum and mesosternum orange, the latter often with a median black spot; ventral surface otherwise black except that some thoracic sclerites are very finely margined with orange and there is often a median orange area on male sixth abdominal sternum. Coxae and trochanters largely or entirely fuscous or black. Femora, tibiae, and tarsi black (anterior surface of femora fuscous or orange basally in one specimen). Clothing setae very fine, inconspicuous, colorless except on appendages, where they are black. Length: 6½-15 mm.

Head rather strongly triangular; tempora well marked; integument very shiny, smooth, sparsely micropunctate, very finely, very sparsely punctate, each puncture with a short seta. Eyes small. Antennae moderately slender, barely tapered, two (female) to two and one-fifth (male) times as long as fore tibia; segments moderately elongate, filiform, compressed. Labrum transverse, moderately rounded at sides, entire anteriorly. Maxillae with laterodistal margin of galea prominently angulate. Labium with third segment no wider than second segment, parallel-sided. Pronotum four-fifths to nine-tenths as wide as long, concavely depressed on anterior half;

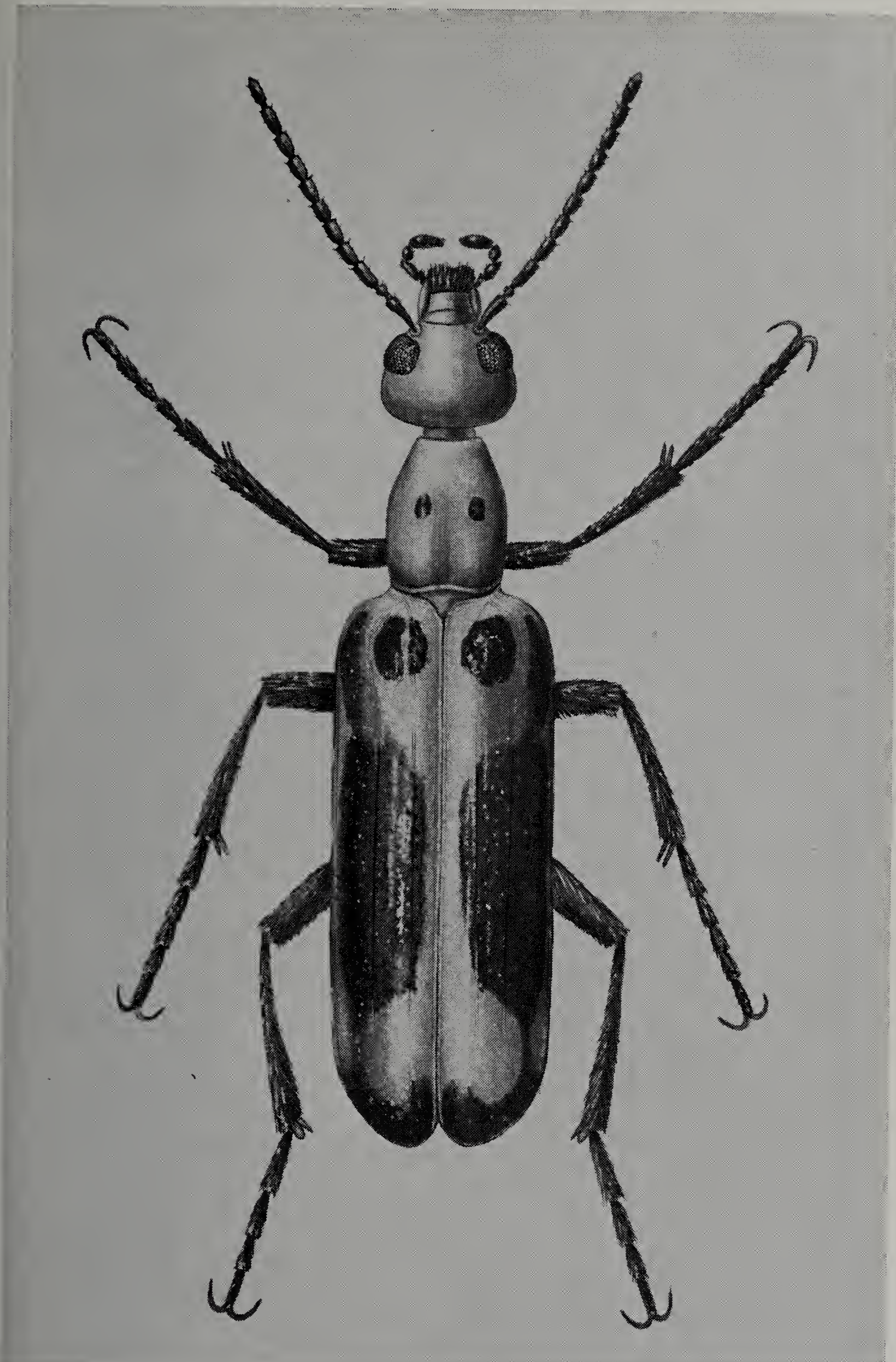


FIGURE 11. *Pyrota terrestris*, male. (Ink wash by Mrs. T. A. Prickett.)

integument as on vertex; disk not wrinkled; sides subparallel from base to anterior third, then weakly convergent. Elytra as shiny as head and pronotum, smooth, obsolescently rugose, minutely, sparsely punctate, with scattered setal punctures which are several times the diameter of the other punctures; costulae weakly marked. Ventral surface very shiny, very feebly microreticulate, minutely, very sparsely punctate and setate. Outer hind tibial spur greatly thickened and obliquely truncate, its truncature oval in outline, without a definite apex; inner spur unusually thick, obliquely truncate, its truncature more narrowly oval, more than half as wide as that of outer spur, usually pointed at apex; outer and inner spurs with truncatures not contiguous. Tarsal pads poorly developed except on male fore legs; first segment of middle and hind tarsi lacking ventral pale setae.

Male. Antennae (Fig. 10) with segment I seven-tenths to four-fifths as long as frontal interocular distance, with posterior apical margin just attaining middle of eye, slightly thicker than in female, curved, with apical setae not forming a brush; ventral surface of segments IV to VII with a well-defined, glabrous edge; III with a less well-defined edge; VII and IX often with a weak edge; III about two-thirds as long as frontal interocular distance, as long as IV, two-fifths as wide as long, not bowed posteriad or sinuate; IV straight; IV to X becoming progressively shorter and slightly narrower; X much shorter than III, half as wide as long. Maxillary palpi as in figure 8; last segment not greatly enlarged or modified in shape, not expanded laterad, about two-thirds as long as frontal interocular distance, with ventral membranous area confined to basal half; third segment slightly longer than wide, not produced laterad, with an extensive ventral membranous area; both first and second segments with setae erect ventrally. Fore tarsi weakly, symmetrically expanded. Sixth abdominal sternum moderately deeply, broadly, obtusely emarginate; membranous area broad, covering apical two-fifths of sternum, nearly vertical in position, clothed with very short setae except along anterior margin. Pygidium entire. Genitalia (Fig. 5) with gonostyli feebly expanded apically, parallel, weakly curved dorsad, heavy; aedeagus with both ventral hooks well developed, the apical one not or only slightly recurved; dorsal hook with numerous spines.

Female. Maxillary palpi with last segment unusually elongate. Sixth abdominal sternum with a relatively narrow, moderately deep, U-shaped emargination. Pygidium as in male.

Geographic Distribution. This species is known from three localities in the Bolson de Mapimí of northeastern Durango, México, and from Cochise County, Arizona.

Type. Holotype, male, from 18 mi. northwest of Yermo, 3800 feet, July 30, 1959, on *Physalis lobata,* R. B. Selander and J. C. Schaffner, in the Chicago Natural History Museum.

Locality Records. This species is described from 71 specimens collected at the following localities: ARIZONA: Cochise County. DURANGO (MÉXICO): 44 mi. northwest of Gómez Palacio, Tlahualilo [de Zaragoza], and 18 mi. northwest of Yermo.

Discussion. This is a very distinctive species, easily recognized by its color pattern, very shiny and smooth elytra, the form of its hind tibial spurs, and other characters. The unusually thick, obtusely truncate inner hind tibial spurs are much like those of *P. perversa* Dillon, but there are no other special similarities between the two species to suggest that their relationship is a particularly close one. Both species resemble *P. punctata* and *P. fasciata* with respect to the small size of the last segment of the maxillary palpi of the male.

Pyrota terrestris keys in Champion (1891-1893) to *P. mylabrina,* from which it may be separated by its color pattern (compare figure 11 of the present paper with plate 20, figure 3 of Champion's work), less strongly modified male maxillary palpi, thick inner hind tibial spurs, and numerous other structural differences.

Because of the few records of this species, there is little information available regarding the seasonal activity period of the adults. The earliest record is July 20 and the latest August 1. The food plants of the adults are *Chaemaesaracha, Physalis lobata* (both Solanaceae), and an unidentified mallow (Malvaceae). The first of these plants seems to be preferred by the beetles.

Pyrota nigrovittata (Haag-Rutenberg), NEW STATUS

Lytta nigrovittata Haag-Rutenberg (1880, p. 51).

Lytta (Pyrota) nigrovittata var. *Adolphi* Pic (1916, p. 10). (NEW SYNONYMY.)

Pyrota bicurvata Selander (1957, p. 135). (NEW SYNONYMY.)

Discussion. Haag-Rutenberg indicated that the type material of *nigrovittata* was in his collection and specified Mirador, México, as the locality from which it had been obtained. His collection, now in the Zoologische Staatssammlung in Munich, contains two specimens (male and female) under his label "*nigrovittata* m[ihi]." Both are from México, but neither is labeled with the name of a specific locality within that country. Despite this discrepancy, these specimens are surely syntypes of Haag-Rutenberg's species, and I hereby designate the male as the lectotype.

On the basis of Haag-Rutenberg's description, Champion (1891-1893) placed *P. nigrovittata* as a junior synonym of *P. divirgata* (Villada and Peñafiel). This synonymy was not recognized by Pic in describing the varietal form *adolphi* but was accepted later by Denier (1934) and myself (Selander, 1957). My acceptance of it was particularly unfortunate, since it led me to redescribe the species as new. Pic's *adolphi* was based on specimens labeled as from "Mexico" and now in the Paris Museum. I have not had the opportunity of examining this material, but from Pic's description the variety differs in no way from typical *P. nigrovittata.*

Literature Cited

Champion, G. C.
1891-1893. Family Meloidae. *In* Godman, F. E., and O. Salvin, Biologia Centrali-Americana, Insecta, Coleoptera, 4(2):364-450, 462-464, pls. 17-21.

Denier, P. C. L.
1934. Contribución al estudio de los Meloidos americanos. II. Ensayo de clasificación de las *Pyrota* (Dej.) Lec. basada en los caracteres sexuales secundarios de los ♂ ♂. Rev. Soc. Ent. Argentina 6: 49-75.

Dillon, L. S.
1952. The Meloidae (Coleoptera) of Texas. Amer. Midland Nat. 48: 330-420.

Haag-Rutenberg, J. G.
1880. Beiträge zur Kenntniss der Canthariden. Deutsche Ent. Zeitschr. 24: 17-90.

Pic, M.
1916. Descriptions abrégées diverses. Mel. Exot.-Ent., fasc. 21: 2-20.

Selander, R. B.
1957. Descriptions and records of North American Meloidae. I. Proc. Ent. Soc. Washington 59: 135-141.

Vaurie, P.
1950. The blister beetles of north central Mexico (Coleoptera, Meloidae). Amer. Mus. Novitates, no. 1477, 68 pp.

BOOK REVIEW

THE CERAMBYCIDAE OF NORTH AMERICA, by E. Gorton Linsley and John A. Chemsak. University of California Press, Berkeley & Los Angeles, 1961-1963.

Professor Linsley has performed a great service to entomologists, foresters, agriculturists and educators by preparing this series of nine informative volumes on the long-horned woodboring beetles. He has consolidated much of the knowledge accruing from twenty years of intensive study of these beetles, coordinated it with the findings of other entomologists, and composed taxonomic keys that will enable us to identify all of the known species and subspecies of cerambycids in this country. Dr. John A. Chemsak assisted in the preparation of Parts I through V, and is co-author of Parts VI through IX.

The books are beautifully illustrated with photographs, drawings, and distributional maps. Part I contains introductory remarks and a good general treatment of the biology, ecology, and behavior of adults as well as larval forms. Both the prehistoric and the modern geographical distribution of cerambycids are discussed, and probable phylogenetic relationships are very convincingly hypothesized. Four pages are devoted to a consideration of fossil records of these beetles and their significance. The last 35 pages are devoted to remarkable photographs of live beetles, mostly by Marjorie Statham and Edward S. Ross. These illustrations alone would be well worth the price of the volume!

The detailed taxonomic, morphological, distributional, biological and ecological treatment of the various subfamilies, tribes, genera, species and subspecies begins in Part II. The keys combine many technical, phylogenetically-important characters with the more superficial traits that enable the user to key out specimens without dissecting the specimens or examining their hind wings. Typical representatives of most genera are beautifully illustrated by accurate, artistic drawings by Frieda M. Abernathy and J. N. Knull. The known distribution of each taxon is clearly indicated on the full-page maps so carefully prepared by Mrs. Juanita M. Linsley. Part II completely covers the smaller subfamilies Parandrinae, Prioninae, Spondylinae and Aseminae, but three entire volumes are needed for the detailed treatment of subfamily Cerambycinae. Part III provides a taxonomic key to all 33 tribes of this subfamily but only gives details of eleven of those tribes. The remainder will be covered in Parts IV and V. Co-authors Linsley and Chemsak are still in the process of completing the manuscript for Part VI (subfamily Lepturinae) and Parts VII and VIII (subfamily Lamiinae). Part IX will consist of an extensive bibliography dealing with all North American Cerambycidae.

This entire set of books will be an indispensable part of every Coleopterist's library and should also be extremely valuable to all persons directly concerned with the activities of wood-inhabiting insects. Even persons without technical entomological knowledge will find that it is usually possible to make accurate identifications by utilizing the photographs and drawings in conjunction with the thorough discussions in the text. Professional entomologists will also be delighted with these volumes and for the first time will now have easy access to all the information needed for making correct determinations of long-horns. The authors are contributing a truly monumental monograph, and the University of California is rendering a great service by making these volumes so readily available. This set of references will surely constitute the most comprehensive treatment of any large family of beetles yet published in the United States. It will result in the intensified study of these beetles throughout North America, and should also serve as a model for other entomologists to emulate when preparing their own publications.—J. Gordon Edwards

LITERATURE NOTICE

A REVISION OF AFRICAN LAEMOPHLOEINAE (COLEOPTERA: CUCUJIDAE), by L. P. Lefkovitch. Bull. British Mus. (Nat. Hist.) Ent. 12(4):167-245, 18 figs., 1962.—Keys and descriptions of 16 genera and 86 species from the Ethiopian Region are provided for this difficult group. In 1959 the author revised the European members. Many of the former subgenera of *Laemophloeus* have been raised to generic status.

A NEW SPECIES OF ISODRUSUS, WITH NOTES ON ISODRUSUS DEBILIS SHARP (COLEOPTERA: CURCULIONIDAE: TANYMECINI)[1]

By ANNE T. HOWDEN[2, 3]

The genus *Isodrusus* was well characterized by Sharp when he described it in 1911 (p. 207) for his unique species *debilis* (p. 208). *Isodrusus* is distinguished by its connate tarsal claws, ocular vibrissae, very short beak, acutely-angled scrobe which reaches the ventral surface, short legs, separated fore coxae, right-angled humeri, and small, very slender aedeagus. It is interesting to note that the new species described below conforms to the generic description nicely, yet it has remained undescribed since it was first collected in 1879.

KEY TO THE SPECIES OF ISODRUSUS

Fore tibiae with 5 to 8 teeth on inner edge. Scales of elytra angular in shape and arranged radially around the strial punctures -------------- INSULANUS new species
Fore tibiae without teeth. Scales of elytra rounded in shape and imbricate -- DEBILIS Sharp

Isodrusus insulanus Howden, NEW SPECIES

(FIGS. 1, 2)

HOLOTYPE.—Male, length 3.0 mm., width 1.2 mm. Color pattern obsolete; prothorax with an indistinct, broad, median, white vitta; sides of elytra broadly white, ventral surface white.

Scales angular in shape, usually triangular or trapeziform; scales usually form a radial pattern around thoracic and particularly elytral punctures; scales of head a little less angular and only subradial. Scales with carinate margin; scales of prothorax and elytra coarsely granular to striate, scales of head coarsely granular to pustulate. Dorsal setae short, fine, completely arched, close to surface and not conspicuous as in *Isodrusus debilis.*

Head and beak (Fig. 1) shorter than in *debilis,* rather evenly convex in profile. Beak flattened and parallel-sided except for excavation of scrobes. Beak with a conspicuous triangular fovea on median line between insertion of antennae; median line obsoletely impressed. Apical emargination of beak approximately right-angled, nearly as deep as wide, subcarinate. Epistoma with anterior edge slightly arcuately emarginate. Vestiture of apex of beak abraded. Scrobe similar to that of *debilis*—lateral portion very short, vertical portion bowed forwards and reaching ventral surface beneath eye. Antennae with scape bowed, funicle 7-segmented, club a little larger than in *debilis.* Eye extremely large and protruding.

Prothorax 1.2 times longer than broad, sides slightly arcuate between obsolete constrictions, disc flat. Prothorax two times as long dorsally as ventrally, punctures on disc obsolete; one vestigial ocular vibrissa on each side. Elytra 2.3 times longer than prothorax, slightly convex transversely, with sides subparallel to apical third,

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[1] Aided in part by Grant No. 438 of the Johnson Fund (1962) from the American Philosophical Society.
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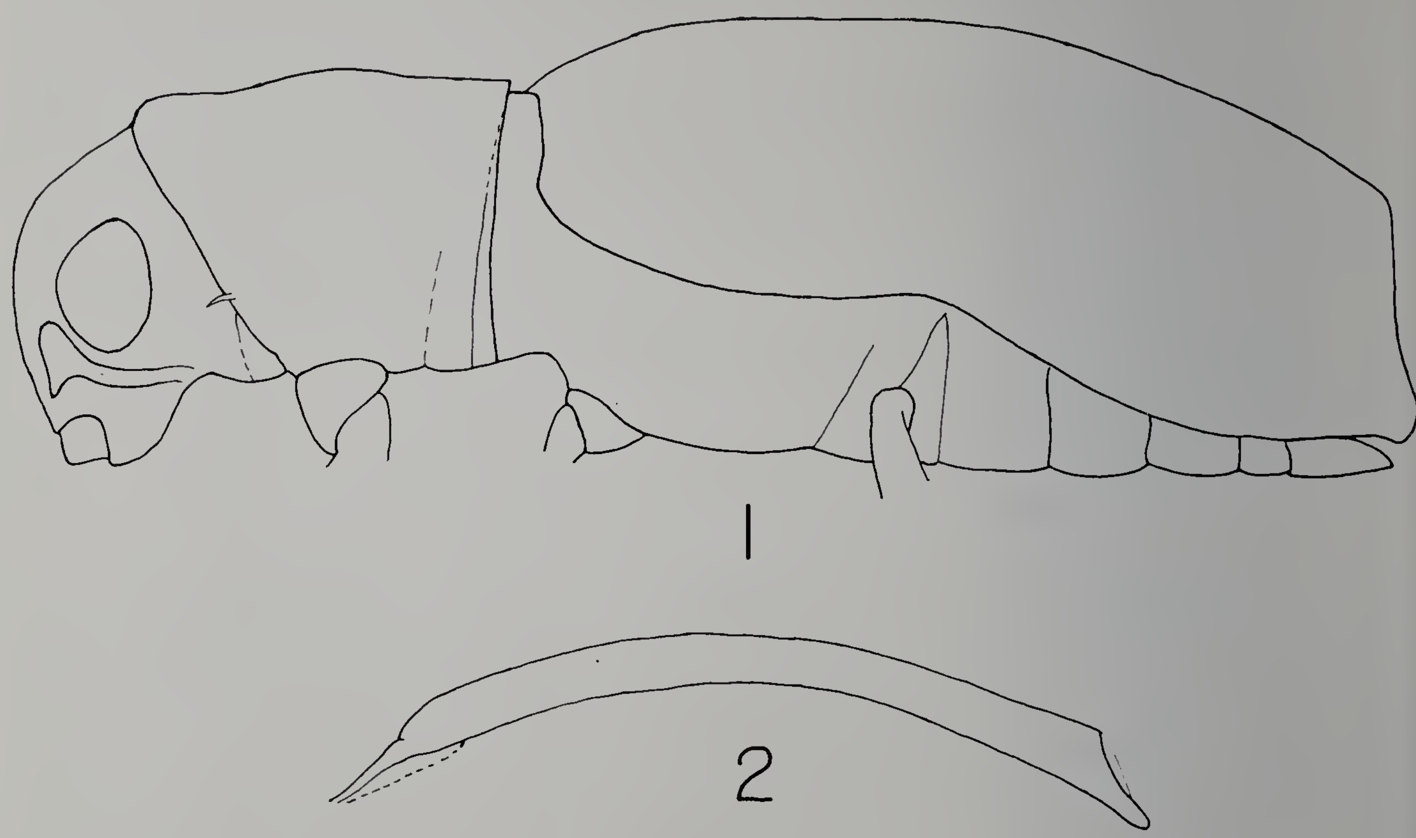
[3] ACKNOWLEDGMENTS: The following entomologists kindly loaned specimens for study from their respective institutions: Mr. Richard Thompson, British Museum (Natural History) (BM); Mr. Hugh B. Leech, California Academy of Sciences (CAS); Dr. Henry F. Howden, Canadian National Collection (CNC); and Mrs. Rose Ella Warner Spilman, United States National Museum (USNM).

slightly emarginate at base. Elytra in profile flattened dorsally, with declivity abrupt and nearly perpendicular. Strial punctures large and deep. Legs longer and more slender than in *debilis.* Fore tibia with six subequal, equidistant, conspicuous teeth. Tarsal claws connate, as in *debilis.* Last visible abdominal sternum very feebly convex, broadly rounded at apex and with margin uninterrupted at apex.



FIGURES 1-2. *Isodrusus insulanus,* new species. 1—Lateral view of holotype. 2—Lateral view of aedeagus of paratype.

ALLOTYPE.—Female, length 3.7 mm., width 1.4 mm. Differs from the holotype in the following respects: form more robust; sides of head and beak conspicuously white; elytra with a dark, oblique subapical fascia; apex of beak with scattered, fine, white setae; ventral edge of eye straight; prothorax 1.1 times longer than broad; a cluster of three very short ocular vibrissae on each side of prothorax; elytra 2.4 times longer than prothorax; elytra in profile slightly arcuate; eight teeth on right fore tibia, six on the left; last visible abdominal sternum more elongate and narrower at apex.

Holotype, Long Island, Bahama Islands, April 1, 1879, Schwarz (U.S.N.M. Type No. 66591). *Allotype, s*ame data as type. *Paratypes:* 1 male, 2 females. One male, same data as type, but April 2; 1 female, same data as type; 1 female, Egg Island, Bahama Islands, May 13, 1933, Wickham, Wickham Coll. All specimens in the United States National Museum except the male paratype which is in the Howden collection.

The aedeagus was dissected from the male paratype which was not in perfect condition. The aedeagus (Fig. 2) is similar to those found in *Pandeleteinus* (Howden, 1959), but it is smaller and even more slender, being slightly narrower than the distal end of the scrobe on the specimen from which it was dissected. The apical opening is oblique and elliptical.

Size of the specimens ranges from the 2.5 mm. of the male paratype to the 3.7 mm. of the allotype. The series exhibits little other variation. The specimen from Egg Island differs from the Long Island specimens in having more finely sculptured and less elongate scales; it has 7 to 8 teeth on the fore tibiae. The ocular vibrissae reach their greatest development in the allotype; in all the other specimens they are absent (or perhaps indistinguishable) or represented by a single seta like the setae on the sides of the thorax and distinguishable chiefly by their position and erectness. The number of tibial teeth varies from 5 to 8.

Though distinctly congeneric with *Isodrusus debilis, insulanus* is immediately distinguishable from it by the following characters: scales angular and radial instead of rounded and imbricate; setae much less conspicuous; eyes much larger and more prominent; fore tibiae dentate; and legs longer and more slender.

As noted by Sharp, the genus bears a strong resemblance to *Isodacrys,* of which *apicale* Howden (1961, p. 91) is the species which *insulanus* most nearly resembles. *Isodrusus insulanus* may be separated from *Isodacrys* by its parallel-sided elytra with humeri, connate tarsal claws, and much more slender aedeagus.

Isodrusus debilis Sharp

Isodrusus debilis Sharp, 1911:208. Green, 1920:197.

The type and paratypes of *debilis* were examined in the British Museum and two paratypes were subsequently loaned for further study. Described from San Jeronimo, Guatemala, the species was apparently not recognized again until Mr. J. W. Green recorded finding it in the Davis Mountains of Texas. These Texas specimens were seen in the California Academy and one specimen was given the author. Since Green's discovery, the species has also been collected in two States of Mexico as follows: *Mexico:* 2 specimens from Real de Arriba, Temescaltepec (BM, CAS); 1 specimen from Lerma (Howden). *Morelos:* 15 specimens from 5 miles north of Cuernavaca (CNC, Howden, Kissinger). The Lerma record should be considered with caution, since the collectors took the specimen in the car two days after collecting the Cuernavaca series; also the geography of Lerma is radically dissimilar to that of the other localities.

San Jeronimo, Guatemala, is described by Vaurie and Vaurie (1949: 15-16) as a village in a dry interior valley at the "east end of the plain of Salama. It was hot and dry, but not so dry as the rest of the plain. . . . A few kilometers away are pine woods up the slopes." A few miles away from San Jeronimo at Salama, Champion noted "Coleoptera characteristic of the drier portions of Mexico" (Vaurie and Vaurie 1949:16).

Real de Arriba, Mexico, is described by Linsley (1935:67) as, "a mountainous area (6000-9000 ft. alt.) with various species of oak and baccharis on the more exposed slopes, an introduced species of alder, *Alnus accuminata* along the streams, and the shrub-like *Ternostroemia pringeli* as well as numerous conifers (*Thuja, Pinus,* etc.) in the higher elevations."

The Cuernavaca, Morelos, locality has scattered stands of pine and oak with many open or planted fields. Most of the Cuernavaca specimens were taken by beating oaks.

The Davis Mountains, Texas, of course, have numerous habitats, some of which are quite similar to those described from San Jeronimo and the Mexican localities.

In view of the long, discontinuous range of *debilis,* specimens from the various localities were carefully compared with each other for possible variations. No noteworthy variations were found except in the scales. The type and one paratype have the dorsal scales noticeably more convex, smooth and shiny than in the other paratypes. However, this is considered normal intra-specific variation since the same condition exists in Davis Mountain specimens and is approached in the Temescaltepec specimens.

Only females have been collected of this species.

Literature Cited

Green, J. Wagener

1920. Notes on American Rhynchophora (Col.) Ent. News 31:193-201.

Howden, Anne T.

1959. A revision of the species of *Pandeleteius* Schonherr and *Pandeleteinus* Champion of America north of Mexico (Coleoptera: Curculionidae). Proc. California Acad. Sci. (4)29(10):361-421.

1961. A revision of the genus *Isodacrys* Sharp (Curculionidae, Tanymecini). Coleop. Bull. 15:75-95.

Linsley, E. Gorton

1935. Studies in the Longicornia of Mexico (Coleoptera: Cerambycidae). Trans. American Ent. Soc. 61:67-102.

Sharp, David

1911. *In Sharp and Champion:* Rhyncophora. Curculionidae. Attelabinae, Pterocolinae, Allocoryninae, Apioninae, Thecesterninae, Otiorhynchinae. Biologia Centrali-Americana, Insecta, Coleoptera 4(3)1889-1911:1-354, 15 pls. (pp. 207-208 issued in 1911).

Vaurie, Charles, and Patricia Vaurie

1949. Insect collecting in Guatemala 65 years after Champion. J. New York Ent. Soc. 72:1-18.

LITERATURE NOTICE

LA GONDWANIE ET LE PEUPLEMENT DE L'AFRIQUE, by René Jeannel, Ann. Mus. Roy. Afrique Centrale [Tervuren] Ser. 8, Sci. Zool., No. 102, 161 pp., illus., 1961.—Distributions of the Pselaphidae and Carabidae are used extensively in this discussion of the part played by Gondwana in animal distribution.

THE WEEVIL GENUS SMICRONYX IN AMERICA NORTH OF MEXICO (COLEOPTERA: CURCULIONIDAE), by Donald M. Anderson. Proc. United States Nat. Mus. 113(3456):185-372, illus., 1962.—66 species of these small weevils are keyed, described, mapped, and partially illustrated. Host records are given when available. The species are arranged in 4 subgenera and 19 species groups.

A REVISION OF THE GENUS TROX IN SOUTH AMERICA (COLEOPTERA, SCARABAEIDAE), by Patricia Vaurie. Bull. American Mus. Nat. Hist. 134(4): 101-168, 104 figs., 2 pls., tables, 1962. (Price $1.50)—35 species are keyed, described, and illustrated. Habits, when known, are given, and distributions are mapped and recorded. This work is up to the usual high standards of Vaurie. She revised the 41 North and Central American species of *Trox* in 1955. Since 1936 all 235 species of *Trox* have been revised.

REMOVAL OF ZALOBIUS AND ASEMOBIUS TO THE PIESTINAE (COLEOPTERA: STAPHYLINIDAE)

By IAN MOORE[1, 2]

When LeConte described the genus *Zalobius* in 1874 (p. 49), based on *Z. spinicollis,* he placed it in the "Coprophili of the Oxytelini." In 1875 (p. 170) he described a second species, *Z. serricollis.* Horn reviewed the Nearctic genera of the Coprophilini in 1895 (p. 236). He placed in it both *Zalobius* and a new genus, *Asemobius,* based on a single new species, *caelatus.* All subsequent students have treated these genera in the same way.

Members of the subfamily Oxytelinae differ from all other staphylinids by the presence of a complete (or, in some specimens of a few species of the Coprophilini, a rudimentary) second sternite. This sternite is absent in *Zalobius* and *Asemobius.* In the Oxytelinae the coxae are large and exserted, whereas in the two present genera they are small and globose in a manner similar to those of members of the Piestinae. These two genera bear at the base of the first visible sternite (the true third sternite) a small keel which is visible between the posterior coxae. Most members of the Piestinae possess a similar structure, the only exceptions being *Trigonurus,* in which a pair of widely diverging keels is present, and *Trigites,* in which no keel exists.

It seems apparent that *Zalobius* and *Asemobius* are more closely related to members of the Piestinae than to those of the Oxytelinae. They should be placed with the former.

KEY TO THE NEARCTIC GENERA OF THE PIESTINAE

1. Anterior tibiae not spinose externally -- 2
   Anterior tibiae spinose externally -- 5
2. Pronotum and elytra costate; last segment of maxillary palpi not narrower than penultimate -- 3
   Pronotum and elytra not costate -- 4
3. Gular sutures widely separated near base --------------------------- ASEMOBIUS Horn
   Gular sutures very approximate near base ------------------------- ZALOBIUS LeConte
4. Last segment of maxillary palpi not narrower than penultimate ---- TRIGONURUS Mulsant
   Last segment of maxillary palpi narrower than penultimate ---------- TRIGITES Handlirsch
5. Elytral disc without impressed striae -------------------------- HYPOTELUS Erichson
   Elytral disc with impressed striae -- 6
6. Clypeal area delimited by a deeply impressed line; mesosternum carinate -- PIESTUS Gravenhorst
   Head without such a line; mesosternum not carinate -------- SIAGONIUM Kirby and Spence

LITERATURE CITED

HORN, G. H.
1895. Coleoptera of Baja California (Supplement I). Proc. California Acad. Sci. (2)5:225-259.

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[1] Associate in Entomology, San Diego Natural History Museum, San Diego California.
[2] I wish to express my gratitude to Hugh B. Leech for the loan of a specimen of *Asemobius caelatus.*

LeConte, J. L.
1874. Descriptions of new Coleoptera chiefly from the Pacific Slope of North America. Trans. American Ent. Soc. 5:43-72.
1875. Descriptions of new Coleoptera of the United States with notes on geographical distribution. Trans. American Ent. Soc. 5:169-176.

BOOK NOTICE

THE BIOLOGY OF MALAYAN SCOLYTIDAE AND PLATYPODIDAE, by F. G. Browne, Malayan Forest Records No. 22, 255 pp., 1961.

Mr. Browne devoted some 30 years to the study of the forest insect fauna of Malaya and Sarawak. During that period he made many observations on Scolytidae and Platypodidae that can be classified as "biological" in the broadest sense. He has recorded his discoveries and, at the same time, assembled data from available sources to make the information as complete as possible. The author discusses the flora of Malaya and the climate. He purposely avoids more than a minimum amount of comment on taxonomy of the beetles feeling that much study remains to be done before justifiable conclusions on systematics of these insects can be reached.

THE ELEMENTS OF STYLE, by William Strunk, Jr., revised by E. B. White, xiv and 71 pages. Macmillan Paperbacks No. 107. 1962. (Price $.95)

This highly recommended little book was, as stated in the introduction, Strunk's attempt to cut the vast tangle of English rhetoric down to size and write its rules and principles on the head of a pin.

BEETLE TALK

In the Bulletin of 1949 Hugh B. Leech gave us a few lines of an interesting letter written by E. A. Schwarz to H. G. Hubbard in 1897. It is from one of the many Schwarz letters published in Journ. New York Ent. Soc., Vol. 37, 1929. The letter is so delightful that we reproduce most of it here. Schwarz is reporting on an odd beetle, later named *Cactopinus hubbardi* Schwarz, collected by Hubbard in *Cereus* cactus in Arizona.

"I must confess that your account of the 'most marvelous Cioid' did not strike me particularly and made up my mind that it was a species of *Ozognathus* (Ptinidae), the males of which have peculiarly-formed horns on the head. On Saturday upon returning from Office after 4 O'cl. P.M. I found your package and in order to see whether everything was all right I opened the pill boxes. When I came to the box containing the 'Cioid' and looked at the latter I came near being paralyzed and it required a superhuman effort and a swallow of whiskey to recover. Your Cioid turns out to be a most remarkable and entirely new genus of Scolytids!! In fact it is a long time since I put my eyes upon a more odd-looking creature than this species. After recovery I mounted at once a couple of specimens, for it happened that at 5.35 P.M. I had invited Smith, Hopkins and Alwood to dinner at Gerstenberg's with the understanding that they should spend the evening hours in my room, all three of them to leave between 9 and 10 o'cl. with the B. & O. R.R. During dinner (everything as usual fried in cockroach grease) I narrated about that Scolytid and Hopkins could hardly wait for the time to look at it. Upon returning home the specimens were at once exhibited and Hopkins became perfectly wild with excitement and cursed his miserable West Virginia Scolytids because they did not show any distinguishing characters except after a most painful scrutiny. One of your Scolytids ♂ happened to be alive and we had an opportunity to watch the movements of this wonderful species. Smith got also excited and in order to prevent further mischief I had Ida at once fetch a pitcher of lager beer. This smoothed the excitement and two subsequent pitchers were drunk to your health, and it was unanimously voted that no one but yourself would have been able to unravel the secrets of the Cereus fauna."

TWO NEW BEETLES OF THE GENUS APHOTAENIUS (COLEOPTERA: SCARABAEIDAE)

By O. L. CARTWRIGHT[1]

The two new species described below increase to four the known species in the genus *Aphotaenius* Cartwright. All are from the Western Hemisphere, one each from the United States, Mexico, Colombia, and Brasil.

Aphotaenius is separated from *Aphodius* Illiger, *Ataenius* Harold, and most other Aphodiinae by characters of the terminal margin of the middle and hind tibiae. The terminal fringe of setae or spicules found in *Aphodius* and *Ataenius* is replaced in *Aphotaenius* by two small triangular teeth, each with a fine, hairlike seta basally on each side (Figs. 1-3). *Saprosites* Redtenbacher has a similar arrangement of teeth but differs in shape and preferred habitat. *Saprosites* is usually elongate, usually somewhat flattened, and is found under the bark of dying trees. *Aphotaenius* is very convex and oval in shape and is found on the ground under dung. *Aphotaenius carolinus* (Van Dyke) prefers the droppings of deer in shady, wooded areas.

KEY TO THE SPECIES OF APHOTAENIUS

1. Coarse punctures of prcnotum quite close throughout; clypeus smooth, only minutely punctate ---------- 2
   Coarse punctures of pronotum sparsely distributed across the basal half of pronotum; clypeus finely punctate as on anterior part of pronotum; Brasil--**PLAUMANNI** new species
2. Smaller species, 2.5 to 3.1 mm. in length; strong distinct clypeal tooth each side of emargination ---------- 3
   Larger species, 3.5 to 3.9 mm. in length; clypeal margin angulate each side of emargination; Colombia ----------**COLOMBIENSIS** Cartwright
3. Strial punctures coarse and strong, laterally over twice as wide as the striae, like well-spaced beads on a string; intervals convex; México----------**HOWDENI** new species
   Strial punctures only weakly crenating intervals; intervals only slightly convex; United States ----------**CAROLINUS** (Van Dyke)

Aphotaenius plaumanni Cartwright, NEW SPECIES

(FIG. 4)

HOLOTYPE.—Length, 2.7 mm., width, 1.1 mm. Strongly convex, lateral margins not visible from directly above, elongate oval, shining black. Legs and clypeus anteriorly reddish. Clypeal margin anteriorly widely emarginate, at most only very slightly angulate each side of emargination, very finely reflexed; median edge between teeth triangularly flattened upward when viewed from directly in front; lateral contour smooth and nearly straight to right angle of inconspicuous gena; surface of clypeus and entire head convex, evenly, uniformly, quite closely, finely punctate as on anterior of pronotum, the punctures separated by one to two diameters. Pronotum convex, posterior angles depressed, all angles obtusely rounded, side margin very finely reflexed, basal border formed by a row of almost contiguous, coarse punctures; fine punctures throughout as on head, coarse punctures, perhaps fifty, irregularly scattered over basal half of the pronotum. Elytra convex, sides not quite parallel, widest at posterior third; striae fine, punctures crenating sides of the intervals; intervals with scattered very minute punctures, almost flat on disc, strongly convex apically. Underside shining; mesosternum alutaceous and punctate with shallow,

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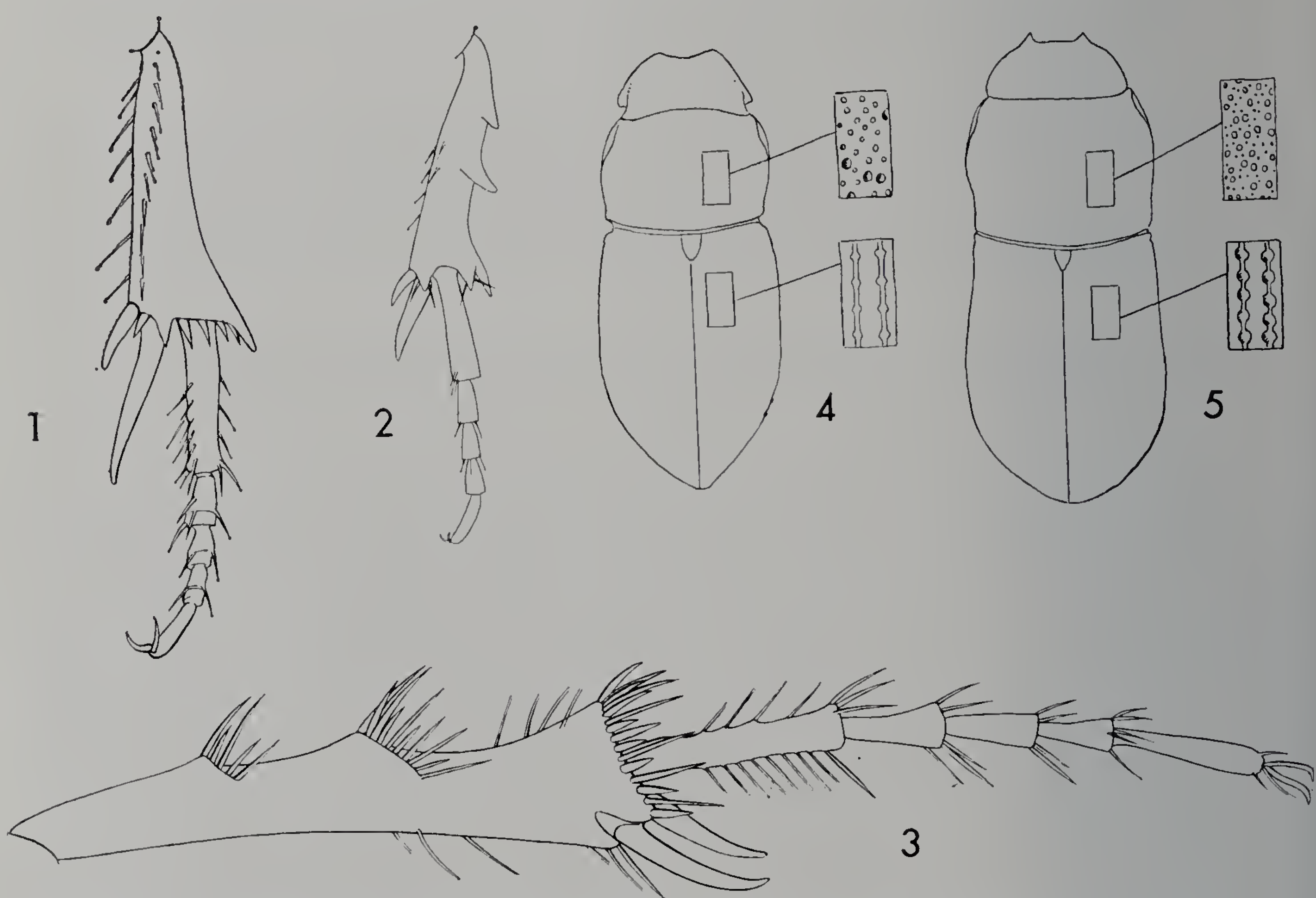
[1] United States National Museum, Smithsonian Institution, Washington, D. C.

moderate punctures separated by one or two diameters; metasternum smooth and shining with widely scattered, very fine punctures separated by three to five times their diameters, alutaceous laterally with a few, moderately coarse punctures added, mid-line sharply, rather deeply impressed, triangular depressed area in front of posterior coxae roughly alutaceous. Abdominal segments widely crenate in front, with scattered minute to fine punctures. Pygidium with fine, scattered punctures separated by two or more diameters, smooth, shining and convex apically, disc flattened and very finely alutaceous, basally with a moderately deep fovea one-fifth as wide as pygidium overhung by a shining, convex ridge. Middle and hind femora without marginal line, some scattered very fine punctures. Sex not determined.

All specimens collected in Brasil by Fritz Plaumann as follows: *Holotype:* Sinimbu, Rio Grande do Sul, September 1960. *Paratypes:* 8, collected with holotype; 6, Sinimbu, 29′30 52′30, 200 m., Sept. 1960; 3, Barras Cassal, Rio Grande do Sul, Sept. 1960; 1, Chapeco, 27′07 52′36, 600 m., July 1960; 2, Nova Teutonia, 27′11 52′23, 300-600 m., April 1947 and August 1952.

Holotype in United States National Museum, No. 66828. Paratypes in United States National Museum, Canadian National Collection, and private collection of Henry F. Howden. Paratypes vary in length from 2.1 to 3.0 mm.; in width from 0.9 to 1.4 mm.

Aphotaenius plaumanni, named after Fritz Plaumann of Nova Teutonia, Brasil, is easily identified by the noticeably punctate clypeus and by the lack of teeth on the clypeal margin. *A. plaumanni* is the only known species of *Aphotaenius* having the clypeus strongly, noticeably punctate.



FIGURES 1-3. Posterior tibia and tarsus showing spurs, spines, and setae. 1—*Ataenius.* 2—*Aphotaenius.* 3—*Aphodius.*

FIGURES 4-5. Differences in shape, punctures, and striae in *Aphotaenius.* 4—*Aphotaenius plaumanni,* new species. 5—*Aphotaenius howdeni,* new species.

Aphotaenius howdeni Cartwright, NEW SPECIES

(FIG. 5)

HOLOTYPE. Length, 3.2 mm., width 1.5 mm. Strongly convex, lateral margins not visible from directly above, elongate oval, shining, black, elytra with a slight reddish tinge, legs and anterior of clypeus reddish. Clypeus widely emarginate with a strong, triangular tooth each side, lateral margin finely reflexed, arcuate from tooth to inconspicuous right angled gena, median edge between teeth triangularly flattened upward when viewed from directly in front; surface convex with evenly placed, very fine punctures separated by three to five times their diameters; a band of almost contiguous, moderately coarse punctures across the head behind frontal suture. Pronotum convex, all angles obtusely rounded, posterior angles depressed, laterally finely margined, bordered laterally and basally by a row of practically contiguous, moderately coarse punctures; surface closely, evenly punctate everywhere with mixed very fine and moderately coarse punctures, the coarse punctures separated by one to two times their diameters. Elytra convex, sides not quite parallel, widest at apical third; striae moderate, basally and laterally with very coarse strial punctures at least twice as wide as the striae and nearly half as wide as the intervals; intervals with scattered minute punctures, convex especially over apical declivity where the striae gradually become as wide as the intervals. Underside shining; mesosternum alutaceous and with close, shallow, moderate punctures added; metasternum coarsely, closely punctate, punctures separated from less than their diameters at middle to one or two diameters at sides, finely alutaceous at sides, mid-line sharply, deeply impressed, triangular depression in front of posterior coxae alutaceous. Abdominal segments strongly crenate in front, some scattered very minute punctures, otherwise smooth and shining. Depressed area of pygidium separated by a longitudinal carina. Middle and hind femora smooth and shining except for very fine, widely scattered punctures; posterior femur with trace of marginal line at knee, middle femur with strong complete marginal line. Tibiae typical for genus; first tarsal segment as long as next three combined, long spur subequal. Sex of holotype unknown.

PARATYPES vary in length from 2.5 to 3.2 mm. A few specimens have the basal pronotal margin slightly lobed. No other variation was noted.

Holotype and 13 *paratypes* collected on Chipinque Mesa, Monterrey, Nuevo León, México, July 26-29, 1960, by H. F. Howden. Holotype and paratypes in Canadian National Collection. Paratypes in the United States National Museum Collection.

Aphotaenius howdeni, named after Dr. H. F. Howden, is closely related to *A. carolinus* (Van Dyke) but may be separated from that species by the very coarse strial punctures at the base and sides of the elytra.

LITERATURE NOTICE

A GAZETTEER TO ACCOMPANY THE "INSECTA" VOLUMES OF THE "BIOLOGIA CENTRALI-AMERICANA," by Richard B. Selander and Patricia Vaurie. American Mus. Novitates No. 2099, 70 pp., 1962.—Contains definitions of names of 790 localities in enough detail so that geographic position can be determined; approximates elevations; also gives maps of major political divisions of 8 countries. Most assuredly, these 70 pages will be welcomed by students of the Central American fauna.

A CATALOGUE OF PAPERS CONCERNING THE DATES OF PUBLICATION OF NATURAL HISTORY BOOKS, and Four Supplements. By Francis J. Griffin and others. Journ. Soc. Biblio. Nat. Hist. 1:1-30, 1936; 2:1-18, 1943; 3:5-12, 1953; 3:165-174, 1957; 4:1-19, 1962.—This continuing reference series is a time saver for systematists involved with difficult priority problems. It brings together widely scattered bibliographical information on a highly specialized subject. Many entomological articles are cited.

NOTE ON BEHAVIOR AND DISTRIBUTION OF MELITTOMA SERICEUM HARRIS (COLEOPTERA: LYMEXYLONIDAE)

On July 2, 1962, about two miles southeast of Henry, Marshall County, Illinois, in the north central part of the State, Glenn observed a male of *Melittoma sericeum* at a black light. While it was resting on a sheet suspended back of the light, the beetle was noted contracting and expanding the lateral flabellate appendage which arises from a notch at the apex of the expanded second segment of the maxillary palpus. This behavior was so conspicuous that it was thought at the time of observation that the structure was part of the antenna. Observations of similar behavior appear not to have been recorded for this species, and the function of this behavior is unknown. This was the only individual of this species that Glenn noted in nearly 35 years of collecting Lepidoptera and Coleoptera in Putnam and adjacent Marshall Counties. Glenn used the black light for the first season in 1962. It is possible that the species has occurred in this locality for many years but was not attracted to white lights which were used.

Scanning the literature disclosed no previous record of *Melittoma sericeum* for Illinois. However, a female of this species, simply labeled "Ill.," had been in the collection of the State Natural History Survey for many years. There is also a new Tennessee record given to us by Dr. R. L. Wenzel, Chicago Museum of Natural History; Bernard Benesh took one specimen at Deer Lodge, Tennessee, July 25, 1932. Other States for which the species has been recorded are: Maine, Massachusetts, New York, Pennsylvania, North Carolina, Alabama, and Indiana. It seems to be everywhere rare although Champlain and Knull (Can. Ent. 55:112, 1923) and Craighead (U.S.D.A. Misc. Publ. 675:220, 1950) recorded the larvae as formerly being very destructive to chestnut.

In addition to chestnut, the larvae of *Melittoma sericeum* are recorded as living in oak logs. Chestnut is known to grow under native conditions in Illinois only in Pulaski County in the southern tip of the State. However, it was more widely distributed under cultivation before the advent of chestnut blight.—MILTON W. SANDERSON, *State Natural History Survey, Urbana, Illinois,* and MURRAY O. GLENN, *Henry, Illinois.*

CURRENT RESEARCH PROGRAMS

These announcements of research underway on beetles are not meant to be requests for specimens or information unless stated to the contrary; a letter to the researcher will determine whether or not specimens or information are wanted. All research workers are invited to send notices of research in progress to the Editor.

CURCULIONIDAE: Revision of *Anthonomus* of North and Central America. By H. R. Burke, Dept. of Entomology, A. and M. College of Texas, College Station, Texas.

CURCULIONIDAE: Revision of *Tachygonus*. By Finley B. Negley, Pennsylvania Dept. of Agriculture, Bureau of Plant Industry, Harrisburg, Penna.

STAPHYLINIDAE: Revision of generic classification of Aleocharinae. By C. H. Seevers, Biology Dept. Roosevelt Univ., Chicago 5, Ill.

TENEBRIONIDAE: Revision of *Palorus*. By D. G. H. Halstead, Pest Infestation Laboratory, London Road, Slough, Bucks., England.

BEETLE TALK

Coleopterists of the District of Columbia attended the First Annual LeConte Memorial Birthday Party at the U. S. National Museum on May 13, 1963.

NOTES ON THE HABITS OF SOME NORTH AMERICAN CURCULIONIDAE (COLEOPTERA)[1]

By D. G. Kissinger[2]

The following notes record observations made on certain weevils occurring in the United States.

Attelabus bipustulatus Fabricius. A host of this species not previously reported is ironwood leaves as observed in eastern Maryland and northern Alabama. Blatchley and Leng (1916) make the statement that the larvae "fed on the dry substance of their nest, . . . " A short experiment was carried out to determine the conditions of relative humidity (R.H.) optimum for development. This was done by collecting a number of leaf rolls from *Quercus alba* L. and *Q. falcata* Michx. and holding them under the desired conditions of R. H. produced by using a particular dilution of concentrated sulphuric acid in a closed container. The rolls were collected on May 1 and examined on June 10. Of 23 leaf rolls held at 100% R. H., 10 contained adults and 2 rolls pupae; 3 contained living larvae. Of 19 leaf rolls held at 90% R. H., 10 contained living larvae but no pupae or adults. Twelve leaf rolls were held at 80% R. H. of which 5 contained living larvae but no pupae or adults; the larvae were smaller than those held at 90% R. H. Apparently the leaf roll must be in a fairly humid environment for the larva to develop rapidly. It is my impression that the leaf roll falls to the ground shortly after the female has finished preparing it; the ground surface would tend to be more humid than the air 5 to 10 feet above the ground. Preliminary investigation did not show a noticeable correlation between weight of leaf roll and sex of emerging adult; rolls producing males weighed about 10.3 to 16.8 mg. while those producing females weighed about 11.9 to 26.1 mg., the last being an unusually large roll.

Apion curticorne Fall. Adults of this species occur at Seneca, Maryland on the composite *Actinomerus alternifolia* DC., a plant which is easily recognized by its winged stem. During August a sizeable collection of flower heads was made; on October 12 a few teneral individuals of *curticorne* were found in the cage containing the dried up flower heads and one individual was dissected from a seed.

Apion cavifrons LeConte. Adults of this species were abundant on flowering and fruiting vines of *Vicia gigantea* Hooker, in Strawberry Canyon, Berkeley, California from February through May (when observations ceased), but larvae were not found.

Apion dolosum Fall. Kissinger (1959) associated adults of this species with *Robinia neomexicana* Gray. Immature pods of this plant were collected near the Barfoot fire lookout, Coronado National Forest, Cochise Co., Arizona (near the Southwestern Research Station). Twelve pods of 60 examined were infested with larvae. The larvae mine the upper or lower part of the pod and invade the developing seed, up to 5 larvae per pod were found.

[1] Aided by a grant, G 19,600, from the National Science Foundation.

[2] Atlantic Union College, South Lancaster, Mass.

Apion nigrum Herbst. The following observations on this species were carried out near Huntsville, Alabama. The immature stages of this species are not easy to study because the pods they occupy are borne usually high in the black locust tree, *Robinia pseudacacia* L. On May 8 the pods were about 0.75 inches long and the flowers were beginning to drop; at this time two eggs and one second (?) instar larva were found. On May 17, 42 pods were examined of which two contained larvae, one larva may have been a 4th instar. On May 21, 900 pods were examined of which seven contained living individual larvae, seven had mummified larvae, and 10 contained head capsules indicating death occurred apparently during an early instar. On June 4, 405 pods were checked of which one contained a dead, late instar larva. By June 21 teneral adults were found on the foliage of the host plant. One pod with a fairly large larva yielded a male adult *nigrum* when held under very humid conditions in the laboratory. Preliminary observations indicate that larvae are not randomly distributed in the pod but occur toward the apex in the kind of "tail" on the pod that is produced when no ovules develop in that region. Practically all the living larvae I found were in the apical part of the pod. Most of the dead larvae were found higher in the pod. Occasionally quite a large space will occur between developing seeds toward the middle of the pod, and some larvae were found here but generally these were dead. Apparently the larvae mine the developing pod and do not attack the developing seeds. When the female excavates a small cavity to receive the egg an adjacent ovule may be killed. The egg cavity is sealed with a small plug of excrement. Usually one larva is found in a pod.

The larval habits of *nigrum* appear to differ somewhat from those of *dolosum* Fall, a closely related species occurring in the mountains of Southwestern United States, both species developing in *Robinia* pods. As noted above *dolosum* may have up to five larvae per pod and these attack the developing seeds; *nigrum* usually has one larva per pod and apparently does not attack the developing seed.

There is at present an unsolved relationship between *A. nigrum, A. porcatum* Boheman and *Robinia pseudacacia* L. Adults of both species of *Apion* may occur together on the foliage of black locust, as was noticed at Huntsville, Alabama and Baltimore, Maryland and also recorded by Blatchley and Leng (1916). The following numbers of specimens were collected on black locust foliage in the study area at Huntsville, Alabama: May 8, only *nigrum,* no *porcatum;* May 17, 50 *nigrum* and 1 *porcatum;* May 21, about as many *porcatum* as *nigrum*. June 4, about 50 *nigrum* and 1 *porcatum;* June 21, about 200 *nigrum* and no *porcatum*. Some live females from the May 21 sample were dissected; *nigrum* females had little fat body and well developed ovaries with large eggs, while *porcatum* females had a great deal of fat body and the ovaries were poorly developed. I suspect that *porcatum* feeds on black locust until its usual host plant can support it, but the actual larval host at present is not known.

Apion patruele Smith. In my revision of *Trichapion* (Kissinger, 1959) it was noted that adults of this species were found on foliage of the legume, *Apios americana* Medic. Near Fitchburg, Massachusetts (in the vicinity of Redemption Rock) larvae and pupae of *patruele* were found on August 27 within developing flower buds of *Apios americana* Medic, the only species of *Apios* common in eastern United States.

Apion proclive LeConte. Kissinger (1959) associated this species with plants of *Lupinus* sp. At San Francisco, California larvae were found mining fairly large (1-2 inches long) seed pods of *Lupinus* sp. Late instars attack the seed, and pupation occurs in the pod at the site formerly occupied by the seed.

Apion puritanum Fall. In the vicinity of Clinton, Massachusetts adults of this species occur on blooms of *Viburnum dentatum* L. during June. The fruit of this plant is somewhat flattened, and egg punctures can be found on the edge of the fruit. Apparently the main barrier to the success of the larva is the developing seed coat. Following successful penetration of the seed coat and entrance into the developing seed, the larva develops rapidly. Mature larvae were found inside the seed by July 30 and (under laboratory conditions) adults were noticed by August 15.

Apion simile Kirby. The following observations were made near Clinton, Massachusetts on the host plant *Betula papyrifera* Marsh. On June 11 eggs and very small larvae (probably first instars) were noticed in fruiting aments. By July 3 pupae were noticed and adults were seen (under laboratory conditions) by the middle of July. The egg is most often laid near the middle of the ament. The site of egg deposition can be detected because one or two bracts turn brown due to injury incurred; these brown spots can be seen fairly easily. The larva then burrows through the fleshy bracts and small developing seeds in a direction parallel to the axis of the ament. Apparently it always burrows toward the base of the ament. The infested ament, although extensively mined, shows no outward indication of infestation except for a few brown bracts at the site of oviposition. The larva apparently feeds mainly on the growing bracts, which at this time constitute the largest part of the ament. The developing seeds become sizable after the larva ceases to feed. Pupation takes place in the ament. Part of the burrow is cleared of frass to form a chamber, either end of which is plugged with a dense mass of frass and excrement. An unidentified lepidopterous larva also mines the aments and usually starts feeding extensively about the time the *Apion* is ready to pupate. Possibly the dense mass of frass referred to above protects the weevil pupa from the caterpillar which may eat unprotected pupae. Dr. W. H. Anderson discovered the larvae of *simile* in birch aments some time ago near Washington, D. C. (unpublished).

Apion lanuginosum Walsh (1867) (not Gerstaecker, 1854) was described from material taken from galls of *Cecidomya* sp. on *"Salix strobiloides."* Smith (1884) renamed the species *Apion walshii*. Kissinger (1959) subsequently showed that *A. walshii* is a synonym of *A. simile* Kirby (1811). At the present time no species of *Apion* is known to develop in galls on willow. Since Walsh's type is presumably lost we are left with Smith's interpretation of the species. Smith could have misinterpreted Walsh's species which really does develop in galls on willow, or Smith may have correctly interpreted the species, and adult *simile* occurred in the gall of *Cecidomya* sp. perhaps as an over-winter shelter. Wahlgren (1951) cites *A. simile* as a gall maker on *"Betula verrucosa"* but the second alternative given above may apply here also.

Brachystylus acutus (Say). The adults of this species have been known to occur on the foliage of persimmon trees for some time (Blatchley and Leng, 1916). Near Huntsville, Alabama larvae and pupae were found 3 to 8 inches below the surface of the ground in the vicinity of roots of persimmon. An adult was subsequently reared from a pupa in cell with fourth instar larval skin.

Myrmex dichrous LeConte. Blatchley and Leng (1916) quote Schwarz's note that the species is rare and occurs on dead palmetto leaves. Near Lake Placid, Highland Co., Florida in the vicinity of Parker Island more than 50 individuals were found in June by beating dried palmetto fronds. I suspect that the weevils were seeking refuge in the fronds rather than ovipositing.

Pseudobaris nigrina (Say). Adults, pupae and larvae of this species were found in the stolons of a mint, *Lycopus virginicus* L., near Huntsville, Alabama on August 17.

Buchananius striatus (LeConte). One adult was found near Huntsville, Alabama by beating small limbs of a dead, fallen black locust, on May 8. This particular area is about one-half mile from the site to be mentioned below for *B. sulcatus* (LeConte) and tends to be drier as it is on the top of a low hill.

Buchananius sulcatus (LeConte). Two adults of this species were found in a small, heavily wooded spot near Huntsville, Alabama at the base of the northern slope of the small hill. This particular site was quite humid and was shaded by very large hickory and white oak trees. The individuals were found by beating small hickory limbs either on or close to the ground surface. One individual found on September 9 was teneral, indicating recent emergence.

Plocamus hispidulus LeConte. One adult was found near Huntsville, Alabama in association with an individual of *Buchananius striatus* (LeConte) as mentioned above.

Cylindrocopturus quercus (Say). Adults and larvae of this species occurred in the smaller, outer branches of *Ambrosia artemisiifolia* L. near Huntsville, Alabama. *A. artemisiifolia* in this location is attacked by at least four weevils. *Baris* sp. larvae mine the cambium of the root stock; *Rhodobaenus tredecimpunctatus* (Illiger) burrows in the lower stem and upper part of the root; *Lixus sylvius* Boheman burrows the upper stem; and *Cylindrocopturus quercus* burrows the branches.

Acalles sordidus LeConte. Adults of this species were found near Huntsville, Alabama at the spot mentioned above under *Buchananius sulcatus* by shaking small, fallen limbs of hickory over a sheet.

Acalles ?inflatus Blatchley. Adults of this species were found at the locality mentioned above under *Buchananius sulcatus* under fallen limbs.

Canistes schusteri Casey. One adult was found beneath a hickory limb at locality mentioned above under *Buchananius sulcatus*. This represents a southern extension of the known range which is given by Blatchley and Leng (1916) as Kentucky, Missouri, and Ohio.

Apteromechus ferratus (Say). Larvae and pupae of this species were found near Huntsville, Alabama within the bark of a recently (year or so) fallen branch of sassafrass; adults were reared. The larvae appeared to mine mostly the bark of the branch without going deeply into the wood. Pupation took place in a cell in the bark.

Cryptorhynchus fallax LeConte. At the same locality mentioned above under *Buchananius sulcatus* larvae of this species were found within fallen branches of hickory; adults were reared. The whitish wood seemed quite old and soft; no termites were present and very few cerambycid larvae or pupae were noticed; the wood was not especially moldy.

Literature Cited

Blatchley, W. S. and C. W. Leng
1916. Rhynchophora or weevils of northeastern America. Nature Pub. Co., Indianapolis. 682. pp.

Gerstaecker, C. E. A.
1854. Beschreibung neuer Arten der Gattung *Apion* Herbst. Stettiner Ent. Zeitung 15:234-261, 265-280.

Kirby, W.
1811. Descriptions of seven new species of *Apion*. Trans. Linn. Soc. London 10:347-357.

Kissinger, D. G.
1959. A revision of the *Apion* subgenus *Trichapion* Wagner in the New World (Coleoptera: Curculionidae). Proc. United States Nat. Mus. 110 (no. 3418):247-389.

Smith, J. B.
1884. Synopsis of the Apioninae of the United States. Trans. Amer. Ent. Soc. 11:41-68, pl. 3.

Wahlgren, E.
1951. Cecidiologiska antekningar VI. Ent. Tidskr., 72:84-156.

Walsh, B. D.
1867. On the insects inhabiting galls of willow. Proc. Ent. Soc. Philadelphia 6:269 (1866).

LITERATURE NOTICE

COMPARATIVE MORPHOLOGY AND PHYLOGENY OF THE SUPERFAMILY CURCULIONIDEA OF JAPAN (COMPARATIVE MORPHOLOGY, PHYLOGENY AND SYSTEMATICS OF THE SUPERFAMILY CURCULIONOIDEA OF JAPAN I), by K. Morimoto. Journ. Faculty Agric. Kyushu Univ. 11:331-373, illus., 1962.—This is a refreshing change from the usual attempts at classification. Morimoto compares a single structure in all taxa before moving on to another structure. The method of comparative morphology, usually called the systemic method, has as its most desirable feature its simplicity; it limits the number of items which a taxonomist must evaluate at one time. Later, the whole animal can be considered. The usual method of comparative morphology of taxonomists is phylogenetic; all structures of one taxon are discussed before moving on to the next taxon. Taxonomists often use the systemic method in revisionary research but present findings in the phylogenetic method. The systemic method is most useful in studying higher taxa where great diversity in a morphological structure is often accentuated or masked by its neighbor. Someday there will be a phase of study called comparative morphology of beetles, just as there is today a comparative morphology of vertebrates. Let's hope it isn't too far in the future. We need more studies like Morimoto's to shorten that future.

ON LARVAE, PROBABLY TAUROCERAS, FROM THE NEOTROPICS (COLEOPTERA: TENEBRIONIDAE)

By T. J. SPILMAN[1]

In the collection of the U. S. National Museum, nine large larvae of the beetle family Tenebrionidae bear the identification label, "near *Scotobates* or *Centronopus.*" None are associated with adults, and until adults are bred from larvae like these or at least are found associated with such larvae, positive identification can not be made. However, I have made tentative identification of the preserved larvae by a process of elimination.

Six of the preserved larvae bear Jamaican locality labels, one is from Honduras, and two are from Brazil. Because Jamaica has only 20 known tenebrionid species, I used that island fauna for my eliminations. First of all, the larvae in question are members of the Tenebrionini, as characterized by St. George (1924:3). Only three species of the Tenebrionini are known from Jamaica: *Zophobas atratus* (Fabricius), *Tenebrio molitor* Linnaeus, and *Tauroceras cornutum* (Fabricius). The larvae of the first two species were included in a key and illustrated by St. George (1924:10, 12, Figs. 51, 62). *Zophobas* and *Tenebrio* can be eliminated from consideration because their described morphological characteristics are different from the characteristics of the larvae in question. Thus, all species, except *Tauroceras cornutum,* are eliminated. Secondly, but of less importance, size might be an indicator. Often, though not always, sizes of larvae and adults are in direct proportions, *i.e.,* a large larva develops into a large adult. On Jamaica most tenebrionid species are of small to moderate lengths; in this size group *Tenebrio molitor* is the largest, with a maximum length of 32 mm. in the larval stage and 18 mm. in the adult stage. Only *Zophobas atratus* and *Tauroceras cornutum* could be considered large, having a maximum length of 26 mm. and 32 mm., respectively, in the adult stages. The larva of the former attains a maximum length of 45 mm. The undetermined larvae are very large, 45 to 57 mm. in length. This large size would point to *Tauroceras cornutum,* for *Zophobas atratus* has already been eliminated on morphological characteristics.

Therefore, an identification label reading, "probably *Tauroceras cornutum* (Fabricius)" is being attached to the six Jamaican larvae. A definite identification can be made when larvae are positively associated with adults. The larvae from Honduras and Brazil are congeneric with the Jamaican larvae, but the number of species of *Tauroceras* described from the mainland, four, precludes specific identification. These larvae are identified merely as, "probably *Tauroceras* sp." The nine larvae are described and illustrated below.

The larvae described as "probably *Tauroceras*" would be determined as

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Scotobates (now *Centronopus,* according to Spilman 1962:3) in the key to the larvae of North American Tenebrionini of St. George (1924:11). The following couplet will separate the two genera:

First abdominal spiracle 3 or more times longer than wide; abdominal dorsal sclerites without coarse punctures, with only a few setigerous punctures and slit-like punctures in anterior sinuous sulcus; ninth abdominal sclerite with numerous spines and tubercles in addition to paired urogomphi . . . . . probably *Tauroceras* Hope

First abdominal spiracle less than 2 times longer than wide; abdominal dorsal sclerites with many coarse punctures scattered over surface and with only a few setigerous punctures; ninth abdominal sclerite without spines or tubercles, with punctures and paired urogomphi . . . . *Centronopus* Solier

The morphological terminology used herein is the same as that used by Wade and Bøving (1921) and St. George (1924) except for areas of the abdominal segments. In *Tauroceras* (Fig. 10) and all other Tenebrionini larvae known to me, abdominal segments 1-8 have a large dorsal sclerotized plate and a smaller ventral plate, with a membranous area connecting the two laterally. A spiracle is located in the anterolateral corner of each dorsal plate just below the longitudinal line. Separate pleural plates are not present. The lateral areas of the dorsal plate and ventral plate are termed the epipleural region and hypopleural region, respectively, by the above-mentioned authors. Use of the terms epipleural and hypopleural leads one to believe that the pleuron is a sclerite that can be delimited.

Snodgrass (1935: 248-251, Fig. 137 A-E) gives the various combinations of abdominal sclerotizations that occur in insects. His Fig. 137 C is comparable to the sclerotization in the Tenebrionini. He says, "The lower limit of the dorsum must be determined by discovering, where possible, the position of the dorso-pleural line . . . , which is often marked by a lateral groove extending into the thorax above the subcoxal pleurites. . . ." This dorsopleural line is easily found in the Tenebrionini; it is the membranous area between the dorsal and ventral plates. The dorsal plate is therefore the tergum. Concerning the lower limits of the pleuron, Snodgrass says, "In the usual condition found in adult and nymphal insects the primitive pleura and sternum of each segment . . . are united in a continuously sclerotized *definitive sternal plate* . . . opposed to the tergum." Thus, the ventral limit of the pleuron, the pleuronventral line, cannot be determined on the abdomen of insects such as the Tenebrionini because the pleura and sternum are united. The area that is usually termed hypopleural region by describers of beetle larvae is probably part of the pleuron that has fused with the sternum! Therefore, I say the terms epipleural and hypopleural are liable to be misinterpreted, even if used to define only general body regions.

I have given definite terms only to the sclerites I am able to delimit. Each of the first eight segments of the abdomen of the Tenebrionini, according to my terminology, have the following basic parts: Dorsal sclerite or tergum, ventral sclerite, dorsoventral connecting membrane. The lateral areas of the dorsal and ventral sclerites are called merely lateral areas, without the confusing reference to pleuron, epipleural region, or hypopleural region.

Description of Larvae, probably Tauroceras cornutum (F.), from Jamaica

Tenebrionine; elongate, straight, cylindrical; relatively heavily sclerotized, especially ninth abdominal segment; overall color dark yellow, except dark brown on head and anterior sinuous sulci of dorsal sclerites, with dorsal sclerites of abdomen having progressively more surface dark brown proceeding from first to eighth so that most of eighth dorsal sclerite is dark brown, ninth abdominal segment completely dark brown. Total length, 25 to 45 mm.

Cranium (Fig. 1) rounded, exerted, broader than long. Epicranial halves meeting posteriorly, at point of contact very short and without sulcus; each half with dense, long, erect setae anterolaterally and anteroventrally, with dense, small punctures dorsoposteriorly. Gula distinct, coriaceous, parallel-sided. Frons composed of two parts, separated by an unpigmented area medially and short sulci laterally; the anterior or epistomal part short, very broad, with dense, erect setae; posterior part vaguely triangular, with lateral borders obtusely angulate at half length, without setae; posteriorly almost attaining occiput. Clypeus strongly transverse, lateral borders covering anteriorly; with dense, confused, erect setae. Eyes indistinct, with whitish hemispherical area just posterior to antennal socket having vague indications of three ocelli. Antenna (Fig. 7) of moderate size; first segment simple, with short setae distally, second segment slightly longer than first, gradually expanded from base to half length, then asymmetrically rounded distally, apical area smooth but showing a darker reticulate pattern on the lighter surface, with minute setae apically; third segment very small, easily overlooked, with 2 minute setae.

Labrum in situ subhemispherical in dorsal view. Aboral surface (Fig. 1) with many confused setae of moderate length, though the posterior setae much longer than others. Adoral surface (Fig. 2) with 3 pairs of long, coarse, depressed, medially directed setae on anterior border; lateral areas pigmented, with confused, short, appressed setae; with large oval central area lightly pigmented, this area ringed with dark, short pile on all but posterior border; posterior border with sharp, asymmetrical, coarse carinae; central area with very short, stout, medially directed seta on lateral border and with a few, usually 3, small sensory organs just medial to each seta; base of adoral surface with pair of thickened sclerotized elongate plates forming a shallow trough, this trough with approximately 8 small sensory organs. *Mandibles* (Figs. 3 and 4) stout, with acute, trifid apex, moderately asymmetrical; dorsal apical tooth on left mandible more basal and blunt than on right mandible; all other teeth on both mandibles acute; middle tooth longest; without tooth in space between 3 apical teeth and molar area; lateral dorsal border of each mandible moderately angulate, in cross section, not sharp, not explanate, with long, dense, undifferentiated setae; lateral area without membranous elevation. *Maxilla* of moderate length. Aboral surface (Fig. 5) having mala and stypes fused, with confused short to very long setae, narrowed basally but truncate at extreme base; cardo large, with a large hemispherical posterior part and a smaller subtriangular anterior part; articulating area large, approximately semicircular. Adoral surfaces (Fig. 6) having mala sclerotized, stout, apically subtruncate, medial surface with border of stout, short setae apically and longer coarse setae basally; otherwise with confused

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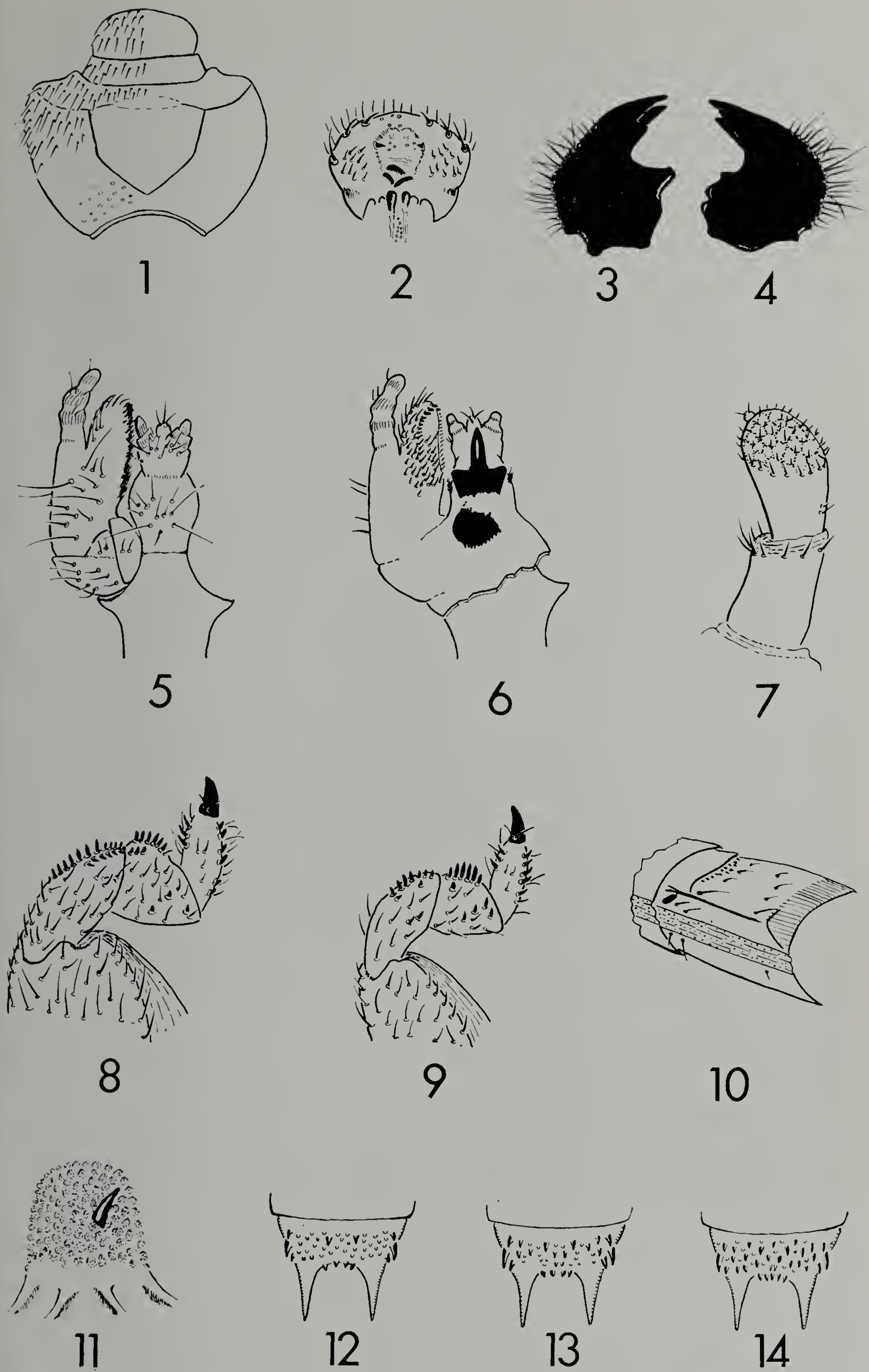
FIGURES 1-12. Larva, probably *Tauroceras cornutum* (F.) 1—Cranium, with labrum attached, dorsal view. 2—Labrum, adoral view. 3—Left mandible, dorsal view. 4—Right mandible, dorsal view. 5—Right maxilla and labium, aboral view. 6—Left maxilla and labium, adoral view. 7—Left antenna, dorsal view. 8—Left prothoracic leg, posterior view. 9—Left mesothoracic leg, posterior view. 10—1st abdominal segment, posterolateral view. 11—Tubercle of 9th abdominal dorsal sclerite, posterior view. 12—9th abdominal dorsal sclerite, dorsal view.

FIGURE 13. Larva, probably *Tauroceras* sp. A. 9th abdominal dorsal sclerite, dorsal view.

FIGURE 14. Larva, probably *Tauroceras* sp. B. 9th abdominal dorsal sclerite, dorsal view.



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setae, those at apex being long; remainder of surface membranous except near lateral borders, with separation of sclerites obscure except near lateral borders. Palpus extending beyond apex of male. Palpifer small, merely a small sclerotized band. *Labium* of moderate length. Aboral surface (Fig. 5) having mentum comparatively long, approximately as wide anteriorly as posteriorly and with confused, long setae; submentum and gula fused; ligula with short fingerlike projection, of approximately same shape and size as last segment of palpus. Adoral surface (Fig. 6) with very large hypopharyngeal sclerome, body of which is transverse and weakly bisinuate on anterior border from which emanates a long, anteriorly directed, sharply sulcate process; posterior to sclerome is an asymmetrical, strongly sclerotized, raised area. Palpus with short, simple segments.

Prothorax long; dorsal sclerite without anterior sulcus; without posterolateral sulcus; with posterior longitudinally striated band; with 3 vague transverse rows of a few, very long, slender setae; laterally without longitudinal line; eusternum with short setae medially. *Mesothorax* shorter, length approximately half length of prothorax; dorsal sclerite with anterior sulcus; without posterolateral sulcus; with posterior longitudinally striated band; laterally with very vague longitudinal line; with very large ovate spiracle; with 2 transverse rows of setae, anterior row with approximately 6 short setae, posterior row with 4 long setae; eusternum with long dense setae anterior to coxae and medially. *Metathorax* longer than mesothorax, length approximately two-thirds length of prothorax; otherwise like mesothorax. *Anterior sulcus* of dorsal sclerites of mesothorax, metathorax, and abdominal segments 1-8 as follows: Weakly sinuous, deep, dark brown, located on anterior border of sclerite; with sharp anterior border and moderately delimited posterior border; with numerous slitlike punctures, each of which is surrounded by a dark brown elliptical area; sulcus short medially and laterally where it contains one row of punctures, but long otherwise where it contains 2 or 3 rows of punctures; laterally sulcus almost joining longitudinal line. *Abdominal segments 1-8* (Fig. 10) with length approximately two-thirds length of prothorax; with anterior sulcus; with distinct longitudinal line; with elliptical spiracle on anterolateral corner of dorsal sclerite, just ventral to longitudinal line, size of spiracle of first segment two-thirds size of mesothoracic spiracle, size of spiracle of segments 2-8 half size of mesothoracic spiracle; with posterior longitudinally striated band; with posterolateral sulcus on lateral portions of longitudinally striated band, curving from anterior border of band to posterolateral corner of band; with 2 transverse rows of setae, anterior row with approximately 5 short setae, posterior row with 4 long setae; ventral sclerites with long seta on each of four corners, first sclerite with dense setae on anterior third, sclerites 2-8 with dense setae on anterolateral corners only. *Abdominal segment 9* (Fig. 12) with a very large dorsal sclerite, forming the apex of the abdomen, having a pair of urogomphi, and with a small ventral sclerite. Urogomphi long, slender, smooth, straight, very sharply acuminate. Dorsal surface of dorsal sclerite with many small tubercles; each tubercle (Fig. 11) with basal struts, a domelike granulate surface, and a very small, stout seta arising posteriorly. Dorsal surface also with a pair of short, curved spines near midline, and with 3 longer spines laterally at base of each urogomphus, middle spine of triad being longest; surface between urogomphi with approximately 8 very short spines. Dorsal sclerite with anterior border and all of ventral surface with dense, long, erect setae. Ventral sclerite forming a flaplike operculum for the segment, with dense, long, erect setae. Posterior body opening containing no papillae, containing only anus.

Prothoracic leg (Fig. 8) large. Coxa with confused, bristlelike setae. Trochanter long, with 2 unequal rows of short, very coarse setae along distal half of ventral surface; otherwise covered with long, confused, bristlelike setae. Femur very stout, on ventral border incrassate, with 2 unequal rows of short, very coarse setae; posterior surface near dorsoapical angle with 3 widely spaced, very short, stout setae; otherwise with dense, confused, bristlelike setae. Tibiotarsus with posteroventral surface bordered by very coarse setae; this surface with very few setae. Pretarsus very stout, with 2 small setae ventrally. *Mesothoracic leg* (Fig. 9) smaller, approximately four-fifths size of prothoracic leg. Coxa with confused, bristlelike setae. Trochanter long, with 2 rows of short, very coarse setae along distal half of ventral surface, these rows with fewer setae than on protrochanter, and a few, very short setae on distal area of posterior surface. Femur stout, ventral border not incrassate, with approximately 6 long, coarse setae; just posterior to this row is 1 very short, coarse seta; posterior surface near dorsoapical angle with 4 short, stout setae. Tibiotarsus with posteroventral surface bordered anteriorly by very coarse setae; this surface with very few setae. Pretarsus very stout, with 2 small setae ventrally. *Metathoracic leg* similar to mesothoracic leg.

Specimens examined. JAMAICA: Montego Bay, 1910, E. A. Andrews leg., 2 larvae; rotten log across stream, St. Thomas, February 8, 1937, E. A. Chapin and R. E. Blackwelder leg. (Station No. 392), 2 larvae; in rotten stump, at ford one mile S. E. of Stony Hill, April 29, 1941, E. A. Chapin leg. (Station No. 526), 2 larvae.

Tauroceras cornutum has been recorded in the literature from Jamaica and South America, the latter without more definite locality.

Description of Larvae probably Tauroceras sp. A, from Brazil

Similar to larva, probably *Tauroceras cornutum* (F.), from Jamaica, but differing as follows: Dorsal sclerite of 9th abdominal segment (Fig. 13) having spines more numerous and slightly longer; with 3 curved spines between median pair and lateral triad; with 2 pairs of small spines ventral to median pair but dorsal to spines between urogomphi. Total length, 45 to 55 mm.

Specimens examined. BRAZIL: Therezopolis, Organ Mts., Estado de Rio de Janeiro, Paul Sandig leg., 2 larvae.

The following species of *Tauroceras* are recorded from South America: *angulatum* (Perty), from Brazil and Argentina; *aries* Dalman, from Brazil; *cornutum* (F.), from South America; and *nitidum* Pic, from Brazil.

Description of Larva, probably Tauroceras sp. B, from Honduras

Similar to larva, probably *Tauroceras cornutum* (F.), from Jamaica, but differing as follows: Dorsal sclerite of 9th abdominal segment (Fig. 14) having spines on whole dorsal surface much more numerous and longer, more so than on larva, probably *Tauroceras* sp. A, from Brazil; tubercles smaller than on other larvae and less numerous than spines; many spines with basal struts similar to struts of tubercles; with obvious, short, stout seta arising on posterior surface of each spine. Total length, 57 mm.

Specimens examined. HONDURAS: Subizana, Yoro, Staddmann leg., 1 larva.

Tauroceras angulatum (Perty) has been recorded from Mexico, British Honduras, Guatemala, Nicaragua, Brazil, and Argentina. It is the only species of the genus recorded from Central America. Perhaps the larva described above could by a process of elimination be identified as *angulatum,* but I prefer to put an indefinite determination label on it because of the possible existence of undescribed species in the large tenebrionid fauna of Central America.

Literature Cited

St. George, R. A.
1924. Studies on the larvae of North American beetles of the subfamily Tenebrioninae with a description of the larva and pupa of *Merinus laevis* (Olivier). Proc. United States Natl. Mus. 65(1): 1-22, figs. 1-68.

SNODGRASS, R. E.
1935. Principles of insect morphology. New York and London: McGraw-Hill Book Company, Inc.

SPILMAN, T. J.
1962. The new world genus *Centronopus,* with new generic synonymy and a new species (Coleoptera: Tenebrionidae). Trans. American Ent. Soc. 88: 1-19, 8 figs.

WADE, J. S. and BØVING, A. G.
1921. Biology of *Embaphion muricatum.* Jour. Agric. Res. 22(6): 323-334, 3 figs., 2 pls.

CONFUSED WATER BEETLES (COLEOPTERA: DYTISCIDAE)

On October 18, 1958, I was engaged in that onerous chore of painting storm window frames. The windows were placed horizontally on saw-horses, about 3 feet off the ground, under the open sky, but in the shade of a tall tree. The day was bright and clear with a moderate southeast breeze. The temperature was around 70° F.

About 2 o'clock I began to be annoyed by beetles landing on the glass with a distinct "plink" and skidding into the paint. I absentmindedly lifted the first few out of the sticky paint and tossed them away. Suddenly I realized that most of them were a single species of small predaceous diving beetle.

It is well known that most dytiscids have the hind legs highly modified for swimming, and are "awkward in locomotion on land," according to Balduf (1935, Bionomics of Entomophagous Coleoptera, p. 30). Thus when they hit the glass they would skid into the paint. It would seem that these beetles were mistaking the horizontal window pane for water. Essig (1942, College Entomology, p. 538) notes that dytiscids are "attracted to bright tin roofs and automobiles." Between 2 and 4 P.M. fifteen specimens of *Laccophilus fasciatus* Aubé were collected from the storm window glass. Only two terrestrial beetles landed on the window during this time; one specimen each of *Meibomeus musculus* (Say) (Bruchidae) and *Tritoma humeralis* Fab. (Erotylidae).

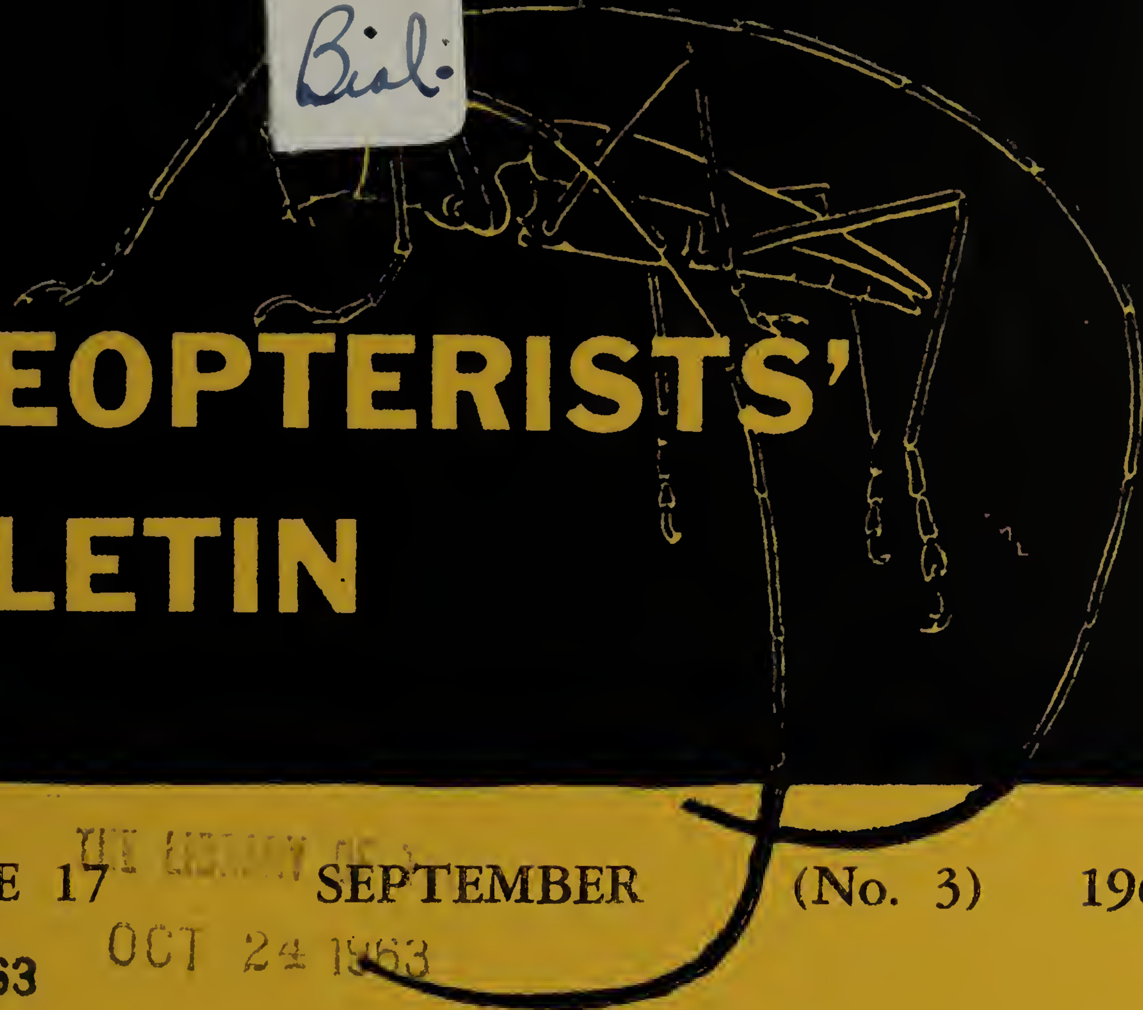
The dytiscids were coming in from the southeast with the prevailing breeze. Probably they were migrating, as Balduf (*op. cit.,* p. 31) says they migrate "mostly by day in spring and autumn, and at night in summer." The nearest large body of water is almost 2 miles to the southeast, but there are smaller ponds nearer in other directions.

The use of glass as a method of collecting dytiscids is not being recommended, but the incident seems to show that at least one species may confuse glass with water under certain conditions. Also, it may indicate that these beetles find new water areas by sight and not by the use of some other sense.

Appreciation is expressed to P. J. Spangler for confirming the identification of the dytiscids, and to J. M. Kingsolver for determining the other two beetles.—GARLAND T. RIEGEL, *Dept. of Zoology, Eastern Illinois University, Charleston, Ill.*

A more cautious taxonomist would have talked of similarity rather than relationship. Taxonomists . . . too often say "related" when they should say "similar to." —Darlington, 1957, Zoogeography, p. 27.

THE COLEOPTERISTS' BULLETIN



VOLUME 17 SEPTEMBER (No. 3) 1963

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

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A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 17 September (No. 3) 1963

A NEW SPECIES OF THE GENUS DICERCA (COLEOPTERA: BUPRESTIDAE)

By G. H. NELSON[1]

While making a revisionary study of the genus *Dicerca* the following new species was recognized. This is described below in order that the name will be available for use elsewhere. Thanks for the loan of material are due all institutions and individuals listed as collections in which paratypes are deposited.

Dicerca frosti Nelson, NEW SPECIES
(FIGS. 1, 2, 3)

Form broad and moderately convex, elytral tips entire, produced; brassy above and below with elytral apices and parts of legs frequently coppery; elytral disk with few weakly raised black areas on intervals; male mesotibia without tooth but slightly dilated on inner margin; female last abdominal sternite tridentate.

MALE HOLOTYPE: Head with front slightly concave, coarsely, rugosely punctured with two irregular, longitudinal, raised areas on vertex; clothed with moderately long, erect, whitish hairs; clypeus broadly, arcuately emarginate; eyes more broadly separated below than above; antenna reaching to middle of lateral pronotal margin, first segment large, elongately globose, second segment rather short and dilated, third slightly longer than second and relatively less dilated, segments serrate from fourth segment distalward, terminal segment rounded at tip.

Pronotal width to length ratio 1.77 to 1, lateral margins gradually expanded from base to widest point just anterior to middle, then strongly convergent to narrowest point at acute anterior angles, anterior margin emarginate, posterior margin sinuate, hind angles rectangular; disk coarsely, rugosely punctured with smooth raised areas as follows; irregular callus on each side midway from lateral margin to midline partially interrupted by oblique, punctate depression and pair of distinct longitudinal callosities separated by punctate median channel which is more depressed posteriorly; punctate areas with short, sparse, recumbent white hairs. Scutellum rounded, surface concave at center.

Elytra with sides slightly sinuate, widest point at middle, then tapering to moderately produced apices, tips bluntly truncate, inner angles slightly produced; surface rugosely punctured, striae distinct, intervals convex with a few elongate, smooth, black areas, intervals carinate toward apices; punctate areas sparsely clothed with short, recumbent, white hairs.

Prosternum rugosely punctured, prosternal process with concave channel, concavity transversely rugose and laterally bordered by prominent smooth carinae, punctured areas densely clothed with moderately long, erect, white hairs; mesosternum

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and metasternum rugosely punctured, more finely so in median concave channel which is laterally bordered by relatively impunctate smooth areas, punctured areas clothed with erect white hairs, especially dense in channel; antecoxal piece with narrow median carina; mesotibia with dilation but no tooth on inner margin.

Abdomen beneath rugosely punctured, especially laterally, more smooth medially, punctures with recumbent white hairs; first sternite concave at base, last sternite emarginate with very short truncate lobe in emargination and with smooth area at middle of base and two longitudinal smooth areas apically.

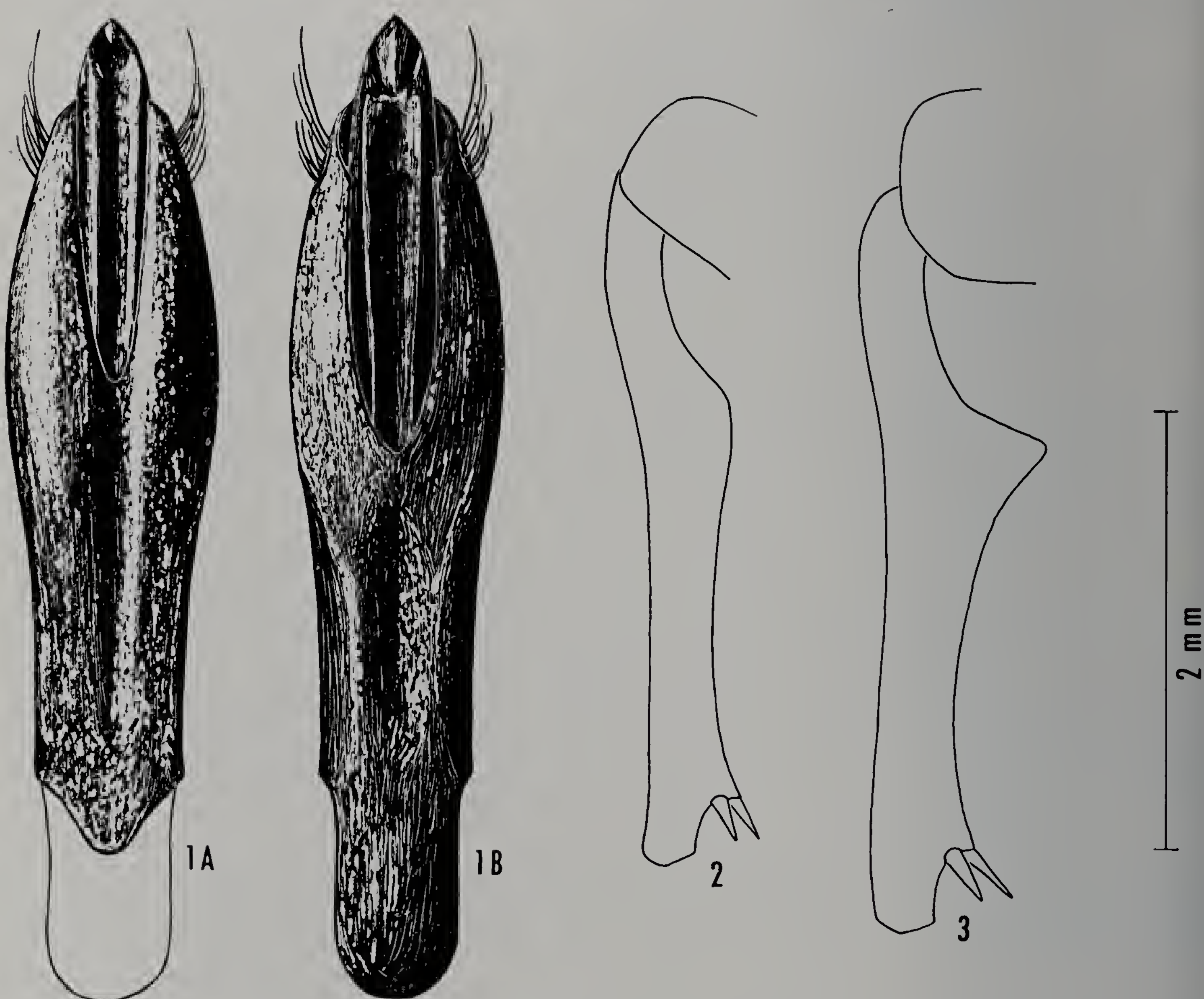
Length: 16.5 mm.; Width: 6.0 mm.

Genitalia (Figs. 1, 2) similar to that of *callosa* Csy. with lateral lobes gradually tapering to apex, median lobe tapering sharply toward apex.

FEMALE ALLOTYPE: Differs from male in being less hairy beneath, lacking dilation on mesotibia and having last abdominal sternite tridentate.

Length: 17.7 mm.; Width: 6.7 mm.

Holotype, male, from OREGON, Harney Co., Steens Mts., June 26, 1922, in collection of the California Academy of Sciences, Entomology, San Francisco. *Allotype,* female, from NEVADA, 10 mi. north of Paradise, June 22, 1941, Ira La Rivers, in collection of the author.



FIGURES 1-2, *Dicerca frosti* new species. 1—Male genitalia, a-dorsal view, b-ventral view. 2—Right male mesotibia.

FIGURE 3, *Dicerca tenebrica* (Kirby). Right male mesotibia.

Paratypes, 153 males and 183 females from: BRITISH COLUMBIA: 1♀, Nicola, May 30, 1923, P. N. Vroom; 2♂♂, 1♀, Salmon Arm, July 2, 1942, August 20, 1928, Hugh B. Leech; 1♂, Copper Mountain, June 9, 1928, G. Stace Smith; 1♂, Chilcotin, June 18, 1923, E. R. Buckell; 2♀♀, Kamloops, June 17, 1942, J. Holland, June 14, 1950, J. Deeble; 1♀, Aspen Grove, July 14, 1927, P. N. Vroom; 3♀♀, Vernon, June 11, 1923, E. P. Venables, June 8, 1918, W. B. Anderson, July 31, 1923, D. G. Gillespie; 1♀, Merritt, September 9, 1924, E. A. Rendell; 1♀, Penticton, August 25, 1924, W. Downes; 2♀♀, Seton Lake, Lillooet, June 24, 1917, June 5, 1926, J. McDunnough; 1♂, 1♀, Summerland, June 3, 1932, June 12, 1932, A. N. Gartrell; 1♂, Lavington, June 30, 1938, G. H. Hopping; 1♂, 4♀♀, Midday Valley, Merritt, June 24, 1924, K. F. Auden, July 16, 1926, Wm. Mathers, July 28, 1923, R. Hopping, June 5, 1921, July 12, 1929; 1♀, Kay Falls, July 18, 1925, R. Hopping; 1♂, Trail, June, 1902, J.M.M.; 1♀, 4 mi. west of Princeton, Yale Region, June 3, 1957, E. I. Schlinger. ALBERTA: 1♂, Waterton, July 4, 1924, H. L. Seamans; 1♀, Blairmore, July 16, 1930, J. H. Pepper. MONTANA: 1♀, Two Glacier Lodge, Glacier National Park, July 6, 1938; 2♀♀, Helena, July 10, 1907, July 21, 1907. WYOMING: 1♂, Jackson Hole National Monument, July 22, 1948, F. M., F. S. and V. S. Beer; 1♂, National Park, July 31, Hubbard and Schwarz; 1♀, Yellowstone National Park, July 7, 1926, H. E. Burke; 1♀, Yellowstone, June 22, 1941, G. P. Mackenzie; 1♂, Freemont Lake, July 25, 1947, Bryant. COLORADO: 2♀♀, labelled simply COL.; 1♀, April 4, 1885; 1♀, Black Mesa, July 23, 1921; 1♀, Yampa, August, P. Laurent. UTAH: 1♂, no further data; 1♀, Logan, June 24, 1933, L. Green; 1♀, Park City, June 17, Hubbard and Schwarz; 1♀, Wasatch Mountains, Mt. Timponogos, 8-9000 feet, June 6, 1926, E. C. Van Dyke; 1♀, Aspen Grove, Mt. Timponogos, July 6, 1935; 3♂♂, Beaver Creek, Kamas, July 4, 1922, E. P. Van Duzee; 1♀, Strawberry Valley, June 7, 1934, E. W. Anthon; 2♂♂, Navajo Lake, June 18, 1940, R. M. Bohart. IDAHO: 1♀, Little Salmon Meadows, August 11, 1940, F. M. Beer; 1♂, Spencer, June 17, 1898; 1♂, Beaver Canyon, July 23, Hubbard and Schwarz; 2♀♀, Rocky Bar, 6000 feet, June 7, 1937, H. P. Lanchester; 2♀♀, McCall, June 24, 1938, H. P. Lanchester; 1♀, Ketchum, 6500 feet, July 12, 1929; 1♂, 11 mi. northwest of Ketchum, July 4, 1953, E. Hall; 1♂, 10 mi. north of Ketchum, July 5, 1940, E. S. McCluskey. OREGON: 1♂, 4♀♀, Harney Co., Steens Mountains, Fish Lake, July 13, 1953, Roth and Beer, July 9, 1953, July 11, 1961, J. H. Baker; 4♂♂, 6♀♀, Steens Mountains, June 24, W. J. Chamberlin, June 23, 24, 25, 1922; 1♀, Grant Co., Canyon Creek Pass, June 13, 1946, F. M. Beer; 1♀, Baker Co., Pine Creek, July 7, 1946, F. M. Beer; 10♂♂, 2♀♀, Summit Prairie, July 23, 1939, Schuh and Gray; 1♂, Blue Mountains, Tollgate Road, June 7, 1938; 1♀, Lake Co., Bull Prairie, 7000 feet, July 23, 1932, D. K. Frewing. NEVADA: 1♂, same data as allotype, 1♂, same place and collector, June 20, 1941; 1♀, Lake Tahoe, August (3-10), 1956, A. C. Cole; 1♂, 1♀, Ruby Mountains, Lamoille, July 11, 1954, A. C. Cole, June 25, 1941, Ira La Rivers; 1♂, 1♀, Ruby Mountains, Lamoille Canyon, Thomas Canyon Camp Ground, June 20, 1960, C. L. Hogue; 1♀, Washoe Co., Thomas Creek, 6000 feet, May 4, 1958, F. D. Parker. CALIFORNIA: 1♂, 2♀♀, Phillips, August 4, W. J. Chamberlin;

1 ♀, Pyramid Ranger Station, H. E. Burke; 1 ♀, Lundy, 7-8000 feet, July 8, 1910, Wickham; 1 ♂, 1 ♀, Fallen Leaf Lake, July 14, 1925; 1 ♂, Vade, H. E. Burke; 1 ♀, Howland Flat, July 11, 1953, R. L. Lyon and G. R. Struble; 1 ♀, Tallac; 1 ♀, Sierra Co., Weber Lake, June 17, 1940, M. Cazier and T. Aitken; 1 ♂, Plumas Co., 10 mi. south of Johnsville, June 12, 1961, J. S. Buckett; 6 ♂ ♂, 12 ♀ ♀, Plumas Co., Buck's Lake, June 23, 1949, L. L. Jensen, J. W. MacSwain and H. A. Hunt, July 1, 1949, A. S. Deal, July 14, 1949, W. W. Middlekauff, J. W. MacSwain and R. C. Bechtel, August 9, 1949, J. W. MacSwain; 1 ♀, Lassen Co., 2 mi. northwest of Blue Lake, July 19, 1947, R. L. Usinger; 1 ♂, Mount Lassen National Park, July 1, 1937, Harold Madsen; 1 ♂, 1 ♀, Lassen National Park, Kelly's Resort, June 13, 14, 1931; 1 ♂, 1 ♀, Modoc Co., Lassen Creek, near Davis Creek, July 27, 1957, W. R. Bauer and J. S. Buckett; 1 ♀, Modoc Co., 5 mi. northeast of Clear Lake, July 10, 1960, D. Q. Cavagnaro; 1 ♀, Upper Echo Lake, 7400 feet, July 6, 1931, E. O. Essig; 1 ♀, Echo Lake, Tahoe, July 8, 1915; 1 ♀, Alpine Co., Hope Valley, July 9, 1948, D. Carter; 1 ♂, Alpine Co., Monitor Pass, July 7, 1959; 1 ♀, Mono Co., Twin Lakes, July, 1930; 1 ♂, 2 ♀ ♀, Mono Co., Walker River, June 25, 1937; 1 ♂, Mono Co., Leavitt Meadow, July 4, 1960; 1 ♂, 5 ♀ ♀, 2 mi. west of Leavitt Meadow, July 4, 1960; 1 ♂, Mono Co., Whiskey Creek, 7300 feet, June 24, 1938, Fleschner; 1 ♂, 1 ♀, Mono Co., Pickel Meadow, August 16, 1960, M. E. Irwin, August 11, 1960, A. S. Menke; 1 ♀, Mono Lake, June 3, 1921, Corinne Hilton; Truckee, 6 ♂ ♂, 5 ♀ ♀, July 6, 1927, E. P. Van Duzee, July 24, 1909, F. X. Williams, June 18, 1936, E. D. Algert; 2 ♂ ♂, 4 ♀ ♀, Trinity Co., Nash Mine, 500 feet, June 13, 1913; 2 ♂ ♂, 3 ♀ ♀, Trinity Co., Carrville, 2400-2500 feet, May 22, 26, 30, June 2, 1934, J. W. Seapy; 1 ♂, Trinity Co., Big Flat, Coffee Creek, June 21, 1934; 1 ♂, McCloud, July 6, 1914; 1 ♀, Mammoth Lake, July 15, 1933, R. M. and G. E. Bohart; 1 ♀, Deer Park Inn, July 17, 1898; 1 ♀, Sequoia National Park, June 5-18, 1960, B. McFarlane; 1 ♂, Sequoia National Park, Wolverton, 7000-9000 feet, June 24, 1929; 1 ♂, El Dorado Co., Meyers, 6300 feet, June 28, 1930, A. T. McClay; 1 ♂, 1 ♀, 3 mi. south of Meyers, Highway 89, August 3, 1960, G. H. Nelson; 3 ♂ ♂, 3 ♀ ♀, Eldorado Co., 3 mi. west of Luther Pass, Alpine Camp Ground, July 8, 1959; 1 ♀, Inyo Co., Lone Pine, June 20, 1937, L. D. Phillips; 71 ♂ ♂, 62 ♀ ♀, Fresno Co., Badger Flat, Huntington Lake, 8000 feet, June 27, 1948, July 23, 25, 1936, July 24-28, 1937, July 20, 21, 26, 27, 1940, all collected by A. T. McClay; 2 ♂ ♂, Huntington Lake, 7000 feet, July 7, 22, 1919, E. P. Van Duzee; 1 ♂, 2 ♀ ♀, Nevada Co., Sagehen Creek, near Hobart Mills, June 29, 1962, R. J. Gill. ARIZONA: 1 ♀, Kaibab National Forest, June 17, 1925, M. W. Blackman; 1 ♀, Flagstaff, July 30, 1938, D. J. and J. N. Knull.

Paratypes are deposited in the collections of: American Museum of Natural History, California Academy of Sciences, Canadian National Collection, Colorado State University, Los Angeles County Museum, Museum of Comparative Zoology (C. A. Frost collection), Ohio State University, The Royal Ontario Museum, U. S. National Museum, University of Arizona, University of California at Berkeley, University of California at Davis, University of California at Riverside, University of Idaho, University of Washington (M. H. Hatch), J. H. Baker, W. F. Barr, F. M. Beer, D. K. Duncan, J. R. Helfer, H. F. Howden, J. N. Knull, Ira La Rivers, Frank H. Parker, Joe Schuh, D. S. Verity, George Walters, R. L. Westcott, and the writer.

HOST: *Dicerca frosti* has been taken in various parts of its range from *Populus tremuloides* Michaux which is probably its host tree.

Dicerca frosti closely resembles *D. callosa* Csy., *D. tenebrica* (Kby.) and *D. hesperoborealis* Hatch and Beer. From *callosa, frosti* differs in its relatively wider pronotum (width to length an average ratio of 1.76 to 1 in male, 1.81 to 1 in female while in *callosa* it is 1.56 to 1 in male and 1.61 to 1 in female), seventh antennal segment longer than broad in *frosti* but broader than long in *callosa.* From *tenebrica* it differs in its relatively wider and more coarsely punctured pronotum (in *tenebrica,* the width to length is an average ratio of 1.61 to 1 in male and 1.64 to 1 in female); in its male mesotibia (fig. 3), which has only a dilation on inner side, while that of *tenebrica* (fig. 4) is toothed; and male genitalia (figs. 1, 2) are different. From *hesperoborealis* it differs by lacking the prominent median groove of the antecoxal piece which is characteristic of *hesperoborealis,* by lacking a tooth on male mesotibia, and in shape of male genitalia.

The males of *Dicerca frosti* range from 14.5 to 20.0 mm. in length (Ave.=17.6 mm.) and from 5.0 to 7.2 mm. in width (Ave.=6.4 mm.); the females from 14.5 to 20.7 mm. in length (Ave.=18.7 mm.) and from 5.2 to 7.7 mm. in width (Ave.=6.8 mm.).

This species is gratefully named for the late C. A. Frost who did much to help stimulate the author's interest in beetles.

In Casey's (1909) key to the species of *Dicerca* of America, *D. frosti* does not key out satisfactorily to any species. It runs to either Group II or Group V and has no close similarity to any species in either group.

Literature Cited

Casey, T. L.
1909. Studies in the American Buprestidae. Proc. Washington Acad. Sci. 10(2): 47-178.

LITERATURE NOTICE

CONTRIBUTO ALLA CONOSCENZA DELLA MORFOLOGIA LARVALE DEL COLEOTTERO DASCILLIDE DASCILLUS CERVINUS L., by Rodolfo Zocchi. Studi Sassaresi (Sezione 3) 9(2):430-445, 10 figs., 1 pl., 1961.—Besides the titular material, the author gives a short review of the position of the family in past classifications and some of his new ideas.

SECONDARY SEXUAL DIMORPHISM IN COTINIS NITIDA L. (COLEOPTERA: SCARABAEIDAE)

By MICHAEL A. GOODRICH[1]

In work on a revision of the genus *Cotinis* Burmeister I dissected the genitalia of many specimens of *C. nitida* and found several external sexual differences. A few earlier workers have commented on external differences of the sexes in *Cotinis*. Bates (1889) and others mention a broader, more robust figure for females and a more slender shape for males in several species. Casey (1915) states that "sexual modifications are few and feeble and reside in the dentition of the anterior tibiae, sometimes also in the longitudinal abdominal impression of the males and relative lengths of the hind tarsi." Nichol (1935) states that in *C. texana* Casey (a species I believe to be a synonym of *C. mutabilis* Gory & Percheron) the sexes can be easily distinguished by differences in the terminal abdominal segment. In females the ventral sclerite of the terminal abdominal segment is armed with bristles and is transversely sculptured, while in males the medial area of this sclerite is almost entirely smooth.

Neither Bates nor Casey made a careful systematic study of secondary sexual differences. In fact, neither author appears to have dissected any specimens to determine sex.

METHOD

Fifty specimens of *C. nitida* from several localities in the northeastern United States were dissected and examined for external sexual differences. Particular attention was directed toward the dentition of the anterior tibiae and the relative lengths of the hind tibiae and tarsi, the development of the clypeal horn, overall size and shape, and the sculpture and pubescence of the pygidium. Micrometer measurements of the relative lengths of hind tibiae and tarsi were made at 10X magnification with a Bausch & Lomb dissecting microscope.

In comparing the dentition of the anterior tibiae a code system was used. It was as follows: A—3 teeth, all well developed and equally spaced; B—3 teeth, the uppermost reduced and somewhat removed from the other two; C—2 teeth. D—dentition further reduced.

In such a ranking, specimens with worn down tibial teeth must be excluded. Such specimens occur regularly in collections and are easily recognized. Of course, all degrees of development were observed, and where a particular example could not be clearly placed in one of the categories, the designation A-B or B-C was used. Subsequently 12 specimens from San Antonio, Texas (the extreme southwestern range of the species) were examined for the same sexual differences seen in the northern population.

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Results and Discussion

Secondary sexual dimorphism was demonstrated by the study. The dentition of the anterior tibiae is distinctly different. In females, the anterior tibiae each show three distinct teeth (Fig. 1) in all but two of 23 specimens. In males, the uppermost tooth is clearly reduced in size and sharpness and distinctly separated from the other two teeth (Fig. 2), or is still further reduced, in all but two of 27 specimens.

The relative lengths of hind tibiae and tarsi are different (Fig. 3). In females the hind tibiae are longer than the corresponding tarsi in all but one of 23 specimens, whereas in males the hind tarsi are longer than their respective tibiae in all but two of 27 specimens.

Fig. 1

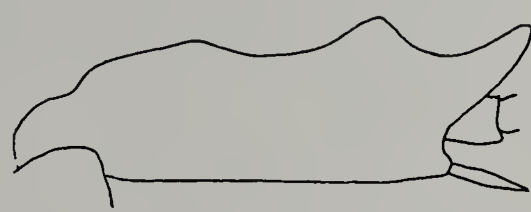

Fig. 2

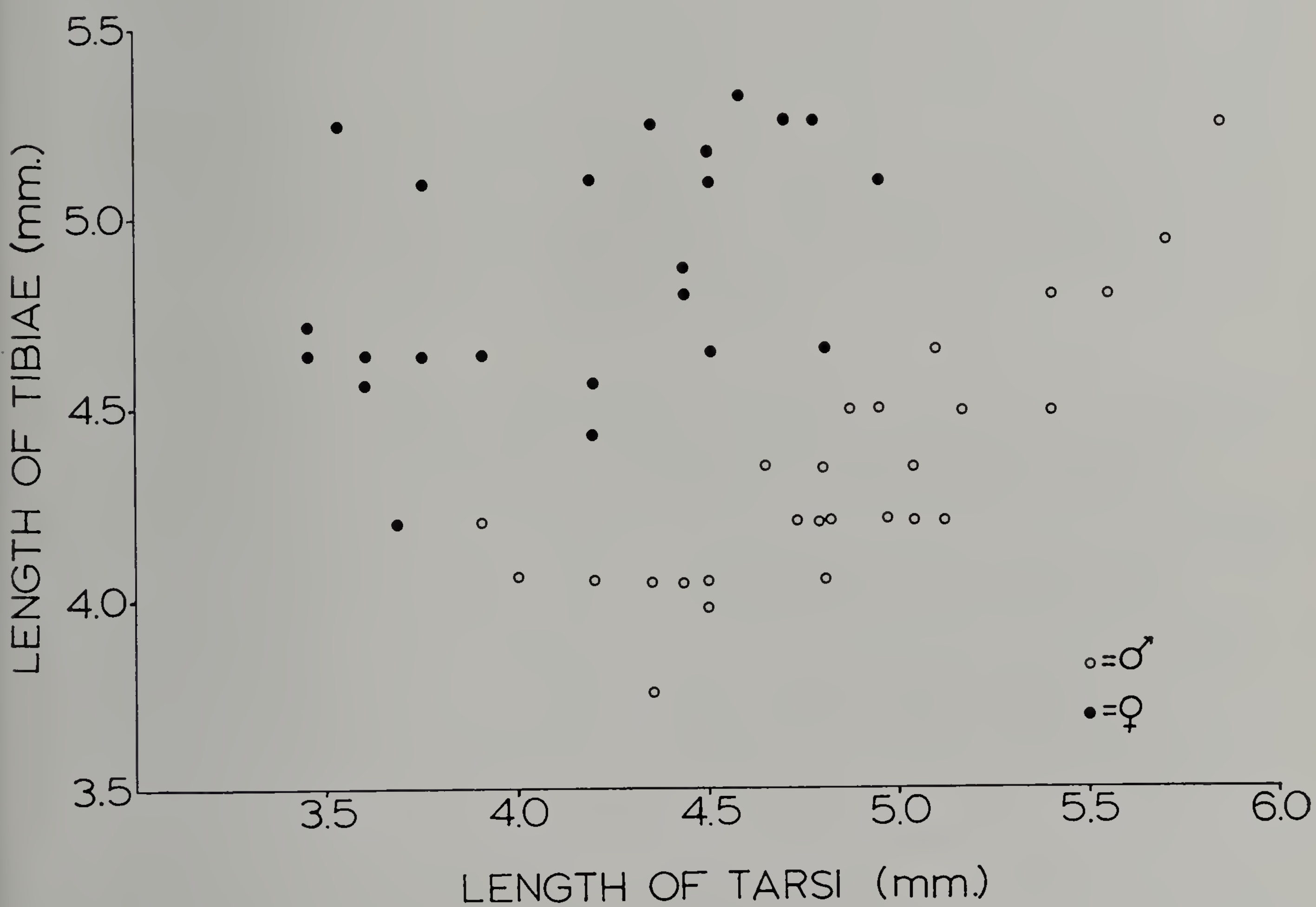

Fig. 3

Figures 1-3, *Cotinis nitida* L. 1— Left anterior tibia of female (tibial type A). 2—Left anterior tibia of male (tibial type B). 3—Scatter diagram of relative lengths of hind tibiae and tarsi in 23 females and 27 males.

The sexual difference in the pubescence of the last abdominal sternite described by Nichol (1935) for *C. texana* is also found in *C. nitida*. In *C. nitida* the median portion is almost smooth in males, and transversely sculptured and provided with yellow hairs in the female. This character, although distinct in a large series, is a relative difference and might prove difficult unless material already determined to sex is compared. Only these three characters were dependable in determining sex. The clypeal horn showed only a tendency of the distal end to be rounded in the female, more angulate in the male.

It has been suggested that females are larger and broader than males; however, this difference is so little as to be detectible only in large series of specimens. The difference in average size between series from various latitudes is far greater. Bates (1889) and Casey (1915) usually describe males of various species in *Cotinis* as narrower and tapering more sharply posteriorly than the females, but this character is at best deceptive and not at all constant.

The color pattern of *C. nitida* is highly variable, but these patterns are not correlated with sex.

The 12 specimens from San Antonio, Texas, had the same sexual dimorphism as in the eastern specimens.

I have attempted to determine if the secondary sexual characters of *C. nitida* occur in the other species in the genus. The sexual difference most applicable to the other species is the character of the terminal abdominal sternite described by Nichol (1935). However, some species do not show this difference, and in some species I have insufficient material to determine its applicability. The lengths of the hind tarsi and tibiae in the sexes appear to be similar, but accurate measurements of long series of each species would be required to prove this. Some reduction in the dentition of the anterior tibiae of the males is observed in other species.

Literature Cited

Bates, H. W.
1889. Pectinicornia and Lamellicornia. Biologia Centrali-Americana, Ins., Coleop. 1886-1890, 2(2):432 pp.

Casey, T. L.
1915. A review of the American species of Rutelinae, Dynastinae and Cetoniinae. Mem. Coleop. 6:1-394.

Nichol, A. A.
1935. A study of the fig beetle, *Cotinis texana* Casey. Univ. Arizona Agric. Expt. Sta. Tech. Bull. No. 55:157-198.

LITERATURE NOTICE

CONTRIBUTI ALLA CONOSCENZA DELLA ENTOMOFAUNA DELLA FERULA COMMUNIS L. III. TILLUS TRANSVERSALIS (CHARP.) (COLEOPTERA CLERIDAE), by Antonello Crovetti. Studi Sassaresi (Sezione 3) 9(2): 550-600, 23 figs, 1961.—More than half the pages are devoted to the biology of this beetle. The remainder concerns morphology of all stages and keys the larvae of the 3 Italian species of *Tillus*.

NOTES ON THE LIFE HISTORY OF ANTHONOMUS SYCOPHANTA WALSH (COLEOPTERA: CURCULIONIDAE),[1] WITH DESCRIPTIONS OF THE IMMATURE STAGES

By D. M. Anderson[2,3]

When B. D. Walsh described *Anthonomus sycophanta* in 1866, he included a number of observations he had made on the life history of the species, but he said very little about the immature stages. The purpose of this paper is to supplement the life-history notes given by Walsh with information gathered in the field by the author in New York State during the summers of 1956, '57, and '58, and to describe the immature stages, other than the egg, from material collected at that time. Some information taken from specimens of this species in the collection of the U. S. National Museum is also included here.

Distribution

The range of this species evidently extends over the major portion of the eastern and midwestern United States and eastern Canada, and into parts of the western portions of both countries, as there are specimens, all apparently representatives of *A. sycophanta,* in the collection of the U. S. National Museum from the following States and Provinces: Alberta, British Columbia, California, District of Columbia, Iowa, Kansas, Louisiana, Maine, Manitoba, Maryland, Massachusetts, Michigan, Missouri, Montana, Nebraska, New Jersey, New York, Ontario, Oregon, Pennsylvania, Quebec, Saskatchewan, Utah, Vermont, Virginia, Washington, and Wisconsin.

Life History

As established by Walsh (1866), this species breeds in willow leaf and twig galls made by various tenthredinid sawflies, principally of the genera *Pontania* and *Euura.* During late June and early July of 1956 and 1957, larvae, pupae, and adults of *A. sycophanta* were taken by the author from sawfly galls on *Salix fragilis* L. on the Cornell University campus at Ithaca, N. Y. Most of the galls agreed with the description given by Felt (1940) for the gall of *Pontania hyalina* Nort. (now *Pontania proxima* (Lep.), according to Benson, 1960). See Figure 9 for a photograph of one of these galls. In early July of 1957, larvae, pupae, and adults of this species were also taken from larger, more rounded willow-leaf galls, which agreed with Felt's description of the gall of *Pontania pomum* Walsh (now *Pontania*

[1] The author is following Blatchley and Leng (1916), who decided to use the name *Anthonomus sycophanta* Walsh for this species until the type of *Anthonomus haematopus* Boheman, of which *A. sycophanta* may be a synonym, can be examined.

[2] The author wishes to express his appreciation to Dr. J. G. Franclemont, Department of Entomology, Cornell University, for pointing out the presence of this species on willow leaves at Ithaca, N. Y., and for taking the photograph shown in fig. 9.

[3] Entomology Research Division, Agric. Res. Serv., U. S. Department of Agriculture, Washington, D. C.

hospes Walsh, according to Benson, 1960), near Hinsdale, N. Y. As described by Walsh (1866), the galls infested by the weevil had been hollowed out, were at least partly lined with frass, and, when more than one weevil was present, they were divided into cells (one cell for each individual) by partitions of frass. When an adult weevil was found in a gall, there was almost always a rounded emergence hole visible in the side of the gall. Whether such holes are made by the larvae before they pupate or by emerging adults could not be established from the material collected. The galls examined at Ithaca (a total of 188 galls) each contained a maximum of 3, usually only 1 or 2, weevil larvae, pupae, and/or adults. In the larger galls on the willows near Hinsdale, there was a maximum of 5 individuals per gall, and there were often 3 or 4 per gall in 39 galls infested (out of 142 examined). No eggs were found in the galls at either of the two localities, but punctures which had the appearance of oviposition holes were seen on the surface of many of the galls examined. On June 24, 1958, several *A. sycophanta* females were seen chewing holes in the willow-leaf galls near Hinsdale, but actual oviposition was not observed.

Many of the galls examined contained sawfly larvae, but, in agreement with Walsh's observations (1866), no weevil larvae were found in the same galls with sawfly larvae. The latter observation suggests that the weevil larvae kill the young sawfly larvae or else may themselves be killed by the latter.

In addition to immature and adult weevils and sawfly larvae, a few small lepidopterous larvae belonging to the families Blastobasidae and Olethreutidae[4] were observed in the galls. These larvae were usually found in the company of dead weevil larvae or pupae, or dead sawfly larvae, and the galls were usually lined with silk webbing, apparently spun by the caterpillars. Whether these caterpillars were acting entirely as scavengers is not clear. In one instance, a caterpillar was found in the same gall with a living weevil larva. Another lepidopterous larva was found in the same gall with two dead weevil pupae, one of which had evidently been partially eaten. In still another gall, containing a dead sawfly larva, a small caterpillar was found just beginning to spin its silk web.

No adult parasitic Hymenoptera or Diptera were found in the galls examined, and no attempt was made to rear them from unopened galls. However, a few small, legless, hymenopterous larvae, unidentified but assumed to be parasitic, were removed from some of the galls.

By early July, 1957, many of the weevil-infested galls examined at both localities contained pupae or adults, and by the last week of July, 1956 and 1957, most of the galls found on *Salix fragilis* at Ithaca were empty, except for a few adults taken from the galls on July 31, 1956.

The host records which follow were taken from adult specimens of *A. sycophanta* in the collection of the U. S. National Museum. The year of collection and name of collector were given with most of these specimens, but are not included here. "Reared from galls (? of *Pontania*) on willow,"

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[4] Identified to family by D. M. Weisman, Entomology Research Division, ARS, U. S. Department of Agriculture.

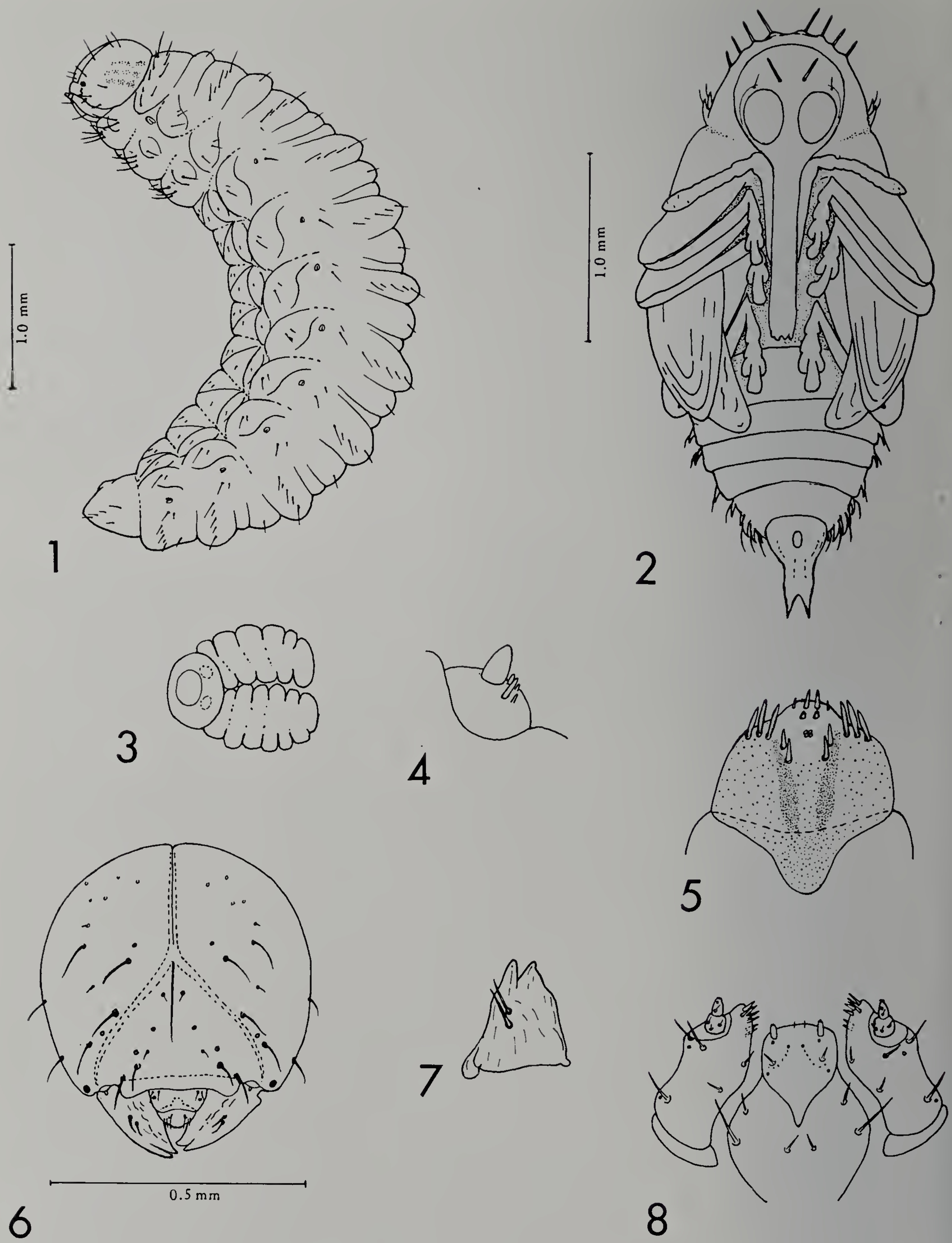
Bar Harbor, Maine, July 20; *"Pontania* gall on willow," Arlington, Mass., June; [reared] "ex willow" [dried sawfly galls attached to pins], Boston, Mass., July 7; "In galls of *Pontania pomum,"* North East, Pennsylvania, Aug. 17; "on *Salix,"* Wakefield, Quebec, June 20; "In willow leaf gall," Salem, Oregon, July 21; "on willow," Ashland, Oregon, April 26, and Orenco, Oregon, May 16; "Reared *Salix* sp." [from sawfly galls, according to Hopkins card 10110b], Medical Springs, Oregon [Sept. 18]; "On willow foliage," Silver Lake, Washington, June 28; "Reared ex gall on willow" [apparently a twig gall, attached to pin], Russian River, California, "about 1912" (no other data).

It should be noted here that *Anthonomus rufipennis* LeConte, a species similar in appearance to *A. sycophanta,* was reported to have been taken from the leaves of sandbar willow, *Salix interior* Rowlee, in Illinois by Tuttle (1956). It is possible that, if the life histories of the two species are similar, they may be confused in the field unless adult specimens are collected and carefully identified.

Immature Stages

The following descriptions of the larva and pupa of this species are based on numerous larvae and pupae removed from the sawfly galls collected at Ithaca, N. Y., and near Hinsdale, N. Y., during June and July of 1957. This material will be deposited in the collection of the U. S. National Museum. The terms used in the description of the larva are defined in a paper by W. H. Anderson (1947).

LARVA: Body nearly circular in cross-section, distinctly curved (Fig. 1). Head free, light yellow in color, except medium brown margins of mandibles and anterior margin of frons; a few mottled bars often visible at side of epicranium. Anterior ocelli present, black. Frontal sutures incomplete; epicranial suture approximately half as long as head capsule; endocarina very distinct, more than half as long as frons (Fig. 6). Dorsal epicranial setae 1, 2, 4, and 5 moderately long, much longer than 3; frontal seta 2 absent, setae 4 and 5 much longer than other two pairs; lateral epicranial seta 2 slightly longer than 1 (Fig. 6). Antenna bearing a subconical accessory appendage and four minute setae, one stouter and longer than others (Fig. 4). Clypeal setae subequal in length, clypeal sensilla present. Labrum bearing three pairs of setae, the posteriormost pair much longer than others, and one pair of sensilla. Epipharynx bearing three anterolateral setae on each side, six anteromedian setae, and two pairs of median spines; labral rods elongate, converging (but not fused) posteriorly; one median cluster of four sensory pores present slightly anterior to anteriormost pair of median spines (Fig. 5). Mandibles stout, bifid at tips; mandibular seta 1 about equal to and almost directly behind seta 2 (Fig. 7). Mala of maxilla bearing six dorsal and five ventral setae; maxillary palpus of two articles (Fig. 8). Postmental seta 2 long, much longer than postmental setae 1 and 3 (Fig. 8). Prementum of labium with one pair of short setae; premental sclerite showing a distinct posteromedian projection, but its anteromedian projection poorly defined (Fig. 8). Labial palpus consisting of only one article. Thoracic spiracle bicameral, its air-tubes annulate. Pronotum bearing eight long and two short setae on each side of midline. Prodorsal fold of mesothorax and metathorax each bearing one short seta on each side of midline; postdorsal folds each bearing a row of five setae, the first third, and fifth much longer than second and fourth, on each side of midline. Two long pleural setae present on prothorax; mesothorax and metathorax each bearing one long pleural seta. Alar area on meso- and metathorax apparently fused with postdorsum. Pedal area prominent, bearing three long setae and one short seta on each of three thoracic segments. Abdomen bearing eight pairs of bicameral spiracles (Fig. 3). Abdominal segments I to VII each having three dorsal folds; one short seta



FIGURES 1-8, *Anthonomus sycophanta:* 1—larva, lateral view; 2—pupa, ventral view; 3—an abdominal spiracle of larva; 4—antenna of larva, dorsal view; 5—epipharynx of larva; 6—head of larva, dorsal view; 7—left mandible of larva, lateral view; 8—labium and maxillae of larva, ventral view.

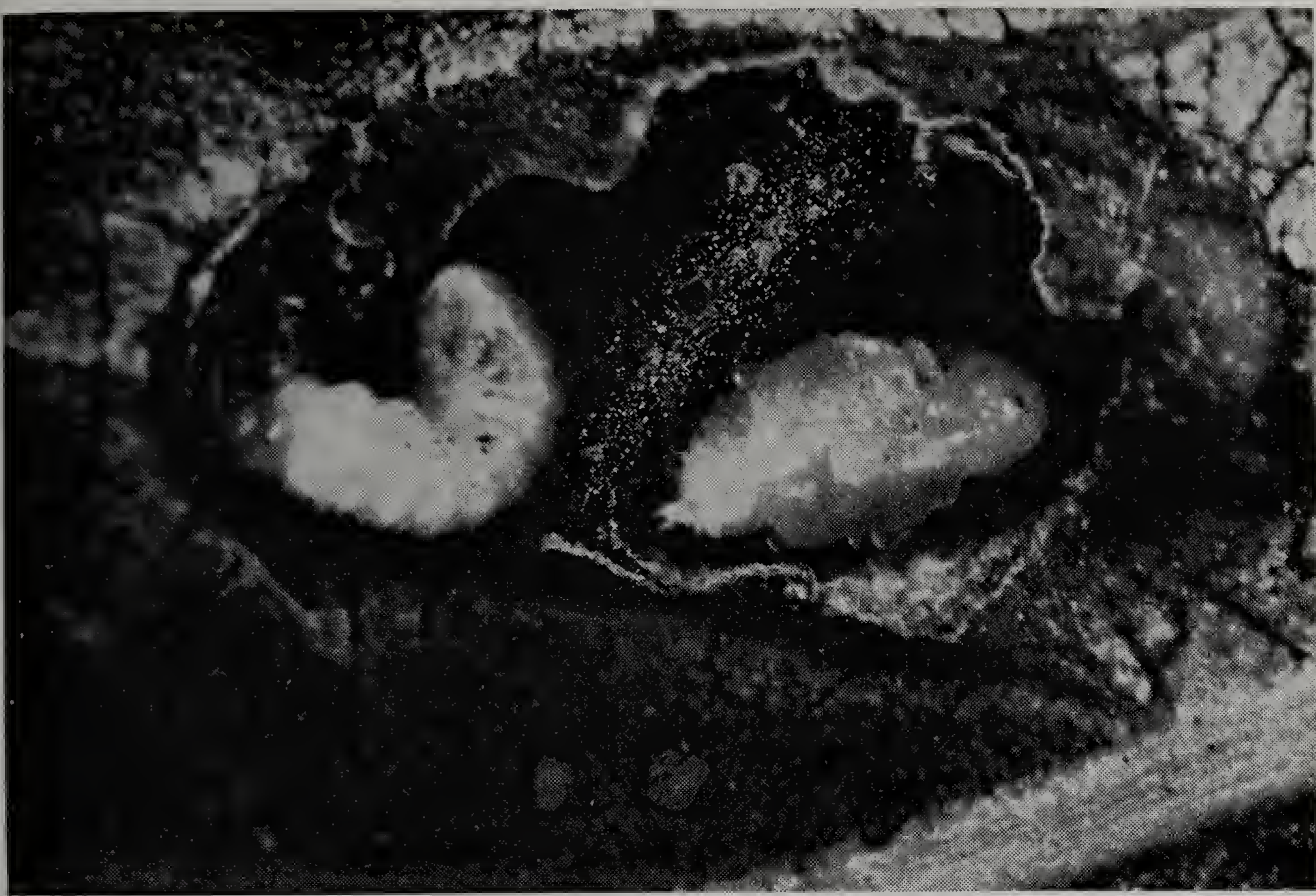


FIGURE 9, A sawfly gall on upper surface of a leaf of *Salix fragilis* L. taken at Ithaca, N. Y., opened to expose a larva and pupa of *Anthonomus sycophanta* inside. Note the partition of frass between the larva and the pupa.

present on each side of midline on each prodorsal fold; a row of five setae present on each side of midline on each postdorsal fold, the first, third, and fifth setae much longer than second and fourth (Fig. 1). Postdorsal folds of abdominal segments I to VII more prominent than prodorsal folds (Fig. 1). Epipleural folds prominent on abdominal segments I to VIII, each fold bearing one long and one short seta. One pair of spiracular setae, one very minute pleural seta, one small pedal seta, and two small eusternal setae present on each of abdominal segments I to VIII (Fig. 1). Abdominal segment IX subconical, bearing several fine setae on each side (Fig. 1). Anus ventral, subterminal, surrounded by four lobes.

Maximum width of head (based on 46 specimens measured): 0.59 mm.

PUPA (Fig. 2): Color cream white, except for eyes, which are pale to dark reddish brown, and spines and setae, which are light brown. Head bearing one pair of long, almost untapered setae and a pair of smaller, more attenuate setae on front above eyes; rostrum entirely without setae. Prothorax bearing a transverse row of three erect, stout setae on each side of dorsal midline a short distance behind apical margin, one pair of erect, stout setae (each on a short tubercle) near midline shortly behind first row of setae, and a curved, transverse row of four setae, each arising from a stout, curved spine, on each side of midline near the base. Tergum of mesothorax bearing a short, oblique row of three erect, slightly tapered setae on each side of midline. Tergum of metathorax with a transverse row of three stout setae on each side of midline. First through third abdominal terga each bearing a transverse row of four tapered setae on each side of midline, the outer three setae much longer than the innermost seta. Fourth through eighth abdominal terga bearing same number of setae as first three, but outer three setae on each side each arising from a stout, curved spine, the spine at outer margin of tergum largest, and a small setaless spine present on each side slightly anterior to and inward from the outermost seta-bearing spine. Spines on seventh and eighth abdominal terga noticeably larger than on preceding terga. Ninth abdominal segment without spines or setae, but having a large bifurcate posterior projection, which is rather heavily sclerotized and slightly pigmented at its outer tips. A pair of rounded spiracles present on each of the first six abdominal segments, but absent or vestigial on seventh and eighth segments. Abdominal pleura and sterna without spines or visible setae. Femora and tibiae of legs unarmed.

Literature Cited

Anderson, W. H.
1947. A terminology for the anatomical characters useful in the taxonomy of weevil larvae. Proc. Ent. Soc. Washington 49(5): 123-132.

Benson, R. B.
1960. Studies in *Pontania* (Hym., Tenthredinidae). Bull. Brit. Mus. (Nat. Hist.), Entomology, 8(9): 369-384.

Blatchley, W. S. and C. W. Leng
1916. Rhynchophora or weevils of North Eastern America. Pp. 296-297. Nature Publishing Co., Indianapolis.

Felt, E. P.
1940. Plant galls and gall makers. Comstock Publishing Co., Ithaca, New York. vii + 364 pp.

Tuttle, D. M.
1956. Notes on the life history of seven species of *Anthonomus* occurring in Illinois. Ann. Ent. Soc. America, 49: 170-173.

Walsh, B. D.
1866. On the insects, coleopterous, hymenopterous, and dipterous, inhabiting the galls of certain species of willow—Part 2nd and last. Proc. Ent. Soc. Philadelphia, 4: 265-267.

LITERATURE NOTICE

SCARAB BEETLES OF THE GENUS ONTHOPHAGUS LATREILLE NORTH OF MEXICO (COLEOPTERA: SCARABAEIDAE), by Henry F. Howden and Oscar L. Cartwright. Proc. United States Nat. Mus. 114(3467):1-134, 11 figs., 9 pls., 1963.—Keys to species and subspecies, descriptions, distribution maps, photographs of both sexes, and habits where known are given. 37 species occur in the U.S. and Canada, 9 of which are newly described. This revision brings to 114 the number of known species in the Western Hemisphere.

CICINDELA OLIVACEA CHAUDOIR, AN ENDEMIC CUBAN TIGER BEETLE, ESTABLISHED IN THE FLORIDA KEYS (COLEOPTERA: CICINDELIDAE)[1, 2]

By Robert E. Woodruff[3]
and
Robert C. Graves[4]

Introduction

Although *Cicindela olivacea* Chaudoir has been collected on the Florida Keys since 1946, it has not been definitely recorded previously from the United States. The species was not listed in the Leng Catalogue or any of its supplements. However, Blackwelder (1944, p. 19) listed it from Cuba and "? U.S.A." Other than this questionable record we have not been able to locate any reference to its occurrence outside the island of Cuba. This study began when Woodruff discovered a specimen in a light trap sample from Grassy Key, Florida, and in an effort to obtain an identification Graves was consulted. We were unable to locate a figure of this species, and a drawing (Fig. 2) is included to aid in its recognition.

Very little information has been published concerning this species. To our knowledge the following is a complete list of references. Chaudoir (1854, p. 118) described the species from Cuba. Chevrolat (1863, p. 185) gave a short description and listed two males in his collection from Cuba without a definite locality. Gundlach (1891, pp. 10-11) gave a brief description with a comparison to *C. tortuosa* Dejean, and mentioned collecting it on the seashore near Havana. Leng and Mutchler (1914, p. 393) merely listed it from Cuba with no additional remarks. The same authors (1916, p. 692) gave a short description based on the works of Chevrolat and Gundlach but indicated that they had not found the species on their expeditions to Cuba.

Redescription of Cicindela Olivacea

Head olivaceous, glabrous except for a pair of ocular setae near each eye; area between eyes rugose, wrinkles becoming confused posteriorly; genae glabrous, rugose; labrum tridentate, teeth prominent, very acute in female and weak, blunt in male (Fig. 1), cream to brown in color, and bearing 4 evenly-spaced erect setae. *Thorax* with pronotal disc rugose, glabrous except for a few white ornamental setae near lateral margins. Proepisternum clothed with white setae. *Elytra* olivaceous, with surface punctate throughout, punctures larger, deeper and denser in basal third, producing a slightly scaly appearance. Punctures show a distinct green reflection.

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[1] Contribution No. 21, Entomology Section, Division of Plant Industry, Florida Department of Agriculture, Gainesville, Florida.

[2] Acknowledgments: We wish to express our appreciation to the following individuals for their assistance and for making records available to us: O. L. Cartwright, United States National Museum, Washington, D. C.; M. A. Cazier, Arizona State University, Tempe; and D. Paulson, University of Miami, Florida.

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[4] Biology Department, Flint Community College, Flint, Michigan.

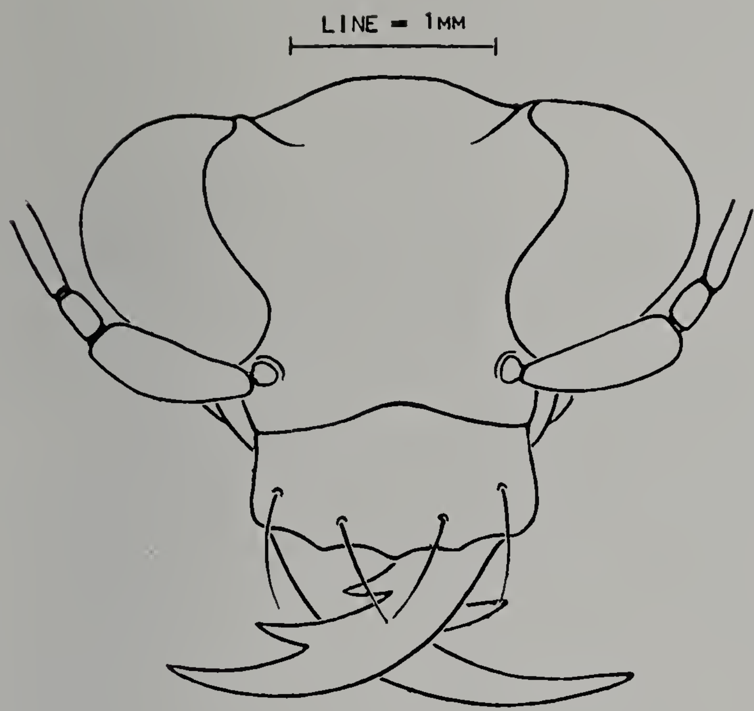
Elytral markings cream-colored, consisting of a simple humeral lunule, an irregular wavy middle band, and an apical lunule (Fig. 2). Marginal line extends anteriorly from middle band and ends in acute point before reaching humeral lunule; posteriorly from middle band it broadens into a bulb. Variation has been noted mainly in middle band and extent of the marginal line. There is a tendency for tip of middle band to be separated in some individuals, forming a dot. In others, middle band resembles a musical note in shape. In one specimen middle band is complete on one elytron and broken, forming a well-defined dot, on other. Leng and Mutchler (1916, p. 689) stated "Elytral markings all separate." This holds true for majority of our specimens, but occasionally marginal line connects with apical lunule. *Abdomen* (except last segment) metallic bronze often with red reflections, clothed on lateral thirds with white setae (although other authors list venter as white, they were misled by these ornamental setae). Last segment non-metallic, brown to testaceous in color, and lacking white setae. *Legs* metallic; bronze, green or olivaceous. Pro- and mesotrochanters with a single subapical seta. All coxae clothed laterally with white setae. Metacoxal disc with single erect seta.

Ecology and Distribution

The following ecological notes are based on a collection of 15 specimens taken at Grassy Key, Florida, by R. E. Woodruff and H. V. Weems, Jr. This area (Figs. 4 and 5) was on the gulf side of the island where the beach was composed of coarse sand, coral and broken shells behind a rocky shoreline of öolitic limestone and fossil coral. *C. olivacea* was first encountered in the rocky area near the water and blended well with the background color. When disturbed, they would occasionally alight on the sandy areas but usually returned to the rocks in a short time. Two other tiger beetles, *C. trifasciata ascendens* Lec. and *C. marginata* Fab., were collected at the same time in equal numbers but predominantly on the sandy beach (Fig. 4). On the rocks (Fig. 5) *C. olivacea* was extremely difficult to capture due to our inability to get the net flush on such an irregularly pitted, sharp surface. Most specimens were collected by our walking along the rocks at the water's edge until a specimen was disturbed and flew to the sandy area where it was easier to capture. Their flight is rapid and erratic, and as in most species of the genus, they seem to have an uncanny knack of avoiding the net. We captured less than 50 per cent of the specimens which were seen.

We examined specimens from the following localities (Fig. 3). FLORIDA: Lower Matacumba [Matecumbe] Key, 12-V-46; Perrin Island, 30-VIII-52 (D. W. Funaro); Crawl Key, 12-VI-58 (J. F. Belshe); Grassy Key, 22-VI-60, mosquito light trap (W. W. Warner); Grassy Key, 12-VI-58 (D. Paulson); Grassy Key, 28-V-62 (R. E. Woodruff and H. V. Weems, Jr.); Stock Island, 1960 (W. W. Warner); West Summerland Key, 14-VI-58 (D. Paulson). CUBA: Pinar del Rio Province, Bah. [Bahia] Honda, 1-3-VI (Wickham); Cabanas, 11-VII-57 (R. S. Howard).

There is little doubt that *C. olivacea* is well established in Florida, especially on Grassy Key where most of the specimens have been collected. Although larvae have not been found, adults have been taken sporadically in the Florida Keys since 1946. This species has been taken in company with the species listed above and in mosquito light traps with *C. severa* Laf. and *C. trifasciata ascendens* Lec. Apparently it is a strong flier and could have been easily introduced on hurricane winds, and since it is a maritime



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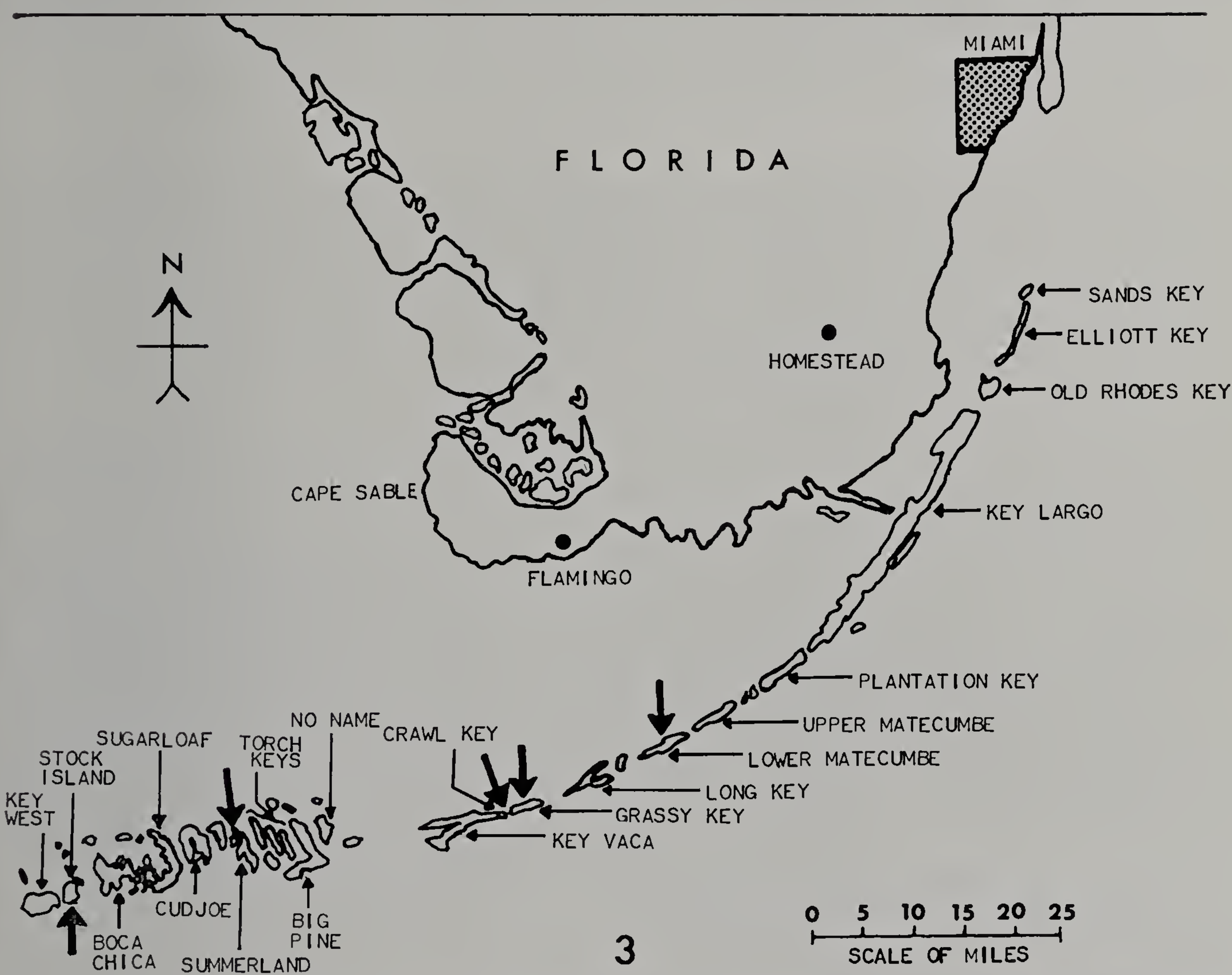

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FIGURES 1-3. *Cicindela olivacea* Chaudoir. 1—Anterior view of head of male, showing labrum. 2—Dorsal view of male (leg setae omitted). 3—Distribution in Florida (enlarged arrows).

FIGURE 4—Habitat of *Cicindela olivacea, marginata,* and *trifasciata ascendens* on Grassy Key, Florida.

FIGURE 5—Rocky area where *Cicindela olivacea* was more abundant on Grassy Key, Florida. (Photographs by R. E. Woodruff.)

species, it could have survived on oceanic drift. It is likely that it is established on Keys other than those we have listed, but it is doubtful that it is presently established on the mainland.

The Perrin Island locality has not been located on the map but is presumably one of the small islands in the Florida Keys. If this assumption is correct, all of the Florida records are in Monroe County. No attempt was made to obtain complete Cuban records, but those listed are both on the coast within 75 miles of Havana. The Entomology Section, Division of Plant Industry, Florida Department of Agriculture, is conducting a survey of the terrestrial arthropods of the Dry Tortugas, the westernmost islands in the chain of Florida Keys and those nearest Cuba. It is interesting to note that, during four intensive collecting trips to this area, no *C. olivacea* were found.

Literature Cited

Blackwelder, R. E.

1939. Fourth supplement 1933 to 1938 (inclusive) to the Leng catalogue of Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon, New York. 146 pp.

1944. Checklist of the Coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 1. United States Nat'l. Mus. Bull. 185:1-188.

Blackwelder, R. E., and R. M. Blackwelder.

1948. Fifth supplement 1939-1947 (inclusive) to the Leng catalogue of Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon, New York. 87 pp.

Chaudoir, M. de

1854. Memoire sur la famille des carabiques. Part 4. Bull. Soc. Imp. Nat. Moscou [Moskovskoe Obshchestvo Ispytatelei Prirody] 27:112-144, 279-352.

Chevrolat, M. A.

1863. Coléoptères de l'île de Cuba. Notes, synonymies, et descriptions d'espèces nouvelles. Ann. Soc. Ent. France (4th Series) 3:183-210.

Gundlach, J.

1891-1896. Contribución a la entomología Cubana. Parte quinta, Coleópteros. Impr. de Montiel (etc.) Habana, 3:1-404.

Leng, C. W.

1920. Catalogue of the Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon, New York. 470 pp.

Leng, C. W., and Mutchler, A. J.

1914. A preliminary list of the Coleoptera of the West Indies as recorded to Jan. 1, 1914. Bull. Am. Mus. Nat. Hist. 33(30):391-493.

1916. Descriptive catalogue of West Indian Cicindelinae. Bull. Am. Mus. Nat. Hist. 35(36):681-699.

1927. Supplement 1919-1924 (inclusive) to catalogue of the Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon, New York. 78 pp.

1933. Second and third supplements 1925-1932 (inclusive) to catalogue of the Coleoptera of America, north of Mexico. John D. Sherman, Jr., Mount Vernon, New York. 112 pp.

PHOTINOIDES, A NEW GENUS, WITH THREE NEW SPECIES (COLEOPTERA: LAMPYRIDAE)

By FRANK A. MCDERMOTT[1]

The recent receipt of specimens of a supposed species of *Photinus* with a remarkable structure of the pygidium and the 8th ventral abdominal segment, from Dr. Wolfgang Weyrauch, of the Instituto Miguel Lillo, Tucumán, Argentina, caused the reexamination of some Bolivian specimens with enlarged 8th ventral segments, received some time ago from Sr. Luis E. Peña of Santiago, Chile. Meanwhile, Mr. J. W. Green, of the California Academy of Sciences, sent me a small Mexican *Photinus* having a similar structure, from the Canadian National Collection. All of these have somewhat similar modifications of the terminal abdominal segments, and the aedeagus of the Bolivian species is definitely not that recognized as typical for *Photinus*. I am therefore establishing a new genus, *Photinoides,* to embrace these species.

In the nearctic species and most tropical species of *Photinus* (Fig. 1) so far examined the 8th (7th visible) ventral abdominal segment is retracted under the 7th so that sometimes only two narrow posterior edges are visible, according to Barber (1941, p. 4). An exception is *Photinus bidenticauda* McDermott (1958, p. 25) in which the 8th ventral segment is broadened posteriorly and is medially sulcate, while the pygidium bears pointed projections directed ventrally. I have, therefore, transferred *Photinus bidenticauda* to my new genus *Photinoides*. In *Robopus* Motschoulsky the 8th ventral segment is well developed and conspicuously the source of light; in *Photinoides* the luminous organs are on the 6th and 7th segments as in *Photinus* and it is doubtful if the residual larval organs on the 8th segment are functional. *Macrolampis* has the 8th ventral segment less retracted than does *Photinus,* but in no species examined has there been structures resembling those of *Photinoides,* and the aedeagal pattern is quite different, according to McDermott (1962, p. 22). In *Photinus* and *Macrolampis* the pygidium is simple, nearly flat or slightly tectiform, and without appendages.

The following key to the South American genera of Photinini is an adaptation of a key by E. Olivier (1907, p. 27), with *Petalacmis* E. Olivier, 1908, and my new genus *Photinoides* added. Two generic names used by E. Olivier are replaced in this key. *Pyractomena* Melsheimer is used instead of *Lecontea* E. Olivier; this change has been in effect for a few years. *Robopus* Motschoulsky, 1852, is used instead of *Heterophotinus* Olivier, 1894; this change will be documented in my forthcoming revision of the lampyrid part of the Coleopterorum Catologus.

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[1] Wilmington, Delaware

Key to the South American Genera of Photinini

1. Antenna with 9 segments, the last segment spatulate and longer than the others combined -- PETALACMIS E. Olivier
   Antenna with 11 segments, with last segment much shorter than others combined-- 2
2. Body broadly elliptical; eyes of male very large, often contiguous; two glazed spots on pronotum ------------------------------------ CRATOMORPHUS Motschoulsky
   Body oval scutiform (that is, narrowed posteriorly), or tectiform; eyes of male not contiguous; no glazed spots on pronotum---------------------- ASPISOMA Laporte
   Body oblong, oval, or parallel-- 3
3. Pronotum elongate, with sides parallel, distinctly angulate at apex-------------- -- PYRACTOMENA Melsheimer
   Pronotum rounded or attenuate in front, with sides not parallel, with apex not distinctly angulate -- 4
4. Luminous organs on the 6th and 7th ventral segments------------------------ 5
   Luminous organs confined to the 8th ventral segment------------------------ 7
5. Body form elongate, pronotum short; 8th ventral segment not short or retracted nor thickened posteriorly -------------------------------- MACROLAMPIS Motschoulsky
   Pronotum and elytra of normal proportions------------------------------- 6
6. Abdomen with 8th ventral segment short or retracted under 7th, its posterior edge not thickened -- PHOTINUS Laporte
   Abdomen with 8th ventral segment long and broad, not retracted, its posterior edge more or less thickened--------------------------------- PHOTINOIDES new genus
7. Antenna variable, facies photinoid--------------------------- ROBOPUS Motschoulsky

Photinoides McDermott, NEW GENUS

Except for the structure of the terminal abdominal segments, the characters of this genus are in general those recognized for the nearctic *Photinus,* as defined by Green (1956, p. 564). But the peculiar terminal segments warrant separation as a distinct genus.

MALE: 8th ventral abdominal segment not retracted but almost as long as 7th and expanded laterally to about ¾ width of 7th; there may be a rather deep emargination of median third of posterior edge and a longitudinal sulcus in basal half, giving a somewhat bilobed appearance; sometimes 8th ventral segment inflated. The 8th ventral segment without luminous tissue, except for residual larval organs; what appear to be transverse muscle fibers may be visible. Pygidium broadly ogival, hairy, the sides deflexed closely over the 8th ventral segment; pygidium simple, or with dentiform ventrad projections, or with a long, curved, distally broadened projection arising from each edge near base, the apices of these projections closely approaching apex of genital segment; genital segment small, semi-elliptical.

FEMALE: The single luminous organ on the 6th ventral segment not subrectangular as is usual in *Photinus* females but narrowly trapezoidal; posterior width of luminous organ about twice basal width.

TYPE-SPECIES: *Photinoides penai* McDermott, new species.

Key to the Species of Photinoides

1. Pygidium without projections on ventral surface, but with ventral surface closely applied to dorsal surface of 8th ventral abdominal segment------------------ 2
   Pygidium with projecting structures-------------------------------------- 3
2. Size small (about 7.0 x 2.5 mm.); elytra dull brown; pronotum with median broad black vitta having ivory-colored areas on each side---------- MEXICANUS new species
   Size large (13.0-15.0 x 4.8-7.0 mm.); elytra grayish yellow to light brown; pronotal disk brown, subrectangular ---------------------------------- PENAI new species

3. Size small (about 6.0 x 2.0 mm.); elytra light brown with wide lateral and narrow sutural margins yellow; pronotal disk roseate with narrow black vitta; pygidium apparently hexagonal, with two subtriangular projections on ventral surface-- ---BIDENTICAUDA (McDermott)
Size large (about 13.0 x 5.0 mm.); elytra dark brown, most of suture and lateral borders ivory colored; pronotal disk brown with two distinct pale lines near side; pygidium with two long curved, spoon-like projections approaching apex of genital segment--MYSTRIONOPHORUS new species

Photinoides mystrionophorus McDermott, NEW SPECIES

(FIG. 2)

Dorsal appearance much like that of numerous species of *Photinus;* outline rather broad and subparallel.

HOLOTYPE, MALE: *Dimensions* 13.0 mm. long, 5.1 mm. wide; widest at about midlength. *Pronotum* 2.75 mm. long, 3.6 mm. wide; slightly widest just forward of posterior angles, the latter obtuse and rounded. Semicircular in forward three-fourths; base nearly straight; sides and apex nearly flat, coarsely but not densely punctate. Disk very convex, the convex portion extending forward over the large eyes; with a very weak median carina; villous on sides and basal half of disk, pale and not dense; a subrectangular brown spot, the forward edge of which is arcuate, covers disk with two very narrow, paler and somewhat pinkish longitudinal streaks near the sides. Lateral and forward surfaces almost white, except for light brown coloration of extended convex portion over eyes. *Scutellum* light brown, punctate, hairy; mesonotal plates dull brown. *Elytra* each 10.25 mm. long by 2.55 mm. wide; practically parallel from basal sixth to apical third; the combined disks of same width as base of pronotum. Explanate margins widening from base to 0.5 mm. at maximum and narrowing gradually posteriorly, becoming indistinct at about apical fifth. No costae visible. Texture coarsely and rather irregularly rugose; villosity short and pale, not dense; a very short secondary pubescence visible in posterior two-thirds. Epipleura basally defined and not prominently widened, gradually approaching elytral margins almost to apices. Ground color of disk translucent dark brown by transmitted light, but appears opaque greyish brown by general illumination, contrasting with the almost white explanate margins, the white area extending into edges of disk to give a pale border about one-third of elytral width at midlength; sutural bead yellow. *Head* with forward portion of vertex dark reddish brown, becoming black basally. Eyes very large, 2.6 mm. across, 0.75 mm. between them over the antennal sockets; intraocular margins nearly parallel. Maxillary palpi large, dark brown, of the usual slightly curved, conoidal shape. Mandibles relatively small, 0.7 mm. across in closed position. *Antennae* 6.65 mm. long, about one-half body length; dark brown becoming practically black distally; slightly compressed, tapering, and very hairy. *Prosternum* truncate in front; yellowish brown, as is also mesosternum; metasternum darker and with very short, dense, appressed villosity. *Abdomen* with ventral segments 2 to 5 short, yellowish brown; 6th and 7th luminous over entire surface, with marked foveae; 6th medially but little longer than 5th owing to the broad emargination; 7th longer than 6th but narrower and broadly but more shallowly emarginate. 8th yellow and as long as the 7th, somewhat laterally expanded. Segments not foliate or lobed. Tergites, except pygidum, dull brown. *Pygidium* broadly ogival, translucent yellow, hairy, sides deflexed over 8th ventral segment and with spoon-shaped projections. *Legs* yellowish brown, darkening distally. Tibial spurs very small and short, dark brown. Claws simple. Tarsi very hairy. *Aedeagus* not exposed, and was not removed because of the danger of damage to the surrounding specific structures.

ALLOTYPE, FEMALE: Generally similar to the male. *Dimensions* 11.9 mm. long by 4.6 mm. wide. *Pronotum* 2.35 mm. long by 4.0 mm. broad—broader than in male. Convex disk mostly reddish, with irregular brown marks at sides and a faint infuscate streak on each side of the median line. *Elytra* 9.85 mm. long by 2.3 mm. wide; somewhat lighter brown than in male. *Head* with eyes 1.4 mm. across, 0.64 mm. between them—markedly smaller than in male. *Antennae* 5.0 mm. long, light brown, and shorter than in male. *Abdomen* with ventral segments 3, 4, 5, 7, and 8 brown; 6 mostly yellow; 8 broadly incurved on each side in apical half and sharply V-emarginate apically. Long-trapezoidal luminous organ median in 6th ventral. *Pygidium* semi-elliptic.

HOLOTYPE male, San Alejandro, Ucayali Basin, Peru, 300 meters altitude collected by Wolfgang Weyrauch, July 31, 1947, Weyrauch No. 1414. ALLOTYPE female, same data as holotype, except collected on July 31, 1955. The types have been returned to Dr. Weyrauch for deposition in the collection of the Instituto Miguel Lillo, Tucumán, Argentina.

Photinoides penai McDermott, NEW SPECIES
(Figs. 3, 5-7)

Dorsal appearance quite similar to that of P. mystrionophorus.

HOLOTYPE, MALE: *Dimensions* 14.65 mm. long by 7.0 mm. wide; slightly elliptical. *Pronotum* 2.8 mm. long by 3.95 mm. broad; semi-elliptic in forward ¾, then narrowing slightly to angles. Edges slightly reflexed. Angles *ca.* 90°, and only slightly produced. Base sinuate. Sides and forward border coarsely but not densely punctate. Very little villosity. Sides nearly transparent, forward border slightly tinged brownish. Disk very convex, dark brown, the convexity extending forward over the large eyes. *Scutellum* brown, mesonotal plates black. *Elytra* each 11.85 mm. long by 3.5 mm. wide. Villosity short and rather dense. No visible costae. Explanate margins narrow. Actual color transparent yellow but appearing dull brown over wings, giving the effect of a pale lateral border. Suture not pale. Bases opaque reddish brown; apices separately rounded. *Head* with frons black; interocular margins parallel; 2.35 mm. across eyes, 0.64 mm. between them; eyes very large. Mandibles relatively small, 0.58 mm. across in closed position. Palpi of the usual form, nearly black. *Antennae* practically black, compressed, densely hairy, 6.25 mm. long. *Prosternum* and mesosternum yellowish brown; metasternum dark brown. *Abdomen* with ventral segments 2, 3, and 4 reddish brown, 5 mostly yellow; 6 and 7 entirely luminous, somewhat longer than the 5th, and with pronounced "foveae"; slightly emarginate medially. 8th segment yellow, as long as 7th and nearly as wide; laterally intumnescent; medially transparent in basal half; small larval organs visible at base. Posterior edge sinuate, with a median cluster of long hairs. All abdominal segments densely pale villous. *Pygidium* ogival, the sides bent down and resting against the dorsal surface of the 8th ventral segment, forming a partially semi-circular opening in which the genital segment may be seen. The pygidium is much longer than the 8th ventral segment, and bears no projections. *Legs* dark brown; claws simple.

ALLOTYPE, FEMALE: Generally similar to the male; dimensions 15.0 mm. long by 6.0 mm. wide. Eyes smaller than in male; antennae 5.0 mm. long. *Abdomen* with trapezoidal luminous organ median on 6th ventral segment; 7th segment brown, contrasting with the pale 6th; 8th segment long, narrowed toward the bilobed apex. *Pygidium* close to and following the edges of the 8th ventral segment.

HOLOTYPE male, El Palmar, Bolivia, 900 meters altitude, collected by Luis E. Peña, October 8, 1956. ALLOTYPE female, Puenta Vilia, Tungas, Bolivia, 1700 meters altitude, collected by Luis E. Peña, December 12, 1955. The holotype and allotype are being deposited in the United States National Museum. The species is named for Sr. Peña, who has collected many interesting specimens for me.

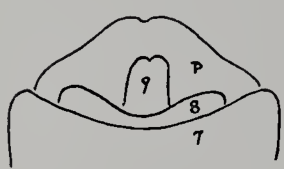
Photinoides mexicanus McDermott, NEW SPECIES
(Fig. 4)

Dorsal appearance much like that of numerous small species of *Photinus;* distinctly smaller than the two preceding species.

HOLOTYPE, MALE: *Dimensions* 7.0 mm. long, 2.55 mm. wide; subparallel. *Pronotum* 1.55 mm. long by 2.1 mm. wide; broadly semi-elliptic; angles about 90°; sides and forward portion not reflexed, both coarsely punctate; disk finely and sparsely punctulate. Short pale villosity on edges and on sides of disk. Disk convex, with longitudinal median brown vitta, widening slightly forward and along basal edge, the brown color extending forward to the apical edge; on each side of vitta an ivory or cream-colored spot having a slight intumnescence at the base. Basal margin slightly curved inward. *Scutellum* elliptical, brown; basal half bent upwards. Mesonotal plates dull brown and of an unusual contour to accommodate the base of the scutellum. *Elytra* each 5.5 mm. long by 1.28 mm. wide; subparallel. Explanate margins narrow. Disk a rather dull brown; lateral borders white nearly to apices; extreme apices black, basal sixth reddish brown and nearly bald. Suture white from basal sixth to apical sixth. Villosity fairly long and dense. *Head* with frons concave, reddish brown; 1.5 mm. across eyes, 0.4 mm. between them; eyes relatively large. Mandibles small; palpi of the usual form. *Antennae* dark brown, slightly compressed, hairy, and very slightly tapered; 3.32 mm. long. *Prosternum* and mesosternum a slightly pinkish ivory; metasternum dark brown. *Abdomen* with ventral segments 2 to 5 dark brown; 6 and 7 entirely luminous and about 1.5 times as long as 5th; both slightly emarginate medially. 8th segment nearly transparent, sharply emarginate medially, and longitudinally sulcate; as wide as the 7th, and about ¾ as long; 9th (genital) ivory, hairy, ogival. *Pygidium* wider and longer than the 8th segment, closely applied to the latter laterally, and arched above the 9th segment; rather pale, with brown edges. *Legs* all more or less infuscate; claws simple.

Female not available.

HOLOTYPE male, 6 miles north of Tomazunchale, San Luis Potosi, Mexico, collected by Henry Howden, August 22, 1960. The holotype is in the Howden collection in Ottawa, Ontario.



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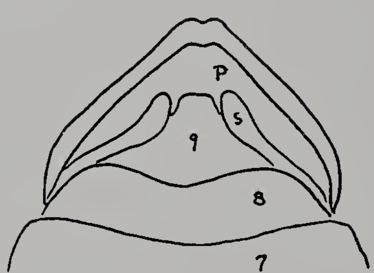

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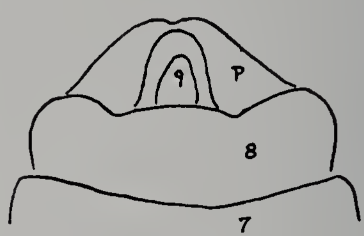

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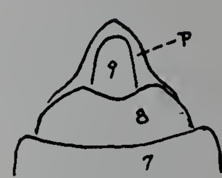

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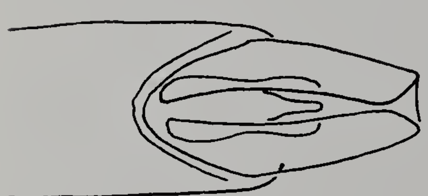

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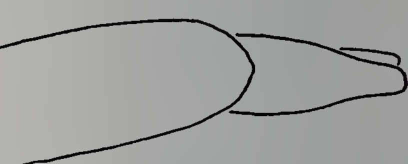

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FIGURES 1-4. Ventral views of male abdominal apices; p means pygidium, s means spoon-shaped projection, and the numbers 7, 8, and 9 refer to the appropriate segments. 1—*Photinus pyralis*. 2—*Photinoides mystrionophorus*. 3—*Photinoides penai*. 4—*Photinoides mexicanus*.

FIGURES 5-7. Aedeagus of *Photinoides penai*, male. 5—Dorsal view. 6—Ventral view. 7—Lateral view.

Literature Cited

Barber, H. S.
1941. Species of fireflies in Jamaica (Coleoptera, Lampyridae). Proc. Rochester Acad. Sci. 8:1-13.

Green, J. W.
1956. Revision of the Nearctic species of Photinus (Lampyridae: Coleoptera). Proc. California Acad. Sci. (4)28(15):561-613, 19 figs.

McDermott, F. A.
1958. Four new lampyrid fireflies. Coleop. Bull. 12:21-28, 3 figs.
1962. Illustrations of the aedeagi of the Lampyridae (Coleoptera). Coleop. Bull. 16(1):21-27, 23 figs.

Oliver, E.
1907. Coleoptera, Fam. Lampyridae. Genera Insectorum, fasc. 53:1-74, 3 pls.

CARPOPHILUS PILOSELLUS MOTSCHULSKY, NEW SYNONYMY AND DISTRIBUTION[1] (COLEOPTERA: NITIDULIDAE)

By Walter A. Connell[2]

Carpophilus pilosellus Motschulsky is a member of the *dimidiatus* group which includes nearly a dozen widely distributed beetles infesting stored products. This species occurs occasionally in the southern part of the United States.

The synonymy is as follows:

Carpophilus pilosellus Motschulsky, 1858, Etudes Ent. 7: 41.

Carpophilus floridanus Fall, 1910, Trans. Amer. Ent. Soc. 36: 122.

Carpophilus halli Dobson, 1954, Ent. Mon. Mag. 88: 299 (NEW SYNONYMY)

Fall's type of *floridanus* from Enterprise, Florida is at the Museum of Comparative Zoology, Cambridge, Massachusetts. It is a male which has its hind tibiae abruptly enlarged for the distal two-thirds of their length. Fall was the first to mention the expanded male hind tibiae in connection with this species. Gillogly (1962. Insects of Micronesia 16: 158), who placed *floridanus* in synonymy, used this character in his key as a basis for separa-

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[1] Published as Miscellaneous Paper No. *448* with the approval of the Director of the Delaware Agricultural Experiment Station. Publication No. *339* and Scientific Article *335* of the Department of Entomology.

[2] Associate Professor, Department of Entomology, University of Delaware, Newark, Delaware.

tion of *pilosellus* from *dimidiatus* (Fab.). However, it is a somewhat variable character and in some males of *pilosellus* it approaches the condition found in *dimidiatus* and *freemani* Dobson where the enlargement is gradual. Male and female specimens of *pilosellus* can be distinguished from *dimidiatus* by examining the antennae and the surface of the hypomeron (i.e., the lateral margin of the pronotum which is inflexed on the underside). The third antennal segment is 1.3 to 1.4 times the length of the second in *pilosellus* and 1.6 to 1.8 times the second in *dimidiatus*. Punctures are present on the hypomeron of *pilosellus,* but they are much shallower and less distinct than those of *dimidiatus*. These punctures are difficult to demonstrate with incandescent illumination, but they may be seen readily at 72 x magnification with fluorescent light or bright, diffused sunlight.

Carpophilus halli was described from material from Nigeria, Sierra Leone, and British Honduras. Examination of material supplied by Dobson and comparison of his figure of the aedeagus with that of North American specimens shows *halli* to be identical with *pilosellus*. Dobson may have been misled by Fall's description, because the male among the specimens of *halli* which he loaned me did not have the hind tibia abruptly enlarged.

In addition to the distribution of *pilosellus* given above, Grouvelle (1913. Coleopterorum Catalogus 56: 91) listed the East Indies, China, Japan, and New Caledonia, while Gillogly (*loc. cit.*) added Madagascar and Micronesia. This species also has been seen in collections from the following localities and materials: U.S.A.: Georgia (wheat flour), Louisiana (wheat flour), Arkansas (corn meal), Kansas (corn meal), Texas (corn meal), California; Mexico; Guatemala (avocado); Nicaragua (sorgum seed); Surinam (tamarind bean pod and garlic); Venezuela (pineapple); Peru (garlic); Curacao (yams); Haiti (*Dioscorea* sp. roots); Dominican Republic (onions); Cuba (cassava); Philippine Islands (*Areca catechu* and starch); and Angola (potato tubers).

CONCERNING ONTHOPHAGUS: In their natural lives they ascend and descend and sink their cylindrical shafts into the soil always in the perpendicular line. To dig in the horizontal is quite foreign to their nature; it is an instinct which they never employ in the ordinary routine duties of their toil. Place them in such a way that they must modify their behaviour. Enclose them, for example, in a horizontal tube where they can burrow in only one line. Do this and their instincts will assuredly beguile them. All they will do is to beat against the barriers. Although the path lies open at their side, yet some of them will be irretrievably lost.—R. W. G. Hingston, 1923, A Naturalist in Hindustan.

PARACYMUS TARSALIS, A NEW SPECIES FROM THE NORTHWESTERN UNITED STATES (COLEOPTERA: HYDROPHILIDAE)

By DAVID C. MILLER[1]

In the course of preparing keys to the species of Hydrophilidae found in the Pacific Northwest for inclusion in the forthcoming Part IV of Dr. M. H. Hatch's *Beetles of the Pacific Northwest,* the following new species came to my attention. It is described here in order to make the name available for use in the above mentioned keys.

Mr. Hugh B. Leech, of the California Academy of Sciences, had independently discovered the species some years ago and has been most generous in allowing me to describe it and to see his material. He has also been kind enough to read the manuscript. Mrs. Helen Houk, of the University of Washington, made the drawings. All material studied has been deposited in the University of Washington collection except where otherwise indicated by the following abbreviations in parentheses following the locality citation (generally equivalent to the source from which the material was originally borrowed): AMNH—American Museum of Natural History, New York; CAS—California Academy of Sciences, San Francisco; CNC—Canadian National Collection, Ottawa; CNHM—Chicago Natural History Museum; DM—Collection of David C. Miller, New York; JS—Collection of Joe Schuh, Klamath Falls, Oregon; SGJ—Collection of Stanley G. Jewett, Salem, Oregon; UI—University of Idaho, Moscow.

Paracymus tarsalis Miller, NEW SPECIES

MALE: Length 2.3-2.7 mm.; form broadly oval; dorsal surface shining dark olive green with the elytra and pronotum laterally and the elytra apically paler, usually brownish; entire dorsal surface strongly and evenly punctate, all parts about equally so; venter dark brown to black, maxillary palpi except for apical segment, antennae basal to cupule, and trochanters generally paler; antennae eight-segmented; protarsal segments thickened, all but apical one broader than long, apical segment bearing a single blunt tooth on inner edge midway to apex and usually a short peg arising from socket of claws, claws very broad and blade-like, anterior one much larger (Figs. 1, 2); metafemora lightly strigate in anterior half; mesosternal projection small, broad and tooth-like; parameres broad, in dorsal view narrowing from about one-third of the way from base to apex, basal piece about twice the length of the parameres (fig. 4).

FEMALE: Externally identical to the male except that the protarsal segments are not thickened and bear no teeth or pegs, and the claws are narrow, not broad and blade-like. Since it is sometimes difficult to separate the female of this species from that of *P. subcupreus* (Say), no allotype or female paratypes are designated.

Holotype: Male, Lakeview, Oregon, June 27-28, 1951, Borys Malkin.

Paratypes (all male): IDAHO: 4, Alturas L. (Sawtooth Mts.) (1, CNHM; 1, DM); 4, Rogerson (Twin Falls Co.) (1, CNHM; 1, UI). OREGON: 1, Aspen L. (JS); 1, Baker Cr. (CAS); 1, Cave Junction (CNHM); 6, Chiloquin (Sprague R.) (1, CNHM; 2, DM); 3, Corvallis

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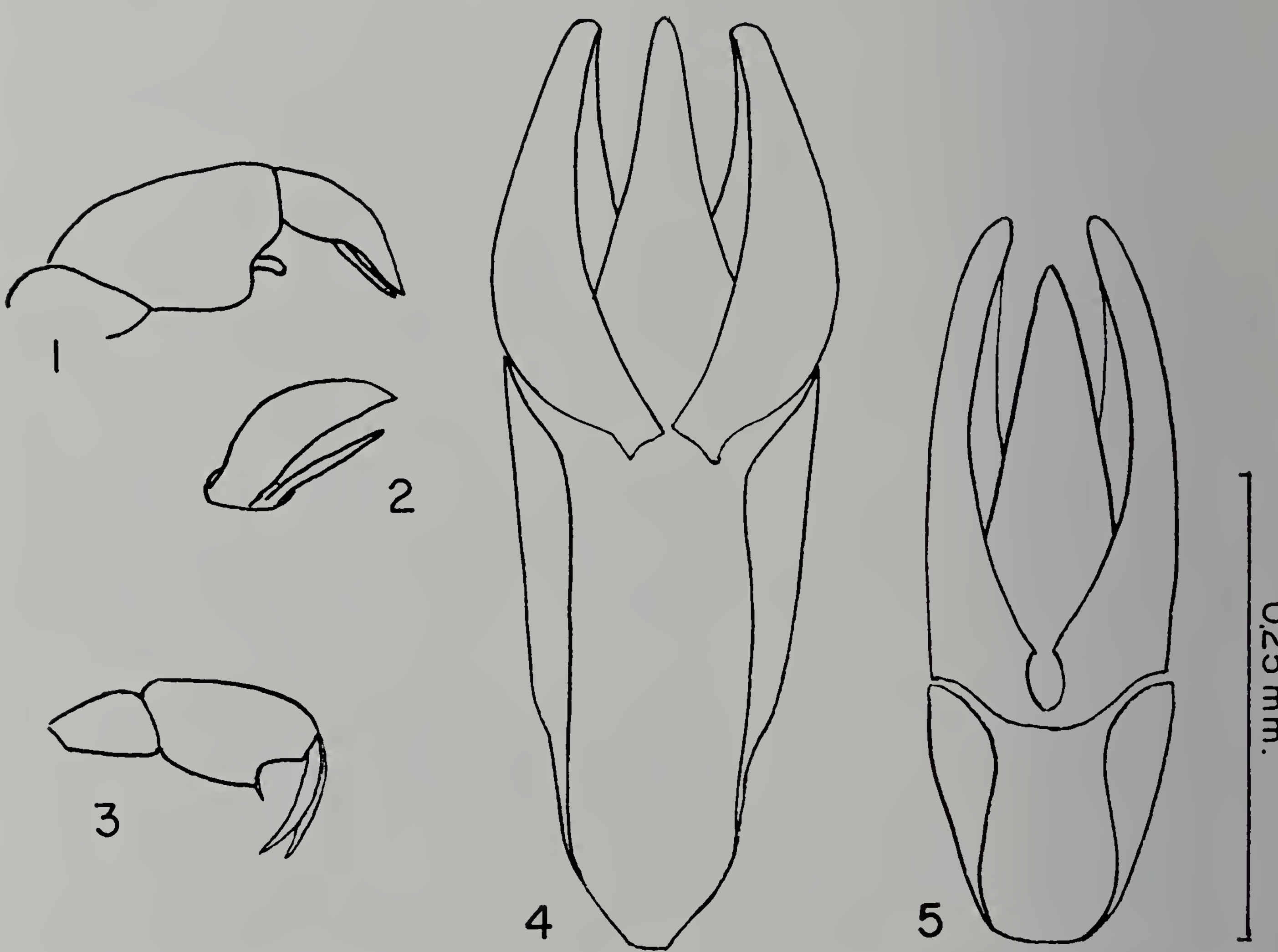
(1, AMNH; 1, JS; 1, CNC); 1, Crump Lake (JS); 2, Lakeview (1, CNHM); 1, Lunch Cr. (Dixie Pass, Blue Mts.) (CNHM); 2, McMinnville; 3, Meryl Cr. (7 mi. N.W. Bly, Klamath Co.) (JS); 2, Roseburg (SGJ); 4, Union Cr. (Jackson Co.) (3, CNHM; 1, DM). CALIFORNIA: 1, Lakeport (1 mi. W. Rockey Pt., Lake Co.) (CAS); 2, Middletown (6.9 mi. N. of) (Lake Co.) (CAS); 1, The Indians (2 mi. S.E. of Santa Lucia Mem. Park, Monterey Co.) (CAS); 2, Trinity Center (Scott Mt. Divide, Trinity Co.) (CAS); 4, Wilson L. (Tehama Co.) (CAS).

In addition to females associated with males from many of the above localities, females probably of this species have been seen from the following localities: IDAHO: Galena (Blaine Co.); Malad City (Little Malad R.). OREGON: Chewaucan R. (Lake Co.); Deming Cr. (Klamath Co.); Redmond (Deschutes R.); Seneca; Steens Mts. (Fish L.). CALIFORNIA: Childs Meadow (Tehama Co.).

The only other species of *Paracymus* which has a range overlapping that known for *P. tarsalis* n. sp. is *P. subcupreus* (Say). *P. tarsalis* runs to *subcupreus* in the currently used keys (Winters 1926, Leech and Chandler 1956). Males of *tarsalis* can be easily separated from *subcupreus* by their larger protarsi with much more enlarged and flattened claws (figs. 1-3) and by their aedeagi (figs. 4-5). Females are more difficult to separate,



FIGURES 1, 2, 4, *Paracymus tarsalis* n. sp. 1—Terminal segments of male protarsus, lateral view. 2—Same, anterior view. 4—Aedeagus.

FIGURES 3, 5, *Paracymus subcupreus* (Say). 3—Terminal segments of male protarsus, lateral view. 5—Aedeagus.

but those of *tarsalis* average slightly larger and are more thickly and coarsely punctate. The punctation of *tarsalis* is approximately equal over the entire dorsum, while that of *subcupreus* is somewhat coarser and thicker on the head and elytra than on the pronotum.

As has been previously pointed out (Fall 1901:218, Winters 1926: 57), *P. subcupreus* (Say) is somewhat variable with respect to the male protarsus. The aedeagus also varies, and it is possible that specimens from western North America do not represent the true *subcupreus*. A study of material from many localities will probably be necessary to settle this point.

Literature Cited

Fall, H. C.

1901. List of the Coleoptera of Southern California, with Notes on Habits and Distribution and Descriptions of New Species. Occ. Papers California Acad. Sci. 8:1-282.

Leech, H. B. and H. P. Chandler

1956. Aquatic Coleoptera, *in* R. L. Usinger (Ed.), Aquatic Insects of California With Keys to North American Genera and California Species. U. of California Press, Berkeley and Los Angeles. Pp. 293-371.

Winters, F. C.

1926. Notes on the Hydrobiini (Coleoptera—Hydrophilidae) of Boreal America. Pan-Pacific Ent. III:49-58.

CURRENT RESEARCH PROGRAMS

These announcements of research underway on beetles are not meant to be requests for specimens or information unless stated to the contrary; a letter to the researcher will determine whether or not specimens or information are wanted. All research workers are invited to send notices of research in progress to the Editor.

BRUCHIDAE: Revision of *Megacerus*. By Arturo L. Teran, Depart. de Zoologica, Universidad Nacional de Tucuman, Instituto Miguel Lillo, Tucuman, Argentina.

CANTHARIDAE: Revision of Nearctic *Silis*. By J. W. Green, California Academy of Sciences, Golden Gate Park, San Francisco 18, Calif.

CHRYSOMELIDAE: Faunistic Study of Chrysomelidae of Alabama. By Edward U. Balsbaugh, Jr., Dept. of Zoology and Entomology, Auburn Univ., Auburn, Ala.

COLYDIIDAE: Study of *Lasconotus* of California. By John Drew, Division of Entomology and Acarology, Univ. of California, Berkeley 4, Calif.

DYTISCIDAE: Taxonomy of *Thermonectus* Dejean. By Kenneth L. McWilliams, Dept. of Biology, New Mexico State Univ., University Park, N. M. (Need specimens for study.)

GENERAL: Compiling Second Bibliographical Supplement to Taxonomic and Major Ecological Literature on Coleoptera. By J. Gordon Edwards, San Jose State College, San Jose, Calif.

SCARABAEIDAE: Revision of *Cotinus*. By Michael A. Goodrich, Dept. of Zoology and Entomology, Pennsylvania State Univ., University Park, Pa.

TENEBRIONIDAE: Reproduction and development in *Tribolium confusum*. By Melissa Stanley, Zoology and Entomology Dept., Univ. of Utah, Salt Lake City, Utah.

KEY TO NEARCTIC XANTHOLININE GENERA AND A NEW PLATYPROSOPUS (COLEOPTERA: STAPHYLINIDAE)

By IAN MOORE [1, 2]

The following key is presented at this time because of the discovery of a xantholine genus new to the United States.

KEY TO THE NEARCTIC GENERA OF XANTHOLININAE

1.	A small sclerite (neck plate) present at anterior margin of prosternum	4
	Neck plate absent	2
2.	Last segment of maxillary palpi much narrower than penultimate	3
	Last segment of maxillary palpi almost as wide as penultimate	**PLATYPROSOPUS** Mannerheim
3.	Gular sutures convergent behind	**DIOCHUS** Erichson
	Gular sutures divergent behind	**OPHIOOMMA** Notman
4.	Elytra overlapping at suture	6
	Elytra not overlapping at suture	5
5.	Pronotum with five or more discal punctures each side	**PAROTHIUS** Casey
	Pronotum with one discal puncture each side	**ATRECUS** Jacquelin du Val
6.	Disc of pronotum impunctate	7
	Disc of pronotum punctate	8
7.	Head with discrete punctures	**SAUROHYPNUS** Sharp
	Head with punctures forming long coalescent grooves laterally	**GYROHYPNUS** Leach
8.	Pronotum with a few punctures arranged in series	9
	Pronotum with confused punctures	16
9.	Superior lateral line of pronotum reflexed, joining inferior lateral line near middle	10
	Lateral lines of pronotum separate to anterior angles	11
10.	Last segment of maxillary palpi not shorter than penultimate	**NUDOBIUS** Thomson
	Last segment of maxillary palpi much shorter than penultimate	**OLIGOLINUS** Casey
11.	Middle coxae contiguous	**MICROLINUS** Casey
	Middle coxae separate	12
12.	Second antennomere much shorter than third	**LISSOHYPNUS** Casey
	Second antennomere not shorter than third	13
13.	Head coarsely punctured	14
	Head extremely finely and sparsely punctured	**XESTOLINUS** Casey
14.	Last segment of maxillary palpi stout at base, more than three-fourths as wide as apex of penultimate	15
	Last segment of maxillary palpi slender at base, about one-half as wide as apex of penultimate	**LEPTACINUS** Erichson
15.	Tempora not flattened behind eyes	**MEGALINUS** Musant and Rey
	Tempora with strong flattened area behind eyes	**HYPONYGRUS** Tottenham
16.	Last segment of maxillary palpi nearly as long as penultimate	17
	Last segment of maxillary palpi much shorter than and narrower at base than penultimate	18
17.	Second antennomere as long as third	**STICTOLINUS** Casey
	Second antennomere as long as next three together	**HABROLINUS** Casey
18.	Anterior tarsi broadly dilated; head with dense longitudinally anastomic punctures	**STENISTODERUS** Jacquelin du Val
	Anterior tarsi slender; head with discrete punctures	19

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[1] Associate in Entomology, San Diego Natural History Museum, San Diego, California.

[2] In connection with this paper, I am particularly indebted to Hugh B. Leech of the California Academy of Sciences who sent me this interesting series of specimens.

19.	Prosternum carinate --	HESPEROLINUS Casey
	Prosternum not carinate --	20
20.	Head densely subopaquely punctured anteriorly on each side--------	NEMATOLINUS Casey
	Head not densely subopaquely punctured --------------------------------	21
21.	Head with strigulose and reticulate ground sculpture-----------------	LEIOLINUS Casey
	Head without ground sculpture------------------------------	LITHOCHARODES Sharp

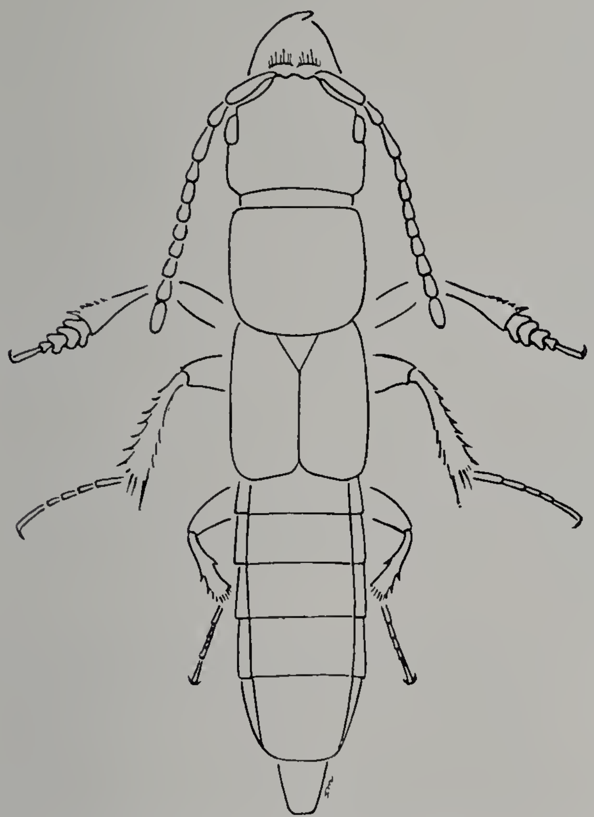

FIGURE 1—*Platyprosopus texanus* Moore, new species.

Members of the genus *Platyprosopus* have heretofore been known from North Africa, Asia, and South America, with a single species described from Mexico. A new species from the United States is described below.

Platyprosopus Mannerheim

Platyprosopus Mannerheim, 1831. Mem. Acad. Sci. St. Petersbourg 1:-450.

Form. Elongate, parallel. *Head.* Subquadrate, narrowed behind to form a neck which is about nine-tenths as wide as head, with more or less distinct nuchal constriction across the dorsal surface. Antennae densely pubescent after third segment; their fossae located much nearer to each other than to eyes under tubercles at front margin of head. Head somewhat produced between antennal tubercles. Labrum bilobed. Mandibles each with stout internal tooth, sulcate externally. Maxillary palpi four-segmented, first segment short, next two stout, widened at apex, fourth a little narrower and longer than third, subparallel. Labial palpi three-segmented, first two segments short and stout, third about as long as second, wider at apex which is truncate. Gular sutures united, raised in an abruptly elevated carina at base. *Thorax.* Pronotum quadrate. Lateral prosternal sutures distinct. Hypomera delimited by a carina. Trochantin prominent. Prosternal epimeron absent. Mesosternum short, its process short and pointed. Metasternal process very short. Elytra quadrate, sutural striae very fine. Scutellum large. All coxae large, contiguous. Tibiae spinose. Tarsi five-segmented. Anterior tarsi dilated, with dense, pale, spatulate setae beneath. Middle and posterior tarsi with first segment elongate, next three short, last as long as first. *Abdomen.* First five visible segments with paratergites. Tergites not impressed at base. First visible sternite without a keel between coxae.

Distribution. Thirty-eight species have been placed in this genus. Its members are found in tropical regions where they are attracted to lights. Very little is known of their habits.

Notes. This genus has usually been placed in the Xantholinini because of its approximate antennae, the only important character which it has in common with members of that tribe. It should probably be placed by itself. It is easily distinguished from members of the Xantholinini by its very broad neck.

Platyprosopus texanus Moore, NEW SPECIES

(Fig. 1)

Color dark ferruginous with appendages a little paler, pubescence testaceous. *Head* about as wide as long. Tempora longer than eyes, nearly parallel, hind angles narrowly rounded. Surface with coarse irregularly spaced umbilicate punctures, rather dense anteriorly and to the sides; interspersed with sparse, minute punctulae; highly polished. Antennae about as long as head and pronotum, hardly incrassate, first segment elongate, second less than half as long as first, third one and one-half times as long as second, fourth slightly elongate, fifth to tenth of about equal size and shape, very slightly longer than wide, eleventh elongate. Under surface very densely punctured and reticulate. *Pronotum* quadrate, a little narrower and about as long as head, sides parallel, angles narrowly rounded, apex straight, base gently rounded. Surface highly polished, with a row of five to seven coarse punctures on each side of midline and 20 to 25 very irregularly placed, coarse punctures to the side; interspaces throughout with numerous minute punctulae. *Elytra* subquadrate, about as wide as pronotum and one-third longer. Surface densely, evenly, minutely punctured throughout, punctures mostly separated by their own diameters. Surface between punctures polished. Clothed with dense, yellow pubescence. Scutellum punctured as elytra. *Abdomen* subparallel in basal two-thirds, narrowed a little in apical third. Surface densely, finely punctured, about the same as elytra but with interspaces finely reticulate and dull. Apex of last sternite with a small oval emargination in the central third which is about twice as wide as deep. *Length* 8 mm.

Female with apex of last sternite gently arcuate.

Holotype, male. Brownsville, Texas, VI-5-32, J. O. Martin, collector, in California Academy of Sciences. *Allotype,* female. Brownsville, Texas, VI-9-32, J. O. Martin, collector, in California Academy of Sciences. *Paratypes,* two males, one female, same data as holotype, in California Academy of Sciences and my collection.

Notes. Probably most closely related to *mexicanus* Sharp, which has the head and pronotum darker and the legs paler, the pronotum more sparsely punctured at the sides. *Mexicanus* apparently lacks the minute punctulae of the head and pronotum.

BOOK NOTICE

PRINCIPAUX COLEOPTERES DE LA PROVINCE DE QUEBEC. EDITION 2. By Gustave Chagnon and Adrien Robert. 440 pp., 29 pls. Les Presses de l'Université de Montréal, C. P. 6128, Montréal 3, Québec. 1962.—The first edition was published by Chagnon in Naturaliste Canadien between 1934 and 1939 and was then bound under the title Contribution à l'étude des Coléoptères de la Province de Québec. The new edition contains some new material, especially corrections of scientific names. A handy glossary of scientific terms and a bibliography have been added. Most of the text is a reprint of the earlier edition. As stated in the title, only the principal genera and species are treated; it is not meant to be complete. The Carabidae are rather well treated, but not so the Phytophaga. This, of course, reflects the status of beetle classification in northern North America. The manual covers a large territory—Québec is twice as big as Texas and almost as big as Alaska. We should be thankful for this publication; it is the only beetle manual for the northeastern part of the continent.

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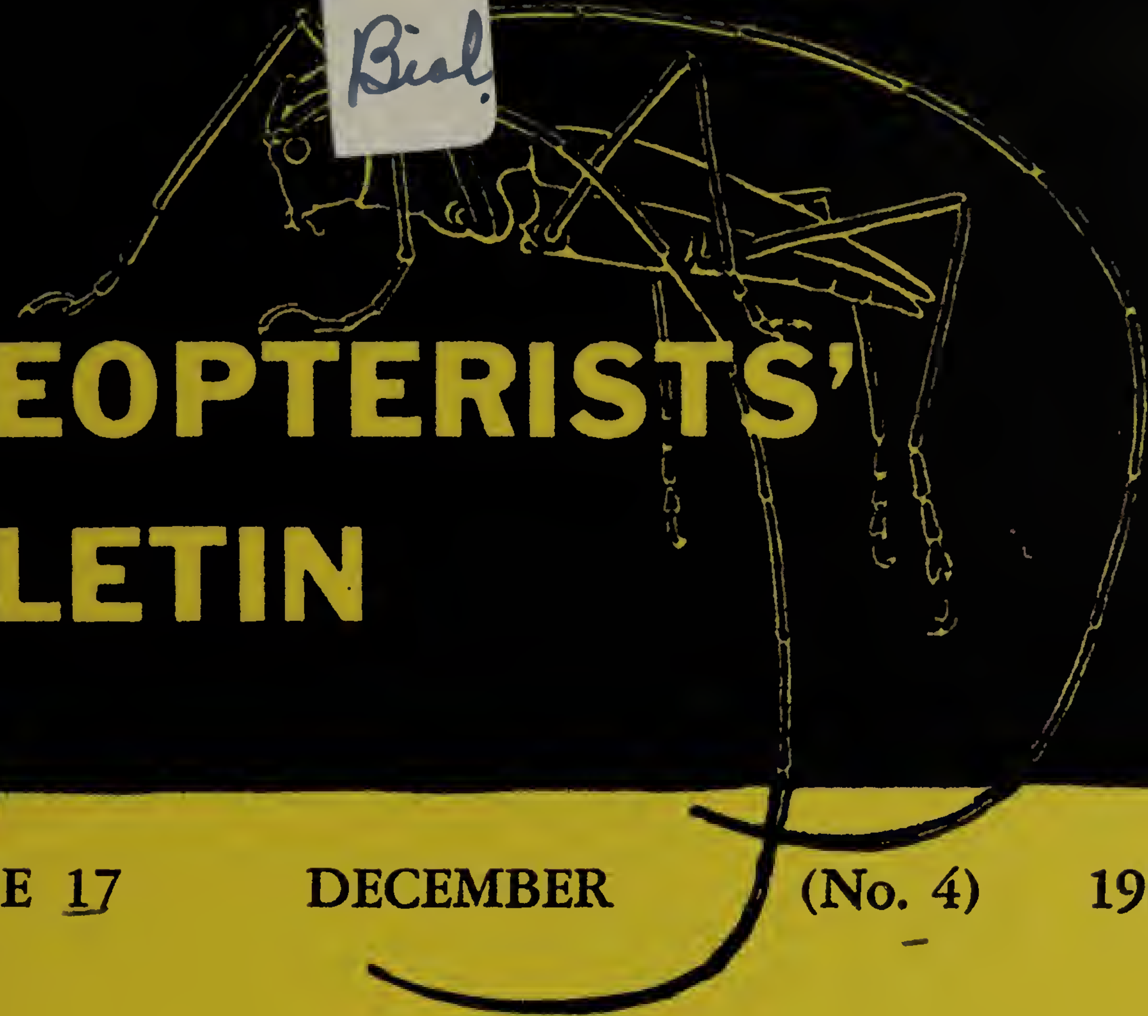

THE COLEOPTERISTS' BULLETIN

VOLUME 17 DECEMBER (No. 4) 1963

THE CATHOLIC UNIVERSITY OF AMERICA PRESS
WASHINGTON 17, D. C.

A Quarterly Publication Devoted to the Study of Beetles

THE COLEOPTERISTS' BULLETIN

Founded 1947 by Ross H. Arnett, Jr.

The Coleopterists' Bulletin is published by The Catholic University of America Press, Washington 17, D. C. and edited by T. J. Spilman. It is issued four times a year beginning with March. All business matters should be addressed to The Coleopterists' Bulletin at the Press. Manuscripts and other editorial matter should be addressed to the editor, U. S. National Museum, Washington 25, D. C.

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EDITORIAL POLICY

Any article, note, or news items likely to be of interest to readers of the **Bulletin** will be considered. Articles with illustrations are particularly desired, and *in all cases, descriptions of new species must be illustrated.* Descriptions of new species or genera MUST contain keys or be correlated with existing keys.

A QUARTERLY PUBLICATION DEVOTED TO THE STUDY OF BEETLES

The Coleopterists' Bulletin

Volume 17 December (No. 4) 1963

A DESCRIPTION OF THE LARVA OF MACROVATELLUS MEXICANUS SHARP (COLEOPTERA: DYTISCIDAE)[1]

By PAUL J. SPANGLER[2]

The genus *Macrovatellus* is known presently from the tropical and subtropical regions of the Western Hemisphere. Nine species have been described in the genus. Of this number, eight occur in South America, and only *M. mexicanus* Sharp is known, thus far, from Mexico. In Mexico, adults have been collected as far north as Alamos in the state of Sonora and 20 miles north of Comondu in Lower California.

The larvae described here as *M. mexicanus* are identified as such by elimination, association and size. *Macrovatellus* is the only Mexican hydroporine genus except *Desmopachria* and *Pachydrus* whose larvae cannot be identified by existing keys. All the species of *Desmopachria* are so small that this genus can be eliminated by size alone. I am also able to eliminate *Pachydrus* because I have undescribed *Pachydrus* larvae from Puerto Rico (where *Macrovatellus* does not occur). In addition, no *Pachydrus* were collected in the small pond at San Blas, Nayarit, where the larval material discussed in this paper was collected.

DESCRIPTION OF LARVA
(FIGURES 1-5)

Length 14 mm.; greatest width of pronotum 1.35 mm.

Color of integument yellowish gray; dorsal sclerites brownish but lighter anteriorly. Head yellowish gray except for a brown lateral stripe and a brown curving line following ecdysial cleavage line and its arms from base to middle of head where the line curves abruptly backwards, hooklike, and terminates at base of nasale. Pronotum brownish with yellowish gray trilobed macula discally. Mesonotum brownish with small, irregularly reniform, yellowish gray macula each side of midline. Dorsum of larva with a median yellowish gray stripe. Head appendages yellowish gray except for slightly darker gray color of second and third antennal segments. Terminal cerci with four alternate bands of brown and yellowish gray from base to apex. Legs entirely yellowish gray.

Head subquadrate, slightly narrower posteriorly and with a distinctive trifurcate nasale as long as length of head. Median branch of nasale narrow and parallel sided to broadly spatulate apex; ventrolateral surface bears two large spines on each side on anterior half and a group of seven or eight small spines are present ventrally

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[1] This study was aided, in part, by grant No. GB-1697 from the National Science Foundation.

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directly behind spatulate apex. Spatulate apex margined with setae of three lengths; the shortest are clavate and arranged in a dense row along lateral and apical margins; on each side of and at about midlength of spatulate apex is a long, rodlike seta; between these two rodlike, lateral setae and along anterior margin of spatulate apex are four clavate setae that are two-thirds as long as the two long, lateral setae. Dorsolateral surface of median branch of nasale with 15 or 16 small setae irregularly spaced on each side from base of median branch to spatulate apex. Apex of median branch of nasale with 9 or 10 long, fine setae on each side. Lateral branches of nasale are about two-thirds as long as median branch. Each lateral branch with small Y-shaped fork at apex, nine ventrolateral spines and one large ventromedial spine. Ecdysial cleavage line united at base, and forking at about one-third length of head; frontal arms curve laterally and terminate between base of nasale and antennae. Dorsal surface of head glabrous except for 15 to 20 short stout setae laterally, 2 or 3 short stout setae and 12 or 13 long hairs around ocular area. Ventral surface of head glabrous except 10 or 11 small setae irregularly spaced along each side of midline and 2 posterior tentorial pits at about midlength of head. Ocular area with six ocelli in a tight cluster. Antenna four-segmented; first and third segments longest, subequal; ultimate segment very small, about one-seventh as long as penultimate; basal segment with approximately eight setae irregularly placed throughout its length; second segment with two setae at apical fourth and one at midlength medially. Mandible long, slender, falciform, curved upward and inward apically, grooved along inner surface and with a stout seta ventrolaterally at base. Maxillary stipes rudimentary. Maxillary palpi slender, elongate, four-segmented; first three segments subequal in length; fourth segment approximately one-fifth length of third; second segment with five long spines; remaining segments glabrous. Labium small, rectangular, with one stout spine laterally and with two slender spines and two long hairs apically between palpi; ligula absent; labial palpus very slender, three-segmented.

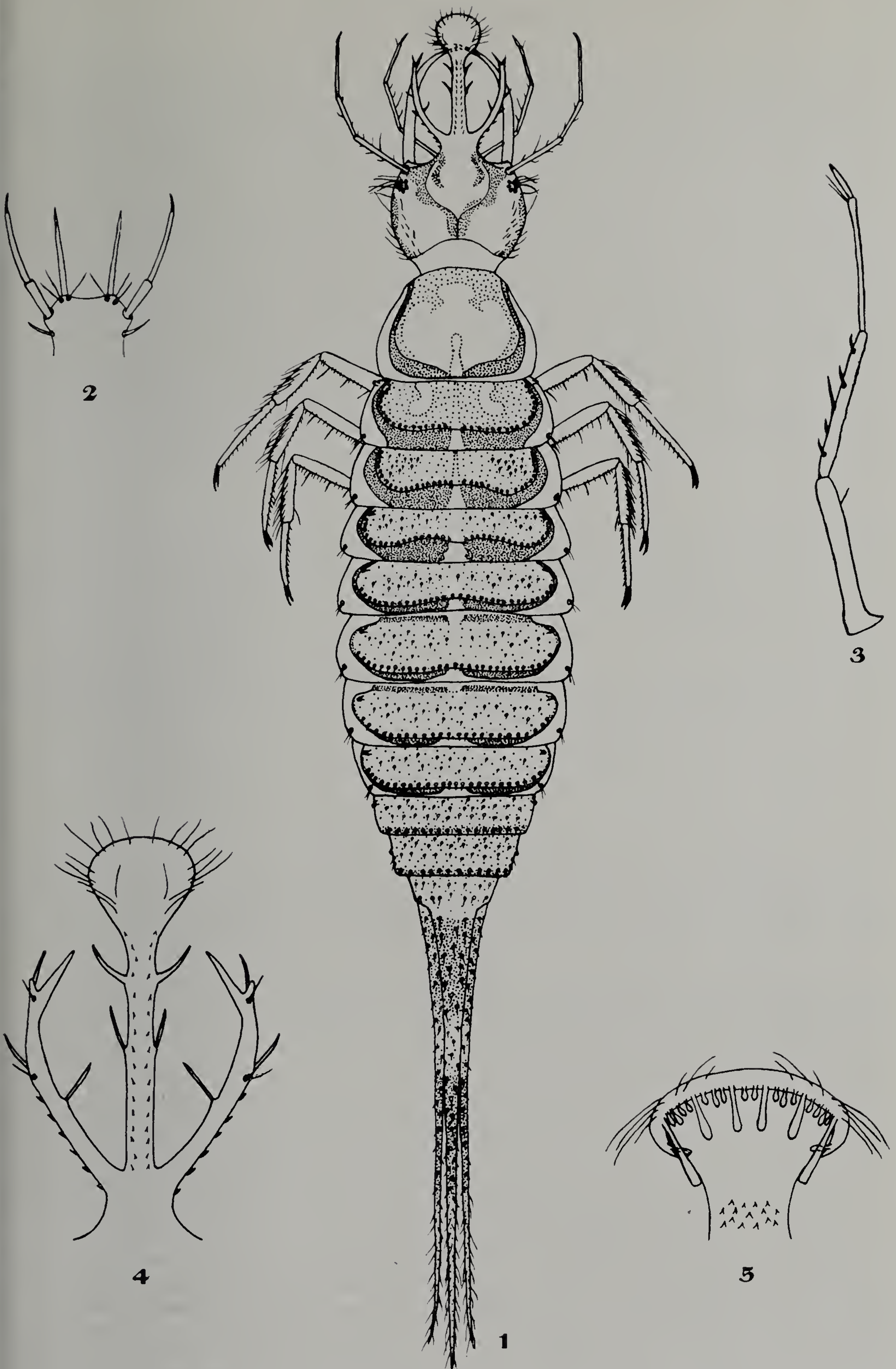
Pronotum subquadrate, wider basally, with numerous long hairs placed irregularly over surface and a few short and stout setae laterally and transversely on hind margin of sclerite. Mesonotum slightly wider than pronotum and half as long; with numerous setae along lateral margins and transversely across hind margin of sclerite and a few setae scattered discally; a spiracular opening is present in pleural region below anterolateral angle of sclerite. Metanotum slightly wider than mesonotum and about as long; setation similar to mesonotum.

Legs elongate, five-segmented. Coxa long; trochanter about one-third as long as coxa; femur as long as tibia and tarsus combined. Tarsus with two elongate, slender claws; outer claw slightly shorter than inner. Coxa with three stout setae on anterior face and two or three at junction of coxa and trochanter. Trochanter with three or four stout setae, one on anterior face and two or three apically. Femur with four or five stout setae on anterior (upper) face and four longer setae on posterior edge. Tibia and tarsus with numerous setae and natatory hairs.

Abdomen with eight distinct segments; segments 1 to 6 with dorsal sclerites; segments 7 and 8 completely sclerotized, ringlike. Segment 7 dark brown; segment 8 yellowish gray. Segments 1 to 7 setose on lateral margins and transversely across hind margin of terga and with a few setae scattered over surface. Segment 8 setose over surface, prolonged posteriorly into a long, slender cercus beneath which arise two cerci of similar shape, size and color. All three cerci unsegmented, bearing numerous setae throughout their length. Lateral margins of terga 1 through 7 each with a spiracle. Mesopleura, metapleura and pleural folds of segments 1 to 6 each with a small seta-bearing sclerite on posterolateral angle.

Judging from their large size, these larvae appear to be third instars.

Variations: The most obvious variation noticed is in the pattern and amount of pigmentation of the dorsal sclerites. The discal macula on the pronotum shown as trilobed in the larva illustrated (fig. 1) may vary in other larvae. In some specimens the yellowish gray color of the disc is so extended that the anterior lobe is eliminated. At the other extreme, pigmentation has progressed onto the disc so that the only remnant of the anterior lobe is an indistinct yellowish gray longitudinal stripe on the middle of the disc. The reniform maculae on the mesonotum of the larva described are reduced to small oval maculae on some of the other specimens.



FIGURES 1-5, *Macrovatellus mexicanus* Sharp. 1—Larva, dorsal view. 2—Labium, ventral view. 3—Maxilla, ventral view. 4—Nasale, dorsal view. 5—Apex of median lobe of nasale, anteroventral view.

Specimens examined: Twenty-two larvae were examined in the course of this study from San Blas, Nayarit, Mexico, collected July 26, 1963, P. J. Spangler. These specimens have been deposited in the collections of the U. S. National Museum.

Distribution: I have seen adult specimens from the following localities in Mexico: Alamos, Sonora, July 15, 1963, P. J. Spangler (2); San Blas, Nayarit, July 26, 1963, P. J. Spangler (48); Colima (1); Sinaloa (4); Rio Guayaleyo near Magiscatzin, Tamaulipas, July 11, 1960, F. N. Young (2). These specimens are in the U. S. National Museum collections. In addition, Leech (1948) reported the species from 20 miles north of Comondu, Lower California, July 23, 1938 (in tinaja) (26) and from Apatzingan, Michoacan, alt. 1,200 ft., August 11, 1941, Harry Hoogstraal (1). Sharp (1882) reported the species from Puebla, Mexico.

Literature Cited

Leech, H. B.
1948. Contributions toward a knowledge of the insect fauna of Lower California, No. 11, Coleoptera: Haliplidae, Dytiscidae, Gyrinidae, Hydrophilidae, Limnebiidae. Proc. California Acad. Sci., 4th Ser., vol. 24, no. 11, pp. 375-484, illus.

Sharp, D.
1882. Haliplidae, Dytiscidae, Gyrinidae, Hydrophilidae, Heteroceridae, Parnidae, Georissidae, Cyathoceridae. Biologia Centrali-Americana, Insecta, Coleoptera, vol. 1, pt. 2, pp. 1-144.

LITERATURE NOTICE

THE DYTISCIDAE (COLEOPTERA) OF UTAH: KEYS, ORIGINAL CITATION, TYPES AND UTAH DISTRIBUTION. By Russell D. Anderson. Great Basin Naturalist 22(1-3):54-75, 1962.—The contents are explained in the title. 20 genera with 80 species are included, upping the State records considerably.

NOTE PRELIMINAIRE SUR LA CLASSIFICATION DES CARDIOPHORINAE D'EUROPE ET DE LA REGION MEDITERRANEENNE [COL. ELATERIDAE]. By Roger Dajoz. Rev. Francaise d'Ent. 30:164-173, 25 figs., 1963.—Contains keys to the 5 palearctic genera and 14 species groups of *Cardiophorus;* genitalic characteristics are stressed and illustrated.

THE CICINDELIDAE OF MICHIGAN (COLEOPTERA). By Robert C. Graves. American Midl. Nat. 69(2):492-507, illus., 1963.—Fourteen species are keyed, their elytral patterns are figured, and their distributions by counties are listed.

ENTOMOLOGIE APPLIQUEE A L'AGRICULTURE. TOME 1, COLEOPTERES. Under the direction of A. S. Balachowsky. Masson et Cie Edituers, Paris, in two parts, 1391 pages, 784 figs., 1962-63. (Price, 132 & 162 N.F.)—Eight volumes in this series will be necessary to complete all insect groups, mites, myriapods, molluscs, and nematodes. This first volume, a large work by many authors, describes the biologies of many economically important beetle species of Europe and adjacent areas. Short recommendations for the control of each species is given. The many illustrations of the beetles or their immature stages and their work are especially good. The treatment of the Curculionidae and Chrysomelidae requires more than half the pages, with the Scarabaeidae running in third. This work brings together much information from many literatures. It should be a big help to those interested in the biologies of beetles.

A REVISION OF THE GENUS OXYGONUS LECONTE WITH A DESCRIPTION OF ONE NEW SPECIES (COLEOPTERA: ELATERIDAE) (TRIBE: AGRIOTINI)

By LEWIE C. ROACHE[1]

INTRODUCTION

Elater obesus—now known as *Oxygonus obesus* (Say)—was described by Say in 1823, however, later this species was transferred to the genus *Oxygonus* and designated as the genotype. LeConte (1863) erected the genus *Oxygonus*. Subsequently, Horn (1871) described *Oxygonus ater* and Schaeffer (1917) described *Oxygonus montanus*. Say's (1823) type of *Elater obesus* is probably lost. I was able to confirm the identity of this species by studying Say's original description and LeConte's review of Say's work.

I have studied Horn's type of *Oxygonus ater* in the Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania, and Schaeffer's type of *Oxygonus montanus* in the United States National Museum, Washington, District of Columbia, thus confirming the identity of these species and also substantiating that these species are congeneric.

Oxygonus is placed in the tribe Agriotini; this is a new assignment for the genus. I am using as the authority for this new assignment Arnett, 1963.

The purpose of the present study is to give a detailed recharacterization of the genus, to redescribe the members of the genus, to present additional data on geographical distribution, and to describe a new species.

During the course of this revision a number of specimens have been examined, including the type material and the general collections of the United States National Museum, Academy of Natural Sciences of Philadelphia, the Museum of Comparative Zoology, Cambridge, Massachusetts, and the Arnett Collection at the Catholic University of America, Washington, District of Columbia.

My sincere thanks to the following individuals for the loan of specimens: Mr. Hugh B. Leech, California Academy of Sciences; Dr. Jerry A. Powell and Dr. E. Gorton Linsley, University of California; Dr. Rupert Wenzel and Mr. Henry Dybas, Chicago Natural History Museum; Dr. Henry Dietrich, Cornell University; Miss Marjorie Statham, The American Museum of Natural History; and Dr. E. C. Becker, Canadian Department of Entomology.

I am also indebted to Mr. James A. G. Rehn and Mr. Harold J. Grant of the Academy of Natural Sciences of Philadelphia for permitting me to study the Horn Collection, and to Dr. P. J. Darlington of the Museum of Comparative Zoology for allowing me to study the LeConte Collection.

I am particularly grateful to Mrs. Barbara Thompson Townsend for her invaluable assistance during the preparation of the illustrations for this paper.

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Genus *Oxygonus* LeConte, 1863

Oxygonus LeConte, 1863, Smithsonian Misc. Coll. 6(140):48.

Type-species.—*Elater obesus* Say, 1823. (Monobasic.)

Description of genus.—Form small, elongate, moderately convex; entire beetle black or only pronotum black with elytra light brown to dark reddish brown. Head directed obliquely in front, prosternal lobe long, tarsal claws with large tooth at base.

Head flat; eyes prominent, moderately protruding; antennae slightly to moderately serrate, reaching three-fourths of pronotum to entire length of pronotum; mandibles large, simple, or moderately cleft near apex.

Median length of pronotum shorter or subequal to median width, lateral margins weakly explanate to strongly explanate, slightly to strongly converging anteriorly; posterior angles slightly divergent to moderately divergent, not carinate to distinctly carinate. Pronotal punctures small and deep; prosternum convex, prosternal lobe long, sparsely to densely clothed with small to medium shiny recurvate pubescence, prosternal sutures double.

Sides of mesosternal cavity stout, slightly diverging anteriorly and slightly declivous. Metacoxal plates widest on inner margin gradually narrowing to outer lateral margin, posterior margin entire. Tarsal claws with basal tooth. Elytra elongate, striated, with punctate striae, intervals flat to moderately raised. Lateral lobes of male genitalia expanded at apex forming apical hooks, basal piece with U-shaped or V-shaped non-sclerotized area.

Discussion.—The taxonomic criteria listed below coupled with the individual descriptions of this paper will facilitate rapid identification of the group and will also serve to separate and recognize the different species. The most important taxonomic criteria used to separate *Oxygonus* from other genera of Elaterids are (1) tarsal claws with basal tooth, (2) long prosternal lobe, (3) head slightly depressed anteriorly, and (4) mouth parts obliquely directed forward. Generally the beetles of this group are small in comparison with some of the other genera of Elaterids.

Key to the Species of Oxygonus

1. Lateral margin of elytra slightly explanate, posterior angles of pronotum moderately to distinctly carinate -- 2
   Lateral margin of elytra markedly explanate, posterior angles of pronotum slightly carinate or not carinate -- 3
2. Entire beetle black -- ATER Horn
   Pronotum dark reddish brown, elytra reddish brown ------------------- ARNETTI n. sp.
3. Lateral margin of elytra strongly explanate, apex strongly acuminate in males, in females acute; posterior angles of pronotum not carinate dorsally; fifth visible sternite in males drawn out into a tongue-like structure, apex deflexed, in females acutely rounded -- OBESUS (Say)
   Lateral margin of elytra prominently explanate, conjointly rounded at apex, posterior angles of pronotum slightly carinate dorsally. Fifth visible sternite more broadly rounded at apex, apex not deflexed ------------------------ MONTANUS Schaeffer

Oxygonus ater Horn

Oxygonus ater, Horn, 1871. Trans. American Ent. Soc. 3:318. (Location of type: Academy of Natural Sciences of Philadelphia, Philadelphia, Penn. Type no. 3374).

Type locality: Amador Valley, California.

This species differs from other species of *Oxygonus* in its uniformly black color and in having posterior angles of pronotum distinctly carinate with carina ending abruptly before reaching vertex of angle.

Description of species.—Length 5-7.2 mm.; width 1.5-2 mm. Body elongate, moderately convex. General color black; pronotum more shiny than elytra. Legs slightly lighter than other parts of body. Pubescence greyish, recurvate, posteriorly directed, thicker on head than elytra; dorsal surface deeply, densely umbilicately punctate.

General ventral surface deeply, sparsely punctate. Antennae (Fig. 4) moderately serrate, extending three-fourths the length of the pronotum, second segment shorter than third, third shorter than fourth, second plus third longer than fourth, fourth through tenth similar, eleventh tapering and rounded apically, longer than tenth. Mandibles large, cleft near apex, apices bluntly rounded.

Pronotum (Fig. 4) convex, median length subequal to median width, lateral margins slightly sinuate anterior to posterior angles, very slightly converging anteriorly; posterior angles distinctly carinate, carina ends abruptly before reaching vertex of angle; posterior border sinuate, biculcate medially and adjacent to each posterior angle. Pronotal epipleura deeply, umbilicately punctate, sparsely clothed with fine short setae, posterior border with two emarginations, a lateral broad, shallow one and a narrow deep mesal one, with slight sinuation between the two emarginations. Mesepisternum partially punctate.

Scutellum (Fig. 4) truncate at base, lateral margin very slightly sinuate on basal third, slightly narrowing apically, apex moderately rounded, densely clothed with moderate length setae. Elytra (Fig. 4) elongate, wider than pronotum, length over twice the width, widest at middle, moderately tapering to apex, apex conjointly rounded; slightly explanate, coarsely deeply punctate; deeply striated, intervals moderately raised, triseriately punctured, punctures modrate giving an overall transversely wrinkled appearance.

Abdomen moderately convex, fifth visible sternite rounded at apex.

Male genitalia (Fig. 5) with median lobe gradually narrowing apically, apex bluntly rounded; lateral lobes stout, shoulders with open hooks; apex broadly acute with very small V-shaped non-sclerotized area, most of basal piece sclerotized.

Distribution.—(Fig. 10) This species is known from California and Oregon.

Specimens examined (44). UNITED STATES: CALIFORNIA: 8, *Humboldt Co.:* Fort Seward, 1. *Kern Co.:* Frazier Park, 1. *Madera Co.:* Ahwahnee, 2. *Mariposa Co.:* 4. *Santa Cruz Co.:* Ben Lomond, 2. *Siskiyou Co.:* 1. *Sonoma Co.:* Mill Cr. W. of Healdsburg, 1. *Tulare Co.:* Colony Mill, 1; Kaweah, 4. *Trinity Co.:* Carrville, 3. *Tuolumme Co.:* Cal. Lyons Dam, 2; nr. Longbarn, 3. *Ventura Co.:* 2. OREGON: *Benton Co.:* Corvallis, 5. *Washington Co.:* Forest Grove, 3.

Oxygonus arnetti Roache, NEW SPECIES

The dark reddish brown pronotum, the reddish brown elytra, and the posterior angles of pronotum moderately carinate with carina becoming evanescent as it approaches the vertex of the angle are sufficient characters to identify this species.

Holotype.—California, Humboldt Co., F. W. Nunenmacher. (Deposited in the California Academy of Sciences, San Francisco, Calif.)

Description of Holotype:—Male. Length, 4.1 mm.; width 1.4 mm. Body elongate, moderately convex. Head, pronotum, ventral surface, and terminal segments of antennae dark reddish brown, mandibles, legs, and elytra reddish brown. Pronotum more shiny than elytra. Pronotum and ventral surface moderately clothed and elytra densely clothed with silky pubescence. Dorsal surface deeply, densely, umbilicately punctate; ventral surface deeply, moderately punctate.

Antennae (Fig. 6) moderately serrate, extending the length of the pronotum, second and third segments similar in shape, third shorter than fourth, fourth slightly subserrate, fifth through tenth similar, eleventh tapering and rounded apically, longer than tenth. Mandibles large, cleft near apex, dorsal lobe shorter than ventral lobe, apices acute.

Pronotum (Fig. 6) convex, median length subequal to median width, lateral margins slightly sinuate at base of posterior angles, very slightly converging anteriorly; posterior angles moderately carinate, carina becomes evanescent as it approaches vertex of angle; moderately punctate, interstices approximately two and one-half times as large as punctures, moderately clothed with fine, golden, silky pubescence.

Scutellum truncate at base, lateral margins very slightly sinuate on basal third, slightly narrowing apically, apex moderately rounded, moderately clothed with moderate length setae.

Elytra (Fig. 6) elongate, wider than pronotum, length twice the width, widest at apical third, sides parallel on basal two-thirds, moderately tapering at apex, apex conjointly rounded; slightly explanate, coarsely deeply punctate; deeply striated, intervals slightly raised.

Abdomen moderately convex, fifth visible sternite rounded at apex, and very densely umbilicately punctate.

Male genitalia (Fig. 7) with shoulders of lateral lobes having very sharp apical hooks; lateral lobes moderately stout below apical expansion. Basal piece has small unsclerotized V-shaped area with indentation on basal border.

Distribution.—(Fig. 10) This species is known from southeastern Oregon and northwestern California.

Specimens examined 33—All designated as paratypes—United States: CALIFORNIA: *Humboldt Co.:* 25; Green Point, 3. *Siskiyou Co.:* 1. *Trinity Co.:* Carrville, 1. OREGON: *Jackson Co.:* Medford, 3. Twenty-six of the paratypes are deposited in the California Academy of Science, San Francisco, Calif., and 7 in the Canadian National Collection, Ottawa, Ontario.

This species is named for my major professor and good friend Dr. Ross H. Arnett, Jr.

Figure 10—Distribution of *Oxygonus* spp.

Oxygonus obesus (Say, 1823)

Elater obesus Say, 1823, Journ. Acad. Nat. Sci. Philadelphia 3:168. Type locality: Missouri.

Elater acutipennis Randall, 1838, Boston Jour. Nat. Hist. 2:36. (Synonymy by LeConte 1863:48.)

Lateral margins of elytra strongly explanate, apex acute to strongly acuminate, posterior angles of pronotum not carinate. It differs from *ater* and *montanus* in its larger size and strongly explanated elytra.

Description of species: Length 10-11 mm.; width 4-4.5 mm. Body elongate, moderately convex; elytra, mandibles, antennae, and legs reddish brown; ventral surface darker reddish brown, pronotum black. Clothed with yellowish pubescence, head and thorax more densely clothed than elytra.

Head moderately depressed, densely umbilicately punctate; eyes vertical, obovate, protruding slightly; antennae (Fig. 2) slightly serrate, as long as pronotum in males, four-fifths as long as pronotum in females, second segment shorter than third, third shorter than fourth, fourth shorter than second and third combined, fourth through tenth similar, eleventh longer than tenth and apically rounded. Mandibles large, cleft near apex, dorsal lobe shorter than ventral lobe, apices acute.

Median length of pronotum (Fig. 2) shorter than median width, posterior angles slightly divergent, not carinate, lateral margins sinuate just anterior to posterior angles, continuing anteriorly borders become rounded and converging strongly. Pronotum convex, very faint median longitudinal line present, with small deep punctures, interstices approximately same size as punctures, surface smooth and shiny. Densely clothed with whitish-silky pubescence, directed in several directions. Posterior border sinuate, bisulcate, with narrow sulcus at base of posterior angles. Pronotal epipleura densely punctate, densely clothed with moderately long silky pubescence, setae arising from punctures anteriolaterally directed; posterior border moderately oblique, broadly sinuate. Mesepisternum densely punctate, densely clothed with long setae.

Scutellum (Fig. 2) truncate at base, moderately sinuate on basal third, broadening apically, apex very broadly rounded, widest on apical third, thickly clothed with moderately long setae, radiating concentrically. Elytra (Fig. 2) elongate, wider than pronotum, length slightly less than twice the width, widest at middle gradually tapering to apex conjointly acutely rounded in females, elongate, acuminate in males; moderately punctate, pubescence moderate in length and density.

Fifth abdominal sternite in males modified into a tongue-like structure deflected at apex, in females acutely rounded at apex, subapically slightly sinuate; abdomen moderately convex.

In male genitalia (Fig. 3) median lobe gradually narrowing apically; ventral surface attenuated, compressed, rounded at apex giving effect of keel-like subapical dorsal surface, broader than ventral surface and fits along inner apical expansion of lateral lobes; shoulder of lateral lobes with short apical hooks, apex of lateral lobes acute; basal piece with V-shaped non-sclerotized area; chitinized rods small.

Distribution.—(Fig. 10) This species is known from Canada through the northern United States from New England westward to North Dakota.

Specimens examined (129). CANADA 2: ONTARIO: Belleville, 1; Point Pelee, 1; Ridgeway, 2; Toronto, 1; QUEBEC: Covey Hill, 1. UNITED STATES: MAINE: 1. NEW HAMPSHIRE: 5. *Cheshire Co.:* Jaffrey, 1; *Grafton Co.:* Rumney, 4. VERMONT: 1. MASSACHUSETTS: *Berkshire Co.:* South Field, 4; *Essex Co.:* Lawrence, 1; Salisbury, 1. *Hampshire Co.:* Amherst, 1. *Middlesex Co.:* Cambridge, 1; Framingham, 1; Jamaica Plains, 1; Wellesley, 3. *Norfolk Co.:* Dover, 5. CONNECTICUT: *Windham Co.:* Pomfret, 1. NEW YORK: 5. *Chemung Co.:* Elmira, 1. *Cortland Co.:* Chicago Boggs, 1. *Dutchess Co.:* Poughkeepsie, 1. *Erie Co.:* Buffalo, 3; Zoar Valley, 1. *Essex Co.:* Crown Point, 5. *Orleans Co.:* Shelby, 2. *Putnam*

Co.: Putnam 1. *Tompkins Co.:* Ithaca, 13; McLean Bogs Res., 5. *Washington Co.:* White Hall, 2. PENNSYLVANIA: *Dauphin Co.:* Hummelstown, 1. *Westmoreland Co.:* Jeanette, 1. INDIANA: *Lake Co.:* Hessville, 5. ILLINOIS: *Cook Co.:* 6; Chicago, 1; Palos Park, 1; Riverside, 2; Willow Springs, 10. *DuPage Co.:* Glen Ellyn, 1. *Lake Co.:* Fort Sheridan, 2. WISCONSIN: 6. *Dodge Co.:* Beaver Dam, 3. IOWA: 1. MINNESOTA: 4. *Hennepin Co.:* Minneapolis, 2; Lake Minnetonka, 3. NORTH DAKOTA: *Cass Co.:* Fargo, 1.

Oxygonus montanus Schaeffer

Oxygonus montanus Schaeffer, 1917, Bull. Brooklyn Ent. Soc. 12:43. (Location of type: United States National Museum, Washington, D.C. Type no. 42628.)

Type locality: Catskill Mountains, Ulster County, New York.

Lateral margin of elytra prominently explanate, conjointly rounded at apex, posterior angles of pronotum slightly carinate. This species differs from *obesus* in having a darker color and being smaller in size.

Description of species: Length 8-10.5 mm., width 2.75-3.25 mm. Body elongate, females more convex than males. Elytra light brown to dark reddish brown; first segment of antennae and legs lighter, pronotum black; general ventral surface darker than dorsal. Clothed with yellowish pubescence, head and thorax more densely clothed than elytra.

Head densely umbilicately punctate. Antennae (Fig. 8) slightly serrate, slightly shorter than pronotum, second segment shorter than third, third subserrate subequal to fourth, fourth through tenth similar, eleventh rounded at apex, longer than tenth. Mandibles large, cleft near apex, dorsal lobe shorter than ventral lobe, apices acute.

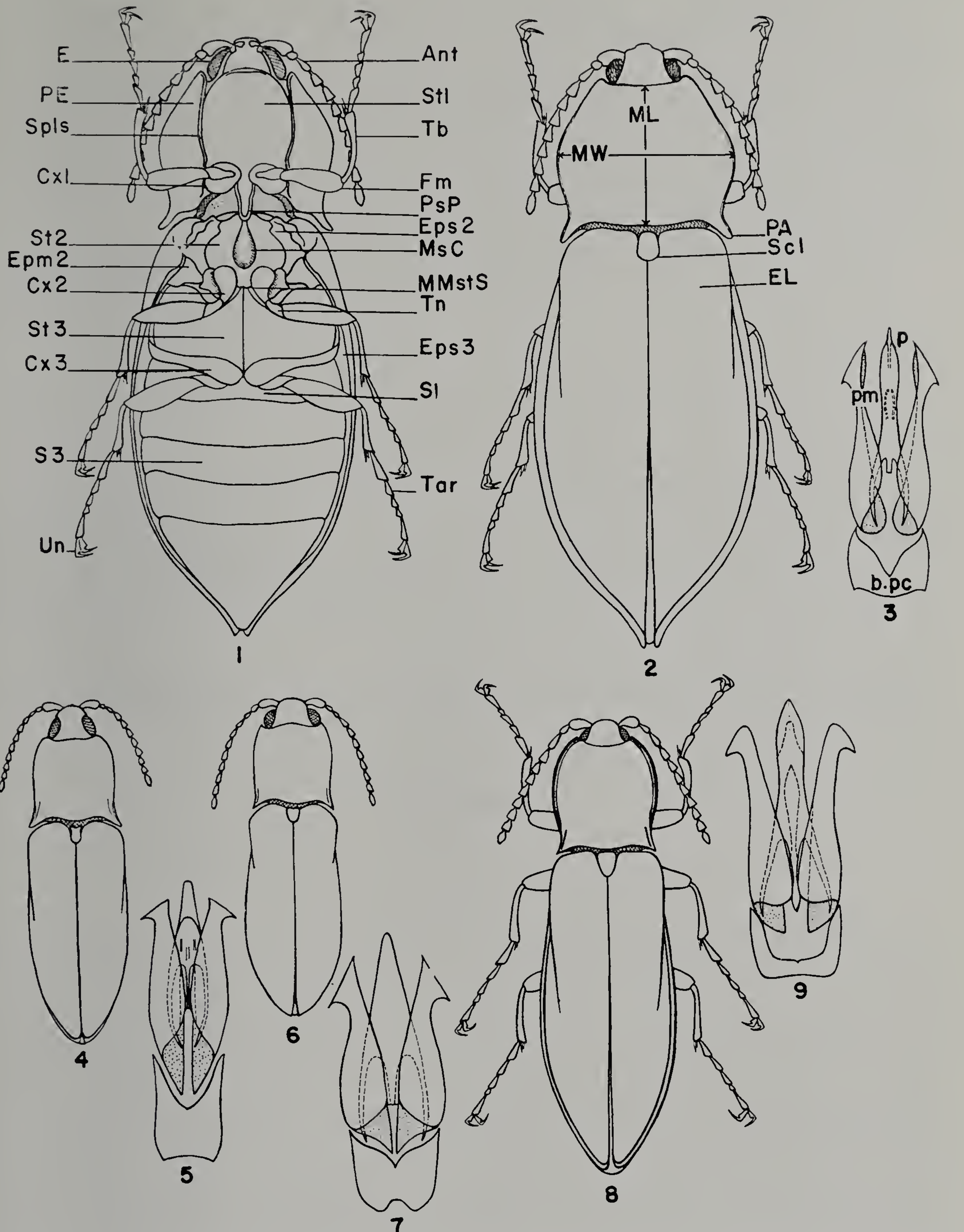
Median width of pronotum (Fig. 8) slightly longer than median length, widest at posterior angles; posterior angles slightly divergent, feebly carinate; lateral margins slightly sinuate anterior to posterior angles moderately converging anteriorly, strongly explanate. Pronotum convex, clothed with moderate length silky pubescence. Posterior border sinuate, medially from each posterior angle four-fifths of the distance to median line of the head is a rounded projection and a sulcus. Pronotal epipleura densely punctate, sparsely clothed with moderately long pubescence, setae arising from punctures laterally directed; posterior border slightly oblique, sinuate, slight notch on outer third, next to procoxal cavity. Mesepisternum impunctate except in concavity immediately behind anterior margin.

Scutellum (Fig. 8) truncate at base, slightly sinuate on basal third, moderately narrowing apically, apex acutely rounded, broadest at base, thickly clothed with medium hairs. Elytra (Fig. 8) elongate, wider than pronotum, length more than twice the width, widest at middle, gradually tapering to apex, apex conjointly rounded; each elytron with nine distinct punctate striae, intervals flat, over four-times wider than striae, clothed with fine pubescence.

Fifth abdominal sternite moderately rounded at apex, abdomen very convex in females, in males converging slightly. Median lobe of male genitalia (Fig. 9) slightly narrowing apically, apex rounded, slightly depressed. Shoulders of lateral lobes also rounded; basal piece with broad U-shaped non-sclerotized area. Chitinized rods large.

Distribution.—(Fig. 10). This species is known from eastern New York, northern Pennsylvania and southern Quebec.

Specimens examined (24). CANADA: QUEBEC: Brome, 1; Gatincan Park, 1. UNITED STATES: NEW YORK: 4. *Essex Co.:* Heart Lake, 1. *Ulster Co.:* Slide Mountain, 15. PENNSYLVANIA: *Sullivan Co.:* Laporte, 2.



FIGURES 1-9, *Oxygonus* spp. 1—Ventral view of *O. obesus*. 2—Dorsal view of *O. obesus*. 3—Male genitalia, dorsal view, *O. obesus*. 4—Dorsal view of *O. ater*. 5—Male genitalia, dorsal view, *O. ater*. 6—Dorsal view of *O. arnetti*, new species. 7—Male genitalia of *O. arnetti*, new species. 8—Dorsal view of *O. montanus*. 9—Male genitalia, dorsal view, *O. montanus*.

Literature Cited

Arnett, Ross H. Jr.
1963. Beetles of the United States. The Catholic University of America Press. Washington, D. C.

Horn, G. H.
1871. Descriptions of New Species of Elateridae of the United States. Trans. American Ent. Soc. 3:299-324.

Hyslop, J. A.
1921. Genotypes of the elaterid beetles of the world. Proc. United States Nat. Mus., 58(2343):621-680.

LeConte, J. L.
1859. The Complete Writings of Thomas Say on the Entomology of North America. Vol. 1, XXIV, 54 pl., vol. 2, iv-814, 13 pl. New York.
1863. List of Coleoptera of North America. Smithsonian Misc. Coll. (140): 1-49.

Leng, C. W.
1920. Catalogue of the Coleoptera of America, North of Mexico. John D. Sherman, Jr., Mount Vernon, New York, X + 470 pp.

Randall, J. W.
1838. Descriptions of new species of coleopterous insects inhabiting the State of Massachusetts. Boston Jour. Nat. Hist. 2:34-52.

Say, T.
1823. Descriptions of Coleopterous Insects Collected in the Late Expedition to the Rocky Mountains . . . J. Acad. Nat. Sci. Philadelphia. 3(1):139-216.

Schaeffer, C. F.
1917. Notes on a few Eucnemidae and descriptions of new Elateridae. Bull. Brooklyn Ent. Soc., 12:39-44.

Schwarz, O.
1907. Elateridae. In Wyatsman, Genera Insectorum, Coleoptera, fasc. 46C. pp. 225-370.

CURRENT RESEARCH PROGRAMS

These announcements of research underway on beetles are not meant to be requests for specimens or information unless stated to the contrary; a letter to the researcher will determine whether or not specimens or information are wanted. All research workers are invited to send notices of research in progress to the Editor.

AGLYCYDERIDAE: Study of Aglycyderidae (=Proterhinindae) of the world. By Elwood C. Zimmerman, Peterborough, New Hampshire.

CURCULIONIDAE: Revision of *Curculio* (formerly *Balaninus*). By Kenneth E. Weisman, 4 Balmoral Ave., Bartonville, Illinois.

CURCULIONIDAE: Study of Curculionidae of Somoa, Fiji, southeastern Polynesia, Melanesia, and Micronesia. By Elwood C. Zimmerman, Peterborough, New Hampshire.

LAMPYRIDAE: Flash communication in several species of *Pyractomena* and *Photinus*. By James E. Lloyd, Cornell Univ., Ithaca, N. Y.

MELANDRYIDAE: Study of Melandryidae of Québec. By Br. Firmin Laliberté, Académie de Québec, 2410 Chemin Ste-Foy, Québec 10e, Québec.

PSELAPHIDAE: Monographic study of Pselaphidae of the Antilles. By Orlando Park, Dept. of Biological Sciences, Northwestern Univ., Evanston, Illinois.

ARAEOCORYNUS CUMINGI JEKEL (COLEOPTERA: ANTHRIBIDAE), A POTENTIAL PEST OF STORED PRODUCTS

Araeocorynus cumingi Jekel has been intercepted alive in beans at Phoenix, Arizona, in seeds of *Samanea saman* (monkey-pod) at Santa Barbara, California, and in beans at Ventura County, California. The beans intercepted in Ventura Co., July 17, 1962, were in the form of a curio brought in by a tourist from Hawaii. The finding of this species in Hawaii, in December 1961, was the first record of it occurring there and the second outside of the Philippine Islands, where it is endemic. Zimmerman (1942, B. P. Bishop Mus., Bull. 172, p. 72) reported this species from Guam. *Araeocorynus* is closely related to *Araecerus,* which includes *A. fasciculatus* (DeG.), a cosmopolitan pest of stored products.—ROSE ELLA WARNER, *Ent. Res. Div., A.R.S., U. S. Department of Agriculture, Washington, D. C.*

LITERATURE NOTICE

MORPHOLOGICAL AND TAXONOMIC STUDY ON THE LARVAE OF ELATERIDAE IN JAPAN (COLEOPTERA). By Hitoo Ohira. Published by the author, Okazaki, Japan, 179 pp., 61 pls., 1962.—Larvae of 78 species in 47 genera in 12 subfamilies are described and keyed in Japanese. However, a key in English is also provided. The excellent illustrations, approximately 9 to a plate, will be especially helpful.

DOLOSUS LELEUPI N. G., N. SP. ET DOLOSUS BASILEWSKYI N. SP., TYPES D'UNE FAMILLE NOUVELLE DE CUCUJOIDEA (COLEOPTERES). By Roger Dajoz. Rev. Zool. Bot. Africaines 67(1-2):91-96, 14 figs., 1963.—This new family, the Dolosidae, has a vague resemblance to the Lathridiidae but is actually nearest the Colydiidae. Perhaps the mandibles and maxillae are the oddest parts of these little beetles. Specimens have been found in the equatorial zone of Tanganyika and eastern Congo.

CONCERNING DUNG BEETLES: The *Gymnopleurus* has sufficient geometrical instinct to clearly appreciate the shape of her pill. . . . I try another experiment. I flatten out the pellet; I, in fact, convert the sphere into a disc. How will the beetles meet the difficulty now? This is a severe test, so let us see how they perform the feat. They are naturally at first a little alarmed, but soon attempt to manipulate the disc. They commence with a futile effort to roll the flat circle along. It is a droll sight. The disc rotates edge over edge, and only with difficulty can it be turned at all. They will sometimes now desert the pellet, probably thinking that their troubles are too great. But some are built of more determined stuff; they refuse to submit to defeat, and will set to work and use every effort to restore the shape.—R. W. G. Hingston, 1923, A Naturalist in Hindustan.

And the poor beetle that we tread upon,
In corporal sufferance finds a pang as great
As when a giant dies.

Shakespeare, Measure for Measure

DESCRIPTION OF THE LARVA AND PUPA OF CANTHOCHILUM HISTEROIDES (HAROLD) WITH NOTES ON ITS BIOLOGY (COLEOPTERA: SCARABAEIDAE)

By Eric G. Matthews[1, 2]

Canthochilum histeroides (Harold) is one of five described species of dung beetles of the subtribe Canthonina (tribe Scarabaeini, or ball rollers) occurring in Puerto Rico. All five species are endemic to Puerto Rico or the Greater Antilles and are the only Scarabaeinae known to occur in Puerto Rico. The Antillean Canthonina are currently under taxonomic revision by Father Francisco Pereira of the Secretaria da Agricultura, São Paulo, Brazil.

The area in which this species was investigated is a portion of the northern slope of the mountain known as El Yunque in the Luquillo National Forest, Puerto Rico. The vegetation consists of tropical rain forest, considerably disturbed by man. Two additional species of Canthonina were collected abundantly in this area: *Canthochilum hispidum* Chapin and *Canthonella pygmaea* (Harold), but no larvae of these two species have yet been obtained. It is quite evident that these three species are strictly adapted to rain forest leaf-litter conditions, as they are not found even in adjacent cow pastures. All three may occur together in one location in the rain forest, but usually one species predominates, often to the complete exclusion of the other two. Each of the three species predominates in at least one area studied. *C. histeroides* is generally the most abundant. I have observed all three fashioning dung into balls and rolling it, in the manner typical of Scarabaeini.

C. histeroides buries the dung balls that are to serve as larval food individually 7-10 centimeters directly below the dung supply. Only brood balls several weeks old were seen; no trace of a burrow could be seen at that time. The brood balls measure 7×8 to 9×11 millimeters, with the longer axis vertical; they are smoothly contoured on the lower half but rough on the upper, probably as a result of the activities of the larva. The brood ball is made of dung with an outer crust of clay soil, which varies greatly in thickness.

Larvae were obtained only on 6 June 1962, and 10 April 1963, in spite of continuing attempts throughout the year. This seems to indicate a reproductive season, consonant with the period of slightly increased rainfall. Pupae were found as little as 36 days after the deposition of the dung supply, indicating a life cycle of around 40-50 days, which is remarkably short for a scarabaeine dung beetle.

Cow dung was used in this study. Normally cow dung is not present in the rain forest and I do not know what type of dung is ordinarily fed

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[2] Acknowledgments—I am indebted to F. S. Pereira, Secretaria da Agricultura, São Paulo, Brazil, for determining the adults of the beetles studied, and to G. Candelas and H. Heatwole, Department of Biology, University of Puerto Rico, for use of the facilities of the Yunque Biological Station.

upon. The only mammals present in the forest are rats (*Rattus* sp.), bats, and man. That the food supply must be very plentiful is shown by the apparent abundance of these beetles. Traps overnight normally yield an average of 18 individuals, counting all three species; one 10 ounce can, after being left overnight, contained 93 individuals, all *C. histeroides*. This species is nocturnal.

Methods

Larvae were collected by burying 46-oz. cans, the bottoms of which had been perforated, in the soil up to the rim, and by filling the cans with soil and a quantity of cow dung on top. These traps were set at intervals along an ascending road in the Luquillo National Forest in May, June, August, and September, 1962, and February, 1963. The cans were collected after about a month and the soil was checked for brood balls. Seventeen balls were found in one can on 6 June 1962 and were broken open. Fourteen balls contained third-instar larvae (inferred because of their size and the fact that the dung supply in the ball was almost gone) and three contained pupae. Seven larvae and two pupae were preserved, the remainder being allowed to develop to maturity in the laboratory. All the adult beetles thus obtained (between 15 and 21 June) were *C. histeroides;* there is thus reasonable certainty of the identity of the larvae. A single additional larva found in the same location on 10 April 1963 was preserved.

Larvae and pupae were killed in Peterson's fluid and thus fixed for about a day, then transferred to 70% alcohol. Two heads and two sets of mouthparts were mounted on slides and cleared in modified Berlese insect mounting medium. Measurements were made with the use of an ocular micrometer.

The terminology used in the following description is from the comparative study of Oberholzer (1959), which in turn largely follows current American usage based on the works of Bøving. Europeans do not use this terminology, which involves primarily the epipharynx, hence their descriptions are of little use for comparative purposes.

The descriptions are based on the following material: Seven third-instar larvae and two pupae collected in dung trap at Km. 9.7, Route 191, Luquillo National Forest, Puerto Rico, 6 June 1962, altitude 1800 feet; one third-instar larva collected in the same locality on 10 April 1963. (Abbreviations in parentheses refer to abbreviations used in illustrations.)

Description of Larva
(Figs. 1-5)

Body strongly doubled with a prominent transverse ridge ("wart") on third abdominal tergite; pronotum without lateral processes; body bare except for two transverse rows of long, sparse setae on each annulet of terga. Total length 7.35-7.55 mm.

Width of head capsule 1.32-1.42 mm.; epicranial suture (eps) continued frontally beyond fork of frontal suture (fs), but without supplementary Y-shaped depression; dorsoepicranial setae (des) two; lateral epicranial setae (les) in two unequal pairs; posterior frontal setae (pfs) two; anterior frontal setae (afs) two, exterior frontal setae (efs) two, and two setae in each anterior frontal angle (aa) (counting one side only in all cases). Antennae four-segmented, but with the basal two segments nearly fused and not articulated; second segment bearing two sense organs of the type called sensilla coeloconica (sc) by Landin (1961); third bearing apically a sensory cone (se) half as long as fourth segment, which is minute. Clypeus with but two exterior setae (ecs). Labrum symmetrical, weakly trilobed, with two paramedian setae (mls) and two lateral setae (lls), plus eight setae on the distal edge. Epipharynx with haptolachus bearing two or three macrosensilla (ms), with a continuous, sinuate mesophoba (mph) which is polystichous on the right side, and a diffuse crepis (cr); tormae united mesally, short asymmetrical anterior (aet) and posterior (pet) epitormae present, apotorma absent; dexiotorma with a long pointed pternotorma (ptt), the left pternotorma very lightly sclerotized; pedium bare, with complete dexio-, laeo-, and protophoba (ph) consisting of close-set filaments, those of protophoba bifurcate; haptomerum (hm) devoid of definite heli, but with three or four small sensilla; chaetopariae (cp) with two or three setae, acropariae (acr) with three stout bristles, and acanthopariae (acp) with one very long bristle; corypha (co) with a row of four short, stout bristles; clithra lacking. Left mandible with scissorial region bearing S1-4 distinct and separate; distal lobe of molar region acute and simple; brustia of many setae; dorso-molar setae absent; one very small ventro-molar seta tuft; scrobis (scr) consisting of one long distal seta and four tubercles in a row; stridulating area not seen. Right mandible with scissorial region showing S1-3 separate and distinct, molar region devoid of teeth, brustia with only two or three bristles, and two ventro-molar tufts; otherwise like left mandible. Maxillae with subdivisions of cardo (car) not clearly differentiated; labacoria (lc) with fine, close-set tuberculation; stridulatory teeth of stipes (str) small, conical, six in number, set in an irregular row; palpus (mp) short, tapering; lacinia (lac) and galea (ga) separated, bearing a number of stout bristles; lacinia with two unci (un), the proximal one setiform, galea with a single terminal uncus (un). Hypopharyngeal sclerite (=oncylus) (hsc) complex, with a strong, blunt dextral projection. Arrangement of setae on glossa as indicated in fig. 3; proximal segment of labial palpus (lp) very short, distal segment subcylindrical, with a cluster of terminal sensilla basiconica.

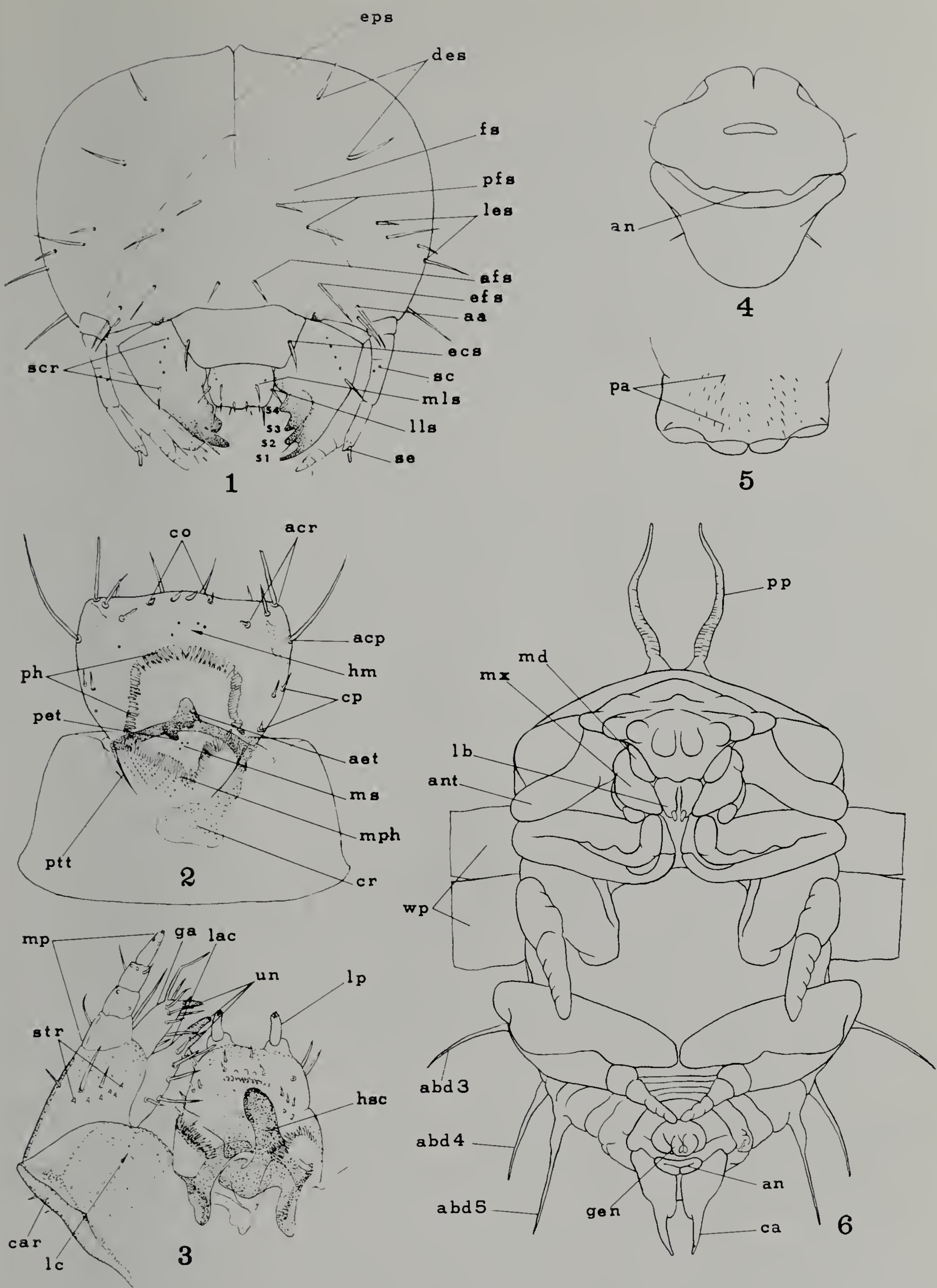
Legs devoid of claws, tarsus bearing a terminal papilla which is surrounded basally by four to six setae and which bears two setae terminally. Legs three-segmented.

Raster with palidia (pa) consisting of two longitudinal, monostichous rows of blunt setae only slightly larger than other setae, which are scattered sparsely in between and on both sides of palidia on venter of tenth abdominal segment.

Anal slit (an) transverse and of a peculiar shape, with two angulations on the ventral lip; a long, curved transverse depression dorsal to anal slit and a short elongate-oval transverse depression in center of ventral area; ventral border with three lobes, of which the median is cleft.

→

Symbols: aa—Setae of anterior frontal angle. abd 3-5—Appendages of abdominal segments 3-5. acp—Setae of acanthopariae. acr—Setae of acropariae. aet—Anterior epitorma. afs—Anterior frontal setae. an—Anal slit. ant—Antenna. ca—Caudal appendage. car—Cardo. co—Setae of corypha. cp—Setae of chaetopariae. cr—Crepis. des—Dorsoepicranial setae. ecs—Exterior clypeal seta. efs—Exterior frontal setae. els—Exterior labral seta. eps—Epicranial suture. fs—Frontal suture. ga—Galea. gen—Developing genitalia. hm—Haptomerum. hsc—Hypopharyngeal sclerite (=oncylus). lac—Lacinia. lb—Labium. lc—Labacoria. lls—Lateral labral seta. lp—Labial palpus. md—Mandible. mls—Median labral seta. mp—Maxilliary palpus. Mph—Mesophoba. ms—Macrosensilla of haptolachus. mx—Maxilla. pa—Palidium of raster. pet—Posterior epitorma. pfs—Posterior frontal seta. ph—Phobae. pp—Pronotal prominences. ptt—Pternotorma. S1-4—Scissorial teeth of mandible. sc—Sensilla coeloconica. scr—Scrobis. se—Sensory cone of antenna. str—Stridulatory teeth of stipes. un—Unci. wp—Wing pads.



FIGURES 1-6. Larva and pupa of *Canthochilum histeroides* (Harold). 1—Head of larva, anterior view. 2—Epipharynx of larva. 3—Left maxilla and labium of larva, anterior view. 4—Anal area of larva with ventral side up. 5—Venter of tenth abdominal segment of larva. 6—Pupa, with wing pads cut off, ventral view.

Description of Pupa
(Fig. 6)

In view of the absence of a systematic basis in the literature for discussing pupal characters in the Scarabaeidae, it seems best at this time to confine the description of the pupa to a presentation of the illustration (fig. 6). Attention is called merely to the long filaments which are located as follows: two approximated median pronotal projections (pp), a pair of lateral filamentous projections issuing from each tergum of abdominal segments 3, 4, and 5 (abd 3, 4, 5) and a pair of terminal caudal filaments (ca) issuing from the anal lobes. Total length of the pupa (including caudal filaments) is 3.51-4.54 mm.

Discussion

Our knowledge of scarab larvae, although advancing, is still very fragmentary. In the Canthonina, only two other species have been properly described, to my knowledge: *Canthon pilularius* (L.), described by Hayes (1930) and Ritcher (1945), and *Deltochilum gibbosum* (F.), described by Howden and Ritcher (1952). The larva of *Deltochilum brasiliense* Laporte has been described by three European authors, but for reasons previously mentioned their descriptions are not usable.

The larva of *Canthochilum histeroides,* described above, differs in the following respects from both *Canthon pilularius* and *Deltochilum gibbosum:* A distinct wart is present on the dorsum of the third abdominal segment (as in *Onthophagus,* according to Ritcher (1945)), the processes of the prothoracic shield are absent (as in *Onthophagus* and *Ateuchus*), the chaetopariae have only two or three bristles and the mesophoba is dextrally polystichous (both as in *Copris, Onthophagus,* and *Ateuchus*), the tormae are asymmetrical with the right pternotorma nearly absent (as in *Ateuchus*), and the palidia are monostichous (as in *Ateuchus*). It further differs from *Canthon* in that the stridulatory area of the maxilla has far fewer teeth, the uncus of the lacinia has a proximal tooth, the median anal lobe is cleft, and the tarsus has two terminal setae. In the last four respects *Canthochilum* resembles *Deltochilum,* so we may consider the larva of this genus to be somewhat closer to that of *Deltochilum* than to that of *Canthon* (without being really close to either). It is interesting to note that Chapin (1934) observed a number of adult similarities between *Deltochilum* and *Canthochilum* when he was describing the latter, and this undoubtedly prompted his choice of a generic name.

The larva here described agrees with Ritcher's (1945) characterization of scarabaeine (=coprine) larvae in all but two respects: the scissorial areas of both mandibles have S1 and S2 separate, and the legs are three-segmented, the femur and tibiotarsus articulating freely. Both conditions appear to be more primitive than what we see in other scarabaeine larvae. However, there seems to be some confusion about the exact number of leg segments in different genera: Paulian (1945), in his key to scarab larvae, distinguishes between *Copris* and *Onitis* on one hand, and *Oniticellus* and *Onthophagus* on the other, by stating that the former pair of genera have the "pattes triarticulées"; and Oberholzer (1958), in describing the larva of *Onitis caffer* Boheman, states that the leg is two-segmented, the trochanter, femur, and tibiotarsus being fused. In any case, the leg of *Canthochilum* is quite clearly three-segmented. The larva of *Canthochilum* shares isolated characters with no less than five unrelated genera of Scarabeinae and shows two unique primitive characters. This indicates that *Canthochilum* may be in a key position in larval phylogeny. The primitive nature of the smaller Canthonina has long been recognized by students of the coprophages, and the need for larval studies has been expressed by Paulian (1945) in reference to the Canthonina and "Panelini."

With regard to the pupa, the prominent filaments merit some discussion. It has been known for some time that the pupae of Scarabaeinae are characterized by the presence of protuberances, at least on the abdomen, and that these serve to isolate the pupa from all direct contact with the dung or earth walls of the brood ball (Paulian, 1949, p. 1024). The filaments of *Canthochilum* are in exactly the same location as the bumps on the pupa of *Deltochilum brasiliense* Castelnau, for instance, as illustrated in von Lengerken (1955), and may be considered to be extensions of these bumps. In no other scarabaeine pupa yet described, however, are these protuberances filamentous. In the Aphodiinae, the caudal projections are filamentous (Paulian, 1945, and Jerath, 1960, both citing Gardner) and this is supposed to distinguish aphodiine pupae from all other scarabs.

A survey of the shape and location of pupal protuberances and stigmata in the Scarabaeinae will form the subject of a separate study.

Literature Cited

Chapin, E. A.
1934. A new genus and species of dung-inhabiting Scarabaeidae from Puerto Rico, with notes on the Coprinae of the Greater Antilles (Coleoptera). Proc. Biol. Soc. Washington 47:99-102.

Hayes W. P.
1930. Morphology, taxonomy, and biology of larval Scarabaeidae. Illinois Biol. Monogr. 12(2):1-119.

Howden, H. F., and P. O. Ritcher
1952. Biology of *Deltochilum gibbosum* (Fab.) with a description of the larva. Coleopt. Bull. 6(4):53-57.

Jerath, M. L.
1960. Notes on larvae of nine genera of Aphodiinae in the United States (Coleoptera: Scarabaeidae). Proc. United States Nat. Mus. 111:43-94.

Landin, B.-O.
1961. Ecological studies on dung-beetles (Col. Scarabaeidae). Opusc. Entomol. Suppl. 19:1-228.

Lengerken, H. von
1955. Die Brutbirnen von *Deltochilum* (Coleopt. Lamellicornia). Wiss. Z. Univ. Halle-Wittenberg, Math.-Nat. 4(5):933-940.

Oberholzer, J. J.
1958. A description of the third stage larva of *Onitis caffer* Bohem. (Copridae: Col.) with notes on its biology. South African J. Agr. Sci. 1(4):415-422.
1959. A morphological study of some South African Lamellicorn larvae. I—Descriptions of the third instar larvae. II—Comparative morphology. South African J. Agr. Sci. 2(1):41-88.

Paulian, R.
1945. Coléoptères scarabéides de l'Indochine, 1ère partie. Faune de l'Empire Français, III. Libr. Larose, Paris, 227 pp., 1 map.
1949. Deuxième sous-ordre.—Haplogastra, pp. 990-1026. *In* Pierre-P. Grassé [ed.], Traité de Zoologie, Vol. 9, Masson et Cie., Paris.

Ritcher, P. O.
1945. Coprinae of Eastern North America, with descriptions of larvae and keys to genera and species (Coleoptera: Scarabaeidae). Kentucky Agr. Exp. Sta. Bull. 477, pp. 1-23.

BOOK REVIEW

THE CHRYSOMELIDAE (COLEOPTERA) OF CHINA AND KOREA, PART 2. By J. L. Gressitt and S. Kimoto. B. P. Bishop Museum, Honolulu, pp. 300-1026, figs. 78-284 (incl. 1 color plate). 1963. ($10.00.)

This large volume completes the taxonomic and distributional study of known kinds of leaf beetles occurring in the Chinese area, spanning portions of both the Oriental and Palearctic regions. The Palaearctic elements represented include the Manchurian and the Central Asian subregions. Many leaf beetles of Taiwan are not included in this study, because they are being separately monographed by Professor Chûjô.

Part 1 (in 1961) dealt with 17 subfamilies of leaf beetles, but only five are covered here. These are Chrysomelinae (191 species), Galerucinae (531 spp), Alticinae (307 spp), Hispinae (116 spp), and Cassidinae (96 spp). For each species, there is a complete list of synonyms and a summary of the known geographical and ecological distributions. There are excellent keys for the separation of all known Chinese genera and species, dozens of genitalic drawings, and hundreds of beautiful illustrations of adults, larvae, and pupae. In all, 175 new species are described in Part 2, in addition to the 68 already described in Part 1. The beetles treated are from all parts of China, but material from the southern regions predominates.

The Summary includes brief tabulations of the geographical distribution of all subfamilies, genera, species, and subspecies, and clarifies many details concerning geographic place-names that might otherwise be confusing to foreign entomologists. The extensive Index deserves special mention also, because it specifies which names are synonyms, which are new species, and, whenever a species name occurs more than once, what are the generic affiliations of each citation.

Throughout the book meticulous attention has been devoted to the detailed locality records, dates, collector references, and indications of present deposition of the specimens cited.

This remarkably thorough monograph should be in the library of every serious entomologist and will be especially essential for active coleopterists. The extensive distribution of many of the genera treated here will often permit practical use of the keys by persons studying leaf beetles in regions rather remote from China. It is a pleasure to praise this worthy addition to entomological literature, and it is hoped that the interest and favorable response of our colleagues will encourage additional accomplishments of this monumental nature in the future!—J. Gordon Edwards, San Jose State College, San Jose, Calif.

Ricksecker often tethered female beetles, like *Prionus,* to a fence with a silk thread in order to capture the males which were thus attracted.—Essig, 1931, A History of Entomology.

TEXAMAUROPS, A NEW GENUS OF PSELAPHIDS FROM CAVES IN CENTRAL TEXAS (COLEOPTERA: PSELAPHIDAE)

By THOMAS C. BARR, JR.[1, 3] AND HARRISON R. STEEVES, JR.[2, 3]

The cavernicolous pselaphids of the United States are represented by several species of *Batrisodes* and *Batriasymmodes* (Batrisini, Batrisina), by a few species of *Bythinopsis* and *Machaerites* (Bythinini), by the remarkable *Speleobama vana* (Speleobamini), and by three species of *Arianops* (Batrisini, Amauropsina) (Park, 1960). Even with the *Arianops,* known from single collections from one cave each in Alabama, Tennessee, and Virginia, the known American cave fauna apparently does not equal the European cave fauna (cf. Jeannel, 1943, 1950) in the proliferation of cave amauropsines. The discovery of the amauropsine genus described in the present paper is thus of special biospeleological interest. Its presence in Texas, from which only one species of cave pselaphid has been described *(Batrisodes schneiderensis* Park, 1960), is also noteworthy. The rich fauna of the numerous caves along the Balcones fault zone in central Texas is still poorly known. In addition to a few undescribed *Batrisodes,* the cave beetle fauna of this region includes several troglobitic species of the carabid subgenus *Rhadine* (Barr, 1960) and occasional troglophilic species of *Tachys* (Carabidae) and Ptomaphagus (Catopidae).

Texamaurops Barr and Steeves, NEW GENUS

Batrisini having the following combination of structural features. Eyes absent, their site represented by a rounded knob. Vertexal foveae well developed, perforate. Antennae 11-segmented, simple. Maxillary palpi 4-segmented, simple; first segment minute; second segment slender and pedunculate; third segment as wide as apex of second segment, ¼ longer than wide; fourth (distal) segment 1⅔ times the length of second segment, acute-subfusiform, widest at middle, bearing a minute palpal cone. Pronotum truncate-oboval with 3 perforate, antebasal foveae. Prosternum without a median carina; mesosternum with median and lateral foveae; metasternum with a deep, antebasal, median impression. Elytron with 2 distinct, perforate sub-basal foveae and a single, perforate, subhumeral fovea on flank; sutural stria entire; metathoracic wings absent. Five tergites visible, the first only slightly longer than second; marginal carinae incomplete; seven sternites visible in female, the first very short and the sixth the longest. Legs with brachysceline articulation, trochanters short and femora obliquely placed so that femur and coxa are subcontiguous. Tarsi 3-segmented, first segment very short and last 2 segments relatively long; protarsi with second and third segments subequal, meso- and metatarsi with second segment longer than third; third segments with single claw and minute accessory seta.

Type-species: *Texamaurops reddelli* Barr and Steeves, new species.

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[3] This investigation was supported, in part, by a grant from the National Science Foundation (G-18765). We wish to thank Dr. J. G. Rozen, Jr., American Museum of Natural History, for loan of *Amaurops, Paramaurops,* and *Amauropidius;* Professor Orlando Park, Northwestern University, for critical reading of the manuscript; and Mr. James R. Reddell, Austin, Texas for contribution of the material described in this paper.

The amauropsines of the United States may be distinguished as follows:

1. Elytron simple, without foveae at base or flank; eastern United States------(ARIANOPS) 2
   Elytron with 2 sub-basal, perforate foveae and a single, subhumeral, perforate fovea on flank; known only from Texas------------------TEXAMAUROPS new genus
2. Pronotum with a distinct, median fovea near the base; endogenous in Appalachian Mountains -----------------------------Subgenus ARIANOPS s. str. Brendel 1893
   Pronotum without a median fovea, with or without small, lateral, sub-basal foveae; caves of Virginia, Tennessee, and Alabama---------Subgenus ARISPELEOPS Park 1951

From European amauropsines, *Texamaurops* is most conspicuously differentiated by the elytral foveae and the comparatively shorter first visible abdominal tergite. In the elongation of the appendages, *Texamaurops* resembles the troglobitic species of *Amaurops (Troglamaurops)* which inhabit caves north and east of the Adriatic Sea.

Texamaurops reddelli Barr and Steeves, NEW SPECIES
(Fig. 1)

Type: Female (Chicago Museum of Natural History), total length 2.72 mm., head 0.63 mm. long × 0.54 mm. wide, pronotum 0.57 mm. long × 0.56 mm. wide, elytra 0.83 mm. long × 0.83 mm. combined width, abdomen 0.86 mm. long × 0.66 mm. wide, antenna 1.80 mm. long, metafemur 1.25 mm. long.

Color reddish-brown, shining; pubescence pale, moderately abundant and semiappressed; general body surface sparsely and weakly punctulate.

Head 6/7 as wide as long (width measured across the ocular knobs and length measured from anterior clypeal margin to occiput); eyes absent, replaced on each side by a short, blunt, tuberculate knob; vertexal foveae prominent, perforate, separated by a well-developed median vertexal carina which extends from the cervicum to just anterior of the level of the vertexal foveae; interfoveal sulcoid impression arcuate and extending anteriorly to the level of the ocular knobs; lateral vertexal carinae as well-developed as median carina, their anterior termini slightly anterior to that of median carina; declivity of face simple and shallowly concave; clypeal margin bluntly rounded; labral margin broadly concave; mandibles strong, left crossed dorsal to right; maxillary palpi as described for the genus; genae and ocular field rugose-tuberculate dorsad to the lateral vertexal carinae; genal beard conspicuous and well-developed; ventral surface of head heavily pubescent and rather coarsely punctulate, with a feeble but distinct mid-gular carina and a deep median basal fovea.

Antennae 11-segmented, simple; scape crescentic and thickened; II-VII elongate, VIII shorter than VII or IX; club feebly developed except XI, which is conspicuously enlarged, longer than IX and X together, with a pedunculate base and narrowly rounded apex. Segments in length ratio as follows, beginning with the scape: 11:8: 11:12:14:12:12:9:12:13:30.

Pronotum oboval with subtruncate apex and base, as long as wide and approximately 1/10 shorter than head; widest at the middle; disc with the following sculptural features: (1) a deep, imperforate median fovea and a deep, perforate lateral fovea on each side, all three foveae at basal 1/4; (2) broad, shallow grooves extending anteriorly from the lateral foveae, delimiting a median, domed field on the disc; (3) posterolateral to the median fovea there is on each side a short, acute spine, from which a feebly raised, tuberculate ridge extends forward to the middle of the disc; (4) a low median carina extending from the median fovea to the base; (5) a small fovea on each side near the base, and one or two minute, punctiform foveae medial to these; (6) a longitudinal median sulcus from median fovea almost attaining apical margin.

Elytra with combined width equal to median length and 1 4/9 as long as pronotum; humeri unarmed, long and sloping; two conspicuous, perforate foveae at the inner base of each elytron; sutural stria entire; no discal impressions; disc with long, semiappressed, sparsely distributed pubescence; disc microsculpture finely reticulo-

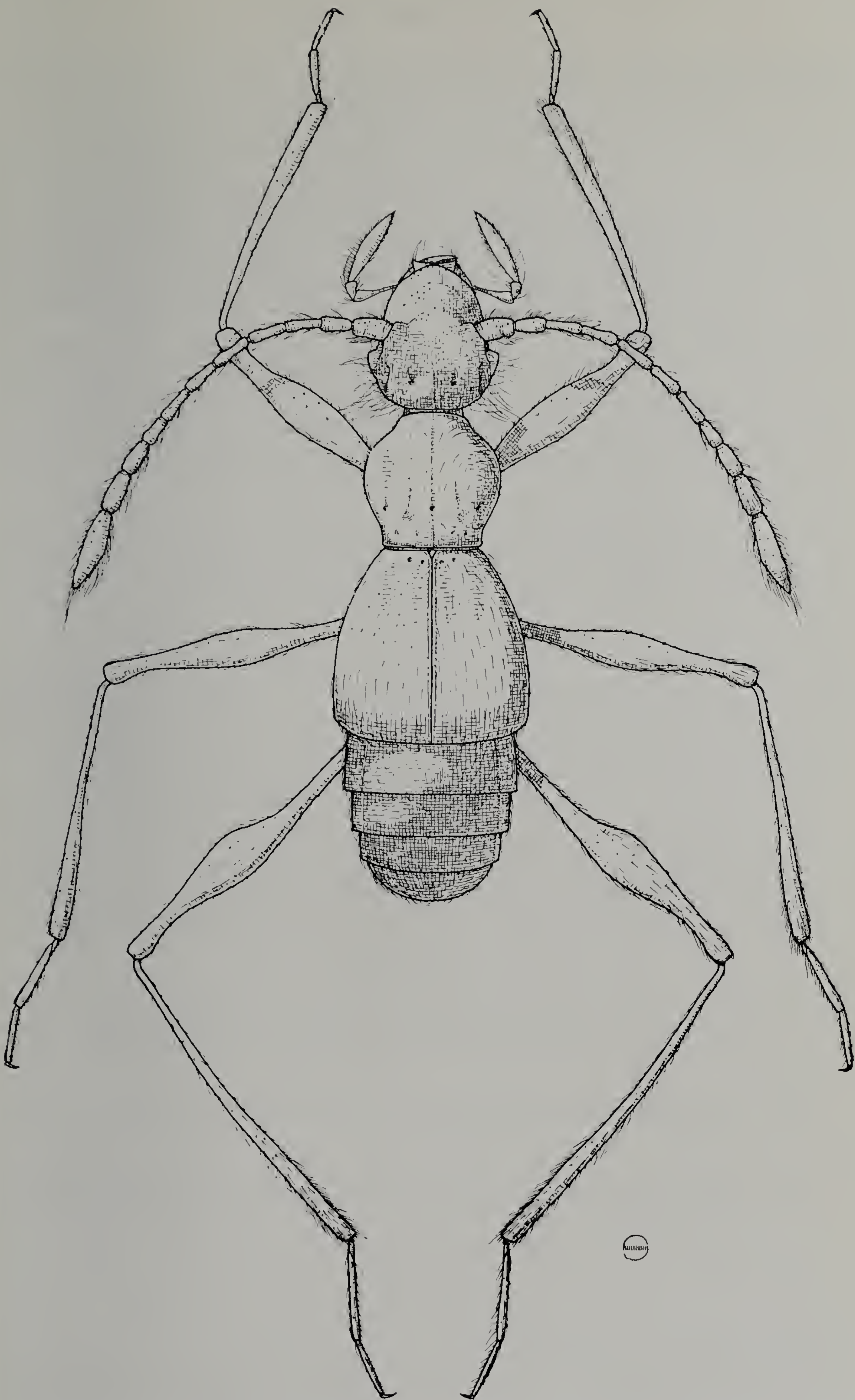

FIGURE 1—*Texamaurops reddelli,* new genus and species. Holotype female, Kretschmarr Cave, Texas.

punctulate; flank with a single, perforate subhumeral fovea and an impressed line parallel to the lateral margin. Metathoracic wings absent.

Abdomen with five visible tergites in median length ratio 6:5:3:5:3; first tergite with marginal carina in basal 2/3; tergites 1-4 with a finely raised external stria on each side; external stria of first tergite parallel to margin (from which it is apically separated by about 1/17 the width of the tergite) in apical 1/3, then medially divergent, entire; fourth tergite with a vestigial marginal carina very close to the base of the external stria. Seven visible sternites in median length ratios of 1:3:2:2:2:5:3; fifth sternite with a lateral, arcuate, submarginal sulcus delimiting the ventral margin of an elongate, triangular sclerite which is dorsally bounded by the vestigial marginal carina and the external stria of the fourth tergite; sixth sternite with simple posterior margin.

Prosternum without a median carina but with a deep antecoxal fovea on each side and with a blunt ridge extending from the lateral margin of each coxal cavity anterodorsally to the apical margin of the prosternum. Mesosternum with prepectoid area strongly alutaceous, with a deep median fovea and a deep lateral fovea on either side; mesocoxal cavities confluent. Metasternum strongly convex, with a deep, V-shaped median impression at the base and a small fovea near the posterior margin of each mesocoxal cavity.

Legs very long and slender, simple, femora spindleshaped; pro- and metafemora widest at the middle, mesofemora widest at about basal 3/5; metafemur a little more than half the total body length; tarsi 3-segmented, first segment small, distal two elongate, second as long as third in protarsi, longer than third in meso- and metatarsi; third segments with a tarsal claw and minute accessory seta.

Male unknown.

Described from a single female, the type, deposited in the Chicago Museum of Natural History. This specimen was collected by James R. Reddell and David McKenzie in Kretschmarr Cave, 15 miles northwest of Austin, Travis Co., Texas, on March 2, 1963. It was found under a rock in the second room of the cave, about 30 feet from the entrance.

A second female, collected in Coffin Cave, 10 miles northwest of Georgetown, Williamson Co., Texas, on Nov. 3, 1963, by James R. Reddell, is apparently conspecific with the holotype, but we have not made it a paratype. It was "found several hundred feet from the entrance crawling among small rocks," according to Reddell, in a personal communication.

Literature Cited

Barr, T. C., Jr.
1960. The cavernicolous beetles of the subgenus *Rhadine*, genus *Agonum* (Coleoptera: Carabidae). American Midl. Nat., 64(1): 45-65.

Jeannel, R.
1943. Les fossiles vivants des cavernes. Paris: Gallimard. 321 pp.
1950. Faune de France, 53: Coléoptères psélaphides. Paris: P. Lechevalier. 421 pp.

Park, O.
1960. Cavernicolous pselaphid beetles of the United States. American Midl. Nat., 64(1):66-104.

BEETLE TALK

Agustine Carmenes, Av. Cral. Flores 991, Las Piedras (Dpto. Canelones), Uruguay, would like to exchange specimens of Coleoptera.

Is Orlando Park getting ready to revise the Pselaphidae of Baker Street? He has just published a book called, "Sherlock Holmes, Esq. and John H. Watson, M.D.: An Encyclopaedia of Their Affairs."

NORTH AMERICAN APION: THE APION SPRETISSIMUM GROUP (COLEOPTERA: CURCULIONIDAE)[1]

By D. G. KISSINGER[2]

This paper is a continuation of the revision of the 260 species of *Apion* occurring in North America. Kissinger (1959a) presents a key to the 29 species groups of *Apion* known from this region. Explanation of abbreviations and measurements is given by Kissinger (1957, 1959b).

I am indebted to Mr. R. T. Thompson for a loan of specimens studied by D. Sharp and H. Wagner.

Seven species are known to belong to the *spretissimum* group, which ranges from southeastern United States to southern Brazil. Only one species, *Apion aculeatum* Fall, was reared; it was from the blooms of *Mimosa pigra.*

The major distinctive structural characters of the group are the secondary sexual modifications of the tarsi of the male in which the first segment of mesotarsus is produced into a spine on the posterior medial surface, the oblique dorsal anterior margin of the antennal scrobe, and the acute basal lateral expansion of the prothorax. Other characters are as follows:

Body minute, less than 1.75 mm. long; integument and legs black (*aculeatum* more or less piceous with front legs brownish yellow); sexual dimorphism of beak quite marked; antennae inserted close to eyes; frons narrow with two rows of coarse punctures; eyes moderately prominent; apex of prothorax distinctly narrower than base and noticeably constricted; femur and tarsus moderately slender; third tarsal segment strongly bilobed; claw with acute basal tooth.

The species in this group are rather difficult to distinguish from each other. As can be seen in the accompanying key, some of the species are very distinctive. But for the most part, it is necessary to rely upon characters that either appear to be weak, as the comparison of the width of the frons to the width of the dorsal tip of the beak, or else are hard to state concisely in unequivocal terms, such as the nature of the sculpturing of the integument or vestiture. Comparatively little material of this group has been available for study with the exception of *A. spretissimum* Sharp, which is abundant in Mexico.

KEY TO SPECIES OF THE SPRETISSIMUM GROUP[3]

1. Males, segment 1 of mesotarsus with a spine on inner margin ------------------ 2
   Females, segment 1 of mesotarsus without spine ------------------------------ 7
2. Scales on elytral interval 2 uniserial or nearly so (Fig. 5), whitish; legs piceous or black -- 3
   Scales on elytral interval 2 biserial (Fig. 4), yellowish; front tibia dark brownish yellow; frons narrower than dorsal tip of beak; beak one-fourth longer than prothorax -- ACULEATUM Fall

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[1] Study aided by grant G 19,600 from the National Science Foundation.

[2] Atlantic Union College, South Lancaster, Mass.

[3] *Apion parvulum* Gerstaecker is not included in the key but is mentioned in the discussion under *A. spretissimum* Sharp.

3. Last visible sternite flat ---------- 4
Last visible sternite impressed apically, with tuft of cilia on lateral border of impression (Fig. 8); frons not narrower than dorsal tip of beak; beak one-fourth longer than prothorax ---------- PRAEDITUM Sharp
4. Frons narrower than dorsal tip of beak ---------- 5
Frons not narrower than dorsal tip of beak ---------- 6
5. Spine on segment 1 of mesotarsus blunt apically; beak at middle with scales prominent, 0.03 mm. or more long (Fig. 3) ---------- FIBULIPES Fall
Spine on segment 1 of mesotarsus acute; beak at middle with minute scales not more than 0.02 mm. long (Fig. 2) ---------- PERSIMILE Fall
6. Scales on frons narrow, hairlike (Fig. 7); length 1.40 to 1.75 mm. ---- DISSIMILIPES Sharp
Scales on frons coarse, quite broad (Fig. 6); length 1.10 to 1.50 mm. SPRETISSIMUM Sharp
7(1). Scales on elytral interval 2 uniserial or nearly so, whitish ---------- 8
Scales on elytral interval 2 biserial, yellowish; beak as long as head and prothorax combined, curved, sculptured beyond middle ---------- ACULEATUM Fall
8. Beak beyond middle with obvious punctures ---------- 9
Beak slightly beyond insertion of antenna nearly smooth, with sparse, minute punctules, very strongly curved and much shorter than head and prothorax combined ---------- SPRETISSIMUM Sharp
9. Beak obviously shorter than head and prothorax combined; antenna inserted at distance from eye less than width of frons ---------- 10
Beak equal to or longer than head and prothorax combined; antenna inserted at distance from eye greater than width of frons ---------- 11
10. Length 1.60 to 1.75 mm.; sutural interval with biserial scales; Arizona and western Mexico ---------- FIBULIPES Fall
Length 1.50 to 1.65 mm.; sutural interval with uniserial scales; southeastern U. S. to eastern Texas ---------- PERSIMILE Fall
11. Pronotum with deep puncutres and deep basal forea, in side view dorsal surface of prothorax quite strongly arcuate; in dorsal view apical third of beak nearly parallel-sided and in apical half with coarse, elongate punctures ------ DISSIMILPES Sharp
Pronotum with fine, shallow punctures and obsolete basal forea, in side view dorsal surfaces of prothorax slightly arcuate; in dorsal view apical third of beak slightly expanded toward tip and in apical half with fine, sparse punctures -- PRAEDITUM Sharp

Apion aculeatum Fall

FIG. 4

Apion aculeatum Fall, 1898, Trans. American Ent. Soc. 25:171. [Lectotype: male, Brownsville, Texas, VI, Wickham, in Fall Colln., M.C.Z. no. 25070.]

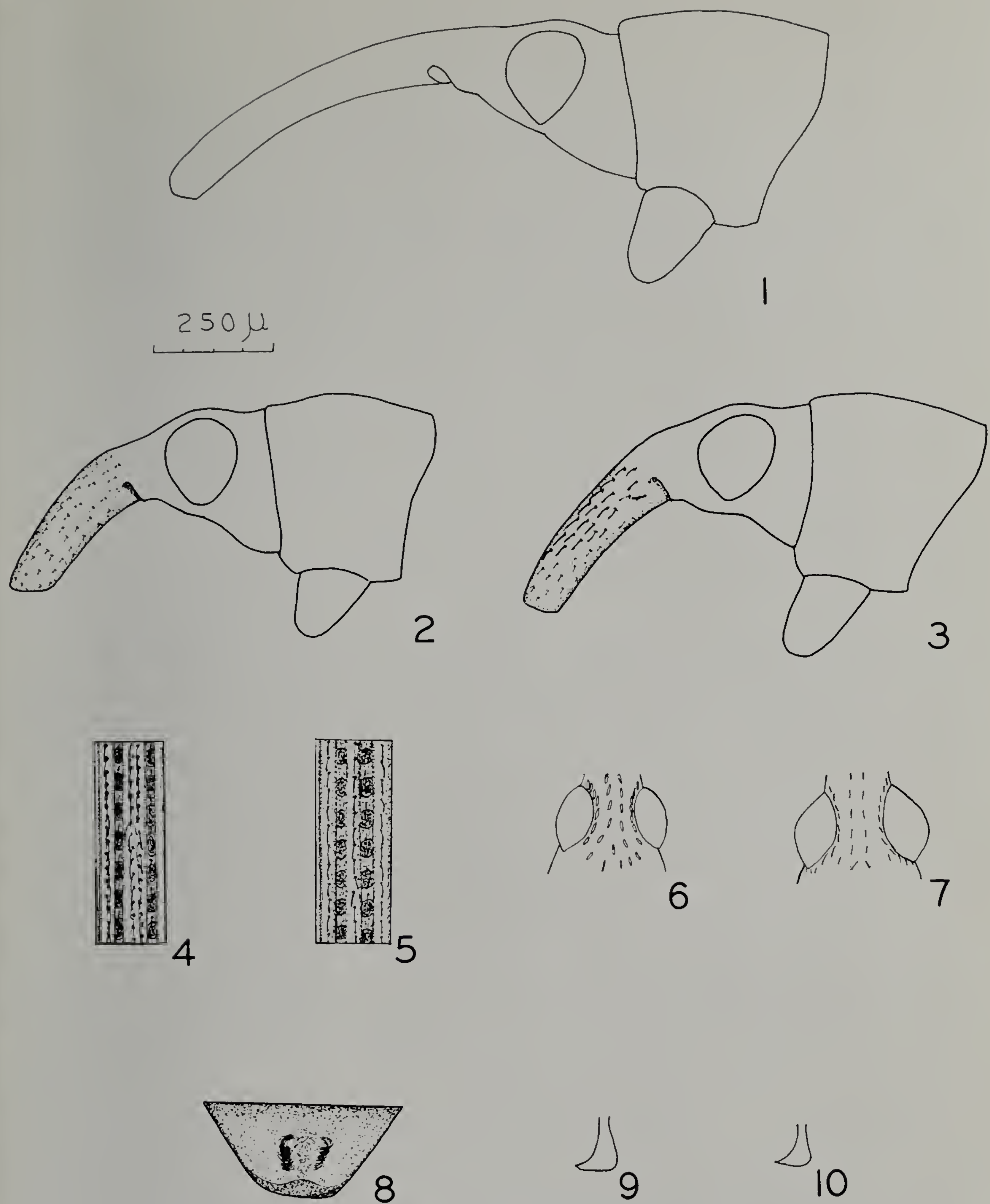
This species is easily distinguished from the other members of the group by the biserial yellowish scales on elytral intervals 2, 4, and 6.

I hereby designate the lectotype of this species as the male specimen in the Fall Collection labeled, "Brownsville, Tex., VI, Wickham, M.C.Z. 25070." A lectoparatype is in the U. S. National Museum with the same data.

In the U. S. National Museum is material from Brownsville, Texas and Matamoros, Mexico, reared from the bloom of *Mimosa pigra*.

Length: 1.43 to 1.50 mm.; width: 0.62 to 0.75 mm.

Distribution: UNITED STATES: TEXAS: Brownsville, 22 April, 1942, Bibby, ex blooms of *Mimosa pigra* (USNM). *MEXICO:* TAMAULIPAS: Matamoros, 31 March, 1942, Bibby, ex blooms of *Mimosa pigra* (USNM). VERACRUZ: "Coyame," Lago de Catemaco, June, 1954, D. G. Kissinger (DGK).



Note: The scale of enlargement is the same for the following 10 figures.

FIGURE 1—Lateral view of head and prothorax of female *Apion praeditum* Sharp. FIGURE 2—Same of male *Apion persimile* Fall. FIGURE 3— Same of male *Apion fibulipes* Fall. FIGURE 4—Diagram of scales on intervals 1 and 2 of *Apion aculeatum* Fall, suture is adjacent to left margin. FIGURE 5—Same of *Apion spretissimum* Sharp. FIGURE 6—Diagram of scales on frons of male *Apion spretissimum* Sharp. FIGURE 7—Same of male *Apion dissimilipes* Sharp. FIGURE 8—Diagram of fifth sternite of male *Apion praeditum* Sharp. FIGURE 9—Diagram of spine on first tarsal segment of middle tarsus of male *Apion fibulipes* Fall. FIGURE 10—Same of male *Apion persimile* Fall.

Apion praeditum Sharp

Figs. 1 and 8

Apion praeditum Sharp, 1890, Biol. Centrali-Americana, Insecta, Coleoptera, 4(3):48. [Type locality here restricted to Aceituno, Guatemala (BMNH)].

Both sexes of this species are quite distinct as can be seen from the characters in the key. The male is quite similar to the male of *spretissimum* but has a comparatively longer beak and finer scales on the frons. The value and uniqueness of the modification of the fifth sternite of the male is clouded by the fact that a male from La Marquesa, Mexico, does not show this modification; otherwise it is nearly identical to a male *praeditum* collected at the same time and place. Three females labelled "Mexico City, Tepeaca, Jalapa Highway, 310 kls" have the beak strongly reflexed above antennal insertion and more arcuate apically, and in dorsal view the beak is not expanded apically; a male collected at the same time shows the usual *praeditum* male fifth sternite modification.

The female is quite similar to that of *dissimilipes* in having a comparatively long beak. In addition to characters in the key, the following may aid in separating females of the two species: *praeditum* has antenna inserted slightly closer to eye at distance about one-fourth greater than width of frons, the eyes are less prominent, laterally body has shorter and slightly coarser scales, and scales on pronotum are shorter 0.02-0.03 mm. long and may be yellow or white; *dissimilipes* has antenna inserted at distance from eye one-half or more than width of frons, beak more curved, the eyes are more prominent, laterally the scales on the body are longer and finer, and scales on pronotum are about 0.03-0.04 mm. long and are white.

Length: 1.37 to 1.87 mm.; width: 0.64 to 0.87 mm.

Distribution: MEXICO: JALISCO: 8 mi. E. La. Venta de Mochitiltic, 20 July, 1955, Meadow grass, R. Selander. MEXICO: 1 mi. W. La Marquesa, 8 December, 1948, E. S. Ross (CAS). MICHOACAN: Ciudad Hidalgo, 14 July, 1955, on grass, R. Selander. MORELOS: Cuernavaca (MCZ). NAYARIT: 8 mi SW Santiago turnoff, 21 July, 1955, on grass, R. Selander. PUEBLO: Huauchinango, June, 1957, D. G. Kissinger (DGK). SAN LUIS POTOSI: "Huichihuayan," 25 September, 1938, L. J. Lipovsky (U.K.) VERACRUZ: Cordoba (CAS). DISTRITO FEDERAL: Mexico City, Tepeaca, Jalopa Highway, 310 Kls., Altitude 2200 M., Coniferous Forest (undergrowth), C. F. Dowling (BMNH). *GUATEMALA:* Aceituno (BMNH), Coban (BMNH), Duenas (BMNH), Guatemala City (CAS, BMNH). *NICARAGUA:* Chontales (BMNH).

Apion fibulipes Fall

Figs. 3 and 9

Apion fibulipes Fall, 1898, Trans. American Ent. Soc. 25:172, pl. 5, fig. 18 [Lectotype: male, La Chuparosa, Baja California, Fall Colln., M. C. Z. no. 25094].

I hereby designate the lectotype of this species as the male in Fall's

Collection labeled "La Chuparosa, M. C. Z. no. 25094." A lectoparatype with the same data is in the California Academy of Sciences.

As noted above this species is very similar to *persimile*. Consult the key for characters that aid in separating the two forms.

Length: 1.62 to 1.75 mm.; width: 0.81 to 0.87 mm.

Distribution: UNITED STATES: ARIZONA: 17 mi. W. Fry (or Sierra Vista), 16 August, 1957, C. W. O'Brien (DGK). *MEXICO:* BAJA CALIFORNIA: "La Chuparosa." SINALOA: Los Mochis, 3 August, 1922 (CAS).

Apion persimile Fall

FIGS. 2 and 10

Apion persimile Fall, 1898, Trans. American Ent. Soc. 25:172, pl. 5, fig. 19 [Lectotype: female, not labeled as to specific locality, probably from "South Atlantic Coast region."]

Lectotype hereby designated as female in Fall's collection labeled "Zimmerman Coll., M. C. Z. no. 25115." Lectoparatypes in J. L. LeConte Coll., M. C. Z. no. 394.

As mentioned by Fall in his original description, this species is very close to *fibulipes*. Present information indicates that the two forms are widely separated geographically. In addition to the information in the key, the scales on the sutural interval of *fibulipes* tend to be biserial while in *persimile* they are uniserial.

Length: 1.50 to 1.62 mm.; width: 0.75 to 0.81 mm.

Distribution: FLORIDA: 2 mi. W. Archer, 23 March 1953, H. F. Howden. LOUISIANA: 20 mi. S. E. Franklin, July, 1954, D. G. Kissinger (DGK); Madison Parish, July, 1932, Sweep, C. F. Rainwater (Tex. A.&M.). MISSISSIPPI: Shuqualak, 16 July 1930, R. H. Beamer (UK). TEXAS: Brazoria Co., 7 June, 1957, H. A. Turner (Tex. A.&M.); Houston, 19 June, 1948, J. L. Ward (USNM); San Antonio, 4 July, 1936, W. D. Field. (UK); Wharton Co., 28 June, 20 July, H. R. Burke (Tex. A.&M.).

Apion dissimilipes Sharp

FIG. 7

Apion dissimilipes Sharp, 1890, Biol. Centrali-Americana Insecta, Coleoptera, 4(3):49. [Type locality here restricted to Guatemala City (BMNH).]

While the female is quite distinctive with its long beak, the male is very similar to the male of *A. spretissimum*. See key and discussion under *A. praeditum* for characters distinguishing female of these two species. The following characters to separate males of *dissimilipes* and *spretissimum* supplement those given in the key: *dissimilipes* has the beak more closely and coarsely punctured, the punctures extending closer to the apex, the tip thus not as polished and less shining; the beak appears to be more robust; the scales on the elytral striae are about as coarse as those on the intervals; the mesothorax is clothed with longer, finer scales; and the prothorax in dorsal view is more strongly constricted apically and basally, the middle area generally appearing more prominent; *spretissimum* has the beak more finely sculptured and with a longer apical region smooth and polished; beak seems less robust; the scales on the elytral striae are much finer than those on intervals, especially on sides of elytra; the mesothorax is clothed with coarser scales; and the prothorax in dorsal view is nearly parallel-sided at base and the apical constriction is not as pronounced.

Length: 1.43 to 1.75 mm.; width: 0.68 to 0.84 mm.

Distribution: MEXICO: TABASCO: Teapa, February, H. H. Smith (BMNH). *GUATEMALA:* Guatemala City, Champion, male compared with type by Sharp (BMNH). *PANAMA:* Volcan de Chiriqui, 25-4000 ft., Champion (BMNH). *BRAZIL:* Bahia, C. Darwin (BMNH); Pernambuco (BMNH).

Apion spretissimum Sharp

Figs. 5 and 6

Apion spretissimum Sharp, 1890, Biol. Centrali-Americana, Insecta, Coleoptera, 4(3):48. [Type locality here restricted to Chontales, Nicaragua (BMNH).]

The female of this species is quite distinctive with its short, strongly curved beak, which is smooth and polished in front of the insertion of the antenna; in the basal half the beak may be somewhat alutaceous and with minute, sparse punctures. The male is rather difficult to distinguish from the male of *dissimilipes;* consult key and discussion under *dissimilipes* for characters separating males of these species.

Length: 1.16 to 1.47 mm.; width: 0.56 to 0.68.

Distribution: MEXICO: COAHUILA: Monclova, Dr. Palmer (BMNH). GUERRERO: Amula, 6000 ft., August, H. H. Smith (BMNH); Atoyac, April and May (BMNH). MICHOACAN: 20 mi. E. Morelia, 7 March, 1953, D. G. Kissinger (DGK). MORELOS: Cuernavaca, June (BMNH). PUEBLO: Huauchinango, June, 1954, D. G. Kissinger (DGK). SAN LUIS POTOSI: Tamazunchale, 28 January 1953, D. G. Kissinger (DGK). TABASCO: Teapa, February and March (BMNH). VERACRUZ: Cordoba, 3 February, 1953, June, 1954, D. G. Kissinger (DGK); Jalapa (CAS); Lago de Catemaco, 13 February, 1953, D. G. Kissinger (DGK), "Coyame," June, 1954 (DGK), 20 klm. S. Catemaco, June, 1954 (DGK); Orizaba (CAS); 18 mi. N. San Andres Tuxtla, 6-12 February, 1953, June, 1954, D. G. Kissinger (DGK). *GUATEMALA:* Aceituno (BMNH); Guatemala City (BMNH, CAS); Livingstone (USNM). *BRITISH HONDURAS:* "M-tee district" (Region around Manatee Bar and Manatee River some 20-25 miles south of Belize) (MCZ). *NICARAGUA:* Chontales (BMNH). *COSTA RICA:* Golfito, 30 October (CAS); "Waldeck," on cacao, 9 April, 1936 (USNM). *CANAL ZONE:* Barro Colorado Is, (USNM); "Bohio," 7 April, 1911, H. H. Jennings (USNM); Gatun, 3 April, 1911 (USNM); Summit XII 1946, N. L. H. Krauss (BMNH). *BRAZIL:* Rio de Janeiro, Fry Colln. (BMNH, det. by Wagner as *parvulum* Gerst.)

Four specimens of *Apion parvulum* Gerstaecker (1854) from Brazil were seen which had been determined by the late Hans Wagner, an authority on *Apion*. Two of the specimens, from Rio de Janeiro, are the same as *spretissimum* Sharp. One female, from Bahia, Brazil, according to the label, had been compared with the type of *parvulum*. It differs from *spretissimum* in that the beak is straighter and in side view the beak is wider at the apex than at the middle; also the front legs are paler in color; otherwise the two forms are very similar. The female of *A. spretissimum* has the beak nearly parallel-sided in apical half when viewed from the side; also the front legs are usually piceous but individuals with quite pale legs have been seen. Examination of the type of *parvulum* and of more material from Brazil will be necessary to determine the true relationship of *parvulum* and *spretissimum*.

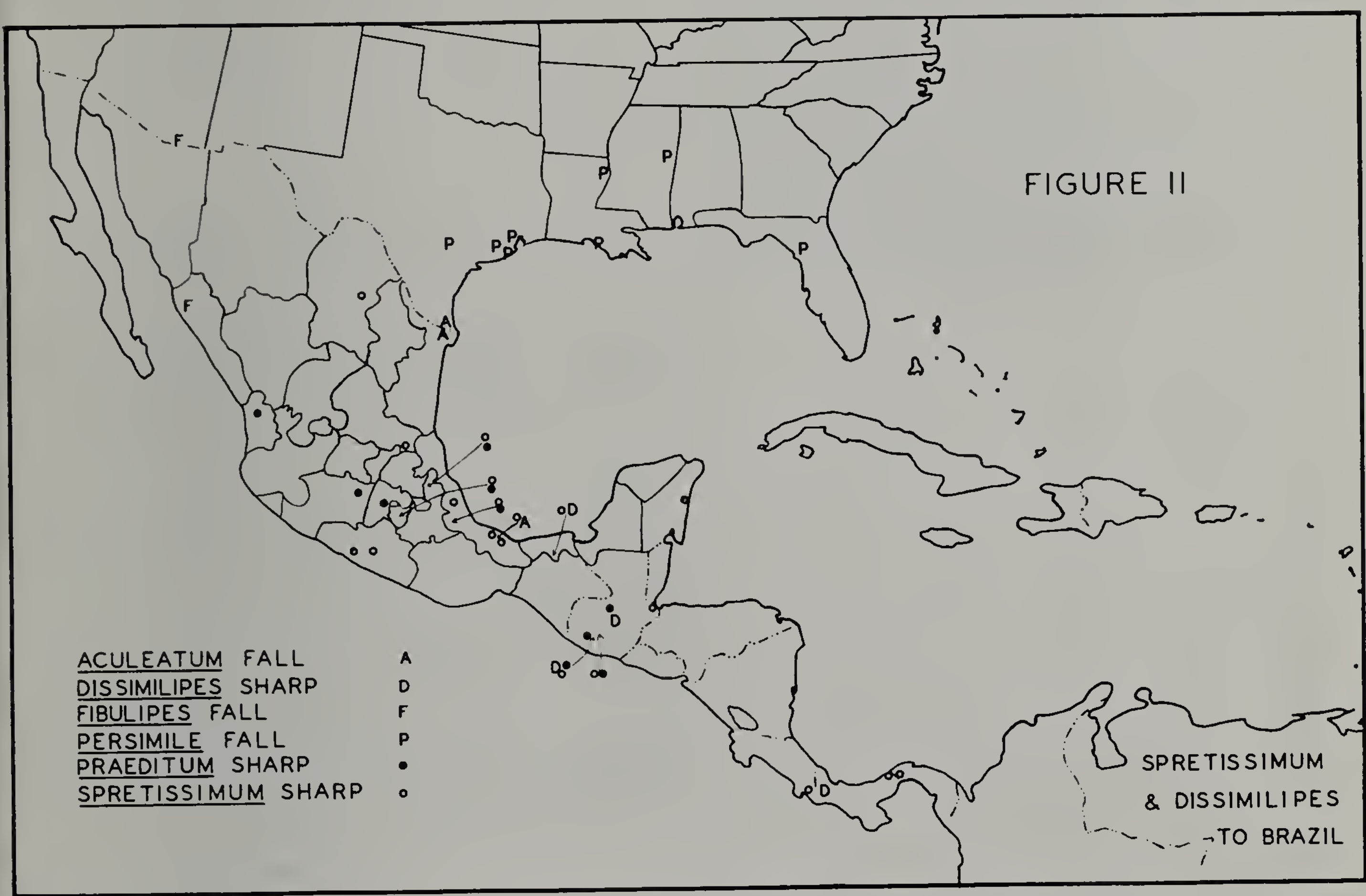


FIGURE 11—Map showing distribution of six members of *Apion spretissimum* Group.

Literature Cited

GERSTAECKER, C. E. A.

1854. Beschreibung neuer arten der Gattung *Apion* Herbst. Stettiner Ent. Zeitung 15:234-261, 265-280.

KISSINGER, D. G.

1957. Studies on North American *Apion* with descriptions of two new species (Curculionidae). Coleopt. Bull. 11:17-24.

1959a. The species groups of *Apion* occurring in North and Central America (Curculionidae). Coleopt. Bull. 13:21-32.

1959b. Revision of the *Apion* subgenus *Trichapion* in the New World (Curculionidae). Proc. United States Nat. Mus. 110:247-389.

GREEN LAMPYRIDS (COLEOPTERA: LAMPYRIDAE)

Green is not an unusual color among insects, but in the Lampyridae apparently only one species, *Aspisoma physonotum* Gorham (Biol. Cent.-Amer., Ins., Coleop., 1885, 3(2):272, pl. 12, fig. 7) has been reported as green. While specimens of this species may have entirely pale green elytra, many have only the lateral borders green. In a collection recently received from Peru were fourteen specimens of a small *Lucidota,* all having some green coloration, ranging from merely a greenish tinge on the pronotum to distinctly green and with a fine green line at the inner edge of the elytral explanate margins and opaque green sutural bead for two-thirds the length from the scutellum. This species is presumably *Lucidota (Leucothrix) albocincta* Pic (L'Échange, 1927, 43:52 hors texte) or closely allied to it, although the green coloration is not referred to in the original description. Accompanying the greenish specimens were seven of a smaller species, only slightly different in appearance, except for the absence of green pigmentation.—FRANK A. MCDERMOTT, *Wilmington, Delaware.*

BEETLE TALK

"The question now arises, since there are differences between adult and larval relations, whether the relationships based on adult characters alone should be used or whether the larval relationships should also be taken into consideration, and if so, how"? So says F. J. Rohlf in an article entitled, "Congruence of larval and adult classifications in *Aedes* (Diptera: Culicidae)," published in Systematic Zoology, Vol. 12, pp. 97-117, 1963. This problem, the lack of congruence, has been hanging fire for a long time, but recently there is a small show of interest in it. As Rohlf says, so too should coleopterists say and think hard on his question. Beetle larvae have been left to specialists on larvae, and coleopterists have been very lax in considering both larvae and adults in their classifications. As a result, if an outsider were to look at most revisions and classifications, he would guess that larvae and adults of beetles are in different orders. Why this situation; why should different stages of the same taxon be handled separately so often? Probably because of custom; the early taxonomists hardly ever mention larvae. So, our task of correlating classifications will be difficult because the backlog of published data is less for larvae than for adults. Even so, the time for correlation is now.

How can larvae help us? In the data-gathering part of making a new classification, the taxonomist searches for new characteristics. Many say they would rather discover a new characteristic in an old taxon than a new taxon. Well, larvae have many characteristics, though they might not always be helpful. We don't ignore incongruent characteristics in adults, so why should we ignore a whole stage of the life cycle just because it might be incongruent? Certatinly the scientific method allows us to weigh data, but it most certainly does not allow us to disregard whole blocks of data.

But, we may ask, are larvae available? Often larvae can not be included in a revision or classification because larvae of the group are unknown. This is not always the case. In the United States a few collections can supply larvae of a few forms. These larvae must be used. And it is probably not wrong to say that a collector is remiss if he fails to collect larvae as well as adults. To neglect larvae in collections or in collecting is to ignore data. And that is the important point, the point to which this argument must always return: rejection of data. When we periodically examine our conscience on our methods of research, we must answer this sore question on ignoring larval data. If we believe that beetle larvae and beetle adults belong to the same order, then we had better begin showing it.—T. J. SPILMAN, *U.S.D.A., Washington, D. C.*